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Regional VARs and the Channels of Monetary Policy*

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Abstract: We find that the magnitudes of the regional effects of monetary policy were considerably dampened during the Volcker-Greenspan era. Further, regional differences in the depths of monetary-policy-induced recessions are related to the concentration of the banking sector, whereas differences in the total cost of these recessions are related to industry mix. (JEL: E52, R12)

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* This paper is derived from Owyang and Wall (2005). The views herein are the authors' alone and do not necessarily represent the views of the Federal Reserve Bank of St. Louis or the Federal Reserve System.

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1. Introduction

Carlino and DeFina (1998, 1999) and Fratantoni and Schuh (2003) estimate the region-, state-, and MSA-level effects of monetary policy shocks using vector autoregressions (VARs). Carlino and DeFina use their results to test hypotheses about the channels of monetary policy, which is the primary focus of our exercise. Motivated by a large literature using aggregate-level data, we go beyond existing studies by considering whether the region-level effects of monetary policy have changed over time. Clarida, Gali, and Gertler (2000), for example, argue that a change in the inflation weight in the Fed's post-1982 Taylor rule has resulted in a more stable policy. To account for such variation, we look at the Volcker-Greenspan era separately and consider whether the regional differences in the effects of monetary policy are related to measures of various channels of monetary policy.

2. A Regional Monetary VAR

Consider a fairly standard three-lag reduced-form VAR:

$$y_t = \sum_{j=1}^{3} \beta_j y_{t-j} + \delta w_t + \varepsilon_t, \qquad \varepsilon_t \sim \mathrm{N}(0,\Sigma) \text{ and } \Sigma = A_0^{-1}\Omega A_o^{-1}{}'; \tag{1}$$

where y_t is the period *t* vector of *n* variables. Energy prices are controlled for by w_t, which are exogenous oil dummies corresponding to the Hoover and Perez (1994) oil dates. We employ a standard lower-block recursive identification in which there is a policy block (federal funds rate) and two non-policy blocks: one with variables that are affected contemporaneously by a monetary policy shock (log CPI price level and log level of real regional personal incomes) and one with variables that are not (10-year Treasury rate and a commodity price index).

In common with the literature, we assume that an idiosyncratic regional income shock does not affect other regions contemporaneously, although it might affect them in subsequent quarters. Our full-sample estimation is for 1960:I - 2002:IV while our Volcker-Greenspan estimation is for 1983:I - 2002:IV. Data are seasonally adjusted and are taken from the Federal Reserve Board (federal funds rate, 10-year Treasury), the Bureau of Economic Analysis (personal incomes, CPI), and the FIBER industrial materials price index.

In addition to allowing for changes over time, our estimation differs from Carlino and DeFina (1998, 1999) in that we consider the effects of a one-time shock to the federal funds rate, rather than the permanent shock that they considered. In their estimation, because the shock to the federal funds rate is permanent, so is the monetary-policy-induced recession. Because we consider a one-time shock, as is standard in the monetary economics literature, we can analyze the dynamics of recovery from a monetary-policy-induced recession.

It is, in principle, possible to use state-level data to estimate 50 different responses to a monetary shock. Unfortunately, the estimation of a 54-variable model with our identification is intractable. As an alternative, we divided the eight BEA regions into 19 sub-regions, each with between two and four states from the same BEA region. The criteria for splitting the regions into sub-regions were contiguity and business cycle similarity, as measured by the simple correlation of states' quarterly PI growth rates.[1] These 19 sub-regions provide enough cross-regional variation to discern the roles of different monetary channels, while allowing estimation in a single, tractable system.

[1] The assignments of states to sub-regions is described in detail in Owyang and Wall (2005). Note that Alaska and Hawaii are excluded.

Table 1 summarizes the results of the regional VAR for the full sample and the Volcker-Greenspan sample. The effects of the monetary-policy-induced recession are represented by the PI loss at the trough (the depth of recession) and the total PI loss over 20 quarters (the total cost of recession). There are large cross-regional differences in the depths and total costs of monetary-policy-induced recessions for both samples, although the magnitudes of these effects differ greatly between the samples.

