THE IMPACTS OF OFF-BALANCE SHEET BUSINESS AND BANK RISK ON COMMERCIAL BANK PERFORMANCE: AN EMPIRICAL TEST OF CHINA'S A-SHARE LISTED COMMERCIAL BANKS

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Abstract

From 2008 to 2016, China's A-share listed commercial banks are used as a sample to verify the impact of off-balance sheet business and bank risk on the performance of commercial banks. This paper adopts the CSMAR database. The sample size was 145 in total. And the annual reports of listed companies in the measurement of off-balance sheet business. Choose the ratio of fee and commission income to operating income to measure the contribution rate of off-balance sheet business income, and the variable is named OBS, which is equal to the total revenue of bank i's (various) off-balance sheet operations in the t-the half-year divided by the bank's operating revenue. Using regression analysis research method, the results show that: (1) the higher the off-balance sheet business, the higher the performance of commercial banks; (2) the higher the risk of banks, the lower the performance of commercial banks. Based on the above conclusions on performance, to better control the risks brought about by the diversification of commercial banks' operations.

Keywords: Off-balance Sheet Business, Bank Risk, Commercial Bank Performance

Introduction

With the adjustment of China's economic structure, the era of extensive economic growth has passed. At the same time, affected by the overall economic downturn, the operation of commercial banks has also fallen into a trough, the profitability has declined, and the non-performing loan ratio has risen. The operating conditions of some industries with excess capacity deteriorated, increasing the non-performing loans of commercial banks.

On the other hand, under the background of supply-side reform, traditional backward and polluting industries will inevitably be eliminated, so it can be expected that the non-performing loans of Chinese commercial banks may further increase in the future. Interest rate liberalization, financial disinter-mediation, Internet finance and other phenomena have further deteriorated the business environment of commercial banks.

In this context, China commercial banks

carry out their own supply-side reforms, not only for the needs of the banking industry's own reforms, but also for the reform of my country's economic structure. In addition to the adjustment of its own credit structure, the bank's own supply-side reform is also an important aspect, which is to continuously innovate and expand new businesses to meet the new financial needs arising from the supply-side reform. Many new businesses involve off-balance sheet business of commercial banks.

However, judging from the current research literature, it is no unified conclusion on what impact the increase in the proportion of off-balance sheet business income of Chinese commercial banks will have on the performance of commercial banks. The increase in the proportion of off-balance sheet business income has different empirical results on the profitability and risk of commercial banks based on the data of commercial banks in various countries and periods.

China's stock market investors are interested in investing in A-shares. A-shares are stocks of companies located in mainland China that are listed on the Shanghai or Shenzhen Stock Exchanges. Shares in this group offer trading options exclusively to key Chinese personalities. Foreign investors are prohibited from investing.

This paper collects data from 16 commercial banks listed on A-shares in China from 2008 to 2016. The 16 listed banks include 5 state-owned commercial banks:

Bank of China (stock code: 601988), Industrial and Commercial Bank of China (stock code: 601398), Agricultural Bank of China (stock code: 601288), China Construction Bank (stock code: 601939) and Bank of Communications (stock code: 601328). 8 joint-stock commercial banks: China CITIC Bank (stock code: 601998), Shanghai Pudong Development Bank (stock code: 600000), China Merchants Bank (stock code: 600036), Hua Xia Bank (stock code: 600015), Industrial Bank (stock code: 601166), Ping an Bank (stock code: 000001), China Everbright Bank (stock code: 601818) and China Minsheng Bank (stock code: 600016). And 3 city commercial banks: Bank of Beijing (stock code: 601169), Bank of Nanjing (stock code: 601009), and Bank of Ningbo (stock code: 002142).

Objective

The objective of this paper is to explore the impact of off-balance sheet business and bank risk on the performance of commercial banks in China. And it is to theoretically supplement the above-mentioned relationship.

