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Relationship Between Monetary Policy and Stock Returns: An Empirical Analysis of the Chinese Case

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Relationship Between Monetary Policy and Stock Returns: An Empirical Analysis of the Chinese Case

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To My Family and Friends

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Chapter 1

Introduction

1.1 Background and Motivation

We often hear people say that stock market is a barometer of the economy, which indicate the importance of stock market in a country's economy. The stock market play an important role in the economy through the financial system. Stock market allows firms' assets to be traded publicly, helps firms to raise money. Stock prices have high sensitivity on economic situation. When government uses monetary policy tools to macro-control economy, such effects will be reflected in stock prices through the monetary policy transmission mechanism.

Since Bernanke and Blinder (1992) proved that interest rate (federal funds rate) is a good indicator of monetary policy, many economists investigated the effects of interest rate changes on stock prices. Thorbecke (1997) argued that a decrease in federal funds rate can increase firms' stock returns. The reason is that an expansionary monetary policy will increase firms' future cash flows or decrease the discount factors at which those cash flows are capitalized. Rigobon and Sack (2004) indicated that an increase in interest rate will reduce stock prices. Similar conclusion also be given by Ehrmann and Fratzscher (2004) and Basistha and Kurov (2008). These two articles indicated a negative relationship between interest rate and stock prices. A very important finding is given by Bernanke and Kuttner (2005) that an unanticipated 100-basis-point decrease in federal funds rate would result a 4% increase of stock prices in the U. S. market.

Most of the existing literatures concern about developed countries' markets, especially the U. S. market. As the most attention grabbing developing country, China deserves to be studied.

1.2 Introduce to Monetary Policy and Stock Markets in China

While learning to developed countries, China has a different stock market structure and monetary policy. It's very important to understand this point because it is not only the essential

motivation of the paper, but also will influence our empirical result very much.

Transition to liberalized financial markets has been subject to strict regulation since China in some respects still is a planned economy (Bohl, Schuppli and Siklos (2010)). First, there are price limits restrictions and official ban of short selling in Chinese market. Second, People's Bank of China (PBC, the central bank of China) prohibits bank loans to be invested in stocks. Third, derivatives market has only recently begun to develop. Both capitalization and trading varieties are very little. Especially there is no interest rate future market in China.

1.2.1 Chinese Stock Markets

Chinese mainland has two stock markets with the names Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE). Since their opening in April 11, 1991 and November 26, 1990, they have expanded rapidly. Both number of listed firms and the total market capitalization are several times larger than the beginning. By the end of 2013, there are 959 firms listed in Shanghai Stock Exchange with the capitalization 15.1 trillion Renminbi (RMB). About Shenzhen Stock Exchange, 1,536 listed firms owing capitalization 8.8 trillion RMB. Researchers think that the development of the two exchanges is seen as asymmetric not only in terms of total market capitalization, but also in that larger firms generally tend to list in SSE (Walter and Howie (2006)).

We should notice that Chinese stocks have been divided into A-shares and B-shares. Foreign predominantly institutional investors were only allowed to trade in B-shares, while domestic Chinese investors could purchase and sell both A-shares and B-shares. B-shares are often denominated in US dollar or HK dollar. The number of B-shares is extremely below A-shares. By the end of 2013, only 53 B-share stocks are still being traded in SSE. With the relaxation of government's regulation on security market, B-shares are disappearing in stock market. Obviously, A-share stocks are more representative in China. The research object of this paper will be A-shares that we think are much more on the behalf of China.

For helping small and medium-size enterprises (SMEs) to finance, a sub-board of SZSE, the SME board, was launched on May 27, 2004. A growth enterprises market (GEM) was also set up

in October 30, 2009 for the firms that have high growth rate and good future but do not fulfill the requirements of profitability or track record presently. The SME and GEM boards have become unique, indispensable and independent segments in China's multi-tier capital market system after years' development and innovation. Both SME and GEM are affiliated to the main board market, and have same trading system, regulatory standards and monitoring teams with the main board market. The only difference between them is the listing standards. For the reason that stocks of firms listed in SME and GEM are also traded in SZSE, as two important parts of the Chinese stock market, they are included in this study.

Investor structure in SSE and SZSE is also greatly different from mature markets. Bohl, Schuppli and Siklos (2010) summarize structure and behavior of investors in China. Only a small fraction of total domestic stock investment is constituted by institutional investments, while 99% of A-share trading accounts are owned by individual investors. This may lead to information asymmetry between investors and firms.

1.2.2 Chinese Monetary Policy

Since the implementation of the planned economy, monetary policy was not taken seriously before China's reform and opening. People even could not hear the words "monetary policy" at that time. But monetary policy has become increasingly important during the last two decades. Generally speaking, instruments of monetary policy in China can be divided into two kinds: non-central bank instruments and central bank instruments. The non-central bank instruments are some kinds of legacies from the planned economy that government use administrative means to intervene in economy. Price controls and wage controls are often used as the non-central bank instruments. Market-regulated prices, guidance prices and their floating rage, government prices are set by government sometimes to influence supply and demand as the price controls policy. Although almost been repealed, wage controls played a significant role as a non-central bank instrument twenty years ago. In that time, China's wage regime was characterized by a centrally regulated salary system.

Compared with the non-central bank instruments, central bank instruments are mainly

used nowadays. Similar to developed countries, several instruments like window guidance, discount and rediscount rates, reserve requirements, open market operations, lending and deposit rates (interest rates) are used by the PBC.

Window guidance policy exerts pressures on banks and other financial institutions, make them to stick to government's guidelines. Before 1998, the PBC mostly carried out a credit ceilings to direct financial institutions' credit size and structure. After 1998 it has been typically executed through window guidance. Similar window guidance policy was applied in Japan until 1990s. The discount and rediscount rates were set within a floating range of 5%-10% below commercial banks' loans and the PBC lending before 1998. With the suspension of such policy ten years ago, the PBC charges rediscount rates in line with other lending rates. Minimum reserve requirements are set by the PBC to manage commercial banks' money creation. Although the instrument of open market operations was adopted in 1993, it had rarely been applied in the first ten years. However, in order to against financial crisis, especially the impact of U. S.'s quantitative easing policy on Chinese economy, open market operation of reserve repo was widely used in 2013.

Interest rate, or lending and deposit rate, which is also the research object of this dissertation, affects firms much commonly and efficiently in China. The one-year official loan rate is administered as the benchmark interest rate by the PBC. Interest rate policy in China shows some characteristics of planned economy. By using the benchmark interest rate, the PBC guides commercial banks in giving them a floating range of their lending rates. Commercial banks can only offer their interest rates in the range set by the PBC. For example, the PBC set both upper and lower limit of lending rate for commercial bank 1.7 and 0.9 times as the benchmark rate in 2004. Adjustment of benchmark interest rate in China is infrequent, and heavily controlled by the central bank, unlike the market driven and frequently updated interest rates in the U. S. (Xu and Chen (2012)). Since July 20, 2013, the PBC fully liberalized the restrictions of lending rate and discount rate for financial institutions. Although the PBC's benchmark rate did a great contribution on China's financial system, it has become a history. For

the reason that our data samples do not reach the time point that the PBC liberalized such restrictions, the benchmark rate (official one-year loan rate) is still used as a measure of monetary policy in the dissertation.

1.3 Research Questions

The link between monetary policy and stock price is the research object of this dissertation. For monetary policy, the benchmark rate we talked about before is going to be used as a representative. For stock price, we use stock return to represent it. The stock return is calculated as $(p_1 - p_0)/p_0$, where p_0 and p_1 are firm's stock prices at time t_0 and time t_1, respectively. We use daily data in the analysis, and the stock price refers to the closing price of a firm's stock in a trading day.

A negative relationship is supposed to exist between interest rate and stock return. The reasons can be attributed to two. The first reason is Keynes's speculative motive. If people realize that the interest rate is going to fall, they will reduce their holdings of money and buy some bonds or other securities. That will make the stock prices rise. In like manner, an increase of interest rate will lower stock prices. The second reason is the effects of monetary policy on firms' performances. A decrease of interest rate reduces the cost of using money, and then stimulates people's consumptions. Firms will benefit from the growth in consumptions and such benefit will be reflected in their stock prices. In another way, firms can pay less cost in financing, which expand their investments. This also enhance firms' stock prices. Similarly, interest rate rise will cause a fall in stock prices. Therefore, a negative relationship is expected.

Someone may come up with the argument of the CAPM (Capital Asset Pricing Model) model to refute the above expectation. We explain it as the following manner. A CAPM model can be explained as below:

$$\bar{R_\iota} = R_F + \beta(\bar{R}_M - R_F) \qquad (1.1)$$

where $\bar{R_\iota}$ is expected return on a security, R_F is risk-free rate, $\bar{R}_M$ is expected return on market. The one-year official loan rate can be considered as a risk-free rate, which is the R_F in Eq. (1.1). So an increase in R_F should make $\bar{R_\iota}$ rise either, which can be considered as a firm's

stock return. That's contradictory with our hypothesis. However, we should pay attention to the item of $\bar{R}_M - R_F$. If the risk-free rate rise, investors' willingness to invest will be reduced. Hence the rate of return on investment, $\bar{R}_M$, will fall down; $\bar{R}_M - R_F$ will become a large negative value. The absolute value of $\beta(\bar{R}_M - R_F)$ may be larger than R_F. In this case, even a rising of risk-free rate may have some contributions on stock return, but as a combined effect, the stock return will decline.

The main purpose of this dissertation is that we want to analysis what factors can influence the effects of monetary policy on listed firms' stock returns. Firstly, we consider firms' financial constraints. If a firm is financially constrained, this firm will find itself difficult to finance neither internally nor externally. Such straits make handicaps in firms' investments and productions, and lower firms' stock returns. We want to test if highly financially constrained firms are affected more by monetary policy changes than lowly financially constrained firms.

Secondly, we consider firms' ownerships. There are a large number of SOEs in Chinese stock market, while the number of SOEs in developed countries is small. SOEs may finance easier than private firms because banks in China share the same state background with them. The industry policy usually inclines towards SOEs, too. All these phenomena make people doubt that SOEs may have a higher capacity against interest rate changes. We want to test if the doubt is true.

Finally, we consider the macroeconomic cycles. In economic expansion, strong demand and supply lead economic prosperity. Obviously the growth in demand and supply can raise listed firms' stock prices. On the other hand, the recession can lower people's confidence and inhibit consumption, then reduce stock prices. However, the effects of monetary policy on stock prices in economic recession may be larger than in expansion because of the 'financial accelerator' effect and investors' pessimism. So we want to test if firms' stock returns are affected more by monetary policy in economic recession.

The above three considerations are the main topics we are going to discuss in the following three chapters respectively. Each one will be tested though empirical models.

Chapter 2

The Effects of Monetary Policy on the Stock Returns of Different Financially Constrained Firms

2.1 Overview

The issue that relationship between stock returns and financially constrained firms has been researched a lot. Kaplan and Zingales (1997), Lamont, Polk and Saa-Requejo (2001) and Chan, Chang, Faff and Wong (2010) determined that financially constrained firms earn lower returns and demonstrate worse performances than relatively unconstrained firms. Many researchers believe that monetary policies indisputably affect stock returns through monetary policy transmission mechanisms. However, conflicting perspectives exist regarding the ways in which monetary policy affects financially constrained firms. Based on an examination of monthly U. S. data from July 1968 to December 1997, Lamont Polk and Saa-Requejo (2001) argued that there is no evidence that the relative performance of constrained firms reflects monetary policy effects. By contrast, Ehrmann and Fratzscher (2004) examined U. S. data and concluded that monetary policy changes affect financially constrained firms more strongly than unconstrained firms. These two conclusions are diametrically opposed.

However, even Lamont, Polk and Saa-Requejo (2001) think their tests are “very simple and should be regarded as an exploratory investigation”. They construct a portfolio that contained financial constraint factors, and use several independent variables that denote monetary policy to do the regression on above portfolio’s return. Though the results show that monetary policy variables do not have significant effect to the portfolio’s return, they also expected that “more sophisticated analysis might yield different results”. In particular, Ehrmann and Fratzscher (2004) found the strongest responses to monetary policy changes among firms with high Tobin’s q ratios; low cash flow to net income ratios; high price-earnings ratios; small size (based on a low market value or a low number of employees); and/or low debt to total capital ratios. Basistha

and Kurov (2008) confirmed Ehrmann and Fratzscher (2004)'s viewpoint that financially constrained that firms' response to monetary policy more strongly by using different proxies to measure degrees of firms' financially constraint.

Although many prior investigations have addressed the topic of monetary policy effects on stock returns, none of these studies have performed an empirical analysis of the Chinese market. The importance of this study may be summarized as follows. First, given that we believe monetary policy can affect stock returns though certain monetary policy transmission mechanisms, we wish to confirm whether Chinese case supports Ehrmann and Fratzscher (2004) and Basistha and Kurov (2008)'s standpoint. In addition, we wish to identify the differences in monetary policy responses between firms with distinct levels of financial constraints, as measured by various indicators. A lack of empirical evidence exists regarding both of these topics. Second, China differs greatly from developed nations with respect to many different factors, including market structure, the process of making monetary policy decisions, monetary policy implementation, investor behavior and various other traits. These differences from developed countries are evident both in the Chinese market as a whole and in examinations of individual Chinese firms. Moreover, because China is an important emerging market, the Chinese stock markets attract a great deal of attention. This study attempts to help investors obtain a significantly better understanding of the Chinese markets.

Therefore the main objective of this chapter is to answer the following questions. Are firms listed in the Chinese stock markets significantly affected by monetary policy? Do differently financial constrained firms react to monetary policy changes in the same way? If not, what are the distinctions in monetary policy responses among firms with different levels of financial constraints?

We introduce a two-step analysis to understand the above questions. We first use an event study methodology to conduct a CAR (cumulative abnormal return) analysis of individual stocks. Many studies have claimed that unanticipated aspects of monetary policy are the primary reason that stocks may demonstrate abnormal returns as a result of monetary policy initiatives.

Campbell (1991) found that changes in expected future dividends or expected future returns are always associated with unexpected stock returns. Kuttner (2001) argued that the response of interest rates to the "surprise" component of monetary policy actions was significantly stronger than the response to changes in the interest rate target itself. Bernanke (2003) and Bernanke and Kuttner (2005) found that an unexpected change of 1% in this target rate produced an average movement in stock prices of 4% in the opposite direction of the rate change. Ehrmann and Fratzscher (2004) analyzed the effect of the surprise component of monetary policy decisions，which is measured as the difference between a monetary policy decision and market expectations, on equity returns on the days of monetary policy announcements. Because the Chinese context lacks a futures market for interest rates, we are unable to calculate monetary policy surprises in the Chinese market. Therefore, we introduced an event study methodology that can be utilized to calculate abnormal returns, eliminating the impact of market expectations.

Event study methodology requires the market is efficient. Certain articles[i] have indicated that the Chinese stock markets may not efficient, implying that these stock market do not necessarily reflect macroeconomic conditions. However, we found certain evidence in the work of Gul, Kim and Qiu (2010) that indicated the validity of event study in the Chinese context. Gul Kim and Qiu (2010) decomposed total return variations into two components: variations that are associated with common (market-wide and/or industry-wide) factors and variations that are associated with firm-specific factors. The research found that return variations that are associated with common factors are relatively well explained but that it is difficult to explain variations that are associated with firm-specific factors. We speculate that Chinese stock markets are weak-form efficient because stock prices fail to reflect information from individual firms but do reflect market conditions. Thus, there should be no problem with the use of CAR analysis in the context of the Chinese stock market.

After we conduct a CAR analysis of the Chinese market, we give a cross-sectional analysis under Ehrmann and Fratzscher (2004)'s framework. We consider various indicators of financial constraints. For each indicator, we examine the impact of monetary policy on the firms that have

been identified as financially constrained organizations by the indicator in question. We then distinguish among the differences in the monetary policy responses that are associated with each examined indicator of financial constraints. In this portion of the study, we primarily adopt Erhmann and Fratzscher (2004)'s methodology; in particular, we categorize firms into three groups based on the positions of these firms in the cross-sectional distribution for each financial constraint indicator. We improve on the approach of Erhmann and Fratzscher (2004) by adopting abnormal returns instead of monetary policy surprises as the dependent variable in the regression.

We confirmed that monetary policy shocks could significantly affect stock returns in the Chinese market. Different effects are observed in firms that are experiencing distinct degrees of financial constraints. We also found in China, the effects of financial constraints on monetary policy impact are not linear; at times, the lowest levels of monetary policy effects are experienced by firms that are facing moderate financial constraints. Moreover, firms' reactions to monetary policy sometimes contrast with our initial assumptions.

We provide a methodological contribution to existing studies. We employ a CAR analysis in an event study methodology prior to conducting a cross-sectional analysis. Many investigations have argued that stock returns are affected more significantly by unexpected interest rate changes than by the actual magnitude of an interest rate change (see Kuttner (2001), Ehrmann and Fratzscher (2004), Bernanke and Kuttner (2005) and Honda and Kuroki (2006)). Previous papers have adopted "interest rate surprise" as a method of measuring the unexpected portion of an interest rate change, which is defined as the difference between the true magnitude of an interest rate change and the expected value of this change based on interest rate futures[ii]. Because an interest rate futures market does not exist in China, the calculation of CARs in the Chinese stock markets in the event study framework and the use of abnormal returns as the dependent variable for this study is the best choice to measure the impact of the unexpected portion of interest rate changes.

The remainder of this chapter is organized as follows. In section 2.2, we develop hypotheses

regarding the distinct impacts of monetary policy by financial constraint indicators. In section 2.3, we describe the study data and introduce the two-step methodology that is used to calculate abnormal return and perform the regression analysis. In section 2.4, we provide empirical results that demonstrate significant differences between the Chinese market and the U. S. market and attempt to explain these differences. In section 2.5, we conclude the chapter and provide some findings.

2.2 Measures of Financial Constraint and Hypotheses

Ehrmann and Fratzscher (2004) and Basistha and Kurov (2008) argued that firms who are lack of financing capacity (in other words, financially constrained) would find being constrained in their production. The financing capacity will be affected by monetary policy through a so-called credit channel of monetary policy transmission. In tightening of monetary policy, policy maker would raise the official interest rates, and then raise market interest rates indirectly. The raising of market interest rates may not only reduce the firms' accessibility of bank loans, but also weaken firms' balance sheets, results firms in poor financial positions. Firms who found them harder to access to funds, will be constrained for the supply of their goods, and the effect will be reflected in their stock prices. Transmission process in monetary policy easing has the same mechanism, but stock prices should upsurge for firms can expend their production more easily. Both in monetary policy tightening and easing, there is a negative effect on firms' stock return. The monetary policy's effect on firms will be asymmetric depend on the degrees of firms' financial constraints.

To analyze how monetary policy affects firms and the differences that may exist between different financially constrained firms, we use several proxies to measure the degree to which firms are financially constrained. In accordance with the approaches of Kaplan and Zingales (1997) and Ehrmann and Fratzscher (2004), we define the term "financial constraint" to indicate restraints that are imposed by a firm's financing situation. In general, firms can engage in either internal financing, which refers to financing that uses a firm's existing cash flow, or external financing, which involves either borrowing funds from a bank or obtaining financing in capital

markets. Firms experience greater difficulty in obtaining internal or external financing are considered to be more strongly financially constrained. We believe that certain firm-specific characteristics, such as size, debt-paying ability and evaluation quality, will affect a firm's financing capabilities.

At first we consider the firm's size. The size of the firm has been regarded as an important indicator of a firm's financial constraints. A series of articles by various authors, including Banz (1981), Reinganum (1981), Christie and Hertzel (1981), Basu (1983), Roll (1983), Keim (1983), Brown, Keim, Kleidon and Marsh (1983) and Schwert (1983) have discussed firm size as an important factor that impacts a firm's stock returns. Firm size is frequently measured in terms of the number of employees of a firm and this firm's market value. However, listed firms in China do not publicize information regarding their numbers of employees. Given the lack of available data regarding employee numbers, in this study, we use market value as the sole indicator of firm size.

