



A Study of Financial Risks of Pharmaceutical Industry Enterprises from the Perspective of Corporate Governance

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Abstract. A good corporate governance structure can effectively control and prevent the financial risk of pharmaceutical industry companies. This study calls on the CSMAR database and selects the comprehensive data on corporate governance and financial risk of Chinese A-share listed companies in the pharmaceutical industry from 2019-2022 to explore the relationship between corporate governance and financial risk in the pharmaceutical industry. The results of the study show that there is a significant negative correlation between the equity structure of pharmaceutical companies and financial risk, indicating that the higher the equity concentration, the lower the financial risk. The study found a negative relationship between executive characteristics and financial risk. In addition, the study analysed the moderating effect of the nature of ownership on the relationship between corporate governance and financial risk. Therefore, this study suggests that pharmaceutical companies should clarify shareholders' responsibilities and rights, improve the dual-track system of management and supervision, and strictly comply with industry norms and laws and regulations. This study provides a reference for reducing the financial risk of enterprises in the pharmaceutical industry.

Keywords: Financial Risks, Pharmaceutical Industry Enterprises, Corporate Governance

1 Introduction

The "14th Five-Year Plan" of the pharmaceutical industry points out that the pharmaceutical industry is not only a strategic pillar industry of the country, but also the cornerstone of building a healthy China[1]. However, with the rapid development of pharmaceutical industry enterprises, financial risk has become an increasingly prominent reality in enterprise management, such as fierce competition in the pharmaceutical industry, the enterprise profit space is squeezed; pharmaceutical industry chain upstream and downstream financial transactions are complex, resulting in commercial bribery, industry monopoly and financial fraud and other problems breeding[2-4]. This has greatly increased the current financial risk of pharmaceutical industry enterprises,

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which seriously impedes the healthy and orderly development of pharmaceutical industry enterprises. At present, there is a lack of research on the financial risk of enterprises in the pharmaceutical industry, and the main research focuses on risk assessment[5]. Corporate governance, as an important element in improving the operational efficiency of enterprises, reducing their financial risks, and promoting their sustainable development, has been relatively under-researched in this field. By analysing and mining big data, the financial risks faced by pharmaceutical companies can be more accurately identified and predicted, thus providing data support and decision-making basis for corporate governance. Therefore, this study selects the data of A-share listed pharmaceutical industry enterprises from 2019-2022 as a sample to explore the impact of corporate governance on the financial risk of pharmaceutical industry enterprises, and puts forward practical countermeasures based on the results of the study, with a view to providing references for the healthy development of China's pharmaceutical industry enterprises.

2 Research Hypothesis

Previous studies have shown that corporate governance is mainly manifested in 3 aspects: equity structure, board characteristics and executive characteristics.

2.1 Relationship Between Equity Structure and Financial Risk

Equity structure is an important part of corporate governance. Relevant research shows that when the concentration of the equity structure is high, the enterprise will produce incentive effects, and the major shareholders will constrain the company's board of directors, the managerial layer and other business leaders by virtue of their control over the company, which will bring positive effects to the enterprise and thus reduce the company's financial risk [6]. At the same time, related research also found that when the proportion of shares held by large shareholders is high, if there is a divergence of interests between large shareholders and managers, large shareholders are more inclined to improve corporate performance, reduce agency costs and thus reduce corporate financial risk[7]. Based on the above research, hypothesis 1 is proposed. Hypothesis 1: There is a negative relationship between equity structure and financial risk in pharmaceutical industry firms.

2.2 Impact of Board Characteristics on Financial Risk in Pharmaceutical Industry Companies

The characteristics of the board of directors are the core elements of corporate governance. Reasonable characteristics of the board of directors can not only choose decisions that are in line with the interests of the enterprise, but also ensure the quality of corporate management and risk control through the monitoring and evaluation mechanism, which provides an important guarantee for the long-term development and stable operation of the enterprise[8]. Related research shows that when independent

directors have more financial background or higher reputation, they are more likely to play a supervisory role in identifying the risk of corporate financial fraud, which in turn reduces the possibility of corporate financial fraud risk[9]. Therefore, Hypothesis 2 is proposed. Hypothesis 2: There may be a negative relationship between board characteristics and financial risk in pharmaceutical industry firms.

2.3 Impact of Executive Characteristics on Financial Risk in Pharmaceutical Industry Firms

The "unity" of the positions of chairman and general manager refers to a situation where these two positions are held by a single individual in an enterprise. When corporate managers implement the "two positions in one" will have greater autonomy and may be deployed in decision-making from the perspective of maximising the interests of the company, reducing the risk of polarisation due to the competition on behalf of the company and control, so the company may be able to create better benefits, and financial risk will be controlled[10]. Therefore, hypothesis 3 of this study is proposed. Hypothesis 3: There may be a negative relationship between executive characteristics and financial risk in pharmaceutical industry firms.

