Original Research Article

The Impact of Board Overconfidence on the Risk of Stock Price Crash

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Abstract: From the perspective of behavioral finance, China's A-share listed companies in Shenzhen and Shanghai from 2010 to 2022 are taken as the research objects in this paper, and the influence of different sources, degrees and types of board overconfidence on the risk of stock price crash is empirically test. Results show that different sources, degrees and types of board overconfidence have disparate impact on stock price crash risk. In other words, as long as the board of directors has the psychological deviation, and when the degree of overconfidence from any one source is very strong, its overconfidence will significantly increase the occurrence of stock price crash risk; while when the degree of overconfidence from both sources are weak, it will not exacerbate, but inhibit the risk of a stock price crash. Further research finds that the corporate supervision mechanism has an inhibitory effect on the stock price crash risk caused by different types of overconfidence, but most of them are not significant, indicating that the governance effect of the corporate supervision mechanism is limited. The research of this paper can provide a reference for China to establish a perfect capital market provision system and regulatory reform.

Keywords: Stock price crash risk; Overconfidence; Better than average; Overoptimism; Supervision mechanism

1. Introduction

Stock price crash will severely hurt the interests of shareholders, shake investors' confidence in the capital market, go against the stable and healthy development of the financial market, and even cause the consequences of resource mismatch, endangering the development of the real economy. Most previous scholars only studied the causes of the stock price crash risk from the principal-agent theory, believing that the stock price crash stems from the long-term concealment of bad news by insiders, and when the bad news could not be concealed any longer and leaked, it will have a huge impact on stock prices, resulting in a sharp decline in stock prices. However, some enterprises that have been proved to have low principal-agent problem also have a high risk of stock price collapse, which cannot be explained by principal-agent theory. Later, some scholars successfully explained the above "anomalies" with behavioral finance theory. In this paper, from the perspective of behavioral finance and based on the theory of overconfidence of managers, the differential influence of board overconfidence with different sources, degrees and types on the risk of stock price collapse is systematically explored, taking Chinese A-share listed companies in Shenzhen and Shanghai from 2010 to 2022 as the research object. Moreover, the regulatory role of corporate supervision mechanism and inspection supervision mechanism in the relationship between overconfidence of the board of directors and the risk of stock price crash is introduced. The research of this paper provides a reference for institutional and regulatory reform in establishing a sound capital market in China.

2. Literature review and research hypothesis

At present, one of the theories to explain the causes of stock price crash risk is the principal-agent "information hoard" theory (Jin and Myers, 2006), with the core idea that the information hoard caused by

the agent motive of enterprise managers is the root cause of the risk of stock price crash. This theory is based on the hypothesis of rational people and belongs to the category of rational people's expectation model; The other is the theory of "manager overconfidence" in behavioral finance (Kim et al., 2016). Kim et al. (2016) believe that even if managers have no selfishness and take the maximization of shareholders' interests as their responsibility, they may lead to stock price collapse due to overconfidence. In their opinion, overconfident executives often overestimate their management capabilities but underestimate the potential risks of the project. When the project finally proved to be a failure, the accumulated bad news was released in a concentrated way, causing the share price to collapse. As for the latter theory, most studies are conducted from the single dimension of overconfidence, ignoring the difference between the two dimensions of "overestimating returns" and "underestimating risks" of overconfidence from different sources. Some scholars have realized that overconfidence with different intensity and sources has different features. Among them, Moore and Schatz(2017) believe that overconfidence with different sources has a great difference in influence on economic decision-making, so it should be treated differently. Other scholars believe that overconfidence does not always play a negative role in the decision-making process of managers.

The above studies on the crash risk of corporate stock prices have been relatively comprehensive, but the analysis from the perspective of corporate managers' overconfidence is still relatively scarce, and the only studies only focus on the single dimension of managers' overconfidence, while the multi-dimensional focus on managers' overconfidence is still rare. Therefore, in this paper, the influence of overconfidence on stock price crash risk will be discussed from the multi-dimensional perspective, which not only enriches the research field of stock price crash risk, but also expands the application of behavioral finance in the field of stock price crash risk. Therefore, in this paper, the impact of the overconfidence of board of directors in different dimensions on the risk of stock price crash is explored, and corresponding assumptions are put forward.

