Macroeconomic Cycles and the Stock Market's Reaction to Monetary Policy

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Abstract

This paper examines cyclical variation in the effect of Fed policy on the stock market. We find a stronger response of stock returns to unexpected changes in the Federal funds target rate during periods of economic weakness and in tight credit market conditions. Proxies for credit market conditions tend to produce stronger evidence of asymmetric response of stock prices to target rate news. Using firm-level data, we also show that firms that are likely to face financial constraints are more affected by monetary shocks in tight credit conditions than relatively unconstrained firms. Overall, the results are consistent with the credit channel of monetary policy transmission.

I. Introduction

Few events are watched by market participants with more interest than decisions of the Federal Reserve regarding monetary policy. This interest stems from a significant impact of news about Fed policy on asset prices. For example, Fleming and Remolona (1997) show that federal funds target rate announcements tend to cause large price changes in the U.S. Treasury market. Fair (2002) reports that more than 30 percent of identifiable events that caused a large immediate price change in the stock market were monetary announcements. Bernanke and Kuttner (2005) show that an unexpected 25-basis point cut in the Federal funds target rate leads to a one percent increase in the level of stock prices on average.

Policymakers recognize that the stock market is an important conduit of monetary policy that can be used to influence real economic activity. Stock prices affect the real economy through a number of channels. One of these channels is the wealth effect of stock prices on consumption and economic growth. Fluctuations in stock prices also affect the firms' cost of capital and their capacity to raise new capital and invest. The first step in each of these channels, however, is the effect of monetary policy on the stock market. A review of FOMC meeting transcripts shows that the Fed officials are often concerned about the possible impact of policy actions on the stock market and the resulting effects on consumption and investment.[1] Therefore, it is important for policy makers to understand what determines the magnitude of the stock market's reaction to policy moves.

This paper argues that there is significant cyclical variation in the impact of monetary policy shocks on stock prices. We show that stocks respond much stronger to monetary shocks in periods of weak economy and in tight credit market conditions. This result is important for several reasons. First, the direction of the time variation supports a credit channel of monetary

[1] See selected quotes in the Appendix.

policy transmission using stock market data. Prior evidence on this issue has been mixed.[2] Second, our findings contribute to the literature on state dependence in the stock market's response to macroeconomic news. Andersen, Bollerslev, Diebold and Vega (2005) find no evidence of state dependence in the stock market's response to monetary news. Using a more accurate measure of monetary news, a longer sample period, and multiple proxies for macroeconomic state, we find strong evidence of such state dependence. Finally, our evidence of cyclical variation in the response of stocks to monetary news should be useful to Fed policymakers by helping them predict the effect of a target rate change on the stock market.

In further analysis, we use disaggregated firm-level data to examine the response of stock returns to monetary shocks in the cross-section of firms. The results show that the response of stock returns to monetary news over the credit cycle depends on individual credit characteristics of firms. Specifically, stocks of companies that are likely to be credit constrained react more strongly to monetary news in tight credit market conditions than stocks of relatively unconstrained firms. This finding lends further evidence supporting the credit channel hypothesis and contributes to the literature by showing how macroeconomic conditions interact with firm characteristics to determine the reaction of stocks to monetary policy moves. We also conduct a sectoral analysis to identify the source of the credit channel effects. The results show that these effects are strongest in business equipment and manufacturing sectors of the economy.

II. Background and Related Literature

A. Channels of Monetary Policy Transmission

There are two channels through which stock prices respond to monetary news. The first and more traditional channel is the interest rate channel that relates to economic activity primarily

[2] See Warner and Georges (2001) and Ehrmann and Fratzscher (2004).

through consumption and investment. A cut in the cost of borrowing should boost the quantity of funds demanded for investment and lead to an increase in economic activity. A drop in the interest rate also promotes current over future consumption. Hypothetically, the interest rate channel may also lead to time variation in the response of stock returns if the elasticity of investment borrowing varies over time or if the intertemporal elasticity of substitution of consumption is cyclical. But, as Peersman and Smets (2005) argue, there is no clear economic reason for the effects of the interest rate channel to vary over the business cycle and no prediction regarding the direction of possible variation.

The second channel of monetary policy transmission, the credit channel, can be subdivided into two mechanisms: the bank loan channel and the balance sheet channel. The bank loan channel stresses cyclicality in the availability of loans. A reduction in the supply of bank credit affects the economic activity of bank-dependent borrowers. The balance sheet channel focuses on changes in creditworthiness of firms due to procyclical fluctuations in the quality of their balance sheets. Both mechanisms of the credit channel stress the supply of funds to the firms. When credit markets are tight, a surprise monetary easing reduces the quantity restrictions on availability of credit, resulting in a larger effect on the level of economic activity.

Theories of the credit channel predict that worsening credit market conditions give rise to the "financial accelerator" effects by amplifying the effect of real or monetary shocks on the economy.[3] Borrowers have better information about their creditworthiness than the lenders do. Such informational frictions lead to an "external finance premium" between the cost of internally generated funds and funds raised from financial markets. Bernanke and Gertler (1989) argue that these frictions are largest in recessions, when weak balance sheets lead to higher costs of external

[3] See, for example, Bernanke and Gertler (1995) and Bernanke, Gertler and Gilchrist (1996) for a review of financial accelerator theories.

finance, resulting in lower investment demand and reduced economic activity. Furthermore, banks and other financial intermediaries may tighten credit standards ahead of a period of weak economy, reducing the supply of credit to weaker borrowers. These riskier borrowers have limited access to alternative sources of credit. As a result, weaker borrowers are more affected by macroeconomic shocks in adverse credit market conditions.

The empirical evidence on the presence of a credit channel is, at best, mixed. For example, Miron, Romer and Weil (1994), Oliner and Rudebusch (1996), and Driscoll (2004) find little support for the bank lending channel of monetary transmission. However, Garcia and Schaller (2002) and Lo and Piger (2005) show that monetary policy has a stronger effect on output in recessions than in expansions, a result consistent with a credit channel. Peersman and Smets (2005) find evidence of the credit channel effects by studying cross-industry heterogeneity in the response of output in seven euro area countries to monetary policy changes. The two studies that examine this issue by looking at the response of disaggregated stock returns to monetary shocks show opposite results. Warner and Georges (2001) find no evidence supporting a credit channel. In contrast, consistent with the credit channel, Ehrmann and Fratzcher (2004) document firm-level heterogeneity in stock responses based on financial constraints.[4]

B. State Dependence in the Stock Market's Reaction to Economic News

Several studies have examined whether the stock market's reaction to economic news depends on the state of the economy. McQueen and Roley (1993) examine state dependence in the stock market response to several macroeconomic announcements, including changes in the Fed's discount rate. They find that in periods of strong economic growth the stock market responds significantly to news about prices and real activity. They also show that bond yields react to

[4] Warner and Georges (2001) examine ten policy shocks from 1991, 1992 and 1994, whereas Ehrmann and Fratzcher (2004) use a sample period from February 1994 to January 2003.

economic news similarly in different economic states. More recently, Boyd, Hu and Jagannathan (2005) show that the stock market's reaction to unemployment news depends on the state of the economy. They provide evidence that the state dependence in the stock market's reaction is related to news about the equity premium and growth expectations.

Andersen et al. (2005) use intraday data to examine the state dependence in the reaction of stock, bond and foreign exchange markets to a wide range of macroeconomic announcements. They find that good economic news tends to have a negative effect on the stock market in periods of economic expansion and a positive effect in recession. Using forecasts of market participants compiled by Money Market Services (MMS) as a measure of the market expectations of the fed funds target rate, Andersen et al. (2005) do not find a significant state dependence in the reaction of the stock market to monetary news.

We add to this literature by using the measure of surprise policy actions derived from the fed funds futures prices proposed by Kuttner (2001) to examine the state dependence in the stock market's reaction to monetary news. This measure of target rate surprises is theoretically cleaner than measures derived from survey-based expectations, since the expected component of the release is incorporated in the fed funds futures prices available immediately before the announcement.[5] It also allows us to examine target rate changes made at unscheduled meetings of the Federal Open Market Committee (FOMC), which are excluded from the sample in Andersen et al. (2005). Furthermore, we use several different proxies for macroeconomic cycles and perform a cross-sectional analysis of the response of stocks to monetary news in addition to looking at the aggregate stock market response.

