The Unintended Consequences of Direct Purchase Stock Market Rescue: Lessons from China

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[1] Xu acknowledges financial support from the National Natural Science Foundation of China (Grant number 71402145 and 71620107005) and the Young Scholar Research Project of the Ministry of Education (Grant number 11YJC630240).

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This version: June 2019

ABSTRACT

After the Chinese stock market dropped one-third in three weeks in June 2015, reportedly driven by lack of liquidity due to the fire sales by margin buyers, the government used hundreds of billions of dollars to purchase shares directly in the secondary market. We validate that margin trading is associated with the surge of stock market before the crisis. We find that firms in systemically important industries, firms with more political ties, and firms with high risk of falling into liquidity spiral are more likely to be rescued. More importantly, compared with matched un-rescued firms, rescued firms did not have higher stock return, but experienced higher volatility, lower liquidity, and lower price efficiency afterwards. Market quality even deteriorated further after the subsequent sale of the purchased shares. Last, rescued firms experience a modest decline in operational performance, while capital structure and investment remained the same. Our evidence suggest that a direct purchase rescue in the secondary stock market could generate serious unintended consequences.

***JEL classification*:** G30 G38 O31

Keywords: Stock market rescue; Secondary market purchase; Political uncertainty

1. Introduction

Over the past few hundreds of years, global capital markets have encountered many business crises, each with varying damaging powers. Till nowadays, it is still unclear whether the regulation authorities should interfere with the crisis, and more importantly, how. Popular intervention approaches include monetary policy adjustments, such as lowering interest rate to boost the economy used in year 1987 after the Black Monday as well as establishing emergent lending facilities in the 2008 financial crisis [1], capital injection into endangered sectors, such as the Trouble Assets Rescue Program (TARP) adopted in 2008 global financial crisis, [2] and secondary market intervention such as changing the rules of trading and purchasing shares directly, such as the shorting ban enacted also in 2008.[3] There is a fourth alternative, the direct purchase rescue, a rescue program through which a government directly purchases securities in its domestic stock market. While the first three approaches of market rescue have been studied relatively extensively, the government direct secondary market purchase approach has not received much attention, mostly due to data availability. In this article, we investigate the effects of a large-scale ($200 billion) direct purchase rescue program, carried out by the Chinese government to directly purchase the shares of public companies, in coping with the stock market crash in 2015.

For the 12 months before June 2015, Chinese stock market experienced a strong bull market, and the Shanghai Composite Index increased by 140% over this short period. The regulators were concerned that the surging trading activities financed by margin loans was filling up an asset

[1] Quite a few studies discuss the relation between the monetary policy and the asset pricing in stock market (Bernanke and Gertler 2001; Mishkin 2011; Bekaert, Hoerova, and Duca 2013; Gali and Gambetti 2015). Adrian et al. (2011) and Duygan-Bump et al. (2013) study the effect of Fed's emergent lending facilities.

[2] Bayazitova and Shivdasani (2012) study the effect of the Capital Purchase Program of TARP as well as banks' participation into this program. Several other studies, such as Duchin and Sosyura (2012) and Berger and Roman (2015), examine the effects of TARP on recipient banks.

[3] Bhanot and Kadapakkam (2006) focus on the consequences of share purchase by Hong Kong Monetary Authority. Boehmer, Jones, and Zhang (2013) tests the effects of short-selling ban on market quality.

bubble. As a result, in June, China Securities Regulatory Commission (CSRC) took stringent controls on margin purchases. The investors, who now received margin calls, started to sell their holdings, and triggered a liquidity spiral (Bian, He, Shue and Zhou, 2017). In response, the A-share market began to crash on Monday June 15, with one third of its market capitalization being lost in the subsequent three weeks. On July 3, the spokesman of CSRC Xiaojun Zhang stated that "*China Securities Finance Corp (CSFC) will increase its capital from 24 billion Yuan to 100 billion ... to stabilize the capital market*". CSRC also confirmed that Central Huijin Investment (CHI) also actively participated in the purchasing activity. Given the role of CSFC and CHI in the rescue program, they are usually referred to as the *National Team*. The rescue program by the Chinese government lasted from early July to mid-August, with an overall spending of more than 200 billions of dollars.[4]

China is not the first government that adopted the direct purchase rescue, it has been used by Japan, Korea and Hong Kong[5] during their stock market crises. As an emerging market, China implemented a rescue program that is quite different from the ones in developed markets. In the rescue of Hong Kong stock market in 1998, the purchase is restricted to only 33 stocks that belong to Hang Seng index. For the China direct purchase plan, the authority didn't restrict its rescue targets to a certain group of firms. Large-scale of rescues in developed market mostly comes with public news release of details to the public. For instance, the TARP in 2018 by the U.S. government gave specific parameters regarding rescue targets and duration. In China, the public information regarding the rescue is scarce, and the opaqueness of the rescue program generated a huge amount

[4] http://finance.sina.com.cn/2016-06-12/guzaizhounian3.html. More details about the institutional background are shown in the Section 2.

[5] Japan and Hong Kong used public funds to purchase index stocks in 1990 and 1998, respectively, while Korea took similar actions in 1989 and 2003.

of uncertainty to all market participants.[6] Although the stock market turmoil seemed to come to a halt right after government's direct purchasing, it is not clear whether and how such government intervention achieved its policy targets.[7] Is this direct purchase program as successful as the one by Hong Kong Monetary Authority (HKMA)? In this study, we provide evidence that the direct purchase programs might have led to unintended consequences in terms of liquidity and uncertainty.

To understand the consequences of the direct purchase rescue, we compare the rescued firms and the un-rescued firms. We define "rescued firms" as those that experienced an increase in National Team ownership during the third quarter of 2015, and we successfully identify 1,363 rescued firms and 1,404 un-rescued firms. Under reasonable assumptions, it is estimated that the Chinese government spent more than 1.2 trillion CNY (roughly 200 billion USD) on purchasing stocks from early July to mid-August, resulting in a 2.5% ownership on average in rescued firms.[8] Regarding the selection of rescue targets, government's strategic industry plan, political factors, and the stock's liquidity conditions are important determinants for rescue targets.[9] After we match each rescued firm with an un-rescued firm, we perform a difference-in-difference analysis on several important aspects of stock market consequences, such as returns, volatility, liquidity, information efficiency, and firm fundamentals.[10]

[6] https://www.cnbc.com/2015/11/27/chinas-national-team-stock-market-ownership.html

[7] Hang Seng index stocks that were bought by the Hong Kong Monetary Authority (HKMA) in 1998 experienced a significant positive abnormal return during the intervention period, without reversals later on (Bhanot and Kadapakkam 2006).

[8] The estimated amount of money is calculated as follows. For each rescued stock, we calculate the number of shares purchased by the National Team and multiply this number with an estimated purchase price. Since the government had never disclosed the actual purchase price, we consider the minimum, mean and median price of each stock during the rescue period, and calculate the corresponding amount spent by the government. The minimum and the median is 1.00 and 1.22 trillion CNY, respectively.

[9] Analyzing the pattern of intervention by the Hong Kong Monetary Authority in 1998, Bhanot and Kadapakkam (2006) also find that the liquidity of a stock is a significant determinant of intervention. Also consistent with the Hong Kong case, we do not find that pre-intervention stock return is associated with the likelihood of being rescued.

[10] We match rescued firms with the ones having similar size and liquidity in the same industry. We get similar results when we match further the factors that matter for the allocation of rescue fund in our previous analysis.

Over a five-week window around the rescue period, rescued firms do not have significantly higher returns than their un-rescued counterparties. One explanation of this finding is that although the purchase by the government could potentially increase the stock price by enlarging the demand for shares, it also generates political uncertainty which could increase the required rate of return and reduce the stock price. However, following the direct purchase rescue, the market quality has declined substantially for the rescued firms. Compared with the un-rescued group, rescued firms returns become much more volatile, with return volatility and price range increasing by 13% and 5%, respectively. Moreover, there exists a deterioration of the liquidity of rescued stocks, as indicated by both stock turnover (decreased by 17%) and the Amihud illiquidity measure (increased by 14%). The rescue program also seems to reduce the price efficiency of the rescued firms which is measured by two price delay variables in Hou and Moskowitz (2005). It implies that rescued firms' stock prices incorporate new information much slower. The government reduced its position in rescued firms during the fourth quarter. Interestingly, this wave of stock selling also makes the market more volatile and impairs the price efficiency. Finally, for the long-term consequences, once government purchased shares of a given firm through the government rescue, the operational performance measured by ROA, ROE and sales growth decrease by 5.4%, 6.3% and 11.9% of one standard deviation, respectively. These findings indicate the rescue program, with the intention of stabilizing the market and restoring liquidity, probably has not achieved its policy goal.

Our paper makes two distinctive contributions from previous literature. First, previous literature has extensively discussed the effectiveness of monetary policy, capital injection and trading rule changes, and yet the conclusion is mostly mixed. By focusing on China, the largest emerging market in the world, our study takes a different perspective, by highlighting the role of

policy uncertainty in a government rescue program. It is likely that whether a government rescue could save the stock market depends on how much policy uncertainty it generates at the same time. In emerging countries like China, government interventions are frequent and opaque, making policy uncertainty a big issue for investors, which could generate unintended consequences.

Second, our paper helps better understand the overall effectiveness of the government rescue program in China. Most of previous papers on the rescue program focuses on the value the rescue generated. For instance, using the Merton (1974) model to estimate firm value and default probabilities, Huang et al (2016) estimate that government intervention increased the value of rescued firms dramatically, a huge net benefit between RMB 2,464 and 3,402 billion. Based on event-study technique, Chi and Li (2017) show that the positive abnormal return of 63 firms that voluntarily disclosed their shares being purchased by the government, disappeared when investors knew the full scale of the government rescue program, suggesting that government intervention did not really create value. Our paper focuses on the market quality measures rather than market values, and helps to provide an overall view of the effectiveness of the government rescue program.