Literature Review

Simply, China A-shares are stocks purchased in RMB, issued by companies registered in China and listed in China, for domestic institutions, organizations or individuals to subscribe and trade in RMB.

According to the diversification theory, the off-balance sheet business income of banks can share resources with non-off-balance sheet business income (Fung & Cheng,

2004), thereby forming economies of scope and improving performance levels (Chiorazzo et al., 2008; Trivedi, 2015; Ahamed, 2017).

To sum up the above, we get:

H1: The higher the off-balance sheet business, the higher the performance of the commercial bank.

But this income diversity also has the potential to increase bank risk (DeYoung & Roland, 2001; Williams, 2016). Chinese scholars (Li, 2011) have studied the data of Chinese listed banks and concluded that the higher the bank risk level, the lower the commercial bank performance.

In summary:

H2: Bank risk is negatively correlated with commercial bank performance.

Methodology

The data in this paper mainly come from the annual reports of listed companies, the China Financial Statistical Yearbook, the RESSET database and the CSMAR database, the public statements of various banks and the website of the National Bureau of Statistics. The off-balance sheet business data in this paper comes from the annual reports of commercial banks and the CSMAR database. The data of commercial bank performance in this paper come from commercial bank annual reports and CSMAR database. The bank risk data in this paper comes from the CSMAR database, and the control variable data comes from the annual reports of listed companies and the CSMAR database.

The sample selection steps are as follows: As of the end of 2019, there were 36 A-share listed banks. Since 20 banks including Bank of Jiangsu and Bank of Shanghai were listed after 2016, the published annual report duration could not meet the requirements of variable construction, so 16 previously listed banks were selected. A commercial bank is a sample. In this study, the period from 2008 to 2016 was intercepted, a total of 9 years, and missing values were eliminated. Based on this, the sample size was 142 in total.

This paper adopts the CSMAR database and the annual reports of listed companies in the measurement of off-balance sheet business. Stiroh (2004), Calmes and Theoret (2010), and Karim et al. (2013), choose the ratio of fee and commission income to operating income to measure the contribution rate of off-balance sheet business income, and the variable is named OBS. OBS is equal to the total revenue of bank I's (various) off-balance sheet operations in the t-th half-year divided by the bank's operating revenue. According to the research of Zeng et al. (2020), Winsorize tail processing was performed on all continuous variables at a ratio of 1%.

According to Ma et al. (2020), the bank risk measurement in this paper adopts NPL.

In this paper, we use Return on Average Assets (ROAA) to measure the performance of commercial banks.

The above are all annual figures.

In practical research, even if the regression results show that the independent variable can cause the change of the dependent variable, the change of the dependent variable is not

necessarily caused by the independent variable but may be caused by another variable that is not put into the model, which varies independently of the independent variable. Therefore, when performing regression analysis, it is necessary to control these other variables that may cause changes in the dependent variable to minimize their influence on the regression results of the model, so that the regression results can be more accurate. According to the existing literature research, this paper selects RMB deposit and loan ratio (%) (Rmbltdra), foreign currency deposit and Equity concentration ratio (%) (shrcr1), and the loan ratio of the top ten customers. (%) (Ttdra) as a control variable. The control variables in this paper are as follows:

1. Renminbi loan-to-deposit ratio (%) (Rmbltdra), according to the research of Zhang et al. (2021), from the perspective of bank profitability, the higher the loan-to-deposit ratio, the stronger the bank's profitability. Therefore, this paper uses the loan-to-deposit ratio as an indicator to measure the bank's operating performance. Specific measurement: The Loan-to-Deposit Ratio (LDR) is the ratio of total loans to total deposits, which reflects the liquidity situation of banks and is the main indicator for measuring bank asset allocation (Zheng & Cao, 2005). This paper obtains data on the return on equity of listed companies from the CSMAR database and matches them on the basis of stock code and age. The RMB loan-to-deposit ratio is the reflection of the loan-to-deposit ratio in RMB.