Banks frequently prefer to lend money to large firms instead of small companies. Moreover, investors in stock markets also frequently trust large firms more than small firms because these investors believe that large firms have a lower risk of bankruptcy than small firms. Furthermore, the issuing of bonds is clearly easier for large firms than for small firms. Thus, although monetary policy tightening would increase the difficulty of borrowing money for both large and small firms, it should be relatively easier to obtain financing for large firms than for small firms. Thus, it may be hypothesized that compared with large firms, small firms would be more financially constrained and would be more influenced by monetary policy changes. Thorbecke (1997) provided support for this perspective. In particular, he found that because monetary policy affects firms' access to credit, monetary shocks have larger effects on small firms than on large firms. Perez-Quiros and Timmermann (2000) also found evidence that relative to large firms, small firms are more strongly affected by tighter credit market conditions because these small firms have little collateral for loans. However, the empirical results shown in Ehrmann and Fratzscher (2004) and Basistha and Kurov (2008)'s papers show that small firms are not always

affected more by monetary policy changes. Lamont, Polk and Saa-Requejo (2001) also argued that size is an imperfect proxy to measure firm's financial constraint. The conclusion that weather firm size is a precise proxy is suspicious. We assume small firms are affected more in China, and formulate our first hypothesis as follows:

Hypothesis 1 (Market Value): In the Chinese stock markets, monetary policy changes affect small firms (firms with low market values) more strongly than large firms (firms with high market values).

Then we will use two direct proxies to measure the degree of firms' financial constraint: cash flow to net income ratio and debt to total capital ratio. Obviously a firm who is holding low level of cash is lack of internal financing ability. Such firms will be restricted in financing their investment. Furthermore, firms that lack of cash flow may suffer bankruptcy because their poor debt-paying ability. Lin, Liu and Liang (2010) noted that a firm that is partially financed by debt may face bankruptcy dangers, which arise if a firm does not have sufficient available cash to meet its obligations. We give the second hypothesis as follows:

Hypothesis 2 (Cash Flow to Net Income Ratio): In the Chinese stock markets, monetary policy changes will exert stronger effects on firms with low cash flow to net income ratios than on other firms.

One may expect that firm with high debt to total capital ratio is a bank-dependent borrower. Unsurprisingly, bank-dependent borrowers are expected to be relatively sensitive to interest rate changes. Thus when interest rates increase, such firm should be affected more strongly. However, the finding by Ehrmann and Fratzscher (2004) is very interesting that firms with low debt to total capital ratio are affected more by monetary policy surprise. They attribute the reason to that firms hold low levels of debt because they are currently financially constrained and can't borrow more. We assume the same phenomenon also occurs in China, and formulate the hypothesis:

Hypothesis 3 (Debt to Total Capital Ratio): In the Chinese stock markets, monetary policy changes will exert stronger effects on firms with low debt to total capital ratios than on others.

Next we go to consider firm's evaluation. We believe that listed firms with high-quality evaluations will win the trust of investors. A firm will not receive financing if investors do not believe that the firm will improve in the future. Price-earnings ratio is an indicator of firm quality that is often considered by investors. In Chinese stock market, people always believe that firms with high price-earnings ratio may predict higher future returns of firms. Therefore, high price-earnings ratio stocks are more attractive for investors that result such firms can access to external funds relatively easily. Song (2000) argued that in Chinese market, price-earnings ratio has a high correlation with stock return. Though it's not that significant, price-earnings ratio has a positive relationship with firm's expected net profit growth. Based on these, a reasonable hypothesis can be provided as follows:

Hypothesis 4 (Price-earnings Ratio): In the Chinese stock markets, firms with low price-earnings ratios will be more affected by monetary policy changes than firms with high price-earnings ratios.

Finally we consider about Tobin's q. Tobin defines a so-called q ratio as the market value of firms divided by the replacement cost of capital. If q is high, the market value of firm is high so that firm can issue equity and get high price of equity. Thus more investment opportunities will exist because firms can buy relatively more goods with only a small issue of equity. Ehrmann and Fratzscher (2004) found firms with high Tobin's q are affected more by monetary policy because they may need to finance those investments and thus be financially constrained presently. By given this finding, we provide the fifth hypothesis as follows:

Hypothesis 5 (Tobin's q): In the Chinese stock markets, monetary policy changes will have a greater effect on firms with high Tobin's q ratios than on firms with low Tobin's q ratios.

In addition, one may think that Hypothesis 5 contradicts with Hypothesis 1 and 3 because firms with high market or high debt to total capital ratio may have a have q. However, Tobin's q of a Chinese firm is often calculated as $q = \frac{Market\ Value + Total\ Debt}{Total\ Assets}$. As we known, total assets is a summary of firm's capital and debt, q should depend on a mixed impact of firm's market value,

capital and debt. So it's hard to judge a firms has a high q only by observing firm has a high market value or debt to total capital ratio.

2.3 Methodology and Data

2.3.1 The CAR Analysis

As we have mentioned above, stock returns are primarily affected by the unexpected component of interest rate changes. We adopt an event study methodology to eliminate the impact of people's expectation for monetary policy. Event study methodology, which was first introduced by MacKinlay (1997), is typically utilized to measure the impact of a specific event on the value of a firm. In this chapter, we will measure the impact of an official loan rate announcement on the stock returns of listed firms. We follow the approach of Numata and Takeda (2010) to execute a CAR analysis. We calculate the CARs that are caused by unexpected changes in the stock market. In the subsequent cross-sectional analysis, we use CARs as the dependent variable and interest rate changes in each event period as the independent variable.

A total of 22 events (loan interest rate changes) occurred during the sample period, which extended from 1997 to 2010. We denote an event day as t_0, the initial date of an event window as t_1 and the final date of an event window as t_2. To assess the robustness of our results, we establish the four event windows of (t_1, t_2)=(0,1), (-1,1), (-2,2) and (-3,3). The estimation window is established as the 150 trading days prior to an event window. Sometimes a *k-1*-th or more previous events are including in the estimation window of the *k*-th event. In such cases, we made some adjustments as follow. We rejected event windows (-3,3) of those previous events from estimation window of the *k*-th event, and shifted the initial day of the estimation window to an earlier date to ensure that there are still 150 trading days in the estimation window. This coping can eliminate previous events' impacts and confirm that the CAR is only caused by the *k*-th event. As an example, an event at 2010.10.20 is included in the estimation window of the event at 2010.12.26. The event window (-3,3), which is from 2010.10.17 to 10.23 are taken out from the estimation window of the event at 2010.12.26.

A market model is used to measure the normal return of each firm. To determine the normal

return of firm *i* during the *k*-th event, the following simple market model can be created:

$$R_{i,k,t} = \alpha_{i,k} + \beta_{i,k} R_{m,k,t} + \varepsilon_{i,k,t} \qquad (2.1)$$

$$\varepsilon_{i,k,t} \sim i.i.d.\, N(0, \sigma^2_{\varepsilon_{i,k,t}})$$

where $R_{i,k,t}$ represents the daily stock return of firm *i* during the estimation window for the *k*-th event, $R_{m,k,t}$ represents the returns of the Shanghai Composite Index or the Shenzhen Composite Index. Parameters $\alpha_{i,k}$ and $\beta_{i,k}$ can readily be estimated with an OLS approach. As stated by MacKinlay (1997), the abnormal returns of a stock are equal to the actual ex post return of this stock over an event window less the normal return of this stock over the same event window. Using parameters estimated from Eq. (2.1), the abnormal return of firm *i* during the *k*-th event can be calculated as follows:

$$AR_{i,k,t} = R_{i,k,t} - \hat{\alpha}_{i,k} - \hat{\beta}_{i,k} R_{m,k,t} \qquad (2.2)$$

We define the CAR as the cumulative abnormal return of a sample from t_1 to t_2, where $t_1 \leq t_2$. The CAR of firm *i* during the *k*-th event may be expressed as follows:

$$CAR_{i,k} = \sum_{t=t_1}^{t_2} AR_{i,k,t} \qquad (2.3)$$

After CAR has been calculated, we utilize the J-statistic to test whether CAR is significantly different from 0. In other words, we should examine whether monetary policy shocks significantly affect stock returns. Given a null hypothesis H_0 that stipulates that $CAR = 0$, the J-statistic may be expressed as follows:

$$J = \frac{\overline{CAR}_k(t_1,t_2)}{\sqrt{\bar{\sigma}_k{}^2(t_1,t_2)}} \sim N(0,1) \qquad (2.4)$$

where $\overline{CAR}$ is the mean of the CARs of firms and $\bar{\sigma}^2(t_1,t_2)$ is the mean of the variance of these CARs. $\bar{\sigma}^2(t_1,t_2)$ may be calculated as follows:

$$\bar{\sigma}_k{}^2(t_1,t_2) = VAR[\overline{CAR}_k(t_1,t_2)] = 1/N^2 \sum_{i=1}^{N} \sigma_{i,k}{}^2(t_1,t_2) \qquad (2.5)$$

$$\sigma_{i,k}{}^2(t_1,t_2) = (t_2 - t_1 + 1)\sigma^2_{\varepsilon_{i,k,t}} \qquad (2.6)$$

The results for CARs and J-statistics are provided in the next section of this chapter.

2.3.2 The Cross-sectional Analysis

We perform a cross-sectional analysis to verify the hypotheses that we provided in section 2.2. In this analysis, for every monetary policy announcement, we use CAR as the dependent variable and changes in one-year loan rates as the independent variable. To measure the level of financial constraints that are faced by each firm, we employ the idea of using several proxies that was introduced by Ehrmann and Fratzscher (2004). In particular, the proxies for financial constraints that are utilized in this chapter include market value, cash flow to net income ratio, debt to total capital ratio, price-earnings ratio and Tobin's q. In general, we divide firms into three groups according to their position with respect to each variable. For example, we sort listed firms from small to large based on their market values and then divide firms into the low-market-value group, the medium-market-value group and the high-market-value group. To distinguish between typical and extreme situations, two categorizations are used in this chapter. A typical situation is denoted by a categorization in which the bottom third of firms represents the lowest 33% of market values, the middle third of firms represents the middle 33% of market values, and the top third represents the highest 33% of market values. By contrast, the extreme situation is denoted by a categorization in which the middle segment of firms lies between the 10% and 90% levels of market values denotes the extreme situation. The other four indicators are also examined using the same categorization methods. All these financial constraint indicators data are published in quarterly or annual reports of listed firms. We got the data from China Securities Market and Accounting Research Database. Table 2-1 provides some summary statistics of the 5 financial constraint indicators.

Table 2-1(a) Summary Statistics of Financial Constraint Indicators under the 33% - 66% Categorization Scheme (Full Period: 1997 - 2010)

Financial Constraint Indicator	Group	Mean	Std. Dev.	Minimum	Maximum
Market Value	Low	1175.05	662.04	29.73	3269.67
	Medium	2359.04	1312.42	1057.13	6951.56
	High	17718.97	88197.27	2087.64	2006550.26
Cash Flow to Net Income Ratio	Low	1.28	0.81	-11.69	3.03
	Medium	3.68	1.59	0.89	8.02
	High	21.20	75.88	1.80	1722.70
Debt to Total Capital Ratio	Low	0.32	0.22	0.00	0.77
	Medium	0.79	0.39	0.02	1.51
	High	2.78	9.07	0.18	273.72
Price-earnings Ratio	Low	22.66	8.69	1.23	46.00
	Medium	42.97	13.01	20.87	82.73
	High	246.34	484.46	39.04	8950.00
Tobin's q	Low	1.14	0.18	0.19	1.68
	Medium	1.48	0.32	1.06	2.31
	High	2.77	3.74	1.20	90.55

Note: The unit of Market Value is million Chinese Yuan.

Table 2-1(b) Summary Statistics of Financial Constraint Indicators under the 10% - 90% Categorization Scheme (Full Period: 1997 - 2010)

Financial Constraint Indicator	Group	Mean	Std. Dev.	Minimum	Maximum
Market Value	Low	806.40	435.00	29.73	1958.59
	Medium	2917.20	2670.00	440.98	22276.35
	High	47616.56	159000.00	4582.78	206550.26
Cash Flow to Net Income Ratio	Low	0.53	0.67	-11.69	1.21
	Medium	4.46	3.56	0.49	20.25
	High	50.91	133.77	4.46	1722.70
Debt to Total Capital Ratio	Low	0.15	0.10	0.00	0.34
	Medium	0.87	0.61	0.00	2.81
	High	5.82	16.05	0.45	273.72
Price-earnings Ratio	Low	16.06	6.11	1.23	28.94
	Medium	53.14	39.84	12.19	301.37
	High	543.38	614.44	85.48	8950.00
Tobin's q	Low	1.01	0.12	0.19	1.35
	Medium	1.56	0.55	0.98	4.30
	High	4.47	7.24	1.45	90.55

Note: The unit of Market Value is million Chinese Yuan.

By selecting event windows four times in our CAR analysis, we obtained four data sets of abnormal returns. Therefore, we perform 40 regressions ($2 \times 5 \times 4$ regressions) to obtain our empirical results. We also control for consumer price index (CPI), producer price index (PPI) and industrial production (IP) announcements in our model. The multivariate regression model can

be expressed as follows:

$$CAR_{i,k} = \alpha + \beta_1 \Delta i_k + \beta_2 \Delta i_k D_{i,k}^{medium} + \beta_3 \Delta i_k D_{i,k}^{high} + \tau_1 D_{i,k}^{medium} + \tau_2 D_{i,k}^{high} + \gamma D_k^{CPI} + \theta D_k^{IP} + \varepsilon_{i,k} \quad (2.7)$$

where $CAR_{i,k}$ is the cumulative abnormal return of firm *i* during the *k*-th event multiplied by 100. To make the parameters more informative, we expanded the CARs that calculated from Eq. (2.2) and (2.3) 100 times. In every *k*-th event, the CARs for each individual firm reflect responses to official loan interest rate changes, degrees of financial constraint, and announcements of CPI, PPI and IP. Δi_k is the official one-year loan rate change during the *k*-th event, and used to represent monetary policy. To test 5 hypotheses we given in Section 2.2, we include the interaction terms between medium financially constrained firms group, high financially constrained firms and interest rate changes, $D_{i,k}^{medium}$ and $D_{i,k}^{high}$. $D_{i,k}^{medium}$ and $D_{i,k}^{high}$ are dummy variables that indicate whether firm *i* belongs to the medium segment or high segment of firms during the period of the *k*-th event respectively. The values of $D_{i,k}^{medium}$ and $D_{i,k}^{high}$ are based on the three-group-categorizations we mentioned before, and being set equal to 1 if the firm belongs to the respective segment and 0 otherwise. The following two variables, D_k^{CPI} and D_k^{IP} are also dummy variables which we use to control macroeconomic condition. D_k^{CPI} takes a value of 1 if there is a CPI or PPI announcement within the (t_1, t_2)=(-3,3) event window that was defined in Section 2.3.1. D_k^{IP} takes a value of 1 if there is an IP announcement within this event window. If there are no CPI, PPI or IP announcements during this window, the aforementioned dummy variables will be set equal to 0. These two dummies are important aspects of the model equation. CPI, PPI and IP, which regularly be announced by State Statistics Bureau around dates of official rate change announcements, are easy to trigger abnormal returns. If we did not control for CPI, PPI and IP announcements during the examined event windows, it would be difficult to ensure that CARs are caused by unexpected components of interest rate change rather than the announcements of these macroeconomic indicators. The use of these two dummy variables can help us increase the accuracy of measuring the CARs that are caused by interest rate changes.

We understand that only the unexpected components of such CPI, PPI or IP announcements can give significant effects on stock returns. However, it's very hard to measure the "announcement surprise". We tried to look up some surveys and interviews about institutional investors' predictions on CPI, PPI and IP announcements. Only if their predictions are very close to National Bureau of Statistics's announcements, we set the dummy variables equal to 0, otherwise 1. However, their predictions always show big differences, sometimes inconsistent. Given the reason that it's impossible to measure the unexpected part of above announcements accurately, we follow Honda and Kuroki (2006) and construct the dummy variables as mentioned above.

α, β_1, β_2, β_3, τ_1, τ_2, γ and θ are parameters; and $\varepsilon_{i,k}$ is an error term. The parameters that we primarily wish to observe in the empirical results are β_1, β_2 and β_3. The parameter β_1 indicates the impact of interest rate changes on firms in the low segment of companies for a particular metric. Similarly, $\beta_1 + \beta_2$ denotes the impact of interest rate changes on the medium segment of companies for the metric in question, and $\beta_1 + \beta_3$ denotes the impact of interest rate changes on the high segment of companies for the metric in question. β_2 denotes the difference between the influence of interest rate changes on the low segment of firms and the influence of interest rate changes on the medium segment of firms. Analogously, β_3 denotes the difference between the influence of interest rate changes on the low segment of firms and the influence of interest rate changes on the high segment of firms. Importantly, the low or high segment designations refer to particular financial constraint indicators and do not necessarily imply either that firms in the low segment for an indicator have low financial constraints or that firms in the high segment for an indicator have high financial constraints.

The hypotheses from Section 2.2 should be verified using β_1, β_2 and β_3. For market value, we assume that interest rate changes should have greater effects on firms with low market value than on firms with high market values. In other words, the observation of $|\beta_1| > |\beta_1 + \beta_2| > |\beta_1 + \beta_3|$ in empirical results would support Hypothesis 1. Similarly, with respect to Hypothesis 2, observed results of $|\beta_1| > |\beta_1 + \beta_2| > |\beta_1 + \beta_3|$ would support our hypothesis by indicating that interest rate changes affect firms with low cash flow to net income ratios more than firms

with high cash flow to net income ratios. Hypothesis 3, which states that firms with low debt to total capital ratio will be more affected by interest rate changes than firms with high debt to total capital ratios, will be supported by empirical results indicating that $|\beta_1| > |\beta_1 + \beta_2| > |\beta_1 + \beta_3|$. With respect to Hypothesis 4, observations that $|\beta_1| > |\beta_1 + \beta_2| > |\beta_1 + \beta_3|$ would support the hypothesis that firms with low price-earnings ratios would be affected more by interest rate changes than firms with high price-earnings ratios. Hypothesis 5, which states that firms with high Tobin's q ratios would be more affected by interest rate changes than firms with low Tobin's q ratios, would be supported by empirical observations indicating that $|\beta_1| < |\beta_1 + \beta_2| < |\beta_1 + \beta_3|$. Parameter β_1 and the parameter combinations of $\beta_1 + \beta_2$ and $\beta_1 + \beta_3$ should all have negative signs because it is obvious that monetary policy is negatively related to stock returns.

2.3.3 Data Description

The CAR analysis in the event study methodology of this investigation uses listed firms' stock returns and daily data from the Shanghai Composite Index and the Shenzhen Composite Index during the period from January 1st, 1997 to December 31st, 2010. We choose this period because Chinese stock markets established price restrictions in December 16, 1996 that restrict stock prices to a maximum increase or decrease of 10% per day. These restrictions are an important policy consideration that would influence stock returns. We calculate CARs at each change in the official one-year loan rate. During the data sample period, official one-year loan rate was changed on 22 occasions[iii].

The cross-sectional analysis utilizes the results that we calculated in the CAR analysis, official changes in the one-year loan rate, firm-level financial constraint indicators, including market value, cash flow to net incomes ratio, debt to total capital ratio, price-earnings ratio and Tobin's q, the occurrence of a CPI or PPI announcement and the occurrence of an IP announcement. All of the data that we use in this chapter are presented below. Data regarding the Shanghai Composite Index and the Shenzhen Composite Index, the returns of individual firms and official loan rates are obtained from Beijing University's China Center for Economic

Research database. Financial constraint indicator data are obtained from quarterly or annual reports of each listed firm as mentioned before. Information regarding CPI, PPI and IP announcements is obtained from the National Bureau of Statistics of China.