The rest of the paper proceeds as follows. Section 2 introduces the institutional background and Section 3 describes the sample. Section 4 examines the decision about what kinds of firms to be rescued, as well as the impact of government rescue on return and market quality. Section 5 shows the real effects of the rescue and robustness test. Section 6 concludes the paper.

2. Institutional background

As the growth of Chinese economy slowed down from 12% in 2007 to 7% in 2014, the Chinese government adopted many approaches to stimulate the economy. In 2008, the Chinese government injected 4 trillion RMB in the market mostly through the loosening of credit by state-

owned banks (Deng et al. 2015). In 2013, to create new growth opportunities for the whole economy, the Chinese government initiated the One-Belt-One-Road strategy, involving infrastructure development and investment in more than sixty countries. Meanwhile, following the successful experiences of other markets, the Chinese regulators aimed at improving market efficiency, by introducing and expanding margin trading in the Chinese A-share market.

On March 31 2010, Shanghai and Shenzhen Exchange allowed margin trading on 90 pilot stocks, all of which were large and liquid stocks in Shanghai Exchange 50 Index and Shenzhen Component Index. Over the next 4 years, the number of eligible stocks increased gradually to 900 stocks in September 2014. For investors to use margin trading, since 2010, they are required to have at least 0.5 million CNY in their brokerage accounts and their accounts are required to be open for at least 18 months. The restrictions were later relaxed by the CSRC in 2013 to promote margin purchase. According to Bian et al. (2018), investors who meet the requirements could borrow margin loans from their brokerage firms at an annual interest rate around 8-9%. The margin loans, combined with their own funds, are used to purchase stocks for which margin purchase is allowed.[11] Qualified investors can also borrow stocks from brokerage firms for short-selling. However, the volume of short selling is minimal compared with that of margin purchase.[12]

The volume of margin buy increased dramatically in 2014, from 296 billion Chinese Yuan (CNY) in January to more than 2.8 trillion CNY by the end of the year. At the same time, the Shanghai Composite Index posted a 50% return in the second half of 2014. The rapid increase in the index value possibly fuels more margin buy, and the total volume of margin buy quadrupled

[11] For instance, investors only need to maintain an account for six months before they become qualified to trade on margin.
[12] While the market value of the tradable shares of the 900 stocks accounts for 80% of the total market value of the tradable shares in A-share market, the volume of margin buy is far more than that of short sales. There are many possible reasons. One explanation for the very limited short selling activities is that due to the high ownership by controlling shareholders in China, the number of shares available for short-selling is very small. The "T+1" trading restriction is also believed to contribute to the inactive short-selling in China. http://finance.jrj.com.cn/2014/12/29040018614790.shtml

in the first half of 2015, as is shown in Figure 1. During the same period, a large number of individual investors who are not qualified to trade using margin loans from their brokers, finance their stock purchase using *shadow* financing which was under the radar of CSRC.[13] Compared with brokers, the shadow margin loan providers allow a much higher leverage ratio of borrowers' trading accounts, and in return they charge a higher interest rate on funds loaned to investors. The shadow margin loan market channels funding to millions of unqualified individual investors and facilitates trading on margin. Powered by an unprecedentedly large volume of margin purchase, the Chinese stock market continue to skyrocket: the Shanghai Composite Index increased from 3,000 in January of 2015 to 5,000 in early June of 2015.

[Insert Figure 1 here]

The sharp increase of stock prices accompanied by the substantial trading volume using unregulated margin loans brought concerns to the regulator about potential bubbles in stock market. In January 2015, mild regulation, such as warning and required self-improvement, were placed on the margin trading activities.[14] However, margin trading activities were barely affected by this regulation, and the stock market index continued to rise by another 50% in the following months. At the end of May 2015, CSRC issued detailed guidelines to regulate the margin trading activities, and required the brokerage firms to execute these guidelines strictly.[15] On June 13, CSRC made another announcement to discipline the unregulated margin purchases: *any brokerage firm that violates the requirement that forbid brokers from facilitating margin purchasing through the use of (unregulated) platforms such as HOMS would be subject to penalty*.[16] According to Bian et al

[13] http://www.xinhuanet.com/fortune/caiyan/ksh/53.htm
[14] http://finance.sina.com.cn/stock/hyyj/20150116/205521318606.shtml
[15] http://www.csrc.gov.cn/guangdong/ztzl/mtbd/201505/t20150525_277716.htm
[16] http://finance.sina.com.cn/stock/y/20150613/123122425154.shtml

(2017), these restrictions possibly trigger a liquidity spiral: investors who faces margin calls start to sell their shares, which pushed down stock prices dramatically, forcing more investors to sell their stocks. Eventually, a stock market crisis started on June 15, with about one-third of the market value evaporated within the next three weeks. The investing community started to panic.

[Insert Table 1 here]

To stabilize the stock market from the tumbling down, the regulators made a few regulation changes right after, with the timeline outlined in Table 1. On June 27, the People's Bank of China announced that it would reduce interest rate for qualified financial institutions. Two days later, on June 29, the Ministry of Human Resources and Social Security announced that China's pension funds may be allowed to include A-share stocks in their portfolio. On July 1, Shanghai Stock Exchange announced that it would reduce the transaction fee by 30%. However, the above attempts did not succeed in stopping the market capitalization from melting down.

On July 3 of 2015, the direct purchase plan started, and the CSRC confirmed that CSFC and CHI would purchase shares actively to stabilize the stock market.[17] However, as no official guideline was provided, general investors are not informed of the details of this purchase plan. One direct result of this opaque purchase program that we can observe is that after the purchase was terminated in mid-August, the CSFC and CHI have become top ten shareholders in almost half of the listed firms in Chinese A-share market. As is shown in Appendix A, CFSC and CHI were present in 743 and 1,113 firms, collectively holding 1,363 A-share firms. In terms of ownership position, these two institutions held about 3.1 percentage of all shares outstanding in A-share market on average.[18] However, it was very hard to estimate the precise cost of the

[17] https://cn.reuters.com/article/factbox-china-share-idCNKCS0PG01620150706

[18] When calculating these two institutions' total stake in listed companies, we have ignored companies in which they are not among the top ten shareholders. Hence we tend to underestimate their total stock ownership in terms of both the number of firms

government rescue program as the government did not disclose any relevant details. Relying on a very conservative approach which assumes that the government purchases stocks at their average prices during the rescue window, our estimate indicates that the Chinese government has spent more than 1.2 trillion CNY (roughly 200 billion USD) on purchasing shares.[19]

[Insert Figure 2 here]

On August 14, CSRC announced that the direct purchase operation made by CSFC was successful, and that the CSFC would not exit from the stock market in the following few years, which was interpreted as the sign of the end of the direct purchase rescue.[20] As we can see in Figure 2, in almost all the quarters since the end of 2015, the magnitude of ownership sales has been much less significant than ownership increases. An exception is the fourth quarter of 2015 when there was a large wave of government ownership decrease and even complete exit, with the stock ownership by the government decreasing in 386 firms and being sold out in another 146 firms, out of the 1,363 firms that were initially rescued.

Overall, different from other rescue programs (e.g., TARP and the rescue by HKMA), the Chinese direct purchase rescue in 2015 is very opaque: the target firm selection and the guidelines for purchasing and selling are never disclosed. The opaqueness generates a considerable level of uncertainty to investors in the market, which is the focus of our empirical study.

3. Data

and the number of stocks.

[19] Considering the opaqueness nature of this rescue program, it is unsurprising to find that several other institutions come up with numbers with a differing magnitude. Reuter's estimation is about 800 billion dollars in July (Source: http://www.reuters.com/article/us-china-markets-rescue-idUSKCN0PX0BA20150723). An updated estimation is 236 billion dollars in September according to the analysis by Goldman Sachs (Source: http://money.cnn.com/2015/09/08/investing/china-stock-market-bailout-beijing/index.html).

[20] http://finance.sina.com.cn/stock/marketresearch/20150814/235422970738.shtml

3.1 Sample

We start from 2,767 firms listed on the A-share market of China at the beginning of June 2015 that have valid information of the identity and share-holding of top 10 shareholders in Wind Financial Terminal (WIND) database. In order to examine the effect of government rescue, we have to identify firms whose shares were purchased by the so-called National Team after the stock market crash. However, due to the opaqueness of this direct purchase program, which institutions act as the National Team and participate in the rescue is not deterministic. In this paper, we take a conservative approach and only include *China Securities Finance Corporation Ltd* (CSFC) and *Central Huijin Investment Ltd* (CHI) as National Team members.[21] Both of these two institutions are 100% state-owned. Although they operate in the form of corporations, essentially they are quasi-bureaucratic entities. Therefore, they wholly serve the interests of the central government.[22]

We then trace the stock ownership of CSFC and CHI in each firm, and define a firm as a rescued firm if we are able to find an increase in ownership by these two institutions in the third quarter of 2015 compared with that in the second quarter. CSFC is found to hold shares in 743 firms and CHI in 1,113 firms in the third quarter of 2015, with these two institutions collectively holding 1,363 firms. The 1,363 firms are considered to be rescued by the government, and the un-rescued group consists of the rest 1,404 firms. In our main analysis, we construct a propensity-matched sample in which each rescued firm is matched to an un-rescued firm from the same industry using market cap and turnover.

[21] CSFC was established in 2011 and acts as an intermediary that facilitates the flow of margin loans as well as securities for short-selling between investors and their brokerage firms. Founded in 2003, CHI represents the central government in making equity investment in state-owned financial institutions.

[22] According to some media reports, more than 20 brokerage firms also participated into the direct purchase program. We exclude these brokerage firms from the National Team, because conflicts of interest were detected after the rescue program was terminated in mid-August as many brokerage firms were found to have taken advantage of the National Team's rescue effort for their own benefit.

