

Research on the Influence of Capital Adequacy Ratio on the Income of Chinese-Listed City Commercial Banks

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Abstract: *With the deepening of interest rate liberalization reform, the profit model of banks with the difference between deposit and loan interest as the main source of income is threatened. Compared with state-owned large banks, urban commercial banks are facing increased competitive pressure. At the same time, China will further improve the capital regulatory standards of commercial banks, and how the changes in regulatory requirements affect the earnings of city commercial banks is worth exploring. Therefore, this paper uses the financial data of 24 listed city commercial banks in China from 2011 to 2021 to study the impact of the capital adequacy ratio on their earnings. The empirical results show that there is a significant negative correlation between the capital adequacy ratio and the return on equity, indicating that the increase in capital adequacy ratio weakens the income level of listed city commercial banks.*

Keywords: *Commercial Banks in Listed Cities, Capital Adequacy Ratio, Earnings*

1. Introduction

Banks are an important part of the financial industry and an indispensable force for the economic development of a country or region. Therefore, it is necessary to implement strict supervision of the banking industry. As for bank capital supervision, the Basel Accord stipulates a series of capital and risk supervision requirements, and our country always follows the spirit of the Basel Accord in supervision standards. From the perspective of the course of financial development, China's regulatory requirements for the banking industry are constantly strengthening, and the capital adequacy ratio, as an important indicator in supervision, is also gradually improving. For China's non-systemically important banks, the capital adequacy ratio should reach at least 10.5%. Thus, China's banking supervision requirements are very strict.

On the one hand, raising the capital regulatory requirements for commercial banks can enhance their ability to prevent risks and promote the steady development of the banking industry. However, too strict capital adequacy requirements will reduce the scale of banks' capital available, form constraints on their business development, and then limit the profit space of commercial banks. In particular, for city commercial banks, due to the lack of internal management maturity and the increasingly fierce competition in the industry, their development is facing greater pressure. In addition, with the further deepening of interest rate liberalization reform and the emergence of new financial models, the traditional profit model of city commercial banks has suffered a blow. It is worth exploring whether city commercial banks with no advantage in capital scale will be further restricted by capital supervision, how the capital supervision requirements affect their earnings, and how the regulatory authorities should determine the capital adequacy ratio supervision requirements of city commercial banks, to make them develop more evenly.

2. Literature Review

2.1. Impact of Capital Adequacy Ratio on the Earnings of Commercial Banks

2.1.1. Positive Impact

The improvement of the capital adequacy ratio sends a "positive signal" to the outside world, which can reduce the operating cost of banks (Chen et al., 2016) ^[1], and then improve the profitability of banks

(Jiang et al., 2012) [2]. Wu (2019) believed that the positive impact of the capital adequacy ratio on banks' ability to obtain earnings will become insignificant due to the increase in bank size [3]. Zou (2013) found that the increase in the capital adequacy ratio indicates that the liquidity risk faced by banks is smaller, and the reduction of liquidity risk can improve the profitability of banks [4]. Duan et al. (2013) found through empirical research that the increase in core capital adequacy ratio is conducive to the improvement of the profitability of commercial banks, among which the promotion effect on rural commercial banks is the most obvious [5]. However, Pan (2013) showed that the impact of the capital adequacy ratio on the profitability of state-owned banks was not significant [6].

2.1.2. Negative Impact

Zheng (2011) found that there was a significant negative correlation between banks' net profit and capital adequacy ratio [7]. Ma et al. (2018) believe that there is an inverted U-shaped relationship between the capital adequacy ratio and the operational robustness of commercial banks. When the capital adequacy ratio exceeds a certain level, further increasing the capital adequacy ratio will reduce the profitability of banks, and at the same time, the operational robustness of banks will also decrease [8]. The research results of Zheng (2017) show that the capital adequacy ratio harms the earnings of small and medium-sized banks, while it has a positive and weak impact on the profitability of state-owned banks [9].

2.2. Literature Summary

To sum up, due to differences in research variables, research samples, and research methods, scholars have not reached a unified conclusion. Moreover, few scholars take a certain type of commercial banks as samples to conduct research, while there are great differences between commercial banks of different natures, and the research results may be biased due to the differences between samples.

