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The Impact of Board Structure Characteristics on Corporate Risk

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Abstract

Risk runs through all aspects of enterprise operation, therefore, risk management is particularly important for enterprises. As the core control mechanism of corporate governance, the structural characteristics of the board of directors directly affect its ability to supervise and manage enterprise risks, and different structural characteristics may have differentiated effects on risk management. This article takes non-financial listed companies on the A-share market in China from 2009 to 2017 as samples, uses monthly return volatility as a proxy variable for corporate risk, selects board size and board independence as two characteristics, constructs a multiple linear regression model, and empirically analyzes the impact of board structure characteristics on corporate risk. The research results show that board size has a certain positive impact on corporate risk, while board independence has no significant effect on corporate risk.

Keywords: Board Structure; Corporate Risk; Risk Management; Board Independence

1. Introduction

Risk is ubiquitous and runs through all aspects of business operations, therefore, risk management is particularly important for enterprises. Risk management was initially defined as a series of methods and strategies that help businesses achieve their primary goals by controlling and monitoring risks. Effective risk management is closely related and interdependent with corporate governance (Sobel and Reding, 2004), and can significantly enhance enterprise value. Research has shown that the integration of risk management and corporate governance is crucial for businesses to respond to crises. Aebi et al. (2012) found that during the global financial crisis, banks with a Chief Risk Officer who reports directly to the board of directors rather than the CEO performed better. This mechanism strengthened the synergy between risk management and corporate governance, thereby improving the risk environment for businesses. However, Elamer's (2018) study points out that many financial institutions have failed to fully integrate risk

management practices into corporate governance, leading to large-scale economic crises worldwide. Gupta et al. (2013) further pointed out that poor governance systems, such as inadequate board oversight of management and inefficient risk management practices, are key reasons why companies face significant risks. Therefore, the board of directors plays a crucial role in corporate governance and risk management.

As the core control mechanism of corporate governance, the board of directors is responsible to shareholders for the effectiveness of comprehensive risk management. Amran et al. (2010) pointed out that the responsibilities of the board of directors include carrying out supervisory tasks, eliminating agency costs, coordinating the interests of shareholders and management, appointing and dismissing management personnel, and supervising the behavior of the CEO. According to COSO (2004), the responsibilities of the board of directors in risk management include: clarifying the overall objectives, risk preferences, and risk tolerance of enterprise risk management, approving risk management strategies and major risk response plans. At the same time, the board of directors needs to have a comprehensive understanding of the major risks faced by the enterprise and their management status, and make effective risk control decisions. However, the structural characteristics of the board of directors directly affect its supervision and management capabilities, and different board structural characteristics may have different effects on risk management.

The corporate bankruptcies at the beginning of the 21st century and the global financial crisis in 2008 have driven improvements in international regulation and put forward clear requirements for board structure. For example, the Sarbanes Oxley Act in the United States stipulates that at least 50% of the board of directors of listed companies must be independent directors, and all members of the audit committee must be independent directors. The guidelines of the UK Financial Reporting Council require listed companies to establish comprehensive risk management frameworks and emphasize the active participation of the board of directors in risk management. The new rules established by the New York Stock Exchange in 2004 further strengthened the requirement for board independence. However, in China, there is still a lack of specialized normative documents for enterprise risk management (Dong, 2021). Therefore, it is necessary to test whether the governance practices of developed countries can also play a certain role in emerging countries. Based on this, this article uses panel data from Chinese A-share listed companies in Shanghai and Shenzhen from 2009 to 2017 to empirically analyze the impact of board structure characteristics on corporate risk.

2. Literature Review

At present, a large amount of literature has studied the characteristics of the board of directors, but most of them focus on their impact on corporate performance. For example, An (2021) empirically analyzed the relationship between board characteristics, heterogeneity, and corporate performance based on cross-sectional data of A-share listed companies. The results showed that the positive effect of board characteristics on corporate performance has not been fully utilized. Bansal et al. (2016) found that board size has a significant positive impact on firm performance.

