Changes over Time in New York State's Responsiveness to Monetary Shocks

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ABSTRACT

This paper extends the existing research on regional economic responses to Federal Reserve policy shocks along two dimensions. First, we focus on the evolution over time of a particular region's responsiveness to federal funds shocks. This differs from prior work that analyzed differences across regions in their responsiveness to a federal funds shock over a single sample period. For the state of New York, we track how the declining importance of interest-rate sensitive manufacturing sub-sectors and construction has altered the region's income response to federal funds rate shocks. The evolution of New York State's responses to fed funds shocks is contrasted with the changes in the Rest-of-Nation's responsiveness.

This paper's second extension of the literature is its use of sequential updating of the data set. Prior research utilized quarterly data sets starting in the late 1950's and ending in the early 1990's. We construct a parsimonious structural VAR model and first estimate the model over the 1958Q1 to 1992 Q4 period. Over this period our results are consistent with earlier findings. Next, we roll the sample period forward one year at a time, keeping the time period's length constant, up through 2004 Q2 and re-estimate the model after each resetting of the sample period.

Overall, our findings are consistent with the view that the declining importance of interest rate sensitive sectors will lead to a decline in the responsiveness of a region's income growth to federal funds rate shocks. In both New York State and the Rest-of-Nation, responsiveness to federal funds rate shocks declined in the more recent periods in a manner consistent with their declining shares of regional income coming from interest-sensitive sectors. Consequently, estimating the model using the entire available data set leads to an overestimation of the current impact on both regions from a federal funds rate shock.

I. INTRODUCTION

It has been established that U.S. regions historically have differed in their responsiveness to changes in Federal Reserve policy as manifested by variations in the federal funds rate. Three potential channels by which regional variation can arise have been identified. These channels involve differences across regions in: the percent of regional output coming from interest-rate sensitive sectors, the percent of regional output coming from small rather than large firms, and the percent of regional lending activity done by small rather than large banks. Empirically, however, for U.S. regions it is only variations in the share of regional output from interest rate-sensitive sectors that has been

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shown to correlate significantly, and in the expected manner, with variations in regional income sensitivity to Federal Reserve policy shocks.

Prior studies investigating variation across U.S. regions in income sensitivity to federal-reserve policy shocks utilize data beginning in the latter 1950's and ending no more recently than 1992. Since 1992, the ongoing evolution of the U.S. economy has resulted both in further declines in the relative importance of construction and interest-rate sensitive manufacturing sub-sectors, as measured by percentage of total output, and in considerable variation across U.S. states in the rate of decline in the importance of these sectors. In this paper, we investigate how the declining importance of construction and interest-rate sensitive manufacturing in total output since 1992 has altered the responsiveness of New York State's income to federal funds shocks.

Given changes in the region's economic structure, our results indicate that one should be cautious in using the previous cross-sectionally based research results linking a region's responsiveness to federal funds shocks to its economic structure to infer likely changes over time within a region in its responsiveness to federal funds shocks. The summative nature of the cross-sectional regressions across states can mask considerable variation across states in the evolution, if any, in a state's responsiveness to federal funds shocks. We show that regional analysts interested in the impact of Federal Reserve policy upon any particular state or region can gain useful insights by tracing changes over time in the region's responsiveness to federal funds shocks.

Our 'rolling regressions' approach also reveals that one should be cautious in assuming constant parameters if the entire sample of available data since the latter 1950's is used. When we compare estimation results over the entire sample period against results from our most recent sample period, we find material differences in the estimated impact of federal funds shocks upon both rest-of-nation and New York State real personal income growth. The large structural changes in the U.S. economy at both the national and regional levels over the past 25 years limit the usefulness of pre 1970 data in forecasting the responsiveness of national or regional economies to interest rate shocks.

II. LITERATURE REVIEW[1]

During the manufacturing boom years of the post-WWII U.S. economy, material variation existed across regions in their responsiveness to monetary policy. Regions for which manufacturing was more (less) important showed more (less) sensitivity to monetary policy shocks in several early studies. Toal (1977) examined regional responses to monetary policy shocks from 1952-1975. He found relatively large regional responses for the Great Lakes, Mideast, and Southeast regions, but small responses in the Rocky Mountain and Southeast regions. Similarly, Garrison and Chang (1979) analyze regional manufacturing earnings from 1969-76 and conclude that monetary policy had the largest impact in the Great Lakes region and the smallest in the Rocky Mountain region. Rather than using multi-state regions, Garrison and Kort (1983) investigate the impact of monetary policy at the state level from 1960 to 1978. Consistent with the earlier work, they found that states in the Great

Lakes region are the most sensitive to monetary shocks while states in the Rocky Mountains are the least sensitive.

