

# RESEARCH ON THE INVESTMENT AND FINANCING EFFECTS OF BANKRUPTCY RISK-EMPIRICAL RESEARCH FROM CHINA<sup>\*</sup>

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## Abstract

In recent years, cases of corporate bankruptcy due to high corporate bankruptcy risk abound. Based on literature research, this paper uses the data of Chinese listed companies from 2007 to 2020, using the least squares method (OLS) and panel fixed effects. This paper discusses the investment and financing effects of enterprise bankruptcy risk. Through the research, it is found that the enterprise bankruptcy risk has the effect of investment and financing. When the bankruptcy risk increases, the financing constraints of the enterprise will intensify, the excessive debt of the enterprise will expand, and the liquidity risk of the enterprise will increase. The research of this paper not only discusses the impact of changes in corporate bankruptcy risk on micro-enterprises and its transmission mechanism from an empirical level, but also helps to clarify the disputes over corporate bankruptcy risk at the policy level and in practice.

**Keywords:** bankruptcy risk investment and financing effects financing constraints panel fixed effects

## Introduction

Existing studies have pointed out that when the following situations occur to an enterprise: (1) when it is difficult for the enterprise to guarantee the repayment of the loan or interest on time; (2) when the net asset of the enterprise is less than zero; (3) when the enterprise liquidates its assets, it is The due debts cannot be repaid in time; (4) When the enterprise and the creditors apply to the court for enterprise bankruptcy, the enterprise is likely to have the risk of bankruptcy (Ross et al., 2000). Once the risk of corporate bankruptcy increases, those companies with a large number of mature loans are more likely to face loan renewal freezes and liquidity crises, which will have a greater negative impact on corporate investment and financing (Almeida et al., 2009). Existing studies have found that financing constraints refer to the excessively high external financing costs of enterprises due to an incomplete market, which makes it difficult for enterprises to achieve optimal levels of investment (Fazzari et al., 1988). At the same time, some scholars have pointed out that the optimal capital structure of an enterprise is actually a game between the tax benefits of corporate liabilities and the expected bankruptcy cost. When a firm's debt ratio exceeds a certain level, bankruptcy risks and costs will outweigh benefits (Robichek and Horne, 1967; Krause and Litzenberger, 1973). When the corporate bankruptcy risk (Altman, 2000; Eidleman, 1995), which consists of working capital, retained earnings, EBIT, owner's equity, operating income and total assets, changes, it will inevitably affect the company's financing constraints and capital structure. It has an important impact, that is, the risk of corporate bankruptcy has investment and financing effects.

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### **Theoretical analysis and research assumptions**

The micro-investment and financing effect of bankruptcy risk is firstly manifested in the increasing financing constraints of enterprises. Access to financing is seen as one of the main drivers of business development (Pham and Talavera, 2018). Corporate financing channels can be divided into internal financing and external financing. Given the endogenous capital, a company must obtain external financing if it wants to operate and grow better. The risk of corporate bankruptcy may further affect external financing. This study will explain the impact of corporate bankruptcy risk on external financing from the perspective of direct and indirect financing.

Financing is an important function of the stock market, and companies can increase the accumulation of needed funds by issuing stocks. The cost of equity capital is the rate of return on investment that takes into account corporate risk (Ghoul et al., 2011; Boubakri et al., 2012), which seriously affects operational risk (Modigliani and Miller, 1958), increases the risk of information acquisition (Lambert et al., 2007). On the one hand, corporate bankruptcy risk is an external manifestation of information risk (Yu Ling, 2017). When this phenomenon occurs, it will be more difficult for investors to predict future investment risks. Make investors have higher requirements for product value or benefits, carry out risk compensation, and continuously increase the cost of equity capital. On the other hand, Easley and O'hara (2004), Lambert et al. (2007) have shown that the greater the information asymmetry, the higher the cost of capital. To a certain extent, corporate bankruptcy reflects the asymmetry of relevant information. The higher the degree of this asymmetry, the higher the risk for investors to assess future returns and the higher the required return on investment, which further increases the cost of their equity capital. In addition, corporate bankruptcy will increase the uncertainty of future cash flow, have a significant impact on the real economy, and increase the cost of equity capital, which may ultimately increase the bankruptcy risk of the company.

