Monetary Policy, Stock Returns, and the Role of Credit in the Transmission of Monetary Policy*

by

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ABSTRACT

We use a multi-factor asset pricing model to investigate whether fluctuations in industry stock returns are due to industry-specific shocks or to monetary and other macroeconomic factors. We find that common factors explain a substantial portion of the variation in stock returns, indicating that economic fluctuations are not due to industry-specific factors alone. We also find that disinflationary monetary policy harms both small and large firms while expansionary policy benefits large but not small firms. These results have mixed implications for the view that credit market frictions propagate monetary shocks_.

I. Introduction

What causes business cycle fluctuations? Do they arise from real factors such as productivity shocks and taste changes, or do nominal factors such as changes in monetary policy also matter? If monetary factors affect real variables, what are the channels transmitting policy changes to the economy? This paper addresses these questions by examining the response of stock returns to monetary policy shocks and other macroeconomic variables. It finds that these common factors explain a substantial portion of the variation in stock returns, indicating that economic fluctuations are not due to real factors alone. It also finds that disinflationary monetary policy harms both small and large firms while expansionary policy benefits large but not small firms. These results have mixed implications for the view that one channel of monetary transmission occurs through its impact of bank loans and on firms' balance sheets. These findings also indicate that small firms bear a greater burden than large firms from changes in monetary policy.

Previous researchers have uncovered evidence that monetary policy and other macroeconomic variables affect the real economy. Bernanke and Blinder [3], using Granger causality tests and variance decompositions from a VAR, have shown that innovations in the funds rate over the 1959:7 - 1989:12 period forecasted industrial production, unemployment, and other real variables well. Romer and Romer [20], using a narrative approach, have documented six episodes over the postwar period when anti-inflationary monetary policy was followed by declines in unemployment and industrial production. Gali [12], using a VAR methodology, finds that money supply shocks over the 1955:Q1 - 1987:Q3 period explain 13 percent of output variability at a five- to ten- quarter horizon.

Stockman [24] used a different tack to test real models of economic fluctuations against those emphasizing the real effects of monetary, fiscal, and other macroeconomic variables. He investigated the fraction of the variation in industrial production growth that was due to industry-specific shocks and to nation-specific shocks. He reasoned that in real business cycle models, industry-specific shocks should be more important than nation-specific shocks. On the other hand, in models emphasizing the real effects of monetary and other macroeconomic policies, nation-specific shocks should be more important than industry-specific shocks. Using a variance components technique and panel data from eight OECD countries, he found that both industry-specific and nation-specific shocks are empirically important. Thus he concluded that technology or taste changes alone do not explain most macroeconomic fluctuations.'

The evidence supporting monetary business cycle models has been accompanied by research investigating whether monetary policy matters in part because of its influence on bank loans and on firms' balance sheets. Bernanke and Blinder [2] have shown in an IS-LM model that if bonds and bank loans are imperfect substitutes, then an open market sale by the Federal Reserve that decreases reserves will also decrease loans. If certain firms have difficulty obtaining credit from other sources, then the reduction in bank loans will lower capital investment and aggregate demand. Gertler and Gilchrist [15] have discussed how a monetary tightening, by increasing interest rates, can worsen cash flow net of interest and thus firms' balance sheet positions. If firms prefer internal finance to external finance, then the diminished liquidity will lower investment and aggregate demand.

Gertler and Gilchrist have argued that smaller firms are more likely to be constrained in their access to credit. They are more likely to obtain funds from banks than from equity, bonds, or commercial paper. They are less likely to be well collateralized. Building on this insight, Gertler and Gilchrist [15] and Christiano, Eichenbaum, and Evans [8] have investigated whether small and large firms respond differently to monetary policy shocks. Gertler and Gilchrist found that sales and inventory investment fall substantially more for small firms than for large firms following a monetary contraction. Gertler and Gilchrist and Christiano, Eichenbaum, and Evans found that total borrowing and bank loans by small firms decrease following a monetary tightening while total borrowing and bank loans by large firms increase. These results are consistent with the view that monetary policy affects real variables in part because of its influence on bank loans and on firms' balance sheets. These results are also of independent interest, as Bernanke [1] has argued, because they imply that small firms bear a disproportionate burden from disinflationary monetary policy.

