

The Impact of Green Finance on the Profitability of Commercial Banks

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Abstract: As global environmental problems are becoming more and more prominent, green finance, as an important means for commercial banks to cope with climate change and environmental pollution, has received widespread attention from the society. As a financial enterprise, the impact of green finance on the profitability of commercial banks is an important issue that needs to be discussed. In this paper, the impact of green finance on the profitability of commercial banks is analyzed theoretically, and the data of 16 commercial banks are selected as samples for empirical analysis, and the results show that green credit business has a negative impact on the profitability level of commercial banks. The results show that green credit business has a negative impact on the profitability of commercial banks. Subsequently, the paper puts forward relevant recommendations for commercial banks to respond to the empirical results. Finally, this paper also points out some shortcomings, including the limited data sample. Future research can further expand the sample scope, explore in depth the profitability of commercial banks' green finance business, and formulate more specific policy measures to promote the sustainable development of green finance.

Keywords: Green finance, Commercial banks, Profitability.

1. Literature Review

Green finance has been widely recognized by all sectors of society, the financial sector and the academic community. At present, scholars at home and abroad have explored green finance from various aspects and have made some achievements. Cheng Zhang (2020) suggests that green finance business of commercial banks will have a positive effect on both business performance and environmental benefits. play a role in improving both operational performance and environmental efficiency [1]. Wang Rui (2020), through a heterogeneity study, found that the development of green financial business for large state-owned commercial banks has a negative impact on their operational efficiency, while for joint-stock commercial banks it has little impact, and for urban commercial banks it has a significant positive impact. positive impact on city commercial banks [2]. Sun Hongmei and Yao Shuqi (2021) found that the performance impact of commercial banks carrying out green financial business has a certain lag [3]. Xu, Fangyuan and Chen, Jie (2023) suggest that green finance can diversify commercial banks' income sources, can not only diversify the income sources of commercial banks, but also strengthen their risk management ability [4]. Wang Wenlong and Zheng Zehua (2024) suggest that green industry funds currently have problems such as insufficient information disclosure, incomplete investment performance accounting, insufficient incentive policies, and insufficiently clear positioning of green stock and debt financial instruments. Etc [5]. Wang Xiaoyou (2024) suggests that in the process of opening green financial business in China, there are problems such as weak industrial foundation, lack of communication between banks, government and enterprises, and imperfect green financial products and service system, which will lead to the ability of commercial banks to profit from green financial business. All these problems will lead to a decline in the ability of commercial banks to profit from green financial business.

2. Empirical Analysis of The Impact of Green Finance on The Profitability of Commercial Banks

2.1. Sample Selection and Data Sources

2.1.1. Explained Variables

Return on Total Assets (ROA), a key indicator of a bank's profitability is calculated by dividing net profit by total assets. ROA reflects the level of profitability of a bank's overall asset position.

2.1.2. Explanatory Variables

Green Credit Balance (GC). Green credit balance represents the scale and extent of business conducted by banks in the field of green finance. Green credit balance is one of the important data published by banks, and it is also the business that accounts for the largest proportion of green finance, so the green loan balance can well represent the scale of green finance, and the green loan balance can usually be found in the annual report, which makes it relatively easy to obtain the data, and the data of each bank are comparable, which is helpful for the comparative analysis of cross-banks and cross-years.

2.1.3. Control Variables

(1) Capital Adequacy Ratio (CAR): A quantity expressed as a percentage of a bank's capital to weighted risk assets ratio. Reflects the bank's capital strength along with its ability to resist risk.

(2) Provision Coverage Ratio (PCR), which reflects the extent to which banks cover non-performing loans, with a high PCR indicating that banks are more adequately preventing risks.

(3) Gearing ratio (ZCFZ), the ratio of total liabilities to total assets on a bank's balance sheet. It measures the proportional relationship between a bank's assets and liabilities. A higher gearing ratio may imply that the bank's liability risk is rising,

which will adversely affect profitability, and the bank's liability risk will rise as a result.