Because of this, this paper focuses on the listed city commercial banks for research. The selection of explanatory variables and explained variables refers to the previous research results, while the selection of control variables is different from the previous research. The internal control variables are mainly determined from the three perspectives of security, liquidity, and profitability in the operation process of banks, and the selection of external control variables is also different. GDP per capita is mainly used to measure the change in the macroeconomic environment and to study the impact of the capital adequacy ratio on the earnings of listed city commercial banks.

3. Theoretical Analysis and Research Hypothesis

MM theory was proposed by professors Modigliani and Miller in the United States and is divided into MM theory without tax and MM theory with tax. Among them, the MM theorem in the state of tax holds that because the interest expense does not need to be taxed, the interest expense should be deducted before calculating the income tax, that is, the interest has the tax shield effect, the higher the interest expense is, the less the income tax expense needs to be paid, to achieve the effect of reducing the cost of capital, promote the growth of its profit scale, and ultimately increase the value of the enterprise. Therefore, the market value of enterprises is closely related to the capital structure of enterprises, and there is a positive correlation between enterprise value and debt scale.

Banks are highly indebted industries, and their liabilities account for more than 80% of total assets. Moreover, commercial banks aim to maximize profits. According to the MM theory in the state with tax, the liabilities of commercial banks are positively correlated with their market value. With the expansion of the scale of bank liabilities, the interest expenses required to be paid are higher, and the interest expenses are not included in the scope of tax payment, which reduces the tax expenses of banks and increases the available capital scale of banks, thus improving their profitability and market value. However, part of the capital of commercial banks is the bank's capital, and the other part is the borrowed capital that absorbs deposits, namely liabilities. The capital adequacy ratio is the ratio of the total capital excluding bank debt to risk-weighted assets. It can be seen that, to a certain extent, the increase in liabilities improves the profit space of banks and makes their market value rise, while the expansion of liabilities makes the capital adequacy ratio of commercial banks decline. Therefore, the capital adequacy ratio of commercial banks is theoretically negatively related to their profitability and market value. Therefore, this paper proposes the following hypothesis:

H1: When other variables remain unchanged, improving the capital adequacy ratio will reduce the income level of listed city firms.

4. Research Design

4.1. Sample Selection and Data Sources

According to CBRC statistics, by the end of December 2022, a total of 30 city commercial banks in China had been listed and traded. Because some city commercial banks have been listed for a short period, and have not yet formed a systematic data publication system. Therefore, this paper eliminates the samples with incomplete data from all listed city commercial banks and finally selects the annual data indicators of 24 listed city commercial banks from 2011 to 2021 as the research object. The data indicators used in this study are mainly obtained from the annual financial reports published on the official websites of banks and the CSMAR database.

4.2. Model Construction and Variable Definition

4.2.1. Model Construction

To test the relationship between the capital adequacy ratio and earnings of commercial banks in listed cities, this paper sets the model as follows:

$$ROE_{it} = \alpha_0 + \alpha_1 CAR_{it} + \alpha_2 \ln SIZE_{it} + \alpha_3 CIR_{it} + \alpha_4 LDR_{it} + \alpha_5 PCR_{it} + \alpha_6 NPL_{it} + \alpha_7 \ln AGDP_{it} + \varepsilon_1 \quad (1)$$

Where, α_0 represents the constant term, $\alpha_1, \alpha_2, \dots, \alpha_6, \alpha_7$ respectively represent the respective regression coefficients of capital adequacy ratio, total assets, cost-income ratio, loan-to-deposit ratio, provision coverage ratio, non-performing loan ratio, per capita GDP, and other variables, I represent I listed city commercial bank, t represents time, therefore, ROE_{it} represents the return on equity of the i -listed city bank in the t year, the other variables have the same meaning, ε_1 represents the random error term. This paper mainly focuses on the coefficient of the core explanatory variable CAR_{it} . If α_1 is significant and negative, it means that the increase in capital adequacy ratio will significantly weaken the income level of listed city commercial banks. Hypothesis H1 is valid.

4.2.2. Variable Definition

Capital adequacy ratio (CAR). Capital adequacy ratio is the ratio between the regulatory capital and risk-weighted assets held by commercial banks. It is an important indicator to measure the operational robustness and potential risks of commercial banks. The level of capital adequacy ratio can reflect the ability of commercial banks to deal with risks. The implementation of unified capital adequacy ratio supervision by regulatory authorities on commercial banks is not only a constraint on banks, but also conducive to fair competition among banks, protecting to maintaining the stability of the financial industry and reducing the possibility of risk occurrence. In addition, the implementation of bank capital supervision prompted commercial banks to further adjust the asset structure, and increase reserves, thereby strengthening the strength of banks.

