Financial Constraints, Monetary Policy Shocks, and the Cross-Section of Equity Returns

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August 10, 2015

Abstract

We analyze the impact of unanticipated monetary policy changes on equity returns and document that financially constrained firms earn a significantly lower return following rate increases as compared to unconstrained firms. Trading volume is significantly lower for constrained firms on FOMC announcement days but the differential return response manifests with a delay. Further, unanticipated increases in Federal funds rate are associated with a larger decrease in expected cash flow news, but not of discount rate news, for constrained firms relative to unconstrained firms. Our results highlight how monetary policy shocks have a disproportionate real impact on financially constrained firms.

Keywords: Financial Constraint, Monetary Policy, Cross-Section of Stock Returns.

JEL Classification: E52, G12, G14, G30.

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1 Introduction

Firms are constrained in raising external capital due to frictions such as asymmetric information (Fazzari, Hubbard, and Petersen (1988); Lamont, Polk, and Saá-Requejo (2001); Kaplan and Zingales (1997), Whited and Wu (2006)). These financial constraints make external funds more costly than internal funds and constrained firms may not be able to invest in positive NPV projects due to lack of funds. A large literature in finance and macro economics has highlighted the implications of financial constraints to business cycles (Kiyotaki and Moore (1997), Kiyotaki (1998)) and how credit market imperfections can propagate and amplify shocks to the macroeconomy (Bernanke and Gertler (1989), and Bernanke, Gertler, and Gilchrist (1996)).

Monetary policy can affect expectations of future interest rates, dividends, and excess returns (Bernanke and Kuttner (2005). It can also affect the credit quality of the pool of borrowers through the interest rate channel and the firm balance-sheet channel of monetary policy by changing firm investment opportunities, net worth and collateral (Bernanke and Gertler (1989, 1995)). Monetary policy, by affecting bank liquidity, may also affect the supply of credit through the credit channel or the bank balance-sheet of monetary policy (Kashyap and Stein (2000)). Bernanke and Kuttner (2005) among others have analyzed the impact of monetary policy on aggregate market returns. But both balance sheet and credit channel predict that monetary policy should have a disproportionate impact on firms that are financially constrained. In this paper, we analyze the differential impact of monetary policy changes on equity returns of firms sorted by measures of financial constraints.

We document two main findings in this paper. First, financially constrained firms earn significantly lower returns than their unconstrained counterparts due to policy shocks following the FOMC event days. Interestingly, we don't find that financially constrained firms earn a lower abnormal stock return relative to unconstrained firms on the day of the unanticipated Fed funds rate changes. Instead, we find that stocks of financially constrained firms expe-

rience a delayed reaction with the differential effect building up and becoming significantly lower in the three days following the FOMC announcement date. A potential explanation for the delayed reaction of financially constrained firms is their significantly lower trading volume on the day of the FOMC announcement as compared to the financially unconstrained firms (see Peng (2005) and Hirshleifer, Lim, and Teoh (2009)).

Second, we decompose the stock returns into cash flow news and discount rate news components following the methodology of Vuolteenaho (2002), that is devised specifically for firm level stock returns. We find that financially constrained firms earn lower average returns than unconstrained firms because monetary policy shocks have significantly adverse effects on cash flow news of the financially constrained firms relative to the unconstrained firms. In contrast, the discount rate news of the constrained and unconstrained firms are affected equally by monetary policy shocks. The fact that cash flow news of financially constrained firms is significantly lower following unanticipated increases in Fed funds rate is consistent with both balance sheet and credit channel of monetary policy and suggests that financially constrained firms may not invest in positive NPV projects due to lack of suitable financing. Consistent with this notion, we find that financially constrained firms seem to draw down more cash and invest less than the unconstrained firms in the four quarters following an increase in the effective Fed funds rate.

We first replicate Bernanke and Kuttner (2005) using firm level stock returns and we find, consistent with Bernanke and Kuttner (2005), change in the Fed funds rate is insignificant in explaining returns, but the unexpected component of monetary policy change (FFShock) is negative and significant on FOMC announcement days.[1] On the announcement day and in the subsequent return windows, there is no significant difference in the returns of constrained and unconstrained firms when we interact financial constraint dummy[2] with change in the

[1] We get the same results as Bernanke and Kuttner (2005) using CRSP value-weighted index returns.

[2] Firms are sorted in descending order into portfolios based on various measures of financial constraints. Our main measure of financial constraints is the Whited and Wu (2006) index. The financial constraints (FC) dummy is 1 for firms in the top quartile of the WW Index and 0 otherwise. In robustness tests, we verify that our results are similar using other measures of financial constraints such as: the KZ Index, the SA Index and lack of bond rating.

Fed funds rate. More importantly, we also document that the differential return between constrained and unconstrained firms is statistically insignificant on the announcement day due to the interest rate shock.[3] It seems a surprise increase in the Fed funds rate triggers a broad market decline that impacts both constrained and unconstrained firms equally. However, there is a clear pattern of negative and significant returns for the constrained firms relative to the unconstrained firms in the days following a FOMC announcement. The magnitude and significance of the differential returns are monotonically increasing with the return window. For a hypothetical 100 basis points unanticipated increase in the Fed funds rate, the constrained firms earn, on average, roughly 7% lower cumulative returns than the unconstrained firms over the four days immediately after the announcement day.[4] We find similar results using firm-level cumulative abnormal returns (CARs) instead of raw returns as the dependent variable in the same regression specification.

Before we explore the delayed response of financially constrained firms to monetary policy shocks, we first check how long the lower returns persist and whether there is a reversal. We find that in various windows ranging from 5 days to 20 days following monetary policy surprises, there is no differential response between financially constrained firms and unconstrained firms. These results give us confidence that some omitted firm characteristic is not driving these results. The differential return effect seems to be only concentrated in the 3 to 4 days following the FOMC announcements.

A potential explanation for the delayed response of the financially constrained firms is the significantly lower trading volume that we document for financially constrained firms relative to the financially constrained firms on the day of the FOMC announcements. These

[3] As expected, there is no significant difference in returns between constrained and unconstrained firms the day before the FOMC announcement as a result of the interest rate shock.

[4] A back-of-the-envelop calculation shows that a long-short strategy of buying the portfolio of unconstrained firms and selling the portfolio of constrained firms can produce returns of roughly 5.6% annually, assuming there are an average of 8 scheduled FOMC meetings a year and each meeting results in a surprise rate hike of 10 basis points. This is significant in the sense that this strategy only requires portfolio holding on 40 days out of the year, using 8 announcements and 5 portfolio holding days each announcement. The rest of the time, the profit from the trade can be reinvested in a risk-free account.

results are consistent with the theoretical prediction of Peng (2005) that predicts faster rate of incorporation of information by large firms than by small firm stocks. These results are also consistent with limited investor attention and investor distraction causing market underreaction (Hirshleifer, Lim, and Teoh (2009)).[5]

To understand the source driving this difference in returns between the financially constrained and unconstrained firms as a result of the unanticipated changes in monetary policy, we decompose firm-level returns into the discount rate (DR) news component and the cash flow (CF) news component using methodologies developed by Campbell for the aggregate market and then by Vuolteenaho (2002) for individual firms. The idea is to check if monetary policy affects the news components of returns differently between the two types of firms. Since the decomposition requires the use of monthly time-series of returns, we first establish our main finding using monthly data.[6] Indeed, we find that constrained firms, on average, earn lower monthly returns than the unconstrained firms in the months during which policy surprises are positive, and vice versa for negative surprises.

To tease out whether the differential impact of monetary policy shocks on constrained and unconstrained firm-level returns comes from the discount rate channel or the cash flow channel, we run panel regressions where discount rate news and cash flow news are separately regressed on contemporaneous expected and unexpected components of monetary policy change each month plus their interactions with the financial constraint dummy. The monetary policy shock by itself increases the DR news while decreases the CF news. This is consistent with the negative returns of the broad market when the Fed funds rate goes up unexpectedly. Our second main finding is that the DR news of constrained and unconstrained

[5]Hirshleifer, Lim, and Teoh (2009) find that the immediate price and volume reaction to a firm's earnings surprise is much weaker, and post-announcement drift much stronger, when a greater number of same-day earnings announcements are made by other firms.

[6]Following Bernanke and Kuttner (2005), we extend the event study to monthly frequency using a second measure of monetary policy surprise based on the difference between the actual average Fed funds rate in a month and the rate implied by the average price of futures contract for the same month. Financial constraint dummies are assigned to the cross-section of firms each month in a similar fashion to the event study using indexes constructed from the most recently available information in quarterly reports.

firms don't react very differently resulting from a monetary policy shock. Whereas the CF news of constrained firms significantly decreases, relative to the unconstrained firms, due to a surprise increase in the Fed funds target rate. This finding suggests that the constrained firms earn lower average returns than unconstrained firms because positive monetary policy shocks lower the expected cash flow of constrained firms more. The evidence also implies that CF news dominates DR news in the cross-section of firms in the context of monetary policy shocks, which is consistent with the variance decomposition of Vuolteenaho (2002) which shows CF news dominates DR news for firm-level returns.

Consistent with the cash flow news channel, we also provide some suggestive evidence that monetary policy has real effects on firm policies. In particular, financially constrained firms seem to draw down more cash and invest less than the unconstrained firms in the four quarters following an increase in the effective Fed funds rate. A one percent increase in the effective Fed funds rate anytime within the last year forces the constrained firms to decrease their investment as a fraction of assets by more than 0.2% compared to the unconstrained firms. These findings are consistent with the differential response of constrained and unconstrained firms to unanticipated monetary policy changes and with findings from Gertler and Gilchrist (1994).

Our paper builds on and contributes to both the literature on the impact of monetary policy on asset prices and the literature on financing constraints. Using monetary policy shocks from a vector autoregression (VAR), Thorbecke (1997) documents that during 1953-90, stock prices react to monetary policy shocks and the response varies across industries and firm size.[7] Bernanke and Kuttner (2005) document that a hypothetical unanticipated 25-basis-point cut in the Federal funds rate target is associated with about a 1% increase in broad stock indexes. Their evidence suggests that unanticipated monetary policy changes

[7]Related, Jensen, Mercer, and Johnson (1996) show that impact of business-conditions proxies (such as term premium, default premium, and dividend yield) on expected security returns is significantly affected by monetary policy. In a similar vein, Jensen and Mercer (2002) provide evidence that risk-premiums associated with beta, size and book-to-market vary with monetary policy.

affect the stock prices due to their effect on expected excess returns.

Our paper also contributes to the literature that analyzes the impact of monetary policy shocks in the cross-section of equity returns. Bernanke and Kuttner (2005), Ehrmann and Fratzscher (2004) show that stock return response to monetary policy varies by industry, with cyclical industries reacting more than non-cyclical industries. Ehrmann and Fratzscher (2004) find that firms with small size, low cash flows, poor credit ratings and low leverage react more to monetary policy. In a closely related paper, Ippolito, Ozdagli, and Perez (2015) show that a two standard deviation increase in the bank dependence of a firm makes its stock price about 25% more responsive to monetary policy shocks and attribute this to interest rate pass-through channel that operates via the direct transmission of policy rates to lending rates through floating-rate spreads in bank loans and commitments. In contrast, Ozdagli (2015) uses the demise of the auditing firm Arthur Andersen as an exogenous shock to the financing frictions faced by its clients and documents that firms with higher financial frictions react less to monetary policy shocks. Weber (2015) shows that firms with sticky product prices are more exposed to monetary policy shocks and Gorodnichenko and Weber (2014) provide evidence that after monetary policy announcements, the conditional volatility of stock market returns rises more for firms with stickier prices than for firms with more flexible prices. We contribute to this literature by documenting that financially constrained firms earn significantly lower returns than their unconstrained counterparts after unanticipated increase in Fed funds target rate.

Our paper differs from the papers that analyze analyzes the impact of monetary policy shocks in the cross-section of equity returns in three important ways. First, we use a holistic measure of financing constraints based on Whited and Wu (2006). More importantly, we show that there is no difference in the returns of constrained firms and unconstrained firms on the day of the FOMC announcement, but this effect builds up over the next three trading days and becomes significant three days and four days after the FOMC event date. We provide a potential explanation for the delayed reaction by documenting the lower trading volume in

constrained firms on the day of the FOMC announcement relative to the unconstrained firms. The delayed reaction of constrained firms is in contrast to the large average aggregate excess returns on U.S. equities in anticipation of monetary policy decisions documented in Lucca and Moench (2015). Finally, we show that constrained firms earn lower average returns than unconstrained firms because positive monetary policy shocks significantly decrease expected cash flows of constrained firms more.