These early studies used single-equation models of personal income, earnings, or employment as a function of national money supply (or other monetary policy variable) and other control variables. A potentially important shortcoming of this approach is the lack of accounting for possible feedback effects between the regional economy and the rest of the nation, as well as any feedback effects in the response of monetary policy to other control variables. Carlino and DeFina (1998) controlled for feedback effects by estimating a VAR model, which allows for feedback effects across regions as well as between the monetary policy variable and oil price shocks. This important methodological advance generated regional results consistent with the earlier studies.

Analyzing the 1958-1992 period using quarterly data, they identified five core regions whose responsiveness to monetary policy closely resembled the national response: New England, Mideast, Plains, Southeast, and Far West. Three non-core regions, however, differed significantly from the national response to monetary policy. The Great Lakes region was more responsive to monetary policy shocks than were the core regions while the Rocky Mountains and Southwest regions were less responsive. Over their sample period national manufacturing averaged 19.2 percent of output while it was 27.0 percent of gross state product (GSP) in the Great Lakes region, the highest of all regions, and only 12.6 percent and 15.2 percent for the Rocky Mountains and Southwest respectfully, the two lowest regional shares.

In an extension of their first paper, Carlino and DeFina (1999) examine the variation in regional responsiveness to monetary policy shocks at the U.S. state level over the same 1958-1992 period. They find substantial variation across states in the eight-quarter cumulative response of real personal income to a one-percentage point federal funds rate increase. Once more, Great Lakes region states are the most sensitive, led by Michigan's nation-leading 2.7 percent point drop in real personal income in response to a 1.0 percent point rise in the federal funds rate, while the Rocky Mountain and Southwest regions contain most of the states whose sensitivities are well below the average-across-all-regions response of a 1.16 percent point decline in real personal income per 1.0 percent point rise in the federal funds rate.

Carlino and DeFina (1999) also estimate a cross-section regression using the 48 states' cumulative response to a federal funds rate shock as the dependent variable. The explanatory variables include the percentage share of a state's GSP from manufacturing along with other variables meant to proxy alternative explanations of the variation across regions in monetary policy sensitivity. Specifications excluding BEA regional dummy variables find that every 1 percent point increase in manufacturing's share of GSP is associated with a 0.027 percent to 0.029 percent point increase (in absolute value) in the cumulative response of state real personal income to a 1 percent point rise in the federal funds rate. Adding BEA regional dummies lowers the impact to a 0.012 percent to 0.015

percent point increase in the cumulative state real personal income response to the rise in the federal funds rate. Since the average cumulative response to the federal funds shock was 1.16 percent points, this implies that those states most dependent on manufacturing over the sample period had sensitivities to federal funds shocks that were 10 to 25 percent larger than the national average.[2]

None of the other potential explanations of the variation across regions in their monetary policy sensitivity were well supported by Carlino and DeFina's (1999) cross-section regression results. The percent of small firms in a region had no discernable impact upon the region's sensitivity to federal funds shocks.[3] The percent of loans by small banks in the region had a negative effect which is the opposite of the sign implied by theory.[4] Several studies since the work by Carlino and DeFina have reinforced the existence of a linkage between a region's income sensitivity to monetary policy shocks and the share of regional output from interest-sensitive sectors.

Gaudreault (2001) analyzes provincial responses to changes in Canadian monetary conditions. Ontario's output is the most sensitive to changing monetary conditions, followed by Quebec, while the Atlantic and Western provinces lag well behind the national level sensitivity to changing monetary conditions. These findings match up with the relative importance of manufacturing across the provincial economies. Arnold (2001) analyzes the effects of monetary policy across 58 regions within the five largest EU nations and finds that regional sensitivity to monetary policy is related to industry mix in the same manner as previously established for the U.S.A. Arnold and Vrugt (2002) analyze regional data for the Netherlands from 1973 to 1993 across 12 regions and 13 industry sectors. They conclude that industry sector variation accounts for most of the variation in interest sensitivity across regions. Arnold and Vrugt (2004) estimate the impact of interest rate shocks on regional output in Germany across ten provinces over the period 1970-2000. As for Carlino and DeFina (1999), they find that the differential effects of monetary policy are related to variations across provinces in industrial composition, but not to either variations in firm size mix or variations in bank size mix.