2.1. The influence of different sources of board overconfidence on the risk of stock price crash

From the source, overconfidence is divided into calibration bias, better than average, control illusion and overoptimism. Since "better-than-average" and "overconfident" are two typical classifications that depict the characteristics of overconfidence of board from both internal and external aspects, especially in the context of China's special institutional culture, they are more prominent. Therefore, in this paper, from the perspective of different sources of the board of directors' overconfidence, only the influence of these two kinds of overconfidence on the risk of stock price crash is discussed. Compared with the overoptimistic type, the better-than-average type of overconfidence has a stronger impact on the risk of stock price crash, because it is more stable and has a higher degree of confidence than the overoptimistic type; in terms of results, better-than-average overconfidence produces more deviations than overoptimistic overconfidence. Accordingly, H1 of this paper is put forward:

H1: The source of board overconfidence affects the risk of a share price crash.

H1a: "Better than average" board overconfidence positively affects stock price crash risk.

H1b: "Overoptimistic" board overconfidence positively affects the risk of stock price crash.

H1c: Compared with the "overoptimistic" board overconfidence, the "better-than-average" board overconfidence has a greater positive impact on the risk of stock price crash.

2.2. The influence of the board overconfidence on the risk of stock price crash in different degrees

Better-than-average and overoptimistic are divided horizontally from overconfidence, reflecting the different sources of overconfidence, while vertically, overconfidence can be divided into strong and weak overconfidence according to the degree. However, board overconfidence from "better-than-average" has a greater impact on share price crash risk than that from "overoptimistic", because they are more committed to personal beliefs and are more likely to put in more effort. Accordingly, H2 in this paper is proposed as follows:

H2: The degree of overconfidence of board affects the risk of stock price crash.

H2a: The strong overconfidence of "better-than-average" boards positively affects the risk of stock price crash.

H2b: The weak overconfidence of "better-than-average" board positively affects the risk of stock price crash.

H2c: The strong overconfidence of the "overoptimistic" board positively affects the risk of stock price crash.

H2d: The weak overconfidence of the "overoptimistic" board positively affects the risk of stock price crash.

H2e: Compared with the strong overconfidence of the "overoptimistic" board, the strong overconfidence of the "better-than-average" board has a greater impact on the risk of stock price crash.

2.3. Effects of board overconfidence on stock price crash risk

In this paper, overconfidence is divided into better than average and overoptimism from the source, and strong overconfidence and weak overconfidence from the degree. Therefore, the sources and degrees of overconfidence are combined in this paper to form different types of overconfidence: "strong better than and strong overoptimistic", "strong better than and weak overoptimistic", "weak better than and strong overoptimistic", "weak better than and weak overoptimistic", which will be used to further explore the impact of different types of boardroom overconfidence on the risk of a share price crash.

As mentioned above, due to factors such as self-realization, the impact of board overconfidence from ' better than average ' on future performance of enterprises is stronger than that from ' overoptimistic '. Therefore, compared with the "weak better than and strong overoptimistic" board overconfidence, the "strong better than and weak overoptimistic" board overconfidence has a greater impact on corporate performance. Accordingly, H3 in this paper is proposed as follows:

H3: The type of overconfidence of the board affects the risk of a stock price crash.

H3a: The "strong better than and strong overoptimistic" board overconfidence positively affects the risk of stock price crash.

H3b: The strong better than and weak overoptimistic" board overconfidence positively affects the risk of stock price crash.

H3c: The weak better than and strong overoptimistic" board overconfidence positively affects the risk of stock price crash.

H3d: The weak better than and weak overoptimistic" board overconfidence positively affects the risk of stock price crash.

H3e: Compared with the "weak better than and strong overoptimistic" board overconfidence, the "strong better than and weak overoptimistic" board overconfidence has a greater positively impact on the risk of stock price crash.

2.4. The regulatory role of the corporate supervisory mechanism

The supervision mechanism is the institutional design for the company owners to effectively review and control the business decision-making behaviors and results of the operators. From the relationship between proxy and agent, the director is only the trustee of shareholders. Within the board, some directors are shareholders themselves, while others are not, and the latter may have insufficient incentive to supervise. In addition, some directors are members of both the board and the management team, so they may conspire with the managers to harm shareholders' interests. Therefore, in order to reinforce the independence of the board and protect the interests of shareholders, more and more companies begin to establish independent directors in the board of directors. The board of supervisors is a full-time supervision organization within the company, responsible to the general meeting of shareholders. The board of supervisors takes the board of directors and the general manager as the objects of its supervision. Once it finds that they have violated the articles of association of the company or done other acts that harm the interests of the company, it may request the board of directors and the general manager to correct them at any time. Therefore, the supervision mechanism can inhibit the stock price crash risk caused by the overconfidence of the board of directors to a certain extent. Accordingly, H4 of this paper is proposed as follows:

H4: Corporate supervision mechanism has an inhibitory effect on the relationship between board overconfidence and stock price crash risk.

