Can State-owned Shareholders' Participation Curb Stock Price Crash Risk?
--Based on Empirical Evidence of A-share Private Listed Companies from 2008 to 2019

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Abstract. After state-owned shareholders buy shares in private listed companies, they will more or less bring about some changes in the development of private listed companies. The existence of state-owned shareholders can enable listed companies to obtain more resources, which will play a certain role in promoting the company's operation. These favorable conditions will also attract more attention from the outside world. In order to study whether these changes will affect or restrain the company's stock price crash risk during the company's development, we take the stock price data of private listed companies in A-shares from 2008 to 2019 as the object of analysis. This paper studies the influence of state-owned shareholders' participation on the risk of stock price collapse of private companies. Through the regression model analysis, it is found that there is a significant negative correlation between the state-owned shareholders' participation in the private listed company and the company's stock price crash risk, that is, the state-owned shareholders' participation in the private listed company can significantly restrain the company's stock price crash risk.

Keywords: Stock price crash risk; State-owned shares, Mixed ownership

1. Introduction

The phenomenon of stock price collapse is mainly due to some reason within the listed company, which leads to a large number of shares of the company in the stock market, so that the stock price of the stock in the stock market has fallen sharply. We do not know when this phenomenon will stop. People generally regard the phenomenon of stock prices falling more than 20% in a single day or a few days as a stock market crash. For the whole financial market, this phenomenon will not only affect the stable development of the financial market, but also cause investors to have negative emotions about the prospect of the development of the capital market, and then affect the development of the national economy. Under the existing economic system, some state-owned enterprises and private enterprises in our country have also begun to choose the mixed ownership reform mode in order to achieve the purpose of stable economic development. At the same time, the Third Plenary Session of the 18th CPC Central Committee has stressed that it is hoped that all sectors of society can develop mixed ownership economy, contribute to the further development of mixed ownership economy, and form a situation in which the public economy is the main body and multiple ownership economies develop together. Up to now, more than 60% of private listed companies in China have chosen to introduce state-owned capital to form enterprises with mixed ownership structure

The factors affecting the risk of stock price crash can be mainly divided into internal factors and external factors. The internal factors are mainly caused by improper incentives and behavioral characteristics of the management. When the management of a company is overconfident, the stock price of the company will often face a greater risk of collapse (Zeng Eming et al., 2017); When auditors change tax expenses through tax services and use some corresponding tax avoidance means, the risk of stock price crash will be reduced (Habib and Hasan, 2016); High levels of internal control, high-quality financial reporting (Ye Kangtao et al., 2015), and auditor industry expertise can all effectively reduce the risk of stock price crashes (Ma Xiaofang et al., 2018). The external factors are mainly related to institutional investors. In general, the stability of investors is negatively correlated with the risk of stock price collapse (Callen and Fang,2013), the phenomenon of political connection

among company executives (Yuan Jun, Pan Hui feng et al., 2018) and the religious atmosphere within the company (Zeng Aimin, Wei Zhi hua et al., 2018). 2017) will also have an impact on management's investment behavior, which in turn affects the company's stock price crash risk. However, with the continuous development of the financial market, the cooperation between state-owned capital and private enterprises is becoming closer and closer, and more and more state-owned capital chooses to enter private enterprises and become the controlling shareholders of the enterprises, which has formed a unique mixed ownership structure in China. With the entry of state-owned shareholders, the management, operation and development of enterprises are also subtly affected, and these changes will eventually affect the risk of stock price collapse of enterprises.

"With the entry of state-owned shareholders, local governments will more or less provide some assistance to the development of private companies. For example, they may help in the approval of certain documents or assist in accelerating the launch and promotion of products for these mixed-ownership companies. They may also facilitate actions against counterfeit products and play a role in maintaining the company's image. In some cases, local government officials, driven by personal gain and future career prospects, may intervene in the company's operations through economic means. When privately-owned enterprises face financial crises with state-owned shareholders involved, they may offer loans to help them overcome these crises. This phenomenon is particularly evident in regions with lower levels of economic development. When private enterprises encounter operational crises, companies controlled by state-owned shareholders often go out of their way to support them and ensure that they continue operating in that region without causing damage to local economic development. As a gesture of appreciation, government departments also tend to allocate more resources and privileges to such privately-held companies with state-owned shareholders controlling stakes. So how does the presence of state-owned shareholders affect the risk of stock price collapse? And what is its extent?"