For the full sample, the median region has a trough PI that is 0.195 percent below initial PI, with the deepest troughs in the regions of the Midwest, and the shallowest in the Northeastern and Mountain regions. The regional pattern of the total costs of recession is less obvious, however, because there is no clear correlation between the depths and lengths of recessions. Nevertheless, there are large cross-regional differences around the median total PI loss of 2.295 percent of PI.

Compared to the full sample, the monetary-policy-induced recessions from the Volcker-Greenspan sample are much shallower and less costly. While the geographic pattern of recession costs is roughly similar between samples, the median trough is only 0.114 percent below initial PI. Further, because regional PI tends to return to and exceed the initial level quickly, the median effect on total PI is actually a small net increase of 0.142 percent of initial PI.

3. Channels of Monetary Policy

We can make use of the cross-section of regional differences in the effects of monetary policy to examine the importance of various channels of monetary policy for the two sample periods. Textbook explanations focus on the *money channel*, by which a monetary contraction reduces the demand for capital and durables, thereby reducing aggregate demand. Because manufacturing industries are relatively more sensitive to interest rates, we proxy for the money channel with the sub-regions' shares of total non-farm employment in the manufacturing sector.[2]

The *broad credit channel* arises because small firms are thought to have higher information and transaction costs when dealing with banks, thereby making it more costly for them to obtain financing (Bernanke and Blinder, 1988). To proxy for this, we use the share of total employment in small firms (i.e., fewer than 100 employees).[3] If the broad credit channel is important, regions with a high share of small firms should see larger PI losses following a monetary tightening.

Empirical studies have also identified a *narrow credit channel*: Small banks are more limited than large banks in their ability to find alternative funding sources when monetary policy is tight and are, therefore, less able to make loans (Kashyap and Stein, 1995). If the narrow credit channel is important, regions in which large banks are relatively important should experience smaller decreases in PI following a tightening of monetary policy. To proxy for the narrow credit channel we use the average deposit share of the largest three and the largest five banks.[4,5]

The results of our OLS estimation using the full-sample VAR results and the Volcker-Greenspan VAR results are presented in Table 2. For each period, we estimated the effects of the channels of monetary policy on the PI loss at the trough and on the total PI loss.

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[2] These data are from the BLS. For the full sample period we used the yearly manufacturing share averaged over 1969-2001. For the Volcker-Greenspan period, we used the same measure averaged over 1983-2001.
[3] These data are from the Statistics of U.S. Business data set. Because data are available starting in 1988, we use the same measures for both periods.
[4] For each region, we use the weighted average of the state deposit shares from the State and Metropolitan Area Data Book (1986, 1991). Because the earliest data are for 1983, we use the same measures for both periods.
[5] Summary statistics for all variables are in Owyang and Wall (2005).

For the full sample, there is no evidence that any of the channels are important for explaining the depth of a recession. None of the estimated coefficients on the monetary-channel variables are statistically different from zero, and the empirical specifications have little explanatory power. There is abundant evidence, however, that all three channels are important for explaining the total costs of a monetary-policy-induced recession, as the estimated coefficients are typically statistically different from zero. Although the signs are as expected for the money channel and the broad credit channel, the results are not as expected for the narrow credit channel. These results echo those of Carlino and DeFina.

When we examine the Volcker-Greenspan period separately, however, we come to quite different conclusions about the channels of monetary policy. Specifically, only the narrow credit channel is important in determining the depths of monetary-policy-induced recessions: Regions in which large banks are more important tend to have shallower recessions. On the other hand, the results for the Volcker-Greenspan period suggest that only the money channel is important for determining the total PI costs of the recessions: Monetary-policy-induced recessions tend to be more costly for regions with large manufacturing sectors.

Our results are in contrast with Carlino and DeFina (1998, 1999), who find that all three channels have some role in explaining regional difference in the effects of monetary policy. Recall, though, that because they look at the effects of a permanent tightening of monetary policy, their estimation does not provide separate results for the depth and total costs of recessions. According to our results, however, this distinction is important because different channels of monetary policy matter for the depth and total costs of monetary-policy-induced recessions.

References

Bernanke, B. and A. Blinder, 1988, Credit, money, and aggregate demand, American Economic Review Papers and Proceedings 78, 435-439.

Carlino, G. and R. DeFina, 1998, The differential regional effects of monetary policy, Review of Economics and Statistics 80, 572-587.