[5] Chun (2006) shows that the forecasts of the fed funds rate extracted from the fed funds futures prices are more accurate than survey forecasts.

III. Data, Key Variables and Sample Selection

Following Kuttner (2001) and Bernanke and Kuttner (2005), the surprise component of the target rate change is computed using the change in the implied rate of the current-month fed funds futures on the day of the Fed policy decision:[6,7]

$$\Delta i_t^u = \frac{D}{D-d}\left(f_t^0 - f_{t-1}^0\right), \tag{1}$$

where f_t^0 is the fed funds rate implied in the settlement price of the current-month fed funds futures contract, *d* is the day of the current FOMC meeting and *D* is the number of days in the month. The settlement price of the fed funds futures is based on the average fed funds rate during the contract's month. The first term in (1) is a scaling factor that adjusts for the number of remaining days in the month affected by the rate change. The current policy surprise Δi^u measures the unexpected change in the fed funds rate expected to prevail until the next FOMC meeting. The expected component of the rate change, Δi^e, is estimated as the difference between the actual target rate change and the surprise.

We use an event study approach by examining a sample period that extends over fifteen years from 1990 to 2004 and includes 138 announcements made by the FOMC regarding the Federal funds target rate.[8] Eighteen of these announcements occurred after unscheduled FOMC meetings.[9] The daily target rate surprises during our sample period are shown in Figure 1.

[Insert Figure 1 about here]

[6] The fed funds futures rate reflects the market's expectation of the average fed funds rate over the contract's month. However, Robertson and Thornton (1997) and Gürkaynak, Sack and Swanson (2006) show that the futures rate is also a good predictor of the funds target rate.

[7] We thank Refet Gürkaynak and Eric Swanson for providing the fed funds target surprises used in Gürkaynak, Sack and Swanson (2005).

[8] Bernanke and Kuttner (2005) examine a sample period from June 1989 through December 2002.

[9] Similar to Bernanke and Kuttner (2005), we omit the target rate announcement made at the unscheduled FOMC meeting of September 17, 2001.

To test our hypothesis concerning the state dependence in the stock market reaction to monetary news, we need to proxy for the state of the economy. Boyd et al. (2005) use an experimental coincident recession index constructed by Stock and Watson (1989) as their measure of the state of the economy. Stock and Watson currently recommend using "next generation" coincident measures of the business cycle, such as the Chicago Fed National Activity Index (CFNAI).[10] The CFNAI is a principal component of 85 economic indicators and corresponds to the economic activity index developed by Stock and Watson (1999). This index is constructed to have a mean of zero and a standard deviation of one. The Chicago Fed (2000) suggests using a three-month moving average of the CFNAI as an indicator of turning points in the business cycle. We obtain historical values of the CFNAI from the website of the Federal Reserve Bank of Chicago.

In addition to using the CFNAI as a continuous proxy for the state of the economy, we also use two alternative recession dummies. Two recessions occurred within our sample period. Our first recession dummy is constructed using the NBER business cycle turning points. This dummy variable is based on information (NBER announcements) that is unavailable to traders in real time. Therefore, we also identify the business cycle turning points using a combination of the CFNAI values and NBER announcements. According to the Chicago Fed (2000), a drop of the three-month moving average of the CFNAI below -0.7 indicates a significant probability that a recession has begun. An increase of the three-month moving average of the CFNAI above 0.2 indicates a significant probability that a recession has ended.[11]

The moving average of the CFNAI dropped below -0.7 in September 1990 and then moved above 0.2 in January 1993. However, the NBER announced on December 22, 1992

[10] See discussion at http://ksghome.harvard.edu/~JStock/xri/

[11] Evans, Liu and Pham-Kanter (2002) provide evidence that these threshold values are useful for identification of business cycle turning points.

that the recession ended in March 1991. The moving average of the CFNAI again declined below -0.7 in January 2001 and then crossed the 0.2 threshold only in November 2003. The NBER announced on July 17, 2003 that a trough in the U.S. business activity occurred in November 2001. Since we want to use business cycle turning points based on the information available to market participants in real time, we set the CFNAI recession dummy equal to one during the periods between September 1990 and December 21, 1992 and between January 2001 and July 16, 2003 and zero otherwise.

Lown and Morgan (2006) show that bank credit standards from the Fed's Senior Loan Officer Opinion Survey predict changes in lending and business activity. This survey is conducted quarterly, with survey participants reporting whether they have tightened or eased their lending standards from the previous quarter.[12] We use the net percentage of loan officers who reported tightening of credit standards for large and medium commercial borrowers. This variable appears to be a good proxy for frictions in credit markets posited by theories of the credit channel of monetary transmission. As an alternative proxy for the credit market conditions, we use the spread between the prime rate and a three-month Treasury bill yield.[13]

Data on interest rates are obtained from the FRED® database of the Federal Reserve Bank of St. Louis. In our cross-sectional analyses, we examine stocks included in the S&P 500 index as in December 2004. To construct this sample of S&P 500 firms, we merge the COMPUSTAT annual files and the daily stock returns from the Center for Research in Security Prices (CRSP) database.

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[12] The results of this survey are available at http://www.federalreserve.gov/BoardDocs/snloansurvey/200610.
[13] This interest rate spread is used for a similar purpose, for example, by Bernanke and Gertler (1995) and Bernanke, Gertler and Gilchrist (2000).

IV. Empirical Results

A. State Dependence in the Stock Market Response

We begin by looking at the average effect of the Fed policy decisions on the stock market. A scatter plot of the fed funds surprises and daily returns on the S&P 500 index is shown in Figure 2. The scatter plot shows that the rate cuts made at several unscheduled meetings were not anticipated by the market and resulted in large stock price increases.

[Insert Figure 2 about here]

We estimate the following regression of the S&P 500 index return on the expected and unexpected components of the change in the fed funds target rate:

$$R_t = \alpha + \beta_1 \Delta i_t^e + \beta_2 \Delta i_t^u + \beta_3 \Delta i_t^u EMP_t + \beta_4 \Delta i_t^u REV_t + \varepsilon_t , \qquad (2)$$

where EMP_t is a dummy variable for the announcements made on the days of employment releases and REV_t is a dummy variable for target rate changes that represented policy reversals.

Equation (2) is estimated twice using OLS, first with all data and then after dropping the unscheduled meeting observations. The primary reason for dropping the unscheduled meetings is that they may contain a different type of surprise than scheduled meetings. A similar approach is used by Bernanke and Kuttner (2005), where they drop several unscheduled meetings among observations classified as outliers. Since OLS estimation could be sensitive to the presence of outliers, we also estimate the regression in (2) using the MM weighted least squares procedure introduced by Yohai (1987). This procedure maintains robustness in the presence of a large number of outliers.

The results for the full sample reported in Panel A of Table 1 are generally consistent with Bernanke and Kuttner (2005). The coefficient estimate of the target rate surprise in the full sample is about -4.5, compared to the estimate of -4.68 reported by Bernanke and Kuttner (2005)

for the full sample. However, similar to their results, we find a lower estimate of the coefficient of the target rate surprise once the unscheduled meetings are dropped.

[Insert Table 1 about here]

We start our examination of state dependence by simply adding in the regression model the recession dummies discussed in Section III. The results presented in Panels B and C of Table 1 show that stocks tend to react more strongly to monetary surprises in recession, especially when the CFNAI recession dummy is used. For OLS results, the difference becomes statistically significant if we consider only scheduled FOMC meetings.