Gertler and Gilchrist ([15], p. 313) make clear that they are investigating the variability of small firms that is correlated with common factors, **not that** which is due to "idiosyncratic risk". Another way of examining this is through the use of multi-factor asset pricing models (e.g., Ross [21] and Cox, Ingersoll, and Ross [10]). In these models, assets must pay risk premia to compensate for their exposures to common factors but not for their exposures to idiosyncratic risks. As developed by Ross [21], excess returns $R_i - \lambda_0$ in a multi-factor framework can be written:

$$R_i - \lambda_0 = \Sigma_j \beta_{i,j} \lambda_j + \Sigma_j \beta_{i,j} f_j + \epsilon_i \qquad (1)$$

where R_i is the return on asset i, λ_0 is the risk-free rate, $\beta_{i,j}$ is the exposure of asset i to macroeconomic variable j, λ_j is the risk premium associated with factor j, f_j is the unexpected change in macroeconomic variable j, and ϵ_i is a mean-zero error term. The expression $\Sigma_j \beta_{i,j} \lambda_j$ represents the expected return on asset i, $\Sigma_j \beta_{i,j} f_j$ represents the systematic component of the unexpected return, and ϵ_i represents the idiosyncratic component of the unexpected return.

There are several advantages to using stock return data to infer whether monetary policy matters and if so why. First, it enables us to learn the dynamic effects of monetary policy on firm performance. Theory posits that stock prices equal the expected present value of firms' future payouts. As Shapiro [22] has noted, these payouts ultimately must reflect economic activity, implying that industry stock prices should be related to future real activity in that industry. Black [4] has similarly argued that an increase in stock prices in a sector more often than not presages an increase in sales, earnings, and capital outlays in that sector. Thus examining how monetary policy innovations affect industry stock returns can shed light on how monetary shocks affect industry output. Second, stock returns are useful for achieving the decomposition discussed by Stockman [24]. The first two expressions on the right side of (1) represent the effects of macroeconomic factors on asset returns while the third expression captures the effects of industry-specific factors. Third, by using stock returns for large and small firms, one can gauge the relative effects of monetary policy shocks on large and small firms. This in turn sheds light on whether monetary policy affects real variables because of the influence of monetary policy on bank loans and on firm balance sheets.

Using a nonlinear seemingly unrelated regression technique and asset returns on 39 portfolios we find that innovations in monetary policy and other macroeconomic variables explain on average 32 percent of the variation in stock returns. These findings indicate that models relying on industry-specific productivity shocks or taste changes leading to sectoral reallocations are not sufficient to explain business fluctuations. We also find that in 96 percent of the cases examined a monetary tightening depresses stock prices. This result supports monetary business cycle models over those emphasizing real factors alone. Finally, we find that while small and large company stocks were both harmed by disinflationary monetary policy during the Volcker deflation, small firms were not helped while large firms were by the subsequent monetary expansion. This finding has mixed implications for the credit view of monetary transmission. It also indicates that small firms bear a larger burden than large firms from changes in monetary policy.

Section II presents the methodology and data employed. Section III contains the results. Section IV discusses the findings. Section V concludes.

II. Data and Methodology

Econometric Methodology

This paper uses a nonlinear seemingly unrelated regression (NLSUR) technique developed by Gallant [13] and McElroy and Burmeister [19]. Equation (1) can be rewritten:

$$E_i = \Sigma_j (f_j + \lambda_j) \beta_{ij} + \epsilon_i \qquad (2)$$

where $E_i = R_i - \lambda_0$. Stacking equation (2) for all N assets produces a system that can be estimated by NLSUR. This system imposes the cross-equation restrictions that the intercepts for each equation depend on the risk premia (the λ_j's) and the risk-free rate (λ_0). As McElroy and Burmeister note, the estimates of the risk premia and the exposures obtained using this method are, even without normally distributed errors, strongly **consistent** and asymptotically normally distributed. Thus this procedure is robust to the nonnormality endemic to asset price data.

