The Impact of Foreign Banks' Entry into China on the Operating Efficiency of China's Banking Industry

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Abstract: Based on the sample data of 13 representative commercial banks in China from 2010 to 2019, this paper studies the impact of foreign bank entry on the efficiency of Chinese commercial banks and the optimal level of opening policies with the efficiency value calculated by DEA as the dependent variable. The results show that: there is an inverted "U" nonlinear relationship between the entry-degree of foreign banks and the efficiency of Chinese commercial banks, that is, under different entry degrees, the impact of foreign banks on the efficiency of Chinese commercial banks first shows positive and then negative, and there is an optimal level for the entry of foreign banks. According to the empirical results, it can be found that the continuous entry of foreign banks since 2010 has promoted the improvement of the efficiency of Chinese commercial banks. However, the entry-level of foreign banks at this stage is far below the optimal level, and foreign banks should be further introduced into China. At the end of the article, it puts forward several issues and corresponding countermeasures that should be paid attention to when improving the efficiency of Chinese commercial banks. Besides, it also summarizes the shortcomings of this article and the future research directions of the author.

1. Introduction

Since 2000, many foreign banks have continued to enter emerging market countries (Podpiera, 2006). There is no doubt that the entry of foreign banks will bring many development opportunities to the host country's banking industry, such as advanced technology and financial innovation methods, which will help the development of the host country's banking industry (Claessens, Demirgüç-Kunt and Huizinga, 1998). Therefore, many emerging market countries, such as India, Brazil, South Africa, continue to relax restrictions on the access of foreign banks to promote the development of their economies (Chen and Liao, 2011). However, emerging market countries should also clearly realize that foreign banks have a global service network, high-quality talents and incentive mechanisms (Gormley, 2010). Compared with developed countries, banks in emerging market countries have more non-performing assets and insufficient capital (Clarke et al. 2003). The influx of foreign banks will aggravate the operational risks of banks in emerging market countries and even affect the stability of the banking industry. (Lensink, Meesters and Naaborg, 2008). Therefore, whether to introduce foreign banks into the country has become a question that needs to

be considered in emerging market countries.

The primary research purpose of this paper is to study whether the entry of foreign banks brings positive or negative effects on the operating efficiency of Chinese commercial banks and the optimal value of entry-level of foreign banks. The main research contributions of this article are as follows: First, this article uses X efficiency instead of the financial indicators or efficiency indicators commonly used in the similar research literature to measure the efficiency of commercial banks. In the existing research on bank efficiency, there are many research results on X efficiency. However, the literature on the influence of foreign banks on the X efficiency of China's banking industry is not only less, but also not comprehensive enough. This article uses the X efficiency index to overcome better the problems of the unity and lagging of financial indicators and other efficiency indicators. This method makes this research more suitable for the analysis of foreign banks entering the optimal level. At the same time, it can also reflect on the policy of foreign bank opening. Second, this article uses a nonlinear quadratic model instead of a linear model commonly used in the similar research literature to analyze the impact of foreign bank entry on the efficiency of Chinese commercial banks. Compared with the linear model, the quadratic model can consider more influencing factors. Therefore, the conclusion is more credible than the general literature. Finally, a new conclusion is drawn that the degree of entry of foreign banks in China and the operating efficiency of commercial banks present an inverted U-shaped relationship. Third, based on empirical evidence, this article summarizes and analyzes the current problems in the entry-level of foreign banks and discusses countermeasures, which provides a basis for the development of the Bank of China and the formulation of national financial policies.

2. Literature review

Regarding the impact of foreign banks' entry on the efficiency of the host country's banking industry, it can be divided into two conclusions: positive and negative. The first two parts of this chapter combed the positive and negative impact literature from theoretical and empirical perspectives. The last part analyzed the reasons for the two diametrically opposed conclusions and made assumptions about the empirical conclusions of this paper.

