Financial enterprise comprehensive performance evaluation method

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Abstract. For the performance evaluation methods of comprehensive financial enterprises that are lacking in the existing performance evaluation methods, this paper constructs a comprehensive performance evaluation model for financial enterprises by taking the comprehensive financial enterprises of banks and insurance as the research object. The weight of evaluation index was determined based on analytic hierarchy process, and the fuzzy comprehensive performance of comprehensive financial enterprise was proposed. The evaluation method is selected and the case analysis is applied to the application of the comprehensive performance evaluation model of “bank + insurance”.

1. Introduction

In 2009, 2011 and 2016, the Ministry of Finance issued financial documents such as “Financial Enterprise Performance Evaluation Methods” to strengthen the performance appraisal of financial enterprises and further standardize the performance evaluation of financial enterprises.

The theory of performance evaluation first appeared in the West, and the theory of performance evaluation has many modes. The most widely used is the performance evaluation based on the balanced scorecard. The process and principles of the Balanced Scorecard were first published by Kaplan and Norton in the Harvard Business Review in the early 1990s.

Regarding the research on the performance of coal enterprises, Zhang Xuemei (2018) combined with the empowerment method and the TOPSIS method to establish a financial performance evaluation model for mining listed companies to improve the performance evaluation of mining listed companies. Fan Rui (2017) based on EVA organically combines corporate strategic objectives, profit drivers and final financial results, and establishes a performance evaluation system that suits the characteristics of China's coal enterprises. Regarding the research on the performance of listed companies in home appliances, Tao Ye (2016) uses the factor analysis method to conduct empirical tests, and comprehensively compares the financial performance of listed companies in the home appliance industry in the past three years, thus proposing strategic recommendations for enterprises. On the research on the performance evaluation of commercial banks, Li Yexiang (2018) established a performance evaluation system for commercial banks through factor analysis to explore the influencing factors of commercial banks' performance.

2. Establish a comprehensive performance evaluation model

2.1. Building an indicator system

Taking the "bank + insurance" combination as an example, the analytic hierarchy process and fuzzy comprehensive evaluation method are used to establish a comprehensive performance evaluation model for financial enterprises.

2.2. Analytic hierarchy process determines indicator weights

(1) Constructing a pairwise comparison judgment matrix

After the performance evaluation index system is established, this determines the affiliation between the elements of each level. Then compare the importance of each factor in each single layer and construct a judgment matrix: $A=(a_{ij})_{n\times n,}$ where $a_{ij}>0$, $a_{ij}=1/a_{ji}$, $a_{ii}=1$, for a_{ij} The numerical value uses a 9-level scale method.

(2) Hierarchical single sorting and consistency check

The geometric mean method is used to normalize the judgment matrix to the column vector and the row vector respectively, and the weight vector W, $W=(w_1, w_2, ..., w_i)^T$ of the target layer and the criterion layer is obtained. The maximum eigenvalue λmax of the decision matrix can be obtained.

Consistency test on the judgment matrix to obtain the consistency index CI, find the average random one-time index RI corresponding to the n value, and calculate the relative consistency index CR, $CR= CI/RI$.

It is generally considered that when $CR\leq 0.1$, the judgment matrix has satisfactory consistency; when $CR>0.1$, the original judgment matrix needs to be adjusted until the conformance criterion is met.

(3) Hierarchical total ordering and consistency check

The weight vectors of each level are obtained from the judgment matrix: W_1, W_2, ..., W_k. Multiply the weight vectors of each layer, calculate the comprehensive weight W of the lowest layer to the target layer, and perform consistency check.

2.3. Based on Fuzzy Comprehensive Evaluation Method

(1) Construct a multi-level performance evaluation index system

According to the Ministry of Finance's publication of the standard values of banking and insurance financial enterprises, the standard value of the “bank + insurance” performance evaluation index shown in Table 1 is obtained.

Table.1. Standard value of performance evaluation indicators

Indicator layer	excellent	good	medium	Lower	Poor
Capital profit rate A11(%)	25.4	18.0	6.6	-7.4	-19.3
Asset profit margin A12(%)	3.9	2.6	1.0	-1.8	-3.8
Cost to income ratio A13(%)	29.8	32.4	33.8	66.2	73.3
Income margin A14(%)	20.1	13.3	1.6	-10.9	-20.9
Expenditure profit rate A15(%)	16.4	11.0	-2.3	-15.9	-29.7
(State-owned) capital preservation and appreciation rate A21(%)	139.3	119.7	108.4	85.7	66.9
Profit growth rate A22(%)	181.9	94.5	27.8	-57.2	-102.7
Economic profit margin A23(%)	20.1	12.7	1.3	-12.6	-24.1
Non-performing loan ratio A31(%)	2.3	2.7	3.8	33.8	47.2
Provision coverage A32(%)	117.4	98.7	70.5	9.1	4.0
Approved asset rate A33(%)	98.9	98.4	93.6	88.8	81.4
Accounts receivable ratio A34(%)	1.3	1.9	5.2	8.6	12.9
Capital adequacy ratio A41(%)	14.7	12.1	11.2	4.7	2.1
Core capital adequacy ratio A42(%)	11.9	10.4	9.2	3.4	0.1
Solvency adequacy ratio A43(%)	539.0	409.3	283.9	146.2	74.3

(2) Subordinate function general determination method

According to the standard values of Table 1, the constructor image is a membership function of Fig 1.