There is a certain "contagion effect" in the capital market. Fleming et al. (1998) pointed out that information can establish cross-market linkages by simultaneously changing investors' expectations in multiple markets or changing expectations in one market, and by affecting prices and volatility in other markets through changes in hedging demand. Therefore, common information and information spillover effects can promote the interconnection between capital markets such as stocks and bonds and the strengthening of money markets. At the same time, other studies have found that the links between these markets are strengthened after a business goes bankrupt. Dungey et al. (2002) studied a series of phenomena arising from the financial crisis, and quantified the changes in the global bond market caused by the financial contagion caused by the Russian crisis and the LTCM collapse. Baur and Lucey (2009) proposed contagion and transfer and confirmed the reality of cross-market contagion effects. Kyle and Xiong (2001) believe that when arbitrage traders face losses, their risk tolerance and liquidity will decrease, and when asset price volatility increases, the correlation of their assets will also increase. The slump in stock prices will change the mentality of investors, and the herd behavior of investors will lower the stock price. According to the financial contagion effect, when investors are in a negative mood, it will spread to the bond market, changing the risk aversion and preferences of investors, increasing the default risk of bond financing, decreasing demand, and ultimately increasing the cost of bond financing.

In terms of credit financing, financial intermediaries decide whether to issue loans, loan interest rates and mortgages by assessing the size of enterprise risks. Corporate bankruptcy further increases the risk of default. Banks and other financial intermediaries believe that

companies do not have the economic strength to meet their obligations, leading to rising regulatory costs. It can be passed on to businesses by increasing loan interest rates and signing more stringent terms, thereby increasing the cost of loans. The study by Jimenez et al. (2006) shows that borrowers need to provide more collateral when the loan risk is high. To a certain extent, this further increases the difficulty of financing for enterprises.

To sum up, the increase of external financing cost caused by enterprise bankruptcy risk limits and constrains the financing behavior of enterprises to a certain extent, resulting in the problem of financing constraints of enterprises. Therefore, this paper proposes Hypothesis 1.

H1: The greater the risk of corporate bankruptcy, the more severe the financing constraints.

The second manifestation of the micro-level investment and financing effect of bankruptcy risk is that it increases the capital structure of enterprises. In order to maximize the value, the optimization and adjustment of the capital structure of the enterprise is the main body of the market economy, and the enterprise is constantly adjusted in accordance with the external economic changes. Based on the cost-benefit principle, the company strengthens and updates the financial leverage ratio, but it also needs to pay a price. Costs of recapitalization, including debt and equity adjustment costs. Regarding the adjustment speed of the capital structure, the previous researches have done relevant analysis to test whether the dynamic change of the capital structure conforms to the trade-off theory. The results show that the optimal capital structure varies with firm characteristics. The company's own characteristics, external macro environment and institutional factors will all have an impact on the dynamic adjustment of the capital structure. For a long time, the capital structure of enterprises has been in a constantly changing environment.

When adjusting the capital structure, the company will further decide whether to expand its shares through financing or repurchase according to the market performance of its shares (Zou Ping, 2015). In recent years, China's stock market has experienced many "bull markets" and "bear markets", and drastic stock price fluctuations have often occurred, which has attracted close attention from the academic and practical circles. An extreme phenomenon of stock price fluctuations is the bankruptcy of enterprises, because managers hide unfavorable news from the capital market by manipulating accounting information. These negative news accumulate too much, and when they accumulate to a certain amount, they will explode in a concentrated manner, causing bankruptcy to occur. For example, after the plasticizer problem was exposed, listed companies such as Hunan Jiugui and Kweichow Moutai suddenly plummeted because of the problem (Kim and Zhang, 2011). When an enterprise has bankruptcy risk, it will affect the change of the company's capital structure to a certain extent. In terms of the external environment of listed companies, the stock market is a very important part. Stock price volatility will change the cost of capital, further increase market risk, and then affect the company's optimal capital structure. Corporate bankruptcy is an extreme phenomenon that inevitably affects its capital structure. When an enterprise faces bankruptcy risks, senior executives actively adjust the capital model and structure according to specific circumstances, thereby reducing the enterprise bankruptcy risk and the resulting capital losses.

