

Study on the Personal Credit Risk Evaluation based on Improved Fuzzy AHP Comprehensive Evaluation Method

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Abstract. On the basis of personal credit rating methodology from home and abroad, combined with the current status of financial institutions, credit rating and specific operational measures, proposed using Modified Fuzzy comprehensive evaluation of individual credit assessment. The method utilizes AHP and group decision making Delphi the right to determine the Combination of the evaluation indexes, obtained quantitative indicators and qualitative indicators set membership for comment were using expert grading method and interpolation, the final overall score by calculating the fuzzy credit risk of individual scientific and reasonable evaluation.

Introduction

Personal credit rating of various financial institutions and credit evaluation system is very important part. In recent years, with the rapid development of China's city commercial banks, rural banks, small loan companies and other business loans of financial institutions, the credit business on individual credit risk assessment more and more attention these financial institutions. Domestic and foreign scholars on individual credit risk rating mainly to the selection and establishment of evaluation index system model. The paper, on the basis of the existing theory, proposed to use fuzzy comprehensive rating method and AHP binding to individual credit evaluation. Improvement of basic principles of Fuzzy AHP Comprehensive Evaluation Method is: fuzzy comprehensive evaluation method is based on many factors affect individual credit risk analysis and classification, a multi-level factor set; binding as any other individual financial institutions, credit rating, determined reviews various indicators set; the right AHP group decision Making and Delphi combination determine index weight; using expert grading method and interpolation method to get the membership of each metric comment sets; finally re-allocated according to weight index is calculated comprehensive evaluation vector obtained personal credit evaluation of the final score.

Improve a Specific Level Fuzzy Comprehensive Evaluation Method in the Personal Credit Evaluation Process

Establish A Personal Credit Evaluation Factors Set. Individual credit risk assessment to determine the factors set individual credit risk assessment is carried out during the most crucial step, it directly

Determine the accuracy of the credit evaluation results. Individual credit risk rating index system in the detailed analysis and comparison of many financial institutions used, based on the research results of other scholars presented in the table shown in the individual credit risk rating index system.

Table 1 individual credit risk assessment system table

Level indicators	Secondary indicators	Rating Standard Description
base this situation condition	age	The young higher score, other lower
	marital status	Married score of 1, single score of 0
	Local residence	The longer the residence time, the higher the score
	education level	The higher level of education, the higher the score
	employer	National enterprises, public institutions, civil servants, teachers score higher
Family court fiscal Business	Fixed assets	Other fixed assets appraised value of real estate, cars, etc.
	Current assets	Total current assets of bank deposits, securities, etc.
	Total annual expenditure	Total household consumption expenditure
	Total annual revenue	The total annual income of family members
letter loan shape condition	Bank credit balances	Is there a bank credit, and balance of payments is not
	Hostage situation	Provide collateral valuation price
	Guarantees	Whether to provide guarantees, and the amount of collateral
letter use Row for	Bank credit record	Whether the use of credit cards and bank loans have a bad record, that the amount of arrears
	Non-payment of tax records	Non-payment of taxes, utilities, telephone number and the amount of fees
	Law and discipline cases	Gambling, drug abuse and other violations of the law

The evaluation index system draws on analysis of other financial institutions, credit rating personal situation, through the basic situation and credit status related to family finances, credit and credit behavior of four-level indicators. For a more comprehensive collection of personal credit information, at every level indicators is subdivided into a plurality of secondary indicators, qualitative assessment and quantitative analysis of a combination of personal credit situation to make more accurate and comprehensive evaluation.

Determine the Set of Reviews. Binding definition of other commercial banks and credit rating agencies to individual credit ratings, the establishment of evaluation set five personal credit final assessment results with "U" to represent, the comment set $U = (U_1, U_2, U_3, U_4, U_5)$, respectively (excellent, good, fair, poor, very poor) five levels, corresponding to the results of individual credit risk assessment is low, low, in general, higher, higher.

Determine the Index Weight. In this paper, the use of Group Decision Analytic Hierarchy Process (AHP) and Delphi Combination of individual credit risk assessment to determine the weight of the index weight. Table 1 shows that individual credit risk evaluation factors were four level indicators and secondary indicators composed of fifteen. Four-level indicators corresponding weight set respectively $W = (W_1, W_2, W_3, W_4)$, two indicators U_{ij} with respect to the right to an index U_i of weight U_{ij} . Weight determination Expert Group to ensure that strangers among individual experts engaged by the right credit evaluation index credit evaluation research scholars,

the CBRC management, bank loan officers, credit rating agencies, and many staff composition. Respectively to each of the group issuing personal credit evaluation importance of the questionnaire, after repeated projections, discussions, research and study, get all the expert judgment of each matrix index attributes. Obtained feature vector \bar{W} i-th component using the geometric mean method.

