

# Bond Default Analysis Based on Z-score Modeling-take Company W as An Example

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## Abstract

Bond market as an inseparable part of the financial market, with the continuous improvement of China's financial market is also in rapid development. However, as China's bond rigid payment is broken, bond defaults began to come one after another, seriously affecting the healthy development of China's bond market. In this context, this paper selects the bond default case of Company W. Through combing the bond default event of Company W and the subsequent processing, we qualitatively and quantitatively analyze its bond default risk influencing factors based on the Z-score model. It is found that Company W has a serious financial crisis, with weak solvency and profitability, which, together with the double blow of external factors, led to its bond default. Finally, based on the analysis of the factors of bond default of Company W, we put forward relevant suggestions for bond issuing enterprises to prevent bond default risk.

## Keywords

Bond default risk, Z-score model, risk prevention.

## 1. Introduction

The development of the financial industry occupies a key position in modern economic development, and the various risks faced in the development of the financial industry will also deeply affect the economic development. With the continuous development of the financial market, the bond market, as an inseparable part of the financial market, is also developing rapidly, according to the data of the China Bond Market Association, as of the end of August 2023, the stock size of China's bond market reached 150.93 trillion yuan, of which 89.63 trillion yuan of interest rate bonds, 46.44 trillion yuan of credit bonds, and 14.86 trillion yuan of interbank certificates of deposit [1]. However, the risk of bond default also threatens the healthy development of China's bond market frequently. The risk of bond default will lead to the normal production and operation activities of enterprises being affected, triggering pessimism of investors on the capital market, and may even be transmitted to the financial system, ultimately undermining the normal operation of the entire financial system [2]. Therefore, the prevention and control of bond default risk is crucial to the healthy development of the financial market. The frequent occurrence of bond defaults has seriously affected the long-term healthy development of China's bond market, and the severe bond default problem has also forced the main body of bond issuers to enhance the awareness of bond default risk identification as well as the ability to prevent it. Therefore, this paper selects the famous A-share game company listed private enterprise W as the research object, analyzes the internal and external reasons of bond default of W based on the Z-score model, and puts forward the corresponding bond default risk prevention and control suggestions to other enterprises according to the lessons of bond default of W, which is beneficial to the risk management of corporate bonds and the benign development of the bond market.

## 2. Analysis of the Current Status of Bond Defaults in China

Before 2014, China's bonds in the government's implicit guarantee has maintained a rigid acceptance, until 2014, "11 super sun bond" has occurred a substantial default, breaking the government's "underwriting" situation, and became the first default in China's bond market. Bonds [3]. Since then, China's bond market corporate bond default door was formally opened, bond defaults occur frequently, the risk of bond default continues to intensify [4].

We can know that the number of bond defaults in China during 2014-2016 showed an upward trend, from 10 in 2014 to 97 in 2016, a total of 87; in 2017, it fell to 49; during 2018-2019, the number of bond defaults in China began to rise again, and reached the peak in 2019, with the number of defaults as high as 206, and the amount of defaults reached 202.7 billion yuan. default amounted to 122.7 billion yuan; in 2020, the new crown epidemic outbreak, China's economy was deeply affected, the number of bond defaults is still high, but it has shown a clear downward trend, and the number of bond defaults is once again back to less than 100 after 2022; the trend of bond defaults is roughly the same as that of the number of bond defaults, which peaked in 2020, with the amount of defaults as high as 153.7 billion yuan, and the number of defaults The amount of bond defaults peaked in 2020 at \$153.7 billion and the number of defaults was 175, and the amount of bond defaults plummeted after 2021. Then look at the bond rollover, the so-called rollover refers to the postponement of the debt of the main body of the listed company, that is, the two sides of the debt to a certain degree of debt, the operation of the creditor agrees to reduce the debtor's debt, postponement of the honoring of the debt and so on. Bond rollover can be used as a last resort to save the credibility of the enterprise and save the enterprise [5], which is a better attitude of the former compared to the bond mine. The number of bond rollovers in China reached its peak in 2022, up to 189, with a rollover amount of 211.9 billion yuan. Thus, it seems that bond default in China has become a normalized phenomenon.

## 3. Case Study of Bond Default of Company W

On January 17, 2017, Company W issued a private placement of corporate bonds for qualified investors. The non-public issuance of bonds does not require public disclosure of information and does not need to be submitted to the Securities and Futures Commission for approval, therefore, after the issuer company successfully issued private corporate bonds, the public market can only inquire into the issuer name, underwriter, issue size, maturity, coupon interest rate, and other key elements of this debt, which is characterized by a low threshold for issuance, a lower issuance cost, and lower disclosure requirements, and it has become a small and medium-sized enterprises fund-raising Priority choice. However, it is also precisely because of this that the bond market is mixed with many bonds with high default risk, which buries the hidden danger of bond default mine for the bond market, and this is exactly the case for W corporate bonds.