(4) Bank size (LnAsset), which is generally expressed in natural logarithmic form, i.e., the logarithm of the bank's total asset size is taken to reflect the size of the bank. A larger bank size may imply more business and a wider allocation of

resources, which has a positive impact on profitability.

2.2. Descriptive Statistics

We used Eviews software to statistically summarize the data collected from the annual reports of 16 banks.

Table 1. Descriptive Statistics

	ROA	GC	CAR	PCR	ZCFZ	LNASSET
Mean	0.00943125	4298.25419	0.135105625	2.36216875	0.9280575	11.02434
Median	0.0093	1727.985	0.1331	2.0695	0.92535	11.03528
Maximum	0.0147	39784.58	0.1926	4.8387	0.9747	12.88941
Minimum	0.0051	27.32	0.0884	1.3244	0.9059	8.375761
Std. Dev.	0.00206776	6205.58849	0.019401593	0.864178578	0.01206583	1.005187
Observations	160	160	160	160	160	160

2.3. Model Selection and Construction

The F-test and Hausman test are both tools used to determine whether to choose a fixed-effects model or a random-effects model in panel data analysis. The F-test is mainly used to determine which one of the fixed-effects models and the mixed regression model is more appropriate. If the p-value of the F-test is very small, the original hypothesis will usually be rejected and the fixed-effects model will be chosen. And Hausman test is used to determine that choice in the fixed effects model and random effects model. If the p-value of the Hausman test is small, the fixed effects model is chosen over the random effects model. These tests are important steps in panel data analysis to select the appropriate model for data analysis and inference.

The first test performed is the F-test, where the original hypothesis assumes that the mixed regression model is the correct model, and if the original hypothesis is rejected then the fixed regression model is used.

As can be seen in Table 2, the P value is <0.01, which rejects the original hypothesis at the 1% confidence level and rejects the mixed regression model in favor of the fixed effect model.

Table 2. F test

Effects Test	statistic	d. f.	Prob.
Cross-section F	81.496050	(15,139)	0.0000

The next exercise was the Hausman model, which was conducted with the original hypothesis that individual impacts are not correlated with the explanatory variables and the model should be set up as a random effects model. The alternative hypothesis is that individual effects are related to the explanatory variables and the model should be set as a fixed effects model.

From the results of Hausman's test in Table 3, the p--value is less than 0.01, i.e., the original hypothesis is rejected at 1% level of significance, thus rejecting the use of random effect model in favor of fixed effect model.

Table 3. Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	268.838161	5	0.0000

Based on the test analysis above, the fixed effects model is listed:

$$ROA_{i,t} = \alpha + \beta_1 GC_{i,t} + \beta_2 CAR_{i,t} + \beta_3 PCR_{i,t} + \beta_4 ZCFZ_{i,t} + \beta_5 LnAsset_{i,t} + \mu_{i,t}$$

Where $i=1,2,\dots,16$ denotes one of the 16 commercial banks and $t=1,2,\dots,10$ denotes one of the years 2013 to 2022.

2.4. Analysis of Regression Results

The fixed effects model was estimated using Eviews software and the following regression analysis was obtained:

Table 4. Fixed Effects Regression Results

Dep. Var.	ROA
GC	-0.0000000336* (-1.9388)
CAR	-0.024734*** (-2.7440)
PCR	0.001201*** (11.3356)
ZCFZ	-0.048563*** (-3.2901)
LNASSET	-0.003676*** (-12.1040)
C	0.095672*** (5.8023)
Observations:	160
squared:	0.9111
F-statistic.	71.2709
Note: ***, **, * indicate that the coefficients are significant at the 1%, 5%, and 10% confidence levels, respectively.	