Return on equity (ROE). There are many indicators to measure the earnings of commercial banks in listed cities, such as return on assets, return on net assets, and profit margin on assets. Based on the availability of data and the full consideration of the representativeness of indicators, this paper finally selects return on equity as the explained variable to measure the income level of listed city commercial banks based on reading previous research literature.

Table 1: Specific meanings of variables.

Symbol of variable	Name of variable
CAR	Capital adequacy ratio
ROE	Return on equity
lnSIZE	Asset size (natural logarithm)
CIR	Cost-to-income ratio
LDR	Loan-to-deposit ratio
PCR	Provision coverage ratio
NPL	Non-performing loan ratio
lnAGDP	GDP per capita (natural logarithm)

In addition, this paper controls the internal factors that affect the bank's earnings, such as total assets (SIZE), cost-income ratio (CIR), loan-to-deposit ratio (LDR), provision coverage ratio (PCR) and non-performing loan ratio (NPL). At the same time, from the macroeconomic point of view of affecting bank earnings, this paper measures the change in the external economy with per capita GDP. Among them, the

two control variables of total assets and per capita GDP have larger values. This paper takes the logarithmic processing of these two indicators to make the research results more accurate and effective. The meanings of all variables are shown in Table 1.

4.3. Descriptive Statistics

The descriptive statistical results of this paper are shown in Table 2. Among them, the average return on equity is 15.2% and the standard deviation is 6.2, indicating that the income level of listed city commercial banks has a large gap, which may be due to their different development scales and the impact of regional macroeconomic development. Some listed city commercial banks were established late and developed slowly. At the same time, due to the differences in the local economy and the quality of local customer groups, there are obvious differences in the degree of credit risk faced by commercial banks in listed cities. In addition, the difference in the efficiency of transformation and development of listed city commercial banks and the ability to tap market segments is also the reason for the income gap. The average level of capital adequacy ratio is 13.2%, the standard deviation is 1.6, the minimum value is 8.09% of the Bank of Jinzhou in 2019, which does not meet the regulatory requirements of 10.5% in China, and the maximum value is 24.86% of the Bank of Suzhou in 2011, far exceeding the industry average level of 12.7% in that year. The statistics of other control variables were similar to those of previous studies.

Table 2: Basic statistical characteristics of variables.

variable	Sample size	mean	Standard	min	median	max
ROE	264	15.2	6.2	-9.86	14.94	32.89
CAR	264	13.2	1.6	8.09	12.99	24.86
lnSIZE	264	26.6	1.0	22.84	26.67	28.74
CIR	264	29.2	5.4	14.83	29.21	41.81
LDR	264	64.9	14.4	29.47	64.73	123.42
NPL	264	1.2	0.6	0.09	1.19	7.7
PCR	264	317.6	319.1	114.05	264.31	3559.27
lnAGDP	264	10.9	0.2	10.49	10.89	11.31

5. Empirical Results and Analysis

5.1. Multicollinearity Test

In this paper, the variance inflation factor (VIF) is used to measure whether there is multicollinearity among independent variables, and the results are shown in Table 3. It can be seen from the results that the VIF values of the explanatory variables and each control variable are below 10, and the admissibility is greater than 0.2, indicating that there is no multicollinearity among the variables.

Table 3: Multicollinearity test.

Independent variable	Degree of tolerance	VIF
CIR	0.808	1.237
lnSIZE	0.483	2.070
NPL	0.599	1.670
LDR	0.577	1.732
CAR	0.813	1.230
PCR	0.686	1.458
lnAGDP	0.502	1.993

5.2. Benchmark Regression

SPSS.22 software was used to analyze the data of 24 listed city commercial banks in China from 2011 to 2021, and the regression results were obtained as shown in Table 4. Except that the P-value of total assets was greater than 0.05, which was not significant, the P-values corresponding to other variables were all below 0.05. It shows that these variables have a significant impact on ROE within a 95% confidence interval.