Research shows that in the choice of corporate financing activities, the role of debt financing is crucial. From the perspective of cost of debt capital, corporate bankruptcy risk reflects corporate downside risk. The lower the downside risk is, the more likely the market expects that the fundamentals of the company will be extremely negative in the future, and the more likely it will go bankrupt. It can be expected that in the relationship between debt capital

and enterprise bankruptcy risk, creditors will reduce their own risks, and then take measures to increase interest rates, indicating that the enterprise bankruptcy risk will lead to the continuous increase of the cost of debt capital. Chen Shaohua et al. (2013) pointed out that one of the important ways for creditors to avoid risks is the cost of debt capital. The high cost of capital means that businesses will have difficulty financing. At this time, in order to maintain the friendly and cooperative relationship with creditors, the management adjusts the capital structure to be close to the optimum, thereby winning the trust of creditors. From the perspective of the cost of equity capital, the stock market can accurately and reasonably price capital. Businesses use price indices as a reference for investment and financing decisions. Therefore, the stock market plays a key role in the efficiency of corporate resource allocation. According to the market timing theory, when the stock price is low and the cost of equity is high, companies with poor performance give up financing in the stock market, or even buy back shares; when the stock price is high, companies with better performance will use lower equity capital cost, financing from the stock market, optimizing the capital structure, and improving resource allocation (Francis et al., 2012). China's capital market is slightly immature, and corporate bankruptcy is often accompanied by a severe undervaluation of stock prices, which will greatly increase the cost of equity capital and cause damage to corporate interests. In order to adjust the capital structure to the best state, companies will adjust the capital structure in a timely manner by issuing repurchase shares, changing debt levels and other measures. When an enterprise faces bankruptcy, the adjustment to the capital structure will be further intensified to prevent more adverse effects from occurring.

In terms of institutional environment and regulatory measures, China's securities market still has a certain distance from that of Western countries. Therefore, the volatility of the securities market is more frequent (Xu Nianxing et al., 2012). Business bankruptcy shows that stock prices deviate significantly from their market value, with serious implications for the long-term value of the business. Based on the analysis of the previous theories, we find that the risk of corporate bankruptcy affects the dynamic adjustment of the capital structure, mainly including the cost of corporate debt capital and the cost of corporate equity capital. In order to protect the stability of the company's value and prevent the transfer of control rights, the management of the company's capital structure will be more stringent, and more attention will be paid to the adjustment of the capital structure to make it close to the optimal level. Previous research has pointed out that the key to influencing the urgency of managers to adjust the capital structure is the level of debt (Faulkender et al., 2012). For companies with excessive debt, a high debt ratio, to a certain extent, represents a further increase in financial risk. The management is very concerned about the adjustment of the capital structure to reduce this risk; at the same time, the excessive debt ratio will also have a relevant impact on the owner's equity. In order to obtain more benefits, shareholders will take this opportunity to exert pressure on the management. To sum up, whether subjectively or passively, the management has the motivation to adjust the capital structure. In the case of insufficient corporate debt, a low debt ratio also means that the company has not yet reached the optimal capital state, which avoids financial risk pressure to a certain extent. Dang Jianbing et al. (2013) pointed out through empirical evidence that over-indebted enterprises can adjust their capital structure faster.

On this basis, this paper analyzes the changes caused by the difference in debt levels on the basis of examining bankruptcy risk and dynamic adjustment of capital structure. If a company is over-indebted, it is easy to fall into a financial crisis, and the relevant creditors will reduce their loans. If bankruptcy occurs at this time, the task of adjusting the capital structure

to reduce risks is even more arduous; if the company has insufficient debt, when bankruptcy does occur, there is no rush to adjust the capital structure, because the company still has room to obtain bank loans.