To formally examine the state dependence in the stock market response to monetary policy surprises, we estimate the following regression:

$$R_t = \alpha + \beta_1 \Delta i_t^e + \beta_2 \Delta i_t^u + \beta_3 \Delta i_t^u State_t + \beta_4 \Delta i_t^u EMP_t + \beta_5 \Delta i_t^u REV_t + \varepsilon_t, \quad (3)$$

where $State_t$ is one of three proxies for the state of the economy or the credit market conditions: (1) the three-month moving average of the CFNAI (lagged by one month), (2) the percentage of loan officers reporting tightening of credit standards for large and medium firms in the Fed's Senior Loan Officer Opinion Survey and (3) the spread between the prime rate and a three-month Treasury bill yield.[14] The CFNAI is constructed using information that is released with a lag of about a month. Therefore, we lag the CFNAI by one month to make sure that only information available to market participants in real time is used in the regression. Similarly, we use the prime rate-T-bill spread on the day before the target rate announcement.

The estimation results of equation (3) are reported in Table 2. In Panel A, we report the results using the CFNAI as an explanatory variable. The coefficient of the interactive term between the policy surprise and the business cycle indicator is positive but insignificant in the

[14] The results obtained using the default spread (the difference between the yield of a corporate BAA bond and a ten-year Treasury yield) as an alternative proxy for credit market conditions were qualitatively similar.

full sample, whereas it becomes significant when only scheduled FOMC meetings are used. Similar to the results in Table 1, these results indicate that stocks react more strongly to monetary news in periods of weak economy. The results appear stronger when the proxies for the credit market conditions are used in the regression.

[Insert Table 2 about here]

The empirical results in Tables 1 and 2 show state dependence in the response of stock returns to target rate news, in contrast to the results of Anderson et al. (2005) showing no such evidence. Consistent with the financial accelerator theories, the federal funds target rate decisions appear to have a larger effect on stock prices when the economy is in recession and when credit markets are tight. This finding also contradicts the conclusions of Warner and Georges (2001), who find no evidence of credit channel effects in the response of stock returns to monetary shocks. The major difference in our approach is the use of a measure of monetary news derived from the fed funds futures prices, as well as a longer sample period.

Prior to 1994, the decisions of the FOMC were not explicitly announced to the public and had to be inferred from the subsequent open market operations. Beginning with the February 4, 1994 meeting, the FOMC began announcing policy decisions immediately after the meeting. Robertson and Thornton (1997), Swanson (2004) and Gürkaynak et al. (2006) argue that the fed funds futures rate became a better predictor of the future target rate after this change in disclosure policy. Furthermore, prior to 1994 unscheduled FOMC meetings were quite frequent, and on a number of occasions the Fed's decisions about the target rate were made public several hours after employment news releases. Therefore, we repeat the analysis above using 1994 through 2004 sub-sample that avoids the above data issues.[15]

[15] We omit the target rate announcement made on February 4, 1994 because it was the first such announcement made immediately after the FOMC meeting and employment report was released on the same day.

The results for regressions using recession dummies, as well as the three proxies for the state of the business cycle or credit market conditions, are shown in Table 3. The coefficient estimate of the target surprise is insignificant, whereas the coefficient of the interactive term with the recession dummy and the target surprise ranges from -5.08 to -9.03, depending on the business cycle turning points and estimation method used. Based on these findings, an unexpected 25-basis point cut in the funds target in recession results in up to a 2.25 percent increase in the overall stock prices, whereas a similar rate cut in expansion has a much smaller effect on stocks. With the CFNAI and the two measures of the credit market conditions consistently significant, the results seem to be stronger than the full sample results reported in Table 2. Overall, the estimates show strong evidence of state dependence in the stock market's response to monetary surprises.

[Insert Table 3 about here]

B. Sensitivity of State Dependence in the Stock Market Response

Given some concerns about endogeneity in the regressions when daily data are used, we reexamine our full sample evidence using intraday data, which should have a lower chance of endogeneity. For example, suppose an employment announcement occurs on a target rate decision day. Using intraday data, we can measure the changes in the fed funds futures price and the return on the S&P 500 index in a narrow window around the public release of the policy decision. Those price changes are likely to be driven primarily by the target rate decision rather than by the employment release that occurred earlier in the day.

We use the return on the S&P 500 index in a window from 10 minutes before to 20 minutes after the target rate announcement. The unexpected change in the target is measured

using the price change of the fed funds futures over the same interval.[16] The results with both recession dummies and the three state proxies are presented in Table 4. When the NBER recession dummy is used, results obtained with both estimation methods show a significantly stronger response of stock prices to monetary news in recession. The CFNAI recession dummy is negative and significant only when robust regression is used. The results with proxies for the state of the economy or credit market conditions show significant state dependence coefficients. The regression R^2s are generally higher when the two credit cycle proxies are used as the state variables.[17]

[Insert Table 4 about here]

Bernanke and Kuttner (2005) note that a funds target rate surprise extracted from the current-month futures prices may be, at least in part, a "timing" surprise. In other words, this surprise may be caused by a change in the timing of an expected policy decision rather than by a totally unexpected Fed action. As an additional robustness check, we examined state dependence in the market reaction to level and timing surprises, using the decomposition of the aggregate monetary surprises proposed by Gürkaynak (2005) and Gürkaynak, Sack and Swanson (2006). The results, which are not reported for brevity but available upon request, showed strong evidence of state dependence in the stock market's response to timing shocks.

C. The Credit Channel and the Stock Market Response

We have shown that the response of the stocks to monetary news depends on the macroeconomic cycle. However, both business cycle variables and credit condition variables seem to capture the

[16] Gürkaynak, Sack and Swanson (2005) show that the stock prices fully adjust to the target rate news within that interval.

[17] The coefficient of the expected change in the target rate is no longer significant, whereas it is significant in the daily data. The significant coefficient of the expected change in the target rate is also reported by Bernanke and Kuttner (2005).

effect of the macroeconomic cycle fairly well. Ehrmann and Fratzscher (2004) argue that use of disaggregated firm-level data can provide further evidence on the pattern of effect of monetary news on stock returns. In this section, we extend Ehrmann and Fratzscher's panel framework to further examine the response of stock returns to monetary news.

The use of disaggregated panel data has three advantages. Firstly, it introduces cross-sectional variation in the dependent variable that helps us to discriminate between the measures of aggregate cycle as explanatory variables. Secondly, it allows us to examine the credit channel effects of firm-specific financial characteristics on stock returns over the macro cycle. Thirdly, it allows us to do a sectoral analysis to account for sector-specific heterogeneity and to examine the sources of the aggregate response.

Ehrmann and Fratzscher (2004) use an unbalanced panel of S&P 500 firms to examine how the response of stock returns to monetary news varies with individual firms' financial characteristics. We extend the Ehrmann and Fratzscher framework to estimate the following regression that also allows for employment announcements, reversals, expected change in the federal funds target rate, macroeconomic cycle effect and interaction of monetary surprise with financial characteristics:

$$\begin{aligned} R_{i,t} = {} & \alpha_i + \beta_1 X_{i,t} + \beta_2 \Delta i_t^e + \beta_3 \Delta i_t^u + \beta_4 \Delta i_t^u EMP_t + \beta_5 \Delta i_t^u REV_t + \beta_6 \Delta i_t^u State_t \\ & + \beta_7 \Delta i_t^u X_{i,t} + \beta_8 \Delta i_t^u State_t X_{i,t} + \varepsilon_t \end{aligned} \tag{4}$$

The variable X_{it} is a proxy for financial constraints of the ith firm. The coefficient β_6 is the effect of the macro cycle on the response of stock returns to the monetary surprise. Finally, the coefficient β_8 captures the stock market response to the monetary surprise depending on the interaction of the macro cycle and the firm-specific financial constraints. Suppose higher values of X_{it} imply higher financial constraints. Then, if higher values of the macro cycle imply tighter

conditions, a negative and significant β_8 illustrates that a monetary tightening results in a larger negative response of financially constrained firms in adverse macroeconomic conditions. Alternatively, if the higher value of X_{it} implies lower financial constraints, we would expect β_8 to be positive.