Asset Returns

To measure the effect of monetary policy shocks on stock returns for different-sized firms we used the same data set employed by Campbell and Mei [5]. These data were for ten value-weighted common stock portfolios sorted by decile based on market capitalization. These stocks were all listed on the New York Stock Exchange. Table 1 provides summary statistics for these data and average market capitalization by decile. These decile stock return data are available until December 1987. In addition, data for the industries listed in Table 2 were also employed.* The one month Treasury bill rate was used as the risk-free rate and subtracted from the portfolio returns before estimation.

Sample Period

The Federal Reserve employed different operating procedures in recent years. During the September 1974 - September 1979 period, as Cook and Hahn [9] have documented, the Fed used the federal funds rate as its intermediate target. Over the October 1979 - August (or October) 1982, the Fed used nonborrowed reserves as its operating target. After August (or October) 1982, the Fed returned to targeting short term interest rates. The ambiguity concerning when the Fed reverted back to interest rate targeting comes because, while the Fed officially acknowledged changing its operating procedures in October 1982, it actually started changing procedures during the summer of 1982 (See Greider, 1987).

Because the Fed has used different intermediate targets over recent years we estimate equation (2) over two sample periods: the first (1974:9 - 1979:9 and 1982:8 - 1987:9) when the Fed targeted short term interest rates and the second (1979:10 - 1982:10) when the Fed targeted nonborrowed reserves. Over the first period we measure monetary policy using innovations in the federal funds rate and over the second period using innovations in nonborrowed reserves. Although our stock return data extend to December 1987, we truncate the sample at September 1987 to avoid anomalous effects that could arise from including the October 1987 stock market crash in our sample. The second sample period extends to October 1982 rather than August because the Jacobian cross-products matrix was not of full rank when the sample ended in August, causing some of the estimates to be biased. For those estimates that were not biased (including those for the ten decile stock returns) the results were similar whether the sample ended in August or October.[3]

The 1979:10 - 1982:10 sample is also of interest because this short period includes two recessions, the second of which ended in 1982:10. This second recession brought the unemployment rate to a postwar high of 11 percent. Gertler and Gilchrist [15] argued that, because credit constraints bind a larger number of small firms in a downturn, changes in monetary policy should have a larger effect on small firms in bad times than in good times. The 1979:10-1982:10 period is useful for examining whether monetary policy has a larger effect on small firms in bad times.

Macroeconomic Factors

We measured monetary policy using innovations in both the federal funds rate and in nonborrowed reserves. To measure unexpected changes in these variables we followed Christian0 *et al.* [8]. They measured innovations in the federal funds rate and in nonborrowed reserves as residuals from a vector autoregression that included lagged values of real GDP, the GDP deflator, an index of commodity prices, the funds rate, nonborrowed reserves, and total reserves. They found that including commodity prices in the regression obviated the "price puzzle" by which tighter monetary policy as measured by innovations in the funds rate and in nonborrowed reserves appeared to cause higher prices.

Since we are using monthly rather than quarterly data we employed industrial production growth rather than GDP and the CPI inflation rate rather than the GDP deflator. Otherwise we used the same variables employed by Christian0 et *al.* We included six lags of each of the variables in our regressions. The residuals from the regressions with the funds rate and nonborrowed reserves as dependent variables were used to measure unexpected changes in monetary policy. Since data on commodity prices were available from Haver Analytics beginning in January 1967, these regressions were performed over the 1967:1 - 1987:9 period.

Apart from innovations in monetary 'policy, the other factors employed were the same used by Chen, Roll, and Ross [7]. They used the corporate bond/Treasury bond spread (the default premium), the Treasury bond/Treasury bill spread (the horizon premium), the monthly growth rate in industrial **production**, unexpected inflation, and the change in expected inflation. To calculate unexpected inflation they first determined the expected real rate on a one-month Treasury bill using the method of Fama and Gibbons [11]. They subtracted this from the nominal Treasury bill rate (known at the beginning of the month) to calculate expected inflation. Unexpected inflation was set equal **to** the difference between actual inflation and expected inflation. The change in expected inflation was set equal to the first difference of the expected inflation series. Chen, Roll, and Ross argued that each of the series that they used, being either the difference between asset returns or very noisy, could be treated as innovations. The data sources are discussed in the appendix.

