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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 much stronger response of stock returns to unexpected changes in the federal funds target rate in recession and in tight credit market conditions. Using firm-level data, we also show that firms that face financial constraints are more affected by monetary shocks in tight credit conditions than the relatively unconstrained firms. Overall, the results are consistent with the credit channel of monetary policy transmission.

1. 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 US Treasury market. Fair (2002) reports that more than 30% 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. Fluctuations in stock prices affect the firms' cost of capital and their capacity to raise new capital and invest. Another channel is the wealth effect of stock prices on consumption and economic growth. 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. 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 on stock prices. We show that the size of the response of stock returns to monetary shocks is more than twice as large in recessions and tight credit conditions as in good economic times. This result is important for several reasons. First, the direction of the time variation supports the credit channel of monetary policy transmission using stock market data. Prior evidence on this issue has been mixed.[1] Second, our findings contribute to the literature on state dependence in the stock market's response to macroeconomic news. Andersen et al. (2007) 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.

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

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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 macroeconomic 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 recessions and in tight credit market conditions than stocks of relatively unconstrained firms. This finding supports 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.

2. Background and related literature

2.1. 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 through consumption and investment. This channel of monetary transmission relies on the effect of interest rate changes on loan demand. A cut in the interest rates reduces the cost of borrowing for investment and leads to an increase in economic activity. Furthermore, reduced cost of borrowing translates into lower cost of capital for firms, increasing the present value of future cash flows and thereby directly affecting the stock prices. A drop in the interest rates also promotes current over future consumption. Alternatively, an increase in the cost of borrowing increases the cost of capital for firms and reduces consumer demand. Hypothetically, the interest rate channel may 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 the 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. 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 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, they are more affected by macroeconomic shocks in adverse credit market conditions.

To sum up, the credit channel implies two sources of variation in the effect of monetary policy on the economy: a macro cycle variation and a firm-dependent variation amplified by the macro cycle. The empirical evidence on the credit channel is somewhat mixed. For example, Miron et al. (1994) and Driscoll (2004) find little support for the bank lending channel of monetary transmission. However, Kashyap et al. (1993) and Kashyap and Stein (2000) provide support for the bank lending channel. Bernanke et al. (1996) and Peersman and Smets (2005) also find evidence of the credit channel effects by testing the cross-sectional implications of the credit channel view.

The two studies that examine the monetary transmission 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 Fratzscher (2004) document firm-level heterogeneity in the effect of monetary news on stocks based on financial constraints.[2] We generalize the framework of Ehrmann and Fratzscher (2004) by simultaneously allowing for the business cycle variation in the stock market response to monetary shocks and for the dependence of this response on firm-specific credit characteristics. This framework accounts for the two credit channel effects, as well as for the traditional interest rate channel.

2.2. 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. More recently Boyd et al. (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. (2007) 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. (2007) 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.[3] It also allows us to examine target rate changes made at unscheduled meetings of the Federal Open Market Committee (FOMC), most of which are excluded from the sample in Andersen et al. (2007). Furthermore, we use several different proxies for macroeconomic cycles and perform a

[2] Warner and Georges (2001) examine 10 policy shocks from 1991, 1992 and 1994, whereas Ehrmann and Fratzscher (2004) use a sample period from February 1994 to January 2003.

[3] Chun (2007) shows that the forecasts of the fed funds rate extracted from the fed funds futures prices are more accurate than survey forecasts.

cross-sectional analysis of the response of stocks to monetary news in addition to looking at the aggregate stock market response.

3. Key variables and sample selection

3.1. Estimation of the target rate surprises

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[4,5]:

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

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.

3.2. Sample selection

We use an event study approach by examining a sample period that extends over fifteen years from 1990 to 2004 and includes 130 announcements made by the FOMC regarding the federal funds target rate.[6] Thirteen of the target rate announcements in our sample occurred after unscheduled FOMC meetings. We exclude eight FOMC announcements made on days with employment releases for two reasons. A regression of target rate surprises on employment surprises showed a strong positive relationship between the two variables, suggesting that the Federal Reserve reacts to employment news released earlier in the day. Therefore, the target rate surprises on employment release days cannot be considered exogenous. The second reason for omitting employment announcement days is the state dependent response of stocks to employment news documented by Boyd et al. (2005). Including employment release days in the sample would require accounting for the state-dependent effect of employment news on stocks, distracting from the focus of the paper. Similar to Bernanke and Kuttner (2005), we also omit the target rate announcement made at the unscheduled FOMC meeting of September 17, 2001.

3.3. Business cycle measures

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. Similar to Boyd et al. (2005), we use the experimental coincident recession index (XRIC) constructed by Stock and Watson (1989).[7] The XRIC indicates the probability that the economy is in recession.

In addition to using the XRIC as a proxy for the state of the economy, we use two alternative recession dummies. Two recessions occurred within our sample period. Our first recession dummy is constructed using the standard NBER business cycle turning points. We also use the business cycle turning points using a combination of values of the Chicago Fed National Activity Index (CFNAI) and NBER announcements. The CFNAI is a principal component of 85 economic indicators and corresponds to the economic activity index developed by Stock and Watson (1999). The Chicago Fed (2000) suggests using a 3-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.

According to the Chicago Fed (2000), a drop of the 3-month moving average of the CFNAI below −0.7 indicates a significant probability that a recession has begun. An increase of the 3-month moving average of the CFNAI above 0.2 indicates a significant probability that a recession has ended.[8] 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 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 US 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.