However, Adams (2010) found that board size has a negative impact on organizational performance. The inconsistency of these research conclusions may be related to sample differences.

The academic consensus on the impact of board independence on corporate performance is inconsistent. Abidin et al. (2009) found a positive correlation between board independence and corporate financial performance, while Wu et al. (2009) pointed out a negative correlation between the two. To explain this inconsistency, Li and Yang (2020) combined board capital to examine the interaction effect between board independence and board capital. The research results showed that board independence indirectly improves business efficiency through the synergistic effect with board capital. This indicates that the independence of the board of directors can only effectively play a role under specific conditions.

The board of directors, as the core control mechanism of corporate governance, is responsible to shareholders for the effectiveness of comprehensive risk management. Therefore, studying the impact of the structural characteristics of the board of directors on its supervisory ability and risk management is of great significance. However, there is limited research on the relationship between board structure characteristics and corporate risk in existing domestic literature, and accounting indicators are often used as proxy variables for corporate risk. For example, Zheng (2015) used profit volatility as a proxy variable for corporate risk-taking and analyzed the impact of board characteristics of non-financial listed companies on risk-taking decisions; Lv and Yin (2017) used the Z-Score index as a proxy variable for bank risk-taking and studied the impact of board characteristics on risk-taking ability in 17 Chinese commercial banks.

However, accounting indicators are difficult to fully reflect market volatility. Based on this, this article uses the monthly return volatility of individual stocks as a proxy variable for corporate risk, selects two structural characteristics of board size and board independence, and empirically analyzes the relationship between board characteristics and corporate risk based on panel data of Chinese A-share listed companies in Shanghai and Shenzhen from 2009 to 2017.

3. Theoretical Background and Assumptions

According to agency theory, agents cannot always prioritize the best interests of the principal and may harm the interests of shareholders for their own benefit, resulting in conflicts of interest between shareholders and managers. Corporate governance, as a control mechanism for enterprises, has the core goal of reducing agency costs. In corporate governance, the board of directors plays a crucial role (Kose and Senbet, 1998). As the core control mechanism of governance, the board of directors is accountable to shareholders for the effectiveness of comprehensive risk management. Therefore, a good board structure can significantly enhance its risk management capabilities. Previous studies have shown that different elements of board structure play important roles in risk management, including board size and board independence.

3.1. Board Size

From a theoretical perspective, according to the resource-based theory, the board of directors should be composed of a wide and diverse range of members to enhance its unique abilities and effectively fulfill its supervisory responsibilities, thereby improving organizational performance. Kutum (2015) conducted an empirical study based on data from Palestinian listed companies, which showed a positive correlation between board size and company performance. Similarly, Bansal et al. (2016) and Liu et al. (2019) validated the positive relationship between board size and corporate performance through studies with different samples. However, according to agency theory, small-scale boards of directors are more efficient in executive supervision because of smooth communication among their members, higher coordination of activities, and less free riding. Larger boards of directors may have a negative impact on organizational performance due to increased complexity (Adams, 2010). The study by Wu et al. (2009) suggests that a large board size may lead to communication barriers and interaction issues, thereby reducing corporate performance. In addition, larger boards of directors have slower decision-making speeds and are more easily controlled by the CEO.

From the perspective of risk management, there is controversy over the effectiveness of risk management among boards of directors of different sizes. Some studies have shown that small-scale boards of directors are more effective in risk management, while others have found that small-scale boards are more likely to face greater risks. Aebi et al. (2012) argue that as the size of the board of directors increases, diversified knowledge helps ensure that corporate investments align with strategic goals and avoid financial crises by reducing adverse selection and moral hazard. Cheng's (2008) empirical study found that companies with larger board sizes have significantly lower volatility in accounting and market performance compared to companies with smaller board sizes. Pathan (2009) pointed out that an increase in board size is significantly correlated with a decrease in the volatility of financial institution returns. In contrast, Wang and Wang (2021) found a significant positive correlation between board size and corporate financial risk based on data from Chinese A-share listed companies from 2017 to 2019. Based on the above discussion, this article proposes the first competitive hypothesis.

