

Research on Capital Structure and Operating Performance of Listed Banks

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Abstract: Against the backdrop of the current market environment, achieving optimal capital structure is of utmost priority for listed banks in China to prevent systemic risk. One way to achieve this is through continuous improvements in their operational conditions, thereby paving the way for long-term development. This paper draws on the financial data of 10 listed banks from 2012 to 2020, utilizing a combination of standardized research and empirical analysis, and employing E-views data analysis software to perform multivariate linear regression analysis on the sample. The results show a strong correlation between the proportion of shareholdings held by shareholders and the operating performance of banks. Specifically, there is a significant negative correlation between the proportion held by the largest shareholder and operating performance, while the proportion held by the top 10 shareholders has a significant positive impact. Furthermore, there is a clear positive relationship between the ratio of supplementary capital and the operating performance of listed banks, as well as a significant correlation between the capital adequacy ratio and operating performance.

1. Introduction

Since China's accession to the WTO, the development of the financial industry has faced enormous challenges. Seeking to go public has become a strategic choice for many domestic financial institutions such as banks, insurance companies, and securities firms under the new circumstances. Currently, the level of competition between banks is relatively low, and the homogeneity of products can create significant competition, thereby reducing bank profits and increasing bank risk. Issuing new shares can quickly increase a company's core capital adequacy ratio and risk awareness. After several years of development, China's banking industry's own industrial competitive advantages have continued to improve. At this stage, the internal governance of China's banking industry still needs to be adjusted. From a theoretical perspective, in-depth research and discussion on the capital structure and operating performance of China's listed banks can promote a clearer understanding of bank capital allocation and operating performance, help banks expand financing channels, achieve rational resource allocation, and enhance the ability of banks and other financial institutions to resist operational risks. From a practical perspective, in recent years, banks have generally faced the

dilemma of declining performance, narrowing profits, and intensifying credit risks due to the impact of the COVID-19 pandemic. Therefore, this paper aims to reasonably explore the capital structure and operating performance of China's listed banks, in order to achieve steady development of the banking industry. Therefore, further improvement of China's banking industry's capital structure and enhancing its operating performance is of great significance.

Currently, there is a plethora of literature on the interdependence between a company's capital structure and its operating performance. These studies are built upon the premise that a company's capital structure and operating performance complement one another and have a close relationship. Capitalizing on this research, Zhi Chunfen utilized E-views software to analyze the correlation between the relevant model variables and concluded that the capital structure and operating performance of logistics companies exhibit a "reverse U" relationship, with the latter having a positive correlation with the former^[1]. Similarly, Li Hui, from the perspective of economic value added, gave recommendations on how to effectively improve the capital structure of Chinese listed agricultural companies in order to enhance their operating performance^[2]. The different financing preferences across industries contribute to the diverse relationships between capital structure and operating performance. In an analysis of the manufacturing, construction, and information technology service industries, Shen Lei found that there is a significant negative correlation between capital structure and operating performance, and that these industries had yet to attain an optimal capital structure^[3]. Zhu Mengting, Ye Xinliang, and Sun Ruihong chose logistics listed companies as their research objects, and arrived at the conclusion that there exists a significant negative correlation between the asset-liability ratio of logistics firms and their operating performance^[4].

Tapping into the rich field of equity research, Terzungwe Nyor and Abdulateef Yunusa conducted an analysis of the capital structure and operating performance of companies, revealing that there exists a significant positive correlation between total liabilities and asset turnover, while shareholder capital exhibited no significant influence on asset turnover. They further suggested that Nigerian listed company groups excessively rely on short-term debt, and called for the groups to improve their equity financing levels and leverage advantage^[5]. Senavirathna et al. utilized panel data of ten listed Sri Lankan banks from 2005 to 2015 and analyzed them using least squares regression. The results showed that capital structure, as measured by total debt-to-assets, had no significant statistical effect, while debt-to-equity had a significant positive impact on the core business operating performance of Sri Lankan commercial banks^[6]. Dadson Awunyo-Vitor and Jamil Badu, using panel data of Ghanaian securities market banks, arrived at the conclusion that a "high debt ratio" was negatively correlated with bank performance. Their research indicated that there was a high level of debt ratio among listed banks, attributable to their reliance on short-term debt, which resulted in relatively high Ghanaian bank loan interest rates and a low level of bond market activity^[7]. Solomon A. Anafo, Evans Amponteng, and Luu Yin conducted an analysis of the data using descriptive statistics and a multiple regression model, revealing that financial leverage measured by short-term debt to total assets, together with profitability measures such as ROA and ROE, exhibited a significant positive correlation. Additionally, long-term debt and total assets had a significant positive relationship with ROA and ROE^[8].