Three variables are used to measure financial constraints: the number of employees, the long-term Standard and Poor's debt ratings, and trade credit. Among these, the first two are also used by Ehrmann and Fratzscher.[18] Firm size is commonly used as a proxy for credit constraints, since large firms tend to have better access to debt markets and are less likely to be affected by informational frictions. Debt rating is a more direct proxy for the magnitude of informational asymmetries faced by firms in the debt markets (e.g., Whited, 1992).[19] Firms that have a bond rating have access to relatively inexpensive external finance. Nilsen (2002) provides evidence that non-rated firms appear to be financially constrained, since they increase the use of trade credit in tight credit market conditions. Our regressions using debt rating as a proxy for credit constraints omit non-rated firms, which are most likely to be credit constrained. Therefore, we also use trade credit (calculated as accounts payable divided by total liabilities) as a proxy for credit constraints. Trade credit is an alternative source of financing offered by the firm's suppliers. Given the large discounts offered when the supplier bill is paid quickly, the implied annual interest rates on trade credit financing are often as high as 40 percent. This makes trade credit a very expensive source of external finance. Petersen and Rajan (1997) and Nilsen (2002) show that financially constrained firms use more trade credit.

[18] We also used other measures of financial constraints from Ehrmann and Fratzscher (2004). The response of the stock returns to monetary news still depends on the macro cycle. These results are not reported due to space considerations.

[19] Debt ratings obtained from COMPUSTAT range from 2 to 23, with higher values implying lower credit quality.

The pooled OLS estimation results of equation (4) without the interactive term between the macro cycle and individual financial constraints are in Table 5.[20] We estimate each regression twice: once using the full sample and then using the post-1994 sub-sample that avoids most of the unscheduled meetings and all employment news releases. Using trade credit as a proxy for financial constraints, we get results supporting the role of macro cycles. The credit cycle variables, bank lending standards and prime rate – T-bill spread, are of correct sign and significant in all cases across different samples and financial constraints proxies. It implies a monetary easing in tight credit conditions has a larger positive effect on stock returns.

The CFNAI performs moderately well – it is always of positive sign though mostly not significant. The NBER business cycle variable is also of correct sign in all cases, but not significant. The number of employees performs poorly as a measure of financial constraints, with and without allowing for the macro cycle effect. This result is consistent with Nilsen (2002), who shows that many large firms increase trade credit in tight credit conditions, suggesting that they are financially constrained. Overall, the results are consistent with the credit channel for all proxies for the macroeconomic cycle but are more precise for the credit cycle variables.

[Insert Table 5 about here]

We now re-estimate equation 4 allowing for the interactive term between macro cycle and financial constraints of individual firms. Based on the previous results, we concentrate on three measures of macro cycles: CFNAI, Survey of Lending Standards and the prime rate – T-bill spread. We also use the two relatively better performing measures of financial constraints: trade credit and credit ratings. We would like to estimate whether a firm's response to monetary news depends on the interaction of its relative financial position (relative to the average financial

[20] The use of pooled OLS is consistent with Ehrmann and Fratzscher (2004). However, allowing for firm-specific fixed effects does not change our results qualitatively.

position at that time) and the macro cycle. We use demeaned (by time) financial constraint variables, demeaned macro cycle variables and target rate surprises.[21]

The estimates in Table 6 confirm the Table 5 results. In the full sample, the credit cycle variables are negative and significant. Moreover, the interactive term is negative and significant as well when the credit cycle variables are used. It implies that the relatively more financially constrained firms react more to a monetary surprise in tight credit market conditions. This evidence, along with the performance of the credit cycle variables, supports the existence of a credit channel effect in the stock market response to monetary news. The business cycle variable, CFNAI, is not significant by itself but the interactive term with trade credit is of correct sign and significant.

[Insert Table 6 about here]

When the 1994-2004 sub-sample is considered, the performance of the interactive term is stronger with the exception of one case of credit ratings and prime rate – T-bill spread. The macro cycles are still significant. The estimates of the interactive terms of the CFNAI and the financial variables are also of correct sign and significant. Overall, the credit cycle variables perform better in the disaggregated data and support a credit channel explanation in both full sample and the 1994-2004 sub-sample.

D. Response of Industry Sectors to Target Rate News

As an additional examination of the cyclical reaction of stocks to target rate surprises, we estimate the regressions in (4) for twelve industry sectors. We expect, as Bernanke and Kuttner (2005) and Ehrmann and Fratzscher (2004) point out, considerable sectoral heterogeneity in the responses to monetary news. Our aim is to isolate the sectors with strongest evidence of credit

[21] The demeaning helps us to avoid the issue of comparing parameter estimates involving multiple interactive terms with non-zero means.

channel effects. That implies that both the credit cycle term and the interactive term between the credit cycle and credit constraints are negative and significant. The variables used are the same as in Table 6.

The results, reported in Table 7, support the evidence on heterogeneity of the response to monetary shocks across sectors of the economy. The response of the durables sector depends on the macro cycles but not on the interactive term. The estimates of the credit cycles are more precise than the CFNAI cycle. The response of the non-durables sector does not depend on the macro cycles and the interactive term is significant only once. The results are strongest for the business equipment sector where the credit and business cycles are important and so are the interactive terms in four out of six cases. For the manufacturing sector, the CFNAI does not perform very well. However, the credit cycle estimates are negative and significant. The interactive terms are also negative and significant for both measures of financial constraints and credit cycles.

[Insert Table 7 about here]

No study, to the best of our knowledge, has explicitly looked at the sectoral composition of credit channel effects on the response of stock returns to monetary news. The closest comparison of the above results can be made with the Bernanke and Kuttner (2005) and Ehrmann and Fratzscher (2004) studies. Both papers show the strongest effects of monetary news in the high-tech (business equipment), telecommunications and durables sectors. We find that the macro cycle effects are most pronounced in the same three industries. Beyond the business equipment, manufacturing and durables sectors, the macro cycle effect is also significant for Retail, Telecom and Financial sectors, though mostly with credit cycle variables.

Overall, the support for a credit channel response of the stock market to monetary news seems to be strongest in the business equipment and manufacturing sectors.

V. Summary and Conclusion

This study examines whether and how the effect of the Fed policy surprise on the aggregate stock returns varies with the cyclical forces of the economy. We find that the response of stock returns to unexpected changes in the fed funds target rate depends on the level of economic activity and credit market conditions. Specifically, the response of stocks to monetary news is significantly stronger in periods of weak economy and in tight credit market conditions.

Further examination using disaggregated data shows that credit cycle measures tend to perform better than proxies for business cycle conditions. We also show that financially constrained firms respond more than relatively unconstrained firms to monetary shocks in tight credit conditions. This effect is strongest in the business equipment and manufacturing sectors of the economy. Taken as a whole, the results support the credit channel of monetary policy transmission.

Not for Publication Appendix: Selected Quotes from FOMC Meeting Transcripts
http://federalreserve.gov/fomc/transcripts/

This appendix contains several representative comments made by the Fed officials relating to the impact of monetary policy decisions on stock prices and the resulting effects on the economy. The emphasis is added by the authors.

Transcript of February 1-2, 2000 Meeting, p. 124
Alan Greenspan, Chairman of the Board of Governors:
"The problem that we have here is that monetary policy works through its effects on overall financial markets. … The only way to eliminate the wealth effect, which has to be eliminated, is for the discount rate – the market interest rate used by investors to calculate the present value of expected earnings – to rise. … *The question is how we can facilitate that rise*. … I am concerned that, if we are too aggressive in this process of tightening, we could crack the market and end up with a very severe problem of instability."

Transcript of May 16, 2000 Meeting, p. 90
William Poole, President of the Federal Reserve Bank of St. Louis:
"Sometimes we are going to have to surprise the market. But I think it is extremely helpful when we are able to have the markets very much on the same wavelength as we are. … The NASDAQ has been more volatile this year than in the entire history of the index. The market is shaky. It is not going to help us if the market cracks. That would cause us a lot of trouble. I don't mean just political trouble; *I mean trouble in carrying forward a monetary policy that does what we need it to do*."

