

Introduction of Credit Risk Evaluation Method for Technology-Based SMEs in China

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Abstract

At present, the existing academic literature on credit risk evaluation models or methods focuses mainly on large and medium-sized enterprises, but there are less researches on the emerging small and medium-sized enterprises of science and technology industry, and there are many risk evaluation models but their applicability needs to be further tested and evaluated. In this paper, it provides an idea of credit evaluation mechanism based on Gray Relation Analysis (GRA) and Support Vector Machine (SVM) model, and construct a credit risk evaluation method to help better provide financing for SMEs and solve related financing difficulties.

Keywords

SMEs, Credit Risk, Grey Relation Analysis, Support Vector Machine, Risk Management.

1. Introduction

Many small and medium-sized enterprises (SMEs) in scientific and technological area are characterized by high research and development costs, therefore many of them generally face financing difficulties. Although the government has adopted a series of policies to support them, such as the successive establishment of technology sub-branches of banks. However, just like commercial banks who provide credit services to other enterprises, banks' technology sub-branches are still using the traditional credit evaluation methods of large enterprises when evaluating the credit risk of technology-based SMEs, thus easily overestimating the credit risk of technology-based SMEs with characteristics such as high growth and high risk, ten resulting in many technology-based SMEs facing a huge shortage of funds. Therefore, in order to break the financing dilemma faced by technology-based SMEs, it is essential to construct a reasonable and targeted credit evaluation method.

2. Literature Review

Scholars in China and abroad have rich research results on credit risk evaluation, which has the strong theoretical guidance significance. Many new quantitative and analytic methods and assessment models have emerged in the field of risk measurement and management research, such as fuzzy neural networks, gray relation analysis (GRA), statistical learning theory (SLT), support vector base (SVM), etc. For example, Wang(2011) constructed a corporate credit assessment model based on gray relation projection tracking. Qian (2015) construct a credit risk evaluation system for technology-based SMEs under the investment linkage model from their own characteristics to provide a theoretical basis for further development of investment business. Sardo& Serrasqueiro (2018) studied the LS-SVM-based credit evaluation model under sample conditions, gave explicit formulate for model parameters, and provided a new method for credit risk evaluation. Chi (2018) constructed a significant small business debt credit rating index system for the impact on default status through variance congruence test and R clustering. Pan et al. (2018) construct a debt credit rating model for small industrial firms based on Fisher's judgment.

Based on the analysis of the previous researches, there are the following shortcomings in the existing credit risk evaluation methods for technology-based SMEs: Firstly, the current research on credit risk evaluation methods for technology-based SMEs has less theoretical support and practical significance in terms of how such enterprises finance and how to improve their credit rating. Secondly, the credit risk evaluation methods and models have not yet reached a consensus in academic research, and most of the research lacks the design of the characteristics of science and technology-based SMEs, and lacks consideration of key factors such as the scientific research team and the transformation of scientific research results, thus the relevant evaluation is not enough to become a reference in practice, and the research still needs to be further developed and improved. Researchers should pay attention to these deficiencies and make improvements.

3. Main Research procedure

3.1. Extraction of credit risk triggers for technology-based SME

By reading the existing literature and relevant assumptions, the researcher could analyze the specific characteristics and financing status of technology-based SMEs and construct corresponding indicators such as credit risk triggers. The grey relation analysis (GRA) is used to extract the indicators that have a significant impact on financing. As there are many indicators affecting credit risk, such as loan amount, total assets of the company, etc., if all the triggering factors are taken into account when constructing the evaluation method, the credit risk evaluation method will not only be extremely cumbersome, but may also lead to a "dimensional disaster". The GRA method, on the other hand, has lower requirements on data sources, higher clustering performance, and many advantages in analyzing the relation of gray systems, with strong operability. Utilizing real data generated from SMEs companies in China could optimize the established credit evaluation method for technology-based SMEs, which can ensure the scientific validity of the model.

3.2. Construction of the GRA-SVM evaluation model and methodology

Researchers could input the important credit risk triggers which extracted from the GRA into the Support Vector Machine(SVM) model to obtain the credit risk evaluation results of technology-based SMEs; finally, the GRA-SVM model is constructed. Contemporary common credit risk evaluation models include Credit Metrics, KMV, CPV and other models, however, due to the wide distribution of credit risk samples of technology-based SMEs and the small sample size, it is difficult to satisfy the normal distribution. As a result, these models cannot be used to evaluate technology-based SMEs. On the other hand, the SVM model developed based on statistical learning theory, mainly for small sample machine learning, could be used to solve the classification problem, is an intelligent early warning method, not only there is no special requirements for sample data distribution, but also the model has many advantages such as the strong promotion ability, a high learning capacity and easy to operate. Therefore, the SVM model is more suitable for analyzing the relevant indicators and data of technology-based SMEs. Therefore, based on the above analysis, the researchers could obtain more accurate and emulation results by choosing the GRA-SVM model.

3.3. Model Testing by analyzing authentic data

In order to make the model could be used in the real world, once the model is established, the researcher can empirically analyze the technology-based SMEs in a particular technology companies center. The credit-related data of relevant enterprises are collected through questionnaire distribution or interview and the data are suitable to test the established GRA-SVM model empirically, and modify the relevant parameters of the model according to the data.

Finally, the credit evaluation risk model and method for technology-based SMEs with practical application value are obtained.

4. Future Estimate

Science and technology-based small and medium-sized enterprises are not only an important force in China's implementation of the innovation-driven development strategy and the construction of an independent innovation economic system, but also the backbone of China's industrial upgrading, promoting mass entrepreneurship and innovation, which plays a vital role in deepening supply-side structural reform and promoting economic and social prosperity. It also makes great contribution to the country's scientific and technological progress, economic growth and employment expansion. If technological innovation is the body of small and medium-sized enterprises of science and technology, then capital is blood, because the adequacy of capital determines the life and death of small and medium-sized enterprises of science and technology. Therefore, it is urgent to solve the financing difficulties of technology-based SMEs, hence the research has a strong practical application value. Secondly, the construction of credit risk evaluation methods will, to a certain extent, innovate the financing model of technology-based SMEs and improve financing efficiency. The researchers have been paying more attention to crack the financing dilemma, innovate the financing model and improve the financing efficiency, thus deepening the existing research plans and enriching the existing research results. Therefore, whether from the theoretical point of view, or from the practical point of view, the research on credit-related aspects of science and technology-based SMEs is of great significance.

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