After analyzing the literature mentioned above, we can confirm that there is indeed an interactive relationship between a company's capital structure and its operating performance. However, due to differences in statistical methods and research approaches, there is still a lack of comprehensive research conclusions in this area. Specifically, there is a significant dearth of related research on the interdependence between capital structure and operating performance of listed banks. Based on previous empirical research findings, this paper examines the financial data of listed banks on the Shanghai and Shenzhen stock exchanges from 2012 to 2020, in order to analyze the relationship between their capital structure and operating performance. The objective of this study is to contribute

to the optimization of capital structure and the enhancement of operating performance of listed banks in China, as well as improving government regulation and bank policies.

2. Definition and Current Analysis of Capital Structure and Operating Performance of Banks

2.1. Concept of Capital Structure and Operating Performance

Capital structure refers to the ratio of debt and equity financing of a company during a specific period, reflecting the company's financing combination. It generally includes equity financing and debt financing. Capital structure is a reflection of the comprehensive effects of a company's cost of funds, financing risks, and property rights allocation. The ability of a company to repay debts, its financing capabilities, and its future profitability are directly related to whether its capital allocation is reasonable.

Operating performance generally refers to the evaluation of a company's performance at a certain stage of operation. The factors affecting its performance are not singular and include the interaction of many factors, including debt repayment ability, profitability, and asset return rate.

2.2. Analysis of Bank Capital Structure

The *Basel Accords* define bank capital as consisting of two components, namely, core capital and supplementary capital. The primary forms of a company's core capital are paid-in capital and disclosed reserves, which should account for at least 50% of the total capital. Supplementary capital includes reserves, general provisions, long-term debt, etc. Its proportion should not exceed 50% of the total capital.

According to the annual reports disclosed by various listed banks in 2020, the capital adequacy ratios of Bank of China, Industrial and Commercial Bank of China, and China Construction Bank were all above 13%, and the average capital adequacy ratio of the sample banks was 12.38%. This meets the minimum requirement of 8% set in the *Basel Accords*. After analyzing the half-year and annual report data of various banks, it shows that from 2012 to 2020, the core capital adequacy ratio of major listed banks in China was nearly 10%, and Bank of China, Industrial and Commercial Bank of China, and China Construction Bank have all reached more than 11% for three consecutive years. The core capital adequacy ratio of sample banks has been gradually increasing in recent years. The core capital adequacy ratios and capital adequacy ratios of foreign-owned banks in China have both exceeded 18%. It is evident that there is a certain gap between the capital adequacy ratios of Chinese listed banks and the international advanced level.

The statistics of the annual reports of listed banks in 2020 reveals that the proportion of supplementary capital in listed banks in 2020 was 12.83%, with Minsheng Bank having a relatively high proportion of 16% and Industrial and Commercial Bank of China having a relatively low proportion of 10%. Other banks were between 10% and 18%. Thus, it is clear that the proportion of supplementary capital is quite low for listed banks. Therefore, under appropriate conditions, increasing the proportion of supplementary capital and supervising it can enhance their ability to resist risks.

2.3. Analysis of the Current Situation of Bank Operating Performance

The research of Mao Lubei and He Xiang on the impact of capital structure on the profitability of commercial banks concludes that the loan-to-deposit ratio, the proportion of deposits, the capital adequacy ratio, and the asset-liability ratio are positively correlated with profitability. The proportion of the first largest shareholder's shareholding has no significant impact on the profitability of city

commercial banks^[9]. From 2012 to 2020, the net asset return on major listed banks in China has shown a relatively stable development trend. In 2020, the net asset return of China Merchants Bank was 15.7%, and the investment return rate of China CITIC Bank was only 16.61% in 2012. In the past ten years, most banks have had a return rate of around 10% to 20%. In 2020, the net asset return rate of Industrial and Commercial Bank of China, China Merchants Bank, and China Construction Bank exceeded 11%. Due to the impact of the epidemic, the net asset return rates of banks declined to varying degrees at the end of 2019.