Transcript of November 16, 1999 Meeting, p. 43
Donald Kohn, Secretary and Economist:
"The cost of not tightening at this time if a firming turns out to have been needed could be a further overshooting of the economy beyond its long-run potential, and hence a larger or more prolonged and possibly more disruptive adjustment later. Equity prices may be a particular risk in this regard. The staff forecast has equity prices remaining near current levels with no near-term change in policy, but *if an absence of tightening is read as suggesting a significantly lower path of interest rates going forward, equity prices could strengthen significantly, boosting consumption and investment*. If such an increase pushed the economy further beyond its sustainable potential and equity prices further above their long-term levels, it would distort resource allocation and pose a greater threat of macroeconomic and financial instability when markets and the economy eventually adjusted."

Transcript of June 29-30, 1999 Meeting, p. 92
Edward Kelley, Jr., Federal Reserve Governor:
"… We have a stock market that is in a very precarious position. It's very fragile and I think very shock prone. Investors can take their chances, but *the concern is that stock market developments could have a strong impact on the real economy*. … I can tell you already that I don't want to go into the October 5 meeting with a predisposition to raise rates because I don't want to be blamed for the crash of the stock market in October!" [Laughter]

Transcript of November 17, 1998 Meeting, p. 88
David Lindsey, Associate Economist:
"The Committee's choice today would seem to boil down to standing pat or easing by another 25 basis points. …*The possibility that a policy easing could spur a further run-up of equity prices--in contrast to the Greenbook forecast of a decline--that could combine with the recent rebound in consumer confidence to impart added impetus to spending, may strengthen the case for staying the Fed's hand at this meeting*."

Transcript of November 17, 1998 Meeting, p. 88
Alan Greenspan:
"There is very little question that there has been considerable easing in a number of the areas where we are concerned. The one area where things have eased regrettably more than I would have liked is the stock market. In a certain sense that has created a major question in my judgment as to whether we should move. *If the Dow Jones industrial average were 200 to 300 points lower, I think the case for moving one additional time and then putting policy on indefinite hold would be fairly strong* for a number of the reasons that have already been discussed today…"

Transcript of December 22, 1998 Meeting, p. 62
Robert Parry, President of the Federal Reserve Bank of San Francisco:
"Mr. Chairman, *I believe our easing of policy and the associated stock market rebound have significantly reduced the chance of recession* or a major slowdown over the next year or so, and for now I think we should leave the funds rate at 4.75% percent."

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Table 1
Response of Daily Stock Returns to Target Rate Changes

	OLS		Robust Regression
	All target rate decisions	Scheduled meetings only	All target rate decisions
Panel A. Baseline results			
Intercept	0.18**	0.21**	0.14*
	(0.09)	(0.09)	(0.08)
Expected change	0.92*	0.73	1.05**
	(0.48)	(0.53)	(0.43)
Unexpected change	-4.53***	-1.50	-4.49***
	(1.52)	(1.69)	(1.01)
Unexpected change ×			
reversal	-9.22***	-18.40***	-9.33***
	(2.10)	(4.94)	(2.30)
employment	5.24***	2.08	5.00***
	(1.52)	(1.62)	(1.70)
R^2	0.280	0.094	0.111
Panel B. With NBER recession dummy			
Intercept	0.18**	0.20**	0.14*
	(0.09)	(0.08)	(0.08)
Expected change	0.88*	0.66	0.99**
	(0.47)	(0.50)	(0.43)
Unexpected change	-3.75**	-0.16	-3.54***
	(1.61)	(1.86)	(1.19)
Unexpected change ×			
recession	-2.15	-7.15**	-2.45
	(1.84)	(3.04)	(1.65)
reversal	-9.99***	-18.91***	-10.27***
	(2.18)	(4.60)	(2.37)
employment	5.33***	0.81	5.04***
	(1.50)	(1.80)	(1.69)
R^2	0.288	0.121	0.116
Panel C. With CFNAI recession dummy			
Intercept	0.18**	0.21**	0.14*
	(0.09)	(0.08)	(0.08)
Expected change	0.91*	0.62	0.87**
	(0.48)	(0.50)	(0.43)
Unexpected change	-3.92	1.10	-0.17
	(2.91)	(1.72)	(1.85)
Unexpected change ×			
recession	-0.85	-5.04*	-5.97***
	(3.16)	(2.81)	(2.12)
reversal	-9.10***	-22.67***	-22.44***
	(2.26)	(5.67)	(6.26)
employment	5.45***	4.50*	7.00***
	(1.66)	(2.35)	(1.77)
R^2	0.281	0.116	0.122

The dependent variable is the one-day S&P 500 return. The sample period is from January 1990 through December 2004 and contains 138 observations, including 18 unscheduled FOMC meetings. The regression is estimated using (1) OLS with the White (1980) heteroskedasticity consistent covariance matrix and (2) MM weighted least squares procedure introduced by Yohai (1987). Standard errors are shown in parentheses. *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Table 2
Effect of the State of the Economy or Credit Market Conditions on the Response of Daily Stock Returns to Target Rate Changes

	OLS		Robust Regression
	All target rate decisions	Scheduled meetings only	All target rate decisions
Panel A. With CFNAI			
Intercept	0.18**	0.20**	0.13
	(0.09)	(0.08)	(0.08)
Expected change	0.90*	0.63	1.01**
	(0.48)	(0.50)	(0.44)
Unexpected change	-4.08**	-0.22	-3.67***
	(1.70)	(1.62)	(1.19)
Unexpected change ×			
CFNAI	0.79	4.63***	1.35
	(1.22)	(1.46)	(1.04)
reversal	-9.25***	-20.43***	-9.44***
	(2.16)	(4.94)	(2.29)
employment	5.49***	1.38	4.36**
	(1.57)	(1.53)	(1.72)
R^2	0.283	0.139	0.115
Panel B. With Survey Measure of Lending Standards			
Intercept	0.17*	0.20**	0.13
	(0.09)	(0.08)	(0.08)
Expected change	0.86*	0.67	1.00**
	(0.47)	(0.48)	(0.43)
Unexpected change	-2.91*	0.36	-3.25***
	(1.31)	(1.64)	(1.23)
Unexpected change ×			
percentage tighten	-0.07**	-0.16***	-0.06*
	(0.04)	(0.05)	(0.03)
reversal	-7.07**	-20.17***	-7.63***
	(3.05)	(4.83)	(2.49)
employment	4.82***	-0.04	4.70***
	(1.62)	(1.66)	(1.71)
R^2	0.304	0.144	0.124
Panel C. With Prime Rate – T-bill Rate Spread			
Intercept	0.17*	0.19**	0.15*
	(0.09)	(0.09)	(0.08)
Expected change	0.73	0.57	0.84*
	(0.46)	(0.47)	(0.43)
Unexpected change	15.14**	17.01	15.28***
	(6.35)	(11.11)	(5.50)
Unexpected change ×			
Spread	-6.07***	-6.10	-6.35***
	(1.93)	(3.79)	(1.67)
reversal	-7.10***	-17.80***	-16.81**
	(2.31)	(5.75)	(6.07)
employment	3.02**	1.03	3.94*
	(1.40)	(1.65)	(1.79)
R^2	0.339	0.112	0.132

The dependent variable is the one-day S&P 500 return. The sample period is from January 1990 through December 2004. The full sample contains 138 observations (136 observations in Panel B regressions), including 18 unscheduled FOMC meetings. The regression is estimated using (1) OLS with the White (1980) heteroskedasticity consistent covariance matrix and (2) MM weighted least squares procedure introduced by Yohai (1987). Standard errors are shown in parentheses. *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Table 3
Effect of the State of the Economy or Credit Market Conditions on the Response of Daily Stock Returns to Target Rate Changes for 1994-2004