H4a: The supervision mechanism has an inhibitory effect on the relationship between "strong better than and strong overoptimistic" board overconfidence and stock price crash risk.

H4b: The supervision mechanism has an inhibitory effect on the relationship between "strong sbetter than and weak overoptimistic" board overconfidence and stock price crash risk.

H4c: The supervision mechanism has an inhibitory effect on the relationship between "weak better than and strong overoptimistic" board overconfidence and stock price crash risk.

H4d: The supervision mechanism has an inhibitory effect on the relationship between "weak better than and weak overoptimistic" board overconfidence and stock price crash risk.

3. Research methods

3.1 Data collection

In this paper, from the perspective of behavioral finance managerial overconfidence theory, normative research methods and empirical research methods are comprehensively used to theoretically and empirically test the causes of stock price crash risk. In this paper, A-share listed companies in Shenzhen and Shanghai from 2010 to 2022 are selected as the research samples. If the way stock ownership measures overconfidence is used, it needs to be compared with the number of shareholdings in the previous year, so the sample collection began in 2009, and the samples of banks, securities companies, insurance companies and other financial regulated companies, the samples of companies with missing financial data between 2010 and 2022, and the companies with ST and *ST are excluded. After screening by the above method, a total of 20,739 samples were obtained, including 3,113 listed companies.

All data in this paper are from Wind except the rate of return from CSMR, and the data analysis is processed by Stata15.0 software. To eliminate the effect of extreme values, all continuous variables at the level of 1 % were winsorized.

3.2. Variable measure

The explained variable in this paper is the stock price crash risk, measured by the skewness coefficient of negative return; the explanatory variable is the board overconfidence, measured from different sources, different degrees and different types of overconfidence; The moderating variable is the supervision mechanism of the company fro principal component analysis, and the first major principal component is adopted to measure; Control variables are selected as company size, monthly average excess turnover rate, book-to-market ratio, return on assets, asset-liability ratio, corporate information transparency, annual effect, and industry effect. See Table 1 for details.

Table 1. Variable Definition Table.

Variable Type	Variable Symbol	Variable Names and Measures
Explained Variable	Ncskew	The negative return skewness coefficient of stocks
Explanatory Variable	BTA	"Better than average" overconfidence. A voluntary increase in shares of the company held by a member of the board of directors. After excluding the influence of performance stocks and dividend stocks, if the board's shareholding at the end of the year increases compared with that at the end of the previous year, the value is 1, otherwise, 0
	OBA	"Overoptimistic" overconfidence. It is the ratio between the sum of the top three salaries of the board of directors and the sum of the top three salaries of the executives. If the ratio is greater than the industry median, it is 1; otherwise, 0
	BTAs	Strong "better than average" overconfidence. When the stock of the company held by the board of directors increases voluntarily in the sample year, and the annual return is lower than the market return in the same period, this variable is set to 1; when it is higher than the market earnings of the same period, it is null; when there is no increase in voluntary shareholding in the year, the value is 0
	BTAw	Weak "better than average" overconfidence. If the stock of the company held by the board of directors increases voluntarily in the sample year, and the annual return is higher than the market return in the same period, this variable is set to 1; if it is lower than the market earnings of the same period, it is null; if there is no increase in voluntary shareholding in the year, the value is 0
	OBAs	Strong "overoptimistic" overconfidence. When the ratio of the sum of the top three salaries in the board of directors to the sum of the top three executives is greater than or equal to 3/4 of the industry quantile, the variable is set to 1; When the ratio is less than 3/4 of the industry quantile and greater than or equal to the industry median, the variable is null; when it is less than the industry median, 0
	OBAw	Weak "overoptimistic" overconfidence. When the ratio of the sum of the top three salaries in the board of directors to the sum of the top three executives is less than 3/4 of the industry and greater than or equal to the industry median, this variable is set to 1; when the ratio is greater than 3/4 of the industry quantile, the variable is null; when it is less than the industry median, it is 0
	BsOs	"Strong better than, strong overoptimistic" overconfidence. When both the strong "better than average" overconfidence and the strong "overoptimistic" overconfidence are 1, the variable is set to 1; when both strong "better than average" overconfidence and strong "overoptimistic" overconfidence are 0, the variable is 0; other cases are null
	BsOw	"Strong better than, weak overoptimistic" overconfidence. When both the strong "better than average" overconfidence and the weak "overoptimistic" overconfidence are 1, the variable is set to 1; when both strong "better than average" overconfidence and weak "overoptimistic" overconfidence are 0, the variable is 0; other cases are null
	BwOs	"Weak better than, strong overoptimistic" overconfidence. When both the weak "better than average" overconfidence and the strong "overoptimistic" overconfidence are 1, the variable is set to 1; when both weak "better than average" overconfidence and strong "overoptimistic" overconfidence are 0, the variable is 0; other cases are null