Hypothesis 1a: The increase in board size has a positive impact on corporate risk.

Hypothesis 1b: The increase in board size has a negative impact on corporate risk.

3.2. Independence of the Board of Directors

From a theoretical perspective, agency theory advocates strengthening corporate governance mechanisms by appointing independent directors (i.e. external directors). External directors usually have the motivation to maintain the reputation of "expert supervisors" and are therefore more inclined to take effective regulatory measures to reduce agency costs between managers and shareholders. Dionne and Triki (2005) pointed out that the higher the proportion of independent directors, the better the board can maintain a high level of control and objectivity in decision-making. Abidin et al. (2009) further pointed out that the diversity of backgrounds, characteristics, experiences, and professional knowledge brought about by a high proportion of independent

directors can help optimize the supervisory process and decision-making efficiency of the board of directors, thereby improving company performance.

However, the stewardship theory suggests that due to the lack of in-depth understanding of internal information by independent directors, their excessive supervision may lead to unnecessary monitoring, thereby hindering management from making decisions based on corporate goals and ultimately reducing the value of the enterprise. Wu et al. (2009) found that independent directors have a lower ability to control organizational governance mechanisms compared to internal directors. Bhagat and Black (1999) further pointed out that too many independent directors may weaken the regulatory function of the board of directors, and suggested that an ideal board of directors should consist of independent directors, internal directors, and affiliated directors to ensure that the board has diverse skills and knowledge.

From the perspective of risk management, independent directors tend to objectively evaluate management activities and effectively mitigate unnecessary risks. However, Borokhovich et al. (2004) found that with the addition of external directors, firms' tendency to use interest rate derivatives increases, which in turn increases firm risk. Pathan's (2009) study also suggests that companies with more independent directors are more inclined to engage in high-risk activities and are therefore more likely to face credit risk or bankruptcy threats. In addition, Ng et al. (2012) studied the relationship between board characteristics and corporate risk-taking based on data from insurance institutions listed on the Malaysian Stock Exchange. The results showed a significant negative correlation between board independence and corporate performance. These research findings suggest that independent directors may not effectively enhance a company's risk management and monitoring capabilities. Based on the above discussion, this article proposes the second competitive hypothesis.

Hypothesis 2a: Board independence has a positive impact on corporate risk.

Hypothesis 2b: The independence of the board of directors has a negative impact on corporate risk.

4. Research Design

4.1. Sample Selection and Data Sources

This article takes non-financial enterprises listed on the Shanghai and Shenzhen A-shares as the research sample, and the research period is from 2009 to 2017. Choosing 2009 as the starting point is mainly based on the following two considerations: firstly, after the global economic crisis in 2008, enterprises in various countries have significantly increased their attention to risk regulation; The second is that the "Basic Norms for Enterprise Internal Control" (2008), as a guiding document, for the first time clarified the concept of risk oriented internal control, which can reflect its implementation effect since 2009. Due to the particularity of the financial industry, this study excluded samples from the financial industry. Meanwhile, due to the close connection between the real estate industry and the financial industry, it is also excluded. In addition, samples

with missing values in the data are also excluded. After screening, 5488 sample observations were ultimately retained, all data from the RESSET database.

4.2. Main Variables and Models

The dependent variable of this article is enterprise risk (Frisk), measured through market-based risk assessment. Market based risk measurement is calculated using the standard deviation of monthly stock returns. When calculating the standard deviation of monthly stock returns, it is required to have at least 6 months of data per year, and samples lacking data will be excluded. The main independent variables of this article are board size (Bsize) and board independence (Bind). The size of the board of directors is measured by the number of board members, while the independence of the board is measured by the proportion of independent directors.