Our paper is also related to the literature that studies whether financing constraints risk is reflected in stock returns. Lamont, Polk, and Saá-Requejo (2001) find that more constrained firms earn lower average returns than less constrained firms. Whited and Wu (2006) use an alternative index and find that more constrained firms earn higher average returns than less constrained firms, although the difference is insignificant. Buehlmaier and Whited (2014) construct a measure of financial constraints using textual analysis and find that constrained firms returns move together and earn an annualized risk-adjusted excess return of 7%. Chava and Purnanandam (2011) show that bank dependent borrowers experienced significantly positive returns around the unexpected rate changes announced in FOMC meetings in Fall 1998 in the aftermath of the LTCM and Russian crisis. Chava, Gallmeyer, and Park (2015) find evidence that tightening credit standards, derived from the Federal Reserve Board's Senior Loan Officer Opinion Survey on Bank Lending Practices predicts lower future stock returns and the predictability is related to cash flow news. Our results documenting the differential impact of unanticipated monetary policy changes on the financially constrained firms through the cash flow channel are broadly consistent with these findings.

The rest of the paper is organized as follows. Section 2 describes the data construction, empirical methodology and presents the summary statistics of the data. The main empirical results documenting the differential impact of monetary policy increases on financially constrained stocks is presented in section 3. In section 4, we decompose returns into the discount rate news and the cash-flow news components to get a better understanding of the impact of monetary policy. Section 5 concludes.

2 Data and Methodology

Our main sample period covers public firms from 1994 to 2007. The decision to start in 1994 is based on the fact that FOMC meetings became regularly scheduled events known to the public at the beginning of each year and less contaminated with other macro announcements because target rate changes were announced. The 2007 cutoff is meant to isolate the stock returns from the effect of unconventional monetary policy as the nominal short rate hit zero-lower-bound in the aftermath of the financial crisis. Quantitative easing (QE) is the main policy tool for the Federal Reserve Board in the liquidity trap, and we have seen large responses from stocks when QE announcements surprised the market.

We obtain quarterly firm characteristics from Compustat. For the event study, returns around each FOMC event windows are collected from the CRSP daily return files. For the time series study, monthly stock returns from CRSP are used. In the event study, we match firm characteristics to event days by lagging the Compustat data to ensure the accounting information is publicly known to market participants. Financial constraint proxies are then constructed based on these lagged firm characteristics. The main financial constraint proxy in the analysis is the Whited and Wu (2006) index defined as:

$$\begin{aligned} WW_{i,t} &= -0.091 \times CF_{i,t} - 0.062 \times DIVPOS_{i,t} + 0.021 \times TLTD_{i,t} - 0.044 \times LNTA_{i,t} \\ &+ 0.102 \times ISG_{i,t} - 0.035 \times SG_{i,t}, \end{aligned}$$

where CF is the ratio of cash flow to total asset, $DIVPOS$ is the cash dividend indicator variable, $TLTD$ is the ratio of the long-term debt to total asset, $LNTA$ is log of total assets, ISG is the firm's three-digit industry growth, and SG is sales growth. Other measures of financial constraint are also used for the robustness of the empirical tests, such as the Kaplan and Zingales (1997) index and the size and age index of Hadlock and Pierce (2010).

We construct monetary policy event days using the same procedure as Piazzesi and

Swanson (2008) where announced FOMC dates are combined with inter-meeting interest rate moves obtained from the Fed funds rate targets between 1994 and 2007. Once the monetary policy event days are tabulated, we calculate the surprise element of policy actions by using the price of Fed funds futures contracts. The standard procedure is outlined in Kuttner (2001) and Bernanke and Kuttner (2005). The main idea is to back out the unexpected target rate changes by changes in price of the current-month futures contract right before and right after FOMC event days. To be exact, shocks to monetary policy based on Fed funds futures is:

$$FFShock = \frac{D}{D-d}(f^0_{m,d} - f^0_{m,d-1}),$$

where $f^0_{m,d}$ is the current-month futures contract price, D is the number of days in the month, and d is the calendar day of the month. The fraction $\frac{D}{D-d}$ is to adjust for the fact that Fed funds futures contract settlement price is based on the average monthly Fed funds rate. The expected component of the policy action is then expressed as the difference between the raw change and the surprise component:

$$FFExpected = MPDelta - FFShock.$$

Using Fed funds futures contract to identify unexpected Fed funds rate changes is standard in the macroeconomic literature. These contracts summarize the average expected Fed funds target rates in the month of expiration. Krueger and Kuttner (1996) suggests that the Fed funds futures price provides an efficient forecast of future rate changes.

2.1 Summary Statistics

Table I provides the summary statistics of the monetary policy events in the sample, expressed in basis points. Leaving out the emergency meeting in September of 2001, there are a total of 116 funds rate target changes from 1994 to 2007, four of which are inter-meeting moves. Panel A is the full sample, Panel B is based on only positive raw policy moves, Panel

B is based on only negative raw policy moves, and Panel D is for the policy days where the target funds rate is unchanged. Overall, the average rate change is 1.51 bps, but the average surprise is −1.22 bps. The maximal positive raw rate change is 75 bps on November 15, 1994, but the largest positive interest rate shock happened three months earlier on August 16, 1994 when the rate implied by the futures price jumped by 14.47 bps. There are a number of maximal negative raw rate changes of 50 bps in the sample, most noticeably in a series of rate cuts starting on January 3, 2001 to May 15, 2001 and again from September 17 to November 6 of the same year. Not surprisingly, the greatest negative target rate shock took place on April 18 2001. These maximal unanticipated target rate shocks happen to coincide with the potential outliers discussed by Bernanke and Kuttner (2005), and some of them are eliminated in the sample when we exclude inter-meeting policy moves.

Panel B in Table I shows the 31 positive raw rate changes. The average rate increase is 29.84 bps, very close to the 25 bps that can be considered a standard step up. The associated $FFShock$ on those days also has a positive mean, at 2.4 bps. Panel C shows the 21 negative raw rate changes. The average rate decrease is larger than the average increase, −31.71 bps. This is driven by the number of rate step downs that are −50 bps each. The surprise component of these rate decreases average −7.42 bps. Finally, Panel D shows the 64 days where no rate changes were made. As expected, the average rate shock is small on those days at −0.94 bps.

Table II Panel A presents the summary stats of the firm accounting variables, respectively, in the data. Following Bernanke and Kuttner (2005), four outlier FOMC events are eliminated from the baseline sample due to their large influence statistics. These dates are October 15, 1998, January 3, 2001, March 20, 2001, and April 18, 2001. For a detailed discussion of the nature of these outlier events, see Bernanke and Kuttner (2005) page 1228. For the purpose of calculating the summary statistics, we only report the baseline sample. There are a total of 263,601 firm-events in the 1994 to 2007 baseline sample, meaning around 2,354 firm observations per each FOMC event day. We start with the full universe

of Compustat firms and filter the sample following a series of screens. First, all observations with negative values for asset, sales, cash, and long- and short-term debt are eliminated due to coding error. Second, following Whited and Wu (2006), we delete utilities and financial firms (SIC codes between 4900 and 4999 or between 6000 and 6999) from the sample as they are inappropriate for the study of financial constraints. Borrowing from Vuolteenaho (2002) for asset pricing purposes, firm observations that fall in one of the following categories are omitted: market capitalization less than $10 million, return on equity less than -100%, and book-to-market ratio less than 0.01 or greater than 100. Finally, to ensure that the difference between financially constrained and unconstrained firms is not dictated by micro-structural reasons, such as liquidity, we eliminate all observations with stock prices less than $5.

The summary statistics of the financial constraint proxies are shown in Panel B. The WW, KZ, and SA indexes are linear combinations of different firm characteristics. This makes the unit interpretation of theses indexes difficult, but in general, a higher index value implies the firm has a tougher time accessing capital.

3 Analysis

We employ a firm-level event study and a time series study using panel data to examine the impact of monetary policy shocks on the cross-section of equity returns. We then conduct return decomposition into cash-flow news and discount rate news to see which component is driven by the policy shocks. The results are summarized here.

3.1 Event Study

Firm Level Returns

Next, we examine if monetary policy change affect firm-level returns. We construct a panel using event window returns around each FOMC event day. We want to examine returns

around the event day window instead of just the event day itself in order to rule out any microstructure noise and price impact from trading. By definition, financially constrained firms are typically small and illiquid, and it is possible that the single-day return of these firms does not fully reflect the information release from Fed funds rate announcements.

Table III reports the coefficients of regressing raw returns on raw monetary policy changes as well as expected and surprise components of monetary policy change using the baseline sample without the outliers. All regressions are conducted using ordinary least squares (OLS), and we report robust standard errors double clustered at the firm and event level. The top panel reports results using the raw interest rate change as the independent variable, and the bottom panel reports results using expected and shock components. Columns (1) to (3) are raw returns the day before, the day of, and the day after of the FOMC event, respectively. Columns (4) to (6) report the results of the cumulative return window two days after, three days after, and four days after the announcement day. All regressions include industry and year fixed effects, log assets, log book-to-market ratio, leverage, and profitability as firm-level controls. The regression equations are:

$$\begin{aligned} r_{i,t} &= \alpha + \gamma * MPDelta_t + Controls_{i,t} + FE_{i,t} + \epsilon_{i,t}, \\ r_{i,t} &= \alpha + \gamma^e * FFExpected_t + \gamma^s * FFShock_t + Controls_{i,t} + FE_{i,t} + \epsilon_{i,t}. \end{aligned}$$

Panel A raw policy change has a mixed impact on firm-level returns. Column (1), increases in the Fed funds rate increase the average return the day before the FOMC announcement day. However, $MP\ Delta$ has no impact on returns the day of, one day and up to four days after the event, as shown in columns (2) to (6), respectively. The positive reaction in column (1) is consistent with the evidence provided by Lucca and Moench (2015) on the pre-FOMC announcement drift.

Panel B in Table III shows that positive monetary policy shocks have a negative and significant effect on firm-level returns only on the day of the FOMC meeting. Column (1)

presents raw returns the day before the FOMC announcement. Thus, this is consistent with our prior belief that interest rate shocks have no impact on returns before the FOMC event since these shocks are unanticipated. In terms of economic significance, for a 1% unexpected increase to the Fed funds rate, the average firm return falls by 5.79% on the day of the announcement, and it further decreases by 1.3% the day after the announcement, although it is not statistically significant.

Note that in Panel B of Table III, the expected component of monetary policy change has a positive and significant impact on firm-level returns on the day of the announcement. Higher anticipated interest rate leads to higher returns on the day of the FOMC meeting.

Cross-sectional Heterogeneity

To understand the differential impact of monetary policy on the returns of constrained and unconstrained firms, we sort firms based on the WW Index[8] into quartiles on each event day. Firms in the bottom quartile are designated as unconstrained, while firms in the top quartile are designated as constrained. The second and third quartile firms are designated as middle. Using dummy variables in the panel, firm returns are regressed on the financial constraint dummy ($FC\ Dummy$), the middle dummy, and their interactions with the monetary policy variables:

$$\begin{aligned} r_{i,t} &= \alpha + \beta * I_{i,t}^{fc} + \gamma * MPDelta_t + \delta * [I_{i,t}^{fc} \times MPDelta_t] + Controls_{i,t} + FE_{i,t} + \epsilon_{i,t}, \\ r_{i,t} &= \alpha + \beta * I_{i,t}^{fc} + \gamma^e * FFExpected_t + \gamma^s * FFShock_t + \delta^e * [I_{i,t}^{fc} \times FFExpected_t] \\ &+ \delta^s * [I_{i,t}^{fc} \times FFShock_t] + Controls_{i,t} + FE_{i,t} + \epsilon_{i,t}. \end{aligned}$$

where $I_{i,t}^{fc}$ is the financial constraint indicator for firm i at time t. The middle dummy and its interactions are not shown in the tables for brevity.

Table IV Panel A presents the results of the regression using $MP\ Delta$ is used. It is

[8]The results are largely the same when we use the KZ Index and the Size and Age Index.

unclear if constrained firms earn higher or lower average returns relative to the unconstrained firms on FOMC event days. The betas are all insignificant, and the sign can be either positive or negative depending on the observation window. This is in line with the literature on whether constrained firms earn higher or lower average returns than the unconstrained firms in the data.[9] Moving on to the interaction between the *FC Dummy* and monetary policy change, the only δ coefficient that is significant is in column (1), which is the day before the FOMC event. This implies that, using *MP Delta* as the measure of monetary policy change, financially constrained firms do not earn significantly different returns than unconstrained firms on or after FOMC event days.