While the above regional studies typically take the entire manufacturing sector as the measure of a region's interest-sensitive output, more recent work using national data has identified considerable variation across manufacturing sub-sectors in their sensitivity to interest rate shocks. Irvine and Schuh (2005) estimate the interest-rate sensitivity of 27 different 2-digit SIC manufacturing, retail, and wholesale trade industries using quarterly data from 1959:1 to 2000:1. Using a variety of VAR models, they estimate several different measures of an industry's interest-rate sensitivity and then create a composite measure of interest-rate sensitivity from these results. They identify nine SIC sectors as being highly interest-rate sensitive. These nine sectors, in descending order of sensitivity are: Motor Vehicles, Retail Automotive, Transportation, Lumber, Stone, Clay, & Glass, Primary Metals, Rubber, Fabricated Metals, Textiles. This study examines the evolution over time in both the total manufacturing share of output and the share from these interest-rate sensitive sectors for both New York State and rest-of-nation.

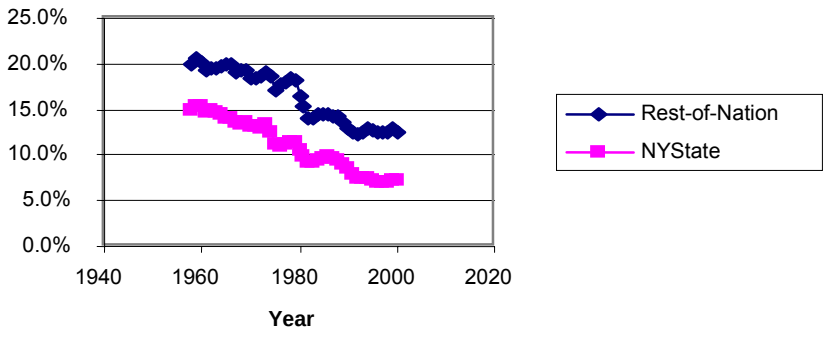
III. MOTIVATION FOR STUDY

The existing literature clearly has established that variations across regions within a monetary union in their responsiveness to monetary policy shocks are determined in part by the relative importance of interest rate sensitive sectors across regions. Regional policy makers and business decision makers, however, are likely to have different questions regarding the impact of monetary policy upon the regional economy. Is the region presently more, or less, susceptible to monetary policy shocks than the nation as a whole? If so, how large is this difference? Has the region's sensitivity to monetary shocks been changing in recent years, and if so, how?

We show that insights into these questions can be obtained from the results of a parsimonious structural VAR model that is re-estimated on an annual basis after rolling forward the sample period one year while holding the sample period length constant. By comparing the estimated impact of monetary policy shocks from the early estimating periods with those of the most recent estimating periods, the stability of the region's sensitivity to monetary shocks can be assessed. If these estimates differ materially across sample periods, then one should utilize the more recent sample period estimates for planning purposes and be cautious about using inferences based on econometric models utilizing all available data since the 1950's.

Our region of analysis in this paper is New York State. As seen in Figure 1, New York's share of personal income from construction and the nine interest-sensitive manufacturing & trade sectors of Irvine and Schuh (2005) has remained 5-6 percent points below the rest-of-nation's personal income share from these sectors. This suggests that New York State's personal income growth will be somewhat less sensitive to federal funds rate shocks than that of the rest-of-nation.

Figure 1: Percentage Personal Income From Construction + Interest Sensitive Sectors*



*Interest sensitive sectors defined by Irvine and Schuh (2005)

In this paper, we investigate how New York's responsiveness to monetary shocks has changed since the early 1990's given the underlying changes in its economic structure, and compare New York's evolving sensitivity to monetary shocks with the rest-of-nation's responsiveness to monetary shocks. Our findings are compared against the conclusions one would draw based upon the prior cross-sectional analysis literature on regional responses to monetary shocks, and key results are highlighted that illustrate the importance of specifically examining the region of interest rather than making inferences solely upon the region's relative ranking in terms of concentration of interest-sensitive sectors.

IV. MODEL

Model Specification

Economic activity in the state of New York and the rest-of-nation is modeled using a structural vector autoregression (SVAR) model. We analyze the dynamic behavior of the 5 x 1 covariance-stationary vector:

(1) $Z_t = [\Delta y_{st}, \Delta y_{Nt}, \Delta p_{ct}, \Delta p_t, \Delta m_t]'$

where Δy_{st} is the growth rate of state real personal income for New York state at time t, Δy_{Nt} is the growth rate of real personal income for the rest-of-nation at time t, Δp_{ct} is the growth rate in the core CPI, Δp_t is the growth rate of the relative price of oil, and Δm_t a measure of monetary policy actions.