3.4. Measures of credit market conditions

In addition to business cycle proxies, we also use two measures of aggregate credit market conditions. 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.[9] We use the net percentage of loan officers who reported tightening of credit standards for large and medium commercial borrowers. Lown and Morgan (2006) argue that this variable is a good proxy for frictions in credit markets posited by theories of the credit channel of monetary transmission.

As an alternative proxy for credit market conditions, we use the spread between the yield on high-yield bonds and AAA-rated bonds. Gertler and Lown (1999) show that the high yield spread reflects the market forces driving "financial accelerator" effects, making it a good measure of the external finance premium. We obtain the yields to maturity for high-yield bonds from the Merrill Lynch High Yield Index, which is available at monthly frequency. The values of the two measures of credit market conditions for our sample of FOMC target rate decisions, along with the XRIC, are shown on Fig. 1. The three variables show substantial positive comovement in the graph.

4. Empirical results

4.1. Baseline results

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 Fig. 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.

[4] The fed funds futures rate reflects the market's expectation of the average fed funds rate over the contract's month. However, Gürkaynak et al. (2007) show that the futures rate is also a good predictor of the funds target rate.

[5] We thank Refet Gürkaynak for providing the target rate surprises used in Gürkaynak et al. (2005).

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

[7] The XRIC is available until the end of 2003 at http://ksghome.harvard.edu/~JStock/xri/0312/xindex.asc.

[8] Evans et al. (2002) provide evidence that these threshold values are useful for identification of business cycle turning points.

[9] The results of this survey are available at http://www.federalreserve.gov/BoardDocs/snloansurvey/200610.

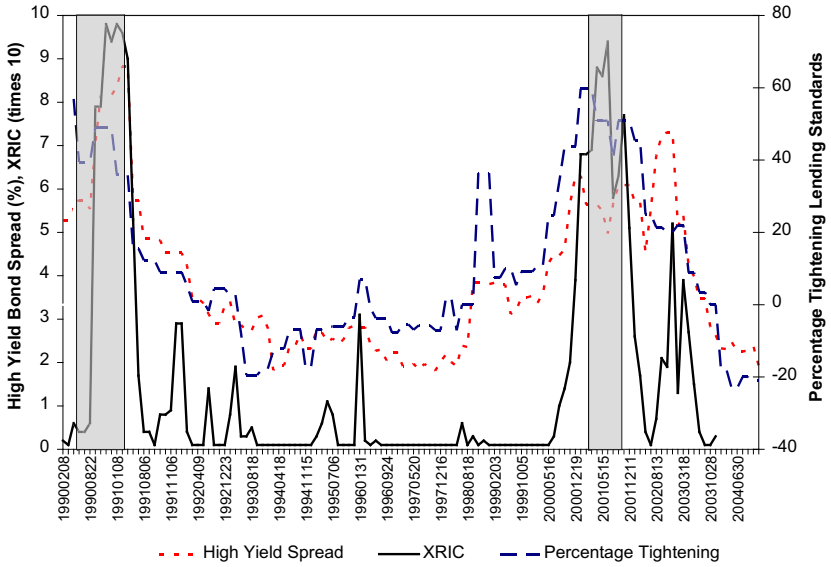

Fig. 1. Measures of business cycle and credit market conditions. The shaded areas are NBER recessions. XRIC is multiplied by 10 for scaling.

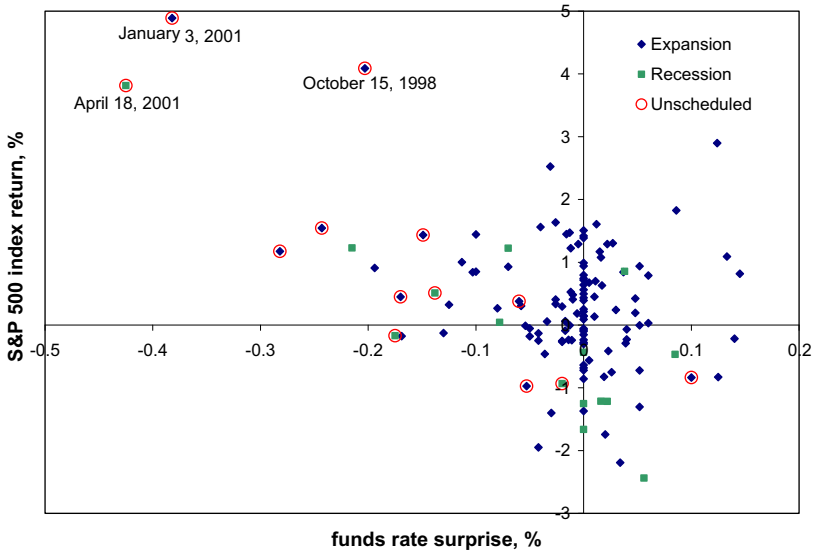

Fig. 2. Scatterplot of daily stock returns and Fed funds target rate surprises. NBER business cycle turning points are used.

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

$$R_t = \alpha + \beta \Delta i_t^u + \varepsilon_t. \quad (2)$$

Eq. (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).[10] This procedure maintains robustness in the presence of a large number of outliers.

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. Swanson (2006) and Gürkaynak et al. (2007) 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

[10] The MM estimation involves three stages. In the first stage, an initial robust estimate of the parameters is computed using the least trimmed squares (LTS) method. In the second stage, the residuals from the first stage are used to estimate a scale parameter for the errors. In the third stage, the scale parameter is used to estimate the final weighted regression parameters.