Accordingly, this paper proposes the following assumptions:

H2: The greater the risk of corporate bankruptcy, the greater the degree of excessive debt.

## Research Hypotheses

### 1. Sample selection

The sample selection time interval of this chapter to study the relevant data of A-share listed companies in Shanghai and Shenzhen stock markets is 2007-2020. Specifically: on the one hand, listed companies began to use the new accounting standards since 2007;

According to research conventions, the following methods are used to deal with the original financial data: firstly, delete listed companies in the financial sector, especially in the banking industry; secondly, delete listed companies with incomplete financial data; thirdly, delete listed companies with missing important observations. Further, all continuous variables are processed by Winsorize the upper and lower 1% quantiles, thereby reducing the influence of outliers. Among them, the financial data sources of listed companies are Wind and CSMAR databases, and other corporate data sources are CCER and CSMAR databases. The empirical analysis and measurement software is Statal4.0.

### 2. Study Design

#### (1) Model and variable assumptions

First, in order to test the impact of bankruptcy risk on financing constraints, this paper first uses the following model to estimate financing constraints:

The measurement methods of financing constraints include KZ index (Lamont et al., 2001), WW index (Whited & Wu, 2006) and SA index (Hadlock & Pierce, 2009). In this study, the KZ index is used for the basic test, and the SA index is used for the robustness test.

Learn from Lamont et al. (2001) and Li Wenjing and Li Mangmang (2017), we set the financing constraint (KZ) model as:

$$KZ = -1.001909 * OCF / Asset + 3.139193 * Lev - 39.3678 * Dividends / Asset - 1.314759 * Cash / Asset + 0.2826389 * Tobin's Q \quad (1)$$

Among them, OCF, Dividend and Cash are operating net cash flow, dividends and cash holding levels respectively, and all of them are standardized on the total assets at the beginning of the period. The gearing ratio and Tobin's Q are represented by Lev and Tobin's Q, respectively.

We then examine the impact of bankruptcy risk policy on financing constraints using the following model:

$$KZ_{it+1} = a_1 + b_1 Risk_t + c_1 X_i + \varepsilon_{it+1} \quad (2)$$

Among them, the explanatory variable is the enterprise bankruptcy risk Risk, which is represented by the Z value. X represents multiple control variables. Referring to Hsu et al. (2014); Li Wengui and Yu Minggui (2015), the control variables of formula (2) include enterprise scale (Size), enterprise asset-liability ratio (Lev), enterprise net profit ratio on total assets (ROA), and enterprise cash flow ratio. (Cashflow), the number of directors of the company (Board), the proportion of independent directors of the company (Indep), and the corporate Tobin Q value (TobinQ), see Table (1) for further explanations and definitions. In

addition, the year dummy variable (Year) and the industry dummy variable (Industry) are set in formula (2).

Second, in order to test the impact of bankruptcy risk on excessive debt, this paper constructs the following empirical model:

Existing studies generally use the following three methods to measure illiquid excess debt: first, the actual debt ratio minus the regression (the result of using the asset-liability ratio to regress the main influencing factors), and then the target debt ratio (Uysal, 2011; Denis and McKeon, 2012; Zhang Huili and Lu Zhengfei, 2013); second, the actual debt ratio minus the average industry debt ratio or the median industry debt ratio in the current year (Jiang Fuxiu et al., 2008; Zhang Huili and Lu Zhengfei, 2013); Third, the Kink value method (Graham, 2000), the ratio of corporate interest expense to corporate actual interest expense when using the maximum tax benefit that corporate debt can achieve (Graham, 2000; Casket et al., 2012).

The difference between them lies in their understanding of the target debt ratio. The first measurement method points out that the target debt ratio of an enterprise is determined by its own characteristics, industry characteristics and the macro environment, which is more comprehensive; the second measurement method points out that the target debt ratio of an enterprise adopts the basic standard of the industry debt ratio, but it may omit the internal industry. The third measure indicates that the target debt ratio of enterprises is affected by taxation. However, recent studies by some scholars have found that when other factors are considered, the impact of taxation on the target debt ratio of enterprises is not significant (Oztekin and Flannery, 2012; Chang et al., 2014). Therefore, mainstream research mainly adopts the first measure.