III. Results

Tables 2 and 3 present the exposures (the β_{ij}'s) of asset returns to monetary policy and the R^2's for each equation.' Table 2 measures monetary policy using innovations in the federal funds rate and Table 3 using innovations in nonborrowed reserves. Of the 39 exposures in Table 2, all but 4 are negative (indicating that a monetary tightening depresses stock returns). 25 of the exposures are significant at at least the '10 percent level and 20 at 'at least the 5 percent level. Of the 31 exposures in Table 3, all are positive (indicating that a monetary tightening depresses stock returns). 22 of the exposures are significant at at least the 10 percent level and 18 at at **least the** 5 percent level. The R^2's over the two Tables average 0.32, indicating that a nontrivial percentage of the total sum of squares of stock returns is explained by macroeconomic factors.

Equation (1) is useful for interpreting the magnitudes of these exposures. It indicates that unexpected changes in the federal funds rate (FFR) and in nonborrowed reserves (NBR) will affect the return on asset i according to the expressions $\beta_{i,FFR}f_{FFR}$ **and** $\beta_{i,NBR}f_{NBR}$. The mean value of $\beta_{i,FFR}$ in Table 2 is -2.4 and the mean value **of** $\beta_{i,NBR}$ in Table 3 is 111. The mean absolute innovations in FFR and NBR over the respective sample periods covered in Tables 2 and 3 are 0.30 and 0.0147. Thus on average news of FFR innovations will affect stock returns by 0.71 percent per month and news of NBR innovations by 1.6 percent per month. These compound to annual effects of 8.95 percent per month for FFR innovations and 21.6 percent for NBR innovations. Thus news of monetary policy changes are precipitating large changes in stock returns over our sample periods. Equation (1) also indicates that stocks' exposures to FFR and NBR influence expected returns according to the expressions $\beta_{iFFR}\lambda_{FFR}$ and $\beta_{iNBR}\lambda_{NBR}$. λ_{FFR} equals -0.33 and is statistically different from zero **at the** 5 percent level and λ_{NBR} equals -.00071 and is not statistically significant at the 5 percent level. The mean absolute value of $\beta_{iFFR}\lambda_{FFR}$ is then 0.78 and the mean absolute value of $\beta_{iNBR}\lambda_{NBR}$ 0.08. These results imply that on average the expected return on a stock decreased by 0.78 percent per month because of its exposure to the funds rate and by 0.08 percent per month because of its exposure to nonborrowed reserves.

The important implication of these findings is that an unexpected tightening of monetary policy produces a large and statistically significant decline in stock returns and that macroeconomic variables explain a substantial portion of the variation in stock returns. These findings present a challenge to real **business** cycle models relying exclusively on industry-specific shocks.

To investigate whether **credit** market frictions are one channel of the monetary transmission mechanism we examined **the** differential effects of monetary shocks on small versus large firms. Over the longer 123 month period including both recessions and expansions, stock returns for the lowest decile firms, which presumable have the fewest collateralizable assets, are weakly correlated with monetary policy shocks. As firm size increases, this correlation increases **almost** monotonically. Also, over the first five deciles, the magnitude of the exposures increases monotonically despite the higher mean returns on lower decile portfolios that should *ceteris paribus* cause their exposures to be larger. Over the shorter 37 month period characterized by two recessions, both lowest decile stocks and higher decile stocks are strongly correlated with monetary policy innovations. To test whether small company stocks are significant over the shorter period because nonborrowed reserves innovations are used instead of funds rate innovations the model was re-estimated over this period using funds rate innovations. As shown in Table 4, when monetary policy is measured using funds rate innovations lowest decile stocks remain highly correlated with monetary policy innovations.