The number of sample observations in each regression of the cross-sectional analysis is approximately 26,000. The number of sample observations varies slightly for each regression. However, this variability does not affect the empirical results of the study because the regressions are independent from each other. A summary of certain data from this study is provided in Table 2-2.

Table 2-2 A Summary of Interest Rate Changes and Announcements of CPI, PPI and IP

Event date	Interest rate change (six-months – one-year)	Announcement of CPI or PPI	Announcement of IP
1997.10.23	-1.44%	0	1
1998.03.25	-0.72%	1	0
1998.07.01	-0.99%	0	0
1998.12.07	-0.54%	0	0
1999.06.10	-0.54%	1	0
2002.02.21	-0.54%	0	0
2004.10.29	0.27%	0	0
2006.04.28	0.27%	0	0
2006.08.19	0.27%	0	1
2007.03.18	0.27%	1	1
2007.05.19	0.18%	0	1
2007.07.21	0.27%	1	1
2007.08.22	0.18%	0	0
2007.09.15	0.27%	1	1
2007.12.21	0.18%	0	0
2008.09.16	-0.27%	1	1
2008.10.09	-0.27%	0	0
2008.10.30	-0.27%	0	0
2008.11.27	-1.08%	0	0
2008.12.23	-0.27%	0	0
2010.10.20	0.25%	1	0
2010.12.26	0.25%	1	1

According to Table 2-2, there are 22 official interest rate changes in our sample, which include 11 instances of interest rate tightening and 11 instances of interest rate easing. We find that official interest rates demonstrate cyclical changes during the examined period and that trends existed in official interest rate changes. In particular, after 6 consecutive occurrences of

interest rate easing, the interest rate was tightened 9 consecutive times; subsequently, there were 5 consecutive decreases in the interest rate, which were followed by 2 consecutive increases in this rate. Official rates most frequently change by 0.54%, 0.27%, 0.18% or 0.25% in either the positive or negative directions. We use short-term interest rates in the model equation for two reasons. First, short-term interest rates and long-term interest rates evince essentially the same patterns of change. Moreover, in China, long-term interest rates are determined from short-term interest rates. The official six-month to one-year interest rate serves as the benchmark interest rate.

Table 2-2 also indicates the values of the two dummy variables that we use in our cross-sectional analysis. As mentioned in section 2.3.2, these dummy variables are set to a value of 1 to indicate appropriate announcements during the (t_1, t_2) = (-3,3) period and otherwise take a value of 0.

2.4 Empirical Results

2.4.1 Results of CAR Analysis

Empirical results for $\overline{CAR}$ values and J-statistic values are provided in Table 2-3. $\overline{CAR}$ is the mean of the CARs for each firm *i* during an event. The J-statistic is used to confirm whether there are abnormal returns that are caused by the unexpected component of interest rate changes.

Table 2-3 The Results of the CAR Analysis (Average Value in Each Monetary Policy Changes)

Event date	Rate Change	$\overline{CAR}(0,1)$ (J-statistic)	$\overline{CAR}(-1,1)$ (J-statistic)	$\overline{CAR}(-2,2)$ (J-statistic)	$\overline{CAR}(-3,3)$ (J-statistic)
1997.10.23	Easing	0.092***	0.226***	0.381***	0.547***
		(5.67)	(5.22)	(5.16)	(5.87)
1998.03.25	Easing	0.026***	0.046***	0.080***	0.105***
		(3.39)	(3.93)	(3.92)	(3.55)
1998.07.01	Easing	0.008	0.017*	0.024*	0.032*
		(0.99)	(1.78)	(1.69)	(1.67)
1998.12.07	Easing	0.012***	0.043***	0.074***	0.098***
		(3.69)	(3.54)	(3.58)	(3.43)
1999.06.10	Easing	0.013***	0.029***	0.057***	0.053***
		(4.88)	(3.87)	(4.60)	(3.08)
2002.02.21	Easing	0.005***	0.008***	0.011***	0.010***
		(9.37)	(8.54)	(9.99)	(7.05)
2004.10.29	Tightening	0.003***	-0.001	0.015***	0.022***
		(3.69)	(-0.98)	(10.08)	(12.69)
2006.04.28	Tightening	-0.006***	-0.008***	0.004	0.013***
		(-7.04)	(-4.25)	(1.49)	(4.72)
2006.08.19	Tightening	-0.001***	-0.001	-0.001	-0.002*
		(-2.59)	(-0.43)	(-0.57)	(-1.51)
2007.03.18	Tightening	0.002	0.015*	0.060***	0.100***
		(0.66)	(1.93)	(4.90)	(5.83)
2007.05.19	Tightening	0.034***	0.083***	0.136***	0.166***
		(9.21)	(7.36)	(7.22)	(6.97)
2007.07.21	Tightening	0.033***	0.083***	0.116***	0.161***
		(5.53)	(6.07)	(5.87)	(5.79)
2007.08.22	Tightening	0.017***	0.051***	0.073***	0.109***
		(4.39)	(4.31)	(3.32)	(4.11)
2007.09.15	Tightening	0.021***	0.058***	0.089***	0.089***
		(5.84)	(5.00)	(5.24)	(4.28)
2007.12.21	Tightening	-0.001	0.012*	0.041***	0.063***
		(-0.18)	(1.78)	(3.63)	(4.22)
2008.09.16	Easing	0.016***	0.031***	0.042***	0.059***
		(8.29)	(5.91)	(4.75)	(4.21)
2008.10.09	Easing	0.014***	0.012**	0.020**	0.041***
		(5.24)	(2.06)	(2.04)	(2.99)
2008.10.30	Easing	0.006***	-0.000	0.008	0.024
		(2.96)	(-0.015)	(0.66)	(1.47)
2008.11.27	Easing	0.019***	0.042***	0.091***	0.138***
		(6.16)	(4.80)	(6.41)	(7.03)
2008.12.23	Easing	0.016***	0.075***	0.118***	0.157***
		(3.92)	(4.82)	(5.67)	(5.93)
2010.10.20	Tightening	0.036***	0.075***	0.123***	0.109***
		(9.44)	(6.76)	(7.30)	(4.28)
2010.12.26	Tightening	0.043***	0.110***	0.200***	0.260***
		(5.70)	(6.15)	(6.73)	(7.71)

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of J-statistics are enclosed in parentheses.

The vast majority of the $\overline{CAR}$ values are significantly different from 0, indicating that

abnormal returns actually occurred during each interest rate change. We observe that in Table 2-3, the absolute values of $\overline{CAR}$ tend to decrease as the examined time window shrinks; thus, $\overline{CAR}(-3,3)$, $\overline{CAR}(-2,2)$, $\overline{CAR}(-1,1)$ and $\overline{CAR}(0,1)$ are typically decreasing in magnitude. This phenomenon indicates that investors may expect official rate changes 1 to 3 days before these changes actually occur. Investor expectations become more accurate as the day of an interest rate change approaches. Therefore, the impact of an interest rate shock will become smaller as the examined time window becomes closer to an event day.

2.4.2 Results of Cross-sectional Analysis

Considering that dependent variable CAR is calculated from 22 events, a period specific heteroskedasticity may occur in cross-sectional analysis. To correct heteroskedasticity, we use a feasible GLS method[iv] to estimate parameters. Results are shown in the following subsections.

2.4.2.1 Results from the 33% - 66% Categorization

Table 2-4 presents the results of the cross-sectional analysis under the 33% - 66% categorization, which we believe is representative of a typical situation. The signs of the measured parameters are negative, which indicates that interest rate changes and stock returns are inversely related. In theory, if monetary policy tightens, stock prices will decline. By contrast, if monetary policy is eased, stock prices will rise. The vast majority of the observed results are significant. Using 5 indicators to measure the degrees of firms' financial constraints, we can confirm that differently financial constrained firms are significantly affected in distinct ways by interest rate changes.

Table 2-4(a) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 1: Market Value)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-0.579*	-0.486***	-0.108	-1.849***
(High Constrained)	(0.360)	(0.137)	(0.269)	(0.305)
$\beta_1 + \beta_2$	-0.630**	-0.698***	-0.160	-1.382***
(Medium Constrained)	(0.303)	(0.122)	(0.111)	(0.189)
$\beta_1 + \beta_3$	-0.426**	-0.342**	-0.033	-0.899***
(Low Constrained)	(0.219)	(0.148)	(0.200)	(0.198)
α	-0.163	-0.002	0.354***	0.795***
	(0.258)	(0.095)	(0.135)	(0.151)
β_2	-0.050	-0.211	-0.052	0.466
	(0.182)	(0.167)	(0.287)	(0.356)
β_3	0.153	0.145	0.075	0.949***
	(0.289)	(0.223)	(0.331)	(0.365)
τ_1	-0.087	-0.194**	-0.102	-0.744***
	(0.082)	(0.083)	(0.140)	(0.169)
τ_2	-0.105	0.010	0.545***	-0.758***
	(0.161)	(0.135)	(0.157)	(0.164)
γ	0.607	0.487***	0.853***	-0.909***
	(0.449)	(0.164)	(0.117)	(0.116)
θ	0.667	0.784***	0.728***	1.919***
	(0.427)	(0.120)	(0.110)	(0.110)
Adj-R^2	0.023	0.009	0.006	0.015

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

First, our results indicate that firm size appears to be an important factor for determining the transmission of monetary policy in the stock market. In particular, we obtained the finding that is consistent with Hypothesis 1. Most large firms in the Chinese stock market are state-owned or state-holding firms. Thus, it is easy for these firms to borrow an enormous amount of money from banks because these firms enjoy state backing and because the Chinese government is typically the owner of Chinese banks. Hence large firms are always affected least than other firms. However, compared with financing externally, small firms prefer to finance internally. Small firms, most of which are private enterprises, find them are very hard to borrow money from bank, even in an easy monetary policy condition. Huang (2003) argued that financial institutions in China have a crimination of ownership that makes private firms difficult to finance. Such they are affected more by monetary policy changes.

Table 2-4(b) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 2: Cash Flow to Net Income Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-0.618***	-0.597*	-1.383***	-1.201***
(High Constrained)	(0.073)	(0.381)	(0.378)	(0.185)
$\beta_1 + \beta_2$	-0.388***	-0.528	-1.162***	-0.888***
(Medium Constrained)	(0.065)	(0.465)	(0.319)	(0.168)
$\beta_1 + \beta_3$	-0.121	-0.434	-0.699***	-0.886***
(Low Constrained)	(0.152)	(0.399)	(0.130)	(0.179)
α	-0.192***	0.012	-0.118	0.422***
	(0.041)	(0.227)	(0.203)	(0.095)
β_2	0.230**	0.070	0.221	0.313
	(0.094)	(0.183)	(0.486)	(0.247)
β_3	0.496***	0.163	0.684*	0.315
	(0.153)	(0.283)	(0.385)	(0.256)
τ_1	0.025	-0.010	-0.367	-0.203*
	(0.043)	(0.086)	(0.249)	(0.119)
τ_2	0.0170*	-0.056	-0.013	-0.206*
	(0.097)	(0.156)	(0.204)	(0.124)
γ	0.613***	0.303	1.233***	-1.540***
	(0.051)	(0.794)	(0.214)	(0.114)
θ	0.522***	0.734	1.870***	1.928***
	(0.060)	(0.757)	(0.178)	(0.111)
Adj-R^2	0.019	0.006	0.010	0.016

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Second, the study results indicate that firms with low cash flow to net income ratios experience significantly stronger effects from monetary policy shocks than firms in medium or high levels of this ratio. Given the reason that firms with high level of cash flow can finance internally in a tightening credit condition, sometimes they aren't affected significantly by monetary policy changes.

Table 2-4(c) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 3: Debt to Total Capital Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-0.504**	-0.871***	-1.045**	-1.029***
(High Constrained)	(0.266)	(0.355)	(0.548)	(0.208)
$\beta_1 + \beta_2$	-0.436**	-0.529	-0.853*	-0.168
(Medium Constrained)	(0.221)	(0.369)	(0.519)	(0.456)
$\beta_1 + \beta_3$	-0.434**	-0.845***	-1.033**	-0.733***
(Low Constrained)	(0.217)	(0.327)	(0.487)	(0.185)
α	-0.236	-0.158	-0.441	0.508***
	(0.176)	(0.140)	(0.368)	(0.108)
β_2	0.067	0.342**	0.191	0.861*
	(0.149)	(0.178)	(0.208)	(0.497)
β_3	0.070	0.025	0.012	0.296
	(0.126)	(0.193)	(0.339)	(0.267)
τ_1	0.042	0.005	-0.093	1.345***
	(0.071)	(0.114)	(0.121)	(0.294)
τ_2	-0.143*	-0.216**	-0.134	-0.810***
	(0.075)	(0.115)	(0.218)	(0.115)
γ	0.967***	0.266	0.674	0.107
	(0.246)	(0.374)	(0.826)	(0.167)
θ	0.858***	1.516***	2.981***	1.871***
	(0.360)	(0.622)	(0.746)	(0.144)
Adj-R^2	0.046	0.029	0.054	0.021

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Third, the results for the debt to total capital ratio are consistent the relationship that was conjectured in Hypothesis 3. In particular, by a significant margin, our results indicate that firms with low debt to total capital ratios experience the strongest effects from monetary policy shocks than other firms. Although we have discussed in the previous subsection, the results may out of people's common knowledge. Following Ehrmann and Fratzscher (2004), we explain this result in the following manner. Firms with a high level of debt may not actually be more financially constrained than other firms. Instead, firms may have a high this ratio because investors trust these companies and would like to continue to lend money to these firms. By contrast, firms with low debt to total capital ratios may currently be financially constrained in ways that render it relatively difficult to borrow additional capital. Specifically, firms may hold low levels of debt because investors do not wish to lend these firms very much money rather than because these

firms do not wish to borrow much money. Similar results that support this viewpoint have been provided by Dedola and Lippi (2005) and Peersman and Smets (2005).

Table 2-4(d) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 4: Price-earnings Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-1.743***	-0.958***	-1.102***	-1.685***
(High Constrained)	(0.211)	(0.334)	(0.263)	(0.402)
$\beta_1 + \beta_2$	-1.354***	-0.568***	-0.507***	-0.657**
(Medium Constrained)	(0.183)	(0.132)	(0.107)	(0.328)
$\beta_1 + \beta_3$	-1.071***	-0.543***	-0.534***	-0.772***
(Low Constrained)	(0.113)	(0.131)	(0.084)	(0.177)
α	-1.449***	-0.481***	0.349***	0.542***
	(0.107)	(0.152)	(0.105)	(0.188)
β_2	0.389	0.390	0.595**	01.028**
	(0.277)	(0.355)	(0.280)	(0.514)
β_3	0.672***	0.415	0.568**	0.913**
	(0.237)	(0.354)	(0.270)	(0.432)
τ_1	1.155***	0.628***	-0.298**	0.921***
	(0.132)	(0.159)	(0.118)	(0.244)
τ_2	0.638***	0.614***	-0.755**	-0.582***
	(0.113)	(0.159)	(0.113)	(0.193)
γ	1.507***	0.144	0.346***	-1.414***
	(0.094)	(0.118)	(0.103)	(0.161)
θ	1.418***	0.870***	1.254***	1.966***
	(0.088)	(0.107)	(0.083)	(0.150)
Adj-R^2	0.033	0.005	0.018	0.013

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Fourth, with respect to price-earnings ratios, we found that the effects of monetary policy shocks on firms with low price-earnings ratios are significantly stronger than the effects of these shocks on other firms. Sometimes monetary policy's effects on firms with low price-earnings are twice than firms with high this ratio. Effects between medium and high group seem not that distinct. This finding is consistent with Hypothesis 4.

Table 2-4(e) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 5: Tobin's q)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-0.361*	-0.495	-0.274*	-0.437***
(Low Constrained)	(0.235)	(0.124)	(0.151)	(0.169)
$\beta_1 + \beta_2$	-0.510*	-0.383***	-0.400*	-0.777***
(Medium Constrained)	(0.319)	(0.115)	(0.260)	(0.197)
$\beta_1 + \beta_3$	-0.675**	-0.759***	-0.836***	-2.113***
(High Constrained)	(0.295)	(0.118)	(0.175)	(0.222)
α	-0.248	-0.088	0.026	0.064
	(0.228)	(0.068)	(0.085)	(0.095)
β_2	-0.149	0.111	-0.126	-0.340
	(0.176)	(0.167)	(0.289)	(0.256)
β_3	-0.314*	-0.265*	-0.563**	-1.676***
	(0.179)	(0.169)	(0.225)	(0.274)
τ_1	0.249**	0.137*	0.410***	0.363***
	(0.100)	(0.088)	(0.149)	(0.124)
τ_2	-0.061	0.001	0.033	0.027
	(0.100)	(0.087)	(0.110)	(0.131)
γ	0.763	0.465***	0.118	-1.489***
	(0.519)	(0.093)	(0.154)	(0.123)
θ	0.558	0.525***	1.087***	1.882***
	(0.467)	(0.086)	(0.116)	(0.122)
Adj-R^2	0.021	0.006	0.006	0.018

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Finally, the study results indicate that on the whole, changes in Chinese monetary policies affect firms with high Tobin's q ratios more strongly by than other firms. This result is consistent with Hypothesis 5. We believe that the reason for our findings is that a high Tobin's q indicates the presence of plentiful investment opportunities for a firm. However, a firm will require high quantities of external funds to finance these investments. Thus, firms with high Tobin's q values may be regarded as financially constrained organizations. These firms will demonstrate a very strong response to monetary policy changes.

2.4.2.2 Results from the 10% - 90% Categorization

The results from the 10% - 90% categorization are presented in Table 2-5. We believe that this categorization can represent an extreme situation. In general, the results from the 10% - 90% categorization are similar to the results from the 33% - 66% categorization in that monetary

policy shocks can significantly affect stock returns in ways that differ for distinct levels of financially constrained firms. However, if we consider the 5 indicators of this study individually, we can identify certain inconsistencies between the findings from the 10% - 90% categorization and the findings from the 33% - 66% categorization.

Table 2-5(a) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 1: Market Value)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-0.778**	-0.588***	-0.315	-2.677***
(High Constrained)	(0.385)	(0.210)	(1.713)	(0.557)
$\beta_1 + \beta_2$	-0.536**	-0.254	-0.159	-1.220***
(Medium Constrained)	(0.277)	(0.247)	(0.291)	(0.129)
$\beta_1 + \beta_3$	-0.391*	-0.408**	0.376	-0.754***
(Low Constrained)	(0.211)	(0.172)	(0.609)	(0.241)
α	-0.138	0.034	0.399	1.272***
	(0.287)	(0.109)	(0.983)	(0.273)
β_2	0.242	0.334	0.156	1.457***
	(0.214)	(0.312)	(1.543)	(0.570)
β_3	0.388	0.180	0.690	1.924***
	(0.382)	(0.269)	(1.883)	(0.605)
τ_1	-0.119	0.038	0.026	-1.151***
	(0.124)	(0.188)	(0.884)	(0.275)
τ_2	-0.061	-0.001	0.336	-1.348***
	(0.224)	(0.135)	(1.086)	(0.287)
γ	0.601	0.806**	0.890*	-0.917***
	(0.457)	(0.411)	(0.563)	(0.127)
θ	0.673*	0.423*	0.774	1.956***
	(0.429)	(0.259)	(0.547)	(0.113)
Adj-R^2	0.023	0.007	0.005	0.015

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

First, an examination of market value reveals that the results from the 10% - 90% categorization are the same as the results from the 33% - 66% categorization. Both sets of results are consistent with Hypothesis 1 and imply firms with low market values are affected more by monetary policy changes.