2.1. Research on positive effects

In theory, many scholars such as Levine (1996), Bush (1997), Berger and Hannan (1998) believe that the entry of foreign banks can improve the operating efficiency of the host country's banking industry and is a measure worthy of implementation. Levine (1996) proposed a demonstration effect. This view believes that foreign banks have advantages over host country banks in terms of business technology, operation management, product innovation, and financial strength. These advantages inevitably put pressure on host country banks. In order to survive, the host country banks will learn from foreign banks to improve management, optimize internal resource allocation, and provide similar financial services and develop new products. Ultimately, the efficiency of the host country's banking industry will be improved due to these changes. Bush (1997) believes that the entry of foreign banks is conducive to the establishment of a complete competition mechanism in the host country, thereby generating positive competitive effects. In some emerging countries, the market economy mechanism is imperfect, and the competition among business entities is blind and vicious competition. The introduction of foreign banks can bring advanced regulatory systems and competition concepts to the host country, help the host country improve the market economy mechanism, establish a good competition concept, and turn vicious competition into the rational competition. In the end, the host country's banking industry continues to improve its operating efficiency in healthy competition.

In the empirical literature on China, Seo, Chao and Park (2013) conducted an empirical analysis based on the panel data of 10 commercial banks that have introduced foreign capital in China for more than two years from 1993 to 2010. They found that foreign financial institutions' equity participation is helpful to increase the non-interest income rate and return on net assets of commercial banks, which promotes the improvement of the efficiency of Chinese commercial banks. Berger, Hasan and Zhou (2009) conducted an empirical study on the panel data of 10 Chinese commercial banks from 1998 to 2007. The study found that the entry of foreign banks is positively correlated with the efficiency of human and fixed resource utilization of Chinese commercial banks. Moreover, the relevance has strengthened with the opening up of China's banking industry. This result verifies the theory of Berger and Hannan (1998) above. Leung.

2.2. Research on negative effects

Although many papers have verified the positive effect of foreign banks' entry, there are also many papers that show that the entry of foreign banks will not improve the efficiency of the host country's banks but will play a negative role. From a theoretical point of view, the negative effect is mainly achieved through the following two ways. (1) Walter and Gray (1983) believe that when foreign banks enter the host country, they will bring excessive competitive pressure to the host country's banks. Relying on outstanding innovation capabilities, high-quality and efficient services, and global networks, foreign banks compete with host country banks for quality customers, businesses, and talents. Fierce competition will impact and damage the efficiency of the host country's commercial banks. (2) Berger and Hannan (1998) believe that foreign banks will gain monopoly status and monopoly profits by their product advantages (that is, providing products that cannot be replaced by local banks), which will reduce the profits of host country banks. When profits decrease, and costs remain unchanged, the operating efficiency of the host country's banks decreases.

Regarding the empirical literature in China, Xiao Juan and Hui (2004) conducted an empirical analysis of the financial data of 14 Chinese banks from 1995 to 2004. The article found that the degree of foreign bank entry and the pre-tax profit rate of Chinese commercial banks showed a significant negative correlation. With the continuous entry of foreign banks, the profits of commercial banks continue to decrease, and the operating efficiency of Chinese commercial banks also continues to decrease. The article believes that this is caused by excessive competitive pressure brought by foreign banks. This conclusion is consistent with Walter and Gray (1983). Leung, Rigby and Young (2003) conducted an empirical analysis on the data of 14 Chinese commercial banks from 1990 to 2001. The article found that due to the advantages of foreign banks with advanced patented technology and huge brand effect, Chinese commercial banks are at a disadvantage in the competition with foreign banks, which leads to a reduction in the profits of the commercial banks. Operating efficiency refers to the comparative relationship between costs and benefits. Therefore, the operating efficiency of the host country's banks continues to decline. This conclusion supports the above conclusion of Berger and Hannan (1998).

2.3. Summary

Both of the conclusions mentioned above are supported by statistical tests. The main reason for the two different results is the economic and political situation of the host country. In order to benefit from the entry of foreign banks, the host country must meet certain thresholds, such as a sound financial market (law and order), political stability, low levels of corruption, and a more proactive macroeconomic policy (monetary policy and fiscal policy) (Kose, Prasad and Taylor, 2009). Only the entry of foreign banks can promote the improvement of the operating efficiency of

the banking industry. In recent years, the Chinese government has not only increased its anti-corruption efforts and severely punished corrupt officials (Fungáčová, Klein and Weill, 2020), it has also continuously improved the legal system in the financial industry. Besides, the Chinese government has been implementing a proactive fiscal policy and a stable Monetary policy (Yan and Feng fu, 2019). Hence, the author expects that under the current circumstances, the entry of foreign banks will have a positive impact on the efficiency of Chinese commercial banks.

