

Empirical Analysis on the Financial Risk of Strategic Enterprises Based on Logit Model

Ming-Guo ZHANG^{1*}, Cheng-Gang LI¹ and Di WANG¹

¹Faculty of Finance, Guizhou University of Finance and Economics, Guiyang, 550025, China
1219753565@qq.com

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Abstract. In economic development, some strategic enterprises in China have a serious surplus of inventory. They fall into financial crisis. In order to reveal the causes of the financial crisis, this paper established Logit model with 757 company samples and 10 indicators as explanatory variables. At the same time, based on the regression results of Logit model, this paper analyzed the financial measures of state-owned enterprises and private enterprises in the face of financial crisis. Empirical results show that strategic enterprises' operating leverage and financial leverage have a significant impact on its financial risk. In addition, facing the financial crisis, state-owned enterprises and private business will significantly reduce the asset liability ratio. At the same time, state-owned enterprises will significantly reduce its fixed assets ratio. But improving the ability of gaining profit is not the first choice to work out of financial distress for them.

Introduction

In the current context of "destocking" and the reforming of state-owned enterprises, financial distressed enterprises have become the focus. This paper established Logit Model to analyze the main factors that make the strategic enterprise fall into financial risk and in-depth studied the measures that enterprises take to go out of financial distress. The paper provides a method of evaluating strategic enterprises's financial risk. These studies are of great significance for state-owned enterprise reforming and enterprise integration in China.

Logit Model is a nonlinear analysis method of statistics and solve the problems where dependent variable are as qualitative indicators. Altman (1968) [1] analyzed the factors that make enterprise fall into financial risk by building the multivariate linear model. Ohlson (1980) [2] established the Logit Model which can predict financial crisis and gave the conditions for the validity of the MDA method. Jones and Hensher (2004) [3] established a mixed Logit Model to research financial risk for the first time. G.Q. ZHANG and S.L. LIU (2005) [4] established the financial risk evaluation system of commercial banks with cluster analysis, multivariate discriminant and Logit Model. S.N. WU and X.Y. LU (2001) [5] studied the effectiveness of financial risk assessment by using Linear discriminant analysis, multiple linear regression analysis and Logit regression analysis and they thought that the Logit model was the most effective. H.Q. FANG and Y. ZENG (2004) [6] believed that the prediction accuracy of Logit Model had something to do with the evaluation system.

Although experts and scholars have given a lot of valuable conclusions from their own perspective, most studies only established a model to evaluate the financial risk and tested the prediction accuracy of the model. They have no further analysis of the measures that the

companies take to get rid of the financial difficulties. This paper establishes Logit model and give an empirical analysis on the financial risk of strategic enterprises. Then the paper gives the comparison and analysis of the financial measures that the state-owned enterprises and private enterprises take in the financial crisis. At last, the article puts forward some suggestions for enterprises to prevent financial risk.

Model Building

Logit Model Introduction

Logit model uses maximum likelihood estimation method to estimate the parameters. We assume that P represents the probability of the occurrence of the financial crisis and X represents the explanatory variables that can make companies fall into financial difficulties. The relationship between P and X is as follows:

$$P = \frac{\exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)}{1 + \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_k x_k)} \quad (1)$$

In the model (1), the β represents the coefficient of X and the exp represents exponential function. The occurrence probability of financial crisis prediction is regarded as a dummy variable problem. In this article, in order to quantify whether the enterprises fall into financial crisis, we take the number 1 when the listed companies are in financial crisis; otherwise, we take the the number 0. In the model (1), the larger the P is, the more likely the company is in financial crisis. We take 0.5 as the critical value of the probability enterprise falling into financial crisis.

The assumptions of Logit model is looser. At the same time , the Logit model doesn't demand standard distribution of the data. The data's quality of listed companies is not high and scarce in China. In theory, the Logit model is appropriate to analyze the financial risk of listed companies in China.

Sample Selection

With significant technological breakthrough as the foundation, strategic emerging industries lead the whole economic and the social long-term development. These industries have the following characteristics: knowledge and technology-intensive, less consumption of material resources, big growth potential and good comprehensive benefit. The strategic emerging industries can be divided into seven areas such as energy saving, new generation of information technology, biotechnology, high-end equipment manufacturing, new energy, new materials and new energy vehicles. In this paper, the listed company declared ST is as a symbol of the financial crisis. According to the characteristics of strategic emerging industries and "industry classification guidelines for listed companies" revised by China Securities Regulatory Commission in 2012, this paper selects 757 samples from Shanghai and Shenzhen Stock Exchanges, including 101 companies which are declared ST.

