Commercial bank financial risk assessment

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Abstract: the commercial bank's main job is to manage money, therefore, commercial Banks are facing financial risk has become the main risk. In this paper, the commercial bank financial risk evaluation index, the fuzzy comprehensive evaluation method to construct the evaluation index system of financial risk in commercial bank.

1. The basic principle of fuzzy comprehensive evaluation method

1.1 The basic steps of fuzzy comprehensive evaluation method

The determining factors and evaluation set namely, is the first step of fuzzy combined evaluation method.

Is a certain features or sign of evaluation objects, the set of all, is the factor set, expressed in formula for. So not only can be used to represent a kind of real objects, also can be used to evaluate objective things leave. In the formula, m is the characteristics of evaluation objects or representation of the total number of assignment on the I (I m or less), I said any one of them. Y branch of industrial and commercial bank of the factors is set in the article related factors constitute the index system of financial risk.

Formula said evaluation set in which evaluators set of all possible evaluation, evaluation is n years. Then, establishes the comprehensive evaluation matrix. Before the comprehensive evaluation, the first step is for evaluation of single factor. During the evaluation of single factor, it is necessary to establish a fuzzy mapping, from to the factor set, can draw, accordingly. Then you can establish fuzzy matrix.

$$R=\begin{Bmatrix} r_{11} & r_{11} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{Bmatrix}$$

In the matrix, fuzzy matrix of a value, is taken as assessing index Y branch of the financial risk of each value. By studying the influence of various influencing factors of m size, determine its weight, which can get the weight. In the factor set, due to the influence of various factors on the evaluation of different, so in according to its influence on empowerment, shall, according to the different proportion of evaluation to determine weight. Article, using entropy method for the determination of weight. To conform to the operation after comprehensive evaluation results are obtained. Set up for the weight, as the comprehensive evaluation model of fuzzy evaluation matrix, "" said synthesis operator.

1.2 The optimal goal

Because of the effect of each index to the evaluation results not only size is different, also to assess the effects of the direction is not the same, the specific performance in some evaluation indexes are positive sex influence on the evaluation results, and there are also some evaluation index to the evaluation result is produced by the reverse effect. Must, therefore, the fuzzy relation matrix used optimal target for processing, make it more standardized.

The fuzzy relationship matrix transpose in $R=\left(x_{ij}\right)_{m\times n}$, get, $R^{T}=\left(x_{ij}\right)_{m\times n}$ Then, with its influence on the evaluation results of normal or reverse, forward and reverse index classification. With indicators are confusion, optimal target processing.

1.3 The operator analysis of fuzzy comprehensive evaluation

In the fuzzy comprehensive evaluation matrix was established, after and to determine the index weight vector, can according to, get the corresponding indicators of the evaluation results.

2. The selection of evaluation indexes

The commercial bank financial risk evaluation index selection is divided into five levels, and, in turn, carries on the analysis, find out risk indexes of every specific indicators include:

2.1 Asset quality risk evaluation index

Because our country rules shall be adopted by the financial system, banking institutions, securities agencies, insurance business must be a clear division. This determines the profit of bank management, mainly from the spread in the operation of deposits and loans, based on this, the main assets of commercial Banks quality risk, can be sure of its main composition is the risk of credit assets. Asset quality risk source mainly in two aspects, respectively is the non-performing loan ratio and provision for coverage.

Non-performing loans. Non-performing loan ratio is most can clear reaction is one of the main indicators of credit risk, in the world, there are mainly two kinds of normal loans of three kinds of bad loans, the former is normal classes and class focus on two kinds of form, the latter by subprime, class, suspicious and loss for five. After the so-called non-performing loan ratio, that is, for all three types of loans and loan ratio: the index and negative correlation to recover the loan, commercial Banks and commercial Banks credit risk were positively correlated; According to the request of China banking regulatory commission (CBRC) non-performing loan ratio to control within 5%.

Provision for coverage. Provisions refers to the fiscal budget, the estimated investment losses will reserve the money prepared, can resist the credit risk is a measure of indicators, namely the provision of loans depreciation reserves and the ratio of non-performing loans. Provision for coverage, the greater the said against the stronger the ability of credit risk, in our country, commercial Banks coverage rainy-day minimum not less than 150%.