Table 1
Response of daily stock returns to target rate changes

	Full sample			1994–2004 sub-sample		
	OLS		Robust regression	OLS		Robust regression
	All target rate decisions	Scheduled meetings only	All target rate decisions	All target rate decisions	Scheduled meetings only	All target rate decisions
Intercept	0.20**	0.21**	0.15*	0.27***	0.24**	0.24**
	(0.09)	(0.09)	(0.08)	(0.11)	(0.10)	(0.10)
Unexpected change	−5.51***	−1.51	−4.23***	−6.99***	−1.68	−4.43***
	(1.52)	(1.57)	(1.02)	(1.67)	(1.54)	(1.38)
R^2	0.185	0.009	0.038	0.257	0.011	0.007
N	130	117	130	91	87	91

The table reports coefficients for the following regression: $R_t = \alpha + \beta\Delta i_t^u + \varepsilon_t$, where R_t is the one-day S&P 500 return and Δi_t^u is the unexpected change in the fed funds target rate. The full sample period is from January 1990 through December 2004. The regressions are 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.

were quite frequent. Therefore, we also estimate our regressions using 1994 through 2004 sub-sample.

The baseline results reported in Table 1 are generally consistent with Bernanke and Kuttner (2005). The coefficient estimate of the target rate surprise in the full sample is about −5.51, or −4.23 when robust regression is used. Similar to Bernanke and Kuttner (2005), we find a lower estimate of the coefficient of the target rate surprise once the unscheduled meetings are dropped. The results are generally similar in the full sample and the 1994-2004 sub-sample.

Table 2
Effect of business cycles on the response of daily stock returns to target rate changes

	Full sample			1994–2004 sub-sample		
	OLS		Robust regression	OLS		Robust regression
	All target rate decisions	Scheduled meetings only	All target ratedecisions	All target rate decisions	Scheduled meetings only	All target rate decisions
Panel A. With NBER recession dummy						
Intercept	0.19**	0.20**	0.15*	0.27**	0.25**	0.23**
	(0.09)	(0.09)	(0.08)	(0.10)	(0.10)	(0.10)
Recession (β_1)	−6.69***	−7.36***	−6.83***	−8.87***	−13.28*	−8.95***
	(1.59)	(2.79)	(1.63)	(0.92)	(7.00)	(2.03)
Expansion (β_2)	−5.01**	−0.21	−2.68**	−6.16**	−0.71	−1.10
	(2.00)	(1.72)	(1.26)	(2.48)	(1.51)	(1.75)
β_1–β_2	−1.69	−7.15**	−4.15**	−2.71	−12.57*	−7.85***
	(2.50)	(3.23)	(2.02)	(2.64)	(7.15)	(2.67)
R^2	0.188	0.038	0.053	0.265	0.054	0.071
N	130	117	130	91	87	91
Panel B. With CFNAI recession dummy						
Intercept	0.19**	0.21**	0.13	0.27***	0.25***	0.24**
	(0.09)	(0.09)	(0.08)	(0.10)	(0.09)	(0.10)
Recession (β_1)	−6.52***	−4.23*	−7.31***	−9.60***	−8.13***	−9.66***
	(1.59)	(2.49)	(1.07)	(1.27)	(2.77)	(1.40)
Expansion (β_2)	−2.73	1.12	0.20	−2.50	1.42	0.80
	(2.93)	(1.57)	(1.87)	(3.15)	(1.55)	(2.00)
β_1–β_2	−3.79	−5.35*	−7.51***	−7.10**	−9.55***	−10.46***
	(3.33)	(2.89)	(2.14)	(3.41)	(3.14)	(2.43)
R^2	0.203	0.036	0.075	0.320	0.088	0.114
N	130	117	130	91	87	91
Panel C. With XRIC						
Intercept	0.19**	0.20**	0.14	0.26	0.24**	0.23**
	(0.09)	(0.09)	(0.09)	(0.11)	(0.10)	(0.10)
Recession (β_1)	−9.14***	−9.04***	−9.54***	−11.74***	−17.15***	−12.60***
	(2.12)	(3.16)	(1.69)	(2.35)	(6.04)	(2.02)
Expansion (β_2)	−3.01	0.68	−2.41*	−3.17	0.82	−0.46
	(2.00)	(1.80)	(1.45)	(2.77)	(1.48)	(1.93)
β_1–β_2	−6.13*	−9.72***	−7.13***	−8.56**	−17.98***	−12.14***
	(3.23)	(3.83)	(2.48)	(4.21)	(6.59)	(3.14)
R^2	0.227	0.055	0.067	0.327	0.095	0.117
N	122	109	122	83	79	83

The table reports coefficients for the following regression: $R_t = \alpha + \beta_1\Delta i_t^u RM_t + \beta_2\Delta i_t^u(1 - RM_t) + \varepsilon_t$, where R_t is the one-day S&P 500 return, Δi_t^u is the unexpected change in the fed funds target rate, and RM_t is one of three recession measures: (1) NBER recession dummy, (2) CFNAI recession dummy, and (3) the experimental coincident recession index (XRIC) constructed by Stock and Watson (1989). The full sample period is from January 1990 through December 2004. The sample period of regressions using XRIC ends in December 2003. The regressions are 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.

4.2. State dependence in the stock market response

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

$$R_t = \alpha + \beta_1 \Delta i_t^u RM_t + \beta_2 \Delta i_t^u (1 - RM_t) + \varepsilon_t, \quad (3)$$

where RM_t is one of three recession measures discussed in Section 3 above: (1) NBER recession dummy, (2) CFNAI recession dummy, and (3) XRIC.

The results presented in Table 2 show that stocks tend to react significantly more strongly to monetary surprises in recession. For example, when robust regression is estimated for the full sample with the NBER recession dummy, the coefficient of the monetary surprise in expansion is about −2.68. This implies that a hypothetical unexpected 100-basis point cut of the fed funds target during economic expansion leads to a 2.68 percent increase in the overall stock prices. In contrast, the stock prices jump by about 6.83 percent in response to a similar monetary surprise in recession, more than double the size of the response in expansions.

