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Original Paper

Major Shareholders' Reduction and the Risk of Stock Price Crash

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Abstract

This paper takes China Shanghai and Shenzhen A-share listed companies from 2007 to 2021 as samples to empirically test the impact of major shareholder reduction on the risk of stock price crash. This paper finds that the reduction of major shareholders promotes the risk of stock price crash of listed companies, that is, compared with listed companies without major shareholders' reduction, the risk of stock price crash of listed companies with major shareholders' reduction is higher, and this conclusion still holds after controlling the conservative factors. Further examination shows that the major shareholder's manipulation of information has an impact on the risk of stock price crash, and the impact of major shareholder's reduction on the risk of stock price crash is more obvious in China state-owned enterprises, non-high-tech enterprises, enterprises in the bull market period and enterprises in areas with low market investors.

Keywords

Risk of Stock Price Crash, Major Shareholders' Reduction, Information Mechanism

1. Introduction

Because of its concealment, rapidity and infectivity, the risk of stock price crash can easily spread from one company to another and from one capital market to another in a very short time, which will not only directly affect the interests of market investors and listed companies, but also affect the healthy and stable development of the capital market, and even affect the real economy (Jin & Myers, 2006; Piotroski et al., 2015). Stock price crashes frequently occur in international capital, such as the global financial market turmoil caused by the US subprime mortgage crisis in 2008, the Russian RTS index plummeting by more than 12% in 2018, and the meltdown of stock markets in many countries in 2020 caused by the COVID-19 epidemic and the global crude oil price. Similarly, the China stock market, as

a new capital market, has experienced frequent stock price crashes. For example, during the 16 months from September 1994 to January 1996, the China Shanghai Composite Index dropped from 1,053 points to 512 points, with the largest drop of 51%. During the 11 months from October 2007 to September 2008, the China Shanghai Composite Index dropped from 6,124 points to 1,802 points, with the largest drop of 70.57%. Therefore, it is not only beneficial to promote the healthy, stable and long-term development of the capital market, but also of great theoretical and practical significance to promote the development of the real economy by studying the risk of stock price crash and finding the influencing factors.

The behavior of management concealing information is considered to be the most important reason for the stock price crash of listed companies. The management hides the negative information of the company for various reasons, such as job promotion, maintaining career prospects, protecting salary and maximizing the value of stock options, and once these negative information breaks out, it will lead to a stock price crash (Graham et al., 2005; Kothari et al., 2009; Kim et al., 2011). However, in listed companies in China, it is often not the management but the shareholders who have the dominant position in information. Due to the particularity of China's capital market and the complexity of China's economy during the transition period, the behavior of the major shareholders of listed companies in China is complicated, and the target selection of the major shareholders of listed companies in China is no longer limited to the comparison of the control benefits and costs of listed companies, but more consideration is given to the overall interests of the group. Therefore, the behavior of China's major shareholders will also affect the performance of the capital market. For example, in China stock market in 2015, more than a dozen thousand shares fell, and the daily decline of the Shanghai Composite Index was more than 5%, which was attributed to the substantial reduction of the restricted shares of major shareholders after the lifting of the ban due to the share-trading reform in China stock market. To this end, the China Securities Regulatory Commission and other regulatory authorities have successively issued a number of regulations to regulate and restrict the behavior of major shareholders in reducing their holdings, such as mandatory disclosure mechanism and prohibition of sensitive period transactions, as well as documents such as CSRC Announcement [2016] No.1 and CSRC Announcement [2017] No. 9. It can be seen that it is of great theoretical and practical significance to discuss the stock price crash from the perspective of major shareholders' reduction.

It has been a unanimous conclusion in the existing literature that insider's reduction will lead to the risk of stock price crash. Sun et al. (2017) pointed out that executives, as insiders, will affect the risk of stock price crash, and the greater the amount of stock reduction and the stronger the motivation, the higher the risk of stock price crash. Yi et al. (2019) also pointed out that there is an obvious peer effect in the process of reducing the holdings of senior executives of listed companies, and this peer effect will lead to the risk of stock price crash. It can be seen that as an insider, because of its information advantage, it will lead to the risk of stock price crash. Then, whether the major shareholders who are

also insiders will reduce their holdings will lead to a stock price crash is the content of this paper.