The dynamics of Z_t are represented by

(2) $AZ_t = B(L) Z_{t-1} + e_t$

where A is a 5x5 matrix of contemporaneous correlation coefficients among the variables, B(L) is a 5x5 matrix of polynomials in the lag operator L, and e_t is 4x1 vector of structural disturbances, or primitive shocks, so $e_t = [\varepsilon_{st}, \varepsilon_{Nt}, \varepsilon_{pct}, \varepsilon_{pt}, \varepsilon_{mt}]$. Each variable in the model can be affected by its own idiosyncratic shock as well as by shocks to any of the other variables. The contemporaneous correlation coefficients in A, and the lag operators in B(L) will specify how shocks to any one variable are transmitted throughout the system of equations. If we rewrite equation (2) in its reduced form we see that:

(3) $Z_t = C(L) Z_{t-1} + \mu_t$

where $C(L) = A^{-1}B(L)$ is an infinite-order lag polynomial and $\mu_t = A^{-1} e_t$ provides the link between the model's structural residuals and its reduced form residuals.

We estimate the elements of A and B(L) using Bernanke's (1986) procedure. First, OLS estimates of the reduced form error terms $\mu_t = A^{-1} e_t$ are obtained from the estimation of equation (3). Next, the variance-covariance matrix for the structural errors e_t is restricted to be both orthogonal, zero contemporaneous covariance, and normalized to unity. This restricts the structural errors variance-covariance matrix to be an identity matrix. Lastly, we need to impose sufficient restrictions upon the A matrix to permit identification of A. Once A is identified, B(L) is estimated from $C(L) = A^{-1}B(L)$ where C(L) comes from the estimation of equation (3).

We place the following restrictions on the A matrix. Shocks to rest-of-nation real personal income do not affect New York State's real personal income contemporaneously and New York State's real personal income shocks do not affect rest-of-nation real personal income contemporaneously. Shocks to either region, however, can influence the other region with a lag of at least one quarter. Another restriction is that Federal Reserve policy shocks do not contemporaneously affect any of the other variables in the system, but can affect them with a lag of at least one quarter. We also restrict the impact of real oil price shocks and core inflation upon either New York State or rest-of-nation real personal income to have zero contemporaneous impact, but allow for impacts with a lag of one quarter or more. The final restriction is that neither New York State nor rest-of-nation real personal income can contemporaneously affect real oil prices or core inflation, but can affect them with a lag of at least one quarter. The federal funds rate variable can be affected contemporaneously, however, by shocks from any of the other variables in the system. With these restrictions in place, the elements of the model are identified.

Selection of Variables

The data in this study are quarterly and range from 1958 Q1 through 2003 Q4. New York State and rest-of-nation economic activity, the Δy_s and Δy_N variables, are measured using real personal income. This is computed using BEA data on nominal real personal income by state and nation and then deflating using the national CPI. State-level CPI are not available over the entire sample period so the national series must be used. Instead of personal income, employment growth could be used as an alternative measure of economic activity. Carlino and DeFina (1998,1999) show that the conclusions drawn regarding differences between a region's responsiveness to monetary shocks and the national average responsiveness to such shocks do not depend upon whether income or employment is used to measure economic activity. Consequently, we confine our analysis to the use of real personal income and focus upon analyzing how the relationships change over time.

The real oil price variable, Δp, is included to account for potential aggregate supply shocks and is computed as the PPI for fuels and related products divided by the total PPI. The core CPI variable, Δp_{ct}, is included as another macroeconomic control variable. It is included to account for changes in

the nominal federal funds rate that may be intended to maintain a certain real federal funds rate. The monetary policy action variable, Δm, is the change in the federal funds rate as is used by Bernanke and Blinder (1992), among others. Leeper, Sims, and Zha (1996) and Bernanke and Mihov (1998) argue that this is the preferred measure. Other alternative measures of Federal Reserve policy would include changes in non-borrowed reserves and the Boschen and Mills (1995) narrative indicator of monetary policy. Once more, however, Carlino and DeFina (1998,1999) show that the analysis of differences between regional and national responsiveness to monetary shocks is robust across these three variables capturing federal-reserve policy actions. Hence, we restrict our analysis to using the more frequently utilized federal funds rate measure of federal-reserve policy actions.

Specification Issues

For inferences from this analysis to be valid, the variables in the SVAR need to be stationary. Results from standard Phillips-Perron (PP) unit-root tests are reported in Table 1. Phillips-Perron tests were used because they allow the disturbances to be weakly dependent and heterogeneously distributed. The critical values are the same as for the Dickey-Fuller battery of unit root tests (Fuller 1976). The real personal income and real price of oil data are reported in logs and log first-differences (growth rates) while the federal funds rate is in levels and first differences. Not surprisingly, the variables are non stationary in their level or log-level form, but are stationary when converted into first difference growth rates. So, the estimated SVAR model will use stationary first differences of real personal income for New York and rest-of-U.S., real personal income, real oil prices, and the federal funds rate.