The finding that monetary policy was not highly correlated with small company stocks over the longer period characterized by recession and expansion but was over the shorter period characterized by recession suggests that small firms do not benefit from a monetary expansion. To test whether this is so we re-estimated the model over the 1982:8 - 1987:9 period (using funds rate innovations to measure monetary policy). This period begins with the monetary expansion of August 1982 and the continuous recovery that many believe was sparked by the monetary expansion. As Table 5 shows, small firms' stocks are not highly correlated with monetary policy innovations over this period while larger company stocks clearly are. These findings suggest that monetary policy exerts an asymmetric effect on small firms' stocks. Disinflationary monetary policy (as occurred during the Volcker deflation) clearly harms small as well as large firms. During subsequent expansions (as occurred over the 1982:8 - 1987:9 period) small firms do not benefit much while large firms do. Thus small firms appear to bear a disproportionate burden from changes in monetary policy.

It is possible to gain further insight into the differential effects of monetary policy on small and large firms during expansions by examining the magnitudes of the exposures for small and large firms. We can obtain rough estimates of what these exposures mean for firms' payouts by using the standard present value model if we assume that the discount rate can be calculated using our multi-factor model and **that the** discount rate is constant over the 5-year period. For a first decile firm a 1 percent unexpected decrease in the federal funds rate produces a capital gain of 2.3 percent while for a fifth decile firm it causes a capital gain of 3.4 percent. Letting P_S and P_L be the prices of the representative small and large firms before news of the federal funds rate decrease and P_S' and P_L' be the prices after the news, the exposures imply:

$$(P_S' - P_S)/P_S = 0.023 \text{ and } (P_L' - P_L)/P_L = 0.034 \qquad (3)$$

Then, for both small and large firms' stocks:

$$P = div_{+1}/(1+r) + div_{+2}/(1+r)^2 + div_{+3}/(1+r)^3 + \ldots$$

$$P' = div_{+1}'/(1+r) + div_{+2}'/(1+r)^2 + div_{+3}'/(1+r)^3 + \ldots \qquad (4)$$

where P and P' are the prices of the stock before and after news of the monetary expansion, div_{+i} is the expected payout of the firm i periods in the future, and r is the rate at which this payout is capitalized. Equation (3) implies:

$$P'-P = (div'_{+1} - div_{+1})/(1+r) + (div'_{+2} - div_{+2})/(1+r)^2 + \ldots$$

$$= \Delta div_{+1}/(1+r) + \Delta div_{+2}/(1+r)^2 + \ldots \qquad (5)$$

To simplify the analysis, we assume that Adiv is constant. Then $P'-P = \Delta div/r$ and:

$$(PS'-P_S)/(P_L'-P_L) = \Delta div_S r_S^{-1}/\Delta div_L r_L^{-1} \qquad (6)$$

Equation (3) implies:

$(P_S' - P_S)/(P_L' - P_L) = \Delta div_S r_S^{-1} / \Delta div_L r_L^{-1} = 0.023 P_S / 0.034 P_L$ (7)

Assuming the price of the representative small firm is less than or equal to the price of the representative large firm,

$\Delta div_S / \Delta div_L \leq 0.023 r_L / 0.034 r_S$ (8)

The monthly discount rate calculated using our multi-factor model were 0.00666 for r_L and 0.00642 for r_S. Thus:

$\Delta div_S / \Delta div_L \leq 0.702$ (9)

Thus the standard present value model and estimates we obtained using our multi-factor model imply that a monetary shock over the 1982-1987 period increases the payoff of small firms by only 70 percent of the payoff of large firms. Since the discount rates are similar, this result is being driven by differences in expected payouts and should carry over even if Adiv is not constant.

IV. Discussion

The finding that monetary policy shocks are only weakly correlated with small firms returns over the 1982-1987 period coupled with evidence that monetary shocks affect the payout of large firms more than the payout of small firms seems inconsistent with the findings of Gertler and Gilchrist [15], although the asymmetric effects over good times and bad times is consistent. To attempt to reconcile our evidence with theirs we consider their findings using funds rate innovations, which are similar to our monetary policy shocks. Over the entire period (including good times and bad times) they do not find a statistically significant difference in the response of large and small firms' sales to funds rate shocks. However, both they and Christian0 et *al.* find that short term liabilities rise (fall) more for large firms than for small firms following a contractionary (expansionary) monetary policy shock. If during a monetary-induced expansion large and small firms' sales increase by a similar amount but liabilities decrease significantly more for large firms than for small firms, then one would expect large company stocks to fare better. The shedding of liabilities by large companies during the expansion would improve the financial health of the company and thus its financial performance.