Based on the regression results in Table 4, we can derive the equation for these fixed effects model:

$$ROA_{i,t} = 0.095672 - 0.0000000336GC_{i,t} - 0.024734CAR_{i,t} + 0.001201PCR_{i,t} - 0.048563ZCFZ_{i,t} - 0.003676LnAsset_{i,t} + \mu_{i,t}$$

We can see that $R^2 = 0.9111$, which indicates that the variables as a whole can have a strong explanation of ROA

and the model fits the sample well. For the F-test, for $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$, we can see from Table 4 that the P-value is very small, so the original hypothesis should be rejected $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$, which indicates that the regression equation is significant, i.e., the variables of "GC", "CAR", "PCR", "ZCFZ", "LnAsset" have significant effect on the explanatory variable "ROA" jointly. ROA" has a significant effect. For the t-test, for $H_0: \beta_j = 0$ ($j=1, 2, 3, 4, 5$), it can be seen from Table 4 that except for "GC" which is significant at 10% confidence level, all the other explanatory variables are significant at 1% confidence level, and therefore $H_0: \beta_j=0$ ($j=1, 2, 3, 4, 5$) should be rejected, respectively, which means that That is to say, each explanatory variable has a significant effect on the explanatory variable "ROA" while the other explanatory variables remain unchanged.

2.5. Robustness Tests

In order to test the accuracy and reliability of the above model, we conduct a robustness test. The robustness test of the core explanatory variable GC with one period lag is shown in Table 5. From the results of the robustness test, it can be found that the model has a good fit with $R^2 = 0.9210$. The correlations between the coefficients of the explanatory variables are broadly consistent with the initial findings, indicating that the model of this study is robust, and the negative correlation between green credit balances and return on assets at 10% significance suggests that the lagged-period robustness test did not change the relevance of the original model.

Table 5. Robustness test results

Dep. Var.	ROA
L.GC	-0.000000046* (-1.9177)
CAR	-0.027760*** (-3.0542)
PCR	0.001591*** (13.0456)
ZCFZ	-0.030899**

Table 6. Robustness Test Results

Dep. Var.	ROA
LNASSET	(-2.2201) -0.003849*** (-11.8062)
C	0.080788*** (5.0031)
Observations: R-squared:	144 0.9210
F-statistic.	71.7360
Note: ***, **, * indicate that the coefficients are significant at the 1%, 5%, and 10% confidence levels, respectively.	

3. Conclusions and recommendations

3.1. Conclusion

(1) The paper selected the data of 16 domestic commercial banks in the past 10 years for empirical analysis, and the results show that there is a certain negative correlation between the return on assets of commercial banks and the balance of green credits, indicating that the current development of green credits will have a negative impact on

the profitability of commercial banks in the short term, which is in line with some scholars' research results.

(2) Although green finance business may have some negative impact on profitability in the short term, it is still significant from the perspective of social responsibility and long-term development. While fulfilling their social responsibility, commercial banks can also contribute to environmental protection and sustainable development. In the future, along with the introduction of relevant policies, the continuous improvement of laws and regulations, the major banks are paying more and more attention to the development of environmental protection, so the positive effect of green credit on the profitability of commercial banks will become more and more significant in the future.

3.2. Recommendations for Countermeasures

(1) Optimize green financial product design. When carrying out green financial business, commercial banks should optimize product design, reduce risk costs and improve profitability. Consideration can be given to formulating more flexible interest rates and repayment methods to attract more customers to participate.

(2) Strengthen risk management and internal control. In the face of the risks posed by green financial business, commercial banks need to strengthen risk management and internal control measures, improve their ability to review and assess green projects, reduce the rate of non-performing assets and safeguard asset quality.

(3) Enhance the information disclosure and transparency of green financial projects. Commercial banks can provide comprehensive and accurate information on green projects to consumers and investors, so that investors can have accurate data to refer to when making investment decisions, so that the flow and use of funds can be more adequate, and green projects can naturally develop rapidly, so that the profitability of banks in the field of green financial projects can be provided.

(4) Conform to the direction of government policies. Commercial banks should conform to government policies, make full use of government policy support and incentives, and utilize policy support and resource advantages to promote the development of green financial business.

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