Loans for pull rate. This metric to measure commercial bank losses, is proportional to the bank losses, the loan rate is higher, rainy-day, the greater the loss of commercial bank, its essence is to stay, the extraction ratio of bad debt reserve. Loan provisioning rate the level of discretion should suit the loan risk, if blindly down the rate of rainy-day, can lead to commercial bank profits inflated. To strengthen the regulation of provisions in our country, in early 2011, enacted stricter prudent provisioning regulatory standards, the reserve ratio of commercial Banks, should be above 2.5%.

The single biggest customer loan ratio. The index are the main indicators reflect the concentration of credit risk in commercial bank, the bank's biggest customers of the ratio of loans to commercial Banks net capital. If the ratio is bigger, can make the credit assets of commercial Banks risk concentration, obviously not conducive to risk control. Regulations in our country, the single biggest customer loan ratio must be below 10%.

The ten biggest customer loan ratio. The index also reflect the concentration of credit risk, the indicator is too large, also can make excessive concentration risk of bank loans. Ten largest customers, commercial Banks in China loan ratio must be below 50%.

2.2 Liquidity risk evaluation index

The liquidity of commercial Banks is inversely proportional to the bank's financial risk, is one of the main factors that reflects the financial risk of commercial bank. Commercial bank's liquidity index, and liquidity ratio, loan-to-deposit ratios, the deposit reserve rate, net lending capital ratio index, etc.

Current ratio. Is proportional to the liquidity of commercial Banks, namely, the greater the liquidity ratio of commercial Banks, the commercial bank liquidity is bigger, but the index is inversely proportional to the financial risks of commercial Banks, commercial Banks liquidity ratio, the greater the current assets and current liabilities ratio, the greater the bank's financial risk is smaller. But sometimes commercial Banks because of factors such as profits, the increase in current liabilities without restraint, forming a larger financial risks, obviously not conducive to risk control, in order to prevent the happening of the risk, regulation in our country, the flow rate must be controlled in 25% above.

Loan-to-deposit ratios. Customer deposits in the commercial bank, commercial bank must pay the deposit user profits, and charge interest on the loan is a major means of commercial Banks operating profit, this explains from on the one hand the higher loan-to-deposit ratios of commercial Banks, the commercial Banks could obtain higher profits. But from the perspective of risk control, high commercial Banks loan-to-deposit ratios, is not conducive to resist risk of the bank. So in terms of risk control, the bank must have a certain scale of cash, in order to store user withdrawal. So if the savings and loan rate is too high, it may cause payment crisis, in order to resist the risk, the regulations in our country, commercial Banks loan-to-deposit ratios must be controlled under 75%.

2.3 Capital adequacy risk indicators

Bank capital adequacy, can reflect the commercial Banks to resist the ability of the financial risk, commercial bank capital adequacy and the ability to resist risk was positively related, the relationship between the funds of commercial Banks more sufficient, the ability to resist risk. Specific indicators are as follows:

Capital adequacy ratio. This metric is an important index to measure Banks to resist risk ability, and ability to resist risk was positively related to relationship. The bank's capital according to the capital formation, can be divided into two kinds, respectively is the core capital and subsidiary capital. In this study the capital adequacy ratio of the total capital, that is, the sum of both. According to the regulation of our country, the bank's capital adequacy ratio must be controlled in more than 8%.

The core capital adequacy ratio. The index and capital adequacy ratios are similar, but the bank's capital in the index for the bank's core capital, is to guarantee the normal running of bank capital. When calculating the core capital adequacy ratio, commercial Banks should be deducted from the core capital of goodwill. According to the request of China banking regulatory commission (CBRC) should not be less than 40%.

2.4 Earnings risk evaluation index

Profit risk evaluation indexes including cost income ratio, capital profitability, earnings per share, net interest margin and net interest margin.

Assets profit margins. The index is one of the important indicators reflect the commercial bank profit ability, the higher the assets of commercial bank profitability, is theoretically Banks' profit ability is stronger. Banks' profit margin calculation, it is the ratio of net profit over the same period a weighted average of the assets. The higher the bank's capital profit margin, the higher the profitability of Banks. The provisions of the China banking regulatory commission (CBRC) of commercial Banks, it is the capital of commercial Banks profit margins should be greater than or equal to 11%.

Earnings per share. The index is one of the main indicators of bank profitability reaction, can be more clearly reflect the bank equity unit profits, is the after-tax profits and equity ratio of the total. : earnings per share and diluted earnings per share, diluted earnings per share, the commercial Banks' shareholders have been deducted the current profit after the earnings per share.

Net interest margin. Net interest margin is our country commercial bank is the most basic source of income. Net interest margin is equal to the gross profit margin, that is, the difference between the cost of capital and revenue. Net interest margin and bank profitability were positively correlated.