The difference between the regression coefficients representing the stock market response in recession and expansion is statistically significant. This difference becomes even more pronounced when the CFNAI recession dummy or the XRIC are used, as well as in the 1994–2004 sub-sample. For example, when the CFNAI recession dummy is used in the full sample, the robust regression estimate of the target surprise coefficient is close to zero in expansion and is about −7.13 in recession, implying a much larger effect of monetary news on stocks in recessionary periods. Overall, the results reported in Table 2 show strong evidence of an economically important difference between the stock market reaction to monetary policy in expansion and recession. This evidence supports the credit channel of monetary transmission.

We estimate the following regression to examine the effect of credit market conditions on the stock market reaction to monetary news:

$$R_t = \alpha + \beta_1 \Delta i_t^u + \beta_2 \Delta i_t^u CC_t + \varepsilon_t, \quad (4)$$

where CC_t is one of two proxies for credit market conditions as discussed in Section 3: (1) the net percentage of loan officers reporting tightening of credit standards for large and medium firms in the Fed's Senior Loan Officer Opinion Survey and (2) the spread between the high-yield bond yields and AAA-rated bond yields.[11] Higher values of the two variables imply tighter credit conditions. To simplify interpretation of the regression coefficients, the credit conditions proxies are normalized using their sample means and standard deviations.

The estimation results of Eq. (4) are reported in Table 3. In Panel A, we report the results using the bank credit standards variable. The coefficient of the interactive term between the policy surprise and the credit cycle indicator is negative and significant for both samples and both estimation methods. For example, using robust regression for the full sample period, the effect of a monetary surprise doubles when the credit conditions variable increases by one standard deviation from its mean. Panel B of Table 3 reports the results using the high yield spread as a measure of credit market conditions. These results are similar, lending further evidence that stocks react more strongly to monetary news in tight credit market conditions.

The empirical results in Tables 2 and 3 show economically large and significant state dependence in the response of stock returns to target rate news, in contrast to the results of Andersen et al. (2007) showing no such evidence.[12] Consistent with the financial accelerator theories, the Fed policy 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 that we use target rate surprises derived from the fed funds futures prices and a longer sample period.[13]

4.3. The credit channel and the stock market response

In this section we use disaggregated panel data on S&P 500 firms to test for the credit channel effects. The credit channel of monetary transmission predicts that firms should react more to macroeconomic shocks in bad economic times for two reasons: first, due to a general reduction in the availability of credit as the bank lending channel predicts, and second, due to a further adverse effect on the balance sheets of the financially constrained firms. The disaggregated data on firm-specific credit characteristics and stock returns can be combined with the data on aggregate macro cycles to examine state dependence in the response of stock returns in the cross-section of firms. Ehrmann and Fratzscher (2004) provide a simple framework to study credit channel effects using disaggregated stock returns data along with firm-specific credit characteristics. In this section, we build on the Ehrmann and Fratzscher's panel framework to further examine the response of stock returns to monetary news.

Ehrmann and Fratzscher 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. They report both sectoral and firm-level heterogeneity in stock market's response to monetary news; the sectoral heterogeneity being interpreted as evidence of traditional interest rate channel and the firm-level financial heterogeneity being interpreted as evidence of the credit channel. We generalize the Ehrmann and Fratzscher's framework in three ways to allow for the traditional interest rate channel, the general credit reduction channel and the balance sheet channel simultaneously. First, based on our previous results, we allow for macro cycle variation in the response to monetary news. Second, we allow the response to monetary news to depend on both macro cycles and firms-specific credit characteristics. Finally, we simultaneously allow for heterogeneous sectoral effects.[14] We estimate the following regression:

[11] The results obtained using the default spread (the difference between the yield of a corporate BAA bond and a 10-year Treasury yield) as an alternative proxy for credit market conditions were qualitatively similar.

[12] We have estimated our regressions using the intraday S&P 500 futures returns and business cycle dates from Andersen et al. (2007) with intraday futures-based target rate surprises. The results showed strong evidence of a business cycle asymmetry, consistent with the results reported in our paper. This implies that the main reason for the difference between our results and those of Andersen et al. (2007) is the use of the target rate surprises derived from the fed funds futures prices, as opposed to their measure based on MMS forecasts. The market forecast derived from fed funds futures prices is likely to be more accurate than the median of the MMS forecasts. We thank Clara Vega for providing the data used in Andersen et al. (2007).

[13] As an additional robustness check, we estimated the regressions in Eqs. (3) and (4) for another sub-sample that starts in December 1998, when, the FOMC started including in its statements an assessment of the balance of risks. The results were consistent with those reported in Tables 2 and 3. We also examined state dependence in the stock market's reaction to changes in the target and path factors of monetary policy suggested by Gürkaynak et al. (2005). The point estimates of the target factor, which drives the current-month fed funds futures rates, showed evidence of state dependence consistent with the results in Tables 2 and 3. The results for these robustness checks are not reported in detail to save space but are available from the authors upon request.

[14] We have a longer sample period than Ehrmann and Fratzscher (2004) and use twelve industrial sectors instead of nine in their study. Our sectors are manufacturing, business equipment, telecom, durables, financial, non-durables, energy, chemicals, utility, retail, health, and others.