We replaced *MP Delta* by *FFExpected* and *FFShock* in the regressions, and the results are shown in Table IV Panel B. Similar to Panel A, the *FC Dummy* by itself is again insignificant across the return windows from column (1) to column (6). Focusing on the interaction between the *FC Dummy* and *FFShock*, the delta coefficients are insignificant in columns (1) to (4) in Panel B but becomes largely negative and significant in columns (5) and (6). Given the nature of the surprise component of the rate change, it is expected that *FFShock* will have no differential effect on constrained and unconstrained returns prior to an FOMC event. What is worth noting is that fact that δ^s coefficient is also insignificant in columns (2) to (4), on the day of the FOMC event, as well as the two days following the event day. In fact, in column (2), on the day of the rate announcement, the financially constrained firms actually earn slightly higher returns than the unconstrained firms by roughly 50 bps on average. It is not until three to four days after the event day, in columns (5) and (6), that we observe a significant difference between the returns of the two types of firms.

FFShock is negative and highly significant by at -5.57% in column (2) of table IV suggests that the market indiscriminately punishes (rewards) all firms immediately following a surprise rate increase (decrease). However, as the return window expands to one day and

[9] See, for example, Lamont, Polk, and Saá-Requejo (2001) and Whited and Wu (2006) See the discussion in Livdan, Sapriza, and Zhang (2009).

up to four days after the event, the financially constrained firms earn significantly lower average returns than the unconstrained firms resulting from the surprise rate increase. In fact, the differential return does not become statistically significant until three days after the announcement. This is evidenced by the fact that in columns (3) and (4), the interactions between the Fed funds rate shock and the *FC Dummy* are negative but statistically insignificant.

Economically, the magnitude of the average differential return between the financially constrained and unconstrained firms cannot be ignored. For the short holding period of three days after the FOMC event, the constrained firms have an average realized return that is 6.23% lower than that of the unconstrained firms for a 1% surprise increase of the Fed funds rate. In the four days after the FOMC event, the difference in the average returns grows to 7.08%. Because of the delayed impact of $FFShock$ on the cross-section of returns, we can devise a self-financed trading strategy such that we long (short) firms in the unconstrained portfolio and short (long) firms in the constrained portfolio if the realized $FFShock$ is positive (negative) on FOMC event days. Assuming the average Fed funds rate shock is ± 10 bps, and using the fact there are eight scheduled FOMC meetings on average in a calendar year, the long-short strategy yields about 4.5% annualized return using the four day post-event window as the holding period.[10] This trading strategy requires portfolio formation on roughly 32 days of the year, four times eight, and the funds can be stored in a risk-free account on the remaining calendar days, thus essentially making the 4.5% excess return.

To examine how far out from the FOMC event day the rate change can impact the difference in returns, we expanded the event study window to up to twenty days. The results are shown in Table V. Column (1) presents the returns on the FOMC announcement day, which is the same as column (2) in Table IV. Columns (2) to (6) show the cumulative returns four-, six-, eight-, ten-, and twenty-days after each announcement as the dependent

[10] In this back-of-the-envelop calculation, we implicitly net out the difference between the unconstrained and constrained returns from the expected and the unexpected components of the rate change. In other words, we take the difference between 1.42% and -7.08%, then multiply it by 10 bps and eight days to arrive at 4.5%.

variable. As it turns out, the differential effect of interest shocks on returns between the financially constrained and unconstrained firms only lasts up to four to five days after the announcement. In Panel A, the coefficient loading of the interaction term of the financial constraint dummy and raw interest rate change (FCx$Delta$) on returns is never significant at the 10% level in any event window. In Panel B column (3), the coefficient loading of the interaction term (FCx$FFShock$) on six-day post-FOMC cumulative returns, although economically large, is insignificant at the 10% level. This is true if we expand the event window up to twenty days in column (6).

The results in Table V provide some confidence in our finding that there is a delay in the differential impact of interest rate shocks on financially constrained and unconstrained equity returns as the expanded observation windows act effectively as placebo tests. As the cumulative return window increases, one should expect the return differential coming from FOMC announcements to diminish in strength and eventually disappear, and this is exactly what we observe in the data.

In order to try to understand where the delayed reaction originates from, we look at the daily trading volume of the same universe of stocks in the return sample. The fact that financially constrained firms earn slightly higher returns (although statistically insignificant) on the announcement day after an unanticipated increase in the Fed funds rate, as shown in Table IV Panel B column (2), indicates that the constrained (small) stocks are treated differently than the unconstrained (large) stocks by the market participants in the aftermath of the Fed announcement. Table VI reports regression coefficients using a daily panel from 1994 to 2007 where log trading volume and log dollar trading volume are the dependent variables. Each day, firms are sorted into four bins based on the financial constraint measure and the *FC Dummy* is assigned to the firms in the top bin. Furthermore, we construct seven FOMC event dummies to denote if a given date is within three days before a FOMC meeting, on the day of a FOMC meeting, or within three days after a FOMC meeting. Columns (1) and (2) present the results of a regression of the log trading volume and log

dollar trading volume, respectively, on the *FC Dummy*, the seven FOMC event dummies, and their interactions. Firm and month fixed effects are included, and $t-stats$ using robust standard errors double-clustered at the firm-month level are reported.

Table VI column (1) shows that, on average, the financially constrained firms are more lightly traded than the unconstrained firms because the coefficient loading on the *FC Dummy* is negative and significant. Consistent with the literature, overall trading volume is low right before a FOMC announcement, and it escalates on the day of and the day after the announcement,[11] as indicated by the coefficient loadings on the $FOMC_{t-1}$, $FOMC_t$, and $FOMC_{t+1}$ dummies. To help explain the lower average return of the financially unconstrained firms relative to the constrained firms on the event day, the interaction term between the *FC Dummy* and the FOMC event dummy (FCx$FOMC_t$) has a negative and significant slope in column (1) of Table VI. This implies that, after controlling for firm characteristics, the unconstrained firms are more heavily traded than the constrained firms leading up to and immediately after the FOMC announcement. Thus, if interest rate increases (decreases) unexpectedly, the stocks of unconstrained firms are immediately traded according to market participants' updated information set and they are punished (rewarded) before the stocks of the constrained firms. Although the difference in trading volume of the unconstrained firms relative to the constrained firms remains statistically insignificant after the event day, the coefficient loading of the interaction term flips signs from negative to positive two days after the announcement (FCx$FOMC_{t+2}$), consistent with the timing of when the differential returns start to appear in Table IV. Column (2) in Table VI reports the results of the same regression as in column (1) except that log trading volume was replaced by log dollar trading volume as the dependent variable in the regression. All the previous findings on log trading volume also hold for log dollar trading volume.

[11] Lucca and Moench (2015) documented stock market volatility decreases significantly leading up to the announcement and bounces back on the day of.

3.2 Time Series Panel Study

The event study results in the previous section highlight the differential response between the average returns of financially constrained firms and that of unconstrained firms around the FOMC event window. In this section, we generalize the study to the time series setting using monthly data as in Bernanke and Kuttner (2005). This approach is more robust to any sample selection biases that might arise in the event study setting. Unlike Bernanke and Kuttner (2005), however, our test specifications require a measure of financial constraint at a monthly frequency, which is not available in the Compustat database. To circumvent this issue, we match end of the month returns of each firm in the CRSP sample to the corresponding firm characteristics publicly available at least 45 days prior to but no more than 183 days before the dates on which returns are observed. This is the same matching procedure we used for the event study to match FOMC day returns to the accounting variables, but now, instead of returns on event FOMC event days, we use end of the month returns. To the extent that firm characteristics do not vary greatly from month to month, this will not systematically alter the outcome of our hypothesis testing.

To see whether financially constrained and unconstrained firms react to monetary policy movements differently in the time series data, we construct dummy variables in each month for quartiles sorted based on the WW Index just like those used in the event study. We then regress monthly firm-level returns on the financially constrained dummy (I^{fc}), the middle dummy, and their interactions with contemporaneous monetary policy change, expected ($AMFExpected$) and surprise ($AMFShock$) components. To be precise, we perform the

following tests using log excess return as the dependent variable:

$$
\begin{aligned}
\hat{r}_{i,t}^{month} &= \alpha + \gamma^e * AMFExpected_t + \gamma^s * AMFShock_t + Controls_{i,t} + FE_{i,t} + \epsilon_{i,t}^{month}, \\
\hat{r}_{i,t}^{month} &= \alpha + \beta * I_{i,t}^{fc} + \gamma^e * AMFExpected_t + \gamma^s * AMFShock_t + \delta^e * [I_{i,t}^{fc} \times AMFExpected_t] \\
&+ \delta^s * [I_{i,t}^{fc} \times AMFShock_t] + Controls_{i,t} + FE_{i,t} + \epsilon_{i,t}^{month}, \text{ and} \\
\hat{r}_{i,t}^{month} &= \alpha + \beta * Index_{i,t}^{fc} + \gamma^e * AMFExpected_t + \gamma^s * AMFShock_t \\
&+ \delta^e * [Index_{i,t}^{fc} \times AMFExpected_t] + \delta^s * [Index_{i,t}^{fc} \times AMFShock_t] + Controls_{i,t} \\
&+ FE_{i,t} + \epsilon_{i,t}^{month},
\end{aligned}
$$

where $AMFExpected$ and $AMFShock$ are monthly proxies of the expected and the surprise components, respectively, of monetary policy change. AMF denotes actual minus futures prices because this measure is calculated as the difference between the average monthly realized Fed funds rate and the last-day-of-the-month price of the Fed funds futures contract immediately prior to the maturity month. Borrowing the notation from Bernanke and Kuttner (2005), this means:

$$AMFShock = \frac{1}{D} \sum_{d=1}^{D} i_{t,d} - f_{t-1,D}^1,$$

where t is the month index for the sample, D is the number of days in a given month, and f^1 is the price of the futures contract in the month prior to maturity. The expected component is defined as:

$$AMFExpected = f_{t-1,D}^1 - i_{t-1,D}.$$

Columns (1) to (3) in Table VII report the baseline sample results, where the months containing outlier FOMC events as defined in the event study are excluded from the sample. This screen leaves us with $364,584$ firm-month observations from 1994 to 2007. Regression results using the full sample including the outliers are shown in columns (4) to (6). The

magnitude and $t-stats$ of the estimated coefficients are greater in the full sample than the baseline sample, but their signs and significance levels are almost identical. For the remaining analysis and the ensuing return decomposition, we focus only on the sample without the outliers. Finally, to be consistent with the return decomposition in the next section, log excess return is used in the panel regression as the dependent variable instead of raw returns.

The results in column (1) in Table VII confirm the monthly regression results on the equity index in Bernanke and Kuttner (2005) at the firm level: the surprise component of monetary policy change is negative and extremely significant. For a 1% unexpected increase in the Fed funds rate, the average firm return declines by 13.88%, which is comparable to the 14.26% drop in the value-weighted index return estimated by Bernanke and Kuttner (2005) (Table VIII, column (b)). Next, we add the financial constraint dummies and the interaction terms to the regression. The γ^s coefficient is still negative and significant in column (2). Unlike our event study, the $FC\ Dummy$ by itself is positive and significant in the monthly data. Furthermore, the δ^s coefficient on the interaction term FCx$AMFShock$ is negative and significant. This means the average return of financially constrained firms is even lower relative to the unconstrained firms due to a positive Fed funds rate shock. This is consistent with the event study findings on two fronts: first, monetary policy surprises generate cross-sectional differences in firm returns; second, the fact that the impact of a monetary policy surprise is not just limited to the day of the policy event but rather has a lasting effect in the post-event window, which explains why the effect shows up in monthly returns. Column (3) reports the regression coefficients when the $FC\ Dummy$ is replaced by the WW Index. As expected, the coefficient loading on the interaction between the WW Index and $AMFShock$ is negative and significant. Given a surprise Fed funds rate increase in a month, firms with a higher financial constraint index earn lower average returns in that month.