We obtain firm accounting information and stock market trading data from CSMAR and WIND database. State ownership data is from the CCER database. Our sample size declines to 2,276 after we delete firms with missing firm characteristics, leaving us with 1,250 rescued and 1,026 un-rescued firms. Most of our analysis relies on samples containing firm-week observations. To avoid the mess of many confounding events during the implementation of the rescue program, we focus on a narrow window, the five weeks before the stock market crash on June 15, and the five weeks after the termination of rescue which was announced on August 14.[23] To mitigate the impact of outliers, all continuous variables are winsorized at the 1% and 99% level.

[Insert Figure 1 here]

3.2. Stock market variables

In this paper, we construct two variables to measure the volatility of stock prices. *Log(Volatility)* is the natural logarithm of the weekly volatility of daily stock returns. *Log(Range)* is the natural log of weekly average stock price range, defined as the ratio of the difference between the daily high and low stock price, over the average of these two prices.

We use two variables to measure stock liquidity, stock turnover and the Amihud illiquidity ratio, both of which calculated on the weekly level and in their natural logarithm.[24] Weekly stock turnover is defined as the ratio of average daily trading volume to total market capitalization each week.[25] Weekly Amihud illiquidity measure is defined as the weekly average price impact (in bps) for each one million Yuan of transactions, following Amihud (2002). Specifically, it is calculated

[23] Our results are robust to alternative event windows, such as 4 weeks or 8 weeks before and after the rescue program.
[24] Another widely used measure of stock market liquidity is the bid-ask spread. However, due to various reasons such as voluminous trading, bid-ask spreads in China have little variation. In our sample period, about 80% of firm-daily observations have a bid-ask spread of 1 cent.
[25] Instead of calculating total trading volume each week, we use the average daily trading volume in order to take in account days in which the trading of a particular stock is suspended.

as

$$Amihud_{ij} = \sum_{t=1}^{N_{ij}} (\frac{|R_{ijt}|}{Vol_{ijt}}) / N_{ij}$$

where R_{ijt} is the stock return of stock *i* on day *t* in week *j* (in bps), Vol_{ijt} is the corresponding daily trading volume (in million Yuan) and N_{ij} is the number of trading days in week *j* for stock *i*.

We construct two variables, namely *D1* and *D2*, as proxies to stock price efficiency. *D1* and *D2* are calculated following Hou and Moskowitz (2005). Specifically, we first run regressions without lagged market returns each month and generate the R-square of each regression. Then we run regressions that include 4 days of lagged market returns and save the R-square from each regression.

$$r_{j,t} = \alpha_j + \beta_j R_{m,t} + \sum_{n=1}^{4} \delta_j^{(-n)} R_{m,t-n} + \varepsilon_{j,t}$$

$\delta_j^{(-n)}$ represents the partial correlation between contemporaneous individual stock return and the market return on day *(t-n)* for firm *j*. *D1* is then defined as one minus the ratio of the R-square from the regression without lagged market returns, over the R-square from the unrestricted regression above.

$$D1 = 1 - (R^2_{\delta_j^{(-n)}=0, \forall n \in [1,4]} / R^2)$$

D2 is defined as follows.

$$D2 = (\sum_{n=1}^{4} n\delta^{(-n)} / se(\delta^{(-n)})) / [(\beta / se(\beta)) + \sum_{n=1}^{4} n\delta^{(-n)} / se(\delta^{(-n)})]$$

where $se(.)$ is the standard error of the corresponding coefficient estimate.

3.3 Firm fundamentals variables.

When we study the selection of rescue targets, we consider a battery of firm characteristics that could affect the government's decision regarding stock purchases. We first construct several

measures of political connection, including a dummy for SOEs, a variable indicating the presence of pension fund holding and a dummy for top management having political connections. SOEs are firms whose ultimate controlling shareholder is the government. The variable *pension* equals one for firms for whom the Chinese social security fund is present as one of the largest ten shareholders. A firm is defined to have political connection if its CEO or chairman has work experience in parliaments or government agencies. The variable *margin* is defined as the average monthly margin trading intensity during the first five months in 2015 before the crash. We calculate individual stock-level margin trading intensity as the fraction of trading using margin loans. We calculate the two-week cumulative return right after the crash on June 15 as a proxy for the severity of stock market meltdown.

We also construct several accounting variables. Firm size is defined as the natural logarithm of book value of assets. Leverage is calculated as long-term debt scaled by book value of assets. Sales growth equals the one-year growth rate of net sales. ROE is calculated as net income divided by total book equity. As one of the special arrangements in the Chinese stock market, "ST (special treatment)" is a label tagged by the regulator to stocks with a significant amount of risks. Usually firms that meet one of the several criteria (e.g., two consecutive years of losses) will receive "ST".

3.4. Descriptive statistics

Panel A of Table 2 provides summary statistics of the attributes of firms in our sample. The average rescued firm in our sample finances 45.5% of assets using debt and has an annual sales growth rate of 16%. More than 40% of the rescued firms are state-owned-enterprises, while this fraction is much lower for the un-rescued group. In our sample, around 45% of the rescued firms have top management who are politically connected with the government. About 16% of rescued firms have the social security fund as one of their major shareholders. The average fraction of

monthly trading using margin loans is 10.7% for the rescued and 4.3% for the un-rescued group in the first half of 2015. Not surprisingly, there is a substantial decline in stock prices during the crash, with the average rescued and un-rescued firm having a three-week cumulative return as low as -45% and -47%, respectively. The percentage of ST firms before the market crash is 0.2% and 2.4% for these two groups.

[Insert Table 2 here]

Panel B presents summary statistics of weekly stock market variables related to stock liquidity, return and volatility, as well as stock price efficiency measures calculated on the monthly level. The sample for return, volatility and liquidity spans the period between five weeks before the stock market crash on June 15, and five weeks after the termination of rescue which was announced on August 14. Weekly observations lying between June 15 and August 14 are excluded from our sample. There are in total 20,234 firm-week observations. Although stock prices declined dramatically during the crash, average (weekly) stock return in our sample period is positive, a result of the dramatic pre-crash increase in stock prices. Weekly stock return volatility is 4.5% and the average price range is 7.7%. On average, about 5% of market capitalization is traded per day. Stock price on average moves by 0.28 basis points per one million Yuan trading volume.

The sample for stock price efficiency includes 3,916 firm-month observations. The sample period spans one month before the stock market crash and one month after the termination of government rescue. Since D1 and D2 intend to capture the ability of lagged market returns in explaining contemporaneous stock returns of the firm, the larger these variables, the more there is a price delay. In un-tabulated analysis, we test the null hypothesis that D1 and D2 is not statistically significant to zero. The null is rejected at 1% significance level, indicating that there is significant price delay for stocks in our sample period.

4. Main results

4.1 Margin trading and stock return

The mania before the June 2015 crash in the Chinese stock market featured a record-high volume of margin purchase. Both policy-makers and practitioners consider margin trading as the cause of the rise and fall of the stock market around the crash period. In this section, we first present a simple test that aims to illustrate how margin trading is correlated with stock returns.

While there is extensive research on the effect of margin requirements on stock volatility[26], little is known regarding how actual margin trading is related to stock returns. Using time series of S&P 500 index returns from 1934 to 1994, Hardouvelis and Theodossiou (2002) find that higher margin requirements are associated with lower conditional stock returns, as high margin requirements reduce systemic risks. In contrast, Seguin and Jarrell (1993) find that stocks eligible for margin trading actually fell less than ineligible stocks around the 1987 "Black Monday" crash, though the former group was subject to margin calls and fire-sale pressure more often. Chang, Luo and Ren (2014) examine the price efficiency implications of margin trading activities in China and find that margin trading does not predict future returns.

Theoretically, margin trading can alleviate mispricing in financial market by relaxing limits of arbitrage. However, it is widely believed that margin trading, especially the margin purchase using highly leveraged financing, caused the surge of the overall stock prices before the crash of the Chinese stock market in mid-2015. Simply tracing the aggregate amount of margin purchase before the crash reveals that margin trading volume nearly quadrupled, accompanied by the stock

[26] See for instance previous work by Salinger (1989), Hsieh and Miller (1990), Hardouvelis and Peristiani (1992), and Hardouvelis and Theodossiou (2002).

market mania.[27] A recent research by Bian et al. (2017) utilizes account-level data and shows that fire sale pressure, which stems from shadow-leverage accounts, leads to the free-fall of stock prices.

We run Fama and MacBeth (1976) regressions which link individual stock returns to the past margin-trading volume for each stock. The sample includes all common stocks listed on Shanghai and Shenzhen Stock Exchange between December 5, 2011 and June 12, 2015.[28] The dependent variable is defined as the raw return over the next 20 trading days, skipping 1 day after measuring margin-trading activities, following Boehmer et al. (2008). We generate the fraction of daily trading volume using margin and take the average of this ratio for the previous five trading days for each stock. As control variables, size, book-to-market, volatility and turnover are calculated using data from the previous calendar month.

[Insert Table 3 here]

Table 3 reports results of Fama and MacBeth (1976) regressions of 20-day cumulative returns on margin-trading volume. Standard errors are adjusted using Newey-West with 20 lags. Column (1) does not control for individual stock characteristics. The coefficient estimate of margin-trading share indicates that higher margin trading volume in the past few days is associated with significantly higher stock returns in the future. Column (2) includes several control variables that are related to future stock returns. The coefficient estimate continues to be significant, with the magnitude becoming slightly smaller. The regression results are consistent with the argument that the rising margin trading volume triggers the stock market bubble.

[27] As can be seen from Figure 1, the total margin trading volume increases from a level around 1.2 trillion CNY at the beginning of 2015 to 4 trillion right before the crash.

[28] On December 5, 2011, another 188 stocks became eligible for margin trading, making the total number of eligible stocks increase to 278. Our sample starts from this date so that there are enough firms in the cross section. The sample period ends at one trading day before the stock market crash on June 15, 2015.The sample used by Chang et al. (2014) spans the period between January 2010 to December 2012 and thus covers a much shorter period than ours.