Table 3
Effect of credit market conditions on the response of daily stock returns to target rate changes

	Full Sample			1994–2004 sub-sample		
	OLS		Robust regression	OLS		Robust regression
	All target rate decisions	Scheduled meetings only	All target rate decisions	All target rate decisions	Scheduled meetings only	All target rate decisions
Panel A. With survey measure of lending standards						
Intercept	0.18**	0.20**	0.14*	0.23**	0.23**	0.23**
	(0.09)	(0.09)	(0.08)	(0.10)	(0.10)	(0.10)
Unexpected change	−2.99***	−1.46	−3.60***	−2.97**	−2.47*	−2.97**
	(1.09)	(1.46)	(1.08)	(1.24)	(1.42)	(1.44)
Unexpected change × percentage tighten	−3.63***	−3.58***	−3.45***	−4.14***	−5.14***	−4.14***
	(0.61)	(1.11)	(0.78)	(0.64)	(1.54)	(0.91)
R^2	0.296	0.063	0.100	0.398	0.102	0.133
N	128	115	128	91	87	91
Panel B. With high yield – AAA spread						
Intercept	0.18**	0.20**	0.13	0.25**	0.24**	0.23**
	(0.09)	(0.09)	(0.08)	(0.10)	(0.09)	(0.10)
Unexpected change	−4.48***	−1.15	−4.17**	−3.92**	−1.31	−2.60*
	(1.35)	(1.47)	(1.08)	(1.61)	(1.49)	(1.43)
Unexpected change × spread	−2.08	−2.40***	−2.54***	−3.83***	−3.59**	−4.32***
	(1.31)	(0.81)	(0.97)	(1.13)	(1.66)	(1.01)
R^2	0.209	0.040	0.046	0.352	0.084	0.110
N	130	117	130	91	87	91

The table reports coefficients for the following regression: $R_t = \alpha + \beta_1 \Delta i_t^u + \beta_2 \Delta i_t^u CC_t + \varepsilon_t$, where R_t is the one-day S&P 500 return, and CC_t is one of two proxies for credit market conditions: (1) the net percentage of loan officers reporting tightening of credit standards for large and medium firms in the Fed's Senior Loan Officer Opinion Survey and (2) the spread between the high-yield bond yields and AAA-rated bond yields. The credit conditions proxies are normalized using their sample means and standard deviations. The sample period is from January 1990 through December 2004 and contains 130 observations (128 observations in the Panel A regressions), including 13 unscheduled FOMC meetings. The 1994–2004 sub-sample contains 91 observations, including four unscheduled FOMC meetings. The regressions are 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
Summary statistics for the financial constraint measures

	Long-term debt rating	Trade credit	Asset size ($ million)	Payout ratio
Panel A. Raw data				
Descriptive statistics				
Mean	8.83	0.17	20,225.35	0.37
Median	8.00	0.13	4923.09	0.24
Standard deviation	2.96	0.14	64,793.28	1.16
	Junk-rated and unrated bonds	High trade credit	Small asset size	Low payout ratio
Panel B. Financial constraint dummy variables				
Constrained firm observations	15,988	11,257	13,812	13,116
Total observations	55,109	45,189	55,109	52,366
Correlations				
Junk rated and unrated bonds	1.00			
High trade credit	0.13	1.00		
Small asset size	0.40	0.17	1.00	
Low payout ratio	0.34	0.21	0.31	1.00

The sample period is from January 1990 through December 2004. The long-term S&P debt ratings obtained from COMPUSTAT range from 2 to 23, with higher values implying lower credit quality. Trade credit is calculated as accounts payable divided by total liabilities. The payout ratio is calculated as cash dividends plus stock repurchases divided by operating income. Financial firms are omitted in calculation of statistics for trade credit. Firms with negative operating income are omitted from calculation of statistics for payout ratio.

$$R_{i,t} = \alpha + \beta_1 \Delta i_t^u + \sum_{\text{Sectors}} \beta_{\text{sectors}} D_{\text{sectors}} \Delta i_t^u + \beta_2 \Delta i_t^u X_{i,t} + \beta_3 \Delta i_t^u \,\text{State}_t + \beta_4 \Delta i_t^u \,\text{State}_t X_{i,t} + \beta_5 X_{i,t} + \varepsilon_{i,t}. \quad (5)$$

The regression is estimated for stocks included in the S&P 500 index as in December 2004.[15] The variable $X_{i,t}$ is a dummy variable taking the value of one if firm i is classified as financially constrained on day t based on COMPUSTAT financial data from the previous year.[16] *State*$_t$ is one of three macroeconomic cycle proxies: the XRIC and the two proxies for credit market conditions. The sectoral heterogeneity is modeled by using eleven sectoral dummies. The base sector is the manufacturing sector and its response to monetary news is given by β_1 in the absence of any other factors. The coefficient β_2 shows an additional response of a financially constrained firm to monetary news. The coefficient β_3 is the effect of the macro cycle on the response of stock returns to the monetary surprise. Finally, the coefficient β_4 captures the stock market response to the monetary surprise depending on the interaction of the macro cycle and the firm-specific financial constraints. If higher values of the macro cycle variable imply tighter conditions, a negative and significant β_4 illustrates that a monetary tightening results in a larger negative response of financially constrained firms in adverse macroeconomic conditions.

To address the simultaneity issue and also for comparability, we follow the approach of Ehrmann and Fratzscher (2004) of introducing firm-specific characteristics using dummy variables based on the COMPUSTAT data for the previous year. Therefore, the firm-specific credit characteristics in Eq. (5) are based on predetermined annual data and can be treated as exogenous to daily stock returns. Finally, we follow the general literature in this area to address the errors in variables critique of the firm-specific financial constraints by using multiple financial constraint proxies.

[15] 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.