There are a couple of problems with this interpretation, however. First, the fact that funds rate shocks are affecting small firms' sales should cause funds rate shocks to be more strongly correlated with small firms' returns than they are. Second, the behavior of short term debt in Figure 1 of Gertler and Gilchrist [15] appears inconsistent with this hypothesis. Their Figure 1 shows that **at the** time monetary policy turned expansionary in late 1982, the rate of change in the growth of short term debt for large companies became positive and the growth rate itself quickly went from -10 percent to +4 percent. This appears inconsistent with the hypothesis that it was a decumulation of debt triggered by the monetary expansion that caused large firms' stocks to outperform small firms' stocks. It is true that later in the period there is some tendency for the debt of large firms to drop relative to the debt of small firms. Thus the differential effects of a monetary expansion on the debt of'large and small firms could explain why large firms' stocks are more responsive than small firms' stocks to monetary shocks.

Another explanation for the attenuated effect of monetary shocks on smaller firms is that wages and prices are more flexible for smaller firms. Christian0 et al. have conjectured that the increase in liabilities by firms following a monetary contraction reflects the decline in cash flow due to decreased sales. The increased borrowing is needed to cover nominal expenditures, which are apparently rigid. If this is true then the fact that small firms' liabilities do not increase as much suggests that they are better able to reduce nominal expenditures during disinflations. Being confronted with more adverse terms of credit, they have a greater incentive to undertake difficult cuts. Large firms during a recession would thus be better able to hoard labor than small firms. During the subsequent recovery, this would cause large firms' profits to outstrip small firms' profits for a couple of reasons. First, given the fact that real wages are procyclical, if some of the hoarded labor was paid nominal wages that were preset during the recession while labor hired during the recovery was paid spot market levels, unit labor costs might be greater for small firms. Second, small firms would encounter hiring and training costs that larger firms employing hoarded labor would not.[5] Prices also might be more flexible for small than for large firms because the greater number of small firms in an industry might imply greater competition and thus less ability for an individual firm to set prices.

Future research should investigate whether the attenuated effect of monetary policy shocks on small firms' stock returns relative to large firms' returns is due to a greater decumulation of debt by large firms, greater wage and price flexibility by small firms, or some other factor. One way to test whether small firms have greater price flexibility than large firms would be to perform a study such as Carlton's [6] examining whether the average time between price changes is shorter for small firms than for large firms.

V. Conclusion

This paper investigated the extent to which business cycle fluctuations are due to monetary policy shocks and other macroeconomic factors as opposed to industry-specific factors. The results indicate that on average 32 percent of the variation in stock returns is explained by macroeconomic factors and that news of contractionary monetary policy triggers a large and statistically significant decline in stock returns. These results cast doubt on real business cycle models that emphasize exclusively industry-specific productivity shocks or taste changes leading to sectoral reallocations.

This paper has also investigated whether one channel of monetary transmission occurs through the impact of monetary policy shocks on returns of large and small firms. It found that disinflationary monetary policy during the Volcker deflation harmed both large and small firms. During the subsequent expansion, however, monetary policy was strongly correlated with large firms' returns but weakly correlated with small firms' returns. These results have mixed implications for the view that one channel of monetary transmission occurs through its impact on bank loans and on firms' balance sheets. Evidence that monetary policy changes have a larger effect on small firms in bad times than in good times is consistent with the fact that credit constraints bind a larger number of small firms in a downturn. However, evidence that monetary policy shocks exert a larger effect on large firms during good times seems inconsistent with the view that monetary policy affects real variables because of credit market frictions. The findings reported here also indicate that the monetary authorities should be concerned about excessive tightening, not only because it slows the overall economy but also because it causes harm to small firms that will not be remedied by future expansionary policy.