Specifically, according to Harford et al. (2009) and Denis and McKeon (2012), we perform Tobit regression on the sample by year. To predict the target debt ratio of enterprises, the regression model is as follows:

$$LEVB_t = \alpha_0 + \alpha_1 SOE_{t-1} + \alpha_2 ROA_{t-1} + \alpha_3 IND\_LEVB_{t-1} + \alpha_4 GROWTH_{t-1} + \alpha_5 FATA_{t-1} + \alpha_6 SIZE_{t-1} + \alpha_7 SHRCRI_{t-1} \quad (1)$$

The actual debt ratio of the enterprise minus the target debt ratio predicted by the model (2) is the excess asset-liability ratio EXLEVB. In the robustness test, we set the dummy variable EXLEB\_dum to measure whether the company is excessively indebted from a long-term perspective. When EXLEVB is greater than 1, EXLEVB\_dum takes 1, otherwise it is 0. The selection of control variables in model (2) is based on Chang et al. (2014). Chang et al. (2014) drew on the Bayesian Information Criterion (BIC) research ideas of Goyal (2009), and pointed out that the factors that affect the stability and reliability of the asset-liability ratio of Chinese enterprises include: enterprise profitability (ROA), the median industry debt ratio number (IND\_LEVB), growth rate of total assets (GROWTH), ratio of fixed assets to total assets (FATA), enterprise size (SIZE), enterprise property rights (SOE) and shareholding ratio of the largest shareholder of the enterprise (SHRCRI).

In model (1), the ratio of the total liabilities of the enterprise to the total assets of the enterprise (LEVB) is used to measure the debt ratio of the enterprise. The more important purpose is to consider the debt from the perspective of the agency cost brought by the debt, which cannot reflect whether the enterprise has a short-term Debt default risk (Myers, 1977; Jensen and Meckling, 1979; Rajan and Zingales, 1995). Other studies (Aghion and Bolton, 1992) regard the debt ratio more as a way for enterprises to shift control from shareholders to stakeholders or debtors during financial crisis. At this time, the more important question for

enterprises is whether With regular repayment ability, a more appropriate indicator is the interest coverage ratio (Rajan and Zingales, 1995; Faulkender and Petersen, 2006). When the interest coverage ratio is too low and the corporate profit is not enough to pay the interest, the company has the risk of debt default. From a short-term and static point of view, this is a type of excessive debt. Therefore, this paper sets the excessively low interest coverage ratio indicator  $EXINTR\_dum$  for calculation. , when the interest coverage ratio is less than 1, it is defined as 1, indicating that the enterprise has excessive debt from a short-term perspective, otherwise it is defined as 0. As a robustness test, we relax the critical value of the interest coverage ratio to 2.5, and set the index  $EXINTR\_dum1$ , that is, when the interest coverage ratio is less than 2.5, take 1, otherwise take 0.

We then examine the impact of bankruptcy risk policy on excess debt using the following model:

$$EXLEVB_{it+1} = a_1 + b_1 Risk_i + c_1 X_i + \varepsilon_{it+1} \quad (4)$$

Among them, the explanatory variable is the enterprise bankruptcy risk Risk, which is represented by the Z value. Control variables include enterprise size (Size), enterprise asset-liability ratio (Lev), enterprise net profit ratio on total assets (ROA), enterprise cash flow ratio (Cashflow), the number of directors of the company (Board), and the proportion of independent directors of the company (Indep). ), enterprise Tobin Q value (TobinQ). In addition, set the annual dummy variable (Year) and the industry dummy variable (Industry) in the formula. See Table 1 for details.

