

Original Research Article

An Empirical Study on the Profitability of Chinese Commercial Banks —Based on Factor Analysis

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Abstract: The supporting role of financial development on the real economy is unquestionable. How to improve the profitability of commercial banks, allocate more resources efficiently and quickly to the key links of development, and urge financial institutions to better serve the real economy, is our breakthrough in economic development bottlenecks important node. Based on the data of 16 listed commercial banks in 2018, this paper uses factor analysis to calculate the profitability scores of each bank, discusses how commercial banks can better serve the real economy, and proposes corresponding policy recommendations.

Keywords: Commercial Banks; Profitability; Factor Analysis

1. Introduction

Profitability, liquidity, and security are the three basic principles of commercial bank operations. As a corporate legal person pursuing profit maximization, profitability occupies the core position of commercial bank management principles. Today, in the context of interest rate marketization, the banking industry has become more and more competitive. Secondly, with the financial reform rules “allowing qualified private capital to establish small and medium-sized banks and other financial institutions in accordance with the law, the construction of a multi-level capital market system will steadily advance. With the landing of the “interest rate marketization process”, the era of high interest margins for my country’s commercial banks has come to an end.

2. Theory and method

(1) Definition of profitability concept

Profitability refers to the ability of commercial banks and other financial institutions to obtain profits in operating activities, that is, the capital or capital appreciation ability of commercial banks^[1]. The stronger the profitability is, the more powerful its development momentum will be. However, the profitability of commercial banks is not completely equal to that of ordinary enterprises^[2]. It is not only general but also specific. Its generality refers to the commercial bank as an independent corporate legal person, profit maximization is its core goal and the foundation of its development. Its particularity is reflected in the fact that currency, which is regarded as a general equivalent, is the business product of commercial banks. Therefore, commercial banks have much higher requirements for risk control and asset

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stability than other industries. In the long run, we also need to maintain the continuous stability of its profitability, establish an efficient, reasonable and scientific management and operation mechanism, and improve internal management capabilities and efficiency, so as to achieve the bank's sound development and rapid progress^[3].

(2) Selection of research methods

The purpose of factor analysis is to use a few unmeasured variables to express the correlation between the original variables^[4]. It can not only help us find the factor that contributes the most to the profitability, but also calculate the score through a specific function to facilitate the comparison of results^[5]. Based on this, this article takes 16 listed commercial banks as examples (including state-owned commercial banks and joint-stock commercial banks), selects 2018 data, selects the profit rate of main business X_1 , return on net assets X_2 , capital adequacy ratio X_3 , and basic Earnings per share X_4 , non-performing loan ratio X_5 , net assets per share X_6 , total assets X_7 , bank credit rating X_8 and cash equivalent net increase X_9 nine indicators, using factor analysis to process and interpret the data of each indicator.

3. Empirical analysis

3.1 Data processing and inspection

Among the selected nine indicators, this paper uses $X_5' = 1 / X_5$ to positively convert the non-performing loan rate, and assigns AAA, AA+, and AA to the bank's credit rating as 3, 2.5, and 2, respectively. Then, use SPSS to standardize the data, standardize the data, convert the original data into non-order-of-magnitude, non-dimensional standardized values, eliminate the impact of different attributes between different indicators, so that the results are more meaningful Comparability. The standardized data is abbreviated as $ZX_1, ZX_2, ZX_3, ZX_4, ZX_5$.

3.2 Selection of factors

From the data test, we further confirmed the applicability of the factor analysis method in the profitability of commercial banks. Next, we need to calculate the characteristic value of each factor and the variance contribution rate. The calculation results are shown in **Table 1**.

Table 1 Total variance explained

Ingredient	Initial Eigenvalue			Extract the sum of squares and load			Rotate the sum of squares loading		
	Total	variance	Accumulation	Total	variance	Accumulation	Total	variance	Accumulation
1	2.961	32.897	32.897	2.961	32.897	32.897	2.852	31.686	31.686
2	2.539	28.208	61.105	2.539	28.208	61.105	2.524	28.047	59.733
3	1.214	13.484	74.59	1.214	13.484	74.59	1.204	13.378	73.11
4	1.049	11.655	86.245	1.049	11.655	86.245	1.182	13.134	86.245
5	0.707	7.856	94.101						
6	0.255	2.83	96.931						
7	0.188	2.089	99.02						
8	0.084	0.931	99.951						
9	0.004	0.049	100						

It can be seen from **Table 1** of the explained total variance that the eigenvalues of the first four items are greater than 1, and the cumulative variance contribution rate of the first four factors is 86.245%, indicating that the first four factors contain the main information of the original variables, so the first four are extracted. The factor is the main component. Furthermore, rotation processing can make the relationship between factors more obvious. After factor rotation, the eigenvalues of the first four factors become more significant, so this article will extract the first four factors as common factors.

