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The Operational Efficiency of China's Top Ten Commercial Banks

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Abstract. Based on DEA model, this paper shows that the performance of China's top ten commercial banks is better than that of foreign banks in China, and that of joint-stock commercial banks is better than that of state-owned commercial banks. China's top ten commercial banks can improve their pure technical efficiency and scale efficiency by strengthening their loan management capabilities, developing diversified business, rationally adjusting their scale and paying attention to human resources management.

1. Introduction

With the deepening of China's reform and opening up and the continuous development of financial globalization, the competition among banks in the global market has become increasingly fierce. Facing with the huge impact of foreign banks in China, how to maintain a seat in the large state-owned commercial banks and how to effectively enhance profit space have become the top priority of domestic commercial banks. Improving the efficiency of commercial banks is the key to prevent bank risks and promote the sustainable development of the banking industry, but also the core of deepening the reform of China's financial system.

Lirong Zhai[1] selected 10 village banks under the jurisdiction of Langfang as an example, find that the efficiency of the bank is measured by the deviation of the efficiency of the village banks from the frontier. Yunhan He[2] pointed out that as one type of the commercial banks, the national joint-stock commercial banks achieve a leap-forward development and become an important force in the financial field in China in a short period of time. Luan Yijun and Zenghua Ma[3] used DEA method to analyze the DEA efficiency of Export-Import Bank of China, Agricultural Development Bank of China and State Development. Linhe Zhang[4] proposed that under the increasing competitive pressure of Chinese banking industry, Chinese banks must improve their investment efficiency in order to adapt to changes in the market. However, at present, the five state-owned banks are generally inefficient, and the efficiency of small and medium-sized banks is uneven. TuDQLe[5] introduced the method of data envelopment analysis using financial ratios, which can get the efficiency scores of banks. In particular, it pointed out that the average efficiency of Vietnamese banks is at a low level, which shows that it still has the possibility to further improve the efficiency in order to achieve best practices. Hacini, I. and Dahou, K[6] examined the differences in technical efficiency, pure technical efficiency and scale efficiency between domestic and foreign banks in Algeria between 2000 and 2012. Verma, R. and Bodla, B. S.[7] evaluate the productivity of Indian listed commercial banks.

2. Empirical Results and Discussion

2.1. Sample Selection

In this paper, ten commercial banks and five foreign banks in China are chosen to analyze, and they are divided into state-owned commercial banks and joint-stock commercial banks so as to analyze and compare the efficiency of banks with different property rights. Among the top ten commercial banks in China, state-owned commercial banks include: Industrial and Commercial Bank of China,

China Construction Bank, Bank of China, Bank of Communications of China, Agricultural Bank of China and Postal Savings Bank of China; joint-stock commercial banks include: Industrial Bank, China Merchants Bank, China Minsheng Bank and China CITIC Bank. In addition, the top five foreign banks in China are HSBC (China), Standard Chartered Bank (China), the Bank of East Asia (China), Citibank (China), and Development Bank of Singapore (China). The sample time is 2017. Empirical data are collected from the official websites and annual reports of the above banks in 2017.

2.2. Input and Output Variables

This paper chooses the Net Core Tier-1 capital, the number of employees and the total deposit as input indicators, and the total amount of loans and advances and profits as output indicators[8] .Core capital refers to equity capital and public reserves. As a component of bank capital, it is also the highest quality and most stable bank capital. Core capital is occupied by banks for a long time, is the core of bank capital, and measures the ability of banks to withstand risks. The number of employees represents the number of official employees on the bank register at the end of this year. It represents the amount of labor used by the bank[9]. It is a symbol of the size of the bank and one of the important indicators of production factors. Total deposits, as the main source and basis of loans, are the costs invested before interest is paid. Loans are the main source of interest for banks, and also an important part of financial support to meet the needs of society to expand reproduction[10]. Total profit is pre-tax profit. It is the goal and achievement of bank operation.