2. Equity concentration ratio (%) (shrcr1)

is the degree of control over the control of the enterprise by the major shareholders. The more dispersed the company's shareholding, the weaker the controlling right of the major shareholders, and vice versa, the stronger the controlling right of major shareholders. In collective action problems, it is often necessary to solve the coordination of member actions through the allocation of control rights. Typically, the principal, who has formal control over the organization, decides on collective action, which is then carried out by the agent. Shareholding ratio of major shareholders (specific indicator: Shrcr1 [shareholding concentration index 1 (%)] - the shareholding ratio of the company's largest shareholder).

3. Loan ratio (%) (Ttdra) of the largest ten customers, according to the "Law of the People's Republic of China on Commercial Banks": "The ratio of the loan balance to the same borrower to the capital balance of a commercial bank shall not exceed 10%". So, the bank's loan concentration will affect the bank's risk. Measurement method reference (Zhu, 2012). The ratio of loans to the top ten clients to net capital = Loans to the top ten clients/net capital.

Therefore, in order to test Hypothesis 1, off-balance sheet business has a linear relationship with commercial bank performance, a regression model (1) is established to test the relationship between the two: Performance t = $\beta0 + \beta1*obst + \beta2*rmbltdrat + \beta3*ttdrat + \beta4*shrcr1t + \varepsilon$ t.

Therefore, in order to test Hypothesis 2, the influence of bank risk on commercial

bank performance has a linear relationship, a regression model (2) is established to test the relationship between the two: Performance$_t$ = β0 + β1*npl$_t$ + β2*rmbltdra$_t$ + β3*ttdra$_t$ + β4*shrcr1$_t$ + ε t.

Results

In the process of discussing the impact of off-balance sheet business, bank risk and commercial bank performance, this paper collects data from 16 commercial banks listed on A-shares in China from 2008 to 2016, conducts descriptive analysis and correlation analysis on them. At the same time, multiple linear regression was carried out with STATA 16.0, and the following results were obtained through data testing.

It is common practice to test the relevance of a model before performing multiple regression. The specific analysis results of the correlation test of the main variables and control variables in this paper are shown in Table 2. As shown in Table 2, the absolute value of the correlation coefficient without variables is 0, and the maximum absolute value is not more than 0.75, according to Wu (2010), the correlation coefficient between the two variables does not exceed 0.75, which can be a smaller collinearity problem between the two, so the possibility of a collinear problem between the variables in this article is small.

Table 1 Descriptive analysis table of Off-balance sheet business and commercial bank performance

Variable	N	Mean	Std.Dev.	Min	Max
ROA (%)	145	.995	.263	0	1.386
OBS (%)	145	16.589	7.523	0	36.295
RMBLTDRA (%)	145	62.712	21.332	0	77.19
TTDRA (%)	145	20.849	8.101	10.93	40.89
SHRCR 1 (%)	145	21.997	18.219	0	63.74

Table 2 Analysis of correlation between Off-balance sheet business and commercial bank performance

Variables	ROA	obs	rmbltdra	ttdra	shrcr1
ROA	1.000				
OBS	0.336	1.000			
RMBLTDRA	0.278	-0.099	1.000		
TTDRA	-0.115	-0.326	-0.065	1.000	
SHRCR 1	0.145	-0.234	0.251	-0.027	1.000

To further confirm the problem of correlation between variables, the VIF test was also carried out on the variables involved in the text (see Table 3), and the absolute VIF values between the variables were less than 2, and the mean value was 1.170, which passed the VIF test, again explaining that the collinearity problem of the variables in the text was small.

Table 3 Multicollinearity between Off-balance sheet business and commercial bank performance

Variables	VIF	1/VIF
OBS	1.270	0.787
RMBLTDRA	1.170	0.852
TTDRA	1.160	0.860
SHRCR 1	1.080	0.928
MEANVIF	1.170	

As can be seen from Table 4, the p-value of the regression between off-balance sheet business and the performance of commercial banks is significant (Significant levels: 1%), and the regression coefficient is positive. The regression shows that among listed commercial banks, the more off-balance sheet business, the higher the performance of commercial banks, and there is a significant positive correlation between off-balance sheet business and the performance of commercial banks.