Table 2-5(b) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 2: Cash Flow to Net Income Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-0.642***	-0.702***	-1.314**	-1.248***
(High Constrained)	(0.136)	(0.226)	(0.615)	(0.375)
$\beta_1 + \beta_2$	-0.442***	-0.495***	-0.189	-0.939***
(Medium Constrained)	(0.042)	(0.073)	(0.639)	(0.114)
$\beta_1 + \beta_3$	-0.449***	-0.373**	-0.520**	-1.558*
(Low Constrained)	(0.118)	(0.147)	(0.239)	(0.813)
α	-0.286***	-0.180*	-0.697**	0.394**
	(0.060)	(0.107)	(0.313)	(0.168)
β_2	0.199	0.207	1.125	0.309
	(0.142)	(0.236)	(0.930)	(0.389)
β_3	0.192	0.329	0.794	-0.311
	(0.180)	(0.271)	(0.668)	(0.905)
τ_1	0.072	0.184*	0.899*	-0.063
	(0.061)	(0.109)	(0.538)	(0.169)
τ_2	0.155*	0.364***	0.724**	1.010***
	(0.081)	(0.114)	(0.331)	(0.346)
γ	0.659***	0.334***	2.634**	-1.684***
	(0.042)	(0.101)	(1.101)	(0.116)
θ	0.589***	0.738***	1.003	1.807***
	(0.040)	(0.084)	(0.680)	(0.119)
Adj-R^2	0.021	0.008	0.016	0.020

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Second, similarly to the results from the 33% - 66% categorization, the results from the 10% - 90% categorization indicated that firms with extreme low cash flow to net income ratios experience most strong effects from monetary policy shocks than firms with extremely high or medium levels of cash flow to net income ratios. This finding is consistent with Hypothesis 2 and indicates that firms with extreme low cash flow to net income ratios are obviously financially constrained seriously than other firms.

Table 2-5(c) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 3: Debt to Total Capital Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Rejected				
β_1	-0.318	-0.943***	-0.897***	-0.820**
(High Constrained)	(0.287)	(0.361)	(0.272)	(0.391)
$\beta_1 + \beta_2$	-0.497**	-0.680**	-0.870***	-0.722***
(Medium Constrained)	(0.213)	(0.342)	(0.154)	(0.149)
$\beta_1 + \beta_3$	-0.547**	-0.910***	-1.009***	-1.318***
(Low Constrained)	(0.305)	(0.342)	(0.275)	(0.411)
α	-0.183	-0.062	-0.136	0.531***
	(0.165)	(0.139)	(0.137)	(0.187)
β_2	-0.179	0.263	0.027	0.098
	(0.169)	(0.240)	(0.302)	(0.415)
β_3	-0.229	0.033	-0.112	-0.498
	(0.227)	(0.279)	(0.383)	(0.554)
τ_1	-0.100	-0.153	-0.261*	-0.181
	(0.076)	(0.109)	(0.153)	(0.196)
τ_2	-0.072	-0.143	-0.100	-0.757***
	(0.109)	(0.122)	(0.193)	(0.216)
γ	1.173***	0.201	0.573***	0.070
	(0.290)	(0.363)	(0.133)	(0.186)
θ	0.823**	1.517**	2.843***	2.164***
	(0.361)	(0.622)	(0.134)	(0.158)
Adj-R^2	0.055	0.028	0.051	0.013

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Third, with respect to debt to total capital ratio, the results from the 10% - 90% categorization differ somewhat from the results from the 33% - 66% categorization. Firms who borrowed extreme amount of money are more sensitive to interest rate. We also found that sometimes firms in the medium debt to total capital group are less affected by monetary policy changes than firms with either extremely high or extremely low this ratio. This result may illustrate that firms with extreme debt to total capital ratio are more financially constrained than firms with typical this ratio.

Table 2-5(d) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 4: Price-earnings Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-3.110***	-2.398**	-1.475***	-2.276***
(High Constrained)	(0.537)	(0.570)	(0.352)	(0.633)
$\beta_1 + \beta_2$	-1.203***	-0.536***	-0.670***	-1.298***
(Medium Constrained)	(0.195)	(0.125)	(0.096)	(0.218)
$\beta_1 + \beta_3$	-0.991***	-0.434*	-0.224*	-0.062
(Low Constrained)	(0.195)	(0.250)	(0.130)	(0.335)
α	-2.174***	-1.272***	-0.121	-0.428
	(0.291)	(0.268)	(0.178)	(0.325)
β_2	1.908***	1.862***	0.805**	0.978
	(0.589)	(0.582)	(0.363)	(0.667)
β_3	2.119***	1.964***	1.252***	2.214***
	(0.547)	(0.623)	(0.375)	(0.722)
τ_1	1.443***	1.410***	0.018	0.986***
	(0.286)	(0.270)	(0.184)	(0.342)
τ_2	1.157***	1.374***	-0.278	0.467
	(0.241)	(0.297)	(0.192)	(0.380)
γ	1.807***	0.129	0.377***	-1.476***
	(0.378)	(0.133)	(0.097)	(0.189)
θ	1.701***	0.863***	1.494***	2.547***
	(0.258)	(0.110)	(0.090)	(0.184)
Adj-R^2	0.044	0.006	0.017	0.013

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Fourth, the results for price-earnings ratio from the 10% - 90% categorization are consistent with our hypothesis. Monetary policy changes exert fabulously more effects on firms with extremely low price-earnings ratio.

Table 2-5(e) The Effects of Monetary Policy on Firms' CARs by Financially Constrained Indicators (Hypothesis 5: Tobin's q)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
Hypothesis Not Rejected				
β_1	-0.520***	-0.891***	-0.825***	-0.762***
(Low Constrained)	(0.111)	(0.167)	(0.242)	(0.286)
$\beta_1 + \beta_2$	-0.337***	-0.473***	-0.026	-0.929***
(Medium Constrained)	(0.119)	(0.078)	(0.306)	(0.124)
$\beta_1 + \beta_3$	-0.703***	-0.942***	-1.178***	-2.333***
(High Constrained)	(0.137)	(0.201)	(0.313)	(0.385)
α	-0.313***	-0.148	-0.012	-0.041
	(0.065)	(0.089)	(0.149)	(0.143)
β_2	0.183	0.418**	0.799**	-0.167
	(0.144)	(0.181)	(0.317)	(0.308)
β_3	-0.183	-0.051	-0.353	-1.572***
	(0.167)	(0.259)	(0.368)	(0.478)
τ_1	0.274***	0.112	0.495***	0.242*
	(0.084)	(0.094)	(0.188)	(0.147)
τ_2	-0.029	0.001	0.107	0.353
	(0.077)	(0.131)	(0.175)	(0.230)
γ	0.814***	0.443***	-0.145	-1.547***
	(0.111)	(0.081)	(0.158)	(0.116)
θ	0.472***	0.584***	1.030***	1.993***
	(0.088)	(0.081)	(0.206)	(0.116)
Adj-R^2	0.020	0.006	0.005	0.018

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Parameters are estimated by using FGLS method. Values of White standard errors are enclosed in parentheses.

Finally, the results from the 10%-90% categorization reveal that a firm with an extremely high Tobin's q value is significantly more strongly affected by monetary policy changes than other firms. This result is consistent with the findings from the 33%-66% categorization. Sometimes firms with extreme low Tobin's q value seem be affected more by monetary policy changes than firms with medium this value. The reason may be that firms with extreme low value of their assets (small q) will find them harder and receive more restrictions to raise external funds. Thus they are affected more than firms in medium group. Comprehensive the two categorizations, we may conclude that firms with high Tobin's q are more financially constrained and will be affected more in monetary policy changes. Overall, the results are consistent with Hypothesis 5.

2.5 Findings

We have analyzed the relationship between stock returns and monetary policy changes in the Chinese stock markets during the 1997 to 2010 time period. First, using CAR analysis, we found that stock returns in the Chinese stock markets are significantly affected by monetary policy shocks, which refer to the unexpected components of interest rate changes that have been announced by the People's Bank of China. We also confirm that as the date of an interest rate change draws nearer, investor expectations of these changes become more accurate.

Second, from the results of a cross-sectional analysis, we have found that monetary policy shifts affect the stock returns of individual firms in a strongly heterogeneous fashion that reflects the different degrees of financial constraints that firms may face. Using five indicators to measure financial constraint, we found that in general, relative to firms with low levels of financial constraints, firms that are financially constrained demonstrate a significantly greater response to monetary policy shocks. However, the effects of financial constraints on monetary policy impact are sometimes not linear. As mentioned in section 2.4 of this chapter, reason for this phenomenon may be among other considerations. The results of this study provide novel findings regarding the Chinese stock markets.

On the whole, we found that although monetary policy shocks affect firms' stock returns, these shocks are transmitted differently to different firms. The asymmetric responses of individual firms to monetary policy shocks are caused by the degrees to which these firms face financial constraints in the Chinese capital markets.

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[i] See Laurence, Cai and Qian (1997), Song, Liu and Romilly (1998) and Lee and Rui (2000).

[ii] Honda and Kuroki (2006) used the three-month Euro-Yen futures rate to capture the surprise component of a change in the target interest rate.

[iii] See Table 2-2 in Section 2.3.

[iv] The feasible GLS procedure is doing as follow. Assume that

$$\mathrm{Var}\left(\hat{\varepsilon}_{i,k}\right) = \sigma^2 \exp\left(\delta_0 + \delta_1 \Delta i_k + \delta_2 D_{i,k}^{medium} + \delta_3 D_{i,k}^{high} + \delta_4 D_k^{CPI} + \delta_5 D_k^{IP}\right).$$

Then we run the regression of Eq. (2.7) and obtain the residuals, $\hat{\varepsilon}_{i,k}$. Create $\log(\hat{\varepsilon}^2{}_{i,k})$ and run the regression on independent variables in Eq. (2.7), we get the estimation of δ_0, δ_1, …, δ_5. Make $\hat{h}_{i,t} = \exp(\hat{\delta}_0 + \hat{\delta}_1 \Delta i_k + \hat{\delta}_2 D_{i,k}^{medium} + \hat{\delta}_3 D_{i,k}^{high} + \hat{\delta}_4 D_k^{CPI} + \hat{\delta}_5 D_k^{IP})$. We estimate Eq. (2.7) by using weights $1/\hat{h}_{i,t}$. Heteroskedasticity can be corrected.

Chapter 3

Monetary Policy's Effects on the Stock Returns between State-owned and Private Enterprises

3.1 Overview

Many researchers investigated the issue that monetary policy shocks have some negative effects on stock returns. Bernanke and Blinder (1992) initially adopted U.S. federal funds rate changes as a tool to measure monetary policy when investigate monetary policy's effects on stock market. Furthermore, Bernanke and Kuttner (2005) found unanticipated 100 basis point cut in such rate would increase stock return in U.S. market by 4%.

Firm's financing capacity perform a role in monetary policy's effects on stock returns through the so-called credit channel of monetary policy transmission. Interest rates would be raised in a tightening monetary policy. Firms' accessibility to bank loans and their balance sheets are weakened by such a raising of interest rates. Therefore, the supply of their goods and investors' evaluation on them would be poorly effected. Such effects will be reflected in their stock prices. Ehrmann and Fratzscher (2004) focused on firms' financial constraints and concluded that monetary policy shocks affect financially constrained firms seriously by using data of U. S. market. A similar conclusion also be found by Basistha and Kurov (2008). Liu (2014) investigated Chinese stock market and found it's similar to the U.S. that financially constrained firms in China be affected more by monetary policy shocks.

However, a very important difference between China and developed countries is neglected when researching the relationship between monetary policy and stock price. Both Chinese economy and stock market has a large proportion of state-owned enterprises (SOEs) while such proportion is small in developed countries. What's more, almost all the banks in China are belonging to government that makes SOEs much easier to finance for they both have state background. In 2008, bank loans to private firms account for less than 15% of the total.[i] Cull and

Xu (2003) argued that banks strongly encouraged by local officials to extend "stabilization loans" to SOEs. Firth, Lin, Liu and Wong (2009) found that state background helps firms obtain bank loans and this suggests that political connections play a role in gaining access to bank finance. Liu (2012) argued that banks tend to loan SOEs makes a tension in private firm's capital chain. Jarreau and Poncet (2014) indicated that state-owned banks in China seems taking discriminatory lending policies against private firms. Banks have higher constraints for private firms but favor SOEs.

The above evidences indicate that SOEs access to funds much easier than private firms. As we mentioned before, firms who are lack of financing capacity would found them financially constrained. Those firms are affected more by monetary policy changes. We reasonably hypothesize that monetary policy's effects on private firms are more serious than on SOEs in Chinese market. Our empirical analysis results support this hypothesis. We also found that when a firm is private and financially constrained, it will be affected most than any other type of firms. The main hypothesis in the previous chapter that financially constrained firms are affected more by monetary policy changes is also confirmed in this chapter.

We do the contribution that we first analyzed monetary policy change's asymmetric effects on stock price between SOEs and private firms in China. We hope the research will help people understand stock markets with Chinese special characteristics.

The remainder of this chapter is organized as follows. In section 3.2, we introduce the SOEs with Chinese characteristics. In section 3.3, we perform the regression analysis and describe the data. In section 3.4, we provide the empirical results. In section 3.5, we conclude the chapter.

3.2 State-owned Enterprises in China

Since the economic reform and opening up, China has experienced tremendous changes that initiated the transition from a command (planned) to a market economy and has promoted economic growth with extreme speed. Privatizing SOEs is a very important step in reform. The privatization of SOEs began in 1980; private firms were not allowed to exist before this time. The year 1993 is seen as a watershed year in which the Chinese government initiated a shareholding

program. At that time, the central government of China began to restructure the ownership of SOEs to improve their productivity and efficiency. SOEs are required to obey the rules of the market economic system. In response, the Chinese government also emphasized central banking system, financial and fiscal system and exchange and trade system reforms.

The Chinese stock market has played a crucial role in transforming SOEs, encouraging non-state capital investments in them. Some SOEs are privatized, but others remain strongly controlled by the government. After 20 years of development, private firms have grown and expanded from small to large, becoming an important part of the national economy. However, SOE reform is a gradual process. In the Chinese stock market, compared with SOEs, private firms are at a disadvantage in not only number but also other features.

According to the China Stock Market Accounting Research database, by the end of 2010, 1035 firms were defined as SOEs in the Chinese stock market, and 1068 firms were private. In the last chapter, we used 5 indexes to measure the degree of firms' financial constraints. The following diagrams show the differences in the 5 indexes between SOEs and private firms.

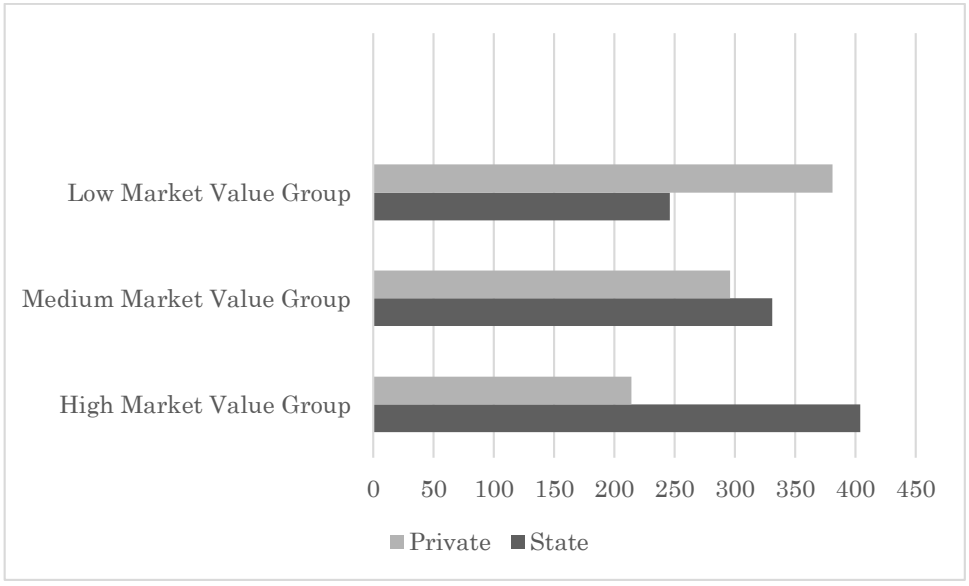

Figure 3-1 Numbers of SOEs and Private Firms by Market Value in 2010

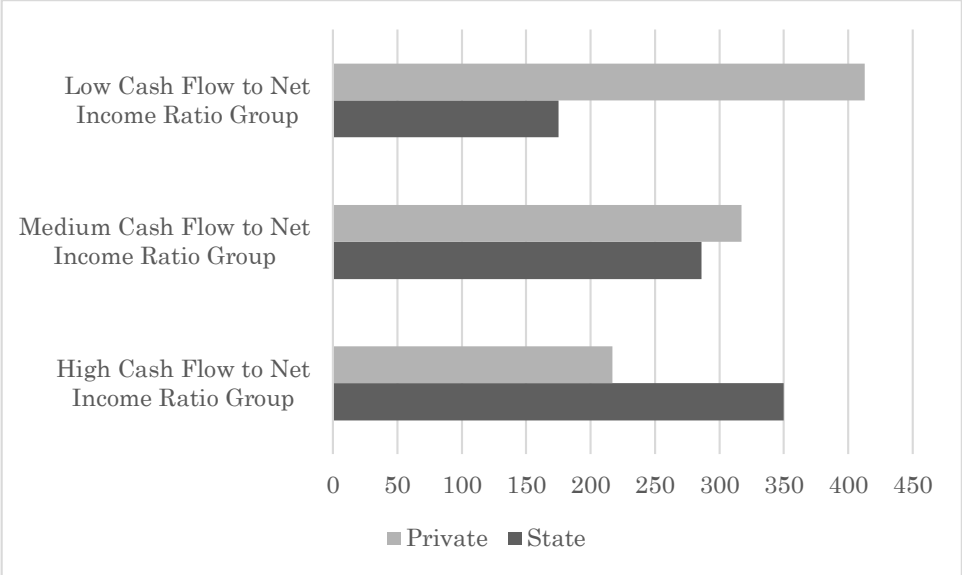

Figure 3-2 Numbers of SOEs and Private Firms by Cash Flow to Net Income Ratio in 2010

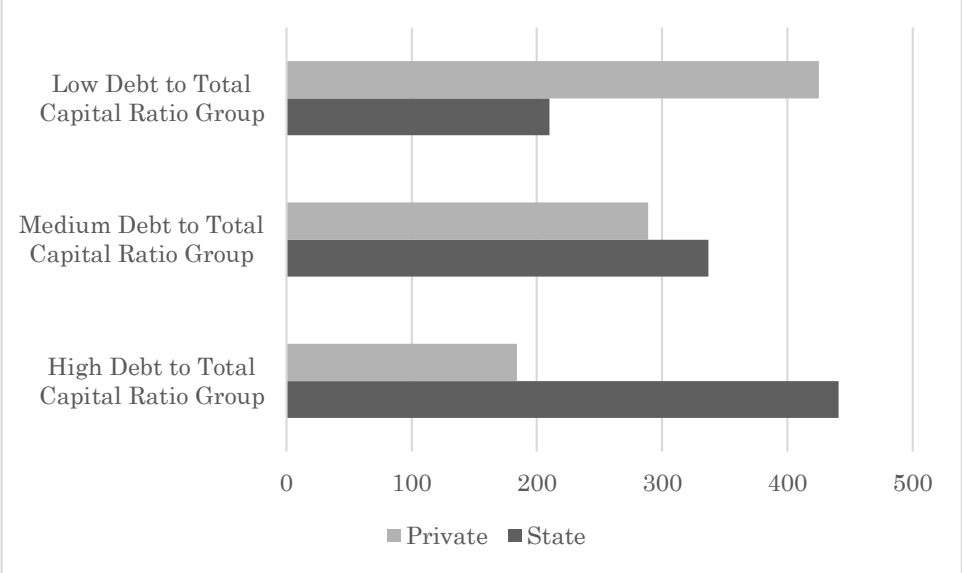

Figure 3-3 Numbers of SOEs and Private Firms by Debt to Total Capital Ratio in 2010