4.2. Which firms to rescue?

Since the direct purchase rescue was quite costly for the government, it is important to understand how the rescue program allocated the money. In this section, we examine whether the likelihood of being rescued is related to specific firm characteristics. Specifically, we are interested in how government's industry preferences, political factors, possible liquidity spiral concerns as well as several firm fundamental attributes determine the government's rescue decision.

We estimate a Logit model in which the dependent variable is a dummy indicating whether a firm's stocks were purchased by the government during the crash. All the predicting variables, except margin trading volume and the three-week cumulative return, are calculated in year 2014. Our sample includes 2,276 firms with non-missing value of predicting variables, and the unconditional likelihood is 49%. We calculate marginal effects at the mean, which allows us to directly interpret coefficients in terms of rescue likelihood. We control for industry preferences in every regression and examine political factors, liquidity spiral concerns and firm fundamentals separately. In the end, we put all of our regressors in one regression as a stronger form of test. Results are shown in Table 4.

[Insert Table 4 here]

Column (1) only includes industry dummies. Compared with firms in other industries, those operating in manufacturing, finance, utilities and the real estate industries have a significantly higher likelihood of being rescued. The finance industry, which has 85.5% unconditional likelihood of being rescued by the government, also has the largest magnitude of coefficient estimate. Manufacturing industries host companies that employ the bulk of labor force in China, which makes it a policy-sensitive sector. Driven by the policy goal of "maintaining a harmonious

society", resource allocation in China (e.g., capital allocation) sometimes tilts toward social goals such as unemployment reduction, instead of profit maximization.[29] Our results also support the social goal driven resource allocation in the stock market rescue setting.

In Column (2), we investigate whether political consideration plays a role in determining whether a firm is included in the rescue list. Not surprisingly, all the three proxies for political factors are both economically and statistically significant. For instance, being an SOE increases the rescue likelihood by as large as 17.6%, and political connections by top management are associated with a 9.1% increase. Having the national pension fund as one of the major shareholders is associated with a 9.4% increase in the probability of becoming rescue target. These effects are substantial if we consider the unconditional likelihood of rescue. It is of course challenging to claim that these variables are capturing political concerns exclusively as they might be correlated with other dimensions of (unobserved) firm characteristics. However, we do find that the political favoritism effect still survives if we include a host of other firm characteristics in the logit model, as revealed in Column (5). Our findings are consistent with those in Duchin and Sosyura (2012) and Li (2013) who document that politically connected firms are more likely to receive TARP money in the US, and with the result in Faccio et al. (2006). Our findings here also imply that political connections, just like their role in other markets/settings such as credit market, also matter in the secondary stock market of China.[30]

Column (3) shows how the concern of firms entering liquidity spiral affects the rescue

[29] Chen et al. (2017) examine capital allocation within business groups in China and find that capital flows are negatively correlated with investment opportunities for state business groups while the Q-sensitivity of investment is positive in private groups. They also find that the negative Q-sensitivity for state groups is largely driven by the policy goal of maintaining social stability, such as boosting local employment.

[30] It is well documented that the allocation of credit in China is determined in a large extent by political connections and this process in general is not efficient. For instance, Cull and Xu (2000) find that bank finance in China did not chase more productive firms. Firth et al. (2009) show that political connections affect the likelihood of gaining access to bank finance, although commercial judgement is also present. Government intervention and political ties also play a role in the primary market. Fan et al. (2007) find that government intervention is negatively related to post-IPO performance.

decision. Pre-crisis margin trading intensity seems to have very significant prediction power. As the fraction of trading using margin loans increases by one standard deviation, the rescue likelihood increases by 17.4%. This effect remains even if we control for other related factors in Column (5). Surprisingly, we fail to find any significant relationship between the price decline and government rescue. This finding implies that the choice of firms to rescue does not necessarily depend on the magnitude of individual stock-level price decline.[31] Instead, the government seems to support the price of firms which are subject to more leveraged-induced selling and hence could suffer more from liquidity spiral.

As supplementary analysis, we investigate how firm fundamentals are associated with the likelihood of being rescued in Column (4). The coefficient estimates imply that the government tends to rescue firms that are larger, firms with lower leverage and slower sales growth, and firms that do not receive special treatment (ST). Among these significant predictors, firm size matters most in the rescue decision making, highlighting the systematic importance of big firms for the whole stock market.[32] In terms of economic significance, a one-standard-deviation increase in firm size is associated with a 31.8% (0.213×1.493=0.318) higher likelihood of being rescued. Saving large firms seems to be prevalent in the bail-out of both corporations (Faccio et al., 2006) and banks (Bayazitova and Shivdasani, 2012). Governments bail out these large firms usually by infusing capital (e.g., preferred equity in the case of TARP) and forgiving debt claims, with the purpose of strengthening the balance sheet. Our setting differs to that used in previous study as we examine the favor of large firms in the secondary market rescue.

[31] The stock prices, hence the stock return, themselves might have already factored in the corresponding likelihood of being rescued by the government during the stock market crash. Whether to base the intervention decision on stock prices then becomes a tricky question (Bond and Goldstein, 2015).

[32] In untabulated analysis, we also include a dummy indicating the leader for each industry in terms of total sales to examine the "too-big-to-fail" hypothesis. The coefficient estimate is insignificant if we also control for firm size, and becomes significantly positive if firm size is excluded from the regression.

Firms with higher financial risks and lower viability are significantly less likely to be rescued, as evidenced by the significant coefficient estimate of leverage and the dummy ST. Firms whose leverage is one standard deviation higher than the mean are 11% (-0.479×0.225 = -0.108) less likely to be rescued. At the same time, the rescue likelihood of ST firms, other things equal, is 36.4% lower than normally traded firms. This implies that government rescue tends to excludes firms that are economically inviable.

Except for a decline in coefficient magnitude, results are quite similar if we put all regressors in one single regression, as shown in Column (5). Taken together, the findings in this section indicate that the government favors firms operating in systematically important industries, those with political importance or ties, and firms subject to higher leverage-induced selling. We do not find evidence that government considers the severity of stock price decline during the crash when they pick rescue targets.

4.3. The effect of government rescue

Before we evaluate the effect of government rescue, we create a matched sample to minimize the difference in basic attributes of stocks between the rescued and un-rescued group. Specifically, within each industry, for each rescued firm, we find one un-rescued firm (without replacement) which has a similar size and turnover rate, following Boehmer, Jones, and Zhang (2013). These firms are matched by the market capitalization of common shares at the end of 2014 as well the turnover rate in the first quarter of 2015. The matching is based on the propensity score generated from a logit regression in which the dependent variable is the dummy for being rescued. Our matching generates a sample which contains 708 rescued firms and the same number of un-rescued firms. As can be seen from Table 5, there are significant differences in size and turnover before the matching, with rescued firms being significantly larger and having slightly larger trading

volume. After the matching, there seems to be no discernible differences in the dimension of size or turnover, as indicated in Panel B.

[Insert Table 5 here]

Using the matched sample, we estimate a DID regression shown in Equation (1) to gauge the impact of government rescue on firms' stock return, liquidity, return volatility, as well as stock price efficiency. The key variable in this difference-in-difference regression is the interaction term between the dummy $Rescue_i$which equals one if firm i was rescued by the government, and the dummy variable $After_t$ which takes the value of one if it is in the post-rescue period, i.e., after August 14, 2015. Since the government conducted additional purchases and selling during the fourth quarter of 2015, which could potentially contaminated our results, we focus on a relatively short window, i.e., a five-week window around the implementation of the rescue program. As control variables, we include market cap (in its natural log), the book-to-market ratio as well as turnover rate into our regressions. All of the control variables are lagged for one week. In order to take into account inherent differences across firms that do not vary over time, we control for firm fixed effects α_i. Time fixed effects γ_t are also controlled to capture market-wide variations over time. Depending on the frequency of our outcome variable, time fixed effects indicate either weekly or monthly fixed effects. Robust standard errors are adjusted for clustering at both the firm and time level.

$$Y_{i,t} = \alpha_i + \gamma_t + \beta * Rescue_i * After_t + \sum_{j=1}^{k} \rho_j x_{i,j,t} + \varepsilon_{i,t} \quad (1)$$

Table 6 shows results of fixed-effect DID regressions on stock returns, liquidity, volatility and stock price efficiency.[33] Since part of the motivation of this stock market rescue is to stop the

[33] Stock return, volatility and liquidity are measured in weekly frequency. In un-tabulated analysis, we find similar results once

stock price from declining further, it is natural to expect a positive impact on stock returns. Surprisingly, we fail to find any significantly positive effect of government rescue on rescued firms' stock returns, as indicated by the coefficient estimate in Column (1). We argue that the insignificant effect of rescue on returns might be a result of two forces that drive prices distinctively. On the one hand, the large price support coming from government's purchase orders to rescued stocks could temporarily push the price higher. On the other hand, stock prices could decline as political uncertainty increases (Pastor and Veronesi, 2012).

[Insert Table 6 here]

We also find that rescued firms' stock return volatility increases by 13% following the rescue, as shown in Column (2). The stock price of rescued firms also becomes more dispersed. The result in Column (3) indicates that the price range of these firms widens by 5.1% after the rescue. These findings imply that the political uncertainty brought by the government rescue program induced the stock market to be more unstable.

Coefficient estimate of the interaction term in Column (4) reveals that firms being rescued experience a larger decline of stock trading activities. Specifically, weekly turnover declines by as large as 17% due to the rescue program. Similar effect is observed if we use Amihud illiquidity as the measure in Column (5). Stocks of rescued firms are found to have much larger price impacts in response to a certain amount of trading volume compared with those of similar un-rescued firms. Our result is consistent with Pasquariello and Zafeiridou (2014) who examine the stock liquidity surrounding the outcome of U.S. presidential elections. They find that trading volume declines and stocks become less liquid during the months prior to elections, implying that political uncertainty

these dependent variables are constructed monthly.

harms the market quality. Direct government intervention in the stock market such as imposing a short-selling ban, leads to a decline in stock liquidity and more generally worsening market quality (e.g., Boehmer et al., 2013). This is also the case in the 2015 crash in China.