2. Theoretical Analysis and Research Hypothesis

The coexistence of multiple major shareholders, whether in mature capital markets or emerging capital markets, is a common phenomenon (Edmans & Manso, 2011), which also means that major shareholders, as insiders, not only have the ability to obtain more information that non-major shareholders cannot, but also have an important impact on corporate decision-making behavior and corporate performance in the capital market. From the research of existing literature, the behavior of major shareholders can influence the decision-making and development of enterprises. For example, the existence of major shareholders can effectively improve the company's performance (Attig et al., 2009), reduce the company's financing cost (Attig et al., 2008) and reduce the degree of enterprise information manipulation (Boubaker & Sami, 2011; Jiang et al., 2018) and the agency cost of enterprises (Chang & Wong, 2009; Cai et al., 2016). However, all the preconditions for major shareholders to play their roles are from owning more shares, and the behavior of major shareholders to reduce their holdings will have corresponding negative effects on enterprises. For example, the major shareholder's reduction will send a signal that the company's valuation is high or the future profit prospect is not good, which will dampen the confidence of external investors and increase the financing cost of the company, thus increasing the financing constraints of the company, which will lead the company to give up some originally good investment opportunities (Bhattacharya, 2002; Ataullah et al., 2014).

First of all, from the perspective of information asymmetry, compared with other small and medium-sized shareholders, large shareholders have more internal information of the enterprise, so the reduction behavior of large shareholders sends a 'bad' message to the outside world, which will trigger other small and medium-sized shareholders to follow suit. As an important insider of listed companies, major shareholders have two kinds of information advantages. One is that they can obtain important information that affects the fluctuation of stock prices based on their own shareholding advantages, so as to make use of the time difference of information disclosure to carry out arbitrage transactions. The other is that major shareholders form judgments on the future development and intrinsic value of enterprises based on the obtained internal information, so as to enable them to conduct stock transactions more accurately (Piotroski & Roulstone, 2005). This means that when there is a major shareholder's reduction, it is likely that the major shareholder obtained the information from the inside in advance and learned that the company had problems in the operation process, so he would take the initiative to reduce his shares. Moreover, when other small and medium-sized shareholders in the market found that the major shareholder had reduced his holdings, he often finished reducing most of his shares, which would further stimulate the small and medium-sized shareholders, thus increasing the risk of the company's stock price crash.

Secondly, from the perspective of market supply, the reduction of major shareholders' holdings is equivalent to increasing the supply of the capital market, resulting in oversupply, which will also put downward pressure on the capital market. The capital market also obeys the law of supply and demand, so when major shareholders start to reduce their holdings, especially a large number of them, it will have an impact on the capital market. At this time, on the one hand, the capital market will not increase the supply because of the major shareholder's reduction, so it is difficult to digest the increase in the number of shares reduced by the major shareholder, which will also lead to an oversupply situation and a decline in the equilibrium price. On the other hand, the reduction of the major shareholder will lead to the follow-up reduction of small and medium shareholders, which will further increase the supply of the capital market and increase the risk of stock price crash again.

Furthermore, from the perspective of agency theory, the reduction of major shareholders' holdings will reduce the regulatory effectiveness of executives, break the balance of interests between major shareholders and executives, reduce the initiative of executives, affect the company's performance, and bring hidden dangers of stock price crash. When major shareholders reduce their holdings, the reduction in the number of their shares will naturally weaken the goal coordination between agents and clients, and break the balance of interests between executives and shareholders. The more they reduce their holdings, the more the balance of interests will tilt towards the company's executives, and the effectiveness of supervision over executives will decline. Therefore, on the one hand, executives are likely to follow the major shareholders to reduce their holdings, especially executives who are also 'insiders' and also know the real situation inside the company. When they see the major shareholders reduce their holdings, they will definitely follow suit (Ke et al., 2003). On the other hand, with the increase in the number of major shareholders' reduction, the incentive effect of options for executives to hold shares will be weakened, which will increase the moral hazard and adverse selection of executives, and at the same time reduce the willingness of executives to seek maximum benefits for shareholders. Therefore, under this double stimulus, the slackness of executives will lead to the decline of the company's performance, and this decline will definitely affect the company's performance in the stock market.