2.3. Discussion

Based on the input-output data of ten commercial banks and five foreign banks in China in 2017, this paper uses DEA model to get their comprehensive technical efficiency, pure technical efficiency, scale efficiency and scale returns. The ability of banks to allocate resources as a whole is embodied by the comprehensive technical efficiency; the level of technology application and proper management of banks will affect the efficiency of pure technology; and the scale efficiency measures the impact of the size of banks on the overall production efficiency[11]. Efficiency values are calculated by DEAP2.1 software, and input orientation is selected.

Table 1. Efficiency Scores given by Data Envelopment Analysis.

No.	Banks	TE	PTE	SE	RTS
1	ICBC	0.850	1.000	0.850	Decreasing
2	CCB	0.901	1.000	0.901	Decreasing
3	BOC	0.810	0.889	0.911	Decreasing
4	BCM	0.935	1.000	0.935	Decreasing
5	ABC	0.926	1.000	0.926	Decreasing
6	PSBC	1.000	1.000	1.000	-
7	CMBC	1.000	1.000	1.000	-
8	CIB	0.940	0.944	0.996	Increasing
9	CMB	1.000	1.000	1.000	-
10	CITIC	1.000	1.000	1.000	-
11	HSBC(China)	0.789	0.886	0.891	Increasing
12	SCB(China)	0.686	0.947	0.724	Increasing
13	BEA(China)	0.828	1.000	0.828	Increasing
14	CITI(China)	0.687	1.000	0.687	Increasing
15	DBS(China)	0.947	1.000	0.947	Increasing

2.3.1. Comprehensive Technical Efficiency

As can be seen from Table 1, only four banks with comprehensive efficiency of 1, accounting for 27% of the selected sample banks, are all Chinese banks. There are three banks whose comprehensive technical efficiency reaches 1, namely China Minsheng Bank, China Merchants Bank and China CITIC Bank.

Table 2. Average Scores for Various Types of Commercial Banks.

Type of Bank	TE	PTE	SE
Foreign Banks	0.787	0.967	0.815
Joint-stock Commercial Banks	0.985	0.985	0.999
State-owned Commercial Bank	0.904	0.982	0.921
All Banks	0.887	0.978	0.910

It is clear that in 2017, the comprehensive technical efficiency of the top ten commercial banks in China is higher than that of foreign banks, and the performance of joint-stock commercial banks is better than that of state-owned commercial banks. There is little difference among joint-stock commercial banks. Except for the three banks whose comprehensive technical efficiency is 1, the comprehensive technical efficiency of Industrial Bank in 2017 is 0.940. Five of the six state-owned commercial banks are not effective in terms of comprehensive technical efficiency.

The comprehensive technical efficiency of Bank of China and Industrial and Commercial Bank of China are 0.810 and 0.850 respectively. In addition, the other banks are higher than 0.900. There are great differences among the five foreign banks. Standard Chartered Bank (China) has the lowest value with 0.686 while the highest value is Development Bank of Singapore (China) which is 0.947.

2.3.2. Pure Technical Efficiency

From Table 1, we can also conclude that 11 banks have achieved pure technical efficiency, accounting for 73% of all sample banks, including Industrial and Commercial Bank, Construction Bank, Communications Bank, Minsheng Bank, China Merchants Bank, Industrial Bank, Postal Savings Bank of China, CITIC Bank, Bank of East Asia (China), Citibank (China) and Development Bank of Singapore (China). Among them, there are five state-owned banks, three joint-stock commercial banks and three foreign banks.

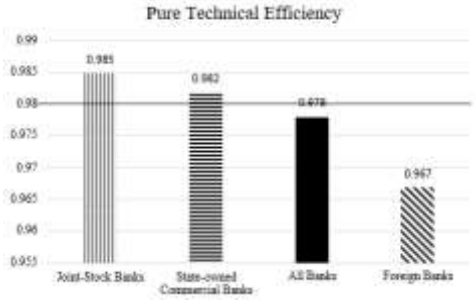

Figure 1. Average Pure Technical Efficiency Value of Various Banks.