	OLS	Robust Regression	OLS	Robust Regression	OLS	Robust Regression
Panel A. With Recession dummies						
	Baseline results		With NBER recession dummy		With CFNAI recession dummy	
Intercept	0.25**	0.23*	0.25**	0.23**	0.25**	0.23**
	(0.10)	(0.10)	(0.10)	(0.09)	(0.10)	(0.09)
Expected change	1.10**	1.06**	0.99**	0.88*	1.03**	0.86*
	(0.48)	(0.49)	(0.46)	(0.47)	(0.46)	(0.47)
Unexpected change	-6.07***	-4.92***	-3.99	-1.56	-3.18	0.46
	(1.79)	(1.39)	(2.59)	(1.78)	(3.22)	(2.05)
Unexpected change ×						
recession	---	---	-5.08*	-7.53***	-5.31	-9.03***
			(2.66)	(2.65)	(3.22)	(2.62)
reversal	-6.32***	-7.51***	-8.39***	-10.85***	-4.13***	-11.63
	(1.81)	(2.73)	(2.61)	(2.87)	(0.94)	(10.81)
R^2	0.336	0.090	0.361	0.147	0.367	0.120
Panel B. With business and credit cycle proxies						
	With CFNAI		With Survey Measure of Lending Standards		With Prime Rate – T-bill Rate Spread	
Intercept	0.24**	0.22**	0.22**	0.22**	0.20**	0.20**
	(0.10)	(0.09)	(0.09)	(0.10)	(0.09)	(0.10)
Expected change	0.99**	0.89*	0.99**	0.99**	0.70	0.70
	(0.45)	(0.46)	(0.43)	(0.48)	(0.47)	(0.48)
Unexpected change	-4.22*	-2.13	-1.99	-1.99	24.69***	24.69***
	(2.21)	(1.52)	(1.47)	(1.71)	(7.59)	(7.84)
Unexpected change ×						
macro cycle	4.46**	6.01***	-0.17***	-0.17***	-8.97***	-8.97***
	(1.81)	(1.67)	(0.04)	(0.05)	(2.20)	(2.25)
reversal	-5.39***	-6.57**	-0.79	-0.79	-4.67***	-4.67*
	(1.34)	(2.57)	(2.28)	(3.03)	(1.25)	(2.64)
R^2	0.382	0.172	0.428	0.208	0.439	0.172

The dependent variable is the one-day S&P 500 return. The sample period is from March 1994 through December 2004. The full sample contains 91 observations, including four unscheduled FOMC meetings. The target rate announcement made on February 4, 1994 is omitted. The regression is estimated using (1) OLS with the White (1980) heteroskedasticity consistent covariance matrix and (2) MM weighted least squares procedure introduced by Yohai (1987). Standard errors are shown in parentheses. *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Table 4
Effect of the State of the Economy or Credit Market Conditions on the Response of Intraday Stock Returns to Target Rate Changes

	OLS	Robust Regression	OLS	Robust Regression	OLS	Robust Regression
Panel A. With Recession dummies						
	Baseline results		With NBER recession dummy		With CFNAI recession dummy	
Intercept	-0.08**	-0.09***	-0.08**	-0.09***	-0.08**	-0.09***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Expected change	0.37*	0.15	0.34*	0.16	0.36*	0.13
	(0.20)	(0.16)	(0.20)	(0.16)	(0.20)	(0.15)
Unexpected change	-3.01***	-2.20***	-2.25**	-1.96***	-2.34*	-1.23*
	(0.81)	(0.42)	(0.91)	(0.46)	(1.40)	(0.67)
Unexpected change ×						
recession	---	---	-2.29**	-2.57***	-0.96	-3.11***
			(1.07)	(0.74)	(1.62)	(0.80)
reversal	-6.56***	-8.01***	-7.32***	-8.26***	-6.49***	-3.35**
	(1.46)	(0.90)	(1.53)	(0.92)	(1.34)	(1.66)
R^2	0.516	0.123	0.538	0.147	0.520	0.171
Panel B. With business and credit cycle proxies						
	With CFNAI		With Survey Measure of Lending Standards		With Prime Rate – T-bill Rate Spread	
Intercept	-0.09***	-0.10***	-0.09***	-0.10***	-0.09***	-0.10***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Expected change	0.36*	0.16	0.31	0.13	0.22	-0.02
	(0.20)	(0.16)	(0.19)	(0.15)	(0.20)	(0.17)
Unexpected change	-2.18**	-1.61***	-1.33**	-1.35***	7.49**	12.54***
	(0.95)	(0.45)	(1.63)	(0.43)	(2.97)	(4.29)
Unexpected change ×						
macro cycle	1.53**	2.19***	-0.08***	-0.07***	-3.20***	-4.82***
	(0.77)	(0.47)	(0.01)	(0.01)	(0.89)	(1.40)
reversal	-6.64***	-6.64***	-4.81***	-4.70***	-5.85***	-2.48
	(1.23)	(0.84)	(0.71)	(0.84)	(1.08)	(1.60)
R^2	0.541	0.178	0.601	0.217	0.574	0.166

The dependent variable is the S&P 500 return over the interval from 10 min before to 20 min after the target rate announcement. The sample period is from January 1990 through December 2004. The full sample contains 138 observations (136 observations in regressions using the survey measure of lending standards), including 18 unscheduled FOMC meetings. The regression is estimated using (1) OLS with the White (1980) heteroskedasticity consistent covariance matrix and (2) MM weighted least squares procedure introduced by Yohai (1987). Standard errors are shown in parentheses. *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Table 5
Effect of the Macroeconomic Cycles
on the Response of Daily Disaggregated Stock Returns to Target Rate Changes

	Without Macroeconomic Cycle	NBER Recession	CFNAI Business Cycle	Survey of Lending Standards	Prime Rate – T-bill Spread
			Full Sample Results		
Unexpected change ×					
Trade Credit	-6.50***	-6.58***	-6.59***	-6.80***	-7.18***
	(1.75)	(1.74)	(1.74)	(1.75)	(1.73)
Macroeconomic Cycle		-2.62	0.97	-0.07**	-6.20***
		(1.66)	(1.05)	(0.03)	(1.64)
Unexpected change ×					
Credit ratings	-0.41***	-0.40***	-0.40***	-0.38***	-0.34***
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Macroeconomic Cycle		-1.41	0.59	-0.06*	-5.44***
		(1.51)	(0.96)	(0.03)	(1.49)
Unexpected change ×					
Employees	-1.85	-1.45	-1.65	-0.93	-0.10
	(2.01)	(1.97)	(1.97)	(1.94)	(1.91)
Macroeconomic Cycle		-2.09	0.66	-0.07**	-6.14***
		(1.64)	(1.03)	(0.03)	(1.62)
			1994-2004 Sub-sample Results		
Unexpected change ×					
Trade Credit	-14.19***	-14.54***	-15.25***	-15.30***	-15.13***
	(2.38)	(2.37)	(2.33)	(2.34)	(2.34)
Macroeconomic Cycle		-4.02	4.10**	-0.15***	-8.43***
		(2.51)	(1.60)	(0.04)	(2.07)
Unexpected change ×					
Credit ratings	-0.70***	-0.68***	-0.65***	-0.63***	-0.62***
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Macroeconomic Cycle		-1.75	2.37	-0.11***	-7.28***
		(2.25)	(1.47)	(0.04)	(1.91)
Unexpected change ×					
Employees	-2.63	-1.92	-1.02	-1.67	-0.41
	(2.55)	(2.48)	(2.41)	(1.98)	(2.43)
Macroeconomic Cycle		-3.28	3.46	-0.08**	-8.39***
		(2.47)	(1.59)	(0.03)	(2.04)

The dependent variable is the disaggregated one-day S&P 500 returns. The full sample period is from January 1990 through December 2004. The full sample is an unbalanced panel containing 138 announcements (136 announcements when the Survey of Lending Standards is used) with three sub-panels each with a different financial constraint variable. Financial firms are excluded when Trade Credit is used. The 1994-2004 sub-sample excludes the target rate announcement made on February 4, 1994 and contains 91 announcements. The regressors include dummies for employment announcements (for the full sample) and reversals (both dummies are multiplied with unexpected change), expected change, unexpected change and financial constraint proxies. All regressions are pooled OLS estimations. Standard errors corrected for cross-sectional correlations in panel data are shown in the parentheses. *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Table 6
Effect of the Macroeconomic Cycles and Firm-specific Credit Conditions on the Response of Daily Disaggregated Stock Returns to Target Rate Changes