To sum up, this paper puts forward the research hypothesis:

H1: There will be a significant positive correlation between the major shareholder's reduction and the risk of stock price crash.

3. Research Design

3.1 Variable Design

3.1.1 Explained Variable: Stock Price Crash Risk, *SPCR*

Since Jin and Myers (2006), negative return skewness coefficient (*Ncskew*) and return fluctuation ratio (*Duvol*) have become the main variables to measure the risk of stock price crash, so this paper refers to Jin and Myers (2006), Hutton et al. (2009), Xu et al. (2014), Lu and Qiu (2023) and so on. Similarly, the negative return skewness coefficient and return fluctuation ratio are used to measure the risk of stock price crash respectively. Since many documents have introduced the measurement methods of these two variables, this paper will not repeat them.

$$Ncskew_{i,t} = -\left[n(n-1)^{3/2}\sum W_{i,t}^3\right] \Big/ \left[(n-1)(n-2)\left(\sum W_{i,t}^2\right)^{3/2}\right] \tag{1}$$

$$Duvol_{i,t} = \log\left\{\left[(n_u-1)\sum_{down} W_{i,t}^2\right] \Big/ \left[(n_d-1)\sum_{up} W_{i,t}^2\right]\right\} \tag{2}$$

In formulas (1) to (2), *w* is the specific weekly rate of return after correction. The larger the numerical values of the variables *Ncskew* and *Duvol* calculated by formulas (1) and (2), the greater the risk of stock price crash of the sample enterprises.

3.1.2 Explanatory Variables: *Reduction of Major Shareholders*, *RMS*

On the one hand, considering the high concentration of shares of listed companies in China, on the other hand, considering that it is difficult for large shareholders with a low shareholding ratio to release information and have an impact on the capital market, this paper defines the scope of large shareholders as the top five shareholders of listed companies. Therefore, if the sum of the shareholding ratios of the top five shareholders of listed companies in one year is lower than the previous year, *RMS*=1, otherwise *RMS*=0.

3.1.3 Control Variable

In order to control other factors that affect the risk of stock price crash except the major shareholder's reduction, referring to the research of existing literature, this paper adds specific weekly return average (*Ret*), specific weekly return standard deviation (*Sigma*), actual controller category (*CAC*), equity concentration (*H*10), independent director ratio (*Pid*), asset Size (*Size*), asset-liability ratio (*Debt*) and return on assets (*Roa*) as controls respectively.

3.2 Empirical Model Design

In order to test the influence of major shareholders' reduction on the risk of stock price crash, this paper constructs the following regression model to test:

$$SPCR_{i,t+1} = \begin{pmatrix} \alpha_1 RMS_{i,t} + \alpha_2 Ret_{i,t} + \alpha_3 Sigma_{i,t} + \alpha_4 CAC_{i,t} + \alpha_5 H10_{i,t} + \alpha_6 Pid_{i,t} + \alpha_7 Size_{i,t} \\ + \alpha_8 Debt_{i,t} + \alpha_9 Roa_{i,t} + \sum Year + \sum Industry + C + \varepsilon_{i,t} \end{pmatrix} \tag{3}$$

In Formula (3), considering the lag of the impact of stock price crash risk, the explained variable is measured by the stock price crash risk variable with a lag of one period. In addition, in formula (3), the year and industry factors are also controlled.

3.3 Data Selection Description

This paper empirically tests the influence of major shareholders' reduction on the risk of stock price crash by taking China Shanghai and Shenzhen A-share listed companies from 2007 to 2021 as samples. In this paper, the original samples are rejected, and the principles of rejection are as follows: (1) Reject sample companies belonging to the financial industry; (2) Eliminate sample companies with special treatment; (3) Exclude the sample companies that are initially listed in the current year; (4) Exclude sample companies listed on B shares or H shares at the same time; (5) Eliminate the sample companies with annual transactions less than 30 weeks; (6) Eliminate insolvent sample companies; (7) Eliminate sample companies with missing data that cannot be compensated. Finally, 25,317 samples of 2,649 listed companies in Shanghai and Shenzhen A-shares from 2007 to 2021 were obtained.

