Credit decision of small and medium sized enterprises

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Abstract: In this paper, the credit rating model of small and medium-sized enterprises is established by using the weighted credit rating model. The credit risk model is used to score the credit risk of small and medium-sized enterprises, and then it is classified into three grades after ranking. The credit risk model of sigmoid function is improved by using logistic curve (sigmoid function) to determine the allocation of credit line of each small and medium-sized enterprise. At the same time, the function model of income interest rate which reflects the loss caused by the loss rate of bank revenue customers is established, so as to determine the granting of different enterprise interest rates.

1. Introduction

At present, the scale is relatively small and the mortgage assets are insufficient, which is a common problem faced by small and medium-sized enterprises. In order to solve these problems, banks have formulated a series of credit strategies to achieve financial equality and financial service equalization by promoting the credit services of small and medium-sized enterprises, merchants and self-employed. They usually assess the strength and reputation of small and medium-sized enterprises according to the bill information, credit policies and the influence of upstream and downstream enterprises, and then provide loan services to enterprises with stable supply-demand relationship and strong strength, and determine the loan amount, interest rate and term. In the huge market economy environment, the support of this strategy is of great significance in activating the market competition vitality of credit subjects, promoting the legalization and institutionalization of credit management of commercial banks, accelerating the development of small and medium-sized enterprises, enhancing employment and improving people's livelihood.

2. Problem analysis

To discuss the credit decision-making of banks to small and medium-sized enterprises is actually to analyze the amount of credit allocated to small and medium-sized enterprises and the size of interest rate under the condition of various factors. On the one hand, it is necessary to maximize the bank & apos; s income, that is, to control the degree of customer churn in a lower range as far as possible, and let the bank charge as high as possible the interest rate. On the other hand, it is also necessary to consider the default risk of the enterprise, that is, to confirm whether the enterprise has the problem of overdue repayment and to evaluate the solvency of the enterprise. From the data, we can foresee that the profit of the enterprise, the sales revenue of the enterprise (the amount of sales), the degree of reputation, the effective bill ratio and so on will become the reasons that affect the bank to judge the enterprise credit risk, which needs us to consider.

Give information about the profitability, size and reputation of the company. Credit risk assessment needs to consider the strength and credit rating of enterprises reflected in historical data. Therefore, the quantification of credit risk can be obtained by weighting enterprise strength and credit rating. The existing data can be used for enterprise credit rating, and the analytic hierarchy process (AHP) can be used to establish a mathematical model to quantify the enterprise strength. Finally, after consulting the data to

determine the weight ratio of enterprise strength and credit rating, we can get the quantitative credit risk, and then reorder the company

3. Model establishment

Combined with the given information and financial expertise, we can calculate the profit margin, which is the measurement index of enterprise profitability, the measurement index of enterprise debt repayment ability, and the measurement index of company scale, namely, the output amount. In addition, the bad debts due to the default expectation of enterprises are also one of the factors affecting the strength of enterprises. Therefore, we choose income, profit, profit rate and bad debt rate as four measurement indicators.

The significance of each evaluation index was determined. We take income, profit, profit rate and bad debt rate as independent variables and credit rating as dependent variables to carry out linear regression to obtain the significance (P value) of each variable, and arrange the p value from small to large to get the weight order of each variable.

According to the calculation results, we set up the contrast matrix between the criterion layer and the target layer according to the 1-9 scale commonly used in AHP. We construct a pairwise comparison matrix A=(aij) 4×4, and a is a positive reciprocal matrix of order 4.

$$A = \begin{pmatrix} 1 & 3 & 5 & 8 \\ \frac{1}{3} & 1 & 4 & 7 \\ \frac{1}{5} & \frac{1}{4} & 1 & 5 \\ \frac{1}{8} & \frac{1}{7} & \frac{1}{5} & 1 \end{pmatrix}$$

In matrix A, the ratio of importance of revenue A1 to income A1 is 1:1; that of income A1 and profit A2 is 5:1; that of income A1 and interest rate A3 is 8:1; that of income A1 and bad debt rate A4 is 3:1, etc. Here, the elements in the pairwise comparison matrix are numbers on the scale of 1-9.

Consistency test is to judge the difference between the construction matrix and the consistency matrix. In general, the judgment matrix obtained from practice is not necessarily consistent, that is to say, it does not necessarily satisfy transitivity. From the theoretical analysis

It is shown that if a is an identical pairwise comparison matrix, there should be:

$$a_{ij}\, a_{jk} = a_{ik}$$

$$1 \le i, j, k \le n$$

In practice, we do not require consistency to be absolutely established, but the degree of inconsistency should be within the allowable range. We mainly consider the following indicators:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

(1) Consistency index

(2) Random consistency index: RI, usually determined by practical experience

4. Model solving

4.1 Comprehensive calculation of risk assessment of different enterprises

By calculating the weight of income, profit, bad debt rate and profit rate in the evaluation of enterprise strength, we can get the strength index of different enterprises. In addition, credit rating is also a very important part of measuring credit risk. We evaluate the risk of the enterprise according to the weight of 50% of the enterprise strength evaluation and credit rating.