Table 4 Multipleregression table of Off-balance sheet business and commercial bank performance

Explanatory variables	Explained variable ROA
obs	.015***
	(2.83)
rmbltdra	.003***
	(2.95)
ttdra	.006*
	(1.74)
shrcr1	.004***
	(3.09)
R-squared within	0.355
F	11.165
Number of obs	86

Note: t-values in brackets, *, **, and ***represent the significant levels of 10%, 5%, and 1%, respectively

Table 5 Robustnesscheck of Off-balance sheet business and commercial

Explanatory variables	Explained variable ROA
obs	.03***
	(6.99)
rmbltdra	.003**
	(2.17)
ttdra	.004
	(1.32)
shrcr1	.004***
	(3.09)
R-squared within	0.487
F	14.712
Number of obs	67

Note: t-values in brackets, *, **, and*** represent the significant levels of 10%, 5%, and 1%, respectively

To verify the reliability of the H1 conclusion, this article uses the method of rejecting extreme values for robustness testing, and the results of the robustness test are shown in Table 5. As can be seen from Table 5, after the robustness test, the regression p-value of off-balance sheet business and commercial bank performance is significant (Significant levels: 1%), and the regression coefficient is positive. There is still a significant positive correlation between the two. H1 robustness test passed.

Table 6 Descriptive analysis table of Bank Risk and Commercial Bank Performance

Variable	N	Mean	Std.Dev.	Min	Max
ROA (%)	145	.995	.263	0	1.386
NPL (%)	145	1.183	.493	.44	2.65
RMBLTDRA (%)	145	62.712	21.332	0	77.19
TTDRA (%)	145	20.849	8.101	10.93	40.89
SHRCR 1 (%)	145	21.997	18.219	0	63.74

A descriptive statistical analysis of bank risk and performance of commercial banks is shown in Table 6.

The specific analysis results of the correlation test of the main variables and control variables in this paper are shown in Table 7. According to Wu (2010), the correlation coefficient between the two variables does not exceed 0.75, which can be considered to be smaller, so the possibility of a collinear problem between the variables in this article is small.

Table 7 Analysis of correlation between Bank Risk and Commercial Bank Performance

Variables	ROA	npl	rmbltdra	ttdra	shrcr1
ROA	1.000				
NPL	-0.407***	1.000			
RMBLTDRA	0.278***	-0.168	1.000		
TTDRA	-0.115	-0.014	-0.065	1.000	
SHRCR1	0.145*	-0.114	0.251**	-0.027	1.000

To further confirm the correlation between variables, the VIF test was also carried out on the variables involved in the article (see Table 8), and the absolute vif values between the variables were less than 2, and the mean value was 1.090, which passed the VIF test, which again explained that the collinearity problem of the variables in the text was small.

Table 8 Multicollinearity between Bank Risk and Commercial Bank Performance

Variables	VIF	1/VIF
NPL_	1.120	0.894
RMBLTDRA_	1.110	0.900
TTDRA_	1.090	0.914
SHRCR1_	1.050	0.951
MEANVIF	1.090	

As can be seen from Table 9, the p-value of the regression between off-balance sheet business and the performance of commercial banks is significant (Significant levels 1%), and the regression coefficient is negative. The regression shows that among listed commercial banks, the higher the bank risk, the lower the performance of the commercial bank, and there is a significant negative correlation between the bank risk and the performance of the commercial bank.

Table 9 Multiple regression table of Bank Risk and Commercial Bank Performance

Explanatory variables	Explained variable ROA
NPL	-.277***
	(-4.68)
RMBLTDRA	.002*
	(1.84)
TTDRA	-.004
	(-1.32)
SHRCR1	.001
	(0.42)
R-SQUARED WITHIN	0.288
F	8.172
NUMBER OF OBS	86

Note: t-values in brackets, *, **, and ***represent the significant levels of 10%, 5%, and 1%, respectively

To verify the reliability of the H2 conclusions, the robustness test is performed using the method of rejecting extreme values, and the results of the robustness test are shown in Table 10.