**Table 1** Definitions and calculation methods of various variables

variable	symbol	variable definition
Company Size	<i>Size</i>	Take the natural logarithm of the company's annual total assets
financing constraints	<i>KZ</i>	formula (1)
Excessive debt	<i>EXLEVB</i>	formula (2)
Assets and liabilities	<i>Lev</i>	The company's total liabilities at the end of the year/the company's total assets at the end of the year
Net profit margin on total assets	<i>ROA</i>	The net profit of the enterprise/the average value of the total assets of the enterprise
cash flow ratio	<i>Cashflow</i>	Net cash flow from business activities/total assets of the business
number of directors	<i>Board</i>	Take the natural logarithm of the number of board members
Proportion of independent directors	<i>Indep</i>	The number of independent directors of the company / the number of directors of the company
Chairman and general manager combined into one	<i>Dual</i>	The two positions of chairman and general manager are the same person, which is defined as 1, otherwise it is 0
Tobin's Q	<i>TobinQ</i>	(market value of tradable stock + number of non-tradable shares x net assets per share + book value of liabilities)/total assets of the company

## (2) Descriptive statistics

In this section, descriptive statistics are performed on the main variables mentioned in Table 1, and the results are shown in Table 2. The mean value of Z value is 3.434918, the maximum value is 63965.46, the minimum value is -11461.5, and the variance is 291.5697; the financing constraint *kzindex\_w*, the mean value is 3.434918, the maximum value is 63965.46, the minimum value is -11461.5, and the variance is 291.5697; the financing constraint *kzindex\_w*, The mean is 1.139472, the maximum is 4.299823, the minimum is -3.666328, and the variance is 1.317593; the financing constraint *saindex\_y*, the mean is 3.434918, the maximum is 13.35699, the minimum is -3.37591, and the variance is 1.552121; the financing constraint *saindex\_m*, the mean is -3.661434, the maximum value is 2.131476, the minimum value is -5.600018, the variance is 0.302996; the debt level *LEVB*, the mean value is 0.4527173, the maximum value is 0.8881562, the minimum value is 0.0615163, the variance is 291.5697; the excess debt *EXLEVB*, the mean value is -5.26, the maximum value is 0.839325, the minimum value is -0.5975323, the variance is 0.1555953; the excess debt *EXLEVB\_dum*, the mean value is 0.5010666, the maximum value is 1, the minimum value is 0, the variance is 0.5000067; the company size, the mean value is 21.91831, the maximum value is 31.13793, the minimum value is 10.8422, the variance is 1.490077; the average value of the asset-liability ratio *Lev* is 0.5103175, the maximum value is 877.2559, the minimum value is -0.194698, and the variance is 4.401588; the net profit margin of total assets *ROA*, the average value is 0.0365535, the maximum value is 20.78764, and the minimum value is -14.58599, variance 0.1904571; cash flow ratio *Cashflow*; mean 0.0450091, maximum 62.78953, minimum -24.97394, variance 0.3351984; number of directors *Board*, mean 2.15992, maximum 3.044523, minimum 1.098612, variance 0.2176444; *Indep* mean ratio of independent directors is 0.3521793, the maximum value is 0.8, the minimum value is 0, and the variance is 0.0912723; the dual mean of two positions is 0.2529999, the maximum value is 1, and the minimum value is 0. The variance is 0.4347364; Tobin Q value *TobinQ*, the mean value is 2.166196, the maximum value is 1752.705, the minimum value is 0.152768, and the variance is 12.79651.

**Table 2** Descriptive statistics

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
<i>Z</i>	49,748	3.434918	291.5697	-11461.5	63965.46
<i>kzindex_w</i>	35,043	1.139472	1.317593	-3.666328	4.299823
<i>saindex_y</i>	41,544	3.921849	1.552121	-3.37591	13.35699
<i>saindex_m</i>	41,544	-3.661434	0.302996	-5.600018	2.131476
<i>LEVB</i>	31,876	0.4527173	0.2016217	0.0615163	0.8881562
<i>EXLEVB</i>	31,876	-5.26E-12	0.1555953	-0.5975323	0.839325
<i>EXLEVB_dum</i>	31,876	0.5010666	0.5000067	0	1
<i>Size</i>	44,950	21.91831	1.490077	10.8422	31.13793
<i>Lev</i>	44,950	0.5103175	4.401588	-0.194698	877.2559
<i>ROA</i>	44,949	0.0365535	0.1904571	-14.58599	20.78764
<i>Cashflow</i>	44,950	0.0450091	0.3351984	-24.97394	62.78953
<i>Board</i>	44,780	2.15992	0.2176444	1.098612	3.044523
<i>Indep</i>	44,776	0.3521793	0.0912723	0	0.8
<i>Dual</i>	39,668	0.2529999	0.4347364	0	1
<i>TobinQ</i>	44,019	2.166196	12.79651	0.152768	1752.705



