The Impact of Revenue Diversification on the Performance of Chinese Commercial Banks

-- Empirical Analysis of Chinese Listed Banks based on the GMM Model

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Abstract: Since the 18th National Congress of the Party, the intensity of financial reforms has been continuously increasing. Against this backdrop, the competitive environment within China's banking sector has become more challenging, leading various banks to confront a spectrum of challenges while also encountering opportunities for growth. With the advancement of marketization, numerous banks have engaged in various forms of operations. This paper employs the Generalized Method of Moments (GMM) dynamic panel model to investigate the impact of diversified operations on the performance of Chinese banks. It posits that the advantages of contemporary diversified operations have not been fully realized due to factors such as operational costs and risk exposure. Accordingly, Chinese commercial banks should devise enhanced risk management strategies, bolster oversight, foster ongoing innovation, and progressively embark on diversified operations. This approach aims to manifest the benefits of operational diversification, thus fostering improvements in banking performance.

Keywords: Commercial Bank; Diversification; Performance; GMM Model.

1. Introduction

Since the establishment of Chinese commercial banks, guided by the three major principles of banking operations, their primary source of income has been net interest income from loans and deposits. In recent years, due to the further penetration of interest rate liberalization resulting from financial globalization, coupled with the continuous development of non-bank financial intermediaries, the banking industry has experienced intensified homogenous competition. In terms of net interest income, banks' profit margins have been consistently shrinking, and commercial banks heavily reliant on traditional loan and deposit businesses are facing significant challenges. To adapt to China's financial development and achieve asset preservation and appreciation, some commercial banks have begun exploring horizontal and vertical expansion of their operations. This move aims to increase non-interest income to some extent. Additionally, diversification of operations also helps in mitigating risks stemming from the past single-line operations, subsequently lowering the non-performing asset ratio and boosting profits. In 2004, as a result of further relaxation of restrictions on separate business operations by the government, internal diversification within commercial banks accelerated. This was manifested in gradual enhancement of cooperation among various financial departments, diversification of income structure away from being solely reliant on net interest income from loans and deposits, and a shift towards a diversified form with non-interest income coexisting with interest income. Furthermore, cross-sector financial product development involving banking, funds, insurance, securities, and trusts has been rapidly progressing.

Currently, there exists differing opinions regarding whether revenue diversification can enhance the operational performance of banks. The non-performing loan ratio and quantity of non-performing loans in Chinese commercial banks have been steadily increasing, while the growth of profits and intermediary business has been slowing year by year. Given these circumstances, this paper aims to delve into the discussion of whether revenue diversification in domestic banks has positively impacted their operational performance.

2. Literature Review

As time progresses and financial innovations continue to emerge, the operational activities of banks have undergone continuous evolution. However, when deliberating upon the effects of diversified operations on commercial banks, scholars' viewpoints diverge significantly. Regarding the impact of diversified operations on the operational performance of commercial banks, three primary stances have been put forth.

2.1. Enhancing Operational Performance of Commercial Banks

Baele (2007) argues that expanding diversified profit channels can contribute to increasing a bank's proprietary value. This conclusion is drawn from data collected from 255 listed banks across 17 European countries. Laeven & Levine (2018) conducted a sample survey of financial groups from 43 countries/regions globally and found that banks exclusively engaged in traditional deposit and loan operations yield lower profits compared to those involved in a broader range of activities. From a theoretical standpoint, Wang Shengxin (2012) of China proposed that diversification strategies significantly impact the enhancement of risk-adjusted profit returns. The author utilized a sample of ten countries for this analysis. From an empirical perspective, Zhang Xiaoyan, Guo Ying (2021), and Li Ningguo (2021) discovered through empirical research that banks can enhance their Return on Assets (ROA) by increasing the proportion of non-interest net income to total income. Moreover, by
diversifying their income levels, they can reduce the volatility of Return on Equity (ROE) and the non-performing loan ratio of bank assets.