4 Return Decomposition: Discount Rate News or Cash Flow News?

To dissect the response of cross-sectional returns due to monetary policy change, we decompose returns into the discount rate (DR) news and the cash flow (CF) news components employing the methodology of Vuolteenaho (2002), devised specifically for firm-level stock returns. The decomposition procedure is straightforward. Following Vuolteenaho's notation, let $z_{i,t}$ be a vector of firm characteristics for firm i at time t, where the first element is the stock return. Then assume $z_{i,t}$ follows the law of motion:

$$z_{i,t} = \Gamma z_{i,t-1} + u_{i,t}.$$

By assuming homogeneity across all firms, then Γ is the common transition matrix for all firms in the sample. However, firms can still behave different over time as the innovations across firms are not perfectly correlated. Next, define the following matrices:

$$\begin{aligned} e1' &\equiv [1\ 0 \dots 0], \text{ and} \\ \lambda' &\equiv e1'\rho\Gamma(I - \rho\Gamma)^{-1}. \end{aligned}$$

Then the decomposition implies that the DR news can be written as:

$$News^{dr} = \lambda' u_{i,t},$$

and the CF news becomes:

$$News^{cf} = (e1' + \lambda')u_{i,t}.$$

The state vector $z_{i,t}$ contains three elements: log excess stock return, log book-to-market ratio, and log profitability. The estimation is done using the equation-by-equation approach for the VAR in three separate predictive regressions, then the estimated transition matrix, $\hat{\Gamma}$, is constructed by stacking the coefficient estimates from each of the three pooled regres-

sions. The variance-covariance matrix is simply $\mathbb{E}[uu']$. The objective of the exercise is to relate DR news and CF news to the monthly monetary policy variables. This means we require the decomposition to be done at monthly frequency. Unfortunately, the accounting variables in Compustat are not available on a monthly basis. In order to perform the return decomposition at the monthly frequency, we assume that the book value of equity and net income do not vary from month to month within the same fiscal quarter. This implies that the return on equity will stay the same for a given firm within the same fiscal quarter, but its book-to-market ratio will vary because the market value of equity is changing.

Table VIII presents the summary statistics of the variables included in the VAR, as well as the estimated transition matrix and the variance-covariance matrix. The estimated transition matrix in Panel B shows that high excess return, book-to-market ratio, and return on equity lead to high excess return and high return on equity the following period. Low excess return, high book-to-market ratio, and return on equity lead to a high book-to-market ratio in the subsequent month. The autocorrelations of book-to-market ratio and return on equity are very persistent while excess return is not as much. Finally, the variance-covariance estimation shows that the errors between excess return and book-to-market ratio are negative correlated, in line with the estimation results in Vuolteenaho (2002).

To differentiate whether the differential impact of monetary policy shocks on financially constrained and unconstrained firms comes from the DR channel or the CF channel, we regress the decomposed DR news and CF news on the contemporaneous expected and surprise components of monetary policy change each month. Furthermore, we interact these measures of monetary policy change with the $FC\ Dummy$ and $FC\ Index$, separately. The

regression equations are:

$$
\begin{aligned}
News_{i,t}^{dr/cf} &= \alpha + \gamma^e * AMFExpected_t + \gamma^s * AMFShock_t + FE_{i,t} + \epsilon_{i,t}^{dr/cf}, \\
News_{i,t}^{dr/cf} &= \alpha + \beta * I_{i,t}^{fc} + \gamma^e * AMFExpected_t + \gamma^s * AMFShock_t \\
&+ \delta^e * [I_{i,t}^{fc} \times AMFExpected_t] + \delta^s * [I_{i,t}^{fc} \times AMFShock_t] + FE_{i,t} + \epsilon_{i,t}^{dr/cf}, \text{ and} \\
News_{i,t}^{dr/cf} &= \alpha + \beta * Index_{i,t}^{fc} + \gamma^e * AMFExpected_t + \gamma^s * AMFShock_t \\
&+ \delta^e * [Index_{i,t}^{fc} \times AMFExpected_t] + \delta^s * [Index_{i,t}^{fc} \times AMFShock_t], \\
&+ FE_{i,t} + \epsilon_{i,t}^{dr/cf}.
\end{aligned}
$$

The regression coefficients are reported in Table IX. In columns (1) to (3) DR news is used in the regression as the dependent variable, and CF news is the dependent variable in the regression for the results in columns (4) to (6).

In columns (1) and (4) in Table IX, the γ^s coefficient on $AMFShock$ is positive and significant as a explanatory variable on DR news and negative and significant on CF news. This matches with our intuition that a positive Fed funds rate shock raises the discount rate and lowers cash flows, both of which decrease the average firm's present value thus its return. We add the *FC Dummy* and its interactions with the expected and surprise components of monetary policy in the regression and present the results in columns (2) and (5). By itself, the coefficient on the constrained dummy is negative and significant on DR news and positive and significant on the CF new. The results confirm the higher log excess return for financially constrained firms in Table VII column (2).

More strikingly, the interaction between the *FC Dummy* and the monetary policy shock is positive but insignificant in column (2) Table IX for DR news, while it is negative and significant in column (5) on CF news. This shows that the DR news of financially constrained and unconstrained firms do not react very differently to a monetary policy shock; however, the CF news of constrained firms is significantly decreased, relative to the unconstrained

firms, due to a surprise increase in the short rate. This finding indicates that the constrained firms earn lower average returns than unconstrained firms because positive monetary policy shocks lower the expected cash flow of constrained firms more. The evidence also implies that CF news dominates DR news in the cross-section of firms in the context of monetary policy shocks, which is consistent with the variance decomposition of Vuolteenaho (2002). Columns (3) and (6) of Table Table IX report the results using *FC Index* instead of the *FC Dummy*, and our main finding is confirmed: monetary policy shock drives returns in the cross-section mainly through the CF news channel.

Finally, to link DR news and CF news back to excess returns in the context of financially constrained and unconstrained firms, log excess return is regressed on the news series separately and their interactions with the *FC Dummy* (*FC Index*) in the following regressions:

$$\begin{aligned}
\hat{r}_{i,t}^{month} &= \alpha + \omega * News_t^{dr/cf} + FE_{i,t} + \epsilon_{i,t}^{month}, \\
\hat{r}_{i,t}^{month} &= \alpha + \beta * I_{i,t}^{fc} + \omega * News_t^{dr/cf} + \zeta^*[I_{i,t}^{fc} \times News_t^{dr/cf}] + FE_{i,t} + \epsilon_{i,t}^{month}, \text{ and} \\
\hat{r}_{i,t}^{month} &= \alpha + \beta * Index_{i,t}^{fc} + \omega * News_t^{dr/cf} + \zeta * [Index_{i,t}^{fc} \times News_t^{dr/cf}] + FE_{i,t} + \epsilon_{i,t}^{month}.
\end{aligned}$$

The regression coefficients are summarized in Table X. Panel A presents the results when CF news is the independent variable, and DR news as the independent variable in the regression results shown in Panel B. In both specifications, only the news is used in the regression for the results in Column (1), while the regression for the Column (2) results includes the *FC Dummy* and the interaction term. The regression for the results in Column (3) includes the FC Index, not the FC dummy. Comparing the R^2s of the regressions in panels A and B, CF news is able to explain much more of the variability in the returns than DR news, 95% to around 20%. This is consistent with the firm-level variance decomposition of Vuolteenaho (2002).

In line with intuition, positive shocks to cash flow lead to higher excess returns in all

specifications in Table X while positive shocks to discount rate result in lower returns. The t-statistics are much higher for the coefficient loadings on CF news than those on the DR news. This is further evidence that CF news drives the cross-section of returns at the firm level. In column (2), the estimated ζ coefficient on $FC\text{x}CFNews$ is negative and significant in Panel A while the coefficient on $FC\text{x}DRNews$ is positive and significant in Panel B. The interpretation of the former is that, for a given size of the positive shock to cash flows, the financially constrained firms experience an increase in average returns, but the size of the increase is smaller than that experienced by the unconstrained firms. Analogously, for a given size of the positive shock to discount rates, the constrained firms experience a decrease in average returns, but the size of the decrease is smaller than that experienced by the unconstrained firms. Taken together, the returns of constrained firms are less sensitive to both the CF news and the DR news than their unconstrained counterparts. For every percent increase of CF news, the average return of the constrained firm is 1.31 bps lower than the average return of the unconstrained firms. On the other hand, for every percent increase of DR news, the average return of the constrained firms is 42.8 bps higher in relative terms.

In column (3) of Table X, the regression replaces the *FC Dummy* with the WW Index as one of the regressors. Compared to column (2), the implications do not change: in Panel A, the average return increases but less so for financially constrained firms given the positive CF news; in Panel B, the average return decreases but less so for constrained firms given the positive DR news. Moreover, the statistical significance of the ζ coefficients on the interaction terms are greater in column (3) than in column (2).

5 Robustness Tests

We perform various robustness tests to check the validity of our results in the main analysis section. The results of these robustness tests are presented in tables included in the Online Appendix. We briefly summarize these results in this section.

5.1 Aggregate Index Event Study

Table A.1 in the Online Appendix shows the results by replicating the baseline results from Bernanke and Kuttner (2005) using the CRSP value-weighted return index as the dependent variable. The reason for conducting this regression is that we have a different sample period (from 1994 to 2007) than BK2005, and our sample has five additional years of scheduled FOMC meetings. In columns (1) and (3), we see that the raw policy change has no explanatory power on the aggregate index return on the day of the FOMC announcement. However, in columns (2) and (4), the unexpected component of policy change, $FFShock$, has a negative and statistically significant influence on the value-weighted index, consistent with previous findings. This is particularly the case in column (4), where all 116 FOMC events in our sample are used in the regression.

5.2 Outlier Observations

In the main analysis of the paper in section 3, we eliminated four outlier event days from study deemed to have the largest influence statistics, according to Bernanke and Kuttner (2005), on the aggregate stock market index. The four FOMC meetings were on October 15, 1998, January 3, 2001, March 20, 2001, and April 18, 2001. For robustness, we include these four meetings in the sample and rerun the event study using all 116 FOMC event days. The results are presented in tables A.2 and A.3 in the Online Appendix. All regressions include industry and year fixed effects, and $t-stats$ are calculated with robust standard errors double-clustered at the firm and year level. There are a total of $273,108$ observations in the sample with outliers.

In Panel A of Table A.2, raw monetary policy change is never significant when regressed on raw returns in the event window around the FOMC meetings. The pre-FOMC announcement drift observed in column (1) of Table III Panel A is gone. When the total Fed funds rate change is decomposed into the expected and unexpected components in Panel B, we find

the unexpected rate change is negative and very significant in column (2), similar to the baseline sample where the outlier event days were excluded. Table A.3 is the replication of the main results of the event study using all available FOMC meetings from 1994 to 2007. As is the case in the baseline sample , Panel A shows that the interaction between the *FC Dummy* and the raw interest rate change is insignificant in explaining returns around the event window. However, column (3) in Panel B shows that the interaction between the *FC Dummy* and the unanticipated rate change has negative and significant slope coefficients when regressed on cumulative returns starting the day after the FOMC meeting day. This is in contrast to the baseline sample without the outlier events where the differential impact of the policy shock on constrained and unconstrained returns does not become statistically significant until three days after the announcement, as described in Section 3.1 in regards to Table IV. Overall, the inclusion of outlier observations in the sample actually strengthens our findings in the main analysis.

5.3 Definition of Financial Constraint

Throughout, we have only focused on one definition of financial constraint, and that's the WW Index. Given the various measures in the literature of what it means for a firm to be financially constrained, we replicate the event study regressions by sorting the firms based on three other commonly used financial constraint definitions: the no-debt-rating (NR) dummy, the SA Index Hadlock and Pierce (2010), and the KZ Index from Kaplan and Zingales (1997). The event study results using these various measures of financial constraint are presented in tables A.4, A.5, and A.6 in the Online Appendix.

The results are almost identical to Table IV when financial constraint is defined by the NR dummy or the SA Index in tables A.4 and A.5: the financial constraint indicator variable is mostly insignificant across all event windows in panels A and B, the coefficient loading on the policy shock is very negative and significant on the event day in Panel B column (2), and the

differential impact of the policy shock on the constrained versus unconstrained returns do not materialize until three to four days after the FOMC announcement in Panel B columns (5) and (6). The only case where the results are not as significant is when we measure financial constraints using KZ Index, as in Panel B of Table A.6, where the interaction between between the *FC Dummy* and the Fed funds rate shock is never statistically significant in all event horizons. However, Whited and Wu (2006) and Hadlock and Pierce (2010) show respectively that WW Index and SA Index do a better job in isolating firms with characteristics associated with financial constraints than the KZ Index.