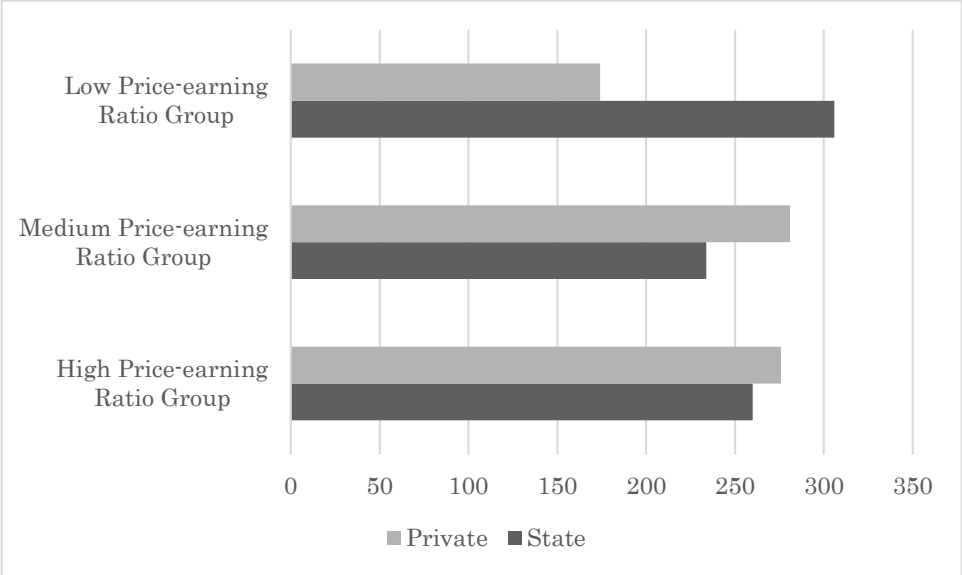

Figure 3-4 Numbers of SOEs and Private Firms by Price-earnings Ratio in 2010

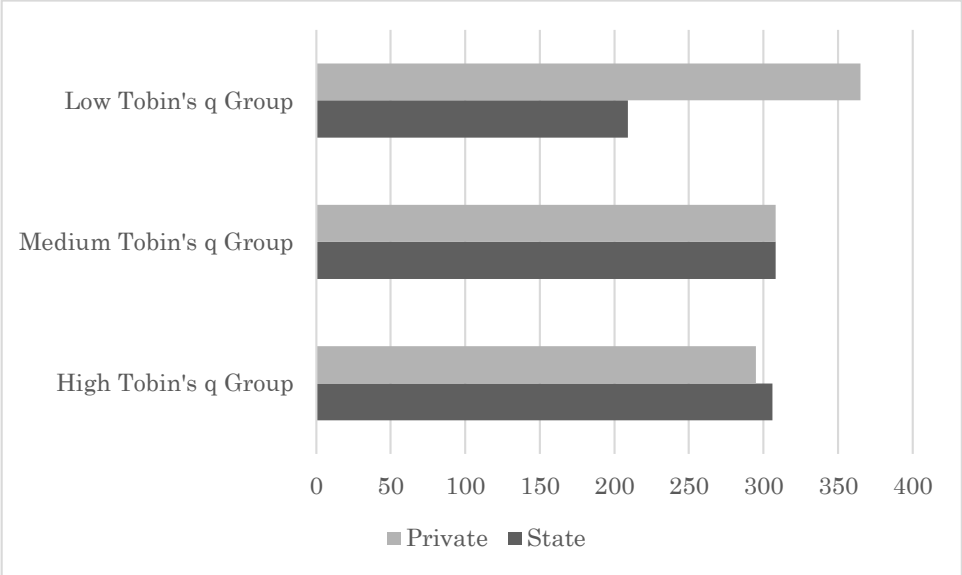

Figure 3-5 Numbers of SOEs and Private Firms by Tobin's q Ratio in 2010

In the diagrams, we adopted the 3 categorizations method again and divided the firms into three groups according to their positions with respect to each index. Within each low, medium and high group, we also separated SOEs from private firms. We can observe that in most cases,

the ownership hypothesis that private firms are more financially constrained than SOEs is consistent with the hypotheses we verified in the last chapter. For market value, most low market value firms are private and most high market value firms are SOEs. This observation may imply that SOEs are larger and sufficiently stable to resist the impact of monetary policy changes. For cash flow to net income ratio, the diagram shows that private firms often hold low cash reserves whereas SOEs hold high cash reserves. Therefore, private firms may be more affected by monetary policy changes because they lack internal financing capability. When considering the cash flow to net income ratio, we can say that SOEs have immunity to monetary policy compared with private firms. For debt to total capital ratio, we can see that SOEs hold high levels of debt, whereas private firms do not. As we argued in the last chapter, firms hold low levels of debt because they are currently financially constrained and cannot borrow more. Firms hold high levels of debt because they are trustable and banks will continue to lend money to them. In China, it is easy for SOEs to borrow extra money from banks because of their mutual state backgrounds. For price-earnings ratio and Tobin's q ratio, the differences between SOEs and private firms in the low and high groups do not appear to be particularly different.

To conclude the above arguments, we conjecture that private firms are more affected by monetary policy changes than are SOEs and that firms that are private and highly financially constrained are most affected. In the next subsection, we use 3 models to test our hypotheses.

3.3 Methodology and Data

3.3.1 Methodology

Three empirical models are used in this paper to test our hypotheses. At first, a baseline model was used to test the main hypothesis that monetary policy affects the stock returns of private firms more than those of SOEs. Then, we extended the baseline model by including the financial constraint dummy variable. We hope that the extended sophisticated model can be used to investigate the differences in monetary policy's effects on stock returns between firms with different financial constraints and different ownership. At last, we gave a robustness test on the extended model by controlling firm size. Because firm size may highly correlated with other 4

financial constraint indicators. And firm size also can be a special indicator that even an investor who is lack of economic knowledge may judge a firm through its size directly. So size may influence a firm's return a lot.

Similar to the last chapter, to analyze the relationship between stock prices and monetary policy changes, we chose the cumulative abnormal returns (CAR) of listed firms as our dependent variable and one-year official interest rate changes as our independent variable. Because only unexpected monetary policy change components can significantly affect stock prices[ii], many researchers use a so-called monetary policy "surprise", defined as the difference between monetary policy decisions and market expectations. However, because of the lack of an interest rate futures market in China, we adopted CAR in the equation to eliminate other factors that could have influenced stock prices. The details of the CAR methodology can be referred to in the previous chapter.

3.3.1.1 Baseline Model

As a starting point, we want to test whether monetary policy changes have different impacts on SOEs vs. private firms. A simple econometric model used is formulated as below:

$$CAR_{i,k} = \alpha + \beta \Delta i_k + \gamma D_k^{CPI} + \theta D_k^{IP} + \varepsilon_{i,k} \qquad (3.1)$$

where $CAR_{i,k}$ is the cumulative abnormal return of firm i during the k-th event and Δi_k is the official one-year loan rate change during the k-th event. D_k^{CPI} and D_k^{IP} are dummy variables to control for macroeconomic conditions. If a CPI (consumer price index) or PPI (producer price index) announcement was made during the period of 3 days before to 3 days after the monetary policy change, the value of D_k^{CPI} is given as 1; otherwise, it is 0. Similarly, if there is an IP (Industrial Production) announcement in a given period, D_k^{IP} is given as 1; otherwise, it is 0. $\varepsilon_{i,k}$ is the error term, and the others are parameters.

Our data samples are separated into SOEs and private firms. We use the two groups of data for a regression using Eq. (3.1) and compare the two βs. If we can observe that the $|\beta|$ estimated by the data from private firms is larger, our hypothesis can be supported preliminarily. The results will be shown in section 3.4.1.

3.3.1.2 Extended Model

As the next step, we extend the model by introducing variables that present firms' ownership and financial constraints. Unlike the baseline model, the data on SOEs and private firms are pooled together. As in the previous chapter, we use five proxies to measure the degree of the firms' financial constraints. In particular, we define that if a firm has a low market value, a low cash flow to net income ratio, a low debt to total capital ratio, a low price-earnings ratio, or a high Tobin's q, that firm is highly financially constrained. We divide the firms into two groups according to the degrees of their financial constraints. Firms are sorted from small to large based on the values of each 5 proxies. Using the above 5 indicators to measure the degrees of firms' financial constraints, 1/3 of the firms with the most financial constraints comprise the high group, and the other 2/3 are in the low group.

After we categorized the listed firms, for our empirical methodology, a panel regression is formulated as follow:

$$CAR_{i,k} = \alpha + \beta_1 \Delta i_k + \beta_2 \Delta i_k D_{i,k}^{High\ Constraint} + \beta_3 \Delta i_k D_{i,k}^{Private} + \beta_4 \Delta i_k D_{i,k}^{High\ Constraint} D_{i,k}^{Private} + \tau D_{i,k}^{High\ Constraint} + \varphi D_{i,k}^{Private} + \gamma D_k^{CPI} + \theta D_k^{IP} + \varepsilon_{i,k} \quad (3.2)$$

where the definitions of $CAR_{i,k}$, Δi_k, D_k^{CPI} and D_k^{IP} are the same as those in Eq. (3.1). $D_{i,k}^{High\ Constraint}$ is a dummy variable that distinguishes whether a firm is highly financially constrained or not. $D_{i,k}^{High\ Constraint}$ has the value 1 if the firm is in the high group, and otherwise, it is 0. $D_{i,k}^{Private}$ has the value 1 if the firm is private, and otherwise, it is 0. α, β_1, β_2, β_3, β_4, τ, φ, γ and θ are parameters, and $\varepsilon_{i,k}$is the error term.

This equation is explained as follows. Our hypotheses will be tested by observing the parameter β of those cross multiplying items with Δi_k. $D_{i,k}^{Private} = 0$ and $D_{i,k}^{High\ Constraint} = 0$ indicate that a firm is a state-owned enterprise and has few financial constraints. The effects of monetary policy changes on this firm can be measured as β_1. $D_{i,k}^{Private} = 0$, and

$D_{i,k}^{High\ Constraint} = 1$ indicate that the firm is a state-owned enterprise and is highly financially constrained. The effects of monetary policy changes on this firm can be measured as $\beta_1 + \beta_2$. $D_{i,k}^{Private} = 1$, and $D_{i,k}^{High\ Constraint} = 0$ indicate that the firm is private and has few financial constraints. The effects of monetary policy changes on this firm can be measured as $\beta_1 + \beta_3$. $D_{i,k}^{Private} = 1$, and $D_{i,k}^{High\ Constraint} = 1$ indicate that the firm is private and highly financially constrained. The effects of monetary policy changes on this firm can be measured as $\beta_1 + \beta_2 + \beta_3 + \beta_4$. We hope to observe the result that $|\beta_1 + \beta_2 + \beta_3 + \beta_4|$ is the largest value, which would indicate that firms that are private and are the most financially constrained will be affected most seriously by monetary policy. The empirical results will be given in section 3.4.2.

3.3.1.3 Robustness Test

In this subsection, a robustness test model is introduced to confirm the results from the previous models. In particular, considering that firm size (market value) may have impact on not only firm's return but also the other four financial constraint indictors, we control this variable by set it as a dummy. Based on Eq. (3.2), the robustness test model is established as follow:

$$CAR_{i,k} = \alpha + \beta_1 \Delta i_k + \beta_2 \Delta i_k D_{i,k}^{High\ Constraint} + \beta_3 \Delta i_k D_{i,k}^{Private} + \beta_4 \Delta i_k D_{i,k}^{Small} +$$
$$\beta_5 \Delta i_k D_{i,k}^{High\ Constraint} D_{i,k}^{Private} + \beta_6 \Delta i_k D_{i,k}^{High\ Constraint} D_{i,k}^{Small} + \beta_7 \Delta i_k D_{i,k}^{Private} D_{i,k}^{Small} +$$
$$\beta_8 \Delta i_k D_{i,k}^{High\ Constraint} D_{i,k}^{Private} D_{i,k}^{Small} + \tau D_{i,k}^{High\ Constraint} + \varphi D_{i,k}^{Private} + \lambda D_{i,k}^{Small} + \gamma D_k^{CPI} +$$
$$\theta D_k^{IP} + \varepsilon_{i,k} \qquad (3.3)$$

where the definitions of $CAR_{i,k}$, Δi_k, $D_{i,k}^{High\ Constraint}$, $D_{i,k}^{Private}$, D_k^{CPI}, D_k^{IP} and $\varepsilon_{i,k}$ are as same as them in Eq. (3.2). $D_{i,k}^{Small}$ is a dummy variable that indicate a firm is small if equal to 1, otherwise 0. For defining a firm is small or large, we sort all the sample firms by their market value from small to large. If the firm is in the top 1/3, we consider this firm as a small firm. By the same token, firms in the bottom 2/3 would be considered as large firms. α, β_1, β_2, β_3, β_4, β_5, β_6, β_7, β_8, τ, φ, λ, γ and θ are parameters, and $\varepsilon_{i,k}$is the error term.

The explanation of this equation is also similar with Eq. (3.2). Since we give three firm-type-

indicators dummies, firms can be divided into eight types. $D_{i,k}^{Private}=0$, $D_{i,k}^{High\ Constraint}=0$ and $D_{i,k}^{Small}=0$ indicate that a firm is a state-owned, lowly financially constrained, large enterprise. The effects of monetary policy changes on this firm can be measured as β_1. $D_{i,k}^{Private}=0$, $D_{i,k}^{High\ Constraint}=1$ and $D_{i,k}^{Small}=0$ indicate that the firm is a state-owned, highly financially constrained, large enterprise. The effects of monetary policy changes on this firm can be measured as $\beta_1+\beta_2$. $D_{i,k}^{Private}=1$, $D_{i,k}^{High\ Constraint}=0$ and $D_{i,k}^{Small}=0$ indicate that the firm is private, lowly financially constrained, large enterprise. The effects of monetary policy changes on this firm can be measured as $\beta_1+\beta_3$. $D_{i,k}^{Private}=0$, $D_{i,k}^{High\ Constraint}=0$ and $D_{i,k}^{Small}=1$ indicate that the firm is state-owned, lowly financially constrained, small enterprise. The effects of monetary policy changes on this firm can be measured as $\beta_1+\beta_4$. $D_{i,k}^{Private}=1$, $D_{i,k}^{High\ Constraint}=1$ and $D_{i,k}^{Small}=0$ indicate that the firm is private, highly financially constrained, large enterprise. The effects of monetary policy changes on this firm can be measured as $\beta_1+\beta_2+\beta_3+\beta_5$. $D_{i,k}^{Private}=0$, $D_{i,k}^{High\ Constraint}=1$ and $D_{i,k}^{Small}=1$ indicate that the firm is state-owned, highly financially constrained, small enterprise. The effects of monetary policy changes on this firm can be measured as $\beta_1+\beta_2+\beta_4+\beta_6$. $D_{i,k}^{Private}=1$, $D_{i,k}^{High\ Constraint}=0$ and $D_{i,k}^{Small}=1$ indicate that the firm is private, lowly financially constrained, small enterprise. The effects of monetary policy changes on this firm can be measured as $\beta_1+\beta_3+\beta_4+\beta_7$. $D_{i,k}^{Private}=1$, $D_{i,k}^{High\ Constraint}=1$ and $D_{i,k}^{Small}=1$ indicate that the firm is private, highly financially constrained, small enterprise. The effects of monetary policy changes on this firm can be measured as $\beta_1+\beta_2+\beta_3+\beta_4+\beta_5+\beta_6+\beta_7+\beta_8$. We hope the results are consistent with the previous models' that private highly financially constrained small firm would be affected the most by monetary policy. The empirical results will be given in section 3.4.3.

3.3.2 Data

The data period is from 2007 to 2010. A total of 13 monetary policy changes occurred in these

4 years, 8 instances of tightening interest rates and 5 instances of easing the rates. The CARs are calculated in the previous chapter and used in the paper directly. The data regarding one-year official loan interest rate changes, the 5 financial constraint proxies and ownership of the firms are obtained from the China Stock Market Accounting Research database. Information regarding CPI, PPI and IP announcements is obtained from the National Bureau of Statistics of China.

Before we give the empirical results, we want to show the statistic description of the original CARs data. From the following table, we can get some information about the difference between SOEs and private enterprises.

Table 3-1 Summary Statistics of CARs (Full Period: 2007-2010)

	CAR(0,1)		CAR(-1,1)		CAR(-2,2)		CAR(-3,3)	
Ownership	State	Private	State	Private	State	Private	State	Private
Mean	0.007	0.037	0.016	0.084	0.028	0.144	0.040	0.245
Medium	-0.002	-0.003	-0.002	-0.003	-0.003	-0.005	-0.002	-0.001
Maximum	3.749	2.749	9.007	6.521	15.000	10.851	16.339	12.790
Minimum	-0.883	-0.884	-1.735	-2.000	-0.986	-0.945	-4.993	-5.638
Std. Dev	0.106	0.221	0.241	0.506	0.401	0.843	0.527	1.249

In each event window, firms are divided into a state group and a private group. The mean values of CARs in private groups are about five times than them in state groups. The values of standard deviation in private groups are also significantly larger. These phenomena all imply that monetary policy's effects on stock returns may be stronger for private firms than SOEs. The medium, maximum and minimum values seem not that distinguish as the mean values and standard deviations.

3.4 Empirical Results

To avoid the periodic heteroskedasticity that can occur in regression equations, the results of the baseline model, the extended model and robustness test model are all estimated using the feasible GLS method. Details of feasible GLS are given in the endnotes of Chapter 2. The results are shown in the following subsections.

3.4.1 Results of the Baseline Model

Table 3-2 The Effects of Monetary Policy on the Stock Returns of State-owned and Private Firms

Variables	CAR(0,1)		CAR(-1,1)	
Ownership	State	Private	State	Private
α	0.027***	0.079***	0.051*	0.243***
	(0.007)	(0.018)	(0.027)	(0.075)
β	-0.156***	-0.314***	-0.179	-0.863**
	(0.037)	(0.093)	(0.133)	(0.373)
γ	0.025***	0.054***	0.010	0.094***
	(0.004)	(0.009)	(0.009)	(0.243)
θ	0.019***	0.028***	0.015	0.057**
	(0.003)	(0.009)	(0.009)	(0.025)
Adj-$\mathbf{R^2}$	0.010	0.009	0.000	0.004
Variables	CAR(-2,2)		CAR(-3,3)	
Ownership	State	Private	State	Private
α	0.018	0.151*	0.102***	0.474***
	(0.031)	(0.082)	(0.038)	(0.112)
β	-0.132	-0.740*	-0.390**	-1.782***
	(0.170)	(0.452)	(0.206)	(0.584)
γ	0.042***	0.219***	0.012	0.222***
	(0.013)	(0.034)	(0.016)	(0.046)
θ	0.060***	0.175***	0.057***	0.189***
	(0.014)	(0.041)	(0.018)	(0.054)
Adj-$\mathbf{R^2}$	0.11	0.028	0.001	0.006

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

We want to compare the parameter β between state group and private group. By selecting 4 event windows, we found that the absolute values of β from private group are significantly larger than state group. The phenomenon indicate that our hypothesis that private firms are affected more by monetary policy changes is not rejected. The signs of β are minus, that indicate there is a negative relationship between stock return and monetary policy changes.

3.4.2 Results of the Extended Model

The results of sophisticated model are shown as below and sorted by 5 financial constraint proxies.