Among them, the coefficient of capital adequacy ratio is negative, indicating that the capital adequacy ratio has a significant negative impact on the earnings of listed city commercial banks, which is

manifested in that the return on equity decreases by 0.314% when the capital adequacy ratio increases by 1%. It can be seen that with the increase in capital adequacy ratio, the available capital for loans and investments of listed city commercial banks decreases, resulting in a decline in their income level. Therefore, hypothesis H1 is true. At the same time, cost-income ratio, loan-to-deposit ratio, non-performing loan ratio, and per capita GDP are also negatively correlated with ROE. The provision coverage ratio has a positive impact on the bank's return on equity.

Table 4: Table of regression coefficients.

variable	Unstandardized coefficient Beta	Standard error	Standardization coefficient Beta	t	P
(constant)	138.700	11.770		11.78	0.00
CAR	-0.314	0.132	-0.084	-2.38	0.02
lnSIZE	0.029	0.285	0.005	0.10	0.92
CIR	-0.298	0.041	-0.260	-7.34	0.00
LDR	-0.074	0.018	-0.170	-4.06	0.00
PCR	0.002	0.001	0.120	3.13	0.002
NPL	-4.265	0.370	-0.474	-11.53	0.00
lnAGDP	-9.348	1.117	-0.376	-8.37	0.00

5.3. Robustness Test

This paper replaces the capital adequacy ratio with the Tier 1 capital adequacy ratio to test the robustness of the model, and the results are shown in Table 5. By comparing the regression results before and after, it is found that the two explanatory variables have the same direction of influence on the return on equity, and both are significant, indicating that there is a negative correlation between the capital adequacy ratio and the returns of listed city commercial banks, and the results are robust. At the same time, among all the control variables, except that the impact of total assets on the earnings of listed city commercial banks has changed and is not significant, the results of the impact of other control variables on the return on equity are consistent and significant within the 99% confidence interval. Therefore, the robustness test results are consistent with the multiple linear regression results, indicating that the empirical results of this paper are robust.

Table 5: Results of the robustness test.

	Model (1)	Model (2)
CAR	-0.314** (0.132)	
TCAR		-0.631*** (0.128)
lnSIZE	0.029 (0.285)	-0.269 (0.283)
CIR	-0.298*** (0.041)	-0.299*** (0.039)
LDR	-0.074*** (0.018)	-0.067*** (0.017)
NPL	-4.265*** (0.370)	-4.377*** (0.350)
PCR	0.002*** (0.001)	0.003*** (0.001)
lnAGDP	-9.348*** (1.117)	-9.411*** (1.068)
Constant term	138.700*** (11.770)	149.639*** (11.665)
N	264	264
adj.R-sq	0.734	0.752

Note: The values in parentheses are standard errors, and *, **, and *** indicate significance at the level of 10%, 5%, and 1%, respectively.

6. Conclusions and Recommendations

6.1. Conclusions

The capital adequacy ratio has a significant negative impact on the earnings of listed city commercial banks in China. Analysis of the reason may be that with the improvement of China's regulatory requirements on the capital adequacy ratio of commercial banks. To meet the regulatory requirements, listed city commercial banks can, on the one hand, adopt internal financing methods such as increasing retained profits or external financing methods such as issuing common stock, and increase the capital adequacy ratio through the molecular strategy of increasing their capital. On the other hand, it can also

reduce the denominator strategy of risk-weighted asset scale by disposing of non-performing assets, to improve the capital adequacy ratio. No matter whether the numerator strategy or denominator strategy is to increase the capital adequacy ratio, with the increase of total capital, the financial leverage ratio of listed city commercial banks will decrease. Meanwhile, compared with the natural advantages of state-owned banks and joint-stock banks, the financing cost of listed city commercial banks is more expensive. In addition, the increase in capital adequacy ratio will also affect the amount of available capital of commercial banks in listed cities, thus hurting their business scope and business structure. These may be the reasons why the increase in capital adequacy ratio reduces its ROE.