5.4 Controlling for Market Return

To control for aggregate market risk, we replicate the regressions using cumulative abnormal returns (CARs) instead of raw returns as the dependent variable, where CARs are calculated using the market model. As before, industry and year fixed effects are used, and standard errors are double-clustered at the firm and event level. The results are presented in Table A.7 in the Online Appendix. The results in Panel A are from a regression that uses the raw interest rate change while the policy change is separated into expected and unexpected components in the regression for Panel B results. Generally speaking, the results of the regressions do not change from Table IV to Table A.7. In Panel A, the β coefficients on the *FC Dummy* are insignificant with varying signs. The interaction term, $FC\text{x}Delta$, is also insignificant across the board.

In Panel B of Table A.7, all regression results on CAR are almost identical to those on raw returns in Table IV: the *FC Dummy* is insignificant across all return windows, while the interaction of the *FC Dummy* and interest rate shock is positive but insignificant on the day of the FOMC announcement and turns negative and significant in the event window three and four days after the meeting. The only noticeable difference between tables IV and A.7 is the fact that shock to the Fed funds rate is no longer statistically significant by itself

on the FOMC announcement day in column (2) after the firm returns are orthogonalized from the market reaction.

6 The Real Impact of Monetary Policy on Firms

To further disentangle the mechanism driving the differential returns between financially constrained and unconstrained firms due to interest rate changes, we examine the impact of interest rate changes in our sample period on certain firm-level accounting variables in the spirit of Gertler and Gilchrist (1994) (GG1994 herein). The approach is based on the intuition that periods of persistent interest rate rise can lead to different financing and investing behaviors between firms on the opposite ends of the financial constraint spectrum, which in turn is reflected in the returns. To investigate the whether the differential responses of financially unconstrained and constrained firms are statistically significant while controlling for other firm characteristics, we conduct five separate panel regressions utilizing the financial constraint dummy variable and a monetary policy proxy. In other words, we regress, in order, sales, inventory, cash, short-term debt and investment as fractions of total assets on the financial constraint dummy, twelve lags of quarterly change in the effective Fed funds rate, and the interactions between the dummy and each of the twelve lagged monetary policy changes.[12]

In each case, firm-level Tobin's q and cash flows are used as controls. All regressions include firm and year fixed effects. In Table XI, resulting point estimates and t-statistics are calculated using robust standard errors with clustering at the firm level are reported after dropping the slope coefficients of the lagged monetary policy changes. To make sense of the overall effect of lagged monetary policy changes on the dependent variables of the financially constrained firms relative to the unconstrained firms, the sum of the four-, eight-,

[12] As previously done, the middle portfolio dummy and its interactions are also included but not reported. Thus, the regression contrasts the average response of the constrained firms relative to the unconstrained firms.

and twelve-quarter lagged coefficient estimates on the interaction terms, as well as the p-value of the hypothesis test against the null that the sum is equal to zero are summarized at the end. The sum of the lagged coefficients of the interactions terms are named Sum of FCx$DeltaFFR$ 4 Lags, Sum of FCx$DeltaFFR$ 8 Lags, and Sum of FCx$DeltaFFR$ 12 Lags for four-, eight-, and twelve-quarters. There are a total of 30,735 firm-quarter observations from 1994 to 2007.

Columns (1) and (2) in Table XI report the sales and inventory regression results, respectively. The sum of the coefficients at the one-, two- and three-year horizons are consistent with what one would expect. An increase in the effective Fed funds rate cuts the sales as a fraction of the assets of financially constrained firms more so than the unconstrained firms. Constrained firms have a more difficult time shedding inventory relative to unconstrained firms after the rate rise, as evidenced by the fact that Sum of FCx$DeltaFFR$ 8 Lags is positive but Sum of FCx$DeltaFFR$ 12 Lags flips to negative. However, the p-values show that none of these sums of coefficients are statistically significant at the 10% level in columns (1) and (2).

The regression results of cash and short-term debt ratios are given in columns (3) and (4) of Table XI, respectively. The financial constraint dummy estimates on top imply that, on average, financially constrained firms hold more cash and carry more short-term debt relative to assets. However, following an increase in the effective Fed funds rate, the constrained firms tend to draw down cash holdings as a fraction of total assets while they reduce the level of short-term debt as the credit market tightens. All sums of lagged coefficients at one-, two-, and three-years are negative in columns (3) and (4). In particular, the relative effect of monetary policy change on the level of cash of the constrained firms is significant at the 1% level within the first year. A 1% increase in the effective Fed funds rate anytime within the last year forces the constrained firms to decrease their cash holdings as a fraction of assets by more than 3.6% compared to the unconstrained firms, denoted by Sum of FCx$DeltaFFR$ 4 Lags.

Lastly, investment ratio results are shown in column (5) Table XI. The financially constrained firms have higher investment-to-asset ratios than the unconstrained firms unconditionally, as evidenced by the slope coefficient of the *FC Dummy*. Conditional on the realization of an interest rate change, the constrained firms decrease their investment-to-assets ratio even further relative to the unconstrained firms after summing up the interaction terms. All sums of the lagged coefficients at the one-, two-, and three-year horizon are negative. The sums of the coefficients are statistically significant at the 10% level, as indicated by the p-value, for a policy change that happens within the last year. A 1% increase in the effective Fed funds rate anytime within the last year forces the financially constrained firms to decrease their investment significantly as a fraction of assets by more than 0.2% compared to the unconstrained firms.

Overall, these results indicate that monetary policy has real effects on firm decisions and outcomes. In particular, the financially constrained firms lose more sales, draw down more cash, borrow less, and invest less than the unconstrained firms in the three years following an increase in the effective Fed funds rate, consistent with intuition and with previous findings from GG1994 using portfolios of small and large firms. Monetary policy has a differential impact on the returns of constrained and unconstrained firms because the constrained firms lose even more flexibility during credit tightening episodes.

7 Conclusion

In this paper, we analyze whether unanticipated monetary policy changes have a differential impact on the stock returns of financially constrained and unconstrained firms. Our results show that financially constrained firms earn a significantly lower return following unanticipated Fed funds target rate increases as compared to unconstrained firms. We find that there is no significant difference between the returns of financially constrained and unconstrained firms on the FOMC announcement day, but the stocks of financially constrained

firms earn a lower return over the next three and four trading days. A partial explanation of the delayed response of the financially constrained firms to unanticipated monetary policy shocks can be found in the significantly lower trading volume in their stocks relative to financially unconstrained firms. Consistent with limited investor attention theory, financially constrained firms that are typically smaller react with a delay to monetary policy announcements.

Further, we decompose the stock returns of financially constrained and unconstrained firms into cash flow news and discount rate news to understand the differential response of their stocks to unanticipated monetary policy shocks. We show that positive monetary policy shocks have a more significant negative impact on the expected cash flows of constrained firms and result in negative returns for these firms around monetary policy increases. Our results highlight how monetary policy shocks can affect the real economy by having a disproportionate impact on financially constrained firms.

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Table I: Summary Statistics of Monetary Policy Changes and Shocks

This table reports the summary statistics of monetary policy changes and shocks during the sample period from 1994 to 2007. There are a total of 116 scheduled and unscheduled FOMC meetings during this period, after excluding the emergency meeting in September 2001. Panel A reports the mean, standard deviation, maximum, and minimum of raw monetary policy changes, as well as monetary policy shocks ($FFShock$) measured from Fed funds future's prices. Panel B reports the same statistics for the instances when the raw policy change is positive. Panel C reports the statistics for the instances when the raw policy change is negative. Finally, Panel D reports the statistics when the central bank leaves the Fed funds' rate unchanged. All values are in basis points.

Panel A	count	mean	sd	max	min
Raw Policy Change	116	1.51	23.15	75.00	-50.00
FFShock	116	-1.22	7.73	14.47	-42.50

Panel B	count	mean	sd	max	min
Raw Policy Change	31	29.84	11.94	75.00	25.00
FFShock	31	2.40	5.34	14.47	-5.38

Panel C	count	mean	sd	max	min
Raw Policy Change	21	-35.71	12.68	-25.00	-50.00
FFShock	21	-7.42	13.95	12.50	-42.50

Panel D	count	mean	sd	max	min
Raw Policy Change	64	0.00	0.00	0.00	0.00
FFShock	64	-0.94	3.78	6.00	-16.91

Table II: Summary Statistics of Firm Characteristics

This table reports the summary statistics of key variables used in the analysis from 1994 to 2007, comprised of 263,601 firm-FOMC event observations from CRSP-Compustat. Financial and utility are dropped from the sample initially. Then, the following screens are applied: asset (atq), sales (saleq), cash (cheq), long-term debt (dlttq), liabilities (ltq) or dividend (dvq) less than zero; equity less than $10 million; book to market ratio less than 0.01 or greater than 100. Panel A reports the summary statistics of firm characteristics. All variable definitions are standard. ROE is return on book equity, where book equity values are constructed based on formula from Kenneth French's website. Panel B reports the summary statistics of the financial constraint index for completeness. WW is the Whited and Wu (2006) index, KZ is the Kaplan and Zingales (1997) index, and SA is the Hadlock and Pierce (2010) index. There are a total of $263,601$ firm-event observations in the sample.

Panel A	(2) mean	(3) p25	(4) p50	(5) p75	(6) sd	(7) max	(8) min
Asset	1523.312	81.142	243.474	850.779	4377.353	30672.000	12.956
Sales	362.520	19.106	63.202	222.423	993.054	7064.000	0.347
Cash	121.568	5.550	22.822	80.292	341.358	2531.486	0.006
Dividends	4.817	0.000	0.000	0.487	20.763	165.000	0.000
Debt	393.985	1.204	26.349	205.473	1203.025	9062.278	0.000
Leverage	0.194	0.013	0.158	0.321	0.185	0.702	0.000
Profitability	0.029	0.017	0.034	0.051	0.049	0.597	-1.005
TobinQ	2.240	1.188	1.638	2.561	1.765	11.081	0.683
LogBooktoMarket	-0.866	-1.330	-0.807	-0.335	0.775	0.840	-3.116
ROE	0.013	0.001	0.025	0.046	0.090	0.317	-0.420

Panel B	(2) mean	(3) p25	(4) p50	(5) p75	(6) sd	(7) max	(8) min
WW Index	-0.268	-0.326	-0.256	-0.199	0.092	-0.101	-0.517
KZ Index	0.883	0.355	0.868	1.372	0.760	2.996	-1.028
SA Index	-3.137	-3.527	-3.108	-2.693	0.636	-1.772	-4.557

Table III: Short Event-Window of Raw Returns on Monetary Policy

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm-level returns over the 112 FOMC event days. Panel A reports the results when we use raw monetary policy change (MP Delta) as the regressor, and Panel B reports the results when we use the expected (FFExpected) and surprise (FFShock) components in the regression. The firm-level returns are calculated over six different event windows and shown in columns (1) to (6). Column (1) reports the results when we use the one-day return the day before the FOMC event day as the dependent variable. Column (2) reports the results when we use the one-day return the day of the FOMC event day as the dependent variable. Column (3) reports the results when we use the one-day return after the FOMC event day as the dependent variable. Columns (4) to (6) reports the results when we use the two-day, three-day, and four-day cumulative returns, respectively, after the FOMC event day as the dependent variable. All regressions include industry and year fixed effects, as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are a total of 263, 601 firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
MP Delta	0.853*	0.258	0.635	1.134	0.708	0.345
	(1.68)	(0.40)	(0.93)	(1.10)	(0.54)	(0.22)
Firm characteristics	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.006	0.009	0.011	0.010	0.014

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FFExpected	1.023*	1.763***	1.116	2.147	1.786	2.033
	(1.75)	(2.69)	(1.15)	(1.57)	(1.19)	(0.97)
FFShock	0.172	-5.786***	-1.299	-2.935	-3.624	-6.436
	(0.13)	(-3.59)	(-0.57)	(-0.87)	(-1.05)	(-1.56)
firm characteristics	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.013	0.010	0.013	0.011	0.016

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table IV: Short Event-Window Study of Raw Returns on Monetary Policy and Financial Constraint