Variable Type	Variable Symbol	Variable Names and Measures
	BwOw	"Weak better than, weak overoptimistic" overconfidence. When both the weak "better than average" overconfidence and the weak "overoptimistic" overconfidence are 1, the variable is set to 1; when both weak "better than average" overconfidence and weak "overoptimistic" overconfidence are 0, the variable is 0; other cases are null
Regulated Variable	Sup	Supervision mechanism. It carries out principal component analysis on nine variables, namely the shareholding ratio of the largest shareholder, the shareholding ratio of the second to the fifth largest shareholder, the shareholding ratio of independent directors, the shareholding ratio of institutional investors, whether the chairman and the general manager hold concurrent positions, the size of the board of directors, the size of the board of supervisors, the number of board meetings and the number of meetings of the board of supervisors. And the first major principal component is used to measure
Control Variable	Size	The size of the firm, the natural logarithm of the total assets at the end of the period
	Turn	The excess monthly turnover rate, the difference value between the average monthly turnover rate of the current year and the average monthly turnover rate of the previous year
	BM	Book to market ratio, total assets at the end of the year divided by total market value at the end of the year
	Roa	Return on assets, net profit divided by the average balance of total assets
	Lev	Liability to asset ratio, total liabilities at the end of the year divided by total assets
	Da	Transparency of company information. Manipulable accruals are used as a proxy variable for the opacity of corporate financial information
	Year	Annual effect. The year in which the sample is located. If it belongs to the year, the value is 1; otherwise, it is 0
	Ind	Industry effect. The industry in which an enterprise is located. If it belongs to the industry, the value is 1; otherwise, it is 0

3.3. Model design

In order to investigate the influence of the overconfidence of the board on the risk of stock price crash, the following model is constructed in this paper to test H1-H3:

$$\text{Crash}=\beta_0+\beta_1 OC+\beta_2 Control+\varepsilon \tag{1}$$

Where, the explained variable Crash represents the risk of stock price crash, measured by NCSKEW. The explanatory variable OC is the proxy variable of the board overconfidence, representing different sources, degrees and types of overconfidence, namely, BAT, OBA, BATs, BATw, OBAs, OBAw, BsOs, BsOw, BwOs and BwOw. Control represents the control variable set, namely company size (Size), monthly average excess turnover rate (Turn), book-to-market ratio (BM), return on assets (Roa), asset-liability ratio (Lev), company information transparency (Da), annual effect (Year) and industry (Ind). **β_0 is intercept term, and ε is random error term.**

In order to investigate the moderating effect of the corporate supervision mechanism between the board overconfidence and the risk of stock price crash, the following model is constructed in this paper to test H4.

$$\text{Crash}=\beta_0+\beta_1 OC+\beta_2 OC*Sup+\beta_3 Sup+\beta_4 Control+\varepsilon \tag{2}$$

Where, the explained variable Crash represents the risk of stock price crash, measured by NCSKEW. The explanatory variable OC is the proxy variable of the board overconfidence, representing different types of overconfidence, namely, strong better than and strong overoptimistic (BsOs), strong better than and weak overoptimistic (BsOw), weak better than and strong overoptimistic (BwOs) and weak better than and weak overoptimistic (BwOw). OC* SUP is the interaction term between different types of board overconfidence and

the risk of stock price crash. SUP stands for corporate supervision mechanism. Control represents the control variable set, namely company size (Size), monthly average excess turnover rate (Turn), book-to-market ratio (BM), return on assets (Roa), asset-liability ratio (Lev), company information transparency (Da), annual effect (Year) and industry (Ind). **β0 is intercept term, and Ɛ is random error term.**