Carlino, G. and R. DeFina, 1999, The differential regional effects of monetary policy: Evidence from the U.S. states, Journal of Regional Science 39, 339-358.

Clarida, R., J. Gali, and M. Gertler, 2000, Monetary policy rules and macroeconomic stability: Evidence and some theory, Quarterly Journal of Economics 115, 147-180.

Fratantoni, M. and S. Schuh, 2003, Monetary policy, housing, and heterogeneous regional markets, Journal of Money, Credit, and Banking 35, 557-590.

Hoover, K. and S. Perez, 1994, Post hoc ergo propter once more: An evaluation of 'Does monetary policy matter?' in the spirit of James Tobin, Journal of Monetary Economics 34, 47-73.

Kashyap, A. and J. Stein, 1995, The impact of monetary policy on bank balance sheets, Carnegie-Rochester Conference Series on Public Policy 42, 151-195.

Owyang, M. and H. J. Wall, 2005, Structural breaks and regional disparities in the transmission of monetary policy, Federal Reserve Bank of St. Louis Working Paper 2003-008C.

Table 1. Monetary-Policy-Induced Recessions: Sub-Regional VAR

	Full Sample		Volcker-Greenspan	
	PI Loss at Trough	Total PI Loss (Gain)	PI Loss at Trough	Total PI Loss (Gain)
North New England	0.177	2.659	0.088	(0.008)
South New England	0.160	2.777	0.076	(0.172)
North Mideast	0.149	2.295	0.086	(0.251)
South Mideast	0.144	1.894	0.081	(0.142)
East Great Lakes	0.304	2.702	0.113	0.565
West Great Lakes	0.198	2.039	0.125	0.167
Northeast Plains	0.286	1.254	0.367	(0.263)
Northwest Plains	0.238	2.243	0.159	(0.200)
South Plains	0.233	2.129	0.125	0.142
Central Southeast	0.244	2.368	0.114	0.436
East Southeast	0.219	3.177	0.132	0.688
North Southeast	0.179	2.314	0.097	(0.156)
West Southeast	0.225	1.774	0.136	0.345
East Southwest	0.186	2.008	0.253	(0.832)
West Southwest	0.244	3.131	0.114	0.605
North Rocky Mountain	0.176	1.026	0.105	(0.868)
South Rocky Mountain	0.174	2.143	0.135	(0.723)
North Far West	0.192	2.384	0.167	(0.037)
South Far West	0.195	2.752	0.113	(1.019)

PI loss at trough is the percentage difference between initial PI and PI at the trough. Total PI loss is area between the impulse response and initial PI over 20 months, as a percentage of initial PI.

Table 2. The Channels of Monetary Policy

	Full Sample				Volcker-Greenspan Period			
	PI Loss at Trough		Total PI Loss		PI Loss at Trough		Total PI Loss	
Constant	0.1790 (0.1428)	0.1697 (0.1473)	3.2651* (0.8638)	3.4009* (1.0184)	0.2036 (0.2161)	0.1765 (0.2239)	-0.7063 (1.2490)	-0.7367 (1.1887)
Manufacturing share	0.0013 (0.0043)	0.0011 (0.0043)	0.0349 (0.0205)	0.0430* (0.0213)	-0.0068 (0.0043)	-0.0071 (0.0048)	0.0829* (0.0438)	0.0849* (0.0393)
Small firms' share	0.0016 (0.0030)	0.0014 (0.0032)	-0.0732* (0.0181)	-0.0780* (0.0201)	0.0036 (0.0055)	0.0038 (0.0057)	-0.0137 (0.0244)	0.0170 (0.0262)
Share of 5 largest banks	-0.0010 (0.0007)		0.0263* (0.0050)		-0.0022* (0.0012)		0.0018 (0.0095)	
Share of 3 largest banks		-0.0008 (0.0010)		0.0325* (0.0057)		-0.0024 (0.0015)		0.0055 (0.0129)
F(3,15)	0.71	0.27	17.49	20.20	1.20	0.92	4.41	4.75
R^2	0.121	0.061	0.782	0.796	0.343	0.288	0.327	0.341
Root MSE	0.045	0.047	0.284	0.275	0.061	0.063	0.455	0.450

Number of observations = 19. White-corrected standard errors are in parentheses. A '*' denotes statistical significance at the 10% level.