### 3. Regression analysis

This paper first uses panel fixed effects [through Hausman test, using fixed effects, the same below], to empirically analyze the impact of corporate bankruptcy risk on financing constraints and excessive debt. The regression results are shown in Table 3.

First, the Z-value has an aspect of financing constraints. Model (1) is the regression result of Z value to financing constraint *kzindex\_w*, and model (2) is the regression result of Z value to financing constraint *kzindex2\_w*. After adding the relevant control variables, the estimated coefficients of the Z value of the core explanatory variable were -0.058 and -0.109, respectively, and were significant at the 1% level. Since the Z value is a reverse indicator, the larger the Z value, the lower the bankruptcy risk of the enterprise, and the financing constraints have a downward trend at this time. This shows that when the enterprise bankruptcy risk decreases, the financing constraints are alleviated, which has important economic significance in both statistics and economics.

**Table 3** The effect of Z value on financing constraints and excessive debt

	(1) <i>kzindex_w</i>	(2) <i>kzindex2_w</i>	(3) <i>LEV</i>	(4) <i>EXLEV</i>
<i>Z</i>	-0.058*** (-27.63)	-0.109*** (-37.65)	0.001*** (42.83)	0.001*** (4.85)
<i>Size</i>	-0.104*** (-9.68)	-0.263*** (-17.98)	0.001*** (11.87)	-0.047*** (-54.60)
<i>Lev</i>	-0.051*** (-5.52)	-0.187*** (-14.89)	0.995*** (3023.97)	0.859*** (211.47)
<i>ROA</i>	-0.489*** (-12.72)	-0.847*** (-16.12)	0.001* (1.74)	0.234*** (36.02)
<i>Cashflow</i>	-2.333*** (-38.73)	-6.041*** (-73.27)	-0.002*** (-3.79)	-0.021*** (-3.78)
<i>Board</i>	-0.040 (-0.75)	-0.034 (-0.47)	0.000 (0.29)	-0.001 (-0.21)
<i>Indep</i>	0.334** (2.14)	0.495** (2.32)	-0.002* (-1.79)	-0.016 (-1.41)
<i>Dual</i>	-0.059*** (-3.04)	-0.081*** (-3.06)	-0.000 (-0.78)	0.002* (1.83)
<i>TobinQ</i>	-0.020*** (-22.45)	-0.038*** (-31.58)	0.000*** (13.19)	0.002*** (8.07)
<i>_cons</i>	3.209*** (12.16)	6.644*** (18.40)	-0.016*** (-10.09)	0.586*** (29.60)
<i>N</i>	30036	30018	30245	30245
<i>R<sup>2</sup></i>	0.162	0.243	0.998	0.677
<i>F</i>	178.062	294.787	5.7e+05	2330.097

Note: Values in parentheses, \*\*\*, \*\* and \* represent that the estimated coefficients of the variables passed the 1%, 5% and 10% significance level tests, the same below.

Second, the Z-value is in terms of over-indebtedness. Model (3) is the Z-value against debt level *LEV*, and model (4) is the regression result of Z-value against excess debt *EXLEV*. After further adding relevant control variables, the estimated coefficients for the Z-values of the core explanatory variables were 0.001 and significant at the 1% level, respectively.

This suggests that excess debt is enhanced when the risk of corporate bankruptcy rises, and it also has significant economic significance in both statistics and economics.