4. Empirical Results and Analysis

4.1 Descriptive Statistical Results

Table 1. Descriptive Statistical Results of the Whole Sample

	N	Mean	Median	Standard Deviation	Maximum	Minimum	5%	25%	75%	95%
Ncskew	25317	-0.290	-0.253	0.709	5.038	-5.171	-1.505	-0.670	0.122	0.773
Duvol	25317	-0.196	-0.196	0.475	2.705	-2.088	-0.972	-0.502	0.112	0.581
RMS	25317	0.555	1.000	0.497	1.000	0.000	0.000	0.000	1.000	1.000
Ret	25317	0.004	0.002	0.013	1.019	-0.043	-0.012	-0.003	0.009	0.024
Sigma	25317	0.064	0.059	0.040	4.630	0.013	0.034	0.047	0.076	0.113
CAC	25317	0.450	0.000	0.498	1.000	0.000	0.000	0.000	1.000	1.000
*H*10	25317	0.167	0.137	0.121	0.810	0.000	0.031	0.076	0.231	0.402
Pid	25317	0.371	0.333	0.071	0.833	0.000	0.300	0.333	0.429	0.500
Size	25317	22.251	22.114	1.254	28.502	15.577	20.455	21.381	22.985	24.494
Debt	25317	0.455	0.454	0.201	0.997	0.007	0.132	0.300	0.606	0.789
Roa	25317	0.057	0.052	0.081	1.305	-3.978	-0.029	0.029	0.084	0.160

From the descriptive statistical results of the whole sample in Table 1, the average values of the variable *Ncskew* and the variable *Duvol* are -0.290 and -0.196, respectively, indicating that there is a certain degree of stock price crash risk of listed companies in China, which is not substantially different from the results measured in the existing literature. The *RMS* average value of the variable is 0.555, which indicates that more than half of the listed companies in the sample have reduced their holdings by major shareholders, which is relatively large, and also indicates that the shareholding of major shareholders of listed companies in China is highly volatile.

Table 2. Descriptive Statistical Results of Grouping

	RMS=1			*RMS*=0			*T* Test	Wilcoxon
	N	Mean	Median	*N*	Mean	Median		*Z*
Ncskew	14055	-0.269	-0.246	11252	-0.316	-0.263	5.220***	2.671***
Duvol	14055	-0.183	-0.189	11252	-0.211	-0.202	4.640***	3.208***

Note. ***, **, and * indicate that they have passed the significance test at the 1%, 5%, and 10% confidence levels, respectively.

According to the grouping test results in Table 2, in the group with *RMS* value of 1, the mean and median of both variables *Ncskew* and *Duvol* are larger than those in the group with *RMS* value of 0, and both of them can pass the *T* test and *Z* test of the conventional confidence level, which indicates that compared with the listed companies without major shareholder reduction, the listed companies with major shareholder reduction have higher the risk of stock price crash.