Table 2 shows that the average pure technical efficiency of all sample banks is 0.978. And Figure 1 shows that the average pure technical efficiency of state-owned commercial banks is 0.982 and joint-stock commercial banks is 0.985, which is higher than the total average of foreign banks 0.967. China's top ten commercial banks have generally higher pure technical efficiency in 2017. Among the state-owned commercial banks, only Bank of China has a pure technical efficiency of 0.889, while other banks are all pure technical efficiency. Among the joint-stock commercial banks, the lowest value is Industrial Bank, the pure technical efficiency is 0.944, and the rest reach the best pure technical efficiency. Compared with Chinese-funded commercial banks, five foreign banks performed poorly in 2017. Only three banks achieved pure technical efficiency and efficiency. They were Bank of East Asia (China), Citibank (China) and Development Bank of Singapore (China),

with the two lowest value being HSBC (China) Bank with 0.886, followed by Standard Chartered (China) Bank, which is 0.724.

2.3.3. Scale Efficiency

As it can be seen from Table 1, at the end of 2017, the banks with scale efficiency reaching 1 are the same as the four banks with comprehensive technical efficiency reaching 1. They are Minsheng Bank, China Merchants Bank, Postal Savings Bank of China and China CITIC Bank, accounting for 27% of the total sample banks. Among them, there are one state-owned commercial bank, three joint-stock banks and no foreign-funded banks. When it comes to Table 2, it represents that the average scale efficiency of all banks is 0.910.

Normally, the scale efficiency of listed commercial banks is generally low, but there are great differences among different types of banks. To be more specific, only the Postal Savings Bank of China owns the scale efficiency with 1, and the other five state-owned commercial banks scale efficiency is lower than 0.950, the overall efficiency of state-owned commercial banks is low, but the overall scale efficiency of joint-stock banks is high. Except Minsheng Bank, China Merchants Bank and CITIC Bank all achieve scale efficiency, the scale efficiency of Industrial Bank is 0.996, also infinitely close to 1.

3. Operating Efficiency of Commercial Banks

3.1. Operating Efficiency of State-Owned Commercial Banks

Among the state-owned commercial banks, only Postal Savings Banks of China achieved comprehensive technical efficiency, pure technical efficiency and scale efficiency in 2017. In addition, Industrial and Commercial Bank of China, China Construction Bank, Bank of Communications of China and Agricultural Bank of China have achieved only pure technical efficiency and efficiency. Some sample banks have appeared the phenomenon that the efficiency value is not 1, but the input redundancy value or the output insufficiency value are both 0, which indicates that their input to the indicators has been fully utilized, there is no over-input phenomenon, and the output is sufficient and the structure is reasonable. The causes of inefficiency are the improper scale of input and output, the way of resource allocation, and the method used to make the operation of banks inefficient. Banks should reasonably allocate the resources according to their own scale reward situation. Integrated technical efficiency is equal to pure technical efficiency multiplied by scale efficiency, which is inseparable from pure technical efficiency and scale efficiency. The low comprehensive technical efficiency is mainly due to its low scale efficiency. Compared with the joint-stock banks, the average scale efficiency of the four joint-stock commercial banks is 0.078 higher than that of the state-owned commercial banks. The low scale efficiency is the reason for the overall low comprehensive technical efficiency of the four state-owned banks. The main reason is that the investment has not been fully utilized, and the scale of state-owned commercial banks is larger than other joint-stock commercial banks. Faced with market changes, the response speed of state-owned commercial banks is slow, the reaction time is long, and the number of outlets is wide and large. This also leads to the large number of employees, the lack of talent management ability and incentive mechanism, which also leads to the declining efficiency and operation of branches. Increased operating costs, coupled with the impact of emerging financial media such as Internet finance. Combined with these factors, the state-owned banks also have the phenomenon of diminishing returns to scale and low efficiency of scale as a whole.