	CFNAI Business Cycle	Survey of Lending Standards	Prime Rate – T-bill Spread
		Full Sample Results	
Unexpected change ×			
Trade Credit	-5.46 (1.90)***	-2.06 (1.68)	-3.54 (1.63)**
Macroeconomic Cycle	1.08 (1.15)	-0.09 (0.03)**	-5.73 (1.78)***
Trade Credit × Cycle	5.57 (2.46)**	-0.44 (0.06)***	-21.62 (3.04)***
Unexpected change ×			
Credit ratings	-0.32 (0.08)***	-0.20 (0.07)***	-0.27 (0.07)***
Macroeconomic Cycle	0.63 (1.06)	-0.07 (0.03)**	-5.36 (1.60)***
Credit ratings × Cycle	0.10 (0.10)	-0.01 (0.00)***	-0.49 (0.15)***
		1994-2004 Sub-sample Results	
Unexpected change ×			
Trade Credit	-9.77 (2.70)***	-5.11 (2.64)*	-8.53 (2.55)***
Macroeconomic Cycle	3.74 (1.65)**	-0.14 (0.04)***	-8.37 (2.13)***
Trade Credit × Cycle	13.44 (3.38)***	-0.48 (0.07)***	-22.53 (2.31)***
Unexpected change ×			
Credit ratings	-0.52 (0.11)***	-0.41 (0.12)***	-0.61 (0.12)***
Macroeconomic Cycle	2.77 (1.41)**	-0.11 (0.04)***	-7.36 (1.86)***
Credit ratings × Cycle	0.26 (0.15)*	-0.01 (0.00)***	-0.11 (0.19)

The dependent variable is the disaggregated one-day S&P 500 returns. The full sample period is from January 1990 through December 2004. The full sample is an unbalanced panel containing 138 announcements (136 announcements when the Survey of Lending Standards is used). Financial firms are excluded when Trade Credit is used. The 1994-2004 sub-sample excludes the target rate announcement made on February 4, 1994 and contains 91 announcements. The regressors include dummies for employment announcements (for the full sample) and reversals (both dummies are multiplied with unexpected change), expected change, unexpected change and financial constraint proxies. All regressors, other than the dummies, are demeaned. All regressions are pooled OLS estimations. Standard errors corrected for cross-sectional correlations in panel data are shown in the parentheses. *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Table 7
Effect of the Macroeconomic Cycles and Firm-specific Credit Conditions on the Response of Daily Disaggregated Sector-wise Stock Returns to Target Rate Changes

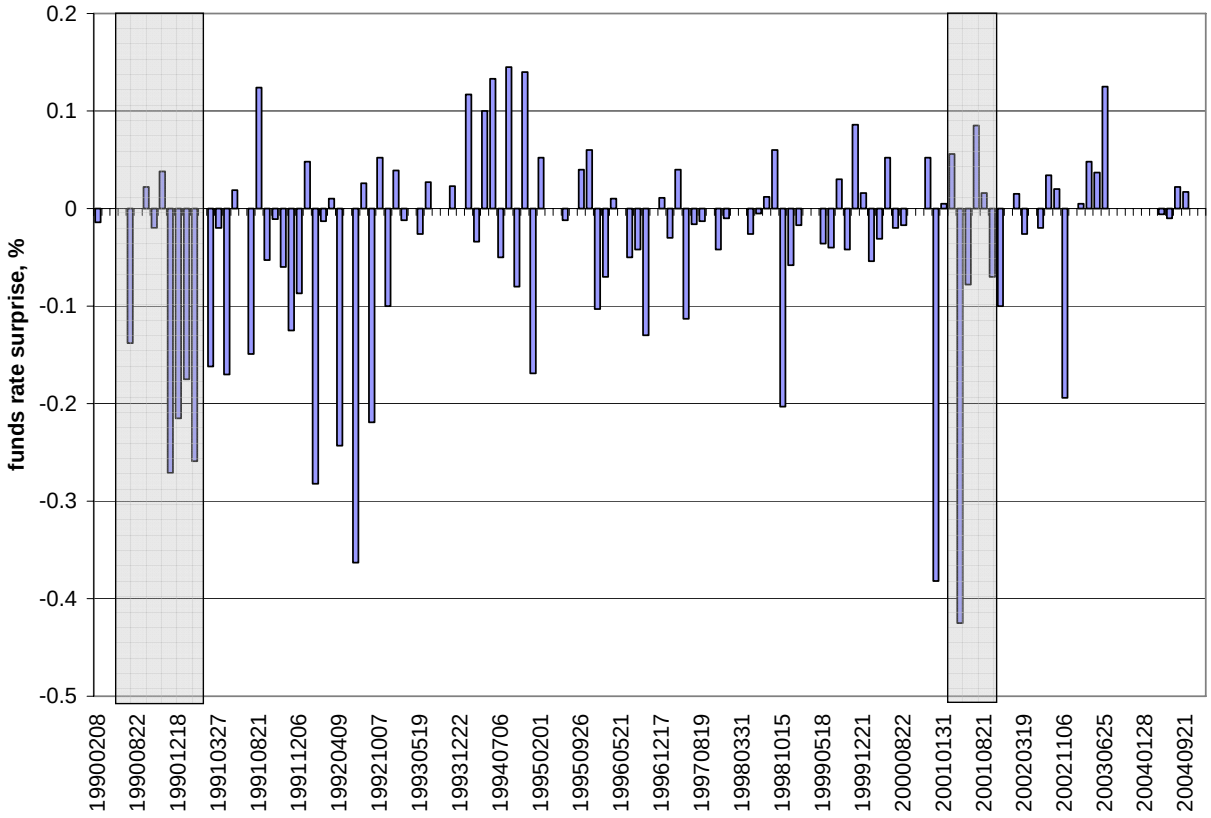
	CFNAI Business Cycle	Survey of Lending Standards	Prime Rate – T-bill Spread
Consumer Durables			
Unexpected change ×			
Macroeconomic Cycle	2.30 (1.42)	-0.14 (0.04)***	-8.44 (2.27)***
Trade Credit × Cycle	1.62 (8.66)	-0.00 (0.26)	19.76 (13.63)
Unexpected change ×			
Macroeconomic Cycle	2.66 (1.40)*	-0.14 (0.04)***	-9.90 (2.22)***
Credit ratings × Cycle	-0.29 (0.27)	0.00 (0.01)	0.22 (0.42)
Consumer Non-durables			
Unexpected change ×			
Macroeconomic Cycle	-0.61 (0.99)	0.01 (0.03)	-0.53 (1.58)
Trade Credit × Cycle	3.99 (4.22)	-0.06 (0.14)	4.42 (7.42)
Unexpected change ×			
Macroeconomic Cycle	-0.70 (1.03)	0.01 (0.03)	-0.43 (1.64)
Credit ratings × Cycle	0.14 (0.21)	-0.01 (0.01)	-0.68 (0.38)*
Business Equipment			
Unexpected change ×			
Macroeconomic Cycle	4.61 (2.07)**	-0.26 (0.06)***	-12.61 (3.12)***
Trade Credit × Cycle	11.07 (4.71)**	-0.33 (0.12)***	-12.31 (6.16)**
Unexpected change ×			
Macroeconomic Cycle	5.48 (0.86)***	-0.26 (0.05)***	-13.93 (2.40)***
Credit ratings × Cycle	0.34 (0.22)	-0.02 (0.01)***	-0.39 (0.31)
Manufacturing			
Unexpected change ×			
Macroeconomic Cycle	1.87 (1.20)	-0.08 (0.04)**	-6.15 (1.87)***
Trade Credit × Cycle	2.63 (3.18)	-0.23 (0.09)**	-15.92 (4.76)***
Unexpected change ×			
Macroeconomic Cycle	2.20 (1.18)*	-0.09 (0.03)**	-6.96 (1.81)***
Credit ratings × Cycle	0.05 (0.17)	-0.01 (0.00)**	-0.77 (0.25)***
Utilities			
Unexpected change ×			
Macroeconomic Cycle	-1.21 (1.20)	0.04 (0.04)	0.60 (1.95)
Trade Credit × Cycle	-4.98 (11.34)	-0.12 (0.32)	-11.44 (16.44)
Unexpected change ×			
Macroeconomic Cycle	-1.14 (1.16)	0.03 (0.04)	0.64 (1.87)
Credit ratings × Cycle	0.15 (0.21)	0.00 (0.01)	-0.16 (0.32)
Retail			
Unexpected change ×			
Macroeconomic Cycle	1.57 (1.35)	-0.11 (0.04)***	-7.69 (2.04)***
Trade Credit × Cycle	0.41 (2.80)	-0.06 (0.08)	-5.85 (3.88)
Unexpected change ×			
Macroeconomic Cycle	1.31 (1.38)	-0.11 (0.04)***	-8.01 (2.07)***
Credit ratings × Cycle	-0.14 (0.18)	-0.00 (0.00)	-0.10 (0.26)