Net interest margin. Reflects a bank's profitability, profitability were positively correlated with the bank, the bank's net interest rate of return, the greater the is the strength of the Banks' ability to

reap the benefits, interest is the ratio of net income and total average interest-earning assets balance. Net interest yield index reflects all interest-bearing assets and asset servicing ability of comprehensive returns.

2.5 Manage risk evaluation index

Through the above analysis, the causes of the fluctuations can cause the commercial bank financial risk are analyzed and classified, according to our country's regulation, build perfect and reasonable financial risk evaluation system. See table 1:

Table 1 Financial risk evaluation index

	Risk stratification	Variable	Risk indicator
Financial risk evaluation index	Asset quality risk	u_1	non-performing loan ratio
		u_2	Provision coverage ratio
		u_3	Loan provisioning rate
		u_4	Single largest customer loan ratio。
		u_5	Maximum ten customer loan ratio
	liquidity risk	u_6	Liquidity ratio
		u_7	Loan-deposit ratio
		u_8	Operating cash flow net debt ratio
	Capital adequacy risk	u_9	capital adequacy ratio
		u_{10}	Core capital adequacy ratio
		u_{11}	Asset-liability ratio
	Profit risk	u_{12}	Return on assets
		u_{13}	Return on equlity
		u_{14}	Earnings per share
		u_{15}	Net interest margin
		u_{16}	Net interest rate of return
	Management risk	u_{17}	Cost-income ratio

3. Using the entropy value method to determine the weight

The entropy is a concept in thermodynamics at the earliest. And other industries, introduced the concept, the more wide application. In the field of communication, is a kind of a measure of uncertainty. The information entropy $H(x)$:

$$H(x) = -\sum P(x_i) \ln P(x_i)$$

In information theory, the greater the amount of information, the information entropy $H(x)$ is smaller, conversely, the smaller the amount of information, the information entropy $H(x)$ is bigger, That is a negative correlation relationship between them. This characteristic of entropy, determines the application of entropy in the information difference size, is the theoretical basis of the entropy value method. Entropy value method is used to determine the index weight process is as follows:

(1) Standardized data processing variables.

In order to comprehensive and objective of the financial risk analysis and evaluation of Y branch, in the selection of indicators, we are a group of 17 indexes are selected, and the forward and reverse classification, because in above, we build a fuzzy comprehensive evaluation matrix, the processing

of these indicators have been standardized, here can be applied directly.

(2) The nonnegative on $X=\left(x_{ij}\right)_{m\times n}$

In the standardization of the data is not negative, in order to make the desires of the entropy value sense, then you need to translation of data, make each entropy to logarithmic, after translational entropy, but in order to be more clear expression of matrix name remains unchanged, namely matrix name still is.

(3) When calculating the indicators of the listed commercial Banks on the index proportion, occupied the whole of commercial Banks and the proportion of indicators.

$$P_{ij}=X_{ij}\Big/\sum_{j=1}^{n}X_{ij},\left(i=1,2,\cdots,m;\ j=1,2,\cdots,n\right)$$

(4) If the indicators data of a commercial bank, presents a state of uniform distribution, then calculate the indicators of entropy and the difference degree, can be calculated through the type:

Entropy is:

$$E_i=-\frac{1}{\ln\left(n\right)}\sum_{j=1}^{n}P_{ij}\ln\left(P_{ij}\right),\text{其中}\frac{1}{\ln\left(n\right)}>0,E_i>0$$

Difference degree is: $H_i=1-E_i$

(5) To calculate the index of entropy weight.

$$W_i=H_i\Big/\sum_{i=1}^{m}H_i$$

Getting the weight vector $W=\left(w_1,w_2,\cdots w_m\right)$，其中$\sum_{i=1}^{m}w_i=1$

4. Establish a fuzzy comprehensive evaluation model of commercial bank financial risk

According to above analysis, the fuzzy evaluation matrix, established the weight value, and analyzed the results of the synthesis of the operator, to determine the composition operator model, J branch of industrial and commercial bank of establishing fuzzy comprehensive evaluation model of financial risk:

$$B=W_{1\times m}X_{m\times n}=\left(b_1,b_2,\cdots,b_n\right),b_j=\sum_{j=1}^{n}\left(w_ix_{ij}\right)$$

Commercial Banks can use the model, the generation into the relevant data of financial risk analysis. And then find the reasons and seek for the corresponding countermeasures.

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