3.2. Operating Efficiency of Joint-Stock Banks

Among the four joint-stock commercial banks, China Minsheng Bank, China Merchants Bank and China CITIC Bank all achieve comprehensive technical efficiency and effectiveness. Industrial Bank's comprehensive technical efficiency is 0.940, pure technical efficiency is 0.944, and scale efficiency is 0.996. It belongs to pure technical inefficiency, which leads to the low comprehensive

technical efficiency of commercial banks. Firstly, take the redundancy value of China Industrial Bank into account, the net investment of core capital of is 63.8 billion yuan in 2017. For customers, the more capital the bank owns capital, the stronger the bank's strength, the stronger the ability to resist risks, the less likely it will fail. But for banks, excessive self-owned capital will reduce the return on net assets, the insufficient utilization of funds and the phenomenon of capital idleness exists. At present, the banking regulatory authorities have a lower limit on the capital adequacy ratio, especially the core capital adequacy ratio, and the net core Tier-1 capital cannot be blindly maximized.

On the whole, joint-stock commercial banks performed very well in 2017, better than state-owned commercial banks. Only Industrial Bank needs to improve its pure technical efficiency to achieve comprehensive technical efficiency and efficiency.

3.3. Operating Efficiency of Foreign Commercial Banks

In 2017, none of the five foreign banks achieved the best comprehensive technical efficiency. Combined with the performance of Chinese and foreign banks in China in 2017, the joint-stock banks of Chinese banks > State-owned Commercial Banks > foreign banks. According to Table 2, foreign banks are not as good as Chinese banks in terms of comprehensive technical efficiency, pure technical efficiency and scale efficiency. The only thing is that the scale returns of foreign banks are all increasing, while only one of them is increasing, most of them are decreasing. This is because foreign banks are still growing and expanding in China, while large-scale Chinese-funded commercial banks are in the stage of scaling down, reducing expansion and improving efficiency.

4. Conclusion and Prospect of the Research

4.1. Conclusion

Through the empirical measurement and analysis of the selected bank data, the following conclusions are drawn:

From the perspective of comprehensive technical efficiency, the number and average level of comprehensive technical efficiency of joint-stock commercial banks are higher than that of state-owned commercial banks, and higher than that of foreign banks. The main reason for the low comprehensive technical efficiency of commercial banks is the low scale efficiency, which needs to optimize the investment and the use of various resources.

In view of pure technical efficiency, the number of large commercial banks with pure technical efficiency is higher than that of joint-stock commercial banks and foreign banks. Generally speaking, the pure technical efficiency of commercial banks is higher while the average difference is very small. Chinese joint-stock commercial banks have slightly higher values than large commercial banks and foreign banks.

As for the scale efficiency, it is generally consistent with the comprehensive technical efficiency. All state-owned commercial banks show diminishing returns to scale. All joint-stock commercial banks except China Industrial Bank keep the same returns to scale, while all foreign banks increase returns to scale. The persistence of state-owned commercial banks in pursuit of scale expansion leads to a decreasing trend of scale efficiency of large commercial banks with the expansion of scale. In addition, with the increasing openness of financial institutions to the outside world and the relaxation of financial market access, foreign banks in China can further increase their outlets and expand their scale. On the whole, it is imminent for commercial banks to improve scale efficiency, so as to enhance the overall comprehensive technical efficiency.

4.2. Prospect of the Research

Many scholars have studied the operational efficiency of banks in various aspects before, but there are still many deficiencies in their academic ability, so there are still many areas to be improved in this paper. Firstly, this paper calculates the operational efficiency of commercial banks mainly through the basic DEA analysis method. The basic DEA method has less analysis and cannot be

interpreted in a deeper level. In the future, a more comprehensive method can be used for comprehensive calculation. Secondly, there are few sample data. This paper uses only one year's data to analyze the changes in the development of banks. The content is too thin and incomplete to accurately estimate the direction of future improvement of different banks. Thirdly, there are fewer types of banks involved in this paper, which will include other types of financial institutions such as urban commercial banks, rural credit cooperatives and so on. Fourthly, the basic DEA method cannot see the specific factors affecting the efficiency of bank operation. Therefore, in the later research, we should use more professional software to make a more in-depth analysis of the influencing factors.

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