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm-level returns over the 112 FOMC event days. Panel A reports the results when we use the financial constraint indicator variable (*FC Dummy*) and raw monetary policy change (*MP Delta*) as regressors, and Panel B reports the results when we use *FC Dummy* and the expected (*FFExpected*) and surprise (*FFShock*) components of monetary policy change. *FC*x*Delta* is the interaction term between the *FC Dummy* and raw monetary policy change. *FC*x*FFExpected* is the interaction term between the *FC Dummy* and the expected component of raw monetary policy change. *FC*x*FFShock* is the interaction term between the *FC Dummy* and the surprise component of raw monetary policy change. The firm-level returns are calculated over six (6) different event windows and shown in columns (1) to (6). Column (1) reports the results when we use the one-day return the day before the FOMC event day as the dependent variable. Column (2) reports the results when we use the one-day return the day of the FOMC event day as the dependent variable. Column (3) reports the results when we use the one-day return after the FOMC event day as the dependent variable. Columns (4) to (6) report the results when we use the two-day, three-day, and four-day cumulative returns, respectively, after the FOMC event day as the dependent variable. All regressions include industry and year fixed effects as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are 263,601 firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	0.000149	-0.000338	0.000100	0.000512	-0.0000764	0.000371
	(0.36)	(-0.75)	(0.19)	(0.69)	(-0.08)	(0.34)
MP Delta	0.911*	0.164	0.611	1.308	0.477	0.251
	(1.89)	(0.25)	(0.91)	(1.24)	(0.37)	(0.17)
FCxDelta	-0.355	0.193	0.151	-0.212	0.362	0.328
	(-1.46)	(0.75)	(0.63)	(-0.55)	(0.68)	(0.48)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.006	0.010	0.011	0.010	0.014

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	0.000207	-0.000184	-0.0000539	0.000320	-0.000664	-0.000252
	(0.48)	(-0.39)	(-0.10)	(0.39)	(-0.66)	(-0.21)
FFExpected	1.112**	1.622**	0.959	2.135	1.100	1.380
	(2.08)	(2.54)	(1.09)	(1.62)	(0.78)	(0.73)
FFShock	0.0157	-5.569***	-0.419	-1.507	-0.775	-2.749
	(0.01)	(-3.48)	(-0.21)	(-0.48)	(-0.22)	(-0.69)
FCxFFExpected	-0.417	0.146	0.430	0.186	1.337**	1.424*
	(-1.29)	(0.44)	(1.21)	(0.34)	(2.06)	(1.66)
FCxFFShock	0.0691	0.515	-1.738	-2.899	-6.230**	-7.079**
	(0.07)	(0.45)	(-1.39)	(-1.33)	(-2.42)	(-2.20)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.013	0.010	0.013	0.012	0.017

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table V: Long Event-Window Study of Raw Returns on Monetary Policy and Financial Constraint

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm-level returns over the 112 FOMC event days. Panel A reports the results when we use the financial constraint indicator variable (*FC Dummy*) and raw monetary policy change (*MP Delta*) as regressors, and Panel B reports the results when we use *FC Dummy* and the expected (*FFExpected*) and surprise (*FFShock*) components of monetary policy change. *FC*x*Delta* is the interaction term between the *FC Dummy* and raw monetary policy change. *FC*x*FFExpected* is the interaction term between the *FC Dummy* and the expected component of raw monetary policy change. *FC*x*FFShock* is the interaction term between the *FC Dummy* and the surprise component of raw monetary policy change. The firm-level returns are calculated over six (6) different event windows and shown in columns (1) to (6). Column (1) reports the results when we use the one-day return the day of the FOMC event day as the dependent variable. Columns (2) to (6) report the results when we use the four-day, six-day, eight-day, ten-day and twenty-day cumulative returns, respectively, after the FOMC event day as the dependent variable. All regressions include industry and year fixed effects as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses.

Panel A	(1) (0,0)	(2) (+1,+4)	(3) (+1,+6)	(4) (+1,+8)	(5) (+1,+10)	(6) (+1,+20)
FC Dummy	-0.000338	0.000371	0.000651	0.00146	0.00154	0.00662**
	(-0.75)	(0.34)	(0.45)	(0.89)	(0.79)	(2.52)
MP Delta	0.164	0.251	-1.351	-1.579	-1.817	-5.939**
	(0.25)	(0.17)	(-0.70)	(-0.75)	(-0.88)	(-2.31)
FCxDelta	0.193	0.328	-0.146	-0.610	-0.530	-0.805
	(0.75)	(0.48)	(-0.14)	(-0.46)	(-0.36)	(-0.33)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.006	0.014	0.014	0.017	0.016	0.015

Panel B	(1) (0,0)	(2) (+1,+4)	(3) (+1,+6)	(4) (+1,+8)	(5) (+1,+10)	(6) (+1,+20)
FC Dummy	-0.000184	-0.000252	0.000118	0.00113	0.00123	0.00668**
	(-0.39)	(-0.21)	(0.08)	(0.66)	(0.58)	(2.22)
FFExpected	1.622**	1.380	-0.0650	-0.560	-1.174	-7.695**
	(2.54)	(0.73)	(-0.02)	(-0.18)	(-0.36)	(-2.06)
FFShock	-5.569***	-2.749	-4.927	-4.545	-3.464	0.958
	(-3.48)	(-0.69)	(-0.93)	(-0.79)	(-0.63)	(0.12)
FCxFFExpected	0.146	1.424*	0.841	0.0389	0.0365	-1.118
	(0.44)	(1.66)	(0.60)	(0.02)	(0.02)	(-0.31)
FCxFFShock	0.515	-7.079**	-6.814	-4.993	-4.361	1.308
	(0.45)	(-2.20)	(-1.58)	(-1.06)	(-0.79)	(0.14)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.017	0.016	0.017	0.017	0.015

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VI: Event Study of Trading Volume

This table reports the coefficient estimates of the cross-sectional regression when we pool daily firm-level log trading volumes and log bid-ask spreads in the full sample. Firms are ranked by the WW Index daily using quarterly information release within three months but no fresher than 45 days. Seven FOMC event window indicator variables are used: three days before each FOMC meeting, the day of the meeting, and three days after the meeting. All regressions include firm and month fixed effects. Robust standard errors with double clustering at the firm and month level are used in reporting the t-statistics in parentheses. There are 8,030,438 observations in the daily panel.

	(1) Log Trading Volume	(2) Log Dollar Trading Volume
FC Dummy	-0.662***	-0.875***
	(-20.98)	(-22.48)
FOMC_{t-3}	0.0355***	0.0347***
	(3.14)	(2.99)
FOMC_{t-2}	0.00751	0.00546
	(0.45)	(0.33)
FOMC_{t-1}	-0.0244*	-0.0251*
	(-1.84)	(-1.84)
FOMC_{t}	0.0592***	0.0620***
	(5.22)	(5.41)
FOMC_{t+1}	0.0570***	0.0609***
	(3.54)	(3.84)
FOMC_{t+2}	0.0156	0.0196
	(0.87)	(1.07)
FOMC_{t+3}	-0.0245	-0.0215
	(-1.65)	(-1.38)
FCxFOMC_{t-3}	-0.0330**	-0.0294**
	(-2.49)	(-2.11)
FCxFOMC_{t-2}	-0.0417***	-0.0368**
	(-2.78)	(-2.36)
FCxFOMC_{t-1}	-0.00400	-0.00256
	(-0.34)	(-0.20)
FCxFOMC_{t}	-0.0297**	-0.0300**
	(-2.58)	(-2.38)
FCxFOMC_{t+1}	-0.00658	-0.00756
	(-0.45)	(-0.49)
FCxFOMC_{t+2}	0.00125	0.00257
	(0.09)	(0.16)
FCxFOMC_{t+3}	0.00587	0.00737
	(0.38)	(0.44)
Firm FE	✓	✓
Month FE	✓	✓
Adjusted R^2	0.734	0.753

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VII: Monthly Panel of Log Excess Returns on Monetary Policy and Financial Constraint

This table reports the coefficient estimates of the panel regression when we pool all firm-level returns for the 1994 to 2007 sample period. The dependent variable in each column is monthly log excess return over the risk-free rate. Columns (1) to (3) report the results when we exclude the months in which any of the four outlier FOMC events documented in the main text occurred, whereas the regressions for the results in columns (4) to (6) include all calendar month in the sample period except September 2001. For columns (1) and (4), the regressors are the expected ($AMFExpected$) and surprise ($AMFShock$) components of a monthly measure of monetary policy change. In columns (2) and (5), we add FC Dummy and its interactions to the right-hand-side variables in columns (1) and (4). Similarly, in the regressions for columns (3) and (6), we add WW Index and its interactions to the right-hand-side variables in columns (1) and (4). All regressions include firm and year fixed effects, as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with clustering at the firm level are used in reporting the t-statistics in parentheses.

				Including Outliers		
	(1)	(2)	(3)	(4)	(5)	(6)
	LogExRet	LogExRet	LogExRet	LogExRet	LogExRet	LogExRet
AMFExpected	-0.450***	-1.281***	-6.625***	-0.180**	-1.251***	-7.317***
	(-5.92)	(-12.07)	(-12.24)	(-2.27)	(-11.49)	(-13.53)
AMFShock	-13.88***	-10.87***	0.640	-19.88***	-13.85***	10.75***
	(-38.80)	(-22.78)	(0.26)	(-48.62)	(-24.13)	(3.89)
FC Dummy		0.00572***			0.00610***	
		(2.91)			(3.18)	
FCxAMFExpected		1.978***			2.434***	
		(9.61)			(11.71)	
FCxAMFShock		-5.575***			-11.41***	
		(-5.71)			(-10.35)	
FC Index			0.0267**			0.0261**
			(2.38)			(2.34)
FCIndxAMFExpected			8.223***			9.535***
			(11.02)			(12.75)
FCIndxAMFShock			-19.55***			-41.30***
			(-5.75)			(-10.68)
Firm FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Observations	364584	364584	364584	381038	381038	381038
Adjusted R^2	0.084	0.085	0.085	0.084	0.085	0.085

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VIII: Summary Statistics and VAR Output of the Return Decomposition

This table contains summary statistics and coefficient estimates for the first order market-adjusted VAR used for the firm-level return decomposition into discount rate (DR) news and cash flow (CF) news following Vuolteenaho (2002). The sample period is from 1994 to 2007. Panel A displays the summary statistics of the raw returns, as well as the inputs to the VAR: log values of excess return, log values of book-to-market ratio, and log values of return on book equity. These variables are cross-sectionally demeaned, denoted by the $\hat{x}$, as in Vuolteenaho (2002). Panel B reports the coefficient matrix (Γ) in columns (1) to (3), and the variance-covariance matrix (Σ) in columns (4) to (6) of the first order VAR. There are $364,584$ firm-month observations in the sample.

Panel A	(1) mean	(2) p25	(3) p50	(4) p75	(5) sd	(6) max	(7) min
Returns	0.012	-0.071	0.000	0.080	0.165	2.923	-0.981
Log Excess Return ($\hat{r}_t$)	-0.005	-0.077	-0.002	0.074	0.161	1.367	-4.060
Log Book/Market ($\hat{\theta}_t$)	-0.742	-1.239	-0.708	-0.210	0.824	4.501	-4.603
Log Return on Equity ($\hat{e}_t$)	-0.008	-0.009	0.020	0.041	0.169	3.989	-4.521

	Γ			Σ		
Panel B	(1) $\hat{r}_{t-1}$	(2) $\hat{\theta}_{t-1}$	(3) $\hat{e}_{t-1}$	(4) $\hat{r}_t$	(5) $\hat{\theta}_t$	(6) $\hat{e}_t$
$\hat{r}_t$	0.026***	0.00564***	0.0381***	0.026	-0.0255	0.0006
	(10.25)	(21.29)	(12.91)			
$\hat{\theta}_t$	-0.0247***	0.984***	0.0298***	-0.0255	0.0397	0.0035
	(-8.01)	(2677.48)	(6.95)			
$\hat{e}_t$	0.0211***	0.000481*	0.850***	0.0006	0.0035	0.0093
	(13.13)	(1.74)	(107.39)			

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table IX: Monthly Panel of Discount Rate News and Cash Flow News on Monetary Policy and Financial Constraint

This table reports the coefficient estimates of the panel regression when we pool all firm-level decomposed returns (news) over the 1994 to 2007 sample period. The dependent variable in each column is monthly discount rate (DR) news and cash flow (CF) news constructed from the return decomposition using a first order VAR. Columns (1) to (3) report results for DR News, whereas columns (4) to (6) report results for CF News. For columns (1) and (4), the regressors are the expected ($AMFExpected$) and surprise ($AMFShock$) components of a monthly measure of monetary policy change. In columns (2) and (5), we add $FC\ Dummy$ and its interactions to the right-hand-side variables in columns (1) and (4). Similarly, in columns (3) and (6), we add WW Index and its interactions to the right-hand-side variables used in the regression for the results in the regression for the results in columns (1) and (4). All regressions include firm and year fixed effects. Robust standard errors with clustering at the firm level are used in reporting the t-statistics in parentheses. There are 364, 584 firm-month observations in the sample.

