

Gauging Cost Efficiency of China's Listed Banks

Chen Chunying*

Zhaoqing University, Economics and Management College, Guangdong Province, China

***Corresponding Author:** Chen Chunying, Zhaoqing University, Economics and Management College, Guangdong Province, China, Email: 2018023029@zqu.edu.cn

ABSTRACT

Most literature on data envelopment analysis results in efficiency values that are too similar to be compared. This study resolves this issue using a "cost efficiency model," surveying the efficiency of Chinese listed banks through an analysis of 25 listed banks from 2001 to 2016. The results show that less efficient banks only improve through measures such as lowering staff size, reducing payroll, or increasing loans and making investments to generate higher revenue. Further, we found that China's listed banks achieved the highest level of cost efficiency before 2006. As banker confidence increased, banks provided more credit, which resulted in higher loan losses, leading to a decline in listed banks' operational efficiency.

Keywords: listed banks; cost efficiency; data envelopment analysis; operational efficiency

INTRODUCTION

Operational efficiency affects a firm's profitability, which is in turn reflected in current yield, return on assets and return on equity (ROE). In the past, research has used diverse methods to identify the key to improving operational outcomes. Academic studies in accounting and finance usually evaluate a business's operational efficiency using financial measures, such as current yield, rate of return on assets, and ROE. Although financial measures of operational efficiency are capable of rendering an objective appraisal, they often fail to provide a comprehensive comparison of differences among business units. However, profitability, which indicates a company's operational outcome during a certain period, is still the center of attention for a company's stakeholders.

The stochastic frontier approach (SFA) is an analysis of non-financial indices that uses parametric analysis. However, the SFA functions constructed often turn out to be less than cogent. Data envelopment analysis (DEA) is another non-financial analysis method. DEA does not require establishment of a functional form, does not require a large sample, is affected by goal ideas, and is suitable for analyzing cases involving multiple items of input and output. This method can provide a wealth of information on resource use and efficiency improvement of business units. DEA

has been adopted in the evaluation of bank operational efficiency in studies by Sturm and Williams [1]; Defung, Salim, and Bloch[2]; and Apergis and Polemis[3]. Prior literature has also identified a significantly positive correlation between the banking industry's efficiency value under DEA and asset return (e.g., Penny [4]; Avkiran[5]; Dewi et al.[6]).

As bank assets are comprise mainly of loans, bad loans are likely to arise, thereby reducing operating revenue and lowering production efficiency. For disbursed loans, provisions for bad debts must be established in advance for potential losses. This increases the cost of financial operations and exacerbates input efficiency. Thus, operational efficiency suffers directly whether observed from the perspective of inputs or outputs. This feature fits with the DEA evaluation requirements as long as there are items of input and output. Prior accounting and finance literature generally acknowledges the existence of earnings management in the banking industry. Therefore, under the premise of a positive relationship between the DEA efficiency values and return on assets in the banking industry, it would be more meaningful to directly investigate operational efficiency by looking into an operational efficiency value that is less susceptible to manipulation.

Kamau[7] notes the important role of banks as financial intermediaries. According to this perspective, banks are intermediaries for the

transference of funds between funds suppliers and the demand side (He, Zhan, and Qiu[8]). In evaluating the banking industry's operational efficiency, the intermediation approach has particularly come into focus in the literature on DEA application. However, the efficiency values in most DEA studies are too close to be compared. Therefore, we adopt the view of the DEA intermediation approach and reference Nguyen et al.'s [9] cost efficiency model to resolve the aforementioned weakness in DEA. We evaluate the operational efficiency of China's listed banks by looking into both their inputs and outputs.

To the best of our knowledge, the cost efficiency model has yet to be applied to evaluate the operational efficiency of China's listed banks. The research period chosen for our work also coincides with the European debt crisis and the global financial crisis triggered by sub-prime loans in the U.S. in 2007–2008. According to Dendramis, Tzavalis, and Adraktas[10], in a financial environment fraught with economic recession and political instability, the credit risks of mortgage loans tend to increase, harming bank operational performance. Adopting Regehr and Sengupta's[11] duration of the global financial turmoil (i.e., 2007–2009), we analyze and assess the viability of our research results by dividing the duration of the study into three parts for the analysis: before, during, and after the global financial crisis. To facilitate observation and comparison with the three years of the crisis, the post-crisis period is then divided into two stages, each containing three years. The research shows that less efficient banks only improve through measures such as decreasing staff size, reducing payroll, or increasing loans and making investments to generate higher revenues. Further, we found that China's listed banks achieved the highest level of cost efficiency before 2006. Greater banker confidence instead led to a decline in the listed banks' operational efficiency.