4. Empirical analysis

4.1. Descriptive statistics

Descriptive statistics are shown in Table 2. It can be seen from Table 2 that the average value of NCSKEW is -0.254, the standard deviation is 0.720, the maximum value is 5.053, and the minimum value is -5.125. These data indicate that the risk of a share-price crash varies widely between different companies. It can be seen from the relevant data of board overconfidence variables that the average value of BAT is 0.305, indicating that nearly a third of the board has the psychological characteristics of "better-than-average" overconfidence; The average value of BATS is 0.158, indicating that more than half of the "better-than-average" overconfident board members are strong overconfident; The average value of OBA is 0.475, indicating that 47.5% of the board have the psychological characteristic of "overoptimistic" overconfidence; The average values of BSOS, BSOW, BWOS and BWOW are 0.0975, 0.0898, 0.0876 and 0.0860 respectively, indicating that 8-10% of the board have the psychological characteristics of "better than average" and "overoptimistic" overconfidence.

Table 2. Descriptive Statistical Table of Major Variables.

Variables	Obs	Mean	Std.Dev.	Min	Max
Ncskew	20,739	-0.254	0.721	-5.125	5.053
BAT	20,739	0.305	0.461	0	1
BATs	20,739	0.158	0.364	0	1
BATw	20,739	0.148	0.355	0	1
OBA	20,739	0.475	0.499	0	1
OBAs	15,590	0.343	0.475	0	1
OBAw	15,544	0.342	0.474	0	1
BsOs	9,692	0.0975	0.297	0	1
BsOw	9,610	0.0898	0.286	0	1
BwOs	9,688	0.0876	0.283	0	1
BwOw	9,671	0.0860	0.280	0	1
DA	20,739	0.0067	0.105	-2.545	2.895
size	20,739	22.25	1.326	15.42	28.64
turn	20,739	620.0	501.7	2.947	5110
PB	20,739	0.399	0.267	-1.347	2.326
ROE	20,739	0.0680	0.719	-54.81	73.37
LEV	20,739	0.456	0.447	0.0071	55.41

4.2. Correlation analysis

The Pearson correlation analysis results of major variables are shown in Table 3. The correlation coefficients of BATS, BSOS and BSOW are 0.0770, 0.0795 and 0.0632 respectively, indicating that the overconfidence of "strong better than", "strong better than and strong overoptimistic" and "strong better than

and weak overoptimistic" has a high correlation with the risk of stock price crash of the company in the future. Besides, most of the correlation coefficients among other variables are less than 0.05, so there will be no serious multicollinearity problem in the analysis of multiple regression below.

4.3. Hypothesis testing

4.3.1. Main hypothesis effect test

The test results of the main hypothesis effect are shown in Table 4. All the dependent variables in the regression model are stock price crash risk, measured by negative return skewness coefficient Ncskew. Models (1) to (2) test the influence of different sources of overconfidence on stock price crash risk; models (3) to (6) test the influence of different degrees of overconfidence on stock price crash risk; and models (7) to (10) test the influence of different types of overconfidence on stock price crash risk.

The regression results of models (1) to (2) show that the coefficients of "better-than-average" overconfidence and "overoptimistic" overconfidence are both significantly positive, indicating that the board overconfidence from the two sources will aggravate the occurrence of the risk of stock price crash. By comparison, the coefficient of ' better than average ' overconfidence is 0.0652 and significant at 1 % level, and the coefficient of ' overoptimistic ' overconfidence is 0.0167 and significant at 5 % level, indicating that the "better-than-average" board overconfidence has a greater positive impact on the risk of stock price crash than the "overoptimistic" board overconfidence, which is consistent with the research conclusions of existing scholars. Thus, Hypotheses H1a, H1b and H1c are confirmed.