4.2 Develop credit strategy

To establish the relationship between the loan amount and the risk assessment score, we use logistic function to establish the mathematical model. Because the hypothesis of logistic model is more in line with the arrangement and distribution of financial data in China, and also in line with China & apos; s economic reality. Compared with the discriminant analysis method which often uses multiple linear regression fitting, the better point of logistic model is that when calculating the fitting degree of the model, the model uses the likelihood value instead of the sum of squares of deviation, so as to solve the nonlinear problem and has high accuracy.

Since the graph corresponding to sigmoid function is logistic curve, we use sigmoid function to fit. The formula of sigmoid function is as follows:

$$S(x) = \frac{1}{1 + e^{-x}}$$

According to the background of the topic, the loan amount of the bank to the enterprise to be lent is 100-1 million yuan. But because. The value range of sigmoid function is (− 1, 1), so we need to improve this function,

$$S'(x) = A \frac{1}{1 + e^{-x}}$$

In this way, the range can contain the range of bank loans. As shown in the figure 1 below,

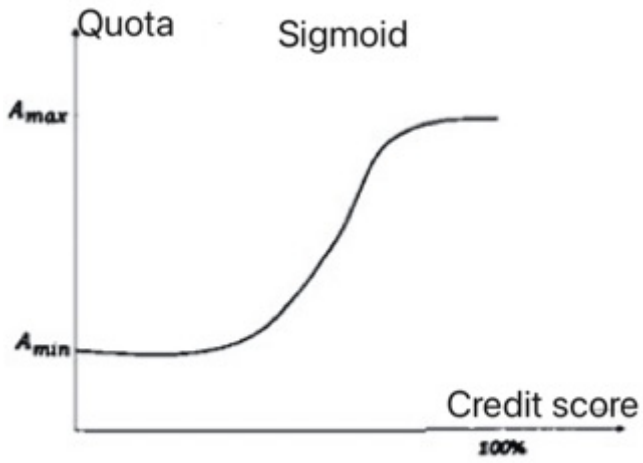

Fig.1 The range can contain the range of bank loans

After removing 20% of the enterprises that do not participate in lending, there are still 100 enterprises left. We set the enterprises with risk assessment score in the bottom 33.3% of the remaining companies as the third level, those in the top 33.3% as the first level, and those in the middle 33.3% as the second level. Therefore, the function image and corresponding points are shown in the figure 2.

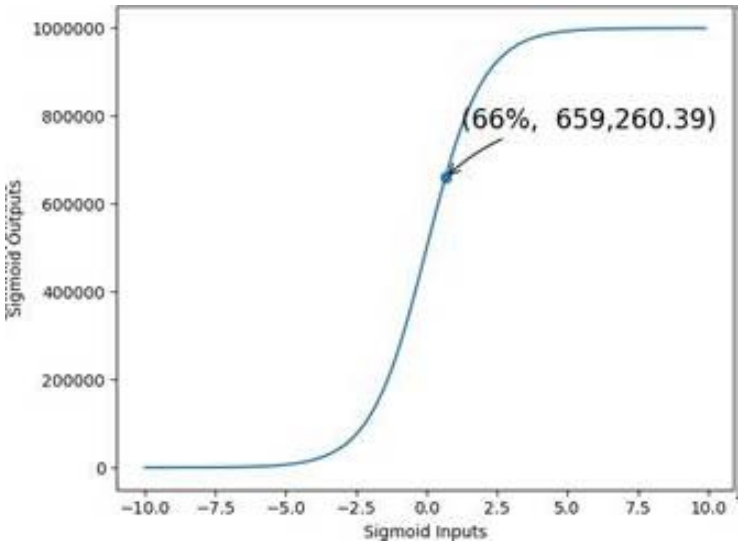

Fig. 2 The function image and corresponding points

Therefore, the range of available credit lines for enterprises in the first level is (659260.391000000]; the range of available credit lines for enterprises in the second level is (581759.38659260.39); the range of credit lines available for enterprises in the third level is [100000581759.38].

5. Model evaluation

5.1 Advantages

(1) In the establishment of the model, the influence of amount, tax amount, price and tax amount, invoice status on the enterprise strength is fully considered, which makes the relative error relatively small, and reflects the comprehensive strength of each enterprise and carries out risk assessment.

(2) In the analysis of the impact of various factors on the evaluation of enterprise strength, we adopt the analytic hierarchy process (AHP), which takes the enterprise strength as a system, and makes decisions according to the mode of thinking of decomposition, comparative judgment and synthesis, and quantifies the influence of each factor on the results, which is very clear and clear.

5.2 Disadvantages

In formulating the strategy, due to the limited time and resources, we only consider the policy, natural disasters, social wind direction, and the emergence of new industries, but ignore the international sanctions on Chinese enterprises and other different aspects. As a result, our strategy will appear a certain degree of discomfort.

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