The remainder of this paper is arranged as follows. Section 2 reviews past literature. Section 3 introduces the research design, while Section 4 presents the results of the empirical analysis, including a descriptive analysis of the sample and an analysis of bank operational efficiency. Section 5 presents the conclusion.

LITERATURE REVIEW

Edwards and Mishkin[12] and Qin [13] consider the banking industry as an important financial intermediary. Under the intermediation

approach, banks provide intermediary financial services—through loans, earnings and investments as outputs, whereas funding costs—including interest expense, labor, and operational costs—are inputs (Chen and Fang [14]). Theoretically speaking, the intermediation approach is more in line with banks' practical operation. During practical operation, bank operational processes include a control mechanism with close internal linkages; therefore, the overall operational process merits special attention when gauging a bank's operational efficiency. Farrell [15] assuming a fixed returns to scale, measured technical efficiency by adopting a model where the company surveyed produces a single output with its inputs. With additional information on the price of inputs, it would be possible to gauge cost efficiency, a prototype of the cost efficiency model. As an evaluation of cost performance from the perspective of cost-benefit analysis, cost efficiency determines performance by measuring the efficiency of production at relative minimum cost for a certain amount of output. Given the same market environment and amount of output, those closer to the effective frontier or the optimum operational unit cost are more cost efficient. Thus, we adopted Nguyen et al.'s [9] cost efficiency model as a criterion for evaluating bank operational efficiency.

RESEARCH DESIGN

We used China's listed banks as our sample and studied data spanning 16 years—from 2001 to 2016. Excluding those with incomplete variables in the analysis of a given year, we studied 25 banks¹, with a total of 193 observations. We sourced all data from the China Stock Market & Accounting Research Database. When performing DEA using the data, the addition of each pair of input and output items diminishes the distinguish ability of the evaluated institution within the analysis. We chose a moderate sample size for the course

¹25 banks included Wujiang Rural Commercial Bank; Bank of Guiyang; Industrial and Commercial Bank of China; Bank of Nanjing; China Merchants Bank; Bank of Ningbo; China Construction Bank; Bank of China; Bank of Beijing; China Citic Bank; Bank of Communications; Shanghai Pudong Development Bank; Agricultural Bank of China; China Minsheng Bank; Huaxia Bank; Ping An Bank; Wuxi Rural Commercial Bank; Zhangjiagang Bank; Bank of Hangzhou; Bank of Shanghai; Changshu Rural Commercial Bank; Jiangyin Bank; Industrial Bank; China Ever bright Bank; Bank of Jiangsu.

of the research because the empirical rule of Thompson et al. [16] and Bowlin and Rozeff’s[17]dictates that the number of institutions examined should be at least double the total number of input and output items. In addition, the total number of input and output variables should not exceed one third of the number of surveyed institutions (Boussofiene, Dyson, and Than assoulis[18]). Thus, we limited the number of input and output items. By consulting relevant literature for China (Wang[19]) and in compliance with the aforementioned rules, the analysis variables selected for DEA include output items (loans, earnings per share, and investments), input items (staff size, size of deposits, and interbank placements), and input costs(employee pay, interest expenses, etc.).First, we suppose C to be a bank’s real cost given a certain input and output, and C^* to be the minimum cost at the margin of effective cost. The bank’s cost efficiency is therefore represented as $CE = C^*/C$. That is, with the same amount of production, the cost that should be saved by the bank is represented as $(1-CE) \times 100\%$. Consequently, the value range of CE —the bank’s operational efficiency—is $[0, 1]$. We then perform further analysis using CE . We also consulted Regehr and Sengupta’s[11] approach, in which they divide the duration of their study into three parts for the analysis: before, during, and after the global financial crisis. To facilitate observation and comparison with the three years of the crisis, the post-crisis period is then divided into two stages, each containing three years.

EMPIRICAL FINDINGS AND ANALYSIS

The skewness of each index is greater than 0, indicating that the positive deviation value in the distribution is large, and is right or positive; that is, there are more sample banks with higher input-output index values. The kurtosis is also greater than 0, indicating the peak of the input-output indicator is steep and is a spike. An analysis of relevant factors shows that there is evident correlation between the variables included in this study, which is consistent with the conditions of the DEA approach—there should be a correlation between input and output items. Judging from the banks’ average efficiency, with a maximum value of 1 and a minimum of 0.586, there is a significant difference in efficiency between them. According to the meaning of the analytical variables, less efficient banks are advised to make improvements by starting with input and

output items (for example, by reducing staff size), cutting back total payroll and saving costs, or by increasing employee productivity through disbursing more loans, increasing investments, and generating more revenue, thereby improving cost efficiency. It is also possible to save costs by absorbing low-interest deposits and decreasing interest expense, or generating more revenue and becoming more cost efficient by sufficiently and effectively lending out deposits as loans or making investments, all while complying with the legal provisions of bank reserve funds. Meanwhile, attention should also be paid to the quality of loan disbursements and investments. During the study, the operational efficiency of China’s listed banks was at its best prior to the global financial debacle, before falling drastically during the crisis, as shown in Table 1.In the first post-crisis period, a time of recovery, bank efficiency stagnated. In the second post-crisis period, in spite of some improvement, efficiency was still below the pre-crisis value. Finally, we performed a separate efficiency analysis on the sample pool from 2016 to the present, finding that bank efficiency still failed to improve.