Different control variables have different effects on the earnings of commercial banks in listed cities. Among them, loan-to-deposit ratio, cost-income ratio, non-performing loan ratio, and per capita GDP have a significantly negative impact on the earnings of listed city commercial banks. The impact of the provision coverage ratio on the earnings of listed city commercial banks is positive. With the increase in provision coverage, the ability of listed city commercial banks to deal with loan losses is improved and they have a strong ability to resist risks. However, the impact of total assets on the return on equity of listed city commercial banks is not significant, and with the change of explanatory variables, the direction of its impact on the explained variables also changes. This may be because the asset scale of commercial banks in listed cities is relatively small, so there is no scale effect, and then the impact on the formation of earnings is not significant.

6.2. Recommendations

6.2.1. Meet Capital Regulatory Requirements and Improve Capital Utilization

According to the empirical results, there is a significant negative correlation between the capital adequacy ratio and the earnings of commercial banks in listed cities, so the capital adequacy ratio should not be kept at a too high level. However, reducing the capital adequacy ratio is not unlimited, and it is necessary to take the capital regulatory requirements as the offline line, based on meeting the capital regulatory standards, the idle capital is used for business expansion, improving the business structure, product innovation, and improving technology. At the same time, it is necessary to optimize the structure of capital, improve the efficiency of capital use, expand their own profit space, and achieve the goal of profit maximization.

6.2.2. Improve the Internal Management System and Improve the Level of Risk Control

Compared with state-owned banks, the operation and management of listed city commercial banks are extensive, the management system and system design are not scientific and sound, the risk identification and evaluation ability is not strong, and the risk management system is not developed, which has a certain impact on the improvement of their profitability. According to the research results, both loan-to-deposit ratio and non-performing loan ratio harm the earnings of listed city commercial banks, indicating that the expansion of the credit scale of listed city commercial banks has a reverse effect on their profitability, which has a great relationship with their risk control ability. Because with the expansion of the credit scale of listed city commercial banks, due to their risk control is not in place, they cannot accurately identify whether there are risks to borrowers and have the trend of blind lending, which leads to the increase of their non-performing loan ratio and ultimately reduces their income level.

6.2.3. Maintain Appropriate Liquidity and Improve Operating Efficiency

As a reference index of bank liquidity, when the loan-to-deposit ratio remains at a high level, it indicates that the bank's loan scale accounts for a large proportion of deposit liabilities. On the one hand, the expansion of the loan scale will bring considerable interest income to the bank; on the other hand, the liquidity and security of the bank will also decrease with the expansion of the loan scale. Moreover, the empirical results show that when the loan-to-deposit ratio is increased, the income level of listed city commercial banks will decline. Therefore, the amount of loans should be controlled to reduce the loan-to-deposit ratio to a reasonable level, so that considerable profits can be obtained and certain liquidity can be maintained to meet the needs of customers. At the same time, listed city commercial banks should reduce the cost-income ratio, and improve operating efficiency, so that each income needs to spend less cost, to improve profitability.

References

[1] Chen, A., Song, Q. (2016). *Research on the impact of capital structure on the profitability of listed*

- banks in our country. *Journal of Rural Finance Research*, (07), 48-51.
- [2] Jiang, J., Zhao, Y. (2012). Capital adequacy ratio, equity structure, and profitability of commercial banks: Based on the empirical research of commercial banks in our country. *Journal of Guizhou University of Finance and Economics*, (01), 33-38.
- [3] Wu, W. (2019). The Impact of Capital Adequacy Ratio on Profitability of China's Commercial Banks. *China's Collective Economy*, (13), 92-93.
- [4] Zou, Z. S. (2013). The Empirical analysis of the relationship between capital structure and liquidity of our country's commercial banks. *Shanghai Finance*, (08), 43-47+117.
- [5] Duan, J. S., Yang, P. (2013). Changes in core capital adequacy ratio and profitability of commercial banks. *Journal of Financial Forum*, (11), 36-43+58.
- [6] Pan, Z. Z. (2013). Empirical research on the effect of capital adequacy on profitability of commercial banks. *Southern Finance*, (11), 43-46.
- [7] Zheng, L. (2011). An empirical study on the relationship between net profit and capital structure of our country's commercial banks. *Journal of Regional Finance*, (03), 71-75.
- [8] Ma, G. Q., Wang, J. (2018). Research on capital adequacy ratio and operation conservatism of commercial banks in our country. *Credit Investigation*, (10), 58-64.
- [9] Zheng, H. (2017). Analysis of the impact of commercial banks' capital adequacy ratio on their profitability. *Journal of Shandong Youth Political Science University*, (04), 97-102.