For the actual estimation of the model, a four-lag structure was used on all variables. This is a sufficiently lengthy period to permit dynamics to work through the system. In addition, the Ljung-Box Q test statistics for the four-lag specification show that the null hypothesis of white noise error terms cannot be rejected at the **.**13 significance level for any of the system's equations.

Table 1: Phillips-Perron Unit-Root Test Results

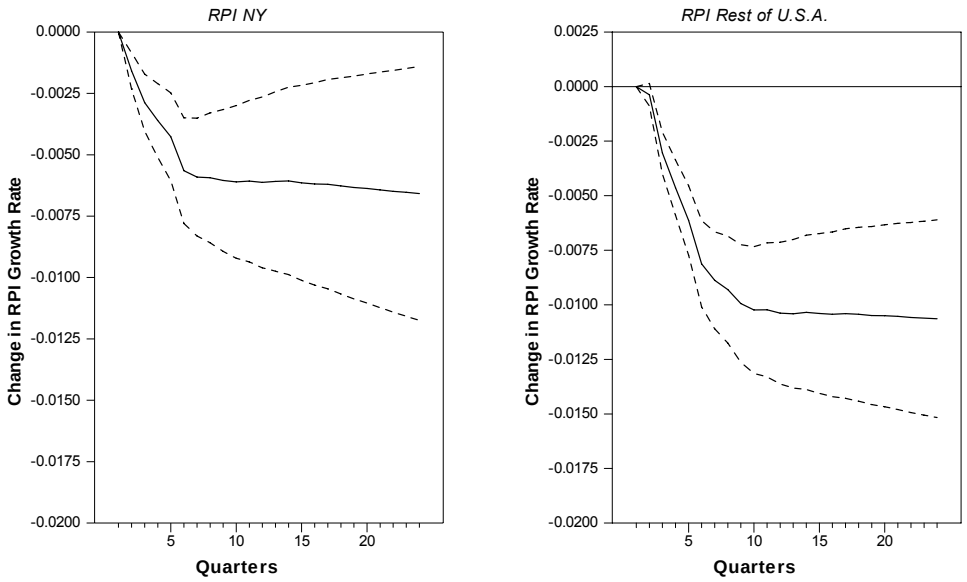
Levels		1st-Difference
New York RPI	-1.91	-13.68*
Rest-of-Nation RPI	-1.82	-9.96*
Relative Core CPI	-1.11	-4.71*
Relative Price Oil	-1.22	-9.03*
Fed Funds Rate	-2.30	-10.27*

*significant at the 1 percent level, critical values in Phillips and Perron (1988)
RPI is real personal income
Two covariance lags used for all variables. Levels estimates had intercept & trend; 1st difference had intercept only.

V. EMPIRICAL RESULTS

We first estimate the model over the 1958 Q1 to 1992 Q4 sample period in order to match exactly the time period used by Carlino and Defina (1998, 1999). The cumulative impulse response functions for the impact of a twenty five basis point increase in the federal funds rate upon New York real personal income growth (RPI NY) and rest-of-nation real personal income growth are given in Figure 2. Consistent with New York state's lower share of income from interest-sensitive sectors as seen in Figure 1 above, the state's maximum response to a federal funds shock is considerably smaller than for the rest-of-nation. New York State's maximum RPI growth rate response to the shock is -.006577 (which implies that the growth rate in New York's real personal income fell by .6577 percent), a value only 61.8 percent as large as the rest-of-nation's maximum response of -.010638 (tables of these values not reported to save space). These results match almost perfectly with those of Carlino and Defina (1999) who estimate that New York State's output sensitivity to federal funds shocks is only 62 percent as large as that of the rest-of-nation (see results in Table 4 of that paper).