2. Literature review

2.1. Research on the economic consequences of mixed ownership reform of state-owned enterprises

State-owned capital entering private listed companies can usually establish a good relationship with the local government, which can help the company to alleviate financing difficulties caused by some unfavorable factors to a certain extent (Hu Xuyang, 2010). According to the paired sample method, we can find that the degree of constraints of mixed ownership is lower than the degree of financing constraints of non-mixed ownership (Baotou Steel, 2016). After the mixed ownership reform, private listed companies can effectively reduce the constraints of enterprise financing, not only reduce the risk of external trust, but also alleviate the financing difficulties caused by information asymmetry to a certain extent (Liang Jiao Jiao, 2020). After the mixed ownership reform of private enterprises, the financing constraints of the enterprises can be effectively alleviated, and the financing structure will be further improved. Moreover, with the transformation of nationalization, the tax cost of enterprises will be reduced to a certain extent, long-term borrowing will increase, and the overall borrowing will also decrease (Wu Qian, 2018). Most scholars generally believe that these private listed companies can significantly improve the benefits of enterprises after the introduction of state-owned capital. From the perspective of investors, the entry of state-owned capital can help enterprises realize the appreciation of their own value, bring short-term positive feedback to the market, and bring significant positive long-term returns and growth in economic performance. In particular, the lower the degree of marketization, the more obvious the impact of state-owned shareholders on performance (Luo Jinhui, 2013; Hao Yang, Gong Liutang, 2017).

2.2. Related research on the influencing factors of stock price crash risk

Stock price crashes are often caused by asymmetric information. Because the information held by internal managers and external investors is not the same, it is found through empirical analysis using

a large amount of data that the management has reasons to hide the negative information of the company, because once the negative information is understood by the market and investors, the negative information will be hidden from the market. Due to the dual effects of emotional instability and company valuation changes, the company's stock price will plummet, leading to the collapse of the stock price (Jin and Myers,2006). If managers try to hide negative news to ensure the smooth progress of loss projects, when the amount of loss keeps increasing, external investment institutions and investors will often choose to sell the company's shares in the stock market after constantly discovering the company's real financial situation. This will eventually lead to a collapse in the company's stock price (Bleck and Liu,2007).

The quality of a company's earnings management will also affect the risk of stock price collapse. When the company's earnings management level continues to improve, the stock price is more prone to sudden growth and sudden decline, which will also increase the risk of stock price collapse (Kim et al. 2013; Hutton et al., 2009). According to the data of listed companies in China (Yang Jinzhi, 2016), the worse the earnings quality is, the higher the risk of stock price crash. External supervision also has a certain regulating effect on the risk of stock price crash. When the market can find out the problems in earnings management of listed companies, the possibility of stock price crash of listed companies will also decline.

The company's external factors will also have an impact on the company's stock price crash risk, such as the optimism and bias of analysts, the share of institutional investors, and the possibility of insider trading. Media attention and the degree of information sharing among different investment entities on social platforms all affect the stock price crash risk of a listed company to varying degrees (Xu Nianhang et al., 2012; Cao Feng et al., 2015; Luo Jinhui et al., 2014; Ding Hui, 2018).