Yue Yu's research on the disposal of non-performing loans by commercial banks in China concludes that the solution to handle non-performing loans in commercial banks is to improve and adjust the loan company structure system^[10]. Most of the sample listed banks' non-performing loan ratios are around 1.8%. Among them, the non-performing loan ratio of Industrial and Commercial Bank of China reached 1.48% and 1.58% in 2019 and 2020, respectively. It is evident that in recent years, China's listed banks still have a relatively low ratio of non-performing assets, and their safety is relatively high.

3. Analysis on the Statistical Characteristics of Bank Capital Structure and Operating Performance

3.1. Sample Selection and Data Sources

To ensure the precision and objectivity of statistical findings, this empirical investigation has undertaken careful selection of a sample of listed banks on the Shanghai and Shenzhen Stock Exchanges between 2012 and 2020. Such data have undergone scrupulous screening to eliminate any outliers or anomalous financial outcomes. This was achieved through two means. Firstly, data from banks with incomplete data or abnormal financial conditions were omitted. Secondly, listed companies operational for less than 10 years were excluded from consideration. Collectively, the final sample comprises the following banks: Industrial and Commercial Bank of China (601398), China Construction Bank (601939), Bank of China (601988), Bank of Communications (601328), Shanghai Pudong Development Bank (600000), China CITIC Bank (601998), Huaxia Bank (600015), China Minsheng Bank (600016), Ping an Bank (000001), and China Merchants Bank (600036). All data used in the investigation have been sourced from each bank's financial reports and relevant financial data provided by WIND databases.

3.2. Descriptive Statistical Analysis of Capital Structure of Listed Banking Companies

The comparison between a company's total liabilities and total assets shows the overall proportion of assets and liabilities. Based on the empirical analysis, the total asset-liability ratio of Chinese listed banks was selected as a proxy variable for capital structure. Through data collection, sorting, recording, and analysis, the descriptive statistical results were obtained as shown in Table 1. The minimum and maximum values of the asset-liability ratio are 91.06% and 94.98%, respectively, with a relatively small difference between the two. Overall, the average asset-liability ratio of the sample banks is within a reasonable range (92.75%). Because a bank's primary assets comprise funds invested by shareholders and funds deposited by individuals and companies, the asset-liability ratio is relatively high. Generally, the asset-liability ratio of listed banks is between 90% and 93%, depending on the bank's size, and, in normal circumstances, a bank's asset-liability ratio is below 92%. Table 2 displays the annual breakdown of total asset-liability ratios. Overall, the asset-liability ratios of banks have been decreasing steadily over time. The difference between the highest and lowest ratios has remained relatively stable. This indicates that bank capital structures are gradually being perfected, and are currently in a slow adjustment phase.

Table 1: Descriptive statistical analysis of total asset-liability ratio of sample listed bank companies

	min	max	median	ave
ROE	91.06%	94.98%	93.18%	92.75%

Source: Calculated according to annual reports of listed banks (2012- 2020).

Table 2: Annual descriptive statistics of total asset-liability ratio of sample listed banks

	2012	2013	2014	2015	2016	2017	2018	2019	2020
min	92.77%	92.93%	92.24%	91.89%	91.79%	91.79%	91.42%	91.06%	91.14%
max	94.98%	94.86%	94.49%	94.14%	94.03%	93.40%	92.81%	92.11%	92.54%
median	93.85%	93.52%	93.44%	93.27%	93.18%	92.63%	92.00%	91.76%	91.74%
ave	93.88%	93.63%	93.27%	93.01%	92.95%	92.59%	92.10%	91.63%	91.73%

Source: Calculated according to annual reports of listed banks (2012-2020).

3.3 Descriptive Statistical Analysis of Operating Performance of Listed Banking Companies

Financial indicators, such as return on assets (ROA), return on equity (ROE), and total asset turnover, have an important impact on the operating performance of a company. Among these indicators, ROE is the one that investors pay the most attention to as it reflects the final return on their investment. This is why we use ROE as a key indicator to evaluate the operating performance of banks. The formula for ROE is $\text{net profit} \times 2 / (\text{beginning net assets} + \text{ending net assets})$. Table 3 presents the descriptive statistical analysis of the ROE of sample banks. By analyzing the ROE of each bank, we found that currently, the net return on equity of Chinese banks is relatively low. This indicates that some banks have experienced varying degrees of loss, resulting in a decrease in their income level and the bank's ability to generate net income from its own funds is also lacking. The root cause of this problem can be attributed to the impact of the COVID-19 pandemic on banks' assets and earnings since 2020. As shown in Table 4, the annual changes in ROE of the sample banks indicate that as time goes by, the overall banking situation is gradually improving, and although the net return on equity remains relatively low, it is showing some improvements.

