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The Influence of Non-Financial Factors on Financial Risk Prediction

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ABSTRACT. In order to analyse the factors that affect corporate financial risk prediction more comprehensively, this paper analysed related indicators of listed companies in China, then introduced non-financial variables such as market, macroeconomics, and managerial education into the financial risk prediction model. Finally used the classification and regression tree (CART) method in machine learning to establish a corporate financial risk prediction model. Compared with the financial risk prediction method that only considers financial variables, the prediction model proposed in this paper has higher accuracy. In addition, this paper verified that the financial risk prediction model has an industry effects, that means the model needs to consider the impact of different industries when it is applied.

KEYWORDS: Financial risk prediction, Non-financial variables, Cart, Industry effects

1. Introduction

Risk prediction is one of the most concerned topics for the survival, operation and development of enterprises, and financial risk is the direct result and ultimate manifestation of a series of risks. Therefore, effective financial risk prediction can not only protect the interests of investors and creditors, but also help business operators prevent risks, and even has important practical significance for the management department to monitor the quality of listed companies and the risks of the securities market. However, in the research of corporate financial risk prediction, most research only considers risks from the perspective of corporate internal financial factors, and only selects relevant financial indicators to study the impact of financial factors on risk prediction, ignoring the consideration of non-financial factors. The forecast result is not accurate.

The current research on topics related to financial risk forecasting lasts for a century. In 1932, Fitzpatrick [1] based on the analysis of the unary model, proposed that the two financial indicators of equity-to-debt ratio and equity net interest rate had a higher ability to judge financial risks. In 1968, Altman [2] used multivariate analysis to forecast and significantly improved forecast accuracy through five financial indicators. Since then, many studies have continued to improve financial indicators, and the research methods have also undergone a statistical analysis process from single to multiple, and from statistical models to artificial intelligence methods. In 2001, Shumway [3] began to study factors other than finance and concluded that market factors had an impact on the corporate crisis. Perhaps due to the few non-financial factors that can be quantified or the national conditions of different countries, there are far more scholars studying financial variables than non-financial variables. Although some scholars such as Maciej Ziba et al [4]. have made innovative breakthroughs in the study of financial early warning models in 2016, they proposed a highly accurate model based on synthetic characteristics to predict crises, but they are still based on financial indicators. Consider the influence of industry and macro factors.

Aiming at the problems existing in the current research status, this paper comprehensively explores the influencing factors of financial risk prediction from both financial and non-financial perspectives. On the basis of financial factors, considering factors such as the market, macroeconomics, and manager's academic qualifications, we collected data from 2,591 listed companies in China, and then studied the financial risk classification characteristics of these listed companies and used the CART decision tree method in machine learning. The influence of non-financial factors and industry effects on the accuracy of financial risk forecasting is studied, and finally a new model that considers more comprehensive financial risk predicting is obtained. The overall framework shown in Figure 1:

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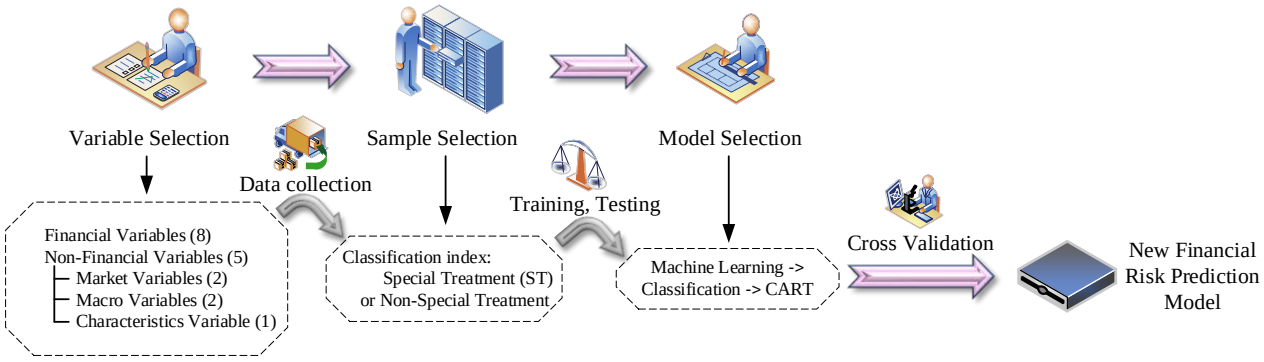