#### 4. Robustness check

The previous analysis finds that when the corporate bankruptcy risk decreases, financing constraints are eased; when the corporate bankruptcy risk increases, excessive debt increases. In order to ensure the robustness of the conclusion, the following uses SA as the proxy variable for financing constraints and EXLEVB\_dum as the proxy variable for excessive debt for robustness testing. Table 4 shows the regression results. It can be found that although the proxy variables are different, the results obtained are still not very different. There is no doubt that the conclusions of this paper are reliable.

Table 4 Robustness test

	Z value and financing constraint SA		Z-values and excessive debt	
	(1)	(2)	(3)	(4)
	saindex_m	saindex_y_w	saindex_m_w	EXLEVB_dum
<i>Z</i>	-0.001*** (-5.40)	-0.001*** (-4.39)	-0.001*** (-7.55)	0.013*** (11.2)
<i>Size</i>	-0.024*** (-28.07)	1.122*** -933.26	-0.022*** (-26.09)	-0.088*** (-19.80)
<i>Lev</i>	0.022*** -30.06	0.052*** -50.15	0.016*** -21.9	2.272*** -107.63
<i>ROA</i>	0.024*** -7.46	0.091*** -20.44	0.016*** -5.18	0.638*** -18.92
<i>Cashflow</i>	-0.051*** (-10.57)	-0.140*** (-20.68)	-0.029*** (-6.28)	-0.057** (-1.96)
<i>Board</i>	-0.009** (-2.18)	-0.007 (-1.15)	-0.008* (-1.91)	-0.023 (-1.18)
<i>Indep</i>	0.037*** -3	0.060*** -3.47	0.045*** -3.78	-0.049 (-0.86)
<i>Dual</i>	0.007*** -5.02	0.005** -2.57	0.007*** -5.09	0.018*** -2.61
<i>TobinQ</i>	0.002*** -29.93	0.004*** -44.5	0.001*** -12.62	0.005*** -5.58
<i>_cons</i>	-2.596*** (-124.01)	-20.165*** (-684.77)	-2.647*** (-129.72)	1.348*** -13.11
<i>N</i>	33948	33948	33948	30245
<i>R<sup>2</sup></i>	0.859	0.981	0.86	0.339
<i>F</i>	6323.834	5.40E+04	6407.102	570.541

## Conclusions and Implications

The results of this paper show that when the bankruptcy risk increases, the financing constraints of the enterprise will increase, and the excessive debt of the enterprise will further expand, thereby increasing the liquidity risk of the enterprise. Substituting proxy variables and

performing an empirical test of robustness, the results are still significant.

The management implication of the research results is that enterprises must pay close attention to the effect of investment and financing on enterprise bankruptcy risk, and establish an appropriate risk early warning mechanism. On the one hand, enterprises should establish dynamic risk management framework, especially bankruptcy risk. Since the liabilities, investment and financing decisions, corporate governance and other behaviors of enterprises are not only interrelated but also inter-temporally related, therefore, enterprises should comprehensively and systematically consider the internal and external risks faced by enterprises when conducting bankruptcy risk management, and establish dynamic risk identification indicators. System, improve the relevant capital structure, investment and financing behavior, organization and management process of the enterprise, and then establish a comprehensive risk management framework with the dynamic risk indicator system as the core to prevent the increase of bankruptcy risk. Listed companies should formulate effective risk early warning mechanisms, strengthen internal control, enhance corporate governance capabilities, and closely integrate the development of external capital markets with corporate internal governance, improve and perfect the internal governance system, and improve corporate financial and non-financial corporate governance. The joint disclosure of information enhances the high quality of financial reports and further reduces investors' mistakes in decision-making. On the other hand, build a target capital structure. Enterprise decision makers should continuously improve their adaptability. In the face of different external environments, if they want to improve the company's own value, they should maintain a rational and objective attitude towards the characteristics of the enterprise, industry teams and different macro environments, and formulate an accurate target capital structure. Based on the target capital structure, determine the rational adjustment of the capital structure, continuously optimize and improve the capital structure of the enterprise, narrow the gap between the target and the actual capital structure, and then effectively improve the efficiency of capital allocation.

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