The regression results of models (3) to (6) show that the coefficient of "better-than-average" strong overconfidence is positive and significant at the 1% level, indicating that "better-than-average" strong overconfidence significantly aggravates the occurrence of stock price crash risk, which makes H2a confirmed. The "better than average" weak overconfidence coefficient is positive and significant at the 10% level, which makes H2b confirmed. The coefficient of "overoptimistic" strong overconfidence is positive and significant at the 1% level, which makes H2c confirmed. While the coefficient of "overoptimistic" weak overconfidence is positive but not significant, which makes H2d partially confirmed. H2e is confirmed by the fact that "better-than-average" board overconfidence has a greater impact on stock price crash risk than "overoptimistic" board overconfidence.

The regression results of models (7) to (10) show that the coefficient of "strong better than and strong overoptimistic" overconfidence is 0.1749 and significant at the level of 1%, which makes H3a verified; the coefficient of "strong better than and weak optimism" overconfidence is 0.1336 and significant at the level of 1%, which makes H3b verified; the coefficient of "weak better than and strong overoptimistic" overconfidence is 0.0860, and significant at the 10% level, so H3c is verified; The overconfidence coefficient of "weak better than and weak overoptimistic" is -0.0039, with the negative coefficient, so H3d has not been verified. Compared with the "weak better than and strong overoptimistic" board overconfidence, the "strong better than and weak overoptimistic" board overconfidence has a greater positive impact on the risk of stock price crash, so H3e has been verified.

Table 3. Variable Correlation Analysis.

Variables	Ncskew	BAT	BATs	BATw	OBA	OBAs	OBAw	BsOs	BsOw	BwOs	BwOw	DA	size	turn	PB	ROE	LEV
Ncskew	1																
BAT	0.0538***	1															
BATs	0.0770***	0.6528***	1														
BATw	0.00930*	0.6276***	-0.1800***	1													
OBA	0.00760***	0.0434***	0.0371***	0.0183***	1												
OBAs	0.0232***	0.0552***	0.0407***	0.0300***	0.9990***	1											
OBAw	0.0102	0.0390***	0.0227***	0.0275***	0.9084***	1.0000*	1										
BsOs	0.0795***	0.5825***	1.0000***	-0.1348***	0.9994***	1.0000*	1.0000*	1									
BsOw	0.0632***	0.5666***	1.0000***	-0.1295***	0.9423***	0.6578***	0.6824*	1.0000*	1								
BwOs	0.0010*	0.5497***	-0.1320***	1.0000***	0.9987***	0.6821***	0.6481***	0.6751**	0.5892	1							
BwOw	0.0012	0.5461***	-0.1308***	1.0000***	0.9020***	0.6814***	0.6825***	0.6528***	0.0589	1.0000***	1						
DA	0.0113	0.0681***	0.0358***	0.0516***	0.0134	0.0192	0.011	0.0406***	0.0296***	0.0507***	0.0511***	1					
size	-0.0916***	-0.0274***	-0.0057	-0.0297***	-0.0314***	-0.0405***	-0.0359***	-0.0174	-0.0364***	-0.0395***	-0.0529***	0.0552***	1				
turn	-0.0454***	0.0720***	-0.0408***	0.1354***	0.0350***	0.0299***	0.0479***	-0.0271***	0.0075	0.1389***	0.1362***	-0.0108	-0.3799***	1			
PB	-0.0288***	-0.0851***	0.0713***	-0.1838***	0.0331***	0.0268***	0.0091	0.0887***	0.0421***	-0.1366***	-0.1434***	-0.0327***	0.4583***	-0.3456***	1		
ROE	-0.0009	0.0219***	0.0021	0.0263***	0.0087	0.0093	0.0058	0.0035	0.0037	0.0167	0.0169	0.1014***	0.0327***	-0.0214***	-0.0277***	1	
LEV	-0.0218***	-0.0392***	-0.0374***	-0.0124	-0.0180***	-0.0211***	-0.0181	-0.0295***	-0.0312***	-0.0547***	-0.0561***	-0.0524***	0.1576***	-0.0513***	0.0149**	-0.0237***	1

Note: ** is a significance level of 1%, ** is a significance level of 5%, and * is a significance level of 10%Source: collated by the author

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Table 4. The Influence of Different Sources, Degrees and Types of Board Overconfidence on the Regression of Stock Price Crash Risk.