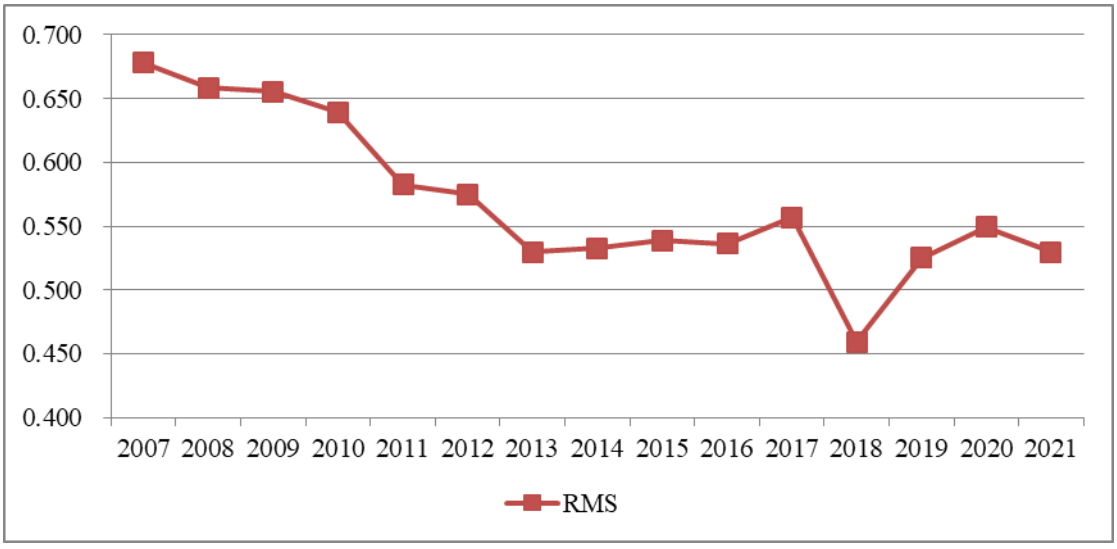

Figure 1. Major Shareholders' Reduction from 2007 to 2021

Judging from the reduction of major shareholders' holdings in each year in Figure 1, the listed companies in China generally show a decreasing trend, especially in recent years, the reduction of major shareholders tends to be in a state of overall balance.

4.2 Correlation Test Results

Table 3. Correlation Test Results

	Ncskew	*Duvol*	*RMS*	*Ret*	*Sigma*	*CAC*	*H*10	*Pid*	*Size*	*Debt*	*Roa*
Ncskew	1										
Duvol	0.872***	1									
RMS	0.033***	0.029***	1								
Ret	-0.141***	-0.165***	0.004	1							
Sigma	-0.090***	-0.092***	0.029***	0.638***	1						
CAC	-0.047***	-0.051***	-0.060***	-0.003	-0.023***	1					
*H*10	-0.031***	-0.031***	-0.336***	-0.002	-0.018***	0.154***	1				
Pid	0.013**	0.011*	-0.026***	-0.006	-0.001	-0.034***	0.046***	1			
Size	-0.066***	-0.082***	-0.147***	-0.057***	-0.139***	0.221***	0.201***	0.014**	1		
Debt	-0.046***	-0.055***	-0.007	0.022***	0.029***	0.231***	0.017***	-0.016**	0.431***	1	
Roa	0.005	-0.005	-0.057***	0.083***	-0.034***	-0.062***	0.108***	0.001	0.057***	-0.232***	1

Note. ***, **, and * indicate that they have passed the significance test at the 1%, 5%, and 10% confidence levels, respectively.

From the correlation test results in Table 3, the correlation coefficient between the variable *RMS* and the variable *Ncskew* or the variable *Duvol* is positive, which means that compared with the listed companies without major shareholder reduction, the listed companies with major shareholder reduction have a higher the risk of stock price crash.

4.3 Regression Results and Analysis

4.3.1 Benchmark Regression Test Results

Table 4. Benchmark Regression Results

	(1)	(2)	(3)	(4)
	Ncskew	*Duvol*	*Ncskew*	*Duvol*
RMS	0.047***	0.028***	0.029***	0.014**
	(0.009)	(0.006)	(0.009)	(0.006)
Ret			-7.715***	-6.455***
Sigma			-0.163	0.097
CAC			-0.040***	-0.028***
*H*10			-0.061	-0.029
Pid			0.132***	0.071*
Size			-0.036***	-0.030***
Debt			-0.014	-0.019
Roa			0.167***	0.071*
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
C	-0.316***	-0.211***	0.509***	0.469***
Adj R^2	0.001	0.001	0.027	0.037

Note. ***, **, and * indicate that they have passed the significance test at the 1%, 5%, and 10% confidence levels, respectively.

From the benchmark regression test results in Table 4, it can be seen that in regression results (1) and (2), the *RMS* coefficient values of variables are both positive and can pass the significance test of 1% confidence level, while in regression results (3) and (4), the *RMS* coefficient values of variables are also positive and can pass the 1% and 5% confidence levels respectively after adding control variables. It can be seen that compared with listed companies without major shareholder reduction, there is a higher the risk of stock price crash of listed companies with major shareholder reduction, which verifies the research hypothesis put forward above.