Figure 2: Real Personal Income Growth Response to Federal Funds Shock - 58:1-92:4

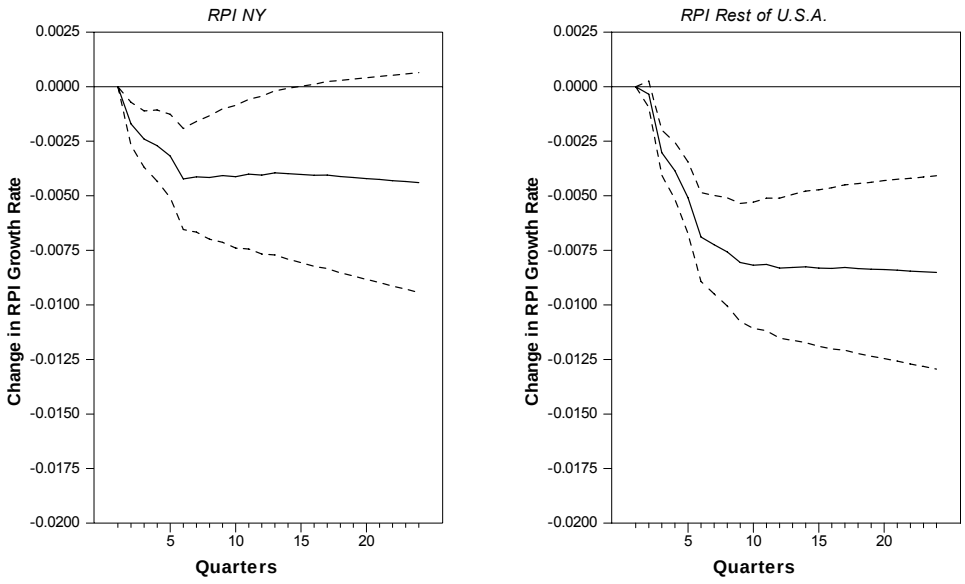


To investigate how this relationship may have changed over time, we next rolled the sample forward to cover 1969 Q1 to 2003 Q4. This time period uses the most recently available data at the time of analysis, and keeps the overall sample period length constant. Over this ending sample period, New York's share of personal income from construction and interest-sensitive manufacturing and trade sectors declined at approximately the same rate as for the rest-of-nation.

These changes raise several questions. Has New York's sensitivity to federal funds shocks declined as the importance of interest-sensitive sectors in its economy declined? How has New York sensitivity to federal funds shocks evolved relative to rest-of-nation's sensitivity given that both regions have exhibited similar trends for the importance of these sectors to total output?

In Figure 3 we see the impulse response functions for RPI growth New York and RPI growth rest-of-nation in response to a twenty five basis point increase in the federal funds rate. For New York, the maximum response to the federal funds shock is -.004395 while for rest-of-nation the maximum response is -.008513. Comparing these results to those related to Figure 2, we find that both New York state and rest-of-nation's sensitivity to federal funds shocks declined considerably in the latter sample period, consistent with the declining importance of interest-sensitive sectors for both regions. New York State's personal income maximum response to federal funds shock in the 69:1-03:4 period is 33.2 percent smaller than it was for the 58:1-92:4 period. Similarly, the rest-of-nation's maximum response declines by 20 percent in the 69:1-03:4 period as compared to the 58:1-92:4 period. The slightly higher rate of declining interest rate sensitivity for New York state means that it has become even less susceptible than the rest-of-nation to interest shocks. For the last period, New York's maximum response of -.004395 is only 51.6 percent as large as the rest-of-nation's maximum response of -.008513, while for the 58:1-92:4 period New York's maximum response was 62 percent of the rest-of-nation's maximum response.

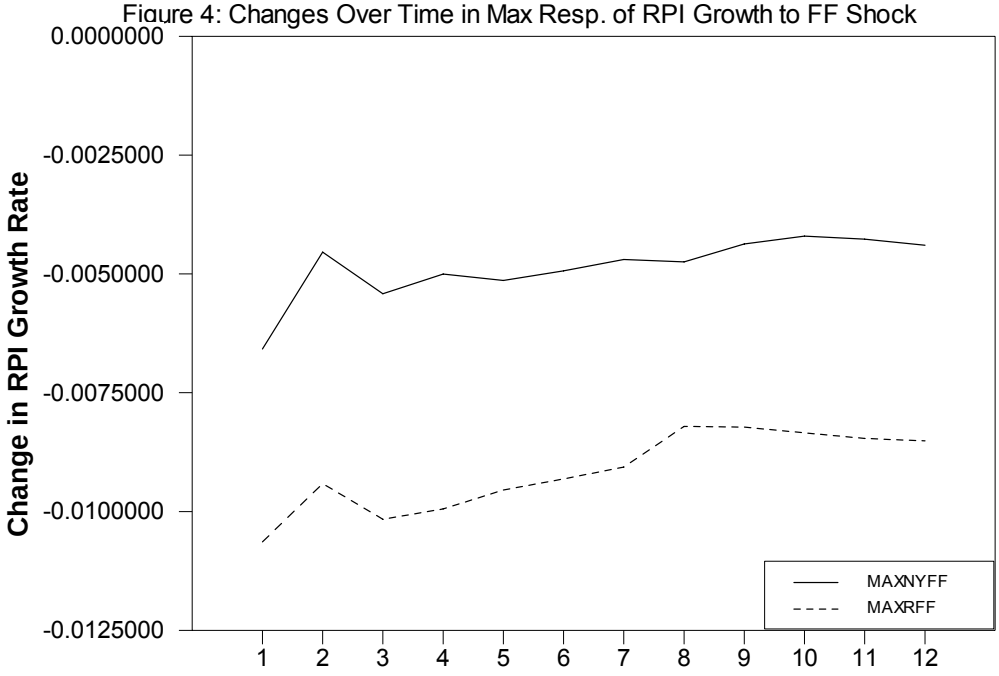
Figure 3: Real Personal Income Growth Response to Federal Funds Shock - 69:1-03:4