The term of the bond is 5 years, the bond amount is \$1 billion, and the coupon rate is 7.79%. The starting date of the bonds is January 19, 2017, and the interest payment date is January 19 each year from 2018 to 2022[8]. It also comes with an investor resale option on the interest payment date of the third interest-bearing year after issuance (2020). The number of the bonds to be resold is 8556610, and the amount of the resale is \$9,223,169,991.90. However, W company in 2018 due to the provision of 4.9 billion yuan of goodwill loss and lead to loss on the basis of the company pre-disclosure of the 2019 annual report shows that the net profit of -1.05 billion yuan to -850 million yuan, has been two consecutive years of loss. 2019, the company bond trading price is also continued to dip, the lowest had fallen to 33 yuan, the market has private bond default made. "Private placement bond default made predictions. As expected, on January 20, 2020, W company announced that due to the company's liquidity constraints, the

company is unable to repay the bond resale payment and the interest on the unsold portion of the resale as scheduled.

## 4. Analysis of the Reasons for Default on W's Bonds

### 4.1. Z-score model analysis

Z-score model was proposed by the American scholar Edward Altman in 1968, which evaluates the financial risk of enterprises by analyzing multiple financial indicators of enterprises. Z-score model is a model analysis used to analyze and predict the risk of corporate bond default and convey risk warning signals to enterprises. Its expression is:

$$Z=1.2X_1+1.4X_2+3.3X_3+0.6X_4+0.999X_5 \quad (1)$$

included among these:  $X_1 = (\text{current assets} - \text{current liabilities}) / \text{total assets}$ ;  $X_2 = (\text{Undistributed Profit} + \text{Surplus}) / \text{Total Assets}$ ;  $X_3 = (\text{Total Profit} + \text{Finance Costs}) / \text{Total Assets}$ ;  $X_4 = \text{Owners' equity} / \text{total liabilities}$ ;  $X_5 = \text{Operating income} / \text{total assets}$ . A higher Z-value indicates that the financial status of the enterprise is better and the probability of bond default is smaller. Generally speaking, a Z value < 1.8 indicates that the enterprise faces greater financial risk and the probability of bond default is higher. In this paper, the financial indicators of Company W for the period of 2018-2022 are selected, and the Z-value of Company W for the past 5 years is calculated according to the Z-score model formula.

**Table 1.** Z-score model scoring results for Company W

	2018	2019	2020	2021	2022
Z	-3.0955	-1.9069	0.6910	0.5807	1.3680
X1	-0.1911	-0.3703	0.2117	0.2718	0.1516
X2	-0.5836	-0.9486	-1.5446	-1.6346	-2.2229
X3	-0.7812	-0.1322	0.1349	0.0131	-0.0897
X4	0.3764	0.1534	3.1546	3.3474	6.6070
X5	0.3032	0.2100	0.2619	0.4919	0.6305

As can be seen from the above table, the Z-value of Company W in the past five years shows an overall upward trend and a larger increase, the Z-value of Company W in 2018-2019 is lower and even reaches a negative number, the Z-value of Company W in 2020 realizes a breakthrough of 0 to reach 0.6910, which becomes the largest increase in the past five years of Company W. Z-value in 2021 declines slightly, and the increase in 2022 is larger to reach 1.3680, indicating that its financial risk is decreasing, i.e., the probability of bond default is also decreasing. In 2021, the Z-value decreased slightly, and in 2022, it increased more to reach 1.3680, gradually approaching the Z-value warning line, indicating that its financial risk is decreasing, i.e., the probability of bond default is also decreasing. However, in terms of the specific value, in the past five years, the Z value of Company W is far below 1.8, even though it shows a larger upward trend, its financial risk is still under a higher level, which becomes one of the important reasons for the default of the enterprise's bonds. The reason for its high financial risk, W company in recent years, the main business continued to shrink, the operation of the new business also failed to achieve the expected results, resulting in W company operating profit continued to appear a sharp decline in the situation, the financial situation is worrying.

## 4.2. Solvency analysis

The solvency of Company W is analyzed from the perspective of financial indicators. In this paper, the current ratio and gearing ratio are selected to measure the short-term solvency and long-term solvency of Company W in the past five years, respectively.