To sum up, for private listed companies, after the introduction of state-owned shareholders, the company's stock price collapse risk will generally change. Scholars usually use two variables, NCSKEW and DUVOL, to measure the stock price crash risk. This paper will evaluate the stock price crash risk of listed companies through these two indicators. Meanwhile, more data will be used as far as possible to jointly characterize and measure the stock price crash risk of private listed companies. Hope to get a more accurate conclusion. Although there are also case studies on the mixed reform of state-owned enterprises, most of these cases focus on the mixed reform of state-owned enterprises, which cannot fully reflect the situation of private enterprises in the mixed reform and the role of these companies in the reform process. Most of them enter the analysis from a single perspective, and it is difficult to comprehensively evaluate the process of mixed reform and the changes in the development of companies. Based on the previous scholars' research results, combined with the current development of private listed companies, this paper hopes to explore the changes in the stock price crash risk that may occur in the future of private listed companies with state-owned shareholders' participation from the perspective of private listed companies.

3. Theoretical analysis and hypothesis

3.1. Theoretical analysis

According to the relevant theoretical research on the causes of stock price crash risk, stock price crash is mainly caused by information asymmetry. According to the signal transmission theory, due to the asymmetry of information in the capital market, with the increase of market competition, enterprises have the motivation to show their own business and financial conditions to the market, and usually take a series of actions to convey relevant information to the market, so as to distinguish themselves from other enterprises. The market responds to these signals in a timely manner [41]. The quality of information disclosure, as a standard for enterprises to show a good internal control environment, is a good signal for enterprises. Therefore, improving the quality of information disclosure can effectively soothe investors' emotions, thereby enhancing the trust of external media and investors in the relevant financial and business development information voluntarily disclosed by the company, weakening the uncertainty they face when making decisions, alleviating the dilemma

of excessively high stock price bubble, and making the stock price reasonably reflect the actual business situation of the company.

For some private enterprises that rely on their own development, the vision and ability of major shareholders have a huge impact on the future interests and long-term development of the company, and the pattern of shareholders will also have a certain impact on the image and culture of the company. However, with the intervention of state-owned shareholders, it can provide some new development impetus for the development of private enterprises, help the management system of these enterprises to be fully improved, the internal innovation ability of enterprises will be enhanced, and the implementation of various rules and regulations will be supervised. Although the behavior of major shareholders of private listed companies will be limited to a certain extent, the development of the company will be more stable, the emergence and processing of negative information will be controlled, and it will be easier to get strong support from some policies of local governments and banks, which will provide a solid backing for the stability of the capital chain of the company, thus affecting the risk of collapse of the private stock price. Therefore, this paper proposes the following hypothesis:

H1: The participation of state-owned shareholders can reduce the future stock price crash risk of private listed companies, and the higher the proportion of state-owned shares, the more obvious the reduction effect will be

4. Research design

4.1. Data source and processing

This paper uses A-share private listed companies from 2008 to 2019 as the initial research sample, and all the data are from the CSMAR database. Considering the particularity of financial data of financial listed companies, this paper excludes the data of financial listed companies; At the same time, in order to ensure the reliability of the calculation of stock price crash risk index, we draw lessons from previous studies and exclude the annual data of companies whose annual weekly return rate is less than 30 weeks. After removing the data with missing data, 17,209 company-year observations are finally obtained. However, there is a first-order lag in the process of regression, so the sample size of the regression equation will be reduced. Finally, WINSOR processing is performed on data other than 1% and 99% quantile of continuous variables.

4.2. Variable definition

Stock price crash risk (CRASHRISK). Referring to the research of Kim et al. (2011), two indexes NCSKEW of negative returns (NCSKEW) and up and down volatility of returns (DUVOL) are used to measure the stock price crash risk. First of all, the correlation regression equation is carried out, and after stripping the influence of market factors on individual stocks, the return rate of individual stocks Wi,t after market adjustment is obtained. NCSKEW and DUVOL are calculated based on Wi and t. The greater the NCSKEW is, the higher the negative skew coefficient is, and the greater the risk of stock price crash is. The higher the value of DUVOL, the more inclined the yield distribution to the left, the greater the risk of collapse.