2.2. Diminishing Operational Performance of Commercial Banks

Acharya et al. (2006) and Nguyen (2012) contend that a higher proportion of non-interest income in a bank’s revenue leads to greater risk arising from profit fluctuations. Consequently, non-interest income is likely to exert a negative impact on the operational performance of commercial banks. Furthermore, some scholars have found through empirical research that as the non-interest business of foreign banks matures, the expansion of non-interest operations results in elevated expenditure costs, leading to higher income volatility. Consequently, the effect of diversified returns is offset, thereby inhibiting enhanced profitability for banks. From a theoretical standpoint, Wei Shijie and Ni Ni (2010) propose that diversification can negatively affect bank revenue due to the inherent uncertainties surrounding non-interest income. In the context of diversified operations, Xue Chao et al. (2014) study the impact on the profitability of 81 urban commercial banks in China over the past decade, asserting that non-traditional businesses significantly decrease the profit levels of city commercial banks. Conversely, scholars Ruan Ke, He Yongfang, and Liu Danping (2015) argue that relying on increasing the proportion of non-interest income to enhance the operational performance of commercial banks obscures the focus on core lending and deposit activities, which is detrimental to their long-term viability. In terms of empirical analysis, Yue Zhengyuan (2020) finds, through an analysis of electronic banking, that the interaction between non-interest income and the proportion of bank revenue, in conjunction with capital relationships, diminishes the operational performance of electronic banks.

2.3. Exerting Differential and Uncertain Effects on Operational Performance

Christian Calmes and Raymond Thoret (2019) conducted an analysis and found that the development of banks’ off-balance sheet activities related to the rational functioning of capital markets contributes to enhancing banks’ diversified operations. These operations can bolster banks’ profitability during periods of economic stability; however, this advantage diminishes during market volatility. Leonardo Gambacorta et al. (2014), in their study of global banks, observed that operational performance shows positive improvement effects when the level of diversification is around 30%. Based on the current research landscape in China, some scholars propose that there exists an “inverted U-shaped” relationship between banks’ operational performance and the proportion of non-interest income in listed banks. Li Tingting (2017) concluded, through the construction and analysis of a multiple linear regression equation, that the relationship between commercial banks’ operational performance and the proportion of non-interest income follows an inverted U-shaped curve, with non-interest income exhibiting a certain range of moderation. After analyzing the “threshold effect” of intermediary business on bank profits in 40 banks, Ni Liang (2019) deduced, through an analysis of global listed bank stock market data, that the impact of non-traditional businesses and diversified asset structures on the performance of domestic and foreign banks is contingent on the nature and scale of the banks. Greater disparities result in significant effects of diversification on banks’ short-term and long-term performance. Liu Qingsong (2019) conducted an analysis of financial data from rural financial institutions and commercial banks from 2006 to 2016. The study revealed that diversified operations have a positive impact on business performance but also increase the operational risks of banks.

Summarizing the previous research, it becomes evident that the outcomes of diversified operations on banking performance lack determinacy. The results of diversification vary based on the environment in which commercial banks operate. Consequently, this paper aims to utilize the Generalized Method of Moments (GMM) dynamic panel model to analyze the impact of diversified operations on the operational performance of listed banks.

3. Research Design

3.1. Sample and Data

Due to the partial availability of comprehensive data on listed banks, this study, after a rigorous selection process, has ultimately chosen a dataset spanning from 2009 to 2022, encompassing data from a total of 16 listed banks. The primary data sources for this study are derived from the Guotai Junan Securities Database.

3.2. Variables Selection and Description

3.2.1. Dependent Variable

Given that this study seeks to investigate the impact of diversified operations on bank performance, the proxy variable for bank performance in this research primarily relies on the Return on Assets (ROA).

3.2.2. Independent Variable

We adopt the Diversification Index (DII) as the explanatory variable for the degree of revenue diversification within banks. Drawing inspiration from the Herfindahl-Hirschman Index (HHI) used to measure industrial diversification, we construct the DII using the proportion of Non-Interest Income to Total Income (SON) and the proportion of Net Interest Income to Total Income (SET). This DII is established to measure the extent of revenue diversification, ranging from 0 to 0.5. A higher numerical value signifies greater diversification. The DII is defined as follows:

\[
DII = 1 - \left( \frac{SON^2 + SET^2}{SON + SET} \right)
\]

3.2.3. Control Variables

The introduction of Net Interest Margin (NIM), Bank Asset Size, Asset Growth Rate, and Loan-to-Deposit Ratio as control variables in the empirical model stems from a substantial body of research that underscores the profound impact of the degree of interest rate liberalization on the growth of commercial bank profits. Furthermore, crucial indicators affecting bank revenue include the Loan-to-Deposit Ratio and the size of commercial bank assets. Additionally, the growth rate of assets can significantly influence bank profitability.