Fig.1 Overall Framework

2. Method

2.1 Variable Selection

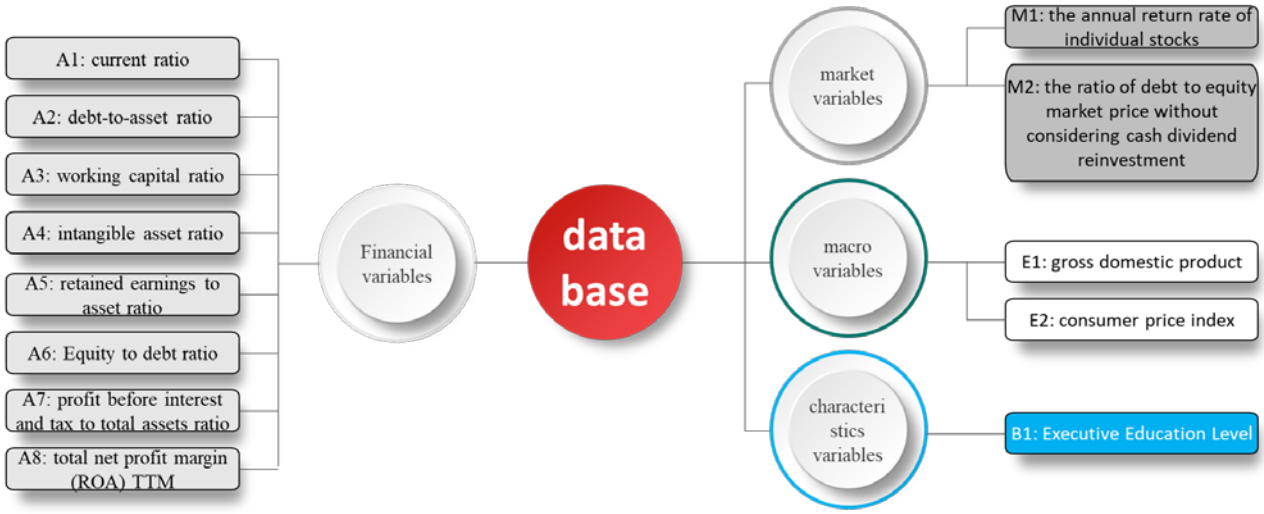

Fig.2 Variable Types Selected in This Paper

Considering the scientific validity of the selected variables, in the model, we adopt several groups of different variables for research. First of all, most of the variables selected in this paper are classical variables adopted by many scholars. Altman's variables are described in detail in [5]. This paper is based on two papers[5] [6]. The accounting variables selected are as follows (symbols are A1-A8): current ratio, debt-to-asset ratio, working capital ratio, intangible asset ratio, retained earnings to asset ratio, Equity to debt ratio, profit before interest and tax to total assets ratio, total net profit margin (ROA) TTM. The market variables under consideration of non-financial factors are as follows (symbols are denoted as M1-M2): the annual return rate of individual stocks and the ratio of debt to equity market price without considering cash dividend reinvestment. At the same time, taking into account the national conditions of each country and the relevant factors of data acquisition, the macro variables are selected as follows (symbols are denoted as E1-E2): gross domestic product (GDP), consumer price index (CPI). Finally, this paper studies the impact of corporate executives' educational background on corporate risk prediction, and selects the characteristics variables as follows (symbol marked as B1): executive education level. All variables are shown in Figure 2:

2.2 Sample Selection

This paper selects a total of 2,591 listed companies from the CSMAR as the research sample. Among them, according to the 2012 edition of the China Securities Regulatory Commission, we select manufacturing and high-tech industries (including information transmission, software and information technology service industries, scientific

research and technology Services) data for two industries. The following will explain in detail the problems and basis of data selection from several aspects:

When studying risk prediction, the companies studied are different, so is it more reasonable to select small and medium-sized enterprises as the sample or large listed companies? On this topic, many scholars have conducted research. Paul [7] used a large number of small and medium-sized data to conduct research and found that predicting the failure of large companies is better than predicting the failure of small and medium-sized companies. Failure is easier. Obviously, it is reasonable for this paper to use listed company data for research, because most of the SME data in this study have not been audited, so the data is not reliable.

The reason why this paper selects data from two industries for research is mainly because risk forecasts need to consider industry effects. Prior to this, most of the forecasting model data did not take into account the problem of model validity caused by different industries, for example [2] did not select data according to industry and scale differences, which made the bankruptcy group choose not Science, bankruptcy and non-bankruptcy groups are not completely in the same industry, they are not comparable, and the conclusions are not highly credible. In related studies[8], support the importance of industrial influence to corporate risk. Therefore, this paper selects manufacturing industries with a large amount of data and high-tech industries with high risks and high returns as samples for research on issues related to industry effects.

According to the characteristics of listed companies in China, we select ST company data and non-ST company data as the criteria for judging whether the company has risks. ST means special treatment. The net profit of a listed company is negative or the equity per share is lower than the par value of the stock is the main reason for being marked as ST shares, but there are other special treatments, for example, the company's compensation amount exceeds the net assets due to litigation. 50% of the value or other abnormal circumstances identified by the China Securities Regulatory Commission, these circumstances are non-financial factors. Therefore, financial risk is actually a financial dilemma caused by financial and non-financial factors, that is, financial distress is equal to financial risk, which is the final result of various factors. Therefore, this paper also uses ST as a measure of whether a company has financial risk. The purpose of the indicator is to study the influence of non-financial factors on financial risk.