Following the approach of Naz (2017), this article selects company size (Fsize), company leverage, and company return on investment (ROA) as control variables, and controls for annual fixed effects and individual fixed effects. Choosing to control company size is because market returns and stock price fluctuations are highly sensitive to changes in company size. At the same time, large companies face more risks and have more resources to support risk management. The size of a company is measured by the logarithm of its total assets. The leverage ratio of a company has a significant impact on the cost of capital and capital budget decisions, therefore the asset liability ratio is used as a measure of leverage ratio. The return on investment is used as a control variable to isolate the impact of governance factors on corporate risk-taking. The specific descriptions of each variable are shown in Table 1.

Table 1. Variable Description

Variable Name	Variable code	Variable definition
Enterprise risk	Frisk	Measure by market risk and calculate the monthly stock standard deviation
Board size	Bsize	Number of Board Members
Independence of the Board of Directors	Bind	Number of independent directors/number of board members
Enterprise scale	Fsize	Natural logarithm of total assets of the enterprise
Enterprise leverage ratio	Leverage	Total liabilities/total assets of the enterprise
Enterprise investment return rate	ROA	Net profit/total assets
particular year	YEAR	Year dummy variable

This article conducted four main analyses: descriptive statistics to present the nature and distribution of data, correlation analysis to present preliminary evidence of the relationship between variables, fixed effects ordinary least squares regression to show the impact of board size and board independence on corporate risk, and analysis of variance to further analyze the influence of independent variables on the dependent variable. The ordinary least squares regression model is as follows:

$$Friskit=\beta_0+\beta_1 Bsizeit+\beta_2 Bindit+\beta_3 Fsizeit+\beta_4 Leverageit+\beta_5 ROAit+\varepsilon it \quad (1)$$

5. Empirical Results Analysis

5.1. Descriptive Statistics

Table 2 presents the descriptive statistical analysis results of the samples. From the table, it can be seen that the average return on assets (ROA) is 68%, significantly higher than the 4.78% reported by Malik et al. (2018). This indicates that the sample companies had a relatively good overall profitability level after the financial crisis. However, judging from the maximum value (73.25%) and minimum value (-71.23%) of ROA, there is a significant difference in performance among the sample companies. From a risk perspective, the average individual stock return volatility (Frisk) is 0.123, which is close to the 0.133 reported by Sayari (2017), but the difference is not significant. The maximum value of individual stock return volatility is 0.21 and the minimum value is 0.09, indicating that the overall risk of the sample enterprises is low, and the impact of the 2008 financial crisis on non-financial institutions is relatively small.

Regarding the size of the board of directors, the average of the sample companies is 13.37, significantly higher than the 8.8 reported by Sayari (2017), indicating that despite the lack of regulatory documents in China, listed companies still attach great importance to corporate governance. However, the maximum (41) and minimum (3) values of board size indicate that there are still significant differences in corporate governance among the sample companies. The average independence of the board of directors (Bind) is 0.34, significantly lower than the 0.769 reported by Sayari (2017), reflecting that there is still a significant gap between China's corporate governance practices and those of developed countries. The average leverage ratio is 52.33%, with a maximum of 329% and a minimum of 16.96%, indicating significant differences in debt levels among the sample companies. The average company size (Fsize) is 22.07, with a maximum value of 27.31 and a minimum value of 9.33, indicating significant differences in size among the sample companies.

The Pearson correlation coefficients between variables are shown in Table 3. From the table, it can be seen that the size of the board of directors (Bsize) is positively correlated with the volatility of individual stock returns (Frisk) at a significance level of 1%, while the correlation coefficient between board independence (Bind) and the volatility of individual stock returns (Frisk) is -0.0067, but not significant, indicating that board size has a positive impact on company risk to some extent, while board independence has no significant impact on company risk. The size of the board of directors (Bsize) is negatively correlated with the independence of the board of directors (Bind) at a significance level of 1%, indicating that sample companies do not rely on

the size of the board of directors in appointing independent directors. There is a significant negative correlation between enterprise size (Fsize) and individual stock return volatility (Frisk) at the 1% level, indicating that compared to small enterprises, large enterprises face more complex operating environments and therefore bear greater risks.