3.2.4. Variable Description and Descriptive Statistics

Table 1 and Table 2 present the description and descriptive statistics of the key variables.

As indicated in Table 2, the average Diversification Index
(DII) across the 16 Chinese commercial banks is calculated at 0.34. This reveals that the level of diversified operations within China’s commercial banks tends to be slightly above the mid-range. However, a notable observation is the substantial disparity between the maximum and minimum values, which highlights significant variations in the extent of banks’ diversification strategies.

### Table 1. Variable Descriptions

<table>
<thead>
<tr>
<th>Variables</th>
<th>Meaning</th>
<th>Calculation Method or Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA1(%)</td>
<td>Return on Assets</td>
<td>Net Income / Net Assets</td>
</tr>
<tr>
<td>DII</td>
<td>Diversification Index of Operations</td>
<td>$DII = 1 - (\text{SHNON}^2 + \text{SHNET}^2)$</td>
</tr>
<tr>
<td>LNASET1</td>
<td>Asset Size</td>
<td>The natural logarithm of Total Assets</td>
</tr>
<tr>
<td>CDB (%)</td>
<td>Loan-to-Deposit Ratio</td>
<td>Loan/Deposit</td>
</tr>
<tr>
<td>GROWTH1(%)</td>
<td>Asset Growth Rate</td>
<td>(Current period - Previous period) / Current period</td>
</tr>
<tr>
<td>JXC1(%)</td>
<td>Net Interest Margin</td>
<td>Net interest income / Total interest-earning assets</td>
</tr>
</tbody>
</table>

### Table 2. Descriptive Statistics of Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Sample size</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Minimum value</th>
<th>Maximum value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA1(%)</td>
<td>160</td>
<td>0.99</td>
<td>0.18</td>
<td>0.44</td>
<td>1.69</td>
</tr>
<tr>
<td>DII</td>
<td>160</td>
<td>0.34</td>
<td>0.09</td>
<td>0.13</td>
<td>0.49</td>
</tr>
<tr>
<td>LNASET1</td>
<td>160</td>
<td>28.90</td>
<td>1.19</td>
<td>25.73</td>
<td>30.95</td>
</tr>
<tr>
<td>CDB (%)</td>
<td>160</td>
<td>74.19</td>
<td>10.96</td>
<td>47.43</td>
<td>99.99</td>
</tr>
<tr>
<td>GROWTH1(%)</td>
<td>160</td>
<td>18.31</td>
<td>15.07</td>
<td>39.56</td>
<td>93.85</td>
</tr>
<tr>
<td>JXC1(%)</td>
<td>160</td>
<td>1.77</td>
<td>0.40</td>
<td>0.59</td>
<td>2.77</td>
</tr>
</tbody>
</table>

### 3.2.5. Unit Root Test

This study employs the suitable panel data unit root test method, the Harris-Tzavalis (HT) test, to conduct unit root tests on the dataset. First-order differencing is applied to the variables DIV and CDB. The ultimate outcomes of the unit root tests indicate that, at a significance level of 5%, all variables firmly reject the null hypothesis of the presence of a unit root.

### Table 3. Unit Root Tests Using the Harris-Tzavalis (HT) Method

<table>
<thead>
<tr>
<th>Variables</th>
<th>Statistic</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROA1</td>
<td>-3.69</td>
<td>0.0001</td>
</tr>
<tr>
<td>DII</td>
<td>-10.78</td>
<td>0.00</td>
</tr>
<tr>
<td>LNASET</td>
<td>-12.03</td>
<td>0.00</td>
</tr>
<tr>
<td>CDB</td>
<td>-5.31</td>
<td>0.00</td>
</tr>
<tr>
<td>GROWTH1</td>
<td>-10.90</td>
<td>0.00</td>
</tr>
<tr>
<td>JXC1</td>
<td>-3.25</td>
<td>0.00</td>
</tr>
</tbody>
</table>