Table 3-3(a) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms (Market Value)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.012***	-0.016***	-0.016***	0.001
(State, Lowly Constrained)	(0.002)	(0.002)	(0.002)	(0.010)
$\beta_1 + \beta_2$	-0.010**	-0.017***	-0.016***	-0.029
(State, Highly Constrained)	(0.005)	(0.005)	(0.005)	(0.033)
$\beta_1 + \beta_3$	-0.021**	-0.023***	-0.019**	-0.140**
(Private, Lowly Constrained)	(0.009)	(0.009)	(0.009)	(0.055)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.026***	-0.028***	-0.024**	-0.196***
(Private, Highly Constrained)	(0.009)	(0.011)	(0.010)	(0.062)
$2\beta_1 + \beta_2$	-0.022***	-0.033***	-0.032***	-0.028
(All State)	(0.005)	(0.006)	(0.005)	(0.035)
$2\beta_1 + \beta_2 + 2\beta_3 + \beta_4$	-0.047***	-0.051***	-0.043***	-0.336***
(All Private)	(0.013)	(0.014)	(0.013)	(0.090)
$2\beta_1 + \beta_3$	-0.033***	-0.039***	-0.035***	-0.139***
(All Lowly Constrained)	(0.009)	(0.009)	(0.009)	(0.057)
$2\beta_1 + 2\beta_2 + \beta_3 + \beta_4$	-0.036***	-0.045***	-0.039***	-0.224***
(All Highly Constrained)	(0.010)	(0.011)	(0.011)	(0.077)
α	-0.006***	-0.007***	-0.007***	0.008***
	(0.001)	(0.001)	(0.001)	(0.003)
β_2	0.002	-0.001	0.001	-0.029
	(0.004)	(0.006)	(0.006)	(0.035)
β_3	-0.008	-0.006	-0.003	-0.141***
	(0.009)	(0.010)	(0.010)	(0.054)
β_4	-0.008	-0.005	-0.005	-0.027
	(0.013)	(0.016)	(0.017)	(0.071)
τ	0.001	0.002	0.003	0.011
	(0.002)	(0.003)	(0.003)	(0.009)
φ	0.011***	0.018***	0.021***	0.055***
	(0.002)	(0.003)	(0.003)	(0.010)
γ	0.036***	0.032***	0.108***	0.114***
	(0.003)	(0.005)	(0.012)	(0.017)
θ	0.018***	0.030***	0.060***	0.064***
	(0.001)	(0.004)	(0.006)	(0.009)
Adj-R^2	0.024	0.015	0.017	0.013

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Our results indicate that using market value as the proxy to measure firms' financial constraints, highly financially constrained private firms are affected mostly than other firms. When firms are lowly financially constrained, private firms are obviously affected more. Similarly, when firms are highly financially constrained, we can also observe the same results. By compare the all state and all private columns, we found that private firms are truly affected more by monetary policy changes than state-owned firms. The conclusion is as same as we get from

baseline model. And the market value hypothesis we given in the last chapter is confirmed again by contrasting the columns of all lowly constrained and all highly constrained.

Table 3-3(b) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms (Cash Flow to Net Income Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.010***	-0.015***	-0.018***	-0.002
(State, Lowly Constrained)	(0.003)	(0.003)	(0.003)	(0.014)
$\beta_1 + \beta_2$	-0.009**	-0.005	-0.010*	-0.042
(State, Highly Constrained)	(0.005)	(0.007)	(0.006)	(0.036)
$\beta_1 + \beta_3$	0.009	0.023***	0.009	0.082*
(Private, Lowly Constrained)	(0.006)	(0.008)	(0.007)	(0.045)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.034*	-0.018***	-0.031**	-0.199*
(Private, Highly Constrained)	(0.017)	(0.018)	(0.018)	(0.109)
$2\beta_1 + \beta_2$	-0.020***	-0.019***	-0.028***	-0.054
(All State)	(0.006)	(0.007)	(0.006)	(0.039)
$2\beta_1 + \beta_2 + 2\beta_3 + \beta_4$	-0.026	0.005	-0.022	-0.118
(All Private)	(0.018)	(0.019)	(0.018)	(0.115)
$2\beta_1 + \beta_3$	-0.002	0.008	-0.010***	0.069
(All Lowly Constrained)	(0.007)	(0.008)	(0.007)	(0.046)
$2\beta_1 + 2\beta_2 + \beta_3 + \beta_4$	-0.043**	-0.023	-0.041**	-0.242**
(All Highly Constrained)	(0.018)	(0.018)	(0.018)	(0.111)
α	-0.006***	-0.006**	-0.010***	-0.006
	(0.001)	(0.003)	(0.002)	(0.008)
β_2	0.002	0.011	0.009	-0.030
	(0.006)	(0.008)	(0.007)	(0.037)
β_3	0.019***	0.039***	0.028***	0.094**
	(0.007)	(0.009)	(0.008)	(0.047)
β_4	-0.045**	-0.052**	-0.049	-0.251**
	(0.013)	(0.022)	(0.022)	(0.129)
τ	0.006**	0.012**	0.011**	0.041**
	(0.003)	(0.005)	(0.004)	(0.018)
φ	0.020***	0.038***	0.033***	0.157***
	(0.003)	(0.006)	(0.005)	(0.019)
γ	0.029***	0.021***	0.100***	0.075***
	(0.003)	(0.006)	(0.012)	(0.017)
θ	0.013***	0.022***	0.057***	0.036***
	(0.001)	(0.004)	(0.006)	(0.010)
Adj-R^2	0.016	0.013	0.018	0.015

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

The results show that highly constrained private firms suffer the most serious effect by monetary policy changes. This finding is as same as when we use market value as the financial constraint indicator. Overall, private firms seem affected more than state-owned firms, especially

in (-3,3) event window. By comparing estimated parameters between all lowly constrained column and all highly constrained column, we get the same conclusion with the last chapter that highly financially constrained firms will be affected more by monetary policy changes.

Table 3-3(c) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms (Debt to Total Capital Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.011***	-0.018***	-0.022***	-0.022*
(State, Lowly Constrained)	(0.002)	(0.003)	(0.003)	(0.012)
$\beta_1 + \beta_2$	-0.008	0.002	-0.005	-0.030
(State, Highly Constrained)	(0.006)	(0.008)	(0.007)	(0.042)
$\beta_1 + \beta_3$	0.005	0.021***	0.011	0.066
(Private, Lowly Constrained)	(0.006)	(0.008)	(0.006)	(0.040)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.019	-0.003	-0.020	-0.125
(Private, Highly Constrained)	(0.015)	(0.017)	(0.016)	(0.105)
$2\beta_1 + \beta_2$	-0.019***	-0.016**	-0.027***	-0.052
(All State)	(0.006)	(0.008)	(0.007)	(0.044)
$2\beta_1 + \beta_2 + 2\beta_3 + \beta_4$	-0.014	0.018	-0.010	-0.058
(All Private)	(0.017)	(0.018)	(0.017)	(0.109)
$2\beta_1 + \beta_3$	-0.006	0.003	-0.011*	0.045
(All Lowly Constrained)	(0.007)	(0.008)	(0.007)	(0.042)
$2\beta_1 + 2\beta_2 + \beta_3 + \beta_4$	-0.027*	-0.001	-0.025*	-0.156*
(All Highly Constrained)	(0.016)	(0.018)	(0.017)	(0.109)
α	-0.009***	-0.011**	-0.014***	-0.025***
	(0.001)	(0.002)	(0.002)	(0.008)
β_2	0.004	0.020**	0.017**	-0.009
	(0.006)	(0.009)	(0.008)	(0.043)
β_3	0.017***	0.039***	0.032***	0.089**
	(0.007)	(0.009)	(0.008)	(0.042)
β_4	-0.028	-0.044**	-0.047**	-0.183
	(0.019)	(0.021)	(0.021)	(0.126)
τ	0.015***	0.027***	0.025**	0.106***
	(0.003)	(0.006)	(0.005)	(0.019)
φ	0.020***	0.038***	0.034***	0.155***
	(0.003)	(0.006)	(0.005)	(0.019)
γ	0.030***	0.022***	0.103***	0.081***
	(0.003)	(0.006)	(0.012)	(0.017)
θ	0.013***	0.022***	0.058***	0.036***
	(0.002)	(0.004)	(0.007)	(0.011)
Adj-R^2	0.018	0.015	0.020	0.019

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

The results show that monetary policy changes have the most negative effects on highly financially constrained private firms, though they are not significant. Differences between SOEs

and private firms seem not that distinguish, but apparently highly financially constrained firms are affected more by monetary policy changes. Private firms seem can't be affected by monetary policy significantly. The reason maybe is that it's very difficult for private firms to borrow money from bank, so they aren't sensitive to interest rate changes.

Table 3-3(d) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms (Price-earnings Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.014***	-0.015***	-0.021***	-0.049**
(State, Lowly Constrained)	(0.003)	(0.004)	(0.004)	(0.023)
$\beta_1 + \beta_2$	-0.004	-0.005	-0.010**	0.024
(State, Highly Constrained)	(0.004)	(0.006)	(0.004)	(0.022)
$\beta_1 + \beta_3$	-0.003	0.017*	-0.001	0.006
(Private, Lowly Constrained)	(0.010)	(0.010)	(0.009)	(0.063)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.014	-0.001	-0.017	-0.194
(Private, Highly Constrained)	(0.014)	(0.017)	(0.017)	(0.100)
$2\beta_1 + \beta_2$	-0.018***	-0.020***	-0.030***	-0.026
(All State)	(0.005)	(0.007)	(0.005)	(0.033)
$2\beta_1 + \beta_2 + 2\beta_3 + \beta_4$	-0.018	0.018	-0.017	-0.088
(All Private)	(0.017)	(0.020)	(0.019)	(0.116)
$2\beta_1 + \beta_3$	-0.017*	0.003	-0.021**	-0.044
(All Lowly Constrained)	(0.010)	(0.011)	(0.009)	(0.066)
$2\beta_1 + 2\beta_2 + \beta_3 + \beta_4$	-0.019	-0.006	-0.027*	-0.070
(All Highly Constrained)	(0.015)	(0.018)	(0.017)	(0.102)
α	-0.002	0.001	-0.005**	0.014
	(0.002)	(0.003)	(0.002)	(0.009)
β_2	0.009*	0.010	0.012*	0.073**
	(0.005)	(0.008)	(0.006)	(0.031)
β_3	0.011	0.033***	0.021**	0.055
	(0.010)	(0.011)	(0.010)	(0.068)
β_4	-0.021	-0.028	-0.028	-0.172
	(0.018)	(0.021)	(0.022)	(0.125)
τ	-0.004	0.005	-0.004	-0.013
	(0.003)	(0.005)	(0.004)	(0.017)
φ	0.023***	0.044***	0.038***	0.177***
	(0.003)	(0.006)	(0.005)	(0.022)
γ	0.030***	0.020***	0.107***	0.085***
	(0.004)	(0.006)	(0.013)	(0.018)
θ	0.013***	0.023***	0.065***	0.039***
	(0.002)	(0.004)	(0.007)	(0.012)
Adj-R^2	0.014	0.011	0.018	0.014

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

In general, highly financially constrained private firms suffer the highest level of effect than

most of the other type firms when using price-earnings ratio as the indicator. Private firms are affected more than SOEs when observing the parameters that estimated by using data of event window (-3,3), while results of other event windows are not that distinguish. The results also confirmed that monetary policy changes have stronger effects on highly financially constrained firms.

Table 3-3(e) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms (Tobin's q)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.006**	-0.007***	-0.011***	-0.005
(State, Lowly Constrained)	(0.003)	(0.004)	(0.003)	(0.020)
$\beta_1 + \beta_2$	-0.023***	-0.028***	-0.029**	-0.087***
(State, Highly Constrained)	(0.004)	(0.005)	(0.005)	(0.021)
$\beta_1 + \beta_3$	0.007	0.017*	0.006	0.072
(Private, Lowly Constrained)	(0.010)	(0.011)	(0.011)	(0.065)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.005	0.012	0.004	-0.008
(Private, Highly Constrained)	(0.008)	(0.009)	(0.008)	(0.052)
$2\beta_1 + \beta_2$	-0.029***	-0.035***	-0.039***	-0.091***
(All State)	(0.005)	(0.006)	(0.005)	(0.030)
$2\beta_1 + \beta_2 + 2\beta_3 + \beta_4$	0.002	0.029*	0.009	0.064
(All Private)	(0.013)	(0.015)	(0.014)	(0.082)
$2\beta_1 + \beta_3$	0.001	0.009	-0.005	0.067
(All Lowly Constrained)	(0.010)	(0.011)	(0.011)	(0.067)
$2\beta_1 + 2\beta_2 + \beta_3 + \beta_4$	-0.028***	-0.016*	-0.025***	-0.094*
(All Highly Constrained)	(0.008)	(0.010)	(0.008)	(0.055)
α	-0.002	0.001	-0.003*	0.021**
	(0.002)	(0.002)	(0.002)	(0.009)
β_2	-0.017***	-0.020***	-0.018***	-0.082***
	(0.005)	(0.007)	(0.006)	(0.029)
β_3	0.013	0.024**	0.017	0.076
	(0.010)	(0.012)	(0.012)	(0.069)
β_4	0.005	0.015	0.015	0.003
	(0.013)	(0.015)	(0.015)	(0.092)
τ	-0.008***	-0.012***	-0.011***	-0.069***
	(0.002)	(0.005)	(0.004)	(0.015)
φ	0.020***	0.036***	0.032***	0.162***
	(0.003)	(0.006)	(0.005)	(0.020)
γ	0.030***	0.024***	0.104***	0.079***
	(0.003)	(0.006)	(0.012)	(0.017)
θ	0.014***	0.024***	0.055***	0.044***
	(0.002)	(0.004)	(0.006)	(0.010)
Adj-R^2	0.015	0.011	0.016	0.014

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

The results show that only SOEs are affected by monetary policy significantly, while private firms seem not. By using Tobin's q as the financial constraint indicator, highly constrained SOEs are apparently affected more than lowly constrained ones. If we put all firms together and only consider about the financial constraint factor, monetary policy changes have stronger effects on highly constrained firms.

3.4.3 Results of the Robustness Test

Table 3-4(a) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms of Different Sizes (Cash Flow to Net Income Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
State, Lowly Constrained, Large	-0.014***	-0.021***	-0.022***	0.018
	(0.002)	(0.003)	(0.003)	(0.013)
State, Highly Constrained, Large	-0.010***	-0.010**	-0.007	-0.035*
	(0.004)	(0.004)	(0.005)	(0.019)
Private, Lowly Constrained, Large	-0.004	-0.007	-0.005	-0.057
	(0.007)	(0.009)	(0.009)	(0.054)
State, Lowly Constrained, Small	-0.004	-0.011***	-0.011***	0.025
	(0.003)	(0.004)	(0.004)	(0.017)
Private, Highly Constrained, Large	-0.055**	-0.055**	-0.047**	-0.306***
	(0.022)	(0.023)	(0.023)	(0.110)
State, Highly Constrained, Small	-0.030**	0.038**	-0.033*	-0.199*
	(0.015)	(0.018)	(0.018)	(0.110)
Private, Lowly Constrained, Small	-0.019**	-0.015*	-0.009	-0.116**
	(0.008)	(0.009)	(0.009)	(0.051)
Private, Highly Constrained, Small	-0.042*	-0.056**	-0.056***	-0.369**
	(0.024)	(0.030)	(0.031)	(0.145)
α	-0.008***	-0.009***	-0.010***	-0.000
	(0.001)	(0.001)	(0.002)	(0.005)
β_1	-0.014***	-0.021***	-0.022***	0.018
	(0.002)	(0.003)	(0.003)	(0.013)
β_2	0.005	0.011**	0.015**	-0.053**
	(0.004)	(0.005)	(0.006)	(0.024)
β_3	0.011	0.014	0.017*	-0.075
	(0.007)	(0.009)	(0.010)	(0.053)
β_4	0.011***	0.010**	0.011*	0.007
	(0.004)	(0.005)	(0.005)	(0.022)
β_5	-0.056**	-0.059**	-0.057**	-0.196*
	(0.023)	(0.027)	(0.027)	(0.108)
β_6	-0.031**	-0.038**	-0.038*	-0.172*
	(0.015)	(0.019)	(0.020)	(0.102)
β_7	-0.026**	-0.018	-0.015	-0.067
	(0.011)	(0.014)	(0.014)	(0.065)
β_8	0.059*	0.045	0.033	0.168
	(0.037)	(0.046)	(0.049)	(0.200)
τ	0.005***	0.007***	0.009***	0.027***
	(0.002)	(0.003)	(0.003)	(0.010)
φ	0.011***	0.018***	0.021***	0.055***
	(0.002)	(0.003)	(0.003)	(0.010)
λ	0.001	0.002	0.003	0.013
	0.002	(0.003)	(0.003)	(0.010)
γ	0.036***	0.032***	0.108***	0.114***
	(0.003)	(0.006)	(0.012)	(0.017)
θ	0.018***	0.031***	0.061***	0.065***
	(0.001)	(0.004)	(0.006)	(0.009)
Adj-R^2	0.027	0.017	0.020	0.016

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Table 3-4(b) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms of Different Sizes (Debt to Total Capital Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
State, Lowly Constrained, Large	-0.011***	-0.019***	-0.022***	0.022***
	(0.002)	(0.002)	(0.002)	(0.007)
State, Highly Constrained, Large	-0.018***	-0.016**	-0.010	-0.065**
	(0.005)	(0.007)	(0.007)	(0.029)
Private, Lowly Constrained, Large	-0.005	-0.005	0.001	-0.034
	(0.007)	(0.008)	(0.009)	(0.042)
State, Lowly Constrained, Small	-0.005	-0.014***	-0.015***	0.028
	(0.004)	(0.004)	(0.004)	(0.016)
Private, Highly Constrained, Large	-0.050**	-0.051**	-0.046**	-0.321***
	(0.021)	(0.023)	(0.023)	(0.124)
State, Highly Constrained, Small	-0.024*	0.027**	-0.020	-0.188*
	(0.013)	(0.015)	(0.016)	(0.102)
Private, Lowly Constrained, Small	-0.017**	-0.013	-0.004	-0.127**
	(0.008)	(0.009)	(0.009)	(0.051)
Private, Highly Constrained, Small	-0.037*	-0.045*	-0.041	-0.302**
	(0.021)	(0.025)	(0.026)	(0.136)
α	-0.009***	-0.011***	-0.013***	-0.009**
	(0.001)	(0.001)	(0.002)	(0.004)
β_1	-0.011***	-0.019***	-0.022***	0.022***
	(0.002)	(0.002)	(0.002)	(0.007)
β_2	-0.007	0.003	0.012	-0.086***
	(0.006)	(0.007)	(0.008)	(0.030)
β_3	0.007	0.014*	0.023**	-0.055
	(0.007)	(0.009)	(0.009)	(0.042)
β_4	0.006	0.005	0.007	0.007
	(0.004)	(0.004)	(0.005)	(0.019)
β_5	-0.039*	-0.049**	-0.059**	-0.201*
	(0.023)	(0.027)	(0.028)	(0.118)
β_6	-0.012	-0.016	-0.017	-0.130
	(0.014)	(0.018)	(0.018)	(0.098)
β_7	-0.018	-0.013	-0.011	-0.100*
	(0.012)	(0.013)	(0.013)	(0.060)
β_8	0.037	0.031	0.027	0.243
	(0.035)	(0.042)	(0.044)	(0.205)
τ	0.008***	0.015***	0.018***	0.054***
	(0.002)	(0.003)	(0.004)	(0.010)
φ	0.012***	0.019***	0.024***	0.058***
	(0.002)	(0.003)	(0.004)	(0.010)
λ	0.001	0.002	0.003	0.012
	0.002	(0.003)	(0.003)	(0.009)
γ	0.037***	0.033***	0.110***	0.117***
	(0.003)	(0.006)	(0.013)	(0.017)
θ	0.018***	0.031***	0.061***	0.065***
	(0.002)	(0.004)	(0.007)	(0.009)
Adj-R^2	0.028	0.019	0.021	0.018