Using relevant financial indicators in 2008-2015 as explanatory variables, this paper does Logit regression analysis with stata12.0 software. The data is from the database of Guo Tai'an (CSMAR).

Index Selection

There are many factors that can affect the financial situation. They can be divided into financial and non-financial factors. Financial factors mainly include corporate solvency, profitability, operation ability, growth ability and the composition of assets, etc. However, it is hard to collect non-financial factors and there is no uniform quantitative criteria. Therefore, this paper mainly adopts the financial indicators in the enterprise financial risk measurement mode. This paper selects 10 indicators to build model such as the current ratio, asset liability ratio, inventory turnover, accounts receivable turnover ratio, operating income growth rate, total asset growth rate, net assets return rate, fixed assets ratio, whether the rate of net profit is negative, whether the owner's equity is less than the registered capital. These indicators were expressed by C1, C3, Y1, Y2, S1, S2, ROE, G1, SN, SZC.

Empirical Analysis

Empirical Analysis of Strategic Enterprises without Nature of Equity Division

Multicollinearity test. Before making regression analysis of the data, we need to do a multicollinearity test to the index. If VIF (variance expansion factor) is less than or equal to 10, it indicates that there is no serious co linear problem between independent variables and other variables.

Table 1. Multicollinearity test results.

Variable	VIF	1/VIF
SZC	1.08	0.9249
SN	1.07	0.9318
C ₃	1.07	0.9327
G ₁	1.04	0.9603
S ₂	1.01	0.9861
ROE	1	0.9966
S ₁	1	0.9989
Y ₁	1	0.9990
Y ₂	1	0.9992
Mean VIF	1.03	

As can be seen from Table 1, the VIF of 10 explanatory variables which we select in this article are all less than 10, which shows that there exists no collinearity problem between variables.

Model Estimation

Table 2. Model estimation results.

Log pseudo likelihood =-450.574	Wald chi2(10) =182.2	
Prob > chi2=0	Pseudo R2=0.3188	
st	Coef.	Std. Err.
C1	-0.0588	0.0948
Y1	-0.0036*	0.0022
Y2	-0.0000	0.0000
S1	0.0055**	0.0025
S2	0.0966**	0.0484
G1	3.5819***	0.8500
C3	2.5339***	0.5742
ROE	-0.0014	0.0054
SN	1.1586***	0.2469
SZC	1.3671***	0.3198
_cons	-3.0035***	0.4336

Note: ***, **, * indicates that the level of 1%, 5%, 10% is significant

The Model Explanation. As can be seen from Table 2, the explanatory variables are significance at the 1% level, the value of Pseudo R² is big and the model has strong interpret ability. The coefficients of fixed assets ratio and asset liability ratio are positive and big and significant at the 1% level. It shows that these two indicators have a positive impact on the probability of the company's financial crisis. The larger corporate fixed asset ratio or asset liability ratio is, the greater the likelihood of a company's financial crisis is. These two indicators also are known as operating leverage and financial leverage. Speaking from theory, the higher the leverage ratio of the enterprise is, the greater the financial risk is. The coefficients of operating income growth rate and total assets growth rate are positive, small and significant at the 5% level. The coefficients of SN and SZC are big and significant at the 1% level, which shows that these two indicators have a greater impact on the probability of corporate financial distress. These two indicators are an important reference for China Securities Regulatory Commission to carry out special treatment about listed companies. Current ratio, inventory turnover, accounts receivable turnover ratio and net asset return are not significant at the 5% level, having no strong ability of explanation on the enterprise financial crisis.

Empirical Analysis of Strategic Enterprises with Nature of Equity Division

State-owned enterprises have more resources and spin space than private enterprises in the face of financial crisis. We divide ST companies into state-owned enterprises and other types of enterprises according to the nature of the equity division. Private enterprises account for the majority of other types of enterprises. So we use private enterprises to represent other types of enterprises. From 2008 to 2015, the number of state-owned strategic emerging enterprises declared ST is 56, accounting for 55% of all the companies declared ST.