Variables	Ncskew									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
BAT	0.0652***									
	-0.0108									
OBA		0.0167**								
		-0.0098								
BATs			0.1289***							
			-0.0138							
BATw				0.0357*						
				-0.0145						
OBAs					0.0324***					
					-0.0119					
OBAw						0.0145				
						-0.0118				
BsOs							0.1749***			
							-0.0247			
BsOw								0.1336***		
								-0.0253		
BwOs									0.0860*	
									-0.0261	
BwOw										-0.0039
										-0.0262
Size	-0.0594***	-0.0580***	-0.0569***	-0.0576***	-0.0591***	-0.0581***	-0.0531***	-0.0558***	-0.0613***	-0.0621***
	-0.0048	-0.0048	-0.0048	-0.0048	-0.0055	-0.0053	-0.0067	-0.0066	-0.0072	-0.0072
Turn	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0001***	-0.0002***	-0.0002***	-0.0001***
	0	0	0	0	0	0	0	0	0	0
PB	0.0429*	0.0313	0.0195	0.027	0.0305	0.0141	-0.0052	-0.0056	0.0185	0.0215
	-0.0241	-0.0241	-0.0241	-0.0244	-0.0279	-0.0277	-0.0356	-0.0354	-0.0359	-0.0361
ROE	-0.0023	-0.0019	-0.0018	-0.0015	-0.0027	-0.0015	-0.003	-0.0027	-0.0022	-0.0019
	-0.0068	-0.0068	-0.0068	-0.0068	-0.0069	-0.0068	-0.007	-0.0069	-0.0069	-0.0069
LEV	0	-0.0011	-0.0002	-0.0016	-0.0047	0.0007	-0.0058	-0.0047	0.0175	0.0169
	-0.0113	-0.0113	-0.0113	-0.0113	-0.0117	-0.0115	-0.0121	-0.0119	-0.0342	-0.0342
DA	0.0566	0.0722	0.057	0.0771	0.0809	0.0667	0.0631	0.0649	0.0607	0.0865
	-0.0473	-0.0472	-0.0471	-0.0472	-0.0536	-0.0545	-0.0709	-0.0704	-0.0631	-0.0674
Year	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Ind	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Constant	1.1546***	1.1238***	1.1016***	1.1260***	1.1183***	1.1241***	0.9457***	1.0386***	1.1692***	1.2105***
	-0.1242	-0.1246	-0.124	-0.1245	-0.1441	-0.1399	-0.1783	-0.1764	-0.1812	-0.1811
Observations	20,739	20,739	20,739	20,739	15,590	15,544	9,692	9,610	9,688	9,671
R-squared	0.06	0.0585	0.0623	0.0585	0.0584	0.0625	0.0673	0.0678	0.0657	0.0676

Note: ** is a significance level of 1%, ** is a significance level of 5%, and * is a significance level of 10%

Source: collated by the author

4.3.2. Moderating effect test

When the board is affected by overconfidence from both sources, most of the overconfidence will affect the stock crash risk. So can a good supervision mechanism in the corporate governance mechanism reduce the risk of stock price crash caused by different kinds of board overconfidence? In this paper, the product term of different types of overconfidence and supervision mechanism is constructed by fitting a variety of supervision mechanisms, which indicates the regulating effect of inspection and supervision mechanism on the relationship between overconfidence and stock price crash risk.

The regression results in Table 5 show that the BsOs * Sup, BsOw * Sup, BwOs * Sup and BwOw * Sup coefficients are negative, indicating that the supervision mechanism has an inhibiting effect on the relationship between board overconfidence and stock price crash risk. But among them, only BsOs*Sup is significant at 5% level, which allows H4a to be fully verified, while the others are not significant, which leaves H4b, H4c, and H4d unconfirmed. In general, the supervision mechanism only has a significant inhibiting effect on the positive relationship between the "strong better than and strong overoptimistic" board overconfidence and the risk of stock price crash, but has no significant effect on the others, which may be because the degree of overconfidence is not strong enough to have a small impact on the risk of stock price collapse, so it is not easy to be detected and corrected by corporate governance.

Table 5. The Moderating Effect of Corporate Supervision Mechanism on the Overconfidence of Board and the Risk of Stock Price Collapse.