3. Empirical study

3.1. Empirical research on the operating efficiency of Chinese commercial banks

3.1.1. Selection of bank efficiency indicators and models

X-efficiency refers to the sum of all technical and configuration efficiencies except scale efficiency and scope efficiency. Generally speaking, it can be regarded as the economic benefit generated by the improvement of the internal management level of the bank (Levine, 1996). The traditional theory holds that bank efficiency only comes from economies of scale and scope (Levine, 1996). Over time, some scholars, such as Leightner and Lovell (1998), Berger and Humphrey (1998), have shown that the scale effects of economy and scope economies are not significant in the banking industry. More and more studies have proved that X-efficiency is an essential factor in determining the performance of financial institutions (Sturm and Williams, 2004).Berger and Humphrey (1997) have shown that the inefficiency caused by uneconomic scale or scope does not exceed 5% of the total cost, and the improvement of X-efficiency (Management level)can save20% of the cost.

The main methods of operating efficiency research are divided into the parametric method (represented by the SFA model) and non-parametric method (represented by the DEA method). This article chooses the DEA model mainly because of the following two reasons. First, the number of large-scale commercial banks in China is limited, and the data is easy to obtain, but the small-scale regional banks are numerous, and the data is hard to obtain. This status quo makes it difficult to increase the sample size. Therefore, the situation in China is in line with the low sample size requirement of DEA technology (Fusheng, 2012). Second, Chinese commercial banks are financial institutions with a complex internal structure, a wide variety of businesses, and a considerable influence of government intervention. It is not a production department or service institution in the traditional sense, and its exact production function form cannot be determined (Fusheng, 2012).

3.1.2. Measurement of bank efficiency indicators

This article uses X-efficiency under the DEA model to reflect bank efficiency. DMU refers to the decision-making unit, and each sample bank is a DMU. In the DEA decision-making model, the more sample DMUs, the more convincing the efficiency comparison of DMUs. Each bank constitutes the evaluated group as DMU. Through the comprehensive analysis of the input and output ratio, and the weight of each input and output index of the DMU (bank) as a variable, the evaluation of bank efficiency is performed. Taking the input-oriented model of the DEA model as an example (Mody and Peria, 2004), assuming there are n DMUs, each DMU has m inputs and s outputs, the efficiency of a DMU (sample bank) is:

$$\text{Max } h_k = \sum_{r=1}^{s} u_r - U_k \tag{1}$$

Suject to

$$\sum_{i=1}^{m} v_i x_{ik} = 1, \sum_{r=1}^{s} u_r y_{rk} - \sum_{i=1}^{m} v_i x_{ik} - U_k \leq 0 \qquad (2)$$

$u_r \geq \varepsilon > 0$; $v_i \geq \varepsilon > 0$; i=1, 2, … , m; r=1,2,…,s; k=1,2,…,n;

Among them, X_{ik} in formula (2) represents the i-th input of the k-th sample bank; Y_{rk} in formula (2) represents the r-th output of the k-th sample bank; v_i and u_r are the weight of the i-th input and the r-th output respectively; The size of U_k can be used to determine whether each sample bank is in a state of increasing or decreasing returns to scale; ε is set to ensure that all input and output items have positive weights; H_k is the efficiency value of the k-th sample bank. H_k is between 0 and 1. The closer to 1 means the higher the efficiency, and the sample bank with $h_k=1$ means the highest efficiency in the sample group.

3.1.3. Selection of input and output items

Reasonable selection of input and output items is the key to using the DEA method to measure bank efficiency. In terms of input, foreign banks entering China, especially those foreign banks that entered China as strategic investors, has insufficient service networks and localization advantages, which will prompt them to spend a lot of costs on expanding service channels and localization (Lu et al. 2019). The investment of foreign banks will further stimulate Chinese commercial banks to increase their software and hardware investment to deal with the loss of staff and customers due to the expansion of foreign banks. At the same time, local banks have an advantage over foreign banks in terms of loanable funds, and local banks will continue to increase this advantage (Clarke et al. 2003). Therefore, this article, like Fusheng (2012), Seo, Chao and Park (2013) and others, selects the number of employees, loanable funds, and fixed assets as input indicators.