[16] The firms included in the S&P 500 index are relatively large, healthy firms. Therefore, in this context, the concept of being financially constrained is a relative rather than an absolute concept, i.e., the firms classified as financially constrained are simply more financially constrained than other firms in the sample.

Table 5
Effect of the macroeconomic cycles on the response of daily disaggregated stock returns to target rate changes

	Without macroeconomic cycle	XRIC	Survey of lending standards	High yield – AAA spread
Panel A. Junk rated or unrated bonds				
Unexpected change	−5.50	−3.78	−2.77	−4.53
	(1.03)***	(1.43)***	(1.21)**	(1.15)***
Unexpected change ×				
Credit ratings	0.41	0.05	−0.65	0.16
	(0.69)	(0.67)	(0.61)	(0.67)
Macroeconomic cycle	–	−4.08	−2.29	−1.63
		(2.37)*	(0.59)***	(0.91)*
Unexpected change ×				
Business equipment	−8.82	−8.60	−8.01	−8.64
	(1.39)***	(1.42)***	(1.37)***	(1.38)***
Telecom	−4.51	−4.21	−3.50	−4.28
	(2.05)**	(2.13)**	(2.01)*	(2.04)**
Durable	−1.01	−1.22	−1.52	−1.13
	(0.85)	(0.85)	(0.82)*	(0.84)
Financial	0.33	0.36	0.46	0.36
	(0.72)	(0.74)	(0.72)	(0.72)
Non-durable	3.97	4.00	3.96	4.00
	(0.80)***	(0.81)***	(0.81)***	(0.80)***
Energy	6.50	6.55	6.61	6.54
	(1.29)***	(1.29)***	(1.29)***	(1.29)***
Chemicals	2.53	2.56	2.56	2.56
	(0.71)***	(0.72)***	(0.71)***	(0.71)***
Utilities	6.53	6.59	6.65	6.57
	(1.19)***	(1.21)***	(1.19)***	(1.19)***
Retail	−1.60	−1.52	−1.29	−1.53
	(0.73)**	(0.75)**	(0.73)*	(0.73)**
Health	3.78	3.85	4.14	3.82
	(1.02)***	(1.04)***	(1.01)***	(1.02)***
Others	−2.56	−2.44	−2.09	−2.45
	(0.67)***	(0.68)***	(0.65)***	
N	55,109	51,357	54,411	55,109
	(0.66)***			
Panel B. High trade credit				
Unexpected change	−5.22	−3.29	−2.63	−4.17
	(1.01)***	(1.43)**	(1.20)**	(1.14)***
Unexpected change ×				
High trade credit	−1.39	−1.41	−1.47	−1.40
	(0.42)***	(0.44)***	(0.42)***	(0.42)***
Macroeconomic cycle	–	−4.74	−2.33	−1.86
		(2.37)**	(0.59)***	(0.91)**
N	45,189	42,108	44,621	45,189
Panel C. Low payout ratio				
Unexpected change	−5.26	−3.46	−2.66	−4.30
	(1.00)***	(1.38)**	(1.16)**	(1.11)***
Unexpected change ×				
Low payout ratio	−1.75	−1.80	−1.90	−1.78
	(0.56)***	(0.57)***	(0.55)***	(0.56)***
Macroeconomic cycle	–	−4.36	−2.29	−1.69
		(2.26)*	(0.56)***	(0.87)**
N	52,366	48,886	51,692	52,366
Panel D. Small firms				
Unexpected change	−5.51	−3.85	−2.99	−4.59
	(1.03)***	(1.43)***	(1.20)**	(1.14)***
Unexpected change ×				
Small firms	0.41	0.38	0.31	0.39
	(0.58)	(0.60)	(0.58)	(0.58)
Macroeconomic cycle	–	−4.08	−2.26	−1.63
		(2.36)*	(0.59)***	(0.91)*
N	55,109	51,357	54,411	55,109

The table reports coefficients for the following regression: $R_{i,t} = \alpha + \beta_1 \Delta i_t^u + \sum_{\text{Sectors}} \beta_{\text{sectors}} D_{\text{sectors}} \Delta i_t^u + \beta_2 \Delta i_t^u X_{i,t} + \beta_3 \Delta i_t^u \text{State}_t + \beta_4 X_{i,t} + \varepsilon_{i,t}$, where R_{it} is the one-day return of firm i, X_{it} is firm-specific dummy variable for credit constrained firms and Δi_t^u is the unexpected change in the fed funds target rate. State_t describes the aggregate business cycle and normalized credit condition variables, including coincident recession probability (XRIC), the net percentage of loan officers reporting tightening of credit standards, or High yield – AAA spread. Finally, D_{sectors} are dummy variables for industrial sectors. The full sample period is from January 1990 through December 2004. The full sample is an unbalanced panel containing 130 announcements (128 announcements when the Survey of Lending Standards is used). The sample period of regressions using XRIC ends in December 2003. Financial firms are excluded when High Trade Credit is used. The coefficients of sector specific dummies are not reported in Panels B–D due to space considerations. All regressions are pooled OLS estimations. Panel-corrected standard errors are shown in the parentheses.
*, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

Four variables are used to measure financial constraints: the long-term Standard and Poor's debt ratings, payout ratio (including stock repurchases), asset size, and trade credit. Firm size, payout ratio and debt ratings are commonly used as measures of financial constraints (e.g., Almeida et al., 2004). The debt rating is a direct proxy for the magnitude of informational asymmetries faced by

Table 6
Effect of the macroeconomic cycles and firm-specific credit conditions on the response of daily disaggregated stock returns to target rate changes