4.3.2 Effect Mechanism Test Results

From the analysis of the previous article, the major shareholders conceal information before reducing their holdings, but in the process of reducing their holdings, the information is continuously released, and when it reaches a critical value, it will bring about a stock price crash. Therefore, this paper will further test the intermediary effect of information quality between the reduction of major shareholders and the risk of stock price crash. In this paper, the absolute value of the residual term of accrued earnings management (|DA|) is used by listed companies to measure the degree of information manipulation. The greater the value of this variable, the worse the degree of information disclosure, and vice versa.

Table 5. Test Results of Influence Mechanism

	(1)	(2)	(3)	(4)	(5)
	Ncskew	*Duvol*	*|DA|*	*Ncskew*	*Duvol*
RMS	0.029***	0.014**	0.018**	0.032***	0.016***
	(0.009)	(0.006)	(0.001)	(0.009)	(0.006)
|DA|				0.060***	0.043***
				(0.004)	(0.003)
Controls	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes
C	0.509***	0.469***	-0.125***	1.036***	0.852***
Adj R^2	0.027	0.037	0.060	0.042	0.055

Note. ***, **, and * indicate that they have passed the significance test at the 1%, 5%, and 10% confidence levels, respectively.

From the test results of influence mechanism in Table 5, the regression results (1) and (2) are the benchmark test results mentioned above, indicating that compared with listed companies without major shareholder reduction, listed companies with major shareholder reduction have higher the risk of stock price crash, while in the regression result (3), the variable *RMS* coefficient is significantly positive, indicating that the higher the degree of information manipulation, the higher the risk of stock price crash of listed companies. In the regression results (4) and (5), the coefficient value of variable |*DA*| is also significantly positive, which shows that information manipulation has formed an intermediary effect between the major shareholder's reduction and the risk of stock price crash. In the process of reduction, the major shareholder manipulates information, which affects the quality of information, and then affects the risk of stock price crash. At the same time, in the regression results (4) and (5), the *RMS* coefficient values of variables can pass the significance test of conventional confidence level, which indicates that information manipulation produces a partial intermediary effect between the reduction of major shareholders and the risk of stock price crash.

4.3.3 Robustness Test Result

In order to test the robustness of the research conclusion, this paper tests the robustness on the basis of benchmark regression. First, the benchmark regression test mentioned above takes the lagging stock price crash risk variable as the explained variable, and this paper makes an empirical test with the current stock price crash risk variable as the explained variable in the robustness test. Secondly, considering the differences of shareholders' ownership and the risk of stock price crash of listed companies in different regions, this paper excludes listed companies whose sample locations are Beijing, Shanghai, Tianjin and Chongqing, and then makes an empirical test again. Thirdly,

considering the possible endogenous problems in benchmark regression, this paper uses two-stage least square method to conduct empirical test again. There is no substantial difference between the results of the robustness test and those of the previous test, which shows that the reduction of major shareholders will promote the risk of stock price crash.

4.3.4 Heterogeneity Grouping Test

(1) Property Right Attribute Grouping Inspection

There is a great difference between state-owned enterprises and non-state-owned enterprises in China, which is manifested in the differences of corporate shareholder attributes, shareholder resources and shareholder performance. Then, whether there is any difference between state-owned enterprises and non-state-owned enterprises in the impact of major shareholder reduction on the risk of stock price crash is the content of this part of the test.

Table 6. Group Test Results of Property Right Attribute and Scientific and Technological Attribute

	State-owned Enterprise Group		Non-state-owned Enterprises Group		High-tech Enterprise Group		Non-high-tech Enterprise Group	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ncskew	*Duvol*	*Ncskew*	*Duvol*	*Ncskew*	*Duvol*	*Ncskew*	*Duvol*
RMS	0.037***	0.025***	0.026	0.015	0.025	0.010	0.032***	0.017**
	(0.013)	(0.009)	(0.023)	(0.019)	(0.139)	(0.010)	(0.012)	(0.008)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C	1.006***	0.743***	0.372***	0.465***	0.775***	0.657***	0.355***	0.365***
Adj R^2	0.039	0.051	0.022	0.030	0.033	0.040	0.025	0.037

Note. ***, **, and * indicate that they have passed the significance test at the 1%, 5%, and 10% confidence levels, respectively.