### 3.3. Model Construction

This study primarily investigates the relationship between bank performance and revenue diversification. Given that certain variables are influenced by economic agents’ preferences and exhibit a degree of continuity and inertia, the impact of economic behavior on these variables could lead to dynamic processes. In other words, their own lags might influence their current values. Particularly for banking loan and deposit operations, the influence of credit might motivate commercial banks to maintain ongoing business transactions with individuals or entities that have already engaged in such operations. Incorporating lagged variables as explanatory factors allows for the construction of a dynamic panel model. In comparison to static panel models, dynamic panel models offer greater continuity and efficiency in estimating model coefficients. Moreover, they prove to be more effective in addressing issues of autocorrelation, endogeneity, and heteroskedasticity. Consequently, capturing the relationship between bank operational performance and revenue diversification could be better reflected through the establishment of the following dynamic panel model:

$$Y_{i,t} = \alpha + \omega_1 Y_{i,t-1} + \beta_1 DI_{i,t} + \sum_{m=1}^{n} \beta_m X_{it}^m + \epsilon_{it}$$ (2)

In this context, $Y_{i,t}$ represents the metric evaluating bank operational performance, specifically the indicator of Return on Assets (ROA), at time t. $Y_{i,t-1}$ corresponds to its lagged value in the preceding period. $DI_{i,t}$ signifies the formulated measure of revenue diversification. A set of control variables for banks is denoted as $X_{it}^m$. The disturbance term is represented by $\epsilon_{it}$. Estimation is carried out utilizing the Generalized Method of Moments (GMM), which is employed to address challenges such as autocorrelation and endogeneity. This methodology serves to mitigate the potential influence of issues related to serial correlation and endogenous variables, contributing to the reliability and validity of the parameter estimates.

### 4. Empirical Results and Analysis

#### 4.1. Estimation and Analysis of the Baseline Model

When conducting estimation using the Generalized Method of Moments (GMM), it is customary to employ two common approaches to assess the validity of variables:

**Autocorrelation Test:** This involves performing an autocorrelation test, commonly known as the Arellano-Bond test. This test assesses the presence of serial correlation in the residuals, which can impact the efficiency of parameter estimates. Detection of significant autocorrelation might indicate the need to refine the model specification or consider alternative estimation techniques. Overidentification Test: The overidentification test, often referred to as the Sargan test, is the second method used to evaluate variable validity. This test examines whether the proxy variables selected for GMM estimation are overidentified under the null hypothesis that GMM is correctly specified. If the selected proxy variables are not overly identified, their inclusion in the model is deemed effective.

In Table 4, we present the estimated outcomes of the dynamic panel model that examines the influence of revenue diversification on bank performance factors. Additionally, the corresponding test results are provided, along with the Mixed Ordinary Least Squares (OLS) and Fixed Effects (FE) estimates, to assess the validity of the model's estimation outcomes.
Chinese commercial banks is detrimental to bank performance. This indicates that the revenue diversification status of banks has a negative effect on bank performance indicator, ROA. The GMM estimation results demonstrate a relatively weak level of statistical significance in its impact on bank performance. Its influence on bank performance is not notably evident from a statistical perspective.

Several factors may contribute to the observed phenomenon: Firstly, a primary possibility is that the expansion of non-interest operations generates higher costs and fees, leading to increased income volatility. This counteracts the effects of revenue diversification and hampers the improvement of bank profitability. However, it may potentially elevate the bank's business leverage and risk profile. Secondly, non-interest income exposes commercial banks to higher risks, and in some cases, could even lead to substantial losses. In comparison to other types of income, interest income is relatively less risky, while non-interest income tends to carry higher risks, especially for market operations susceptible to economic cycles and changes in fair value. Consequently, other non-interest operations significantly contribute to the negative impact on bank operational performance. Thirdly, the realization of economies of scope within banks heavily relies on the strong substitutability of diversified products. If commercial banks only achieve diversification in terms of product types, but the products are relatively homogeneous, the scope economies become challenging to attain. As a result, the positive effects brought about by product diversification are offset, ultimately leading to reduced bank performance. Fourthly, as revenue diversification increases, the operational risks introduced by human factors could negatively affect profitability. If business personnel perform poorly in investment, trading, or foreign exchange operations, or lack sufficient risk identification experience, the elevated potential risks and uncertainties would also undermine income stability. In summary, the adverse effects of revenue diversification on bank performance can be attributed to a combination of factors, including increased costs, higher risks associated with non-interest income, insufficient scope economies, and heightened operational risks due to human factors.

Net interest margin is the ratio of net interest income to total interest-earning assets of a bank, serving as a crucial metric for measuring the efficiency of commercial banks. In the context of the three regressions involving bank net interest margin and bank profitability, a positive correlation is evident, characterized by a notably strong statistical significance. This indicates that as the net interest margin expands, bank profitability improves accordingly. Thus, interest income plays a pivotal role in fostering the operational performance of commercial banks. The enhancement of efficiency within commercial banks serves to facilitate their overall development.