In terms of output, the entry of foreign banks will lead to intensified competition in the host country's bank market. This competition will not only lead to a reduction in the profits of traditional spread business (interest income) but also because foreign banks have advantages in intermediate business (excellent innovation capabilities, Services and global networks), leading to a significant decline in non-interest income of host country banks (Wezel, 2010). Therefore, the output indicators of this paper are interest income and non-interest income.

3.1.4. Measurement results of the efficiency of Chinese commercial banks

X-efficiency is divided into output technical efficiency (TE), configuration efficiency (AE) and cost efficiency (CE) under the DEA model. CE is a comprehensive reflection of technical efficiency and configuration efficiency, and is numerically equal to the quotient of TE and AE.This efficiency value best represents the cost control and technical level of commercial banks (Yeyati and Micco, 2007). Therefore, this study takes the cost efficiency value under the DEA model as the X-efficiency value, which is the dependent variable of the model below. Finally, the cost efficiency measurement results of the sample banks from 2010 to 2019 are obtained, as shown in Table 1.

It can be seen from Table 1 that the overall cost efficiency of the sample banks is showing a fluctuating upward trend. The development process can be divided into two stages. The first stage is from 2010 to 2017. During this period, due to the short-term maladaptation of Chinese commercial banks in the early stage of opening up, the increase in cost efficiency was slow. The second stage is 2018-2019, which is the stage to further implement the full opening of commercial banks. The cost efficiency value has increased rapidly. The total sample cost efficiency value has risen rapidly from 0.914 at the end of 2017 to 0.955. In general, since 2010, with China's further opening to the outside world, the efficiency of Chinese commercial banks has increased greatly, which to a certain extent shows that the entry of a large number of foreign banks may have promoted the efficiency of Chinese commercial banks. But whether this cause-effect relationship really holds up requires empirical research in the next part.

Table 1: X-efficiency (cost efficiency) measurement results of sample banks

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Industrial and Commercial Bank of China	0.854	0.842	0.748	0.876	1.00	0.846	0.875	0.993	1.00	1.00
China Construction Bank	0.902	0.945	0.996	1.00	1.00	0.987	1.00	1.00	0.923	1.00
Bank of China	0.823	0.843	0.735	0.873	0.835	0.758	0.789	0.872	0.896	0.912
Agricultural Bank of China	0.673	0.684	0.713	0.702	0.822	0.738	0.790	0.854	0.880	0.871
Bank of Communications of China	0.846	0.714	0.638	0.855	0.840	0.736	0.777	0.848	0.920	0.913
Industrial Bank of China	0.812	0.834	0.802	0.859	0.895	0.850	0.913	0.624	0.740	0. 862
China Merchants Bank	0.923	0.945	0.957	1.00	1.00	0.980	1.00	1.00	0.959	1.00
China Minsheng Bank	0.778	0.895	0.912	0.979	0954	0.959	1.00	0.811	0.915	0.943
China Citic Bank	0.865	0.860	0.893	0.912	0.945	0.957	0.951	1.00	1.00	1.00
China Everbright Bank	0.836	0.831	0.812	0.879	0.886	0.794	0.939	0.948	1.00	0.921
Shanghai Pudong Development Bank	1.00	0.994	1.00	1.00	0.934	1.00	1.00	0,974	1.00	1.00
Shenzhen Development Bank	1.00	1.00	1.00	0.964	1.00	1.00	1.00	0.989	1.00	1.00
Huaxia Bank	0.913	0.959	0.962	0.949	0.971	0.905	1.00	0.972	0.980	0.998