2.4 The Role of Nature of Ownership in the Relationship Between Corporate Governance and Financial Risk

The nature of enterprise property rights mainly refers to the nature and form of asset rights owned by the enterprise, which has an important impact on the company's business behaviour, profitability and performance[11]. The nature of property rights of state-owned enterprises is usually owned or controlled by the state, their governance structure is more standardised, their operations are more in line with national policies and regulations, and their financial risks may be lower[12]. The property rights of non-state-owned enterprises are usually held by private individuals, their governance purpose is focused on profit maximisation, and their governance structure is usually more decentralised, which may increase the financial risk of the enterprise[13]. Therefore, hypothesis 4 of this study is proposed. Hypothesis 4: There is a correlation between the nature of ownership and financial risk of firms in the pharmaceutical industry. The model is shown in Figure 1.

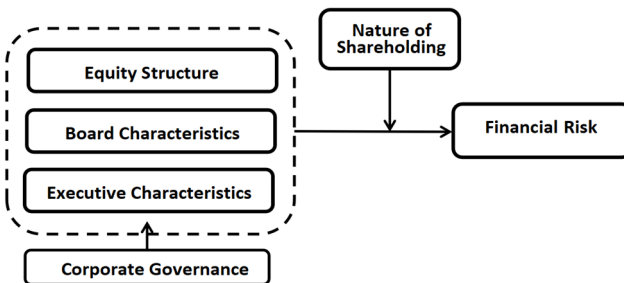


Fig. 1. Research path

3 Methods

3.1 Sample Data Selection

In this study, the data of corporate governance and financial risk of pharmaceutical industry enterprises from 2019-2022 are selected, and the data exclusion criteria are 1) missing data; 2) data anomalies; and 3) enterprises labelled as ST and *ST. The final sample of 309 pharmaceutical industry companies included in the sample, and the collected samples were statistically and analytically analysed using SPSS27.0.

3.2 Definition of Research Variables

3.2.1 Explained Variables.

The statistical model proposed by Altman for predicting corporate bankruptcy was chosen for this study, where the smaller the value of this variable, the higher the financial risk, and the model is accurate up to 72%-80%. The specific formula is as follows:

$$Z=1.2X_1+1.4X_2+3.3X_3+0.6X_4+0.999X_5$$

There among, X_1 = Working capital/total assets, X_2 = Retained earnings/total assets, X_3 = EBIT/total assets, X_4 = Total market value of common and preferred shares/total book value of liabilities, X_5 = Sales revenue/total assets. By calculating and observing the Z-values of a company over several consecutive years, one can detect the early signs of financial crisis in the company (Figure 2).

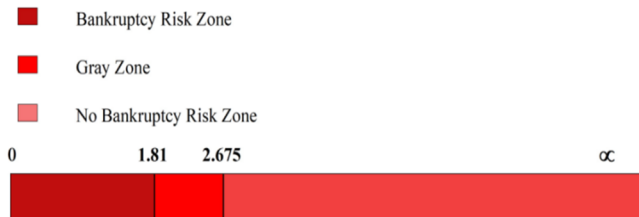


Fig. 2. Z-value risk interval

3.2.2 Explanatory Variables.

Referring to related studies, equity concentration is expressed as an index of the proportion of shares held by the top 5 shareholders (HH5); board of directors' characteristics are expressed by the proportion of independent directors (IDDS); and the characteristics of executives are expressed by "two positions in one (DUAL)" [14, 15].

3.2.3 Moderating Variables.

The nature of property rights is the moderating variable of this study, and the nature of property rights of enterprises in the pharmaceutical industry refers to the ownership of the enterprise and the distribution method, in this study, "0" and "1" represent state-owned enterprises and non-state-owned enterprises, respectively.

3.2.4 Control Variables.

Referring to previous related studies, the control variables were chosen as: Return on equity ratio, Asset-liability ratio, Tobin's Q Ratio, Enterprise size and Year[14].All variables are detailed in Table 1.