	XRIC	Survey of lending standards	High yield – AAA spread
Panel A. Junk rated or unrated bonds			
Unexpected change	−4.37	−3.39	−4.62
	(1.41)***	(1.20)***	(1.14)***
Unexpected change ×			
Credit ratings	1.84	1.07	0.38
	(0.98)*	(0.74)	(0.71)
Macroeconomic cycle	−2.78	−1.80	−1.50
	(2.30)	(0.58)***	(0.88)*
Credit ratings × cycle	−4.54	−1.75	−0.42
	(1.93)**	(0.46)***	(0.70)
Unexpected change ×			
Business equipment	−8.54	−7.87	−8.62
	(1.41)***	(1.36)***	(1.38)***
Telecom	−4.28	−3.59	−4.29
	(2.13)**	(2.01)*	(2.04)**
Durable	−1.15	−1.43	−1.11
	(0.84)	(0.82)*	(0.84)
Financial	0.34	0.42	0.35
	(0.74)	(0.72)	(0.72)
Non-durable	4.03	4.01	4.00
	(0.81)***	(0.81)***	(0.80)***
Energy	6.54	6.58	6.54
	(1.29)***	(1.29)***	(1.29)***
Chemicals	2.61	2.63	−2.58
	(0.72)***	(0.71)***	(0.71)***
Utilities	6.54	6.56	6.56
	(1.20)***	(1.19)***	(1.19)***
Retail	−1.58	−1.41	−1.54
	(0.74)**	(0.73)*	(0.73)**
Health	3.88	4.19	3.82
	(1.04)***	(1.02)***	(1.02)***
Others	−2.50	−2.19	−2.46
	(0.68)***	(0.65)***	(0.66)
N	51,357	54,411	55,109
Panel B. High trade credit			
Unexpected change	−4.24	−3.55	−4.47
	(1.38)***	(1.18)***	(1.13)***
Unexpected change ×			
High trade credit	2.19	1.91	−0.23
	(0.76)***	(0.57)***	(0.55)
Macroeconomic cycle	−2.66	−1.61	−1.37
	(2.22)	(0.56 ***	(0.86)
High trade credit × cycle	−8.36	−2.91	−1.98
	(1.48)***	(0.35)***	(0.59)***
N	42,108	44,621	45,189
Panel C. Low payout ratio			
Unexpected change	−4.29	−3.61	−4.63
	(1.34)***	(1.14)***	(1.10)***
Unexpected change ×			
Low payout ratio	1.19	1.32	−0.63
	(1.02)	(0.78)*	(0.71)
Macroeconomic Cycle	−2.62	−1.59	−1.19
	(2.14)	(0.54)***	(0.82)
Low payout ratio × Cycle	−6.96	−2.77	−1.98
	(1.95)***	(0.46)***	(0.76)***
N	48,886	51,692	52,366
Panel D. Small firms			
Unexpected change	−4.22	−3.47	−4.68
	(1.39)***	(1.19)***	(1.13)***
Unexpected change ×			
Small firms	1.80	2.17	0.79
	(1.16)	(0.90)**	(0.80)
Macroeconomic Cycle	−3.25	−1.86	−1.46
	(2.24)	(0.57)***	(0.86)*
Small firms × Cycle	−3.29	−1.59	−0.68
	(2.02)	(0.49)***	(0.81)
N	51,357	54,411	55,109

The table reports coefficients for the following regression: $R_{i,t} = \alpha + \beta_1 \Delta i_t^u + \sum_{\text{Sectors}} \beta_{\text{sectors}} D_{\text{sectors}} \Delta i_t^u + \beta_2 \Delta i_t^u X_{i,t} + \beta_3 \Delta i_t^u \text{State}_t + \beta_4 \Delta i_t^u \text{State}_t X_{i,t} + \beta_5 X_{i,t} + \varepsilon_{i,t}$, where R_{it} is the one-day return of firm i, X_{it} is firm-specific dummy for credit constrained firms and Δi_t^u is the unexpected change in the fed funds target rate. State_t describes the aggregate business cycle and normalized credit condition variables, including coincident recession probability (XRIC), the net percentage of loan officers reporting tightening of credit standards, or High yield – AAA spread. Finally, D_{sectors} are dummy variables for industrial sectors. The full sample period is from January 1990 through December 2004. The full sample is an unbalanced panel containing 130 announcements (128 announcements when the Survey of Lending Standards is used). The sample period of regressions using XRIC ends in December 2003. Financial firms are excluded when High Trade Credit is used. The coefficients of sector specific dummies are not reported in Panels B–D due to space considerations. All regressions are pooled OLS estimations. Panel-corrected standard errors are shown in the parentheses.
*, **, *** indicate that the coefficient is statistically significant at 10%, 5%, and 1% levels, respectively.

firms in the debt markets. 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. We create a dummy for financially constrained firms based on the firms with junk debt ratings and the firms with unrated bonds and positive debt.[17] Based on this criterion, about 29% of firm-observations are classified as credit constrained.

We also use trade credit (calculated as accounts payable divided by total liabilities) to identify financially constrained firms. 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%. This makes trade credit a very expensive source of external finance that is unattractive to firms with access to alternative financing sources. Nilsen (2002) and Atanasova (2007) show that financially constrained firms use more trade credit. Danielson and Scott (2004) find that firms use more trade credit when more desirable sources of financing, such as bank loans, are unavailable. We classify the top quartile of high trade credit users as financially constrained, excluding financial firms. Two additional dummies for financially constrained firms are based on the bottom quartiles of the distributions of the payout ratio and asset size.[18] The quartile rankings used for the payout ratio, asset size, and trade credit are performed separately for each FOMC announcement day.[19]

The descriptive statistics for the four financial characteristics are in Table 4. Panel B of the table reports the number of firm-observations treated as credit constrained based on each indicator. The correlations between the dummy variables for credit constrained firms based on each indicator are all positive, as expected, ranging from 0.1 to 0.4. We use these dummy variables in estimating Eq. (5).