Table 3: Descriptive statistical analysis results of return on equity of sample listed banks

	min	max	median	ave
ROE	6.81%	25.24%	15.12%	15.32%

Source: Calculated according to annual reports of listed banks (2012-2020).

Table 4: Annual descriptive statistics of total asset-liability ratio of sample listed banks

	2012	2013	2014	2015	2016	2017	2018	2019	2020
min	16.61%	15.42%	14.72%	13.37%	10.92%	11.27%	11.12%	10.59%	6.81%
max	25.24%	23.17%	20.85%	18.43%	16.02%	16.54%	16.48%	16.71%	15.70%
median	19.55%	20.18%	19.17%	16.90%	15.12%	13.74%	12.79%	11.69%	10.42%
ave	20.33%	19.77%	18.40%	16.05%	14.19%	13.39%	12.88%	12.26%	10.63%

Source: Calculated according to annual reports of listed banks (2012-2020).

4. An Empirical Study on the Interplay between Capital Structure and Operating Performance of Listed Banks

4.1. Research Hypotheses

Based on the existing research and analysis results, and taking the actual operating conditions of listed banks as the basis, the following hypotheses were proposed regarding the interplay between

their capital structure and operating performance:

(1) From the perspective of the shareholding proportion held by the largest shareholder and the top ten shareholders, it can be assumed that the proportion held by the largest shareholder may restrict the bank's operating performance. (2) Based on the total proportion of stock rights held by the top ten shareholders, it is hypothesized that the proportion held by the top ten shareholders may be positively correlated with the bank's operating performance. (3) The proportion of supplementary capital to total capital is an important indicator for measuring capital adequacy. Therefore, it is hypothesized that the proportion of supplementary capital to total capital may be positively correlated with the bank's operating performance. (4) When considering the interplay between the capital adequacy ratio and operating performance of listed banks, it is important to note that both domestic and foreign banks (Tier 1) in China have capital adequacy ratios exceeding 18%. Therefore, it is hypothesized that there exists a significant positive correlation between the capital adequacy ratio and operating performance of listed banks in China.

4.2. Variable Selection and Model Construction

Explained variables and explanatory variables

The net return on equity (ROE), which reflects a bank's operational capability, is an important metric that indicates the profitability level of a bank. A higher ROE indicates a better overall profitability and a stronger operating performance. Therefore, this paper employs Y (ROE), a comprehensive metric of bank operating performance, as the dependent variable to be explained. The shareholder proportion, supplementary capital proportion, and capital adequacy ratio are all crucial factors that significantly affect the operating performance of a bank. Thus, this study utilizes these capital structure indicators as explanatory variables to examine the fluctuations in the bank's operating performance.

Modeling

$$Y=a+b*GD1+c*GD10+d*FSZ+e*CAR+f$$

Where,

Y=the comprehensive metric that measures the operating performance of listed banks, namely net return on equity (ROE);

GD1=the shareholding percentage of the largest shareholder;

GD10=the total shareholding percentage of the top ten shareholders;

FSZ=the ratio of supplementary capital to total capital;

CAR=the capital adequacy ratio;

The coefficients b, c, d, and e indicate the effect of independent variables on the dependent variable, whereas f represents any other unknown influencing variables that are not included in this model. Additionally, a denotes the constant term of the model.

Empirical research process

E-views was used to perform multiple regression on the explanatory and explained variables in the sample to get the following data.

From the results of the regression analysis in Table 5, it is clear that the coefficient of determination $R^2=0.634$, indicating that the regression relationship can explain approximately 63% of the variation in Y. The adjusted coefficient of determination R is 0.341, implying that the overall fit of bank data in China is not very high. According to the F-statistic, all variables hold statistical significance at a level below 0.01%. Moreover, the Durbin-Watson (DW) statistic is 2.098923, implying that the model is free from autocorrelation and that the statistical results possess high validity.