$$\bar{W}_i = \left(\prod_{j=1}^n \beta_{ij} \right)^{\frac{1}{n}}$$

Then each component (W_1, W_2, W_3, W_4) were normalized to give U_i a U about the relative importance of the vector \bar{W}_i . Similarly, an index can be calculated under the two respective U_{ij} index weight W , and ultimately get the right weight for all indicators set W .

$$W_i = \frac{\bar{W}_i}{\sum_i^n \bar{W}_i}$$

Determine Index Membership for Comment and Fuzzy Judgment Matrix. Table 1 shows the individual credit risk assessment system, including the evaluation of quantitative indicators numerically and in words

Expression level of qualitative indicators and quantitative indicators in accordance with different values is divided into discrete and continuous variables, when the score for these different types of indicators need to use different methods to determine its membership. Constituted by the fuzzy membership matrix R . rating

Qualitative indicators can be divided into two types, one is the use of quantitative methods grade rating indicators, such as: education, work units, law and discipline cases, these indicators need expert scoring method, according to the actual situation was evaluators determine its membership: excellent 1-0.8 points, good 0.8-0.6 points in the 0.6 to 0.4 points, the difference between 0.4-0.2 points, very poor 0.2-0 points. First by a plurality of experts are given for each indicator membership of reviews score, and then score each of the indicators in each of the reviews were average, as the value of its final membership. Another choice is a binary variable indicators such as: marital status, married score higher index is "1", a single low score "0."

Quantitative indicators use interpolation to map the actual value of the indicator on the corresponding $[0, 1]$. Credit raters by actual survey of personal income and credit situation in the region, the optimal value and the worst value of the personal credit evaluation, and the optimal value is set to "1", the worst value is set to "0" establishment of index values interval $[0, 1]$, respectively, and then map the actual evaluation of the data to the corresponding $[0,1]$ to obtain membership of the indicators of the actual value. Since the indicators are positive and reverse of the points, the higher the score positive indicators, such as: fixed assets, current assets, total annual income, collateral, the guarantees and other indicators, the customer's credit rating, the higher the score; reverse indicator the higher the score, such as: total annual spending, the balance of bank credit, bank credit, non-payment of tax records and other indicators, the customer's credit rating, the lower the score. Therefore, when different types of index calculation membership should use different formulas:

$$\text{For positive indicators: } R(i) = \frac{x - x_i}{x_{i+1} - x_i}$$

$$\text{For reverse indicators: } R(i) = \frac{x_{i+1} - x}{x_{i+1} - x_i}$$

Among them, the limits x_i, x_{i+1} are different evaluation score range $x_i < x < x_{i+1}$.

Redit Status Comprehensive Evaluation. Fuzzy matrix R rating and weighting set W , can be calculated weighted composite membership vector P . The formula is:

$$P = W \times |R_i| = (W_1, W_2, \dots, W_m) \times \begin{pmatrix} r_{11} & r_{12} & \dots & r_{15} \\ r_{21} & r_{22} & \dots & r_{25} \\ \dots & \dots & \dots & \dots \\ r_{m1} & r_{m2} & \dots & r_{m5} \end{pmatrix}$$

And the introduction of fractional set $F = (100, 80, 60, 40, 20)$ T, to obtain the final results of fuzzy comprehensive evaluation value of Z:

$$Z = P \cdot F$$

Fuzzy comprehensive evaluation based on the value of Z scores to determine the individual's credit rating. 100-80 score in credit conditions is divided between excellent, as good 80-60 minutes between for 60-40 minutes in between, as the difference between 40-20 points, between points 20-0 very bad. Individual credit risk assessment results correspond respectively to low, low, in general, higher, higher.

Conclusions

This study was conducted in the mortgage, car loan, venture capital and other personal demand, bank personal credit review system for continuous improvement, individual credit risk assessment system need to be improved in the context of the proposed. In this paper, personal credit evaluation, evaluation model, index weights has done a detailed argument. Given the current situation of personal credit and financing difficulties, the establishment of personal credit evaluation system includes four basic family, family finances, credit and credit behavior; by Fuzzy AHP Comprehensive Evaluation Method to improve the use of AHP and group decision making Delphi combination to determine the weight of index, Delphi method can guarantee the authority to determine the index weight, group decision making AHP judgment result reflects the will of the group's influence to avoid the one-sidedness of expert judgment; quantitative and qualitative indicators were used expert scoring method and interpolation method to get the membership of each metric. The improved fuzzy AHP comprehensive evaluation method to improve the personal credit evaluation system, clear weight concrete method of determining membership, so that individual credit risk rating method is more scientific and reasonable.

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