Taking into account the significant impact of fixed assets ratio and asset liability ratio on financial risk, we need to know whether the two indexes are significantly different before and after the listed company remove "ST". Then we can analyse the financial measures that strategic emerging enterprises take in the face of financial crisis. In addition, this paper studies whether listed companies' profitability will be improved significantly after removing "ST". Due to the profitability of enterprises can be influenced by the external economic environment easily, we are not able to directly compare different periods' profitability index. We measure this with the absolute growth of profitability. Specific steps are as follows: Firstly, we will call the year when enterprises take off "ST" as $t = 0$, the year before $t=0$ as $t = -1$, the next year after $t=0$ as $t = 1$, and so on. In order to reduce the influence of extreme value, we will respectively conduct the Mann-Whitney median difference examination between the value of fixed assets ratio of companies removing "ST" at $t = 1, t = 2, t = 3$ and the value at $t = 0$. Also, we respectively conduct the Mann-Whitney median difference examination between the value of asset liability ratio of companies at $t = 1, t = 2, t = 3$ and the value at $t = 0$. Next, we will create the first data cluster by respectively using the value of return on net assets of companies removing "ST" at $t=1, t=2, t=3$ minus the value at $t=0$. Then, we create the second data cluster by using the value of return on net assets of companies removing "ST" at $t=0$ minus the value at $t=-1$. Finally, we conduct the Mann-Whitney median difference examination between the data sets in the first cluster and the data sets in the second cluster. Of course, the companies have been divided into state-owned enterprises and private enterprises. Inspection results is shown in Table 3, Table 4 and Table 5:

Table 3. Mann-Whitney tests of asset-liability ratio.

	State-owned enterprises				Private enterprises			
	t=0	t=1	t=2	t=3	t=0	t=1	t=2	t=3
Asset-liability ratio (median)	0.581	0.475	0.468	0.363	0.449	0.392	0.325	0.323
Mann-Whitney test (Prob > z)		0.08	0.05	0.04		0.262	0.036	0.005

Table 4. Mann-Whitney tests of fixed assets ratio.

	State-owned enterprises				Private enterprises			
	t=0	t=1	t=2	t=3	t=0	t=1	t=2	t=3
Fixed assets ratio (median)	0.254	0.142	0.115	0.104	0.052	0.047	0.025	0.020
Mann-Whitney test (Prob > z)		0.035	0.011	0.088		0.423	0.179	0.129

Table 5. Mann-Whitney tests of ROE D-value.

	State-owned enterprises				Private enterprises			
	t ₀ -t ₋₁	t ₁ -t ₀	t ₂ -t ₀	t ₃ -t ₀	t ₀ -t ₋₁	t ₁ -t ₀	t ₂ -t ₀	t ₃ -t ₀
The difference value between the two phases of ROE (median)	-0.01	-0.02	-0.01	-0.00	-0.00	-0.01	-0.01	0.01
Mann-Whitney test (Prob > z)		0.37 4	0.96 0	0.84 3		0.85 2	0.90 0	0.53 8

From the above tables, we can safely draw the conclusion: After removing "ST", state-owned enterprises' fixed assets ratio decrease significantly, while private enterprise' fixed assets ratio was not significant; the asset liability ratio of state-owned enterprises and private enterprises both decrease significantly; the return on net assets of state-owned enterprises and private enterprise have no obvious change. Therefore, in the event of a financial crisis, listed companies all reduce the asset liability ratio, state-owned enterprises will reduce fixed assets ratio significantly. At the same time, Whether it is state-owned enterprises or private enterprises, to improve their competitiveness in order to increase the income is not the main measure to get rid of the financial difficulties.

Conclusion and Suggestion

This paper establishes Logit model with 757 listed company and 10 financial indicators , using financial information from1998 to 2015. And then this paper analyses the factors that affect strategic emerging enterprise financial situation. We conduct median difference tests respectively between the absolute growth of the assetliability ratio, fixed assets ratio , return on equity after removing "ST" and current observations of those enterprises removing "ST". Study results show that strategic emerging enterprise financial risk is mainly caused by the enterprise investment in fixed assets and leveraging. Therefore, enterprises should combine their own strategic development goal with the financial risk. Also, companies should control the financial risk in a reasonable range. The consequences will be very serious to pursue development to have excessive investment in fixed assets and leveraging. Finally companies will not only face with the threat of delisting, but also spend a lot of money and manpower to get rid of financial difficulties.

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