From the results (1)-(4) in Table 6, in the sample group of state-owned enterprises, the coefficient value of the variable *RMS* is significantly positive, indicating that in the state-owned enterprises in China, the reduction of major shareholders can have an obvious positive effect on the risk of stock price crash. In the sample group of non-state-owned enterprises, although the coefficient value of the variable *RMS* is positive, it fails to pass the significance test of the conventional confidence level, which shows that the reduction of major shareholders has no obvious impact on the risk of stock price crash of non-state-owned enterprises in China. Compared with non-state-owned enterprises, the major shareholders of state-owned enterprises in China are mostly enterprises or institutions controlled by the

state, and their information concentration ratio is stronger. Therefore, market investors will think that the reduction of major shareholders of state-owned enterprises reveals more information, and thus the reduction of major shareholders of state-owned enterprises will have a stronger role in promoting the risk of stock price crash.

(2) Scientific and Technological Attribute Grouping Inspection

There are also some differences between the shareholders of science and technology enterprises and non-science and technology enterprises, because the differences in scientific and technological innovation of enterprises will lead to different attitudes of enterprise shareholders towards long-term and short-term shareholding, and thus there are also differences in the impact of major shareholders' reduction. Then, whether there is any difference in the impact of major shareholders' reduction on the risk of stock price crash between science and technology enterprises and non-science and technology enterprises is the content of this part of the test.

From the results (5)-(8) in Table 6, it can be seen that in the sample group of high-tech enterprises, although the coefficient value of the variable *RMS* is positive, it fails to pass the significance test of the conventional confidence level, indicating that in high-tech enterprises, the influence of major shareholders' reduction on the risk of stock price crash is not significant. However, in non-high-tech enterprises, the coefficient value of variable *RMS* is significantly positive, which indicates that in non-high-tech enterprises in China, the reduction of major shareholders' holdings can have a significant positive effect on the risk of stock price crash. Compared with high-tech enterprises, the major shareholders of non-high-tech enterprises are relatively scattered, so the reduction of major shareholders of non-high-tech enterprises has a stronger role in promoting the risk of stock price crash.

(3) Market Form Grouping Inspection

The stock market in different market situations shows different characteristics. Usually, when the market is in a bull market, analysts tend to predict more optimistically and there is more information in the capital market, which makes market investors clearer and pay more attention to the information that has a significant impact on the stock price of enterprises in the short term. In the bear market, the amount of market information is relatively small. At this time, the information about the establishment and progress of post-doctoral workstations made public by enterprises will be paid more attention by market investors, and this information related to the essence of enterprise development will also have the effect of correcting investors' behavioral deviations.

Table 7. Group Test Results of Market Form and Investor Protection

	Bull Market Group		Bear Market Group		High Investor Protection Group		Low Investor Protection Group	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Ncskew	*Duvol*	*Ncskew*	*Duvol*	*Ncskew*	*Duvol*	*Ncskew*	*Duvol*
RMS	0.048***	0.021**	0.018	0.010	0.039	0.020	0.201***	0.093***
	(0.015)	(0.010)	(0.012)	(0.008)	(0.137)	(0.090)	(0.013)	(0.009)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
C	0.337**	0.212**	0.734***	0.701***	0.930***	0.865***	0.537***	0.399***
Adj R^2	0.031	0.053	0.028	0.034	0.042	0.054	0.031	0.039

Note. ***, **, and * indicate that they have passed the significance test at the 1%, 5%, and 10% confidence levels, respectively.

From the results (1)-(4) in Table 7, in the bull market sample group, the coefficient value of the variable *RMS* is significantly positive, which indicates that in the bull market, the reduction of major shareholders has a significant positive impact on the risk of stock price crash. In the bear market sample group, although the *RMS* coefficient value of the variable is positive, it fails to pass the significance test of the conventional confidence level, indicating that the influence of major shareholders' reduction on the risk of stock price crash is not obvious in the bear market. Compared with the bear market period, during the bull market period, because market investors have relatively more choices, when market investors find that major shareholders reduce their holdings, the probability of following the reduction is greater, and the impact on the risk of stock price crash is more obvious.