One possible cause of the differences in results over the two sample periods analyzed above is that the estimation results themselves are fragile and that parameter estimates fluctuate somewhat

randomly as the sample period is adjusted. We check if the differences in results between the 58:1-92:4 sample period and the 69:1-03:4 sample period are due to a discernable ongoing trend in the estimated links between RPI growth and federal funds rate shocks, or if the results fluctuate randomly from sample period to sample period. To do this, we first run the model over the 58:1-92:4 time period and collect the maximum RPI growth rate response to a federal funds shock for both New York and rest-of-nation. Next, we rotate the sample period forward one year to 59:1-93:4 and repeat the same analysis. This procedure is done a total of 12 times until the final time period of 69:1- 03:4 is estimated. So, in Figure 4 Time 1 is 58:1-92:4, Time 2 is 59:1-93:4, …., and Time 12 is 69:1-03:4.

Figure 4: Changes Over Time in Max Resp. of RPI Growth to FF Shock



NOTE: Period 1 is 58:1-92:4, Period 2 is 59:1-93:4, ….Period 12 is 69:1-03:4

In Figure 4 the maximum response of New York RPI growth to a 25 basis point rise in the federal funds rate (MAXNYFF) for each sample period is reported along with the maximum response of rest-of-nation RPI growth to a 25 basis point rise in the federal funds rate (MAXRFF) where period 1 is the earliest sample and 12 is the latest sample. While the graph is not strictly monotonic, there is a clear trend over the rolling sample periods for a decline in the sensitivity of both New York's RPI and rest-of-nation's RPI to federal funds shocks as the magnitude of the negative effect from a rise in the federal funds rate is lower for more recent sample periods. Hence, our earlier findings of a 33.2 percent and 20 percent reduction over the earliest and latest sample periods in the sensitivity of RPI growth to federal funds shocks for both New York State and rest-of-nation respectively remain valid. Similarly,

our earlier conclusion that New York State is less sensitive than the rest-of-nation to federal funds shocks and has become even less sensitive over time than has rest-of-nation also remains valid.

These findings are consistent with the decline over time in the importance of interest sensitive sectors for both New York State and the rest-of-nation as reported in Figure 1. Both regions had approximately a 7.5 percentage point decline in the share of personal income from interest sensitive sectors from 1958 to 2003. The downward trend in these shares matches well with the declining trend in the sensitivity of both regions to federal funds shocks as noted in Figure 4. Also, note that while both regions had approximately the same 7.5 percentage point decline in the share of personal income from interest sensitive sectors, since New York State started with a smaller share value than the rest-of-nation, the relative rate of decline in the importance of interest sensitive sectors was larger for New York State than the rest-of-nation. This is consistent with the earlier finding of a decline from 61.8 percent for the 1958:1—92:4 period to 51.6 percent for the 1969:1-2003:4 period in New York's maximum response to a federal funds shock relative to the rest-of-nation's maximum response to the same shock.

The trending values of the estimated impact from federal funds rate shocks seen in Figure 4 suggests that one might be better off confining their sample period to the more recent data so long as adequate degrees of freedom can be retained. If all available data is used, the resultant coefficient estimates might not best capture current dynamics for the purposes of inferring the likely impact today from a federal funds shock. To investigate this issue, we re-estimated the model using the entire 58:1-03:4 sample period. The maximum response of real personal income growth to a federal funds shock is compared against the results from the first and last sample periods of the rolling periods. The findings are summarized in Table 2 and indicate that using the entire sample period does in fact lead to an overestimate of both New York State and rest-of-nation's sensitivity to federal funds shocks. This is especially true for New York State. Comparing results for the 69:1-03:4 period against the 58:1-03:4 period, the estimated max response of real personal income to a federal funds shock is 29.9 percent higher for New York Sate and 6.1 percent higher for the rest-of-nation when the full sample is used.