The loan-to-deposit ratio, while considered a factor, demonstrates a relatively weak level of statistical significance in its impact on bank performance. Its influence on bank performance is not notably evident from a statistical perspective.

4.2. Robustness Test

Despite maintaining a consistent basic product portfolio, the value of the income diversification index (DII) might change due to various factors, which suggests a limitation of this measure. For instance, a bank could lower its loan interest rates while simultaneously increasing associated fees, such as commitment fees. Even if the total income remains unchanged, the DII value would be altered. To address this issue, this study employs an alternative variable, denoted as DII2, to examine the robustness of the regression results in relation to income diversification. Additionally, the non-interest income is decomposed into two components: fee and commission net income (FEE) and other non-interest income (OER), creating a new income diversification index, DII2.

The formula is as follows:

\[
\text{SEE} = \frac{\text{Fee and commission income}}{\text{Operating income}}
\]

\[
\text{OER} = \frac{\text{Other non-interest income}}{\text{Operating income}}
\]

\[
DII^2 = 1 - (\text{SEE}^2 + \text{OER}^2 + \text{SET}^2)
\]

The dynamic panel is modified as follows:

\[
Y_{it} = \alpha + \omega_1 Y_{i,t-1} + \beta_2 DII_{i,t}^2 + \sum_{m=1}^{M} \beta_m X_{it}^m + \epsilon_{it}
\]
indicating that the model retains its robustness. The signs of the level of diversification in commercial banks still has a reduction is marginal. Therefore, this study can conclude that although the coefficient has slightly decreased, the income diversification and bank profitability remains indicator with DII2, the correlation coefficient between values and z-values.

5. Conclusion and Recommendations

The level of revenue diversification in Chinese commercial banks has been increasing year by year. However, the verification through the GMM model indicates that there exists a certain negative correlation between revenue diversification and bank performance. The signs of the variables remain consistent with those mentioned earlier, indicating that the model retains its robustness.

From Table 5, it can be observed that after replacing the DII indicator with DII2, the correlation coefficient between income diversification and bank profitability remains negative. Although the coefficient has slightly decreased, the reduction is marginal. Therefore, this study can conclude that the level of diversification in commercial banks still has a negative impact on bank performance. The signs of the variables remain consistent with those mentioned earlier, indicating that the model retains its robustness.

5.1. It is Recommended to Gradually Diversify Revenue Streams While Maintaining a Strong Foundation in Traditional Depo-Sit and Lending Businesses

Traditional operations serve as the foundation for commercial banks. As banks pursue diversification in their operations, it is essential to ensure the stability of traditional activities, which often carry lower business risk and contribute to the bank's overall stability. In the pursuit of increased revenue and operational diversification, banks should adopt a gradual and systematic approach. They should enhance their risk management and operational capabilities incrementally, accumulate relevant experience, and establish a solid groundwork for the development of diversified businesses. This approach will help avoid unchecked growth in non-interest income, which could potentially compromise both the safety and profitability of the institution.

5.2. To Facilitate Financial Innovation, Reduce Operational Costs and Risks, and Enhance Human Resource Management Quality

With the continuous advancement of society and technology, various technological innovations have found applications in the financial sector. Chinese commercial banks should keep up with the times by enhancing their financial technology capabilities, fostering continuous innovation, diversifying their financial products, and investing in the development of talent in this field. The goal is to leverage financial technology to reduce operational costs, elevate risk management standards, and provide regular training for staff involved in these aspects. Throughout this process, the expansion of diversified income channels should be prioritized, actively engaging in non-interest income activities, mitigating the homogenization of non-interest products' competition, and seizing opportunities presented by the current era.

5.3. Chinese Commercial Banks should Undertake Income Diversification Activities based on Their Own Practical Circumstances

The development of diversified income streams presents both advantages and challenges for commercial banks. While it can open up new revenue channels, expand the bank's customer base, and generate substantial profits, it also impacts the traditional lending and deposit-taking activities of the bank. This diversification may lead to reduced liquidity within the bank's system, and the associated expenditures have also faced criticism. Therefore, commercial banks should carefully consider their unique circumstances, including asset size, business goals, management capabilities, and risk management capacity. This assessment will enable banks to select appropriate strategies for income diversification that align with their capabilities and promote business transformation and upgrading.

References