In addition, the correlation coefficients between the variables are all less than 0.6, and the average variance inflation factor (VIF) is 1.25, which is lower than 3, indicating that there is no multicollinearity among the variables and multiple linear regression analysis can be performed.

Table 2. Descriptive Statistical Analysis

Variable	Sample Size	Mean Value	Standard Deviation	Minimum Value	Maximum Value
Bsize	5488	13.37	4.26	3	41
Bind	5488	0.34	0.096	0.06	0.8
ROA	5488	68	8.3	-71.23	73.25
Leverage	5488	52.33	25.60	16.96	329.00
Fsize	5488	22.07	1.52	9.33	27.31
Frisk	5488	0.123	0.037	0.09	0.21

Table 3. Correlation Coefficient Table

Variable Name	Bsize	Bind	ROA	Leverage	Fsize	Frisk
Bsize	1.0000					
Bind	-0.289***	1.0000				
ROA	-0.0167	0.0110	1.0000			
Leverage	0.0163	-0.0445**	-0.5730	1.0000		
Fsize	0.1122***	-0.0067	-0.1085***	-0.1165***	1.0000	
Frisk	0.0446***	-0.0032	-0.0072	0.0160	0.1620***	1.0000

Note: * * * indicates that the value is significant at the 5% level

5.2. Multiple Linear Regression Analysis

Table 4 shows the results of the least squares regression with individual time fixed effects. From the table, it can be seen that the estimated coefficient of board size (Bsize) is 0.075, which

is significant at the 1% significance level, indicating that an increase in board size will increase the risk of the enterprise. This result supports hypothesis 1a. However, this result is inconsistent with Cheng's (2008) conclusion that companies with larger board sizes are based on lower market volatility. An excessively large board size may lead to increased complexity, communication barriers, and free riding issues, thereby slowing down decision-making speed and increasing corporate risk.

Regarding the independence of the board of directors (Bind), the estimated coefficient is -0.002, indicating that independent directors help to mitigate unnecessary risks. However, this coefficient is not significant, indicating that hypothesis 2 is not supported. This result is inconsistent with Borokhovich's (2004) and Pathan's (2009) conclusion that independent directors are more inclined to drive higher risk activities, but consistent with Wang Jinrong and Wang Ning's (2021). This may indicate that the appointment of independent directors by sample companies is more formal, and independent directors have not played their due role in risk regulation, or their participation is insufficient. This reflects that there is still a certain gap in risk management and regulation in China compared to developed countries.

Regarding the control variable, the estimated coefficient of return on assets (ROA) is -0.011, which is significant at the 10% level, indicating that low-risk enterprises typically have higher profit returns, consistent with Sayari's(2017) research results. The estimated coefficient of leverage ratio is 0.015, which is significant at the 5% level, indicating that high leverage enterprises face greater risks, consistent with the research results of Malik et al.(2018). The estimated coefficient of company size (Fsize) is 0.021, significant at the 1% level, indicating that large enterprises face greater risks compared to small businesses, which is consistent with the research results of Elamer(2018). Large scale enterprises typically have larger business volumes and face more complex operational environments.

Table 4. Results of Multiple Regression Analysis

	Frisk			
	coefficient	Standard error	T-value	P-value
Bsize	0.075***	0.028	2.69	0.007
Bind	-0.002	0.0118	-0.16	0.873
ROA	-0.011*	0.0068	-1.85	0.064
Leverage	0.015**	0.008	1.98	0.048
Fsize	0.021***	0.001	15.72	0.000
_cons	-0.351***	0.029	-11.89	0.000
individual	YES			

Year	YES
Observation value	5488
WithinR^2	0.1206

Note: *, * *, * * * respectively indicate significant values at the 10%, 5%, and 1% levels.