Table 7 (continued)

	CFNAI Business Cycle	Survey of Lending Standards	Prime Rate – T-bill Spread
Energy			
Unexpected change ×			
Macroeconomic Cycle	-3.46 (1.67)**	0.07 (0.05)	1.35 (2.73)
Trade Credit × Cycle	12.25 (7.18)*	-0.46 (0.21)**	-27.94 (10.78)***
Unexpected change ×			
Macroeconomic Cycle	-3.30 (1.60)**	0.07 (0.05)	1.33 (2.66)
Credit ratings × Cycle	-0.04 (0.20)	-0.00 (0.01)	0.07 (0.30)
Chemicals			
Unexpected change ×			
Macroeconomic Cycle	-0.30 (1.18)	-0.02 (0.04)	-3.53 (1.87)*
Trade Credit × Cycle	-10.35 (7.97)	0.05 (0.25)	9.89 (12.39)
Unexpected change ×			
Macroeconomic Cycle	0.15 (1.19)	-0.03 (0.03)	-4.32 (1.85)**
Credit ratings × Cycle	-0.03 (0.24)	-0.01 (0.01)	-0.49 (0.40)
Telecom			
Unexpected change ×			
Macroeconomic Cycle	1.77 (2.51)	-0.17 (0.07)**	-8.54 (4.04)**
Trade Credit × Cycle	-13.57 (88.58)	0.59 (1.94)	55.04 (111.35)
Unexpected change ×			
Macroeconomic Cycle	2.28 (3.49)	-0.16 (0.10)	-5.91 (5.12)
Credit ratings × Cycle	1.77 (0.90)*	-0.03 (0.02)	0.73 (1.17)
Health			
Unexpected change ×			
Macroeconomic Cycle	-1.60 (1.32)	0.03 (0.04)	0.25 (2.11)
Trade Credit × Cycle	2.41 (4.02)	0.08 (0.12)	2.32 (5.69)
Unexpected change ×			
Macroeconomic Cycle	-2.69 (1.34)**	0.05 (0.04)	1.23 (2.04)
Credit ratings × Cycle	-0.35 (0.24)	0.00 (0.01)	-0.00 (0.32)
Financial			
Unexpected change ×			
Macroeconomic Cycle	-0.38 (1.26)	-0.06 (0.04)*	-5.40 (1.92)***
Credit ratings × Cycle	0.10 (0.16)	-0.00 (0.00)	0.20 (0.24)
Others			
Unexpected change ×			
Macroeconomic Cycle	1.23 (1.24)	-0.12 (0.04)***	-7.40 (1.90)***
Trade Credit × Cycle	-2.54 (3.87)	-0.20 (0.11)*	-17.62 (5.88)***
Unexpected change ×			
Macroeconomic Cycle	0.30 (1.38)	-0.07 (0.04)*	-6.89 (2.02)***
Credit ratings × Cycle	-0.00 (0.30)	0.01 (0.01)	0.22 (0.39)

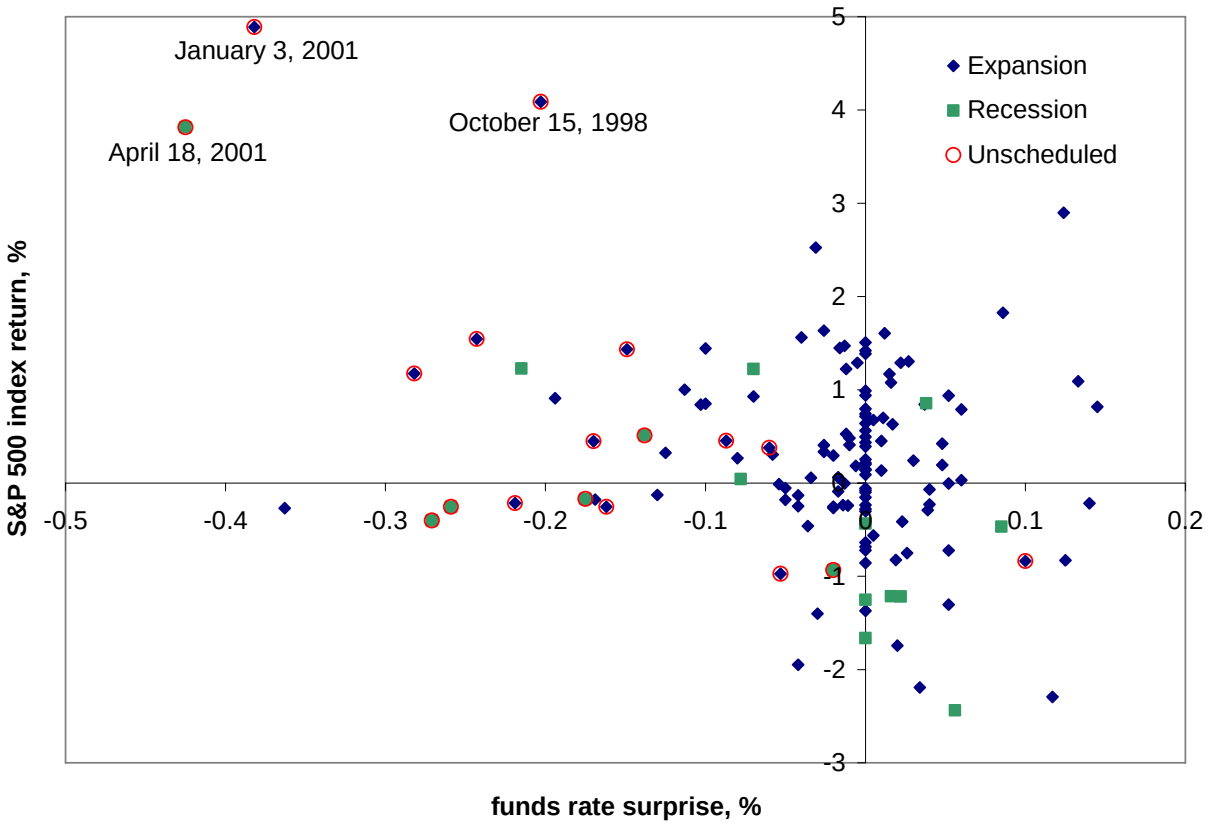
The dependent variable is the disaggregated one-day S&P 500 returns. The full sample period is from January 1990 through December 2004. The full sample is an unbalanced panel containing 138 announcements (136 announcements when the Survey of Lending Standards is used). Financial firms are excluded when Trade Credit is used. The regressors include dummies for employment announcements and reversals (both dummies are multiplied with unexpected change), expected change, unexpected change and financial constraint proxies. All regressors, other than the dummies, are demeaned. All regressions are pooled OLS estimations. Standard errors corrected for cross-sectional correlations in panel data are shown in the parentheses. *, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Figure 1
Fed funds target rate surprises



The shaded areas are NBER recessions.

Figure 2
Scatterplot of daily stock returns and Fed funds target rate surprises



NBER business cycle turning points are used.