2.3 Model Selection

Since the nature of financial risk prediction in this paper is a classification problem, and according to a systematic review of bankruptcy models [9], the characteristics and comparison of various tools are introduced in detail, so this paper selects CART Decision tree as a modeling method. It uses a completely different method from traditional statistics to construct prediction criteria, and is given in the form of a binary tree, which is easy to understand, use and explain.

This paper marks ST companies and non-ST companies as 0 and 1, and considers that most studies use a 1:1 ratio to select two sets of data, which exaggerates the sample frequency of special treatment companies. This ratio ranges from 1.5% to 50%. Therefore, this paper uses the actual proportion of data on the market to select samples. First use most of the sample data as the training set, and then use the remaining samples as the test set to verify the accuracy of the model. The results of related cross-validation are introduced in the next section.

3. Experiment

The results of this experiment are divided into two parts. In the first part, three groups of experiments are carried out: Group I only considers the influence of accounting variables on the model prediction; Group II adds market and macroeconomic variables to Group I; Group III On the basis of Group II, the factor of manager’s educational background is added. The second part is to study the sample data of different industries. Group IV and Group V both use the variables of Group III. Under the premise that other factors remain unchanged, Group IV uses sample data from high-tech industries, while Group V uses data from manufacturing companies for research. The results of five groups of experiments in two parts are shown in the following table 1:

Table.1 10-Fold Cross-Validation Result of Cart Model

Group	Select Variable (Variable Symbol)	Industry	Non-ST Accuracy (%)	ST Accuracy (%)
I	A1-A8	High-tech industry + Manufacturing	87.98	71.25
II	A1-A8, M1-M2, E1-E2		92.26	75.00
III	A1-A8, M1-M2, E1-E2, B1		92.66	76.67
IV	A1-A8, M1-M2, E1-E2, B1	High-tech industry	94.83	73.33

V		Manufacturing	88.75	79.44

It can be seen from the above table that the non-ST prediction accuracy rate of group III is 4.68% and 0.4% higher than that of group I and group II, and the non-ST prediction accuracy rate of group III is higher than that of group I and group II, respectively. 5.42% and 1.67%. It shows that on the basis of accounting variables, considering market and macroeconomic factors can make the risk prediction model perform better. The difference between the results of the IV group and the V group is more than 6.08%, which shows that under the premise of certain variables, the performance of the prediction model in different industries is different.

4. Conclusion

This paper focuses on the subject of financial risk prediction, and designs a complete set of processes in the financial risk prediction model from data acquisition, variable selection, model methods, and accuracy verification. The influence of market, macro-economy and manager's educational background factors on corporate financial risk prediction is studied, and the CART decision tree method of algorithm model suitable for prediction research is adopted. With the help of a large number of sample data training and verification models, a financial model with good accuracy is obtained. Risk prediction model.

At the same time, this paper also has the following enlightenment: in the process of financial risk forecasting and analysis of enterprises, on the one hand, the influence of non-financial factors should be considered on the basis of traditional financial factors, such as the influence of market and macroeconomic factors studied and verified in this paper. On the other hand, the industry effect is also a factor that cannot be ignored in the study of this topic. When conducting financial risk forecast analysis in different industries, it is necessary to combine the actual situation of the industry and control all factors in order to ensure that the company and stakeholders Benefits enable enterprises and even the country's economy to develop steadily.

References

[1] Fitzpatrick P. A comparison of Ratios of Successful Industrial Enterprises with Those of Failed Firms. Certified Public Accountant, pp.598-605,656-662,727-731. October, November and December, 1932.

[2] Altman, E. I. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. The Journal of Finance, Vol.23, No.4, pp.589-609, 1968.

[3] Shumway, T. Forecasting bankruptcy more accurately: A simple hazard model. Journal of Business 74, pp.101-124, 2001.

[4] Ziba M, Tomczak S K, Tomczak J M. Ensemble boosted trees with synthetic features generation in application to bankruptcy prediction. Expert Systems with Applications, pp.58, 2016.

[5] Altman, E. I. Corporate Financial Distress and Bankruptcy: A Complete Guide to Predicting and Avoiding Distress and Protting from Bankruptcy (John Wiley and Sons, Inc., New York), 1993.

[6] Dietrich J R. Discussion of Methodological Issues Related to the Estimation of Financial Distress Prediction Models. Journal of Accounting Research, Vol.22, No.83, 1984.

[7] Pompe P P M, Bilderbeek J. Bankruptcy prediction: the influence of the year prior to failure selected for model building and the effects in a period of economic decline. Intelligent Systems in Accounting Finance & Management, Vol.13, No.2, pp.95-112, 2010.

[8] Berkovitch E, Zender I J F. The Design of Bankruptcy Law: A Case for Management Bias in Bankruptcy Reorganizations. Journal of Financial & Quantitative Analysis, Vol.33, No.4, pp. 441-464, 1998.

[9] Alaka H A, Oyedele L O, Owolabi H A, et al. Systematic Review of Bankruptcy Prediction Models: Towards A Framework for Tool Selection. Expert Systems with Applications, No.94, pp. 164-184, 2017.