Table 1. Definition of variables

	Variant		Symbol	Define
dependent variable	financial risk		Z	The smaller the Z-score, the greater the financial risk.
independent variable	Shareholding structure	Shareholding concentration	HH5	Herfindahl index of shareholdings of top 5 shareholders
	Board	Proportion of independent directors	IDDS	Number of independent directors/numbers of board of directors
	Executive	The degree of two-unit	DUAL	1 if the chairman of the board of directors is also the general manager, otherwise 0
moderator variable	Nature of shareholding		OWN	State-owned enterprises 1, non-State-owned enterprises 0
control variable	Growth		GROW	(Total assets at the end of the year - total assets at the beginning of the year)/total assets at the beginning of the year
	Return on equity ratio		ROE	Net profit/net assets
	Asset-liability ratio		LEV	Total liabilities/total assets
	Tobin's Q Ratio		TBQ	Taken from the CSAR database
	Enterprise size		SIZE	Logarithm of total business assets
	Year		Year	Annual dummy variables

3.3 Regression Modeling

The following multiple regression model is constructed by combining the existing literature and research hypotheses: To test hypothesis 1, a model of the effect of equity structure on financial risk is constructed:

$$Z = \beta_0 + \beta_1 HH5 + \beta_2 GROW + \beta_3 ROE + \beta_4 LEV + \beta_5 TBQ + \beta_6 SIZE + \varepsilon \tag{1}$$

To test hypothesis 2, a model of the effect of board characteristics on financial risk is constructed:

$$Z = \alpha_0 + \alpha_1 IDDS + \alpha_2 GROW + \alpha_3 ROE + \alpha_4 LEV + \alpha_5 TBQ + \alpha_6 SIZE + \varepsilon \tag{2}$$

To test hypothesis 3, a model of the effect of executive characteristics on financial risk is constructed:

$$Z = \gamma_0 + \gamma_1 DUAL + \gamma_2 GROW + \gamma_3 ROE + \gamma_4 LEV + \gamma_5 TBQ + \gamma_6 SIZE + \varepsilon \quad (3)$$

4 Results

4.1 Descriptive Statistics

Table 2 shows that the minimum value of Z value of China's pharmaceutical industry enterprises is -0.027, the maximum value is 185.280, and the mean value is 10.229, which shows that the financial risk of China's pharmaceutical industry enterprises is polarised and at a high level [15, 16]. The mean value of shareholding concentration (HH5) is 55.929, indicating that the shareholding concentration of pharmaceutical industrial enterprises is high; the mean value of the proportion of independent directors (IDDS) is 0.37, indicating that the proportion of independent directors of pharmaceutical industrial enterprises is low; and the mean value of the proportion of two-employer-union (DUAL) is 0.31, indicating that the proportion of two-employer-union of pharmaceutical industrial enterprises is low.

Table 2. Descriptive statistics of main variables

Variant	MIN	MAX	AVG	SD
HH5	22.970	89.970	55.929	13.283
IDDS	0.290	0.560	0.370	0.044
DUAL	0.000	1.000	0.310	0.462
GROW	-34.450	6,642.430	36.093	378.504
ROE	-1.193	0.813	0.080	0.163
LEV	0.037	0.900	0.347	0.176
TBQ	0.280	73.150	2.667	4.663
SIZE	8.610	11.210	9.667	0.459
Z	-0.027	185.280	10.229	17.353

4.2 Correlation Analysis

According to Table 3, there is a positive correlation ($P < 0.01$) between Z-score and equity concentration (HH5), indicating that the higher the degree of equity concentration (HH5), the higher the Z-score, the lower the financial risk of enterprises in the pharmaceutical industry; financial risk and the proportion of independent directors (IDDS) are not correlated ($P > 0.05$); and there is a positive correlation ($P < 0.01$) between Z-score and the degree of two-unit (DUAL) are positively correlated ($P < 0.01$), indicating that the higher the degree of second job integration, the lower the financial risk of enterprises in the pharmaceutical industry. Therefore, the smaller the shareholding concentration (HH5) in pharmaceutical industry enterprises, the lower the financial risk; the proportion of independent directors does not directly affect the

financial risk of pharmaceutical industry enterprises; the higher the proportion of DUAL, the lower the financial risk. Except for independent directors, the effects of shareholding concentration (HH5) and DUAL on financial risk are basically consistent with the predictions of previous studies.

Table 3. Pearson correlation coefficient test

Variant	HH5	IDDS	DUAL	GROW	ROE	LEV	TBQ	SIZE	Z
HH5	1								
IDDS	0.052	1							
DUAL	0.039	-0.034	1						
GROW	0.001	-0.002	-0.025	1					
ROE	.191**	0.097	.120*	-0.069	1				
LEV	-.112*	0.05	-.121*	-0.039	-.324**	1			
TBQ	0.073	0.106	-0.006	0.036	.288**	0.059	1		
SIZE	.114*	-0.037	-.218**	0.03	.150**	.314**	-.162**	1	
Z	.209**	-0.028	.169**	0.012	.208**	-.441**	.258**	-.157**	1

Note: *: P < 0.05; **: P < 0.01; ***: P < 0.001.