We use D1 and D2 proposed by Hou and Moskowitz (2005) as proxies for stock price efficiency. Different to the previous indicators that are calculated on the weekly level, the two price efficiency measures are calculated on the monthly level. Therefore, the sample here includes one month before the stock market crash and one month after the termination of government rescue. Coefficient estimate of the interaction term is positive and statistically significant in both Columns (6) and (7), implying that lagged market returns become more capable of predicting stock returns of rescued firms after the crash. Besides, the economic significance is phenomenal. For instance, D2 increases by 0.716 after the rescue, which is equivalent to 13% of its standard deviation. In other words, stock prices of rescued firms becomes slower in incorporating market-wide information.

The observed decline in information efficiency following government direct equity purchase is consistent with findings in the literature which documents that government intervention brings about additional frictions into the stock market that hampers the achievement of price efficiency. Brunnermeier et al. (2018) demonstrate that direct government intervention diverts investors' information acquisition regarding asset fundamentals to learning about "government's noises", making the price less informative about the asset fundamentals. Pasquariello (2017) shows that government's direct trading in the foreign exchange market leads to violations to the Law of One Price in a larger magnitude in the stock market as measured by ADR parity violations.

4.4. Subsequent ownership changes

As presented in Figure 2, government's stake in listed companies keeps changing since the initial rescue. Most notably, during the fourth quarter of 2015, the National Team reduced its ownership in a significant fraction of firms that were initially rescued. In this section, we trace the subsequent change of ownership by the National Team, namely further *purchase* and *sell* of those stocks that were initially acquired by the government during the third quarter of 2015. Examining the effect of subsequent ownership changes provides more insight regarding the effect of direct secondary market intervention by the government. As one of the merits of this exercise, it enables us to test alternative explanations to our main results. For instance, the decline in stock liquidity following government rescue demonstrated in Table 6 could well be explained by the mechanical decline in the number of shares tradable in the open market as they were bought and held by the National Team. If our results are driven by less tradable shares, then we should expect an increase in liquidity following selling and exit by the National Team. A similar conjecture can be derived for return volatility and price range. However, if the mounting uncertainty regarding further intervention is the underlying mechanism, we should expect very similar effects of subsequent ownership changes, no matter they involve an increase or decrease in government positions. More importantly, we expect the effect of subsequent selling by the government is much more prominent than purchases. The reason is that the additional political uncertainty associated with subsequent selling ought to be larger than that associated with stock purchases.

Out of the 1,363 firms that were rescued during the third quarter, 791 firms do not report any changes of ownership by the National Team in the fourth quarter. Among the rest, 40 firms report an increase in ownership, 386 report a decrease, and the National Team unwinds its position completely in 146 firms. However, considering that our sample extends into the first quarter of 2016 when the government continued to adjust their positions, we exclude those stocks with

changes in government ownership position during 2016 Q1. We are left with 626 firms with constant ownership, 308 firms with a decline and 22 firms with an increase in ownership.

We then compare firms with changing government ownership with those for which the government ownership stays constant by interacting the variable *purchase* and *sell* with the dummy *after*. To facilitate the comparison between different types of further intervention (e.g., purchase and sell), instead of running separate regressions, we put the two interaction terms into one single model. Again, we control for firm and week (or month) fixed effects in all specifications. We adopt the same window length as the main analysis. Our sample for return, volatility and liquidity spans the period between five weeks before and five weeks after the end of 2015Q4. The stock price efficiency sample contains one month before and one month afterwards.

[Insert Table 7 here]

Table 7 presents the estimated effect of subsequent ownership changes. Similar to our main finding, we fail to find any impact on stock returns, either for further purchase or selling. However, we find that the selling of stocks that were initially purchased by the government has made stock prices more volatile. As shown in Columns (2) and (3), volatility and price range has increased by 6.2% and 4.7%, respectively after the selling. In contrast, we do not find any significant impact of subsequent purchase on volatility. This is consistent with our expectation as the selling of stocks that were initially purchased invokes more political uncertainty.

The coefficient estimates in Columns (4) and (5) indicate that neither further purchase nor selling has significant impact on stock turnover, while the effect on Amihud illiquidity is quite marginal. The finding here implies that the reduced number of tradable shares as a result of government purchase should not be the explanation of why secondary market rescue reduces stock

liquidity in our setting. The liquidity effect of subsequent stock selling, combined with our main results regarding stock liquidity, implies that it is not stock purchase or selling in the secondary market *per se* that is detrimental to liquidity, but the government intervention itself.

Results in the last two columns indicate that while further purchase does not hurt price efficiency, stock selling by the National Team has made stock prices significantly slower in incorporating information. In terms of economic magnitude, D1 and D2 of stocks that were later sold has increased by 14% and 15% of one standard deviation after the fourth quarter, compared with those without any changes in ownership position.[34] Overall, our findings regarding the effect of subsequent ownership changes lend support to our main argument.

5. Further analysis

5.1. Real effects

Previous research has shown that there are significant firm-level outcomes, such as changes in profitability and leverage, following bail-outs (e.g., Faccio et al., 2006; Jiang et al., 2014). Several recent studies document that being rescued by government also changes rescue targets' behavior. For instance, TARP recipient banks are found to take more risks after the bailout (Black and Hazelwood, 2013; Duchin and Sosyura, 2014). Berger and Roman (2015) find that TARP distorts competition in the banking market as recipients increased both their market share and market power. According to Li (2013), TARP stimulates bank lending as recipient banks increase their loan supply with a large magnitude. However, Lin et al. (2017) document that relationship borrowers of TARP recipient banks end up losing access to credit due to regulatory uncertainty. In this section, we test whether the secondary market rescue by the Chinese government has real

[34] The standard deviation of D1 and D2 in the sample used in this section is 3.282 and 2.804, respectively.

effects.

We examine potential real effects in three aspects, namely financing activities, investment and firm performance. For financing activities, we look at the use of debt financing and cash holdings. We examine firms' investment in three areas, including capital investment, R&D and acquisitions.[35] Regarding firm performance, we check profitability (*ROA* and *ROE*) and sales growth. We retrieve firm accounting information from the annual report. The sample period spans two years before and two years after the rescue, i.e., from 2013 to 2016.[36] We adopt the same specification as Equation (1) and control for both firm and year fixed effects. To facilitate interpretation, all variables are standardized by scaling the original value by the corresponding standard deviation.

[Insert Table 8 here]

Results are reported in Table 8. Coefficient estimate of the interaction term in Panel A implies that government's purchase of stocks in the secondary market does not have any impact on rescued firms' financing or investment behavior. This finding is in sharp contrast to what has been documented in research on TARP recipients' investment behavior. The distinctive nature of the stock market crash in China compared with 2008 sub-prime crisis in the US might be the cause of the different effects identified here. While the main intention of TARP is to strengthen banks' balance sheet and to increase capital adequacy, the common stock purchase by Chinese National Team is mainly to restore liquidity in the secondary market. In other words, the stock market rescue

[35] Acquisition expenses are not directly accessible as they are not reported in annual reports. We collect acquisition expense data from CSMAR acquisition module. We keep successful deals in which the firm is the acquirer and keep only asset acquisition. We code acquisition expenses to zero for firms without any acquisition that year.

[36] We could potentially use quarterly and semi-annual accounting reports. However, considering that these two types of reports are not audited and the poor accounting quality in China could add noise to our inference, we retrieve accounting numbers only from annual reports.

in China is not directly linked to the balance sheet of firms.

Panel B presents regression results in which firm performance measures are the dependent variables. Surprisingly, we find that the performance of rescued firms deteriorates after the rescue with high statistical significance. Note that the magnitude of coefficient estimates here should be interpreted in terms of standard deviations. For instance, compared with matched un-rescued firms, ROA of rescued firms declines by 5.4%, ROE declines by 6.3%, sales growth slows down by 11.9% of one standard deviation of the corresponding outcome variable following the rescue. In general, the magnitude of performance deterioration is modest. However, it is still relevant to the economic efficiency of this rescue. Take ROE as an example. Further declines in ROE could result in lower stock prices, making it harder for the government to exit in the future.

The decline in firm performance could be due to the less informative stock prices as a result of government intervention. As shown in Section 4.3, stock prices become less capable of incorporating information after the rescue. We speculate that once the government directly intervenes trading in the secondary market, the stock price becomes a very noisy measure for firm value. For managers who are evaluated and compensated based on stock price, they would be reluctant to take effort to increase firm value, making the firm performance deteriorate.

Another reason is related to the government's capacity to monitor the firm and changing manager incentives. After the third quarter of 2015, government in fact becomes one large shareholder of rescued firms. However, it is highly unlikely that government can monitor the firm as effectively as large shareholders and creditors, potentially leading to worsened governance. Government as ineffective monitors is probably one of the reasons why firms bailed out by the government in history perform worse than those saved by other stakeholders (Jiang et al., 2014). In fact, being rescued by government may even exacerbate moral hazard issues, which constitutes

a usual critique on government bail-out policies.[37] Overall, while the rescue does not have any impact on firm financing and investment decisions, it has modest but negative impact on firm performance.

5.2. Robustness

In our main analysis, the pre-event window is defined as the five weeks before the stock market crash beginning on June 15, 2015. While this choice seems to be natural, it is subject to potential contamination caused by the massive stock market turmoil prior to the big crash. Prices during this period might have deviated from the fundamentals, making some of the measures not reliable. As a robustness test, we adopt an alternative pre-event window, i.e., the five weeks after August 14 in 2014, which covers similar calendar days one year before our post-event window in 2015.

[Insert Table 9 here]

Results are shown in Table 9. All regressions generate coefficient estimates that are highly similar to those in Table 6, indicating that our results are unlikely a result of discretionary pre-event window selection.