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Table 3-4(c) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms of Different Sizes (Price-earnings Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
State, Lowly Constrained, Large	-0.018***	-0.024***	-0.023***	-0.024
	(0.003)	(0.004)	(0.004)	(0.017)
State, Highly Constrained, Large	-0.007**	-0.012***	-0.013***	0.026
	(0.003)	(0.003)	(0.003)	(0.015)
Private, Lowly Constrained, Large	-0.023*	-0.027*	-0.021	-0.155**
	(0.014)	(0.014)	(0.013)	(0.075)
State, Lowly Constrained, Small	-0.014**	-0.020***	-0.017**	-0.062
	(0.006)	(0.007)	(0.007)	(0.049)
Private, Highly Constrained, Large	-0.029**	-0.025*	-0.025	-0.173**
	(0.012)	(0.016)	(0.017)	(0.087)
State, Highly Constrained, Small	0.001	-0.001	0.000	0.024
	(0.011)	(0.010)	(0.009)	(0.057)
Private, Lowly Constrained, Small	-0.024**	-0.023*	-0.015	-0.222***
	(0.012)	(0.014)	(0.014)	(0.083)
Private, Highly Constrained, Small	-0.058**	-0.078*	-0.075*	-0.365**
	(0.028)	(0.040)	(0.043)	(0.159)
α	-0.005***	-0.006***	-0.006***	0.009*
	(0.001)	(0.002)	(0.002)	(0.005)
β_1	-0.018***	-0.024***	-0.023***	-0.024
	(0.003)	(0.004)	(0.004)	(0.017)
β_2	0.011	0.013**	0.009*	0.050**
	(0.004)	(0.005)	(0.005)	(0.024)
β_3	-0.005	-0.003	0.002	-0.130*
	(0.014)	(0.015)	(0.014)	(0.072)
β_4	0.005	0.004	0.005	-0.038
	(0.007)	(0.008)	(0.008)	(0.051)
β_5	-0.017	-0.011	-0.013	-0.069
	(0.018)	(0.023)	(0.024)	(0.098)
β_6	0.003	0.006	0.008	0.036
	(0.014)	(0.013)	(0.012)	(0.067)
β_7	-0.005	0.000	0.000	-0.029
	(0.019)	(0.023)	(0.023)	(0.098)
β_8	-0.032	-0.063	-0.064	-0.161
	(0.037)	(0.051)	(0.055)	(0.194)
τ	-0.004**	-0.003	-0.005*	-0.005
	(0.002)	(0.003)	(0.003)	(0.009)
φ	0.013***	0.021***	0.025***	0.066***
	(0.002)	(0.003)	(0.004)	(0.012)
λ	0.001	0.002	0.004	0.019
	0.002	(0.003)	(0.004)	(0.012)
γ	0.039***	0.032***	0.116***	0.128***
	(0.004)	(0.006)	(0.014)	(0.018)
θ	0.019***	0.035***	0.069***	0.074***
	(0.002)	(0.004)	(0.007)	(0.010)
Adj-R^2	0.027	0.017	0.020	0.016

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Table 3-4(d) The Effects of Monetary Policy on the Stock Returns of State-owned, Private and Financially Constrained Firms of Different Sizes (Tobin's q)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
State, Lowly Constrained, Large	-0.011***	-0.016***	-0.014***	0.012
	(0.002)	(0.003)	(0.003)	(0.009)
State, Highly Constrained, Large	-0.017***	-0.023***	-0.027***	-0.020
	(0.005)	(0.006)	(0.006)	(0.025)
Private, Lowly Constrained, Large	-0.017*	-0.017	-0.012	-0.087
	(0.010)	(0.012)	(0.013)	(0.062)
State, Lowly Constrained, Small	-0.012*	-0.019**	-0.016**	-0.062
	(0.007)	(0.008)	(0.008)	(0.050)
Private, Highly Constrained, Large	-0.010	-0.009	-0.008	-0.094
	(0.010)	(0.013)	(0.012)	(0.068)
State, Highly Constrained, Small	-0.006	-0.011*	-0.012*	0.006
	(0.005)	(0.006)	(0.006)	(0.018)
Private, Lowly Constrained, Small	-0.017	-0.024	-0.017	-0.169*
	(0.015)	(0.017)	(0.017)	(0.101)
Private, Highly Constrained, Small	-0.014*	-0.002	0.003	-0.110**
	(0.007)	(0.007)	(0.007)	(0.054)
α	-0.007***	-0.006***	-0.006***	0.011***
	(0.001)	(0.001)	(0.001)	(0.003)
β_1	-0.011***	-0.016***	-0.014***	0.012
	(0.002)	(0.003)	(0.003)	(0.009)
β_2	-0.006	-0.008	-0.013*	-0.032
	(0.005)	(0.007)	(0.007)	(0.026)
β_3	-0.006	-0.002	0.003	-0.099
	(0.010)	(0.013)	(0.014)	(0.062)
β_4	-0.001	-0.003	-0.002	-0.074
	(0.007)	(0.008)	(0.008)	(0.050)
β_5	0.014	0.016	0.016	0.025
	(0.016)	(0.019)	(0.020)	(0.089)
β_6	0.012	0.006	0.017	0.100*
	(0.009)	(0.013)	(0.012)	(0.055)
β_7	0.002	-0.003	-0.003	-0.008
	(0.019)	(0.024)	(0.025)	(0.118)
β_8	-0.017	-0.003	-0.000	-0.034
	(0.024)	(0.030)	(0.031)	(0.147)
τ	-0.000	-0.001	-0.004	-0.020***
	(0.001)	(0.003)	(0.003)	(0.008)
φ	0.011***	0.019***	0.023***	0.055***
	(0.002)	(0.003)	(0.004)	(0.010)
λ	0.002	0.003	0.005	0.015
	0.002	(0.003)	(0.003)	(0.010)
γ	0.036***	0.033***	0.111***	0.113***
	(0.003)	(0.006)	(0.013)	(0.017)
θ	0.018***	0.031***	0.058***	0.065***
	(0.001)	(0.004)	(0.006)	(0.009)
Adj-R^2	0.024	0.014	0.017	0.012

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Table 3-4 show the results from the improved model. Since we controlled the firm size, the results meliorated a lot that most of the coefficients became significant. The results are consistent with what we get from Eq. (3.2). We can find that private firms generally be affected more than SOEs, and private highly financially constrained small firms often be affected most by monetary policy changes. The hypothesis we given in Section 3.1 cannot be rejected.

3.5 Findings

In this chapter, we also put viewpoint on monetary policy changes' effects on listed firms' stock returns in China. We found such effects are asymmetric between SOEs and private firms. Generally speaking, monetary policy changes' effects on private firms are larger than on SOEs. The reason can be attributed to the degree of difficulty of financing from banks.

The five financial constraint indicators including market value, cash flow to net income ratio, debt to total capital ratio, price-earnings ratio and Tobin's q are introduced again in empirical models. A baseline model and an extended model are used to test our hypothesis that private firms would be affected more by monetary policy changes. A robustness test model is used to confirm the results we got from previous models. Overall, a private highly financially constrained small firm will be affected most seriously by monetary policy changes. Most of the time, in both SOEs group and private group, highly financially constrained firms are affected more. We can also get the same conclusion when we put SOEs and private firms together. The conclusion got from the previous chapter has been proven again in this article. The empirical results also show that compared with firm's ownership and size, degree of firm's financial constraint seems to be a more influential factor on firm's stock return.

[i] China Statistical Yearbook 2008.

[ii] See Kuttner (2001), Bernanke (2003), Bernanke and Kuttner (2005).

Chapter 4

Stock Market's Reaction to Monetary Policy in Macroeconomic Cycles

4.1 Overview

In the previous two chapters, we focused on firms' degrees of financial constraints and ownerships respectively. This chapter will discuss monetary policy's effects on firms' stock returns in different macroeconomic cycles.

Many studies have proved that monetary policy changes exert effects on stock returns. To sum up, Thorbecke (1997), Rigobon and Sack (2003), Ehrmann and Fratzscher (2004), Bernanke and Kuttner (2005), Chen (2007), Basistha and Kurov (2008), Kurov (2010) derived the conclusion of a negative relationship between monetary policy changes and stock prices in U. S. market. In the previous chapters, we analyzed Chinese stock market and found a similar conclusion. In particular, a decrease in interest rates lowers the cost of finance, makes firms have more willingness to investment, leads to an economic vitality. Obviously firms' stock prices will benefit from the economic vitality. A cut in interest rates also reduces the cost of mortgage and consumer loan, stimulates the consumption. Firms' performances will get better from the growth of demand. What's more, a decrease in interest rates promotes people's willingness of buying securities, and increases the present value of firms' future cash flows, thereby enhance stock prices directly. When interest rate rise, the opposite mechanism will play a role in the transfer process. As the result, the stock prices will fall. For these reasons, a negative relationship is expected to be observed between monetary policy and stock prices.

However, the effects of monetary policy on stock returns should be asymmetric in economic expansion and recession. There are two reasons. The first reason is the financial accelerator effect that propounded by Bernanke, Gertler and Gilchrist (1996). Firms need to finance either internally or externally for their investment opportunities. When they decide to finance

externally (borrow from banks or other financial markets), apparently they have more information about their creditworthiness than the lenders do. Such informational asymmetry will result a requirement of the additional compensation from the lenders, make the cost of external financing higher than internal financing. The studies of Bernanke and Gertler (1989) and Bernanke, Gertler and Gilchrist (1999) indicated that the informational asymmetry is larger in the economic recession. So we may think that firms will be affected more by monetary policy in recession because it's relatively harder for firms to finance. The second reason is investors' pessimism. Except the traditional theory, behavioral finance theory also gives us some hints. Shefrin (2000) mentioned in his book that "analysts' forecasts have actually become pessimistic" and "excessive optimism has disappeared". In stock market, investors tend to be pessimistic. When they heard some bad news, they would feel very upset. However, when they heard some good news, they would not be happy at the same degree. That makes investors cautious and passive in recession, and then results negative impacts on stock prices.

Based on the above discussions, we hypothesize that the effects of monetary policy changes on stock returns are stronger in recession than in expansion. As the conclusion, we confirmed the hypothesis through two empirical models. Furthermore, we introduced financial constraint factors in the model and found highly financially constrained firms in recession are affected most seriously.

The remainder of this chapter is organized as follows. In section 4.2, we introduce the macroeconomic cycles in China. In section 4.3, we perform the empirical models and describe the data. In section 4.4, we provide the empirical results. In section 4.5, we sum up the chapter and give the conclusion.

4.2 Macroeconomic Cycles in China

Since the implementation of reforming and opening, China's economy is growing rapidly in the last three decades. From 1979 to 2013, Chinese GDP maintained a high average annual growth rate at 9.9%. Accordingly, GNI and consumer spending per capita grew by 19.7 and 9.6 times respectively in this period. From an international comparative perspective, calculated under

exchange rate method, Chinese GDP ranked tenth in the world in 1978. By 2010, Chinese GDP surpassed Japan and ranked second in the world. Some economists even predicted that China will overtake the U. S. and become the largest economy.

Although China's economy has never been observed a negative growth, the fluctuation is still excessive. An economic development peak appeared in 1978, the first year of reforming and opening. In this year, the GDP growth rate reached 11.7%. But the GDP growth rate fell into bottom in the following, only 5.2% in 1981. Then China's economy began to get warm again. The GDP growth rate in 1984 was 15.2%, grew more vigorously than any other time in the last 30 years. History is always a striking similarity, economic growth rate fell to 3.8% in 1990 but reached an interim peak of 14.2% in 1992. Because of the reform of the command economy and the establishment of the market economy, the smoothness of economic growth improved significantly from 1992. The periods of economic expansion and recession also extended after 1992.

From 1992 to 2013, the macroeconomic cycles can be divided into 2 expansions and 3 recessions. The following figure shows such macroeconomic cycles.

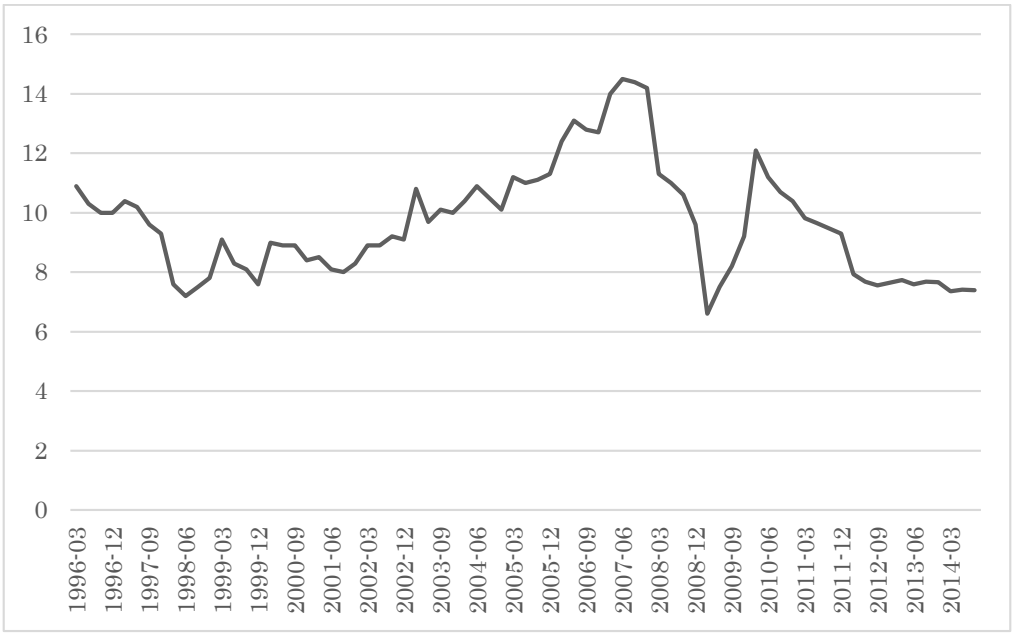

Figure 4-1 Macroeconomic Cycles in China from 1996 to 2014

The above figure is made of the real GDP growth rate quarterly data from Q1 1996 to Q1 2014. The unit of vertical axis is percentage. Because the National Bureau of Statistics started to edit GDP growth rate quarterly data from 1996, data from 1992 to 1996 are not included in the figure. The GDP growth rate shows a downward trend from 1992. The Asian financial crisis in 1997 exacerbated this downward trend, leaded a lowest point of 7.2% at Q2 1998. Then the economy started to recover and lasted about 9 years. A highest point appeared at Q2 2007. A global financial crisis which occurred in 2007 resulted another two years recession. To combat this crisis, China adopted comprehensive monetary and fiscal policies, made economy enter in a rising channel. However, the Eurozone crisis affected China, caused another recession from Q2 2009.

Our data period for empirical analysis is from 1997 to 2010. In this period, macroeconomic cycles contain a recession from Q1 1997 to Q2 1998, an expansion from Q3 1998 to Q2 2007 and another recession from Q3 2007 to Q1 2009, another expansion from Q2 2009 to Q1 2010.

4.3 Methodology and Data

4.3.1 Methodology

To test our hypothesis, two models are going to be applied in this section. Firstly, we use a baseline model to test the main hypothesis that the effects of monetary policy on stock returns will be stronger in economic recession than in expansion. Secondly, we use an extended model which is improved from the baseline model by introducing financial constraint indicators to confirm the conclusions we got from the baseline model and previous chapters.

Generally, to analysis the relationship between stock returns and monetary policy changes, the dependent and independent variable in the above two models are individual firms' cumulative abnormal returns (CAR) and one-year official loan interest rate changes, respectively. The reason why we adopt these two variables has been mentioned many times. But we want to explain it again. Economists[i] found that monetary policy change can be divided into two parts: an expected component and an unexpected component. Only unexpected component of monetary policy change has significant effects on stock returns. In the existing researches,

economists use a so-called monetary policy surprise to denote the unexpected component of monetary policy change. The surprise is calculated as the difference between real changes in interest rate and investors' forecast in the future market. For there is no future market of interest rate in China, we calculate CARs which are only caused by unexpected component of monetary policy change to eliminate the impacts of investors' forecast. Details of the two empirical models are going to be shown in the following two subsections.

4.3.1.1 Baseline Model

At first, a baseline model is used to test our hypothesis that monetary policy would have stronger effects on stock returns in economic recession than in expansion. The baseline model is formulated as below:

$$CAR_{i,k} = \alpha + \beta_1 \Delta i_k + \beta_2 \Delta i_k D_k^{Recession} + \nu D_k^{Recession} + \gamma D_k^{CPI} + \theta D_k^{IP} + \varepsilon_{i,k} \quad (4.1)$$

where $CAR_{i,k}$ is the cumulative abnormal return of firm i during the k-th event. Δi_k is the official one-year loan rate change during the k-th event. $D_k^{Recession}$ is a dummy variable we use to identify macroeconomic status. If it's an economic recession, $D_k^{Recession}$ equals to 1; otherwise 0 (economic expansion). D_k^{CPI} and D_k^{IP} are two dummy variables to control for announcements of macroeconomic conditions. If a CPI (consumer price index) or PPI (producer price index) announcement was made during the period of 3 days before to 3 days after the monetary policy change, the value of D_k^{CPI} is given as 1; otherwise, it is 0. Similarly, if there is an IP (Industrial Production) announcement in the above given period, D_k^{IP} equals to 1; otherwise, it is 0. $\varepsilon_{i,k}$ is the error term, and the others are parameters.

β_1 and β_2 are used to test our hypothesis. β_1 denotes to monetary policy's effects on stock returns during macroeconomic expansions. β_2 denotes to the difference of monetary policy's effects on stock returns between in macroeconomic expansions and in recessions. Our hypothesis cannot be rejected if we can observe that $|\beta_1| < |\beta_1 + \beta_2|$. The results will be shown in section 4.4.1.

4.3.1.2 Extended Model

In this subsection, we improve the baseline model by introducing financial constraint dummy. Similar as the previous chapters, five same indicators are used to identify the degree of firm's financial constraints. Generally speaking, we believe a firm is highly financially constrained if the firm has a low market value, cash flow to net income ratio, debt to total capital ratio, price-earnings ratio or high Tobin's q. In particular, we sort firms by the five indicators from small to large. If a firm is in the top third when we use the anterior four indicators, or a firm is in the bottom third when we use Tobin's q, we define this firm is highly financially constrained.

We added a dummy variable that indicates firms' financial constraint position in the baseline model. The new model can be formulated as follow:

$$CAR_{i,k} = \alpha + \beta_1 \Delta i_k + \beta_2 \Delta i_k D_{i,k}^{High\ Constraint} + \beta_3 \Delta i_k D_k^{Recession} + \beta_4 \Delta i_k D_{i,k}^{High\ Constraint} D_k^{Recession} + \tau D_{i,k}^{High\ Constraint} + \nu D_k^{Recession} + \gamma D_k^{CPI} + \theta D_k^{IP} + \varepsilon_{i,k} \quad (4.2)$$

where the definitions of $CAR_{i,k}$, Δi_k, $D_k^{Recession}$, D_k^{CPI} and D_k^{IP} are the same as those in Eq. (4.1). $D_{i,k}^{High\ Constraint}$ is the new added dummy variable to indicate the status of firms' financial constraint. If $D_{i,k}^{High\ Constraint}$ equals to 1, the firm is highly financially constrained. By contrast, if $D_{i,k}^{High\ Constraint}$ equals to 0, the firm is lowly financially constrained. α, β_1, β_2, β_3, β_4, τ, ν, γ and θ are parameters, and $\varepsilon_{i,k}$is the error term.

Similar with the model in Chapter 3, we are going to observe the βs to validate our hypothesis. Firms are divided into four types. When $D_k^{Recession} = 0$ and $D_{i,k}^{High\ Constraint} = 0$, the firm is in an economic expansion and lowly financially constrained. β_1 can measure the effects of monetary policy changes on this firm's stock return. When $D_k^{Recession} = 0$ and $D_{i,k}^{High\ Constraint} = 1$, the firm is in an economic expansion and highly financially constrained. $\beta_1 + \beta_2$ can measure the effects of monetary policy changes on this firm's stock returns. When $D_k^{Recession} = 1$ and $D_{i,k}^{High\ Constraint} = 0$, the firm is in an economic recession and lowly

financially constrained. $\beta_1 + \beta_3$ can measure the effects of monetary policy changes on this firm's stock returns. When $D_k^{Recession} = 1$ and $D_{i,k}^{High\ Constraint} = 1$, the firm is in an economic recession and highly financially constrained. $\beta_1 + \beta_2 + \beta_3 + \beta_4$ can measure the effects of monetary policy changes on this firm's stock returns. The signs of these parameter sets are expected to be minus that indicate a negative relationship between interest rate changes and stock prices. The magnitudes of these parameter sets show the strengths of monetary policy's effects on stock returns. According to our hypothesis, the value of $|\beta_1 + \beta_2 + \beta_3 + \beta_4|$ should be the largest. Obviously a highly financially constrained firm will have to suffer the greatest impact from monetary policy changes in economic recession. The empirical results are going to be shown in section 4.4.2.

