Study on the Financial Performance of China's A-Share Listed Commercial Banks

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Abstract. Under the background of the accelerating pace of financial globalization, China's commercial banks are facing not only the challenges of domestic reform and innovation but also the fierce competition in the global financial market and the impact of foreign banks. Therefore, it is particularly important to build a set of a perfect financial performance evaluation system. This paper takes the financial performance evaluation of 36 A-share listed commercial banks as the research object and divides into 13 indicators in four aspects: profitability, development ability, per share index and risk control ability. The entropy weights of 13 indicators and the financial performance rankings of 36 listed commercial banks are obtained by entropy weight method and grey relational analysis. Combined with the current situation of operation and management of China's commercial banks and the results of empirical analysis, it is concluded that commercial banks should standardize the development of intermediary business, speed up the pace of transformation and establish a risk prevention and control mechanism.

Keywords: Commercial bank; Financial performance; Entropy weight method; Grey relational analysis.

1. Introduction

With the accelerated pace of financial globalization, expanding the opening of the banking industry to the outside world has become an important epitome of the two-way opening of China's financial industry. In this context, commercial banks are facing not only the challenges of domestic reform and innovation but also the fierce competition in the financial market and the impact of foreign banks. As the core of the modern financial system, commercial banks play a very important role in the economy and society with their functions such as credit creation, economic regulation, financial services and so on. To adapt to the trend of globalization, China must vigorously promote economic restructuring and change the mode of economic development. In this context, using scientific and reasonable methods to construct the index system of financial performance evaluation of commercial banks is a major systematic project, and it is also an inevitable requirement for China's commercial banks to actively cope with the economic development under the new normal. [1,3,4]

Many scholars at home and abroad have studied the performance of commercial banks from different angles. After an in-depth study of the current situation of the American banking industry, Young uses the data model to conclude that the size, ownership structure and capital structure of commercial banks play a very important role in the American banking industry. Chen Min emphatically evaluates the financial performance of listed banks from the external point of view, puts forward the AHP-DEA model, selects 13 listed banks in China as research samples, and confirms the feasibility of the model in bank performance evaluation from the actual situation. According to the literature, it is found that there are few methods to analyze the financial performance of commercial banks by using the combination of the entropy method and grey relational analysis method. Therefore, this paper constructs the financial performance evaluation system of listed commercial banks through the combination of these two mathematical models, hoping to provide a feasible scheme for the financial performance evaluation of commercial banks and promote the international competition level of China's commercial banks.

2. Data Collection

The data are all from the 2019 semi-annual reports of 36 A-share listed commercial banks in Guotai'an and Wind database. The indicators include 13 indicators in four aspects: profitability, development capability, index per share and risk control ability. Their secondary indicators are shown in Table 1 below.[2]

Table 1. 13 indicators

First-level indicators	Secondary indicators
Profitability	Net Profit Margin of Total Assets
	Return on Equity
	Operating Margin
Development capability	Total Assets Growth Rate
	Net Profit Growth Rate
	Owner's Equity Growth Rate
Index per share	Earning Per Share
	Net Assets Per Share
	Operating Cash Flow Per Share
Risk control ability	Core Capital Adequacy Ratio
	Bad Loan Ratio
	Provision Coverage
	Loan-to-deposit Ratio

3. Empirical Analysis

3.1 Model Building

1. Matrix standardization

Assuming that there are evaluation indicators, evaluation objects, and the value of each financial performance evaluation indicator is $a_{ij}(i=1,2,\ldots\ldots,m; j=1,2,\ldots\ldots,n)$, the original matrix A is normalized to form a matrix X. [5,6]

$$x = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{nn} & x_{n2} & \cdots & x_{nn} \end{bmatrix}$$

Use the normalization formula $\overline{Z}_{ij} = \dfrac{x_{ij} - \min\{x_{1j}, x_{2j}, \cdots, x_{nj}\}}{\max\{x_{1j}, x_{2j}, \cdots, x_{nj}\} - \min\{x_{1j}, x_{2j}, \cdots, x_{nj}\}}$ to normalize the matrix X.

2. Calculate the proportion of the I sample value to the index under the index j

After the above step, the nonnegative matrix $\overline{Z}_{ij}$, calculates its probability matrix P, The calculation formula of each element p_{ij} of p is: $P_{ij} = \dfrac{\overline{z}_{ij}}{\sum_{i=1}^{n}\overline{z}_{ij}} (i=1,2,\ldots\ldots,n; j=1,2,\ldots\ldots,m)$.

3. Calculate the entropy weight of the index

For the j index, the formula for calculating its information entropy is $e_j = \dfrac{1}{\ln n} \sum_{i=1}^{n} p_{ij} \ln(p_{ij})$.
Information Utility value $d_j = 1 - e_j (j = 1, 2, \ldots\ldots, m)$ The information utility value is normalized, that is, the entropy weight of each index is obtained: $W_j = \dfrac{d_j}{\sum_{j=1}^{m} d_j} (j = 1, 2, \ldots\ldots, m)$.

