

Impact of Default Distance on Financial Warning of Listed Companies

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Abstract:

Distance to Default is a measure of credit risk based on stock trading data. According to the result, the default distance can improve the goodness of fit and forecasting ability of the financial early-warning model, but the improvement effect is limited. And with the increasingly fierce market competition, the impact of financial risk on the survival and development of enterprises is also growing. Modern enterprises must fully understand the causes of financial risks, establish and improve risk control mechanisms, prevent and resolve various financial risks in the development of enterprises, To ensure that the development of enterprises toward a reasonable, scientific and healthy direction.

Keywords: default distance, financial crisis, financial warning

1. Introduction

Because of the impact of the international financial crisis is still fermenting. Most companies are caught up in difficult operating conditions due to the financial crisis, and the dilemma of doing business has led many corporate companies to go bankrupt. Examples are too numerous to mention. It is more and more important for the listed company managers and managers know how to identify the potential risks in advance and then analyze the risks to control the risks. Financial early warning analysis refers to analyzing the enterprise financial statements and related operating data, Use data management and financial data to inform the business operators and other stakeholders in advance about the dangerous situation the enterprise is facing, and analyze the possible causes of the financial crisis and the problems hidden in the financial operation system of the enterprise, in advance to make preventive measures.

In 1938, Secrist used only the balance-sheet ratio, to measure the difference between failing banks and normal banks. And the earliest financial warning research goes back to Beaver (1966), who has first use the statistical methods to establish a single variable financial early warning model and found the forecast accuracy can reach to 87%. And then Altman (1968) introduced multiple linearity determination models into financial early warning research. Finally, he got the prediction equation contains five discriminant variables, namely the famous Z-Score model, and the accuracy of the model up to 95%. But Martin (1977) thought that the Z-score model can only judge whether the sample company has a crisis of financial failure and can not measure the probability of its occurrence. The current assumptions are too much so it difficult to meet. To this end he set up early warning model of corporate financial crisis by Logistic regression analysis, and finally found that only 6 out of 25 financial ratios have strong predictive ability. Next, Ohlson (1980) used the probability model to analyze financial distress prediction problem, and his research has been up to the correct rate of 96.12%. Based on the five variables of Z model in 1990, Odom & Sharda used neural network construction model to predict bankruptcy. The research shows that the training samples have a 100% accuracy rate, 81.75% of the enterprises that retain the sample failed, and 78.18% of the companies that retain the normal sample. It can be seen that the neural network has strong financial forecasting ability.

With the introduction of non-parametric methods such as artificial intelligence, foreign financial early warning research shows a multi-angle development trend.

As time went by, some scholars put default distance as a variable into the financial alert model, intended to improve the information content and effectiveness of the model. And default distance is one of the output results in KMV credit risk measurement model. Which refers to the standard deviation of the market value in the assets of the enterprise within a certain period of time from the book value of the liabilities. And this metric measures the extent to which companies can not repay their debt on time, directly related to the underlying meaning of the financial crisis.

Li Wubing and Xu Junbin (2003) added credit risk variables such as breach of contract to traditional financial ratio variables, and used Logit and ANN models to build a financial early warning model, and use it to examine the inclusion of credit risk variables one year and two years before the financial crisis. To examine the inclusion of credit risk variables whether can significantly improve the predictive power of the model or not. The results of this study show that credit risk variables reduce the overall sample prediction accuracy, but make the verification sample prediction accuracy to improve.

This article will based on the financial data and transaction data of Busan Special Steel, and builds a

financial early-warning model for listed companies with financial indicators and default distance, and explores the role and effect of breach distance in the financial early-warning model.

2. The theoretical basis of default distance

The theoretical basis of default distance is the option pricing theory, which is an evaluation technique to estimate the expected value of the underlying financial assets during the validity of the option under uncertain conditions. In 1973, Black and Scholes first pointed out that shareholder's equity is a call-value option based on the value of the company. Supposing that the stock price behavior pattern is a stochastic movement following the Wiener process and under a series of assumptions, next, they derived the option pricing model. (Altman, 1968)

In 1974, Robert C. Merton published an article titled "Pricing for Corporate Debt." He used the option pricing model to solve a firm's pricing problem.

3. Model and research methods

In view of the characteristics of the financial crisis forecasting and the frequency of related research, this paper selects the multivariable Logistic regression model as the target model.

$$\text{Logit } P = \ln \frac{P}{1-P} = U_0 + \sum_{i=1}^n U_i x_i + X$$

Logit P is the likelihood ratio, Logistic regression is the dependent variable. Describe whether a listed company is in a financial crisis as a two-value quality variable, a company with financial crisis as 1, and a company without financial crisis as 0. U_0 is the intercept term, X_i is a specific predictor, U_i is the regression coefficient, X is the residual term.