	(1) DR News	(2) DR News	(3) DR News	(4) CF News	(5) CF News	(6) CF News
AMFExpected	0.0168	0.136***	0.701***	-0.264***	-1.174***	-6.778***
	(1.30)	(8.81)	(7.23)	(-3.63)	(-12.01)	(-13.35)
AMFShock	1.486***	1.236***	0.645	-12.56***	-9.735***	0.326
	(16.71)	(12.04)	(0.91)	(-35.85)	(-21.14)	(0.14)
FC Dummy		-0.0125***			0.0147***	
		(-24.21)			(8.97)	
FCxAMFExpected		-0.257***			2.198***	
		(-7.41)			(11.36)	
FCxAMFShock		0.279			-4.975***	
		(1.13)			(-5.28)	
FC Index			-0.112***			0.0912***
			(-24.64)			(9.69)
FCIndxAMFExpected			-0.899***			8.665***
			(-6.66)			(12.35)
FCIndxAMFShock			1.179			-17.38***
			(1.17)			(-5.25)
Firm FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.025	0.030	0.037	0.032	0.033	0.033

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table X: Monthly Panel of Excess Returns on Discount Rate News, Cash Flow News and Financial Constraint

This table reports the coefficient estimates of the panel regression when we pool all firm-level returns over the 1994 to 2007 sample period. The dependent variable in each column is monthly log excess return over the riskfree rate. In Panel A, we uses CF News as the explanatory variable in the regression, and in Panel B we use DR News as the explanatory variable in the regression. Column (1) is the baseline regression where News is the only regressor. In the regression for column (2), we add $FC\ Dummy$ and its interaction to News. In the regression for column (3), we add WW Index and its interaction to News. All regressions include firm and year fixed effects. Robust standard errors with clustering at the firm level are used in reporting the t-statistics in parentheses. There are $364,584$ firm-event observations in the sample.

Panel A	(1) LogExRet	(2) LogExRet	(3) LogExRet
CF News	1.047***	1.049***	1.150***
	(464.06)	(239.71)	(58.69)
FC Dummy		0.00936***	
		(20.32)	
FCxCFNews		-0.0131**	
		(-2.39)	
FC Index			0.0855***
			(21.86)
FCIndxCFNews			-0.132***
			(-5.24)
Firm FE	✓	✓	✓
Year FE	✓	✓	✓
Adjusted R^2	0.957	0.957	0.957

Panel B	(1) LogExRet	(2) LogExRet	(3) LogExRet
DR News	-2.050***	-2.149***	-5.009***
	(-27.32)	(-13.61)	(-8.92)
FC Dummy		-0.00129	
		(-0.73)	
FCxDRNews		0.428**	
		(2.40)	
FC Index			-0.0359***
			(-3.16)
FCIndxDRNews			3.738***
			(5.55)
Firm FE	✓	✓	✓
Year FE	✓	✓	✓
Adjusted R^2	0.200	0.204	0.205

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XI: Firm Accounting Variables on Monetary Policy and Financial Constraint

This table reports the coefficient estimates of five separate firm-level regressions where the dependent variables are, in order, sales, inventory, cash, short-term debt, and investment. All variables are scaled by total assets. The explanatory variables are the financial constraint dummies, twelve lags of the changes in the effective Fed funds rate over each quarter plus the interactions between the financial constraint dummy and the lagged monetary policy changes. All regressions control for Tobin's q and cash-flows, as well as firm and year fixed effects. Lagged Fed funds rate changes are not reported and omitted in the table. Sum of the point estimates of the interaction terms and the p-value of the hypothesis test of the null that the sum is equal to zero are summarized. The sample period is from 1994 to 2007. There are $30,735$ firm-quarter observations in the sample.

	(1) Sales	(2) Inventory	(3) Cash	(4) Short Term Debt	(5) Investment
FC Dummy	0.0650***	0.0579***	0.0463***	0.0199***	0.00243***
	(8.20)	(10.55)	(7.81)	(5.77)	(3.48)
FCxDeltaFFR$_{t-1}$	0.370	0.590	-1.109	-0.440	0.0228
	(0.49)	(1.23)	(-1.63)	(-1.20)	(0.25)
FCxDeltaFFR$_{t-2}$	0.0754	0.834*	-1.526**	0.540	-0.0874
	(0.10)	(1.74)	(-2.19)	(1.36)	(-0.98)
FCxDeltaFFR$_{t-3}$	-1.305*	-0.692	-0.367	-0.302	-0.0167
	(-1.77)	(-1.52)	(-0.56)	(-0.78)	(-0.18)
FCxDeltaFFR$_{t-4}$	0.800	0.339	-0.666	0.0209	-0.126
	(1.12)	(0.77)	(-1.10)	(0.06)	(-1.40)
FCxDeltaFFR$_{t-5}$	-0.621	-0.610	3.073***	-0.229	0.0505
	(-0.70)	(-1.07)	(3.60)	(-0.51)	(0.45)
FCxDeltaFFR$_{t-6}$	0.0243	-0.890**	0.345	-0.187	-0.00341
	(0.03)	(-2.11)	(0.55)	(-0.51)	(-0.04)
FCxDeltaFFR$_{t-7}$	-0.756	0.281	-1.431**	0.115	-0.120
	(-1.19)	(0.75)	(-2.50)	(0.38)	(-1.50)
FCxDeltaFFR$_{t-8}$	-0.557	0.339	-0.579	-0.502	0.0325
	(-0.86)	(0.85)	(-0.85)	(-1.57)	(0.41)
FCxDeltaFFR$_{t-9}$	0.807	0.135	-0.661	-0.0206	-0.0554
	(1.18)	(0.34)	(-1.04)	(-0.06)	(-0.68)
FCxDeltaFFR$_{t-10}$	-0.229	0.0942	1.097**	-0.201	0.0136
	(-0.38)	(0.26)	(2.06)	(-0.72)	(0.19)
FCxDeltaFFR$_{t-11}$	-1.225**	-0.646*	-0.455	0.154	-0.0617
	(-2.28)	(-1.96)	(-0.93)	(0.57)	(-0.92)
FCxDeltaFFR$_{t-12}$	0.268	0.0126	0.206	-0.0595	0.0876
	(0.40)	(0.03)	(0.32)	(-0.19)	(1.27)
Firm FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
Adjusted R^2	0.441	0.498	0.363	0.180	0.273
Sum of FCxDeltaFFR 4 Lags	-0.0597	1.071	-3.669***	-0.180	-0.207*
p value	0.955	0.130	0.00143	0.739	0.0739
Sum of FCxDeltaFFR 8 Lags	-1.970	0.191	-2.260	-0.983	-0.247
p value	0.220	0.859	0.171	0.190	0.147
Sum of FCxDeltaFFR 12 Lags	-2.348	-0.213	-2.074	-1.110	-0.263
p value	0.232	0.874	0.281	0.205	0.184

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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A Additional Results

In this Online Appendix, we present additional tables for robustness tests described in Section 5.

Table A.1: Event Study of Monetary Policy Impact on the Aggregate Return

This table extends the Bernanke and Kuttner (2005) event study to 2007 by regressing FOMC event day CRSP value-weighted index returns on raw monetary policy changes ($MP\ Delta$), as well as the expected ($FFExpected$) and surprise ($FFShock$) components of the raw changes. Columns (1) and (2) are done excluding four outlier FOMC events as outlined by Bernanke and Kuttner (2005): October 15, 1998, January 3, 2001, March 20, 2001, and April 18, 2001. Columns (3) and (4) report the regression results using the entire sample, which contains 116 FOMC events.

			Including Outliers	
	(1)	(2)	(3)	(4)
	CRSP VW	CRSP VW	CRSP VW	CRSP VW
MP Delta	-0.160		-0.689	
	(-0.35)		(-1.04)	
FFExpected		0.411		0.840*
		(0.92)		(1.78)
FFShock		-4.096**		-7.691***
		(-2.24)		(-4.62)
Constant	25.87***	22.27**	32.44***	19.70**
	(2.81)	(2.43)	(3.00)	(2.13)
Observations	112	112	116	116
Adjusted R^2	-0.008	0.034	0.012	0.257

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.2: Short Event-Window Study of Raw Returns on Monetary Policy including Outliers

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm-level returns over the 116 FOMC event days, including the four (4) outlier events. Panel A reports the results when we use raw monetary policy change ($MP\ Delta$) as the regressor, and Panel B reports the results when we use the expected ($FFExpected$) and surprise ($FFShock$) components. The return windows in columns (1) to (6) are defined in the same manner as the previous tables IV. All regressions include industry and year fixed effects as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are 273,108 firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
MP Delta	0.587	-0.0929	0.493	0.919	0.402	-0.144
	(1.05)	(-0.14)	(0.71)	(0.86)	(0.30)	(-0.09)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.012	0.009	0.007	0.007	0.006	0.009

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FFExpected	0.593	2.272***	1.316	1.797	0.815	0.737
	(0.88)	(3.68)	(1.51)	(1.37)	(0.53)	(0.37)
FFShock	0.567	-7.961***	-2.245	-2.001	-0.972	-3.074
	(0.28)	(-6.41)	(-1.42)	(-0.62)	(-0.26)	(-0.71)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.012	0.035	0.010	0.009	0.007	0.010

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.3: Short Event-Window Study of Raw Returns on Monetary Policy and Financial Constraint including Outliers

This table reports the coefficient estimates of the cross-sectional regression by pooling all firm-level returns over the 116 FOMC event days, including the outliers. Panel A reports the results when we use the financial constraint indicator variable (*FC Dummy*) and raw monetary policy change (*MP Delta*) as regressors, and Panel B reports the results when we use *FC Dummy* and the expected (*FFExpected*) and surprise (*FFShock*) components of monetary policy change. *FC*x*Delta* is the interaction term between the *FC Dummy* and raw monetary policy change. *FC*x*FFExpected* is the interaction term between the *FC Dummy* and the expected component of raw monetary policy change. *FC*x*FFShock* is the interaction term between the *FC Dummy* and the surprise component of raw monetary policy change. The firm-level returns are calculated over six (6) different event windows and shown in columns (1) to (6). Column (1) reports the results when we use the one-day return the day before the FOMC event day as the dependent variable. Column (2) reports the results when we use the one-day return the day of the FOMC event day as the dependent variable. Column (3) reports the results when we use the one-day return after the FOMC event day as the dependent variable. Columns (4) to (6) report the results when we use the two-day, three-day, and four-day cumulative returns, respectively, after the FOMC event day as the dependent variable. All regressions include industry and year fixed effects as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are 273,108 firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	0.000601	-0.000498	0.000459	0.00121	0.000844	0.00140
	(0.98)	(-0.88)	(0.87)	(1.46)	(0.83)	(1.22)
MP Delta	0.648	-0.0589	0.558	1.203	0.322	-0.00794
	(1.16)	(-0.09)	(0.81)	(1.10)	(0.24)	(-0.01)
FCxDelta	-0.440	0.114	-0.0862	-0.517	0.0330	-0.175
	(-1.37)	(0.46)	(-0.33)	(-1.34)	(0.07)	(-0.28)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.012	0.009	0.007	0.007	0.007	0.009

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	0.000403	-0.0000768	0.000176	0.000745	0.0000608	0.000421
	(0.86)	(-0.16)	(0.32)	(0.90)	(0.06)	(0.35)
FFExpected	0.637	2.158***	1.176	1.829	0.403	0.338
	(0.98)	(3.46)	(1.42)	(1.41)	(0.27)	(0.18)
FFShock	0.704	-7.266***	-1.256	-0.587	0.441	-0.538
	(0.31)	(-5.59)	(-0.85)	(-0.20)	(0.13)	(-0.14)
FCxFFExpected	-0.215	0.0520	0.380	0.164	0.997*	1.090
	(-0.66)	(0.16)	(1.22)	(0.35)	(1.67)	(1.38)
FCxFFShock	-1.449	0.400	-2.174***	-3.570***	-4.290***	-5.847***
	(-1.01)	(0.46)	(-2.64)	(-2.96)	(-3.02)	(-3.66)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.035	0.011	0.009	0.007	0.011

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.4: Event Study of Raw Returns where Financial Constraint is Defined by the No-Debt-Rating Dummy