TABLE 1 Summary Statistics for Decile Portfolios[a]

Portfolio	Mean	Standard Deviation	Average Market Capitalization
First Decile (smallest)	0.024	0.080	12,000,000
Second Decile	0.023	0.068	36,000,000
Third Decile	0.022	0.063	82,000,000
Fourth Decile	0.021	0.059	130,000,000
Fifth Decile	0.020	0.055	200,000,000
Sixth Decile	0.020	0.053	320,000,000
Seventh Decile	0.019	0.052	480,000,000
Eighth Decile	0.017	0.051	800,000,000
Ninth Decile	0.016	0.049	1,500,000,000
Tenth Decile (largest)	0.013	0.046	5,800,000,000

a. Average market capitalization was calculated based on data in Ibbotson Associates [16] and was discounted back to the end of 1987 using Ibbotson Associates data for stock returns on large and small firms over that period.

TABLE II Nonlinear Seemingly Unrelated Regression Estimates of the Exposures of Portfolio Returns to News of the Federal Funds Rate"

Portfolio	Exposure	t-statistic	R-squared
First Decile (smallest)	-1.99	-1.17	0.19
Second Decile	-2.30*	-1.65	0.21
Third Decile	-2.52**	-1.95	0.23
Fourth Decile	-2.88**	-2.48	0.27
Fifth Decile	-2.90**	-2.66	0.27
Sixth Decile	-2.84**	-2.76	0.29
Seventh Decile	-2.86**	-2.90	0.32
Eighth Decile	-2.67**	-2.77	0.33
Ninth Decile	-2.78**	-3.19	0.40
Tenth Decile (largest)	-2.39**	-2.87	0.34
aluminum	-2.02	-1.28	0.07
automobiles	-3.26**	-2.49	0.17
chemicals	-1.03*	-0.90	0.11
cosmetics	-2.71**	-2.20	0.19
financial (life insurance)	-1.96*	-1.87	0.30
financial (multi-line insurance)	-3.19**	-3.52	0.27
financial (personal loan companies)	-1.49	-1.03	0.26
financial (property casualty insurance)	-3.18**	-2.79	0.29
financial (savings & loan)	-8.28**	-4.24	0.42
food	-2.07**	-2.39	0.31
high grade common stocks	-1.92**	-2.44	0.29
homebuilding	-4.05**	-1.94	0.23
hotel	-2.91	-1.54	0.11
leisure	-2.38	-1.36	0.12
low priced common stocks	-2.11	-1.32	0.14
machine tools	-2.50	-1.38	0.05
money center banks	-1.02	-0.79	0.30
office equipment	0.49	0.35	0.17
paper	-3.60*	-1.88	0.13
publishing	-2.93*	-1.92	0.14
restaurants	0.18	0.13	0.22
retail stores (drug stores)	-3.33**	-2.14	0.18
retail stores (general merchandise)	-1.87	-1.39	0.23
shoes	-2.03	-1.37	0.16
small company stacks	-2.65**	-2.08	0.20
tobacco	-1.61	-1.51	0.18
toys	0.10	0.05	0.10
transportation (railroads)	-2.08**	-2.06	0.23
utility companies	-2.14**	-2.58	0.29

*,** Significant at the 10% and 5% levels respectively.

a. The sample period is 1974:9-1979:9, 1982:8-1987:9. Each equation has 117 degrees of freedom.

TABLE III Nonlinear Seemingly Unrelated Regression Estimates of the Exposures of Portfolio Returns to News of Nonborrowed Reserves'

Portfolio	Exposure	t-statistic	R-squared
First Decile (smallest)	122**	2.70	0.49
Second Decile	136**	2.84	0.49
Third Decile	130**	2.87	0.50
Fourth Decile	128**	2.81	0.50
Fifth Decile	138**	3.23	0.52
Sixth Decile	114**	2.62	0.45
Seventh Decile	114**	2.63	0.49
Eighth Decile	96.9**	2.45	0.52
Ninth Decile	97.0**	2.32	0.47
Tenth Decile (largest)	70.0*	1.70	0.39
automobiles	51.0	0.66	0.14
financial (life insurance)	64.0	1.23	0.43
financial (property casualty insurance)	52.5	1.06	0.50
financial (savings & loan)	114	1.41	0.57
food	88.2**	2.58	0.55
high grade common stocks	63.7**	1.79	0.45
homebuilding	290**	3.20	0.54
leisure	74.9	0.83	0.18
low'priced common stocks	173*	2.71	0.45
machine tools	186**	1.99	0.37
money center banks	71.1	1.53	0.60
office equipment	121**	2.14	0.35
paper	109**	2.03	0.44
publishing	119**	2.40	0.44
restaurants	141**	2.23	0.42
retail stores (drug stores)	105*	1.68	0.37
shoes	16.0	0.34	0.34
small company stocks	138**	2.85	0.46
toys	157	1.41	0.29
transportation (railroads)	106	1.26	0.21
utility companies	42.2*	1.68	0.68