4. Determine the parent sequence

In the grey relational analysis, it is necessary to determine the analysis sequence and set the parent sequence (reference series) as: $Y_0(t) = \{X_0(1), X_0(2), \ldots\ldots, X_0(n)\}$. This sequence is the affected sequence or optimal value; the data sequence composed of influencing factors is called subsequence (comparison sequence): $Y_i(t) = \{X_i(1), X_i(2), \ldots\ldots, X_i(n)\}, i = 1, 2, \ldots\ldots, n$.

5. Calculate the correlation coefficient

Record the minimum difference between the two levels as : $a = \min_{i} \min_{k} |x_0(k) - x_i(k)|$ The maximum difference between the two levels as $b = \max_{i} \max_{k} |x_0(k) - x_i(k)|$ From which we define the grey correlation coefficient

$$\gamma(x_0(k) - x_i(k)) = \frac{a + \rho b}{|x_0(k) - x_i(k)| + \rho b} (usually \ \rho = 0.5)$$

6. Determine the score of the evaluation object

According to the above formula, we can derive the correlation between the mother sequence $Y_0(t)$ and the child sequence $Y_i(t)$. And the score is normalized:

$$S_k = \frac{1}{n} \sum_{k=1}^{n} \gamma(x_0(k) - x_i(k))$$

7. Determine the ranking of the financial performance of commercial banks

According to the formula, $E = W_j \times \gamma$ the financial performance of listed commercial banks in China is evaluated and ranked.3.2result analysis.

According to the above calculation idea, the calculation obtains the index entropy weight W_j(j=1,2,……,16) of 36 listed commercial banks, The details are shown in Table 2.

The proportion of entropy weight of the net profit rate of total assets is the largest among all 13 indicators, indicating that for commercial banks, how to effectively use funds to obtain maximum economic profits is still a top priority. The second-largest provision coverage rate means that for profit-oriented commercial banks, they have enough funds to withstand risks when they have bad debts.

Table 2. Entropy weight of 13 indicators

First-level indicators	Secondary indicators	Weights(W_j)	Rank
Profitability	Net Profit Margin of Total Assets	0.5413	1
	Return on Equity	0.0272	10
	Operating Margin	0.0091	12
Development capability	Total Assets Growth Rate	0.0359	9
	Net Profit Growth Rate	0.0444	7
	Owner's Equity Growth Rate	0.0584	4
Index per share	Earning Per Share	0.059	3
	Net Assets Per Share	0.0565	5
	Operating Cash Flow Per Share	0.0069	13
Risk control ability	Core Capital Adequacy Ratio	0.0423	8
	Bad Loan Ratio	0.0122	11
	Provision Coverage	0.0592	2
	Loan-to-deposit Ratio	0.0475	6

Table 3. Correlation coefficient and ranking of listed commercial banks

Bank	Correlation coefficient	Rank	Bank	Correlation coefficient	Rank
Ping An Bank	0.0278	24	Changshu Bank	0.0239	33
Bank of Ningbo	0.0280	23	Industrial Bank	0.0294	16
Jiangyin Bank	0.0250	28	Bank of Beijing	0.0243	32
Zhangjiagang Rural Commercial Bank	0.0308	7	Shanghai Bank	0.0215	35
Bank of Zhengzhou	0.0286	20	Agricultural Bank of China	0.0310	3
Qingdao Bank	0.0248	29	Bank of Communications	0.0311	2
Qingdao Rural Commercial Bank	0.0306	10	Industrial and Commercial Bank of China	0.0247	30
Bank of Suzhou	0.0307	9	Changsha Bank	0.0307	8
Shanghai Pudong Development Bank	0.0304	12	Postal Savings Bank Of China	0.0281	21
Hua Xia Bank	0.0151	36	China Everbright Bank	0.0311	1
Minsheng Bank	0.0281	22	Bank of Chengdu	0.0308	6
China Merchants Bank	0.0292	17	Zijin Bank	0.0261	25
Wuxi Bank	0.0289	19	China Zheshang Bank	0.0304	13
Bank of Jiangsu	0.0308	5	China Construction Bank	0.0309	4
Hangzhou Bank	0.0294	15	Bank Of China	0.0299	14
Xi'an Bank	0.0255	27	Guiyang Bank	0.0224	34
Bank of Nanjing	0.0289	18	China Citic Bank	0.0305	11
Chongqing Rural Commercial Bank	0.0245	31	Su Nong bank	0.0260	26

The grey correlation coefficient shows the financial performance of commercial banks under different entropy weights of 13 indicators. it can be seen from Table 2 that the top three financial performance are Everbright Bank, Bank of Communications and Agricultural Bank of China. it shows that the three commercial banks have shown a strong trend in terms of profitability and risk control ability.

4. Conclusion

Based on the above analysis, this paper believes that commercial banks need to pay attention to financial business innovation, standardize the development of intermediary business and enhance the profitability of off-balance sheet business, but also promote the effective integration of traditional resource capacity advantages and new channels, comply with the development trend of the times, and speed up the pace of transformation. And, in the development of business, do not forget to establish a reliable risk management mechanism, maintain the safety of the banking system, and promote the steady development of commercial banks.

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