In this paper, we study the role of default distance in the financial early-warning model. The specific research methods are as follows: Select the research samples from Chinese listed companies, construct the Logistic regression model with typical financial indicators as predictors, then introduce the default distance as a new variable (Yotzov, 2014) The Logistic regression model which combines the financial indicators with the default distance; and compares the goodness of fit and the forecast effect of the two models to find out the role of default distance indicators in the financial early-warning model.

4. Sample selection

As the default range of the forecast range of one year, it is necessary to select the financial year before the financial crisis as the forecast data. (Pan B & Ling F, 2012) For the model, there is a function similar to the sign function between the dependent variable and the profitability indicator: $\text{Logit } P = 1$ when net profit < 0 , and $\text{Logit } P = 0$ when net profit > 0 . The use of profitability indicators as predictors has no meaning, as it is itself a direct basis for dependent variables. (Kurz-Kim, 2012) This paper selects five types of financial indicators that do not include profitability indicators, trying to reflect the characteristics of the phenomenon of financial crisis. Each type of financial indicators contains three kinds of alternative indicators, select a high level of significance and other indicators of the same type of strong correlation of indicators, as a representative of the typical indicators into the model.

5. Research methods

● significance test

In order to find out the index that can distinguish the crisis company and the normal company, Inventory Turnover (X11), Accounts receivable turnover (X12), Total Asset Turnover (X13), Current Ratio (X21), Quick ratio (X22), Working capital proportion (X23), Short-term borrowings (X31), Asset-liability ratio (X32), Multiples of interest earned (X33), Other receivables (X41), Other payables (X42), Accounts receivable (X43), Sales Cash Ratio (X51), Cash inflow ratio of operating activities (X52), Cash Flow Debt Ratio (X53), Default distance (X6), 16 indicators were tested for the mean between groups. (Tian, 2008) First, the Kolmogorov-Smirnov method is used to explore the normality of each index. Then, the significance test method is selected based on the normality test results. The test results show that most of the indicators do not meet the normal distribution should be used non-parametric significance test. (Liu & Wang & Zhang, 2005)

Indicator M-W U Significance test results

Indicators	M-W U	p	Indicators	M-W U	p
X11	1352	0.026	X41	680	0.000
X12	1147	0.001	X42	1133	0.000
X13	850	0.000	X43	1762	0.842
X21	573	0.000	X51	1233	0.004
X22	760	0.000	X52	1685	0.546
X23	622	0.000	X53	1055	0.000
X31	755	0.000	X6	918	0.000
X32	587	0.000			
X33	462	0.000			

Non-parametric method tests showed that most of the indicators passed the test at a significant level of 0.001, indicating that these indicators have economic connotations that reflect different financial conditions. According to the significance level, X13 and X53 become the selected variable of the classification. It is worth noting that the difference in default distance between groups is very significant, indicating that it is feasible to introduce the model as a variable. (Tan, 2005)

● Correlation test

According to the table the three indicators of liquidity ability, the three indicators of debt-servicing ability and the two indicators of earnings management are of the same significance level. (Tsai, 2013) It is necessary to further examine the relevance of the indicators within the category to determine the selected variables.

Based on the degree of correlation between the indicators within the class, X21, X32 and X41 have strong representative to be selected as model variables. At this point, the typical primary financial indicators selected include X13, X21, X32, X41 and X53, together with the default distance X6, constitute the model predictive variables.

6. Logistic regression model after the default distance was introduced to predict the result

The introduction of default distance in the model did not significantly affect the regression coefficients of financial indicators, and the regression coefficients of financial indicators and Wald test probabilities showed only slight changes. The default coefficient is -0.654 in the new regression equation, which is negatively correlated with the probability of crisis, indicating that the listed company with a small default distance is more likely to have a financial crisis, which agrees with the economic meaning of default distance itself. (Barisik, 2010)

The default distance is close to the asset-liability ratio (X21) but lower than the other four financial indicators. After the introduction of default distance, Logistic regression model to predict the correct rate was 85.8%. The introduction of default distance can improve both the goodness of fit and the forecasting effect of Logistic regression models. Because the default distance can provide information that financial indicators can not reflect, which helps to improve the information content and effectiveness of the financial early warning model. (Andreica, 2013) However, the default distance has a limited role in the Logistic regression model, Logistic regression model increase the default distance predictor variables, still can not has a substantial change in the goodness and prediction of the effect yet.

7. Conclusion

The default distance based on the stock transaction data can improve the explanatory power and forecasting ability of the financial early-warning model. However, this index has a weakening effect on the information content of the financial early-warning model and can not produce significant positive impact, in goodness of fit and the forecasting effect of the model.

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