*,** Significant at the 10% and 5% levels respectively.

a. The sample period is 1979:10-1982:10. Each equation has 31 degrees of freedom.

TABLE IV Nonlinear Seemingly Unrelated Regression Estimates of the Exposures of Portfolio Returns to News of the Federal Funds Rate[a]

Portfolio	Exposure	t-statistic
First Decile (smallest)	-1.33**	-2.20
Second Decile'	-0.77	-1.12
Third Decile	-0.87	-1.36
Fourth Decile	-1.09*	-1.72
Fifth Decile	-1.11*	-1.82
Sixth Decile	-0.99	-1.64
Seventh Decile	-0.99	-1.66
Eighth Decile	-0.84	-1.55
Ninth Decile	-0.75	-1.31
Tenth Decile (largest)	-0.70	-1.27

*,** Significant at the 10% and 5% levels respectively.

a. The sample period is 1979:10-1982:10. Each equation has 31 degrees of freedom.

TABLE V Nonlinear Seemingly Unrelated Regression Estimates of the Exposures of Portfolio Returns to News of the Federal Funds Rate"

Portfolio	Exposure	t-statistic
First Decile (smallest)	-2.27	-1.49
Second Decile'	-2.60**	-1.99
Third Decile	-3.11**	-2.35
Fourth Decile	-3.29**	-2.57
Fifth Decile	-3.37**	-2.66
Sixth Decile	-2.94**	-2.41
Seventh Decile	-3.15**	-2.62
Eighth Decile	-2.63**	-2.21
Ninth Decile	-2.55**	-2.25
Tenth Decile (largest)	-2.13*	-1.94

*,** Significant at the 10% and 5% levels respectively.
a. The sample period is 1982:8-1987:9. Each equation has 56 degrees of freedom.

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Appendix

Data Sources

The data were obtained from various sources. Data on decile stock returns were obtained from Jianping Mei. Data on other portfolio returns were obtained from Standard and Poor's [23] and from Ibbotson Associates [16]. Data on Treasury bill returns, inflation, the horizon premium, and the default premium were obtained from Ibbotson Associates. Data on industrial production, the inflation rate, commodity prices, the federal funds rate, total reserves, and nonborrowed reserves were obtained from the Haver Analytics data tape. The Haver mnemonics for these variables were, respectively, IPN, PCU, PZALL, FFED, FARAT, and FARAN.

Notes

* We thank Jianping Mei for providing us with the decile stock return data.

1. Examining the importance of industry-specific shocks versus macroeconomic shocks is actually useful for testing only a subset of RBC models, those emphasizing industry-specific productivity shocks or taste changes producing sectoral reallocations (e.g., Long and Plosser [17]). However, as Lougani [18] has argued, since aggregate productivity shocks have little explanatory power for aggregate investment and for the recessions of 1974-1975 and 1981-82, multiple sector RBC models are in many ways more promising than single sector RBC models.

2. Three of these portfolios (high grade common stock, low priced common stock, and small company stock) were included to spread cross-sectional returns over a wider range. As Chen, Roll, and Ross [7] discussed, this is useful when estimating equation (2).

3. Even when the sample extended to October, some of the estimates were biased. Dropping those estimates that were biased, we were left with 31 portfolios over this shorter sample period.

4. The exposures associated with the other factors are available on request.

5. The asymmetric effect of monetary shocks during recessions and expansions could be explained if small firms were less able to reduce nominal wages for those still employed during recessions to spot market levels than they were able to raise nominal wages for new hires during expansions to spot market levels.