Source: Author's calculations

Table 2: Definition table and expected results of research variables

Variable category	Variables and symbols	Variable definition	Economic significance and reasons for selection	Expected correlation with foreign bank entry
dependent variable	Bank efficiency (XE)	Cost efficiency of commercial banks measured by DEA method	The cost efficiency of a bank directly reflects the cost control and management level of the commercial bank. It is the de-quote of the bank's technical efficiency and allocation efficiency, and comprehensively reflects the situation of technology and allocation capabilities.	Positive correlation
Independent variable	The degree of entry of foreign banks (F)	Proportion of assets of foreign banks in China	The degree of penetration of foreign banks in the country. This indicator can directly reflect the proportion of foreign banks entering China. Use this data as an independent variable to measure the impact on commercial banks.	/
Macroeconomic control variables	Money supply growth rate (M2)	Money supply growth rate	Reflects the overall impact of the macroeconomic environment, especially the change in China's money supply, which directly affects the credit scale and profitability of commercial banks, thereby affecting bank efficiency.	Positive correlation
Industry level control variables	Herfindahl index (Hz)	Sum of squares of market shares of all sample banks	Reflecting the market structure of China banking industry is equivalent to analysing the degree of industry monopoly and the environmental factors affecting the efficiency of local banks.	Negative correlation
	Stock market development (SG)	The ratio of total stock market value to GDP	Investigating the competitive pressure from non-bank financial institutions and taking stock market financing as the competitive object of bank financing, this indicator shows the degree of development of China's stock market and the efficiency of banks through competition.	Negative correlation
Bank level control variables	Bad loan ratio (BL)	The proportion of bad loans in total loans	The bad loan ratio of commercial banks directly affects the cost efficiency of banks. Especially when the bad loan ratios of foreign banks and local banks are quite different, it is necessary to use its influence as a control variable.	Negative correlation
	Proportion of non-interest income (FL)	Non-interest income as a percentage of operating income	The proportion of non-interest income reflects the bank's business structure characteristics, innovation capabilities, and service levels. It has the characteristics of low cost and high income. There is a big difference in this indicator between local banks and foreign banks, so it is listed as a control variable.	Positive correlation

Source: Leung,Rigby and Young(2003), Claessens and Van Horen (2013)

3.2. Empirical research on the impact of foreign bank entry

3.2.1. Selection of research variables and expected results

This paper uses the efficiency values of the 13 sample commercial banks from 2010 to 2019 as the dependent variable of the model, and the degree of entry of foreign banks as the independent variable. This independent variable represents the level of development and penetration of foreign banks in the host country's banking system and can also reflect the degree of threat to the host country's banking system (Berger, Hasan and Zhou, 2009). This paper selects the proportion of foreign bank assets to measure the degree of foreign capital entering the Chinese banking industry and the influencing factors of commercial bank efficiency as control variables, the variables are shown in Table 2.

3.2.2. Model establishment

This article introduces the quadratic term, which can analyze the influence of traditional linear correlation and judge the nonlinear relationship between foreign capital entry and Chinese commercial banks' efficiency based on the sign of the quadratic coefficient. Therefore, the setting results of the model are as follows:

$$XE_U = a_0 + \alpha_1 F_t + a_2 F_t^2 + \sum_{j=s}^{m} a_j Z + \varepsilon_{it} \tag{3}$$

Among them, XE_{it} represents bank efficiency, F_t represents the degree of foreign bank entry, and Z represents a series of factors affecting bank efficiency. α_0 is the intercept term, ε_{it} is the error term, and α_1, α_2, and α_j are the coefficients of the corresponding variables.

3.2.3. Regression results of the model

In order to eliminate the influence of heteroscedasticity and autocorrelation, this paper uses Driscoll-Kraay standard errors to perform regression analysis on the model.

Table 3: Regression results of the model

variable	coefficient	Driscoll-Kraay St. Err.	t value
Constant term	0.7262	0.091	(8.36) ***
F	0.0813	0.032	(4.88) ***
F2	-0.0042	0.002	(-5.29) ***
M2	1.7622	0.213	(3.15) ***
HZ	-0.6852	0.540	(-1.84) *
SG	-0.0145	0.007	(-0.43)
BL	-0.7859	0.532	(-1.99) *
FL	1.1359	0.054	(11.69) ***
R2	0.64		

Source: Author's calculations

3.3. Analysis

3.3.1. The entry of foreign banks has a positive impact

After controlling for other variables' influence, the first-order coefficient of foreign bank entry is positive, and the second-order coefficient is negative. Both are significant at the statistical level of 1%. Those coefficients show that the entry of foreign banks has a non-linear impact on Chinese

commercial banks' efficiency. When other conditions remain unchanged, there is an inverted U-shaped relationship between the entry of Foreign Banks and the Operating Efficiency of Chinese Commercial Banks. F* refers to the threshold of foreign bank entry's impact on Chinese commercial banks' efficiency or the optimal level of foreign bank entry. According to the data in Table 9, F* equals 9.68%. Therefore, when foreign bank assets account for 9.68%, foreign banks' entry will have the most significant beneficial impact on Chinese commercial banks' efficiency.