4.3 Multiple Regression Analysis

As shown in Table 4, there is a positive correlation between Z-score and shareholding concentration (HH5) ($\beta=0.135$, $P<0.01$), the higher the shareholding concentration (HH5), the higher the Z-score, and Hypothesis 1 is verified; Z-score is not correlated with the proportion of independent directors (IDDS) ($\beta=-0.022$, $P>0.05$), and Hypothesis 2 is not valid; There is a significant positive correlation between DUAL and Z-score ($\beta=0.141$, $P<0.01$), then the higher the proportion of DUAL, the higher the Z-score. Hypothesis 3 is valid.

Table 4. Multiple regression results

Variant	Z		
	Model (1)	Models (2)	Models (3)
HH5	0.135**		
IDDS		-0.022	
DUAL			0.141**
GROW	-0.024	-0.025	-0.025
ROE	-0.095	-0.08	-0.083
LEV	-0.485***	-0.500***	-0.503***
TBQ	0.318***	0.33***	0.329***
SIZE	0.076	0.096	0.098
Year	containment	containment	containment
R2	0.315	0.282	0.284
F	19.752	18.254	21.319

Note: *: P < 0.05; **: P < 0.01; ***: P < 0.001

4.4 Regression Analysis of Moderating Variables

As shown in Table 5, the Z-score was analyzed by group regression with the nature of ownership as a moderating variable to verify the effect of "state-owned" and "non-state-owned" corporate governance on the Z-score of enterprises in the pharmaceutical industry. Shareholding concentration (HH5) has a non-significant effect on Z-score across different ownerships ($\beta_1=0.162$, $P_1 >0.05$; $\beta_2=0.075$, $P_2 >0.05$;). The proportion of independent directors (IDDS) has a significant effect on Z-score across different ownerships ($\beta_2=0.075$, $P_2 >0.05$;). The effect of the nature of property rights on the proportion of independent directors (IDDS) and Z-score is insignificant ($\beta_1=0.086$, $P_1 >0.05$; $\beta_2=-0.052$, $P_2 >0.05$;). "State-owned is insignificant" ($\beta_1 = 0.04$, $P_1 > 0.05$), while "non-state-owned" is significant ($\beta_2 = -0.052$, $P_2 < 0.01$;). In summary, although there is a non-significant effect under different property rights, which the authors believe may be due to insufficient sample size, the regression coefficients of different property rights are still significantly different, and therefore Hypothesis 4 is considered to be valid.

Table 5. Regression results for moderating effects

Variant	Z					
	Models (4)		Models (5)		Models (6)	
	GOV	N-GOV	GOV	N-GOV	GOV	N-GOV
HH5	0.162	0.075				
IDDS			0.086	-0.052		
DUAL					0.04	0.125**
GROW	0.113	-0.055	0.123	-0.054	0.125	-0.054
ROE	-0.135	-0.078	-0.183	-0.055	-0.19	-0.092
LEV	-0.687***	-0.437***	-0.724***	-0.435***	-0.73***	-0.453***
TBQ	0.318**	0.503***	0.347**	0.516***	0.376**	0.52***
SIZE	0.087	0.022	0.169	0.02	0.187	0.057
Year	containment	containment	containment	containment	containment	containment
R2	0.44	0.453	0.426	0.451	0.42	0.463
F	8.127	32.184	7.661	31.876	7.49	33.422

Note: *: $P < 0.05$; **: $P < 0.01$; ***: $P < 0.001$

5 Conclusions

According to the empirical study, the paper shows that: First, the equity structure of pharmaceutical industry enterprises and Z-score show a significant positive correlation, and there is a significant positive effect of equity structure on Z-score, indicating that the higher the equity structure the higher the Z-score, then the lower the financial risk of pharmaceutical industry enterprises. Second, there is no significant correlation between board characteristics and Z-score of pharmaceutical industry firms and there is no significant effect of board characteristics on Z-score. Third, executive characteristics of pharmaceutical industry enterprises show a significant positive correlation with

Z-score, and executive characteristics have a significant positive effect on Z-score, indicating that the higher the executive characteristics, the higher the Z-score, the lower the financial risk of pharmaceutical industry enterprises. Last, the impact of corporate governance of pharmaceutical industry companies on financial risk varies in degree among companies with different nature of ownership.

6 Implications

Combined with the characteristics of the pharmaceutical industry, this study concludes that enterprises in the pharmaceutical industry should focus on the following aspects in strengthening corporate governance and reducing financial risk:

1)Optimize the shareholding structure of enterprises in the pharmaceutical industry. The duties and rights of shareholders should be clearly defined to facilitate the effective exercise of their functions, and at the same time effectively protect the rights and interests of shareholders;2)Improve the executive employment system of enterprises in the pharmaceutical industry. The scope of responsibilities of executives should be clarified to ensure awareness of their responsibilities and rights;3)Enhance regulatory compliance and fulfillment of ethical responsibilities. It is necessary to ensure that the enterprise operates in compliance with the regulations and reduce the financial risk caused by the violation of the regulations.

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