# Does Monetary Policy Help Least Those Who Need It Most?


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QAC Summer 2007



## 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

➢ Effects of monetary policy depend upon relative levels of economic performances of each state

 - Asymmetry

➢ Expansionary and contractionary policy have asymmetric effects on states with relatively fast growth 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 a gauge of an economic performance of the states.

 - Use 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 1969Q1 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, $y_{it}$

 - 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 new measure of monetary shocks by Romer and Romer (2004) for robustness check.

• 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

$$y_{it} = \sum_{j=1}^{p} \alpha_j y_{it-j} + \sum_{k=0}^{q} \beta_k z_{t-k} + \sum_{k=0}^{q} \sum_{j=k+1}^{p+k} \gamma_{jk} (y_{it-j} \cdot z_{t-k}) + \varepsilon_i + \mu_t + \nu_{it} \qquad (1)$$

where:

$y_{it}$ = observations on the endogenous measure of economic activity for state i in time period t,

$\varepsilon_i$ = the composite error term including state fixed effects,

$\mu_t$ = a stochastic time trend

$v_{it}$ = idiosyncratic state-level shocks

- $\gamma_{jk}$ 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:

$$\tilde{y}_{it} = y_{it} - \frac{1}{N} \sum_{i=1}^{N} y_{it}$$

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

$$\tilde{y}_{it} = \sum_{j=1}^{p} \alpha_j \tilde{y}_{it-j} + \sum_{k=0}^{q} \sum_{j=k+1}^{p+k} \gamma_{jk} (\tilde{y}_{it-j} \cdot z_{t-k}) + \tilde{\varepsilon}_i + \tilde{\nu}_{it} \qquad (2)$$

- We use a weighted LSDV (Least Squares Dummy Variable) estimator to account for

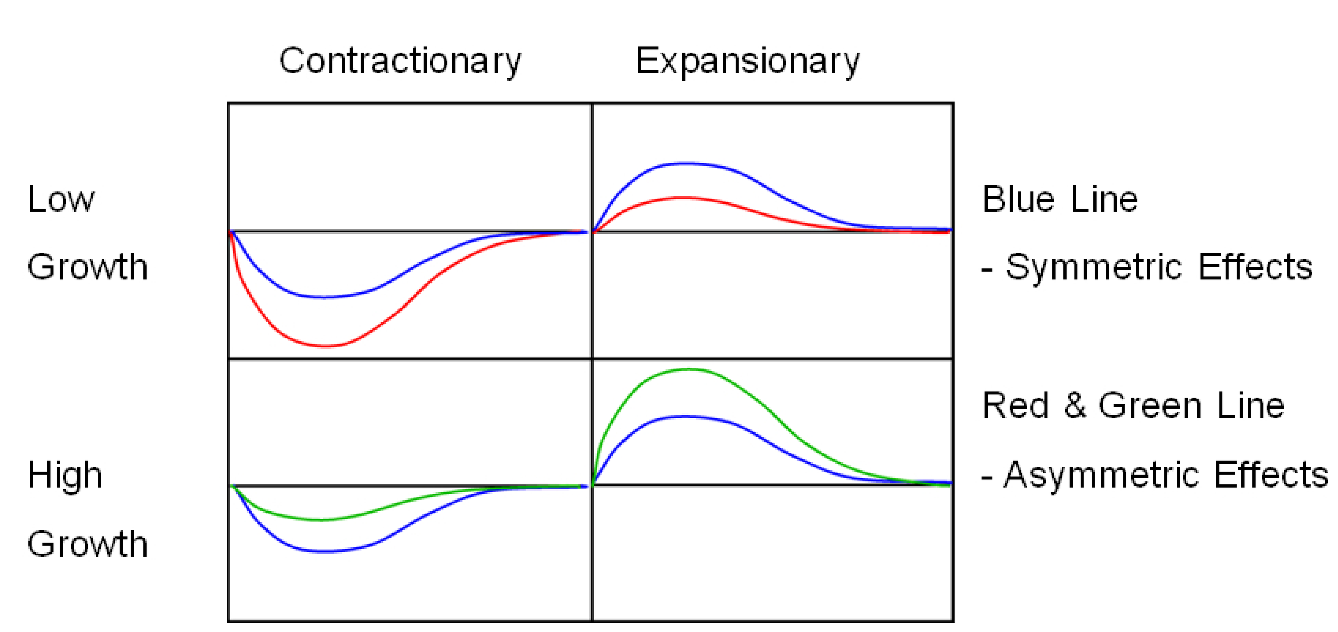
  a) the state-fixed effects that might be correlated with the regressors, and

  b) overestimation of small volatile states that unduly influence our results.
- Equation (2) is the basis for our empirical results.