As can be seen from Table 10, after the robustness test, the regression p-value of bank risk and commercial bank performance is significant (Significant levels: 1%), and the regression coefficient is negative. There is still a significant negative correlation between the two. H2 robustness test passed.

Table 10 Robustness check of Bank Risk and Commercial Bank Performance

Explanatory variables	Explained variable ROA
NPL	-.330***
	(-4.79)
RMBLTDRA	.002
	(1.24)
TTDRA	-.001
	(-0.37)
SHRCR1	.001
	(0.57)
R-SQUARED WITHIN	0.330
F	7.649
NUMBER OF OBS	67

Note: t-values in brackets, *, **, and *** represent the significant levels of 10%, 5%, and 1%, respectively

Discussion

This paper mainly conducts descriptive analysis and correlation analysis on the collected data. Descriptive analysis showed that most of the data were normally distributed, indicating a relatively reasonable range of data. In correlation analysis, although most of the data have a certain correlation, the correlation coefficient is not high and is statistically independent. After that, multiple linear regression analysis and binary logistic regression analysis were used to perform regression analysis on the research model proposed in this paper. The regression results show that the H1 and H2 models proposed in this paper have good significance and good robustness. H1 and H2 are established. The establishment of H1 validates the applicability of the hypothetical premise of H1 in the literature review. In the literature review, according to the theory of diversification, off-balance sheet business income of banks can share resources with off-balance sheet business income (Fung & Cheng, 2004), thus forming economies of scope and improving performance (Chiorazzo et al., 2008; Trivedi, 2015; Ahamed, 2017). This article H1 just verifies the above point. Meanwhile, in the literature review, income diversity may also increase bank risk (DeYoung & Roland, 2001; Williams, 2016). Chinese scholars (Li, 2011) used a fixed effect regression model to analyze the financial data of the 16 listed banks involved in this paper for a total of 6 years from 2004 to 2009, and concluded that the higher the bank risk level, the lower the commercial bank performance.

This article H2 supplements the research samples of scholars (Li, 2011): the time range of the research samples involved has been expanded (2008 to 2016), which also verifies the views of the above literature.

The establishment of H2 validates the applicability of the hypothetical premise of H1 in the literature review.

At the same time, the above results show that the off-balance-sheet business of commercial banks has a positive effect on bank performance, and the risk of banks is negatively related to the performance of commercial banks.

The above results solve the uncertainty of the impact of off-balance sheet business promotion on bank performance or bank risk.

Conclusion

This paper takes China's A-share listed commercial banks from 2007 to 2016 as the research object. Through empirical research, two conclusions are drawn: First, off-balance sheet business is positively correlated with the performance of commercial banks. Second, bank risk is negatively correlated with commercial bank performance. The results of the study provide the evidence of the impact of off-balance-sheet business promotion on bank performance or bank risk.

The research in this paper proves that the degree of off-balance sheet business development is positively correlated with the operating performance of commercial banks. The higher the off-balance sheet business, the higher the performance of commercial banks.

This empirical study takes 16 commercial banks listed on A-shares in China as samples, and observes the samples for 9 consecutive years, which is representative. Added empirical evidence to the research on the impact of off-balance sheet business on commercial bank performance. It also provides theoretical support for Chinese commercial banks to carry out off-balance sheet business and diversification strategies.

In view of the possible increase of bank risks under the diversification strategy of commercial banks, it is necessary to attract the attention of bank executives to restrain risks and prevent the negative impact on the performance of commercial banks. This has certain enlightenment significance for Chinese commercial banks to carry out diversified business and has certain enlightenment for the operation of commercial banks.

Acknowledgments

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