Table1. Average bank efficiency before, during, and after the global financial crisis.

Year	Average efficiency	Ranking
2001–2006, pre-crisis	0.946	1
2007–2009, during the crisis	0.867	3
2010–2012, first post-crisis period	0.880	2
2013–2015, second post-crisis period	0.862	4
2016, present	0.813	5

Banker confidence and bank operations were affected during the global financial crisis. Therefore, this study further examines the relationship between banker confidence and bank efficiency. According to Dendramis et al. [20], in a financial environment fraught with economic recession and political instability, the credit risk of mortgage loans tends to increase, harming banks’ operational performance. We analyze and assess the viability of their research results, using annual analysis to control for the impact of different economic environments and political elements on bank operating efficiency. As shown in figure 1, in 2015 and 2016, Chinese premier Li Keqiang mentioned on several occasions the need to enhance financial and economic efficiency and the efficiency of financial resource allocation. Active measures were then adopted in national policies that

increased banker confidence, instead leading to a decline in the operational efficiency of listed banks. When China's average banker confidence index² is higher, bankers are optimistic. Bank managers will increase the amount of loans and investments, or relax restrictive conditions on businesses or individuals who need loans. As Chen and Li [21] note, when banks provide loans, financial problems related to non-performing assets may be introduced, which cause loan losses. Banks' manager increases (decreases) loan amount may result more (less) non-performing assets, and the bank industry lowers (increases) interest rates to attract (deter) customers who need loans. Frequently reducing (increasing) interest rates requires risk compensation that leads to higher (lower) credit risk customers receiving loans. As banks bear more (less) credit risk, bank managers should need to increase (decrease) the provision for bad debt loan losses.

When banks propose higher loan losses, bank profits are reduced and loan assets are undervalued. Conversely, banks will increase the net profit on their financial statements and overvalue loan assets if lower loan losses are reported (Chen and Li, 2018). Therefore, as can be seen from Figure 1, in the three spike periods of China's average banker confidence index, banks are all less efficient. Conversely, in 2015, China's average banker confidence index was lower, and banks had higher operating efficiency values.

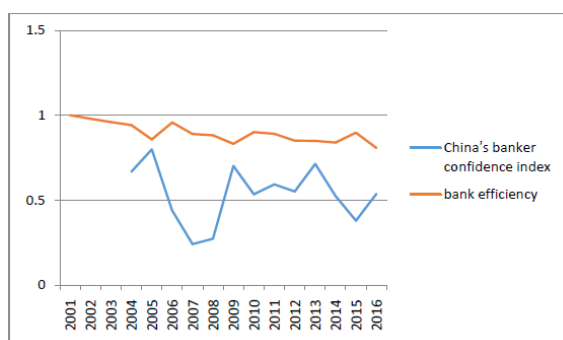


Figure 1. China's average banker confidence index and bank efficiency.

CONCLUSION

By adopting the intermediation approach and evaluating bank operational efficiency using the cost efficiency model, we address the similarity of efficiency values observed in most DEA

analysis literature. Less efficient banks are advised to make improvements by starting from input and output items (for example, by reducing staff), reducing total payroll and saving costs, or by increasing employee productivity by disbursing more loans, increasing investments, and generating more revenue, thereby improving cost efficiency.

It is also possible to reduce costs by absorbing low-interest deposits and decreasing interest expense, or generating more revenue and becoming more cost efficient by adequately and effectively lending out deposits or making investments, all while complying with the legal provisions of bank reserve funds. Meanwhile, attention should also be paid to the quality of loans and investments.

Further, we found that the operational efficiency of China's listed banks was at its best prior to the global financial debacle. In spite of some improvement in the post-crisis period, bank efficiency was still below the pre-crisis values. In addition, greater banker confidence led to a decline in listed banks' operational efficiency because banks were required to increase their provision for bad debt loan losses to cope, as the increased credit provided by banks resulted in higher loan losses.

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²China's average banker confidence index data could only be traced back to the beginning of 2004.

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