Table 2: Estimated Maximum Responses of Real Personal Income Growth to Federal Funds Rate Shocks[5]

Period	RPI NY	RPI Rest-of Nation
58:1-92:4	-.006577	-.010638
69:1-03:4	-.004395	-.008513
58:1-03:4	-.005707	-009032

CONCLUSION

This study utilizes a structural VAR model to analyze the evolution since the early 1990's in the responsiveness of real personal income (RPI) growth to federal funds rate shocks for both New York and the rest-of-nation. We find that there has been a material reduction in the sensitivity of RPI growth to federal funds rate shocks for both New York and rest-of-nation. Comparing estimates over the 1958 Q1 to 1992 Q4 period with those from the latest period of 1969 Q1 to 2003 Q4, we find a 33.2 percent and a 20 percent decline in sensitivity of real personal income growth to federal funds rate shocks for New York and the rest-of-nation respectively. These declines in interest sensitivity are consistent with the declining trend for the share in personal income from interest-rate sensitive sectors for both New York state and rest-of-nation.

We completed a rolling regression VAR analysis that rotates the sample period forward one year at a time and shows that the RPI growth responses to federal funds shocks, for both New York and rest-of-nation, trended over time in a manner consistent with estimates from the first and last sample periods. These findings call into question the wisdom of estimating regional responses to federal funds shocks using all available data, and constant parameter estimate techniques, if one hopes to use the results to infer how the region's economy may respond in the near future to changes in the federal funds rate. Using the entire sample period, rather than the most recent 69:1-03:4 sample, overestimates the impact of a federal funds rate shock upon both New York and rest-of-nation RPI growth.

ENDNOTES

1. The material related to regional effects from monetary shocks in this section is drawn heavily from the excellent, and much more exhaustive, literature reviews found in Carlino and Defina (1998, 1999).
2. The basis for this estimate is that over their sample period, the average share of GSP from manufacturing was 20.1 percent while for several states it exceeded 30 percent. Using 10 percent points as the difference between the manufacturing intensive states and the national average, this adds between 10 * .012 = 0.12 percent points and 10 * .029 = 0.29 percent points to the cumulative response of real personal income. Starting from the national average base of 1.16 percent points, this is an increase of between 0.12 / 1.16 = 10.3 percent and 0.29 / 1.16 = 25 percent
3. See Bernanke and Blinder (1992) and Gertler and Gilchrist (1994) for an explanation of the 'credit view' of monetary policy transmission in which monetary policy shocks have a direct impact on banks' abilities to make loans. Since small firms are known to be more dependent than large firms on bank loans for financing, this suggests that regional variation in the small firms versus large firms mix may explain some of the regional variation in sensitivity to monetary shocks. Oliner and

Rudebusch (1995) provide another potential 'credit channel' that focuses upon the greater information asymmetry problems between firms and lenders for small firms rather than large firms. This implies that during tighter credit periods, a larger fraction of lending will go to larger firms.

4. Kashyap and Stein (1995) claim that since larger banks have more funding options than do smaller banks, lending by larger banks will be less sensitive to Federal Reserve policy changes than will be small bank lending. Hence, an increasing regional share of small banks should make the region more, not less, sensitive to federal funds rate shocks.
5. The summary of results in Table 2 highlights the three consistent findings in this paper. First, the responsiveness of RPI NY to a federal funds rate shock is smaller than the responsiveness of RPI Rest-of-Nation across all sample periods. Second, the responsiveness of RPI NY to a federal funds rate shock declines as the data sample period becomes more recent. Lastly, the responsiveness of RPI Rest-of-Nation also declines as the data sample period becomes more recent. It should be noted, however, that in this study, as often happens with VAR analysis utilizing a modest number of observations, the standard errors of the estimates are relatively large. Consequently, the 95 percent confidence band around both the RPI NY and RPI Rest-of-Nation parameter estimates encompass a wide range. Another consequence is that the hypothesis of no difference between RPI NY and RPI Rest-of-Nation cannot be rejected at the p = .05 level for any of the sample periods reported in Table 2. Nor can the hypothesis of no change in RPI NY (or of no change in RPI Rest-of-Nation) between the sample periods reported in Table 2 be rejected at the p = .05 level.

   Despite the inability to strictly reject these null hypotheses, the consistency of both the findings of New York having a lesser response than Rest-of-Nation, and of the sensitivity to federal funds shocks declining over time for both New York and Rest-of-Nation, indicate that the link between the importance of interest-sensitive sectors to a regional economy and that economy's responsiveness to federal funds shocks is operating in the expected manner.

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