The higher the current ratio, indicating that the enterprise's asset liquidity is stronger, the stronger the short-term solvency, generally considered that the current ratio is more appropriate in more than 2; The lower the gearing ratio, indicating that the enterprise's assets from the liabilities of the funds accounted for a smaller proportion of the longer-term solvency, generally considered that the gearing ratio within 0.4-0.6 is more appropriate. We can know that the current ratio of Company W during 2018-2019 shows a decreasing trend and is much lower than 2, and the current ratio fell to the lowest point in 2019, which releases the signal to the outside world that the liquidity of the enterprise's current assets and short-term solvency are very poor. At the same time, it also reflects the enterprise's capital turnover problems, short-term solvency is seriously insufficient, in the case of short-term debt over pressure, the probability of bond default risk will rise sharply, which will eventually lead to the inability of W Company to pay the resale amount of bond investors at the beginning of 2020 constituting a substantial default. 2020-2022 current ratio is greater than 2, which indicates that the short-term solvency of W Company has a larger. During 2018-2019, Company W's gearing ratio was greater than 0.6, the gearing ratio was too high, and the gearing ratio rose to the highest point in 2018, indicating that Company W's asset-liability structure was seriously irrational, and it had been in a state of high leverage, and the credit risk was subsequently at a higher level. During 2020-2022, the gearing ratio showed a more obvious downward trend, indicating that Company W's long-term solvency has improved significantly, but a low gearing ratio means that the company's ability to use funds is weak, which may lead to a waste of funds and an increase in operating costs.

## 4.3. Profitability analysis

The profitability of Company W is analyzed from the perspective of financial indicators. In this paper, operating profit margin and net gearing ratio are selected respectively to measure the profitability of Company W in the past five years.

The higher the operating profit margin and net gearing ratio, the better the profitability of the enterprise. During 2018-2019, both the operating profit margin and net gearing ratio of Company W fall to negative values, the profitability indicators are abnormal, and there are serious problems with profitability as well as the ability to continue operations. The enterprise has been caught in a financial risk, and the lack of profitability prevents its ability to settle its debts, which led to a bond default in 2020, the company defaulted on its bonds, and between 2020 and 2021, operating profit margin and return on net assets increased to greater than 0, indicating that its profitability had eased. However, in 2022, both of Company W's profitability indicators fall to negative values again, and the profitability indicators are abnormal again. This shows that Company W's profitability is more unstable.

## 5. Implications of W's Bond Defaults for China's Financial Market

### 5.1. Broadening financing channels and optimizing the debt structure

Through the analysis of the financial situation of Company W, it is found that its debt repayment ability and profitability are characterized by high volatility and high risk, and there is a greater risk of bond default, which is also the most critical reason for the bond default problem of Company W in 2020. Therefore, the company should correctly examine its own development ability, broaden financing channels, reasonably control the scale of debt, and improve the efficiency of the use of funds. It needs to do: first, the company should break the limitation of

over-reliance on external financing and prioritize internal financing activities that are flexible and have low financing costs. In addition, enterprises can also broaden financing channels with the help of financial leasing, letters of credit, the introduction of strategic investors and other ways. At the same time, it can promote asset securitization, and actively open up all channels such as the use of various parties; secondly, enterprises should avoid the short-termization of debt financing, appropriately increase the proportion of the company's long-term liabilities, optimize the structure of the enterprise's liabilities in order to improve the liquidity of funds, to avoid a large number of debt centralized Enterprises should pay attention to their own debt-related indicators, according to the actual situation of the company and the industry to set the relevant debt indicators threshold, and track the dynamic changes in the indicators, predict the indicators break through the critical value of the point in time to make timely debt warning to prevent the risk of bond default.

## 5.2. Improvement of corporate governance mechanisms and information disclosure levels

The non-operational appropriation of funds by the actual controller of Company W was the trigger for the breakage of its capital chain, while the overloading of related guarantees and the involvement in too many lawsuits exposed the many problems in Company W's corporate governance and internal control. In the final analysis, the healthy development of a company is inseparable from the perfection of its own governance mechanism. Need to do: first, optimize the shareholding structure, realize the fairness and transparency of the company's business decision-making, approval and implementation , to avoid the phenomenon of one-share dominance; second, the company needs to improve the internal control system to ensure that the binding force of the company's management, and to prevent the actual controller from using their own rights, overriding the internal control by virtue of their own will to manipulate the company, so that the internal control system is virtually null and void. Thirdly, external independent directors and internal supervisory boards should pay attention to the assessment and supervision of the management, focusing on whether the decision-making on major matters such as guarantees in the name of the company and related transactions are strictly implemented in the relevant procedures, and whether there is the phenomenon of implementation before approval.

## 6. Conclusion

To sum up, China's bond default phenomenon every year the frequency of high and has been showing a rising trend, W company's bond default is a typical example, this article after a detailed analysis of internal and external risks of W company found that W company has serious debt crisis, debt structure is unreasonable, coupled with the external financing environment tension, led to the phenomenon of bond default.

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