Table 1. Variable definition

Variable class	Variable name	Variable symbol	Measurement method
Dependent variable	Stock price crash risk	NCSKEW	The company's negative income skew coefficient
		DUVOL	The ups and downs of a company's earnings
Independent variable	State-owned equity participation	State1	Whether there are state-owned shareholders among the top ten shareholders of the company
	State equity	State2	The proportion of shares held by Chinese shareholders among the top ten shareholders of the company
Control variable	Company size	Size	Take the natural logarithm of the company's total assets at the end of the year
	Enterprise asset-liability ratio	Lev	The ratio of total liabilities to total assets at the end of the year
	Average weekly return	Ret	Average weekly returns of individual stocks
	Standard deviation of weekly return	Sigma	Standard deviation of weekly characteristic return of individual stocks
	Return on total assets	ROA	Company's annual net profit/total assets at the end of the year
	The proportion of the largest shareholder	H1	Total number of shares held by the largest shareholder/Total shares of the company (%)
	Share of top 10 shareholders	H10	Total number of shares held by Top Ten shareholders/Total shares of the company (%)
	Two part-time jobs	dual	Whether the chairman serves as the general manager
	Industry	Ind	Industry dummy variables are set according to the "Guidelines on Industry Classification" published by the SFC in 2012
	Year	Year	Annual dummy variable

According to the regulations of China Securities Regulatory Commission, the information of the top ten shareholders of listed companies is required to be disclosed in the annual report of listed companies. We first obtained the data sample of the top ten shareholders of private listed companies from 2008 to 2019 through the CSMAR database. The top ten shareholders are then classified by nature. If the shareholders are national or local SASAC, government agencies, institutions, state-owned enterprises and scientific research institutes, it is regarded as having state-owned shareholders, otherwise it is regarded as having no state-owned shareholders. For the identity of the shareholder itself is a state-owned enterprise, we have confirmed one by one by checking the information of the sky eye check, the enterprise check and the company's official website. In this paper, whether a private enterprise has state-owned shares (State 1) is used as an independent variable. In order to further guarantee the accuracy of the results, the existence of state-owned shareholders in the private listed company is recorded as 1, otherwise it is recorded as 0. The proportion of state-owned shareholders in private enterprises (State 2) is taken as the second independent variable. Drawing on the existing research on stock price crash risk, the control variables adopted in this paper include: Average weekly return rate (Ret), standard deviation of corporate return rate (Sigma), Return on total assets (ROA), asset-liability ratio (Lev), company Size (Size) (this paper takes the natural logarithm of total assets to measure enterprise size), Return on equity (ROE), whether the chairman serves as the general manager (dual), This paper also sets industry and year as dummy variables.

4.3. Empirical model

In order to test the relationship between state-owned equity participation and the stock price crash risk of private enterprises, model (1) was constructed to test the impact of state-owned equity participation on the stock price crash risk of private listed companies by referring to the studies of Hutton et al. (2009) and Jiang Fuxiu et al. (2018).

$$\mathrm{CRASHRISK}_{i,t} = \alpha_0 + \alpha_1 State1_{i,t} + \alpha_2 Contorl_{i,t} + \mathrm{Year} + \mathrm{Ind} + \varepsilon_{i,t} \quad (1)$$

Among them, CRASHRISK i,t represents the stock price crash risk of the company in the year t, and the independent variable and control variable respectively adopt the T-period index. Observe the regression coefficient of State1i,t. If the regression coefficient of α1 is significantly negative, it indicates that state-owned shares can reduce the risk of stock price collapse of private enterprises.