5.3. Further Analysis

In order to further explore the impact of board size and board independence on company risk, this article conducted a variance analysis on these two independent variables. Firstly, based on the size of the board of directors, the sample companies were divided into two groups: the group with a board size greater than the average (Big) and the group with a board size smaller than the average (Small). The results are shown in Table 5. Secondly, based on the independence of the board of directors, the sample companies were divided into two groups: the group with board independence greater than the average (High) and the group with board independence less than the average (Low). The results are shown in Table 5.

From Table 5, it can be seen that the average risk level of companies with larger board sizes is 0.126, while the average risk level of companies with smaller board sizes is 0.122. There is a significant difference between the two at the 5% level, indicating that larger board sizes increase the risk of companies, which is consistent with the results of the multiple regression analysis mentioned earlier. On the other hand, the average risk level of companies with high board independence is 0.1234, while the average risk level of companies with low board independence is 0.1232. There is no significant difference between the two, indicating that board independence has no significant impact on corporate risk, which is consistent with the results of the aforementioned multiple regression analysis.

Table 5. Results of Analysis of Variance

Bsize				Bind			
average value		Mean difference	P-value	average value		Mean difference	P-value
Big	Small			High	Low		
0 .12585963	0.1221277	0 .002732*** （7.21）	0.0073	0.12338155	0.12317105	0.000211 （ 0.04 ）	0.8347

Note: The number in parentheses is the F-value, and * * * indicates that the value is significant at the 5% level.

6. Conclusion

This article uses the monthly return volatility of individual stocks as a proxy variable for corporate risk. Based on data from non-financial listed companies in China's A-share market from 2009 to 2017, board size and board independence are selected as two board characteristics. The impact of board structure characteristics on corporate risk is empirically tested through a multiple linear regression model. The results of univariate analysis showed that the average size of the board of directors of the sample companies was 13.37, significantly higher than the 8.8 reported by Sayari (2017), indicating that Chinese listed companies attach more importance to corporate governance, but there are still significant differences in governance structure among companies. The results of multiple regression analysis indicate that the size of the board of directors has a significant positive impact on corporate risk, suggesting that an excessively large board size may lead to increased complexity, communication barriers, and free riding issues, thereby reducing decision-making efficiency and increasing corporate risk.

Regarding the independence of the board of directors, univariate analysis shows that the mean independence of the board of directors in the sample companies is 0.34, significantly lower than the 0.769 reported by Sayari (2017), reflecting the gap between China's corporate governance practices and those of developed countries. The multiple regression results indicate that board independence has no significant impact on corporate risk, which is inconsistent with the conclusions of Borokhovich (2004) and Pathan (2009), but consistent with the research of Wang Jinrong and Wang Ning (2021). The possible reason is that the appointment of independent directors by sample companies is more of a formality, and independent directors have not effectively played their role in risk regulation or have not fully participated in the risk regulation process.

Further grouping tests showed that companies with larger board sizes had significantly higher risks than those with smaller board sizes, while the risk difference between companies with higher and lower board independence was not significant. This conclusion further supports the results of multiple regression analysis.

This article has the following limitations: firstly, it only selects board size and board independence as characteristics of board structure, without considering other board characteristics; Secondly, when using individual stock return volatility as a proxy variable for corporate risk, market system risk is overlooked; Finally, this article only considers market-based risks and does not address risks based on accounting indicators.

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Conceptualization, J.G and W.H.; methodology, J.G and W.H.; software, J.G and W.H.; validation, J.G and W.H.; formal analysis, J.G and W.H.; investigation, J.G and W.H.; resources, J.G and W.H.; data curation, J.G and W.H.; writing—original draft preparation, J.G and W.H.; writing—review and editing, J.G and W.H.; visualization, J.G and W.H.; supervision, J.G and W.H.; project administration, J.G and W.H.; funding acquisition, J.G and W.H. All authors have read and agreed to the published version of the manuscript.

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