This table reports the coefficient estimates of the cross-sectional regression when we pool all firm-level returns over the 112 FOMC event days. Panel A reports the results when we use the financial constraint indicator variable (*FC Dummy*) and raw monetary policy change (*MP Delta*) as regressors, and Panel B reports the results when we use *FC Dummy* and the expected (*FFExpected*) and surprise (*FFShock*) components of monetary policy change. *FC*x*Delta* is the interaction term between the *FC Dummy* and raw monetary policy change. *FC*x*FFExpected* is the interaction term between the *FC Dummy* and the expected component of raw monetary policy change. *FC*x*FFShock* is the interaction term between the *FC Dummy* and the surprise component of raw monetary policy change. The firm-level returns are calculated over six (6) different event windows and shown in columns (1) to (6). Column (1) reports the results when we use the one-day return the day before the FOMC event day as the dependent variable. Column (2) reports the results when we use the one-day return the day of the FOMC event day as the dependent variable. Column (3) reports the results when we use the one-day return after the FOMC event day as the dependent variable. Columns (4) to (6) report the results when we use the two-day, three-day, and four-day cumulative returns, respectively, after the FOMC event day as the dependent variable. All regressions include industry and year fixed effects, as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are 228, 356 firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
NR Dummy	0.000132	0.000306	0.000103	0.000147	-0.000510	-0.000654
	(0.48)	(1.03)	(0.33)	(0.31)	(-1.07)	(-1.23)
MP Delta	0.980*	-0.00118	0.704	1.294	0.696	0.518
	(1.94)	(-0.00)	(0.95)	(1.14)	(0.50)	(0.35)
NRxDelta	-0.207	0.236	-0.126	-0.328	0.0151	-0.107
	(-1.44)	(1.34)	(-0.70)	(-1.03)	(0.04)	(-0.22)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.015	0.006	0.011	0.012	0.011	0.015

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
NR Dummy	0.000169	0.000400	-0.0000240	-0.0000855	-0.000956	-0.00117*
	(0.59)	(1.27)	(-0.07)	(-0.15)	(-1.66)	(-1.86)
FFExpected	1.230**	1.532**	0.921	1.859	1.050	1.343
	(2.35)	(2.32)	(1.02)	(1.43)	(0.75)	(0.73)
FFShock	-0.157	-6.545***	0.237	-0.252	0.707	-1.143
	(-0.11)	(-3.40)	(0.10)	(-0.07)	(0.16)	(-0.24)
NRxFFExpected	-0.261	0.101	0.0586	0.00931	0.664	0.649
	(-1.50)	(0.50)	(0.23)	(0.02)	(1.46)	(1.19)
NRxFFShock	0.180	1.190	-1.450	-2.754	-4.638**	-5.534**
	(0.28)	(1.51)	(-1.63)	(-1.59)	(-2.23)	(-2.27)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.015	0.013	0.011	0.013	0.012	0.017

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.5: Event Study of Raw Returns where Financial Constraint is Defined by the Size and Age Index

This table reports the coefficient estimates of the cross-sectional regression when we pool all firm-level returns over the 112 FOMC event days. Panel A reports the results when we use the financial constraint indicator variable (*FC Dummy*) and raw monetary policy change (*MP Delta*) as regressors, and Panel B reports the results when we use *FC Dummy* and the expected (*FFExpected*) and surprise (*FFShock*) components of monetary policy change. *FC*x*Delta* is the interaction term between the *FC Dummy* and raw monetary policy change. *FC*x*FFExpected* is the interaction term between the *FC Dummy* and the expected component of raw monetary policy change. *FC*x*FFShock* is the interaction term between the *FC Dummy* and the surprise component of raw monetary policy change. The firm-level returns are calculated over six (6) different event windows and shown in columns (1) to (6). Column (1) reports the results when we use the one-day return the day before the FOMC event day as the dependent variable. Column (2) reports the results when we use the one-day return the day of the FOMC event day as the dependent variable. Column (3) reports the results when we use the one-day return after the FOMC event day as the dependent variable. Columns (4) to (6) report the results when we use the two-day, three-day, and four-day cumulative returns, respectively, after the FOMC event day as the dependent variable. All regressions include industry and year fixed effects, as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are $266,524$ firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	-0.000272	-0.000733	-0.0000309	0.000414	0.00000274	-0.000397
	(-0.58)	(-1.61)	(-0.06)	(0.50)	(0.00)	(-0.37)
MP Delta	0.959**	0.120	0.668	1.259	0.435	0.157
	(2.06)	(0.19)	(0.98)	(1.23)	(0.35)	(0.11)
FCxDelta	-0.258	0.263	0.0113	-0.211	0.427	0.338
	(-0.94)	(1.01)	(0.04)	(-0.47)	(0.66)	(0.39)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.006	0.009	0.011	0.010	0.014

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	-0.000245	-0.000641	-0.000230	0.000132	-0.000665	-0.00120
	(-0.48)	(-1.31)	(-0.38)	(0.13)	(-0.63)	(-1.00)
FFExpected	1.116**	1.554**	0.991	1.983	1.027	1.253
	(2.15)	(2.46)	(1.12)	(1.55)	(0.74)	(0.68)
FFShock	0.378	-5.490***	-0.175	-0.832	-0.557	-2.552
	(0.31)	(-3.59)	(-0.09)	(-0.28)	(-0.17)	(-0.66)
FCxFFExpected	-0.284	0.240	0.337	0.274	1.480*	1.639
	(-0.75)	(0.63)	(0.77)	(0.38)	(1.73)	(1.51)
FCxFFShock	-0.0766	0.430	-2.191	-3.490	-6.692**	-8.456**
	(-0.07)	(0.34)	(-1.43)	(-1.38)	(-2.52)	(-2.45)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.013	0.010	0.013	0.012	0.017

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6: Event Study of Raw Returns where Financial Constraint is Defined by the Kaplan and Zingales Index

This table reports the coefficient estimates of the cross-sectional regression when we pool all firm-level returns over the 112 FOMC event days. Panel A reports the results when we use the financial constraint indicator variable (*FC Dummy*) and raw monetary policy change (*MP Delta*) as regressors, and Panel B reports the results when we use *FC Dummy* and the expected (*FFExpected*) and surprise (*FFShock*) components of monetary policy change. *FC*x*Delta* is the interaction term between the *FC Dummy* and raw monetary policy change. *FC*x*FFExpected* is the interaction term between the *FC Dummy* and the expected component of raw monetary policy change. *FC*x*FFShock* is the interaction term between the *FC Dummy* and the surprise component of raw monetary policy change. The firm-level returns are calculated over six (6) different event windows and shown in columns (1) to (6). Column (1) reports the results when we use the one-day return the day before the FOMC event day as the dependent variable. Column (2) reports the results when we use the one-day return the day of the FOMC event day as the dependent variable. Column (3) reports the results when we use the one-day return after the FOMC event day as the dependent variable. Columns (4) to (6) report the results when we use the two-day, three-day, and four-day cumulative returns, respectively, after the FOMC event day as the dependent variable. All regressions include industry and year fixed effects, as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are $266,523$ firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	-0.000615	-0.000510	0.0000683	-0.000567	-0.000604	-0.00131
	(-0.81)	(-0.80)	(0.09)	(-0.56)	(-0.52)	(-0.89)
MP Delta	0.810	0.262	0.597	0.974	0.845	0.467
	(1.56)	(0.41)	(0.86)	(0.95)	(0.63)	(0.29)
FCxDelta	0.0947	0.131	0.188	0.367	0.00921	0.00969
	(0.48)	(0.95)	(1.16)	(1.31)	(0.03)	(0.02)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.006	0.009	0.011	0.010	0.014

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	-0.000640	-0.000526	-0.00000938	-0.000605	-0.000559	-0.00117
	(-0.86)	(-0.83)	(-0.01)	(-0.61)	(-0.48)	(-0.79)
FFExpected	0.940	1.755***	1.073	2.013	2.081	2.386
	(1.53)	(2.64)	(1.06)	(1.41)	(1.34)	(1.10)
FFShock	0.415	-5.738***	-1.286	-3.248	-4.499	-7.809*
	(0.28)	(-3.52)	(-0.52)	(-0.84)	(-1.19)	(-1.77)
FCxFFExpected	0.134	0.220	0.319*	0.468	0.00485	-0.0967
	(0.55)	(1.51)	(1.81)	(1.16)	(0.01)	(-0.21)
FCxFFShock	-0.168	-0.468	-0.699	-0.315	0.0379	0.728
	(-0.30)	(-0.87)	(-1.08)	(-0.24)	(0.03)	(0.52)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.013	0.013	0.010	0.013	0.011	0.016

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.7: Event Study of Cumulative Abnormal Returns on Monetary Policy and Financial Constraint

This table reports the coefficient estimates of the cross-sectional regression when we pool all firm-level returns over the 112 FOMC event days. Instead of employing raw returns, here the dependent variable is the firm-level cumulative abnormal returns (CAR) after controlling for the market return in the event windows. Panel A reports the results when we use the financial constraint indicator variable ($FC\ Dummy$) and raw monetary policy change ($MP\ Delta$) as regressors, and Panel B reports the results when we use $FC\ Dummy$ and the expected ($FFExpected$) and surprise ($FFShock$) components of monetary policy change. The interaction terms and the return windows in columns (1) to (6) are defined in the same manner as those in table IV. All regressions include industry and year fixed effects as well as controlling for log asset, log book-to-market ratio, leverage, and profitability at the firm level. Robust standard errors with double clustering at the firm and event level are used in reporting the t-statistics in parentheses. There are $263,601$ firm-event observations in the sample.

Panel A	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	-0.000198	-0.000336	0.00000773	0.000496	-0.000241	-0.000310
	(-0.53)	(-0.79)	(0.02)	(0.86)	(-0.33)	(-0.37)
MP Delta	0.258	-0.198	-0.110	0.196	0.269	0.393
	(0.93)	(-0.82)	(-0.38)	(0.42)	(0.49)	(0.77)
FCxDelta	-0.355	0.194	0.152	-0.210	0.363	0.327
	(-1.46)	(0.76)	(0.63)	(-0.55)	(0.68)	(0.47)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.007	0.002	0.001	0.002	0.001	0.005

Panel B	(1) (-1,-1)	(2) (0,0)	(3) (+1,+1)	(4) (+1,+2)	(5) (+1,+3)	(6) (+1,+4)
FC Dummy	-0.000155	-0.000288	-0.000173	0.000232	-0.000878	-0.00102
	(-0.39)	(-0.64)	(-0.36)	(0.34)	(-1.03)	(-1.01)
FFExpected	0.273	-0.0394	-0.0877	0.161	0.283	0.491
	(0.88)	(-0.14)	(-0.19)	(0.25)	(0.39)	(0.68)
FFShock	0.111	-0.707	0.169	0.849	1.467	1.535
	(0.16)	(-0.99)	(0.21)	(0.74)	(1.06)	(0.98)
FCxFFExpected	-0.419	0.146	0.432	0.188	1.338**	1.421
	(-1.29)	(0.44)	(1.21)	(0.34)	(2.06)	(1.65)
FCxFFShock	0.0711	0.516	-1.739	-2.904	-6.231**	-7.071**
	(0.07)	(0.46)	(-1.39)	(-1.33)	(-2.42)	(-2.20)
Industry FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
Adjusted R^2	0.007	0.003	0.002	0.002	0.002	0.005

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

B Variable List

(1) Variable	(2) Description
AMFExpected	Monthly measure of the expected component of the interest rate change
AMFShock	Monthly measure of the unexpected component of the interest rate change
CF News	Cash flow news decomposed from returns
DeltaFFR	Quarterly change in the effective Fed funds rate
DR News	Discount rate news decomposed from returns
ΔMP	Total change in interest rate around FOMC announcements
FC Dummy	Financial constraint dummy
FC Index	Financial constraint index
FE	Fixed effects
FFExpected	Expected component of the interest rate change around FOMC announcements
FFShock	Unexpected component of the interest rate change around FOMC announcements
FOMC	Dummy variable if a trading day is on or within three days of a FOMC meeting
Γ	Coefficient matrix of the return decomposition vector autoregression
I^{fc}	Indicator variable of the financial constraint dummy
$Index^{fc}$	Financial constraint index
KZ	Kaplan and Zingales (1997) financial constraint index
MP Delta	Total change in interest rate around FOMC announcements
$News^{cf}$	Cash flow news decomposed from returns
$News^{dr}$	Discount rate news decomposed from returns
NR Dummy	Indicator variable of firms with no-debt-rating used as a financial constraint dummy
$\hat{r}$	Log excess return
$\hat{\theta}$	Log book to market ratio
$\hat{e}$	Log return on equity
Σ	Variance-covariance matrix of the return decomposition vector autoregression
SA	Size and Age Index from Hadlock and Pierce (2010)
WW	Whited and Wu (2006) financial constraint index