4.3.2 Data

The data we adopted in our analysis include firms' CARs, official one-year loan rate changes, five financial constraint indicators and the actual GDP growth rates. The data period is from 1997 to 2010. Totally 22 times of monetary policy changes occurred in the period. Table 2-2 in Chapter 2 gives more information about these monetary policy changes. The CARs used in this chapter are as same as them in Chapter 2. A summary of CARs is given in Table 2-3 in Chapter 2. Except CRAs, the data regarding one-year official loan interest rate changes, the 5 financial constraint proxies are obtained from the China Stock Market Accounting Research database. The data regarding actual GDP growth rates, CPI, PPI and IP announcements are obtained from the National Bureau of Statistics of China.

4.4 Empirical Results

All the results in this section are estimated using feasible GLS to avoid the periodic heteroskedasticity. For details about feasible GLS, please refer to the endnotes in Chapter 2. The results of baseline model and expanded model are shown below.

4.4.1 Results of the Baseline Model

Table 4-1 The Effects of Monetary Policy on Stock Returns in Economic Expansion and Recession

Variables	CAR(0,1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
$\boldsymbol{\beta_1}$	-0.006***	-0.008***	-0.011***	0.002
(Expansion)	(0.001)	(0.001)	(0.001)	(0.002)
$\boldsymbol{\beta_1 + \beta_2}$	-0.010***	-0.013***	-0.015***	-0.055***
(Recession)	(0.003)	(0.003)	(0.003)	(0.018)
α	0.002***	0.004***	0.005***	0.011***
	(0.000)	(0.000)	(0.000)	(0.001)
$\boldsymbol{\beta_2}$	-0.004	-0.005	-0.004	-0.056***
	(0.003)	(0.003)	(0.003)	(0.018)
$\boldsymbol{\nu}$	0.000	0.002	-0.002	0.028***
	(0.002)	(0.002)	(0.002)	(0.009)
γ	0.017***	0.025***	0.072***	0.069***
	(0.002)	(0.004)	(0.008)	(0.011)
Θ	0.015***	0.027***	0.062***	0.072***
	(0.002)	(0.004)	(0.006)	(0.009)
Adj-$\mathbf{R^2}$	0.011	0.009	0.012	0.009

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

We can see most of the parameters in above table are statistically significant. β_1 and β_2 are used to test our hypothesis. As we explained before, the values of $|\beta_1|$ and $|\beta_1 + \beta_2|$ represent the strengths of monetary policy's effects on firms' stock returns in economic expansion and recession, respectively. Firstly, in all eight β_1s and $\beta_1 + \beta_2$s, seven's signs are minus. Only a sign of one β_1 is plus, and the β_1 is insignificant. The results are reasonable because obviously monetary policy and stock returns have a negative relationship. Secondly and more importantly, in each event window of CAR, the absolute value of $\beta_1 + \beta_2$ is larger than it of β_1. The results support our hypothesis that the effects of monetary policy on stock returns are stronger in economic recession than expansion.

4.4.2 Results of the Extended Model

Same as the previous chapters, we use 5 proxies to measure the degrees of firms' financial constraints and try to find the asymmetric effects of monetary policy on stock returns of different financially constrained firms in macroeconomic cycles. Five result tables are given below and sorted by financial constraint proxies.

Table 4-2(a) The Effects of Monetary Policy on Financially Constrained Firms in Economic Expansion and Recession (Market Value)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.003***	-0.002*	-0.003*	0.009***
(Expansion, Lowly Constrained)	(0.001)	(0.001)	(0.001)	(0.002)
$\beta_1 + \beta_2$	0.000	0.000	0.001	0.025***
(Expansion, Highly Constrained)	(0.001)	(0.002)	(0.002)	(0.004)
$\beta_1 + \beta_3$	-0.015***	-0.022***	-0.020***	-0.049***
(Recession, Lowly Constrained)	(0.003)	(0.003)	(0.003)	(0.016)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.021***	-0.029***	-0.030***	-0.110***
(Recession, Highly Constrained)	(0.005)	(0.006)	(0.006)	(0.023)
α	0.000	0.001	0.002***	0.006***
	(0.000)	(0.000)	(0.000)	(0.001)
β_2	0.003*	0.002	0.004	0.016***
	(0.002)	(0.002)	(0.003)	(0.004)
β_3	-0.013***	-0.020***	-0.017***	-0.058***
	(0.003)	(0.003)	(0.003)	(0.016)
β_4	-0.009	-0.009	-0.015**	-0.076***
	(0.006)	(0.007)	(0.007)	(0.021)
τ	0.002***	0.004***	0.004***	0.011***
	(0.001)	(0.001)	(0.001)	(0.002)
ν	-0.004***	-0.004***	-0.004***	0.020***
	(0.002)	(0.001)	(0.001)	(0.003)
γ	0.019***	0.030***	0.077***	0.074***
	(0.002)	(0.004)	(0.008)	(0.011)
θ	0.017***	0.031***	0.065***	0.075***
	(0.001)	(0.004)	(0.006)	(0.009)
Adj-R^2	0.017	0.013	0.018	0.014

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

First, when we use market value as the financial constraint indicator, the empirical results support our hypothesis. We can find that both lowly and highly financially constrained firms in economic recession experience stronger effects from monetary policy than in economic expansion. If we compare these two types of firms, highly financially constrained firms seem to be affected more than lowly financially constrained firms. But in economic expansion, highly financially constrained firms do not seem to be affected more. Most of the time they don't even be affected significantly. This phenomenon may indicate that some kinds of firms are immune to interest rate changes in economic expansion. On the whole, firms in economic recession will be affected more by monetary policy than in economic expansion.

Table 4-2(b) The Effects of Monetary Policy on Financially Constrained Firms in Economic Expansion and Recession (Cash Flow to Net Income Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.006***	-0.007***	-0.010***	0.002
(Expansion, Lowly Constrained)	(0.001)	(0.001)	(0.002)	(0.002)
$\beta_1 + \beta_2$	-0.006***	-0.010***	-0.011***	0.005
(Recession, Highly Constrained)	(0.001)	(0.002)	(0.002)	(0.003)
$\beta_1 + \beta_3$	-0.004	-0.006*	-0.008***	-0.009
(Expansion, Lowly Constrained)	(0.003)	(0.004)	(0.003)	(0.019)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.024***	-0.030***	-0.030***	-0.159***
(Recession, Highly Constrained)	(0.007)	(0.008)	(0.008)	(0.044)
α	0.002***	0.004***	0.005***	0.011***
	(0.000)	(0.001)	(0.001)	(0.001)
β_2	-0.000	-0.003	-0.002	0.003
	(0.002)	(0.003)	(0.003)	(0.004)
β_3	0.001	0.001	0.001	-0.010
	(0.003)	(0.004)	(0.004)	(0.019)
β_4	-0.020**	-0.021**	-0.021**	-0.153***
	(0.008)	(0.009)	(0.009)	(0.049)
τ	-0.001	-0.000	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)
ν	0.000	0.002	-0.001	0.029***
	(0.002)	(0.002)	(0.002)	(0.009)
γ	0.018***	0.025***	0.073***	0.070***
	(0.002)	(0.004)	(0.008)	(0.011)
θ	0.015***	0.028***	0.064***	0.073***
	(0.002)	(0.004)	(0.006)	(0.009)
Adj-R^2	0.012	0.010	0.013	0.011

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Second, the results are consistent with our hypothesis when we use cash flow to net income ratio as a financial constraint indicator. In most instances, effects of monetary policy on the stock returns of lowly financially constrained firms in expansion are the weakest, while such effects on the stock returns of highly financially constrained firms in recession are the strongest. However, effects of monetary policy on stock returns between highly financially constrained firms in expansion and lowly financially constrained firms in recession are difficult to be distinguished.

Table 4-3(c) The Effects of Monetary Policy on Financially Constrained Firms in Economic Expansion and Recession (Debt to Total Capital Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.007***	-0.010***	-0.013***	-0.001
(Expansion, Lowly Constrained)	(0.001)	(0.001)	(0.002)	(0.002)
$\beta_1 + \beta_2$	-0.002	-0.001	-0.001	-0.018***
(Recession, Highly Constrained)	(0.001)	(0.002)	(0.002)	(0.003)
$\beta_1 + \beta_3$	-0.001	-0.002	-0.005*	0.017
(Expansion, Lowly Constrained)	(0.003)	(0.004)	(0.003)	(0.016)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.031***	-0.037***	-0.037***	-0.211***
(Recession, Highly Constrained)	(0.008)	(0.008)	(0.008)	(0.050)
α	0.001***	0.002***	0.003***	0.009***
	(0.000)	(0.001)	(0.001)	(0.001)
β_2	0.005***	0.009***	0.014***	0.018***
	(0.002)	(0.002)	(0.003)	(0.004)
β_3	0.006**	0.008**	0.008	0.017
	(0.003)	(0.004)	(0.003)	(0.017)
β_4	-0.035***	-0.044***	-0.046***	-0.246***
	(0.008)	(0.010)	(0.009)	(0.054)
τ	0.001	0.002**	0.004***	0.004**
	(0.001)	(0.001)	(0.001)	(0.002)
ν	0.001	0.003	-0.001	0.030***
	(0.002)	(0.002)	(0.002)	(0.010)
γ	0.018***	0.026***	0.075***	0.072***
	(0.002)	(0.004)	(0.008)	(0.011)
θ	0.015***	0.028***	0.065***	0.074***
	(0.002)	(0.004)	(0.007)	(0.010)
Adj-R^2	0.013	0.011	0.014	0.014

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Third, our results show that highly financially constrained firms suffer the strongest effects of monetary policy in recession. Highly financially constrained firms in expansion and lowly financially constrained firms in recession are not significantly affected by monetary policy changes. Overall, our hypothesis can be proved by observing the results. Highly financially constrained firms face the most difficult situation in recession than all other types of firms.

Table 4-3(d) The Effects of Monetary Policy on Financially Constrained Firms in Economic Expansion and Recession (Price-earnings Ratio)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.004***	-0.007***	-0.009***	0.007**
(Expansion, Lowly Constrained)	(0.001)	(0.002)	(0.002)	(0.003)
$\beta_1 + \beta_2$	-0.006***	-0.010***	-0.013***	-0.007**
(Recession, Highly Constrained)	(0.001)	(0.002)	(0.002)	(0.003)
$\beta_1 + \beta_3$	-0.013***	-0.015***	-0.018***	-0.072***
(Expansion, Lowly Constrained)	(0.004)	(0.004)	(0.004)	(0.003)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.009	-0.014*	-0.016**	-0.055
(Recession, Highly Constrained)	(0.006)	(0.007)	(0.007)	(0.038)
α	0.002***	0.004***	0.006***	0.014***
	(0.000)	(0.001)	(0.001)	(0.001)
β_2	-0.002	-0.003	-0.003	-0.014***
	(0.002)	(0.002)	(0.003)	(0.004)
β_3	-0.008*	-0.008*	-0.009*	-0.079***
	(0.004)	(0.005)	(0.005)	(0.026)
β_4	0.005	0.004	0.006	0.031
	(0.007)	(0.009)	(0.009)	(0.046)
τ	-0.003***	-0.004***	-0.005***	-0.015***
	(0.001)	(0.001)	(0.001)	(0.002)
ν	0.002	0.005*	0.001	0.039***
	(0.002)	(0.003)	(0.002)	(0.011)
γ	0.019***	0.025***	0.078***	0.077***
	(0.002)	(0.005)	(0.009)	(0.013)
θ	0.016***	0.031***	0.073***	0.082***
	(0.002)	(0.004)	(0.007)	(0.011)
Adj-R^2	0.014	0.012	0.015	0.014

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Fourth, the results are consistent with our hypothesis when we use price-earnings ratio to measure the degrees of firms' financial constraints. Firms in recession withstand more impact from monetary policy changes than they in expansion. But the differences between lowly and highly financially constrained firms in each economic status are not apparent.

Table 4-3(e) The Effects of Monetary Policy on Financially Constrained Firms in Economic Expansion and Recession (Tobin's q)

Variables	CAR(0.1)	CAR(-1,1)	CAR(-2,2)	CAR(-3,3)
β_1	-0.005***	-0.007***	-0.008***	0.005**
(Expansion, Lowly Constrained)	(0.001)	(0.001)	(0.002)	(0.002)
$\beta_1 + \beta_2$	-0.005***	-0.009***	-0.012***	0.003
(Recession, Highly Constrained)	(0.002)	(0.003)	(0.004)	(0.005)
$\beta_1 + \beta_3$	-0.008**	-0.013***	-0.013***	-0.035
(Expansion, Lowly Constrained)	(0.004)	(0.004)	(0.004)	(0.023)
$\beta_1 + \beta_2 + \beta_3 + \beta_4$	-0.009**	-0.010**	-0.009**	-0.057**
(Recession, Highly Constrained)	(0.004)	(0.005)	(0.004)	(0.028)
α	0.001**	0.002***	0.003***	0.009***
	(0.000)	(0.001)	(0.001)	(0.001)
β_2	-0.000	-0.002	-0.003	-0.001
	(0.002)	(0.003)	(0.004)	(0.005)
β_3	-0.003	-0.006	-0.005	-0.040*
	(0.004)	(0.004)	(0.004)	(0.023)
β_4	-0.000	0.005	0.007	-0.020
	(0.006)	(0.007)	(0.008)	(0.036)
τ	0.002***	0.004***	0.004***	0.006***
	(0.001)	(0.001)	(0.001)	(0.002)
ν	-0.001	0.001	-0.002	0.021**
	(0.002)	(0.002)	(0.002)	(0.009)
γ	0.018***	0.025***	0.071***	0.068***
	(0.002)	(0.004)	(0.008)	(0.011)
θ	0.016***	0.030***	0.061***	0.076***
	(0.002)	(0.004)	(0.006)	(0.010)
Adj-R^2	0.012	0.009	0.012	0.009

Notes: *, ** and *** indicate statistical significance at the 10%, 5% and 1% levels, respectively. Values of White standard errors are enclosed in parentheses.

Finally, our results support the hypothesis when we use Tobin's q ratio as a financial constraint indicator. Both lowly and highly financially constrained firms in recession are affected more by monetary policy changes than they are in expansion. Although most of the firms are affected significantly by monetary policy changes, the strength of effects between lowly and highly financially constrained firms seems not to be distinct.

4.5 Findings

The main purpose of this chapter is to analysis the hypothesis that if monetary policy changes have stronger effects on listed firms' stock returns in economic recession than in expansion. By using the baseline model and the extended model, above hypothesis can be proved in China.

Firstly, we use CARs as the dependent variable and interest rate changes as the independent

variable, and macroeconomic status as a control variable in the baseline model. We found the effects of monetary policy on stock returns in recession are 1.5 to 2 times than in expansion.

Secondly, we add a dummy variable which represent firms' financial constraints. Five financial constraint indicators we explained in Chapter 2 and Chapter 3 are applied again to determine the dummy variable. Using these indicators, firms are divided into four types, including lowly financially constrained firms in expansion, highly financially constrained firms in expansion, lowly financially constrained firms in recession and highly financially constrained firms in recession. The last type of firms always be affected most seriously than any other type of firms. However, it's difficult to measure which type of firms are affected more between highly financially constrained firms in expansion and lowly financially constrained firms in recession. Sometimes even lowly financially constrained firms in expansion are not the type of firms who receive the minimal effects. But we conclude the results overall, economic recession and high financial constraints are the two factors that make firms be affected more by monetary policy changes.

[i] See Kuttner (2001), Bernanke (2003), Bernanke and Kuttner (2005).

Chapter 5

Conclusion

5.1 Summary

This dissertation made an analysis of the link between monetary policy and stock prices. By using official one-year loan rates as the measure of monetary policy, we found a negative relationship between monetary policy and stock prices. In particular, an increase in interest rates will make stock prices fall; while a decrease in interest rates will make stock prices rise. We also tried to find out what factors can influence such relationship. As a result, the degree of firm's financial constraint, firm's ownership and macroeconomic status can exert influences on the strength of monetary policy's effects on stock returns.

In Chapter 1, we introduced the background and motivation of the dissertation. As the second largest economy in the world, China has attracted lots of attentions from investors. This dissertation try to help investors understand Chinese stock markets and monetary policy. We gave a brief description of Chinese stock markets and monetary policy, and pointed out the content we were going to study in the following chapters.

In Chapter 2, our key word of the influential factor is financial constraint. Firstly, we adopted the CAR analysis to calculate listed firms' abnormal returns. As we discussed before, the CARs can help us eliminate other factors that can affect stock returns than monetary policy. Through this analysis, we can get "pure" returns that only caused by interest rate changes. Secondly, we used the CARs as dependent variable to study our cross-sectional analysis. Five financial constraint indicators that we borrowed from Ehrmann and Fratzscher (2004) are used to measure the degrees of firms' financial constraints. Based on the magnitude of each indicator, firms are divided into three groups: low group, medium group and high group. We should emphasize that the low medium high only shows firm's position in the categorization, not indicates a firm is highly financially constrained or not. The degrees of firms' financial

constraints should depend on the nature of each indicator. As a conclusion, we found highly financially constrained firms are affected more than other type of firms.

In Chapter 3, we put our viewpoint on firms' ownership. The presence of a large number of SOEs is a major nature of China's stock market. Because almost all the banks in China belong to government, SOEs may finance more easily from banks for their mutual state background. Hence it is reasonable for us to doubt that monetary policy's effects on stock returns should be asymmetric between SEOs and private firms. The empirical results from baseline model confirmed our doubt that monetary policy's effects are stronger for private firms than SOEs. After the baseline model, we introduced five financial constraints indictors in the model and found that highly financially constrained private firms would be affected more by monetary policy changes than other firms. To verify the above results, we improved the model by controlling firm size, and got the same conclusion. What's more, we found highly financially constrained private small firms are affected most seriously.

In Chapter 4, we analyzed the influences from macroeconomic cycles on stock returns. Although China's economic growth rate has never been below 0 in the past twenty years, there are still economic expansion and recession in China. By using actual GDP growth rate as a tool, we divided Chinese economy into two times of recession and two times of expansion from 1997 to 2010. We found monetary policy changes exert stronger effects on stock returns in recession rather than in expansion. The reason can be attributed to the "financial accelerator" effects and investors' pessimism. Like the previous chapters, we introduced five financial constraint indicators, and found that highly financially constrained firms in economic recession would be affected the most than other types of firms.

In Chapter 5, we summarized the contents of the previous chapters. We are going to point out some shortcomings that we recognized in the next subsection, and make them as the future topics.

5.2 Future Research

First, in order to compare our results with Ehrmann and Fratzscher (2004)'s, we used same

financial constraint indicators in the dissertation. We want to find out other indicators which may reflect Chinese firms' status better in the future.

Second, official one-year loan rates are used as the representative of monetary policy in the dissertation. However, other instruments like deposit reserve policy, open market operations and rediscount policy are also used by the center bank. Some financial innovations in monetary policy have emerged in the last few years, too. We want to use other representatives, or combine them together, to analysis the monetary policy's effects on stock returns.

Third, we analyzed monetary policy's effects on stock returns under the influences of firms' financial constraints, ownerships and macroeconomic cycles. But these three factors have not been analyzed in one empirical model. We want to see the combined effects of them in future research. In addition, there should be some other factors that can also have some influences. We will try to find such factors and continue our research.

Overall, the above research issues are worthy for scholars who desire a deeper understanding of Chinese stock markets and monetary policy. We look forward to more intensified research.

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