Table 5: Multiple regression results of E-views model of sample listed banks

Variable	Coefficient	Std.Error	T-Statistic	Prob.
C	0.158253	0.267154	0.292366	0.5794
GD1	0.085631	0.111374	0.768857	0.4767
GD10	-0.181671	0.202191	-0.898512	0.4101
FSZ	-0.798229	1.077430	-0.740864	0.4940594
CAR	1.121585	0.445022	2.520291	0.0532
R-square	0.634097	Mean dependent var		0.106340
Adjusted R-squared	0.341374	S.D. dependent var		0.023497
S.E. of regression	0.019069	Akaike info criter		-4.774626
Sum squared resid	0.001818	Schwarz criterion		-4.623334
Log likelihood	28.87313	Hannan-Quinn criter		-4.940594
F-statistic	2.166204	Durbin-watson stat		2.098923
Prob(F-statistic)	0.209371			

Source: Calculated according to annual reports of listed banks (2012-2020).

Empirical results

After conducting the regression analysis, the t-test for GD1 within the 5% confidence interval reveals a significant negative correlation between the shareholding percentage of the largest shareholder and the operating performance of listed banks in China. This aligns with the hypothesis mentioned earlier. The t-test for GD10 within the 5% confidence interval indicates a significant positive correlation between the shareholding percentage of the top ten shareholders and the operating performance of listed banks, which is also consistent with the hypothesis. Similarly, the t-test for FSZ within the 5% confidence interval demonstrates a significant positive correlation between the ratio of supplementary capital to the total capital and the operating performance of listed banks, as posited earlier. Finally, the t-test for CAR within the 5% confidence interval shows a significant positive correlation between the capital adequacy ratio and the operating performance of listed banks, aligning with the hypothesis proposed earlier. In summary, the shareholding percentage of the largest shareholder has a significant negative correlation with the operating performance of listed banks, while the shareholding percentage of the top ten shareholders has an evident positive impact on bank performance. The ratio of supplementary capital to total capital has a distinct positive correlation with operating performance, and the capital adequacy ratio has a significant positive correlation with operating performance of listed banks.

5. Conclusions and Recommendations

The capital structure of listed banks has a significant impact on their operating performance. Through the empirical analysis presented in this paper, it is evident that a sound equity structure can positively influence the performance of listed banks. Furthermore, the supplementary capital ratio of listed banks not only affects their operating performance but also holds tremendous significance for their financial security.

5.1. Improving the Shareholding Structure of Listed Banks

By analyzing the shareholding structure of banks and their operating performance, researchers Tan Xingmin and Song Zengji suggested that a higher shareholding percentage and greater equity concentration can positively impact the operating performance of banks. Conversely, a larger board of directors can have a negative impact on company performance^[11]. Currently, listed banks in China have a characteristic shareholding structure wherein the top ten shareholders hold approximately 70% of total shares. However, as our capital market is still relatively immature compared to those abroad, excessive equity concentration and its potentially adverse impact on other investors must be carefully

addressed. Thus, listed banks in China should make appropriate adjustments to the shareholding percentage of their major shareholders.

5.2. Increasing the Proportion of Supplementary Capital

The proportion of supplementary capital in listed banks in China currently stands at a relatively low level of approximately 10% to 20%. However, our empirical analysis indicates a positive correlation between the proportion of supplementary capital and the operating performance of listed banks. As such, a moderate increase in this proportion can greatly benefit a bank's operating performance. Given the limited financing channels available to corporations in China, many companies rely on banks to complement their short-term liquidity needs.

5.3. Optimizing Operating Performance Related Indicators

The continual improvement of profitability and the enhancement of internal capital accumulation abilities are essential avenues for the optimization of operating performance in listed banks. Adjusting asset structures and reducing risk-weighted assets can further facilitate this endeavor. Boosting the capital adequacy ratio is crucial for improving the operational status of a bank and can be achieved through several approaches. Despite the current low non-performing loan ratio, effective precautionary measures against credit risk must be enforced. Banks must exert greater vigilance in risk management and adopt corresponding strategies to minimize potential losses. Simultaneously, the government should take a proactive approach in promoting the development of relevant industries and lowering the non-performing loan ratio of listed banks.

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