2) Asymmetric Policy Effect

$$\tilde{y}_{it} = \sum_{j=1}^{p} \alpha_j \tilde{y}_{it-j} + \sum_{k=0}^{q} \sum_{j=k+1}^{p+k} \gamma_{jk}^{+} (\tilde{y}_{it-j} \cdot z_{t-k}^{+}) + \sum_{k=0}^{q} \sum_{j=k+1}^{p+k} \gamma_{jk}^{-} (\tilde{y}_{it-j} \cdot z_{t-k}^{-}) + \tilde{\varepsilon}_i + \tilde{\nu}_{it} \qquad (3)$$

- Where $z^{+}_{t-k}$ and $z^{-}_{t-k}$ are the contractionary and expansionary changes to monetary policy, respectively.




•A positive/negative sign on $\gamma^{+}_{jk}$ implies that contractionary policy widens/reduces the gap between relatively slow and fast growth states.

•A positive/negative sign on $\gamma^{-}_{jk}$ implies that expansionary policy reduces/widens the gap between relatively slow and fast growth states.

•We expect $\gamma^{+}_{jk}$ and $\gamma^{-}_{jk}$ 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 FE 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 $\gamma_{jk}$ terms (p-values are in parenthesis)

 - $\gamma_{10}$-$\gamma_{51}$: $\sum_{k=0}^{1}\sum_{j=k+1}^{4+k}\gamma_{jk}$ = 0.06 (0.02)  $\gamma_{10}$-$\gamma_{73}$: $\sum_{k=0}^{3}\sum_{j=k+1}^{4+k}\gamma_{jk}$ = -0.02 (0.50)

 - $\gamma_{10}$-$\gamma_{62}$: $\sum_{k=0}^{2}\sum_{j=k+1}^{4+k}\gamma_{jk}$ = 0.03 (0.22)  $\gamma_{10}$-$\gamma_{84}$: $\sum_{k=0}^{3}\sum_{j=k+1}^{4+k}\gamma_{jk}$ = -0.02 (0.30)

➢ The sum of $\gamma_{10}$-$\gamma_{51}$ supports our hypothesis with statistical significance.

• Equation(3)

 - Our hypothesis: a positive sum of $\gamma^{+}_{jk}$ and a negative sum of $\gamma^{-}_{jk}$

 - $\gamma^{+}_{10}$-$\gamma^{+}_{51}$: $\sum_{k=0}^{1}\sum_{j=k+1}^{4+k}\gamma^{+}_{jk}$ = 0.01 (0.84)  $\gamma^{-}_{10}$-$\gamma^{-}_{51}$: $\sum_{k=0}^{1}\sum_{j=k+1}^{4+k}\gamma^{-}_{jk}$ = -0.04 (0.36)

 - $\gamma^{+}_{10}$-$\gamma^{+}_{62}$: $\sum_{k=0}^{2}\sum_{j=k+1}^{4+k}\gamma^{+}_{jk}$ = 0.04 (0.12)  $\gamma^{-}_{10}$-$\gamma^{-}_{62}$: $\sum_{k=0}^{2}\sum_{j=k+1}^{4+k}\gamma^{-}_{jk}$ = -0.01 (0.74)

 - $\gamma^{+}_{10}$-$\gamma^{+}_{73}$: $\sum_{k=0}^{3}\sum_{j=k+1}^{4+k}\gamma^{+}_{jk}$ = -0.01 (0.80)  $\gamma^{-}_{10}$-$\gamma^{-}_{73}$: $\sum_{k=0}^{3}\sum_{j=k+1}^{4+k}\gamma^{-}_{jk}$ = -0.07(0.09)

 - $\gamma^{+}_{10}$-$\gamma^{+}_{84}$: $\sum_{k=0}^{4}\sum_{j=k+1}^{4+k}\gamma^{+}_{jk}$ = 0.00 (0.88)  $\gamma^{-}_{10}$-$\gamma^{-}_{84}$: $\sum_{k=0}^{4}\sum_{j=k+1}^{4+k}\gamma^{-}_{jk}$ = -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.