6. Conclusion

After the Shanghai Composite index lost more than 30% of its value in less than 3 weeks in 2015, Chinese government used hundreds of billions of dollars to save the stock market from crisis. We show that after the government finished its stock-purchasing program, purchased stocks experienced significantly reduction in liquidity and price efficiency, with a moderate increase in

[37] The moral hazard effect of the government bail-out of the banking industry is well documented both theoretically and empirically. Here the moral hazard refers to shirking or related value-destroying activities by corporate insiders.

return volatility. In addition, the sale of the purchased shares by the government further impedes the market quality to some extent. Last, listed firms have lower operational performance, while capital structure and investment do not change.

We draw two important implications from this paper. First, compared with the effect of TARP, government purchasing shares in secondary market fails to boost the stock price: instead, it generate huge uncertainty about the government intervention, damaging the market quality afterwards. Our paper collaborates with the studies regarding the short-selling ban, suggesting that government intervening the secondary stock market directly brings troubles. Second, current research with respect to the net benefit of China's government rescue in 2015 shows conflict results. Our finding that market quality declines significantly after government rescue provide strong support for the unintended cost of such government intervention.

We acknowledge three caveats of our study. First, without clear control for counterfactual, we can't answer whether or not the market could have been better had the government chosen a *laissez-faire* stance or adopted alternative policies. Second, our results depend on the nature on the crisis. The 2015 Chinese stock market crash featured a liquidity crisis, instead of a fundamental deterioration. Third, the results depend on the institutional environments. In particular, some of our analysis reveals that the effect of government intervention depends on the transparency of policy details. The heightened political uncertainty as a result of a lack of transparency could bring in lots of unintended consequences. Further researches are needed to better understand the whole picture about the relation between government rescue and financial market.

Acknowledgement

We are grateful for helpful comments from Philip Dybvig and seminar participants at University of Victoria of Wellington. We remain responsible for all errors and omissions.

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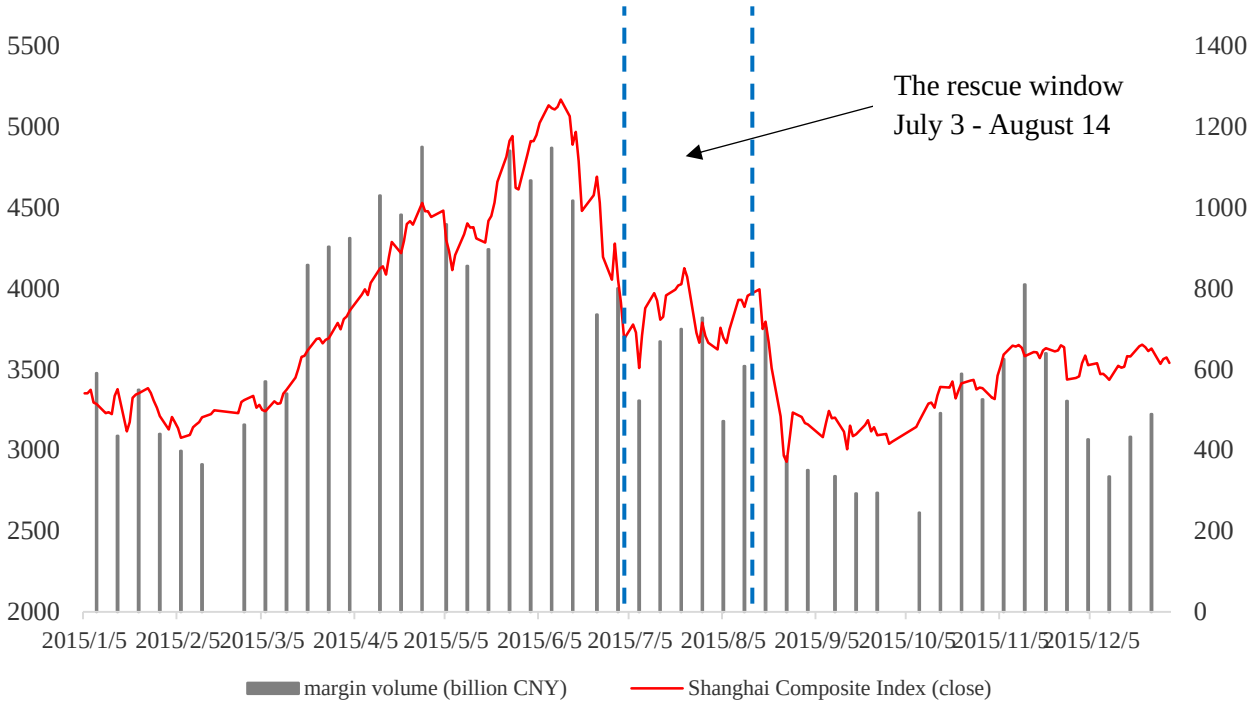

Figure 1
The 2015 Chinese Stock Market Crash

This figure presents the daily Shanghai Composite Index and the weekly margin trade volume during 2015. The crash of the stock market began on June 15, 2015 and the Chinese government initiated the rescue program on July 3 which subsequently came to an end on August 14. Daily margin-trading volume data is obtained from WIND.

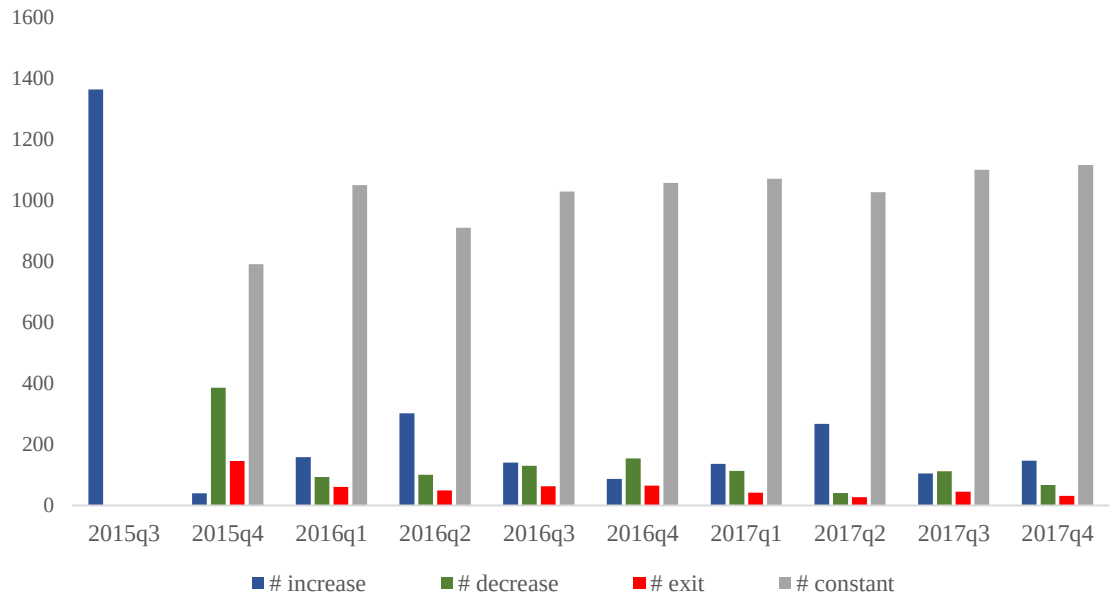

Figure 2
The Change of National Team Ownership in Rescued Firms during the Post-crash Period

This figure depicts the subsequent change in National Team ownership of firms who were rescued during the crash. Each quarter we count the number of rescued firms in which the National Team ownership has increased, decreased or stayed constant compared to that in the previous quarter. We further divide firms with a decrease in National Team ownership into two groups, namely firms with positive ownership after the decrease and firms for which the National Team completes an exit.

Table I

Timeline of events related to 2015 Chinese stock market crisis and the government rescue

Before the crisis

November 21, 2014: The People's Bank of China, reduced its benchmark deposit rate (one-year) by 0.25%, to 2.75%, and decreased the one-year lending rate by 0.4%, to 5.6%. It was the first cut since the summer of 2012.

January 16, 2015: The president of CSRC, Mr. Gang Xiao made a report reminding the potential risk caused by the dramatic increase in margin trading since 2014. CRSC also made regulatory enforcement to 12 brokerage firms for violating the rules of margin trading. The CSI300 Index (the index represents the performance of top 300 stocks traded in the Shanghai and Shenzhen stock exchanges) opened down 6.1 percent on the following Monday.

May 21, 2015: CSRC and Securities Association of China requests Chinese brokerage firms to self-check and suspend the activities that may facilitate the margin purchase through HOMS software.

June 12, 2015: CSRC publicly restated the ban on brokerage firms facilitating the margin trading.

During the crisis

June 15 to June 19, 2015: Shanghai Composite index fell by more than 13% this week.

June 26, 2015: Shanghai Composite index fell by about 20% since June 15.

June 27, 2015: People's Bank of China cut its one-year benchmark lending rate by 0.25% to 4.85% and its one-year deposit rate by 0.25% to 2%.

June 29, 2015: An official draft was released, implying that China's pension fund may be allowed to invest into the stock market.

July 1, 2015: The transaction fees in the exchanges would be reduced by 30% since August 1.

July 3, 2015: The stock market kept declining, about 30% lower than its position in mid-June. CSRC announced that the IPOs would be reduced and more funds would be infused into CSFC to stabilize the stock market. An investigation towards suspected manipulation of the stock market was also launched.

July 4, 2015: 21 brokerage firms collectively announced that they would use more than 120 billion yuan to stabilize the stock market by purchasing blue-chip ETFs.

July 5, 2015: People's Bank of China announced that it would provide liquidity for CSFC to further stabilize the stock market. CHI also announced that it started to purchase ETF and would keep similar operation later on.

July 8, 2015: CSRC request that, in six month, the controlling shareholders, shareholders with more than 5% ownership, directors and managers should not sell their holdings. Until then, more than 1000 listed firms, about 30% of the overall number of listed firms in Chinese stock market, voluntarily suspended their share trading.