Variables	Ncskew			
BsOs	0.1535***			
	-0.0402			
BsOs_Sup	-0.0432**			
	-0.0523			
BsOw		0.1393***		
		-0.0404		
BsOw_Sup		-0.0078		
		-0.0431		
BwOs			0.0530*	
			-0.0378	
BwOs_Sup			-0.0161	
			-0.0437	
BwOw				0.0033
				-0.0388
BwOw_Sup				-0.0421
				-0.0404
Size	-0.0577***	-0.0588***	-0.0636***	-0.0627***
	-0.0092	-0.009	-0.0098	-0.0098
Turn	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	0	0	0	0
PB	-0.0448	-0.0371	-0.0447	-0.0406
	-0.0541	-0.0533	-0.0555	-0.0557
ROE	-0.0043	-0.0041	-0.0044	-0.0044
	-0.007	-0.0069	-0.007	-0.007
LEV	-0.0082	-0.0069	0.0156	0.0085
	-0.0117	-0.0114	-0.0442	-0.044
DA	0.115	0.1359	0.1011	0.0959
	-0.0922	-0.0907	-0.0794	-0.0835
Year	yes	yes	yes	yes
Ind	yes	yes	yes	yes
Constant	1.0967***	1.1430***	1.2648***	1.2997***
	-0.2349	-0.2296	-0.239	-0.2384
Observations	3,956	3,938	3,939	3,922
R-squared	0.0931	0.093	0.0881	0.0921

Note: ** is a significance level of 1%, ** is a significance level of 5%, and * is a significance level of 10%

Source: collated by the author

4.3.3. Robustness test

To enhance the robustness of the test results above, the robustness of the main test results is verified from three aspects: the measurement method of transforming stock price crash risk, excluding the years before the economic crisis, and controlling other demographic variables that may lead to board overconfidence. Beyond that, an endogeneity test has also been performed. To ensure the preciseness of the test results, the control variables of all the robust test parts remain consistent with those of the main test. The test results still have robustness.

5. Conclusion and prospect

In this paper, through the regression test on the data samples of A-share listed companies in Shenzhen and Shanghai stock markets from 2010 to 2022, the following results are obtained : (1) Different sources of board overconfidence have different impacts on stock price crash risk. In this paper, the difference between the "better-than-average" source of overconfidence and the "overoptimistic" source on stock price crash risk is empirically tested. The results show that the board of directors tends to overestimate individual abilities because of "better-than-average" overconfidence, and will make greater efforts to ensure the implementation of decisions in the decision-making process. Therefore, compared with the overconfidence from "overoptimistic" sources, the "better-than-average" overconfidence will have a more significant impact on the risk of stock price crash. (2) Different degrees of board overconfidence have different effects on stock price crash risk. The results show that when the degree of overconfidence of "overoptimistic" board of directors is low, its influence on the occurrence of stock price crash risk is not significant; while for the "better-than-average" board overconfidence, due to its ' decision-making commitment ' characteristics, even a low degree of psychological deviation will significantly aggravate the risk of stock price crash. (3) Different types of board overconfidence have different impacts on stock price crash risk. The results show that when the board of directors has two sources of overconfidence at the same time, as long as the degree of overconfidence of one source is strong, it will have a positive impact on the stock price crash risk. Moreover, when the board of directors has a high degree of psychological deviation in overconfidence from both sources, it has the greatest impact on the risk of stock price crash ; yet when the degree of overconfidence of the board of directors from both sources is low, the risk of stock price crash will be restrained rather than aggravated. (4) Corporate supervision mechanism can inhibit the relationship between board overconfidence and stock price crash risk, but the inhibition is limited. The inhibitory effect of supervision mechanism on ' strong better than and strong overoptimistic ' overconfidence is obvious and significant at 5 % level, but the governance effect on stock price crash risk caused by ' strong better than and weak overoptimistic ', ' weak better than and strong overoptimistic ', ' weak better than and weak overoptimistic ' overconfidence is not significant, which indicates that the role of corporate internal governance mechanism has yet to be explored in the Chinese context. The research in this paper not only enriches the research results on the causes of stock price crash risk, but also expands the research scope of different dimensions of board overconfidence and supplements the research results on corporate governance to a certain extent, which provides a reference for improving the institutional and regulatory reform of the capital market. Therefore, it has important theoretical and practical significance.

Future research can also start from the following four aspects: firstly, increase the research on the economic consequences of stock price crash risk. Secondly, improve the measurement of managerial overconfidence. Thirdly, further explore the regulatory role of internal and external corporate governance

mechanisms.Fourth, improve the verification mode of research hypotheses.

Funded Project

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