5. Empirical results and analysis

5.1. Descriptive statistics

Table 2. Descriptive statistics

Variable	N	Mean	minimum	median	median maximum	standard deviation
NCSKEW	16,865	-0.228	-2.353	-0.191	1.779	0.661
DUVOL	16,865	-0.145	-1.35	-0.146	1.131	0.457
size	16,865	21.71	19.303	21.622	25.041	1.028
Lev	16,865	0.387	0.046	0.376	0.883	0.195
Ret	16,865	0.003	-0.02	0.002	0.042	0.011
sigma	16,865	0.068	0.029	0.061	0.173	0.026
ROA	16,865	0.041	-0.339	0.041	0.204	0.058
h1	16,865	31.936	7.86	29.99	71.17	13.374
h10	16,865	58.614	21.52	60.34	88.34	14.73
dual	16,865	0.358	0	0	1	0.479

Descriptive statistics are shown in Table 1. The mean values of NCSKEW and DUVOL are −0.228 and −0.145 respectively, both of which are negative, indicating that state-owned equity participation can reduce the risk of stock price collapse of private listed companies. The standard deviation of NCSKEW and DUVOL is 66.1% and 45.7% respectively, indicating that there are still some differences in stock price crash risk among different companies. The average value of state-owned shares is 44.1%, indicating that more than two fifths of the top ten shareholders of private listed companies have state-owned shareholders. It can be seen that the phenomenon of state-owned capital entering private listed companies is not rare. The average share of state-owned equity is 2.372%, and the highest is 33.57%, indicating that the share of state-owned equity in private listed companies is not high. The average value of company size is 21.710, and there is little difference in each distribution, indicating that the size of companies in this sample data is similar. The complexity of audit business involved in these listed companies is similar, and the average return on total assets (ROA) is only 4.1%, while the difference between the minimum value (-33.9%) and the maximum value (20.4%) even reaches 54.3%, indicating that the overall profit level of China's listed companies is not high, but there is serious polarization. Some companies are extremely profitable, and some listed companies are so profitable that they may even face the risk of being delisted. The average value of asset-liability ratio (Lev) is 38.7%, which is at a medium low level, but the minimum value is 4.6% and the maximum is 88.3%, which indicates that the sample data also have a large difference in solvency.

5.2. Correlation analysis

According to the pwcorr correlation table, first of all, the significant correlation between state-owned shareholders and NCSKEW and DUVOL at the level of 5% and 1% respectively can preliminarily support the h1 hypothesis in this paper, indicating that state-owned shareholders (State 1) can play a certain role in reducing the stock price crash risk of private listed companies. Secondly, state-owned equity is also significantly correlated at the level of 5% and 1% respectively on NCSKEW and DUVOL. It can be preliminarily believed that with the increase of state-owned equity, the risk of stock price collapse of private companies will gradually reduce.

Table 3. pwcorr correlation coefficient of the main variable

	ncskew	duvol	State1	State2	ret	sigma
ncskew	1					
duvol	0.862***	1				
State1	-0.014*	-0.026***	1			
State2	-0.008	-0.013*	0.544***	1		
ret	-0.168***	-0.173***	-0.024***	-0.018**	1	
sigma	-0.177***	-0.158***	-0.002	-0.002	0.478***	1
h1	-0.013	-0.013*	-0.049***	-0.131***	0.017**	-0.018**
size	-0.035***	-0.057***	0.118***	0.032***	-0.066***	-0.197***
lev	-0.040***	-0.048***	0.078***	0.043***	-0.014*	-0.019**
roa	0.013*	0.002	-0.053***	-0.045***	0.095***	-0.067***
h10	0.009	0.012	-0.114***	-0.051***	0.014*	0.021***
dual	0.006	0.012	-0.032***	-0.044***	0.003	0.027***
	h1	size	lev	roa	h10	dual
h1	1					
size	0.021***	1				
lev	-0.032***	0.449***	1			
roa	0.157***	0.001	-0.323***	1		
h10	0.589***	-0.033***	-0.173***	0.251***	1	
dual	0.057***	-0.110***	-0.103***	0.025***	0.096***	1

5.3. Regression result analysis

According to the research model (1), whether the participation of state-owned shares affects the stock price collapse risk of family enterprises is tested, and the regression results are shown in Table 3. According to regression (1), when the dependent variable is NCSKEW, the regression coefficient of state-owned participation has a significant negative correlation at 1% level; According to regression (3), when the dependent variable is DUVOL, the regression coefficient of state-owned equity participation is significantly negatively correlated at 1% level, indicating that state-owned equity participation can significantly reduce the stock price crash risk of private listed companies. From an economic point of view, compared with private enterprises without state-owned shareholders, the risk of stock price collapse of private listed companies with state-owned shareholders has decreased to 19.2%.