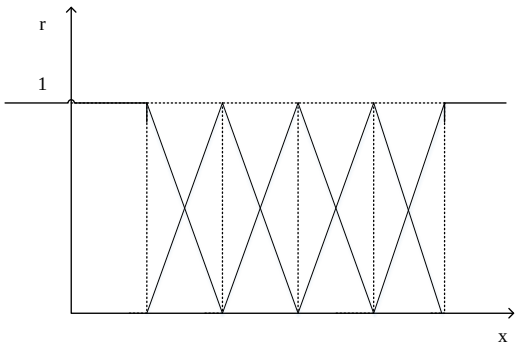

Fig. 1 Membership function image

(3) Fuzzy comprehensive evaluation

First, get the first-level fuzzy comprehensive evaluation set, $D_i=W_i*R_i$.

Then from the bottom layer to the criterion layer to get the comprehensive evaluation matrix *D*.Finally, a comprehensive judgment matrix *N*,$N=W*(D_1,D_2,\ldots,D_n)^T$.

(4) Calculate the overall performance evaluation score

The performance evaluation types corresponding to the performance evaluation scores in the "Financial Enterprise Performance Evaluation Method" are shown in Table 2.

Table.2. Performance Evaluation Level

grade	Excellent A	Good B	Medium C	Lower D	Poor E
Numerical segment	[85,100]	[70,85)	[50,70)	[40,50)	[0,40)
average value	92.5	77.5	60	45	20

Make the performance evaluation score set *S*, *S*= (92.5,77.5,60,45,20), The overall performance evaluation score is: $F=S*N^T$

3. Case evaluation application

(1) Determine index weights and hierarchical ordering

According to the evaluation index data of China Ping An 2017 Annual Report, the importance degree of performance evaluation indicators was compared according to the "Financial Enterprise Performance Evaluation Method". The judgment matrices *A*, A_1, A_2, A_3, *and* A_4 are finally determined, and the five judgment matrices are normalized.

A single ordering and consistency check of the indicators yields a summary table as shown in Table 3.

Table.3. Summary of indicator consistency test

matrix	Weight vector Wi	λmax	CI	RI	CR
A	$(0.39, 0.27, 0.14, 0.20)^T$	4.13	0.04	0.89	0.05
A_1	$(0.54, 0.24, 0.06, 0.08, 0.08)^T$	5.28	0.07	1.12	0.06
A_2	$(0.40, 0.40, 0.20)^T$	3.00	0	0.52	0
A_3	$(0.09, 0.07, 0.56, 0.28)^T$	4.19	0.06	0.89	0.07
A_4	$(0.25, 0.25, 0.50)^T$	3.00	0	0.52	0

(2) Hierarchical total ordering

The performance evaluation comprehensive weight *W* is obtained from the index weight value under a single level, and the consistency is met after the test.

$W=(0.21, 0.10, 0.02, 0.03, 0.03, 0.11, 0.11, 0.05, 0.01, 0.01, 0.08, 0.04, 0.05, 0.05, 0.10)^T$

(3) Building an evaluation matrix

Referring to the standard value of the performance evaluation index of Table 1, the degree of membership of each indicator is obtained and the evaluation matrix is obtained.

(4) Fuzzy comprehensive evaluation

Comprehensive evaluation of the indicator layer from the bottom of the indicator to obtain a first-level fuzzy comprehensive evaluation set D_i, $D_i=W_i*R_i$.

Multiplying the weight of the target layer by the weight of the target layer W and the evaluation set matrix D to obtain the final synthesis result $N.N$ = (0.24,0.35,0.29,0.07,0.05).

(5) Calculate the overall performance evaluation score

China Ping An 2017 performance evaluation comprehensive score is

F=(92.5,77.5,60,45,20)×$(0.24,0.35,0.29,0.07,0.05)^T$ =71

Ping An's performance evaluation rating is good.

4. Conclusion

Based on the related research on performance evaluation at home and abroad, this paper studies the performance evaluation of comprehensive financial enterprises that is lacking in the existing performance evaluation methods. For comprehensive financial enterprises, according to their major financial businesses, the indicator system will be constructed in accordance with the "Financial Enterprise Performance Evaluation Measures". Taking the comprehensive financial enterprises of banks and insurance as the research object, the comprehensive performance evaluation index system of "bank + insurance" was established.

Based on the analytic hierarchy process method, the weights of evaluation indicators are determined, and a fuzzy comprehensive evaluation method for comprehensive financial enterprise performance is proposed. From the perspective of quantitative analysis, the membership functions of each financial indicator at different performance evaluation levels are given in detail, and the application analysis of the "bank + insurance" comprehensive performance evaluation model is carried out.

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