The threshold F* is used as the demarcation point, and the inverted U-shaped curve between the entry-level of foreign banks and the efficiency of Chinese commercial banks can be divided into the left and right parts. The left half is defined as a favorable range. When the proportion of foreign bank assets is in the favorable range, it is considered that the opening to the outside world is insufficient. The continued entry of foreign banks will be beneficial in improving the efficiency of Chinese commercial banks. The right half is defined as a harmful range. When the proportion of assets is in the harmful range, it reveals that excessive opening has occurred. The continued entry of foreign banks will damage the efficiency of Chinese commercial banks. Judging from China's banking sector's actual status opening to the outside world from 2010 to 2019 (Figure 1), although the proportion of foreign banks' assets during the sample period has continued to increase, they have always fallen within the above-mentioned favorable range. The proportion of foreign banks' assets in the sample interval shows that since 2010, foreign banks' entry has promoted the efficiency of Chinese commercial banks.

Based on the previous literature, on the one hand, the increased entry of foreign banks will bring tremendous competitive pressure to Chinese commercial banks. These pressures will prompt Chinese commercial banks to increase their awareness of the competition. Therefore, China's industrial banks will intensify reforms, adjust their organizational structure, and transform their business models. Ultimately, operating efficiency will be improved with the bank's actions (Bueh, 1997). Furthermore, foreign banks' entry has brought a more substantial demonstration effect, enabling Chinese banks to learn more advanced management concepts and skills, improve financial service levels and innovation capabilities (Levine, 1996). On the other hand, due to the relatively low proportion of foreign banks' assets and the low level of development of foreign banks in China, the effect of foreign banks on domestic banks' market share and talent preemption is minimal, and the impact is small (Seo, Chao and Park, 2013). Compared with the two forces, the positive effect is greater than the negative effect. Therefore, the increase in the entry of foreign banks will promote the efficiency of Chinese commercial banks. However, when the proportion of assets exceeds the threshold, the competition between Chinese local banks and foreign banks will become fierce, and foreign banks will largely seize the market share of domestic commercial banks (Fusheng, 2012). The negative impact of competition for customers, businesses, and talents will outweigh the Competitive effect and demonstration effects (Walter and Gray, 1983), resulting in a decline in Chinese commercial banks' efficiency.

3.3.2. China should further introduce foreign banks

It is worth noting that as of the end of 2019, foreign banks' assets accounted for only 1.98% (Figure 1), far from reaching the threshold of 9.68%. This data shows foreign banks' entry-level is still relatively low. Foreign banks have not entirely played its role in promoting the efficiency of Chinese commercial banks. Therefore, expanding the level of opening up in the future is very beneficial to promote China's banking industry's efficiency.

4. Conclusion and recommendations

The question studied in this paper is whether the entry of foreign banks will bring positive or

negative effects on the operating efficiency of Chinese commercial banks and the appropriateness of the level of entry of foreign banks. The empirical results show an inverted "U"-shaped nonlinear relationship between the entry-level of foreign banks and Chinese commercial banks' efficiency. Before the entry-level of foreign banks reaches the threshold (the inflection point of the inverted "U" curve), foreign banks' entry will promote the efficiency of Chinese commercial banks. When the entry-level exceeds the threshold, foreign banks' entry will damage Chinese commercial banks' efficiency.The threshold (9.68%) is the best level for foreign banks to enter. The current proportion of foreign bank assets is far below the threshold, so the continued entry of foreign banks has promoted Chinese commercial banks' efficiency. China should increase the intensity of the introduction of foreign banks so that foreign banks' assets reach the threshold as soon as possible and promote the banking industry's vigorous development.

There are still some limitations to this paper's research question, which is mainly manifested in that foreign bank entry on the efficiency of Chinese commercial banks will be interfered with by foreign strategic investors' entry. This paper does not separate this influence. Studying the impact of foreign strategic investors' entry on the operating efficiency of Chinese commercial banks is of great practical significance. Studying this problem can help Chinese commercial banks make correct decisions in introducing strategic investors and has guiding significance for cross-border mergers and acquisitions. This question will be the direction of my follow-up deepening research on bank efficiency.

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