In order to reduce the influence of subjective factors and make the observation data clearer, we use the rotated

component matrix. The calculation results are shown in **Table 2**. **Table 2** shows that F_1 mainly reflects the capital adequacy ratio, with a load of 0.906, which can be named the first profitability factor; F_2 mainly means basic earnings per share, with a load of 0.977, which can be named the second profitability factor; F_3 mainly reflects the net assets per share, the load is 0.971, which can be named the third profitability factor; F_4 mainly reflects the bank credit index, and the load is 0.898, which can be named the fourth profitability factor.

Table 2 Rotation component matrix

	Rescale			
	Ingredients			
	1	2	3	4
Zscore(X_1)	0.863	0.139	0.378	-0.042
Zscore(X_2)	0.556	0.707	0.155	-0.219
Zscore(X_3)	0.906	0.015	-0.172	0.064
Zscore(X_4)	-0.053	0.977	-0.045	0.091
Zscore(X_5)	-0.211	0.933	-0.074	0.181
Zscore(X_6)	-0.064	-0.066	0.971	0.06
Zscore(X_7)	0.817	-0.261	-0.161	0.342
Zscore(X_8)	0.121	0.234	0.108	0.898
Zscore(X_9)	0.493	-0.231	-0.142	0.399

After selecting and naming the factors, it is necessary to calculate the score coefficient matrix of each factor, that is, the profit rate of main business, return on net assets, capital adequacy ratio, basic earnings per share, non-performing loan ratio, net assets per share, total the weight of nine indicators, including assets, bank credit rating cash, and net increase in equivalents, relative to the four public factors.

Table 3 Component score coefficient matrix

	Ingredients			
	1	2	3	4
Zscore(x1)	0.324	0.055	0.299	-0.152
Zscore(x2)	0.242	0.293	0.095	-0.303
Zscore(x3)	0.331	0.017	-0.153	-0.075
Zscore(x4)	-0.022	0.387	-0.062	0.043
Zscore(x5)	-0.094	0.364	-0.08	0.148
Zscore(x6)	-0.045	-0.057	0.814	0.097
Zscore(x7)	0.256	-0.107	-0.126	0.202
Zscore(x8)	-0.079	0.05	0.111	0.787
Zscore(x9)	0.127	-0.102	-0.105	0.298

According to the component score coefficient matrix in **Table 3**, the scores of each factor and the comprehensive score of profitability can be calculated. The specific calculation process is as follows:

$$F = \frac{31.686F_1 + 28.047F_2 + 13.378F_3 + 13.134F_4}{86.245}$$

The calculation results are shown in **Table 4**:

Table 4 Profitability scores and rankings of banks in 2018

Rank	bank	Profitability score	Rank	bank	Profitability score
1	China Merchants Bank	0.96	9	Agricultural Bank of China	0.1
2	Construction Bank	0.59	10	HSBC Bank	-0.12
3	Industrial Bank	0.55	11	Minsheng Bank	-0.23
4	ICBC	0.41	12	Bank of Communications	-0.25
5	Bank of China	0.24	13	Everbright Bank	-0.43
6	Bank of Nanjing	0.23	14	CITIC Bank	-0.51
7	Bank of Beijing	0.16	15	Ping An Bank	-0.57
8	Shanghai Pudong Development Bank	0.11	16	Bank of Zhengzhou	-1.24

4. Conclusion and suggestion

4.1 Conclusions

Referring to the comprehensive scores of the above 16 commercial banks' profitability in 2018, it can be seen that in terms of profitability, state-owned banks have obvious advantages over joint-stock commercial banks. In 2018, the profitability performance of banks in various countries was relatively stable, but there are still big differences among banks. Among them, China Construction Bank and Industrial and Commercial Bank of China have shown good profitability, occupying a leading position among state-owned commercial banks, and showing stable profitability. Bank of China and Agricultural Bank of China occupy the 5th and 9th places respectively among 16 commercial banks, which are better than joint-stock commercial banks as a whole, and their comprehensive profitability scores are both positive. In 2018, the performance of joint-stock commercial banks in terms of profitability was generally at a low-middle level, and some comprehensive scores of profitability were even negative. But there are also new generations, such as China Merchants Bank's profitability performance even surpassed state-owned banks to rank first.

4.2 Policy suggestion

For commercial banks, profitability, liquidity and safety are their business goals. Good liquidity and safety provide a strong support for commercial banks to improve their profitability. For the government, how to strengthen financial development to serve the real economy, adhere to the real economy as the center, economic system, and financial tools as the fulcrum, while gradually opening the financial market, reasonably respond to the risks of economic globalization, develop inclusive finance, and stimulate micro subject productivity, etc., are self-questions that we must consistently ask.

Profit maximization is the primary goal of a commercial bank as a corporate legal person. It is the most basic means to improve its own profitability by controlling costs to improve operational efficiency, expanding service targets, to develop retail banking services, and improve the level of financial technology innovation. Furthermore, in the context of financial globalization, it is unrealistic to "do not run into the river" as before. We must take the initiative to open up the financial market and change the small goal of "going fast" in the past. Under the wave of globalization we must "go steady" and strictly control the risks faced by commercial banks such as credit risk, market risk, and liquidity risk, while continuously optimizing our own credit structure and improving risk response capabilities.

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