July 9, 2015: Ministry of Public Security of the People's Republic of China jointed CSRC to investigate “malicious short selling”.

August 14, 2015: CSRC announced that the rescue program through CFSC temporarily came to an end. CFSC should not quit from the stock market completely in the following several years, or actively intervene the trading in stock market.

Table II
Summary Statistics

This table presents summary statistics of firm characteristics as well as capital market indicators of firms listed on the Chinese A-share market in year 2015. Our sample consists of 2,276 firms for which key firm characteristics are non-missing. We identify 1,250 rescued firms whose stocks were acquired by the National Team during the stock market crash in mid-2015. Panel A shows basic firm characteristics one year before the stock market crash. Panel B shows summary statistics of several capital market indicators. Among them, return, volatility, range, turnover and Amihud illiquidity are calculated on the weekly level. The corresponding sample period includes the five weeks before the stock market crash beginning on June 15, and the five weeks after the termination of rescue which was announced on August 14. Weekly observations lying between June 15 and August 14 are excluded from our sample. The two price efficiency measures, *D1* and *D2*, are calculated on the monthly level. The price efficiency sample period spans one month before the stock market crash and one month after the termination of government rescue. Variable definitions can be found in the Appendix.

Panel A: Firm characteristics

Firm type	*Rescued*			*Un-rescued*		
	N	Mean	s.d.	*N*	Mean	s.d.
SOE	1,250	0.455	0.498	1,026	0.325	0.468
Political connection	1,250	0.448	0.497	1,026	0.393	0.489
Pension	1,250	0.164	0.371	1,026	0.124	0.330
Margin	1,250	0.107	0.110	1,026	0.043	0.090
Cumulative return	1,250	-0.447	0.170	1,026	-0.473	0.198
Size	1,250	22.595	1.664	1,026	21.587	1.012
Leverage	1,250	0.455	0.221	1,026	0.435	0.219
Sales growth	1,250	0.300	0.200	1,026	0.228	0.142
ROE	1,250	0.079	0.091	1,026	0.046	0.127
ST	1,250	0.002	0.040	1,026	0.024	0.154

Panel B: Capital market indicators

Variables	*N*	p25	median	mean	p75	*SD*
Return	20,234	-0.100	0.009	0.011	0.110	0.142
Volatility	20,234	0.029	0.042	0.045	0.059	0.021
Range	20,234	0.062	0.079	0.077	0.092	0.021
Turnover	20,234	0.027	0.042	0.049	0.063	0.031
Amihud	20,234	0.006	0.013	0.028	0.033	0.044
D1	3,916	0.070	0.145	0.240	0.323	0.240
D2	3,916	-0.396	0.343	0.395	1.077	5.471

Table III
Margin Trading and Stock Returns

This table reports results of Fama and MacBeth (1976) regressions of cumulative returns on margin-trading volume of common stocks listed on Shanghai and Shenzhen Stock Exchange between December 5, 2011 and June 12, 2015. The dependent variable is the raw return over the next 20 trading days, skipping 1 day after measuring margin-trading activities. Size, book-to-market, volatility and turnover are calculated using data from the previous calendar month. For each stock, we generate the fraction of trading using margin and take the average of this ratio for the previous five trading days. Standard errors are adjusted using Newey-West with 20 lags. Coefficient estimates are reported and *t*-statistics are displayed in parentheses below. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
Margin-trading Share	0.003**	0.002**
	(2.51)	(2.52)
Log(MktCap)		-0.005*
		(-1.74)
Book to market		0.004***
		(2.18)
Return volatility		0.002
		(0.95)
Previous month return		-0.001
		(-0.81)
Turnover		-0.005***
		(-4.54)
N	402,961	402,961
R-sq	0.0134	0.1221

Table IV
The Choice of Rescue Targets by the National Team

This table presents results of Logit regressions explaining the likelihood of being rescued by the National Team during the 2015 stock market crash. The dependent variable is a dummy which equals one if a firm's stocks were acquired by the National Team in the third quarter of 2015. Industries to which the firm belongs, as well as various firm characteristics in 2014 are used to predict the likelihood of being rescued. The standard errors are heteroskedasticity consistent. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable	*Rescued*				
	(1)	(2)	(3)	(4)	(5)
Manufacturing	0.101***	0.106***	0.076***	0.057**	0.062**
	(3.94)	(4.11)	(2.84)	(2.08)	(2.20)
Utilities	0.098*	0.017	0.080	-0.009	-0.003
	(1.73)	(0.29)	(1.34)	(-0.15)	(-0.04)
Finance	0.484***	0.483***	0.427***	0.352***	0.334***
	(17.19)	(16.23)	(7.89)	(3.68)	(3.05)
Real estate	0.126***	0.100**	0.077	0.013	0.013
	(2.62)	(2.02)	(1.47)	(0.25)	(0.24)
SOE		0.176***			0.077***
		(7.27)			(2.72)
Pension		0.094***			0.058*
		(3.07)			(1.83)
Political connection		0.091***			0.040*
		(4.07)			(1.65)
Margin			1.611***		0.892***
			(14.72)		(7.33)
Cumulative return			0.125		-0.042
			(1.57)		(-0.48)
Size				0.213***	0.162***
				(16.51)	(11.58)
Leverage				-0.479***	-0.411***
				(-6.91)	(-5.78)
Sales growth				-0.185***	-0.191***
				(-4.17)	(-4.18)
ROE				0.024	0.019
				(0.47)	(0.49)
ST				-0.366***	-0.354***
				(-3.75)	(-3.62)
N	2,276	2,276	2,276	2,276	2,276
Pseudo R-sq	0.0154	0.0299	0.0744	0.1312	0.1404

Table V
Matching

This table describes firm characteristics before and after matching. We begin with all stocks traded on the Chinese A-share market before the 2015 stock market crash with non-missing market capitalization and turnover. Rescued firms are those whose stocks were purchased by the National Team during the crash. Using propensity-score matching, for each rescued firm, we find one un-rescued firm which has a similar size and turnover, and operates in the same industry. We compare the mean and provide the corresponding p-value of student t-test and Wilcoxon test at the bottom of each panel.

Panel A: Before matching

Variables	*Market cap*		*Turnover*	
	Mean	Median	Mean	Median
Number of firms	2,570		2,570	
Rescued firms	22.950	22.892	1.886	1.546
Un-rescued firms	22.276	22.271	1.957	1.668
Difference	-0.674	-0.621	0.071	0.122
p-value (*t*-test)	0.000		0.184	
p-value (Wilcoxon)	0.000		0.012	

Panel B: After matching

Variables	*Market cap*		*Turnover*	
	Mean	Median	Mean	Median
Number of firms	1,634		1,634	
Rescued firms	22.317	22.385	1.988	1.623
Un-rescued firms	22.381	22.395	1.935	1.683
Difference	0.064	0.010	-0.053	0.060
p-value (*t*-test)	0.113		0.418	
p-value (Wilcoxon)	0.490		0.998	

Table VI
The Effect of the Stock Market Rescue Program

This table presents results of difference-in-difference regressions that examine the effect of secondary market direct purchase program initiated by the Chinese government in July 2015. We form a propensity-score matched sample in which each rescued firm is matched to one un-rescued firm with a similar size and turnover, within the same industry. The dummy variable *Resc*ue takes the value of one if the National Team acquired the firm's stocks in the third quarter of 2015. The dummy variable *After* equals one if it is after August 14, 2015. The sample period from Columns (1) to (5) includes the five weeks before the stock market crash beginning on June 15, and the five weeks after August 14. Weekly observations lying between June 15 and August 14 are excluded from our sample. In Columns (6) and (7), we examine the effect of government rescue on stock price delay which is measure by D1 and D2, following Hou and Moskowitz (2005). The price delay sample spans one month before the stock market crash and one month after the termination of government rescue. Detailed variable definitions can be found in the Appendix. We control for week or month fixed effects, depending on the frequency of our sample. The dummies *Rescue* and *After* are absorbed by the firm- and time- fixed effects. Robust standard errors are adjusted for clustering at both the firm and week level. The t-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variables	Return	Log(Volatility)	Log(Range)	Log(Turnover)	Log(Amihud)	D1	D2
Rescue × *After*	0.005	0.127***	0.051**	-0.168***	0.138***	0.028**	0.716***
	(0.46)	(2.94)	(2.23)	(-6.04)	(3.78)	(2.08)	(2.67)
Log(Mktcap)	-0.165***	0.018	0.023	-0.465***	-0.619***	-0.094	-1.324
	(-6.12)	(0.24)	(0.61)	(-6.71)	(-6.71)	(-1.62)	(-1.20)
Book-to-market	0.088**	-0.123	-0.104	0.541***	-0.749***	0.063	-2.928**
	(2.14)	(-0.51)	(-0.89)	(3.19)	(-4.36)	(0.93)	(-2.49)
Turnover	-0.027***	0.096***	0.105***	0.306***	-0.531***	0.064***	1.839***
	(-5.14)	(3.42)	(6.03)	(8.08)	(-14.28)	(3.57)	(5.08)
Week FE	Yes	Yes	Yes	Yes	Yes	No	No
Month FE	No	No	No	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12,531	12,531	12,531	12,531	12,531	1,612	1,612
Adj. R-sq	0.6855	0.4714	0.5229	0.4964	0.8111	0.4740	0.0546