Table 4. State-owned shares and stock price collapse risk: Basic return

variable	(1) NCSKEW	(2) NCSKEW	(3) DUVOL	(4) DUVOL
State1	-0.034***		-0.031***	
	(-3.22)		(-4.11)	
State2		-0.003**		-0.002***
		(-2.31)		(-2.97)
Ret	-9.678***	-9.639***	-8.411***	-8.343***
	(-10.94)	(-10.83)	(-13.47)	(-13.28)
sigma	-8.155***	-8.121***	-4.283***	-4.276***
	(-21.53)	(-21.34)	(-16.83)	(-16.69)
h1	-0.002***	-0.003***	-0.002***	-0.002***
	(-4.84)	(-5.24)	(-4.73)	(-5.20)
size	-0.060***	-0.061***	-0.047***	-0.049***
	(-8.66)	(-8.73)	(-9.68)	(-9.89)
lev	0.049	0.049	0.029	0.031
	(1.36)	(1.34)	(1.16)	(1.21)
ROA	0.211*	0.209*	0.055	0.053
	(1.9)	(1.87)	(0.7)	(0.68)
h10	0.003***	0.003***	0.002***	0.002***
	(6.2)	(6.66)	(6.15)	(6.77)
dual	0.013	0.012	0.008	0.007
	(1.17)	(1.05)	(1.06)	(0.94)
Constant term	1.823***	1.826***	1.207***	1.224***
	(10.08)	(10.03)	(9.03)	(9.09)
N	14743	14601	14752	14610
Yesr	Control	Control	Control	Control
Ind	Control	Control	Control	Control
R-squared	0.128	0.127	0.118	0.117

Note: ***, ** and * are significant at 1%, 5% and 10% statistical levels respectively

The regression result (2) can also prove that when the dependent variable is NCSKEW, the regression coefficient of state-owned equity is significantly negatively correlated at 5% level, indicating that the higher the proportion of Chinese equity owned by a private enterprise, the more it can reduce the stock price crash risk of the private listed company. From the economic perspective, take regression (2) as an example, the regression coefficient of state-owned equity is -0.00265, which proves that every percentage point increase of state-owned equity in private companies, the risk of stock price collapse will decrease by 0.00265. According to the regression results of control variables, size, ret, sigma and h1 all showed significant negative correlation. This indicates that the larger the scale of the private listed company, the higher the idiosyncrasies rate of return, the larger the standard deviation of weekly return, and the higher the shareholding ratio of the largest shareholder. In summary, according to the existing results, H1 hypothesis can be fully proved, indicating that state-owned equity participation can significantly reduce the stock price crash risk of private listed enterprises, and the higher the share of state-owned equity, the more significant the reduction of stock price crash risk.

6. Conclusion and enlightenment

Based on the financial data of A-share listed private companies from 2008 to 2019 as research samples, this paper mainly studies whether there is A correlation between state-owned shareholders' participation and the stock price crash risk of private enterprises, and what kind of correlation they

are. Finally, this paper concludes that state-owned shareholders' participation can help private listed companies reduce the stock price crash risk. With the increase of the share of state-owned equity, the inhibition effect is more obvious.

Through the research results, we can clearly see that the risk of stock price collapse of private listed companies with state-owned shareholders is significantly lower than that of listed companies without state-owned shareholders. As an important part of China's capital market, private companies have been facing a lot of pressure in the competition in the capital market, and may encounter fund problems due to loans or other force majeure reasons. Most private listed companies often do not dare to forge ahead, thus missing the opportunity to make the development of the company more beneficial. It can not only bring capital to enterprises, but also reduce the risk of potential capital chain break and help enterprises seize opportunities.

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