(4) Investor Protection Grouping Inspection

The higher the level of investor protection, the higher the information transparency of listed companies, and the smaller the impact of major shareholders' reduction, especially the probability that ordinary market investors will reduce their holdings with major shareholders will be lower. Therefore, in listed companies with high investor protection and low investor protection, whether there is any difference in the impact of major shareholder reduction on the risk of stock price crash is the content of this part of the test.

From the results (5)-(8) in Table 7, in the sample group with high investor protection level, although the *RMS* coefficient value of the variable is positive, it fails to pass the significance test of the conventional confidence level, which indicates that due to the protection of market investors, the major shareholder's reduction behavior is relatively less destructive. However, in the sample group with low investor protection level, the *RMS* coefficient value of the variable is significantly positive, which

indicates that the reduction of major shareholders has a more obvious impact on the risk of stock price crash in enterprises with relatively low investor protection level. Compared with high investor protection areas, in low investor protection areas, due to the weak external governance environment, an effective external governance system has not been formed, thus amplifying the impact of major shareholder reduction on the risk of stock price crash.

5. Conclusions

The risk of stock price crash is a hot topic in macro-economy and micro-finance in recent year. In addition, the stock price crash is harmful to listed companies, capital markets and macro-economy, which is also a concern of both academic and practical circles. As an insider, the major shareholder's reduction behavior will accelerate the crash of listed companies' share prices because it sends "bad" information to the capital market. Therefore, this paper takes China Shanghai and Shenzhen A-share listed companies from 2007 to 2021 as samples to empirically test the impact of major shareholder reduction on the risk of stock price crash. This paper finds that the reduction of major shareholders promotes the risk of stock price crash of listed companies, that is, compared with listed companies without major shareholders' reduction, the risk of stock price crash of listed companies with major shareholders' reduction is higher, and this conclusion still holds after controlling the conservative factors. Further examination shows that the major shareholder's manipulation of information has an impact on the risk of stock price crash, and the impact of major shareholder's reduction on the risk of stock price crash is more obvious in China state-owned enterprises, non-high-tech enterprises, enterprises in the bull market period and enterprises in areas with low market investors.

Based on the conclusion of this paper, the following countermeasures and suggestions are put forward. First, we should strengthen the norms and constraints on the reduction of major shareholders. As an insider of listed companies, major shareholders have more information that non-major shareholders do not have, so their reduction behavior will inevitably lead to market investors' "speculation", which will lead to market fluctuations, thus bringing more uncertain factors to the capital market. The existing literature research also points out that the major shareholder's reduction has more "negative" effects on listed companies, and in China, the regulatory authorities have also issued relevant policies to restrict the major shareholder's reduction. Therefore, the regulatory authorities should further restrain the behavior of major shareholders, restrain the behavior of major shareholders with stricter conditions, and reduce the negative impact of major shareholders' reduction. Second, the external governance of listed companies should be strengthened. In addition to the internal governance system of listed companies, good external governance can also have a positive impact on listed companies. However, due to the wide geographical scope of China, although listed companies in different regions face the same policy system, due to the differences in economic development in different regions, listed companies actually face different external governance systems. Therefore, we should strengthen the

external governance environment faced by listed companies in China, promote internal governance with good external governance, and effectively enhance the overall governance effect of listed companies. The third is to improve the quality of information disclosure of listed companies. Good information disclosure not only restricts the risk of stock price crash, but also effectively protects market investors. Therefore, on the one hand, listed companies should actively disclose all kinds of information in a timely, accurate and complete manner to ensure market investors' right to know information; On the other hand, the regulatory authorities should also strengthen the supervision of information disclosure of listed companies, and effectively supervise the acts of deliberately hiding information, delaying disclosure of information, and incomplete disclosure of information, so as to reduce the impact of information asymmetry on market investors.

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