Table VII
The Effect of Subsequent Ownership Changes

This table shows results of DID regressions which examine the effect of subsequent changes in stock ownership by the National Team in rescued firms in the fourth quarter of 2015. Firms for which the National Team ownership remains constant are compared with those for which the ownership has increased (*Purchase*) or decreased (*Sell*) during the fourth quarter of 2015. The sample includes five weeks before and five weeks after the end of 2015Q4. The dummy variable *After* takes the value of one if it is after 2015Q4. The dummy variable *After* is then interacted with the dummy variables *Purchase* and *Sell*. We control for firm and time (week or month) fixed effects in all specifications. The dummies *Purchase*, *Sell* and *After* are absorbed by the firm- and time- fixed effects in the regressions. Heteroskedasticity- and autocorrelation-robust standard errors are adjusted for clustering at both the firm and week level. The t-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variables	Return	Log(Volatility)	Log(Range)	Log(Turnover)	Log(Amihud)	D1	D2
Purchase × *After*	-0.001	0.070	0.042	0.017	0.040	0.585	0.605
	(-0.18)	(1.02)	(0.87)	(0.37)	(0.60)	(0.69)	(0.68)
Sell × *After*	-0.001	0.062**	0.047***	0.035	0.050*	0.450**	0.427**
	(-0.42)	(2.54)	(3.36)	(1.37)	(1.95)	(1.98)	(2.16)
Log(Mktcap)	-0.185***	-0.339***	-0.102	-0.439***	-0.542***	0.335	-0.374
	(-4.58)	(-2.89)	(-1.21)	(-5.35)	(-6.32)	(0.37)	(-0.33)
Book-to-market	0.059	0.294	0.346***	0.371*	-0.206	2.173*	3.843***
	(1.34)	(1.39)	(3.02)	(1.75)	(-1.18)	(1.66)	(2.68)
Turnover	-0.029***	0.033	0.088***	0.366***	-0.372***	-0.201	0.008
	(-5.91)	(1.14)	(4.37)	(7.75)	(-12.44)	(-0.76)	(0.02)
Week FE	Yes	Yes	Yes	Yes	Yes	No	No
Month FE	No	No	No	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,143	9,143	9,143	9,143	9,143	1,716	1,716
Adj. R-sq	0.6538	0.5222	0.7371	0.3804	0.8423	0.0134	0.0397

Table VIII
Real Effects of the Government Rescue

This table shows results of DID regressions which examine the real effects of the secondary market direct purchase program. The sample spans the period between 2013 and 2016. Each rescued firm is matched to one un-rescued firm from the same industry with a similar size and turnover. All of the variables in this table have been standardized by scaling the original value by the corresponding standard deviation. All specifications control for firm and year fixed effects. The dummies *Rescue* and *After* are absorbed by the firm- and year-fixed effects. Heteroskedasticity- and autocorrelation-robust standard errors are adjusted for clustering at both the firm and year level. The t-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Effect on firm financial and investment policies

	(1)	(2)	(1)	(2)	(3)
Dependent variables	Leverage	Cash ratio	Capex	RD	Acquisition
Rescue × *After*	0.003	0.000	-0.097	-0.016	-0.037
	(0.12)	(0.01)	(-1.34)	(-0.41)	(-0.37)
Log(Mktcap)	-0.008	-0.101***	-0.101**	-0.118*	-0.234***
	(-0.60)	(-3.35)	(-2.15)	(-1.69)	(-6.25)
Firm FE, Year FE	Yes	Yes	Yes	Yes	Yes
N	5,398	5,398	5,398	5,398	5,398
Adj. R-sq	0.001	0.030	0.004	0.351	0.013

Panel B: Effect on firm performance

	(1)	(2)	(3)
Dependent variables	ROA	ROE	Sales growth
Rescue × *After*	-0.054*	-0.063**	-0.119***
	(-1.82)	(-2.46)	(-2.73)
Log(Mktcap)	0.197***	0.151***	-0.182**
	(6.07)	(4.02)	(-2.08)
Firm FE, Year FE	Yes	Yes	Yes
N	5,398	5,398	5,398
Adj. R-sq	0.027	0.016	0.010

Table IX
Robustness: Pre-event period in 2014

This table presents results of difference-in-difference regressions that examine the effect of the Chinese secondary market direct purchase program. The sample period includes the five weeks after the termination of rescue which was announced on August 14 2015, and the same weeks in 2014. We form a propensity-score matched sample in which each rescued firm is matched to one un-rescued firm from the same industry with a similar size and turnover. The dummy variable *Rescue* takes the value of one if the National Team acquired the firm's stocks in the third quarter of 2015. The dummy variable *After* equals one if it is after August 14, 2015. All specifications control for firm and time (week or month) fixed effects. Robust standard errors are adjusted for clustering at both the firm and week level. The t-statistics are shown in parentheses. ***, ** and * denote significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variables	Return	Log(Volatility)	Log(Range)	Log(Turnover)	Log(Amihud)	D1	D2
Rescue × *After*	-0.003	0.121***	0.069***	-0.138***	0.125***	0.026*	0.404*
	(-0.37)	(2.86)	(4.05)	(-4.92)	(4.76)	(1.74)	(1.86)
Log(Mktcap)	-0.051***	-0.067	0.071***	-0.343***	-0.631***	-0.016	0.569**
	(-4.71)	(-1.25)	(3.06)	(-7.23)	(-13.96)	(-0.87)	(2.41)
Book-to-market	-0.038	-0.120	-0.040	-0.425***	0.131	-0.062	-0.093
	(-1.17)	(-1.00)	(-0.49)	(-3.55)	(1.56)	(-1.01)	(-0.12)
Turnover	-0.018***	0.085***	0.101***	0.430***	-0.476***	0.003	-0.056
	(-4.73)	(5.43)	(8.45)	(15.69)	(-15.94)	(0.29)	(-0.44)
Week FE	Yes	Yes	Yes	Yes	Yes	No	No
Month FE	No	No	No	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	11,612	11,612	11,612	11,612	11,612	1,630	1,630
Adj. R-sq	0.7079	0.6597	0.8212	0.4675	0.6770	0.5224	0.0173

APPENDIX A: Purchased Stocks

This table presents the ownership position of the National Team and the industry distribution of stocks purchased by the government. CFSC refers to China Securities Finance Corp and CHI refers to Central Huijin Investment, both of which constitute the so-called National Team of the secondary market direct purchase program initiated by the government after the 2015 June crash. We compare the number of stocks held by the two aforementioned investors at the end of the second the third quarter of 2015, and define rescued firms as those with an increase in position held by the National Team between the two quarters.

Panel A: Ownership position of the National Team shareholders

Investors	Number of stocks purchased	Percentage of firms with ownership (total = 2,767)	Average percentage of ownership
CFSC	743	26.85%	2.44%
CHI	1,113	40.22%	2.15%
National Team	1,363	49.26%	3.09%

Panel B: The industry distribution of purchased stocks

Industry	Number of firms rescued	Number of firms in the industry	Percentage of firms rescued
Agriculture, forestry and fishery	13	43	30.23%
Mining	52	75	69.33%
Manufacturing	844	1,773	47.60%
Utilities	52	89	58.43%
Construction	36	72	50.00%
Wholesale and retailing	65	149	43.62%
Transportation, warehousing and post	47	83	56.63%
Hotel and restaurant	2	10	20.00%
Communication, software and IT services	68	150	45.33%
Finance	45	49	91.84%
Real estate	69	130	53.08%
Leasing and commercial services	17	29	58.62%
Scientific research and technology services	8	20	40.00%
Hydro, environmental and facility management	11	31	35.48%
Education	0	1	0.00%
Medical and social work	3	4	75.00%
Culture, sports and entertainment	19	34	55.88%
Other	11	25	44.00%
Total	2,767	1,363	49.26%

APPENDIX B: Variable definition

Variables	Definitions	Source
Government's secondary market intervention		
Rescue	Dummy variable indicating whether the change of ownership by the national team between the 3rd quarter and the 2nd quarter is larger than zero or not	WIND
Purchase	A dummy equal to one if the National Team continue purchasing stocks of a rescued firm in the 4th quarter of 2015	WIND
Sell	A dummy equal to one if the National Team sells stocks of a rescued firm in the 4th quarter of 2015	WIND
Stock market variables		
Log(Turnover)	The natural logarithm of the ratio of weekly average turnover to weekly market cap	CSMAR
Log(Amihud)	The natural logarithm of weekly Amihud illiquidity measure, which is defined as the weekly average of price impact (in bps) for each one million Yuan of transactions.	CSMAR
Return	Weekly stock return	CSMAR
Log(Volatility)	The natural logarithm of weekly stock return volatility	CSMAR
Log(Range)	The natural log of weekly average price range	CSMAR
Log(MktCap)	The natural logarithm of market cap which is defined as the product between stock prices (weekly) and the number of common shares outstanding	CSMAR
D1	A price efficiency measure calculated in a way following Hou and Moskowitz (2005)	CSMAR
D2	A price efficiency measure calculated in a way following Hou and Moskowitz (2005)	CSMAR
Margin-trading volume	The difference between weekly margin purchase volume and weekly short sell volume. Weekly margin buy volume is calculated as the sum of daily margin buy volume and weekly short sell volume is calculated in a similar way	WIND
Margin-trading Share	The average margin-trading share of volume for the previous five trading days, where margin-trading share is the fraction of trading volume using margin	WIND
Firm characteristics		
Size	The natural logarithm of book value of assets	CSMAR
Leverage	Total debt scaled by book value of assets	CSMAR

Sales growth	Annual sales growth rate	CSMAR
ROE	Net income divided by total equity	CSMAR
SOE	A dummy variable indicating ultimate control by the government	CSMAR
Political connection	A dummy which equals one if the CEO or chairman has political background; and zero otherwise. Political background includes working experience in parliaments or government agencies	CSMAR
ST	A dummy which equals one if the firm has been labeled "Special Treatment (ST)" by the regulator. Usually firms that meet one of the several criteria (e.g., two consecutive years of losses) will receive "ST" and therefore be considered as ones with significantly higher investment risks.	CSMAR
Cumulative return	The three-week cumulative return following June 15, 2015	CSMAR
Cash ratio	Cash divided by total assets	CSMAR
Capex	Capital expenditures scaled by the book value of total assets	CSMAR
RD	R&D expenditures scaled by net sales	CSMAR
Acquisition	Annual total acquisition expenses scaled by the book value of assets	CSMAR