The pooled OLS estimation results of Eq. (5) without the interactive term between the macro cycle and the dummy for financially constrained firms are in Table 5.[20] The first column shows the regression results without allowing for macro cycle effects in the response to monetary news. It shows that the manufacturing sector stocks decline by 5.5% for an unexpected 100 basis point increase in the fed funds rate. The sectoral dummies show a fair amount of heterogeneity across industries. The business equipment stocks respond the most, declining by 14.32% (sum of 8.82 and 5.5) for a hypothetical 100 basis point increase in the target rate. The response of the telecom and durables sectors is quite strong as well. The financial sector response is almost identical to the response of the manufacturing sector. These results are consistent with the findings of Ehrmann and Fratzscher (2004) on sectoral heterogeneity. The stronger response of cyclical and capital-intensive industries can be explained by sensitivity of the demand for their products to interest rate fluctuations, supporting the traditional interest rate channel of monetary transmission.

In column two of the table, we introduce the business cycle variable XRIC as the macro cycle. Consistent with the results for the aggregate stock returns in Tables 2 and 3, the coefficient of the interactive term is significantly negative. It implies that, if the probability of recession is one, a 100 basis point shock will lead to an additional 4.08% decline in the stock prices. The estimates in the third column show that a one standard deviation tightening of lending standards will result in an additional 2.29% stock price decline in response to a 100 basis point increase in the fed funds target rate. In the fourth column using the high-yield spread, the corresponding number is −1.63%. In Panels B, C and D of Table 5, we show similar results using the financial constraint dummies based on the other three measures: trade credit, payout ratio and asset size. These results also show large and significant additional declines in the stock returns in adverse business or credit conditions. The coefficient of interactive term with the macro cycle is always negative and significant.[21]

Ehrmann and Fratzscher show that the reaction of stock returns to monetary news is sensitive to the financial characteristics of the firms. They interpret this result as supportive of the credit channel. However, the estimates of the interactive term between monetary news and firm-specific financial constraint dummies in Table 5 show mixed evidence of such sensitivity. The reason for this mixed evidence is that we additionally allow for sectoral heterogeneity and the macro cycle in the regression equation.[22] To sort out this issue, we perform a stronger test for the credit channel by allowing the stock reaction of monetary news to depend on the interaction of firm specific financial characteristics and the macro cycle. We estimate the regression in Eq. (5) by including the interactive term between the macro cycle and the credit constraint dummies. This test shows whether the credit constrained firms react more than the unconstrained firms in adverse macroeconomic conditions, as predicted by the balance sheet channel, with the firm-dependent variation amplified by the macro cycle.

The results are reported in Table 6. The first column of the table shows the estimated coefficients with XRIC as the macro cycle. The estimated coefficient of the interactive term between the target rate surprise, XRIC and the credit constraint dummy based on debt ratings is −4.54, implying that credit constrained firms show a bigger decline in stock prices in adverse business cycle conditions. The coefficient is significant at the five percent level. The point estimates of the coefficient of this interactive term based on different measures of macro cycle and financial constraints are always negative.[23] Moreover, the coefficient is significant at the 5% level in 9 out of 12 cases reported. Consistent with the balance sheet channel of monetary transmission, these findings show that firms that are likely to be financially constrained tend to be affected the most by monetary policy moves during bad economic times.

Another coefficient of interest in Table 6 is the coefficient of the interactive term between the financially constrained firm dummies and the target rate surprise. It is either negative and insignificant or positive and sometimes significant. A comparison of how that coefficient changed from Table 5 to Table 6 shows a fairly large increase in its estimate in all cases. This comparison implies that the additional effects of monetary shocks on stock returns of financially constrained firms occur primarily in adverse macroeconomic conditions.

5. Summary and conclusion

This study examines whether and how the effect of monetary policy on stock returns varies with the cyclical forces of the

[17] Some firms have no bond ratings and no debt. For example, Microsoft did not have a long-term S&P debt rating until 1998. Such firms are not treated as financially constrained.

[18] The empirical conclusions of the paper are robust to using alternative cutoff points.

[19] We also considered using sector-specific distributions on each announcement date, as suggested by a referee. However, some sectors in the S&P 500 index have very few firms. Moreover, intersectoral variation also provides important information in the regressions, as macroeconomic cycles do not affect all sectors uniformly.

[20] The use of pooled OLS with panel-corrected standard errors is consistent with Ehrmann and Fratzscher (2004).

[21] The coefficients of the sectoral dummies are not reported in panels B, C and D of the table for space considerations. These coefficient estimates are very similar to the estimates shown in Panel A of Table 5.

[22] The financial constraint dummies do have significant negative coefficients when the sectoral dummies and the macro cycle are omitted from the regression equation. These estimates are not reported due to space consideration but are available from the authors upon request.

[23] Allowing for firm-specific fixed effects does not alter the results qualitatively. The estimates are available from the authors upon request.

economy. We find that the effect of unexpected changes in the fed funds target rate on stock returns depends on the state of the business cycle and on credit market conditions. Specifically, the response of stocks to monetary news is at least twice as large in recessions and tight credit conditions as in good economic times. We also show that financially constrained firms respond more than relatively unconstrained firms to monetary shocks in adverse macroeconomic conditions. This result supports the credit channel by showing that macroeconomic cycles interact with firm-specific financial characteristics to determine the effect of monetary shocks on stock returns.

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