

The Impact of Green Credit on Commercial Bank Performance

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Abstract: Under the background of China's "double carbon" goal, green credit has become the core tool for commercial banks to support green transformation. It is of great significance to study the impact of green credit on the performance of commercial banks. Based on the sample of 23 A-share listed commercial banks from 2012 to 2023, this paper empirically tests the impact of green credit on bank performance. The study found that green credit has a significant negative impact on the overall performance of commercial banks. Further heterogeneity analysis shows that large-scale banks can achieve performance improvement with the help of policy support and scale effect, while small and medium-sized banks have a negative effect. High-risk management banks have no significant negative impact, while low-risk management banks have a significant negative effect. This study provides reference and theoretical support for banks and related institutions to scientifically formulate and implement green credit policies.

Keywords: Green Credit; Business Performance; Fixed Effects Model; Heterogeneity Analysis.

1. Introduction

The international community is paying more and more attention to environmental protection. Countries have formulated relevant policies and objectives to achieve a balance between economic development and environmental protection. China actively responds to the call for global green development, and clearly puts forward the ambitious goal of "carbon peak, carbon neutrality" in 2020, which points out the direction for the green and low-carbon transformation of the economy and society. In order to achieve this goal, China has vigorously developed green finance and built a relatively complete green finance policy system. Green credit plays an important role in China's green financial system, and its scale has continued to grow in recent years.

As a major participant in the financial market, commercial banks play a vital role in the development of green credit. On the one hand, commercial banks help the development of environmentally friendly, low-carbon and recycling industries by providing financial support. On the other hand, with the continuous development of the green financial market, commercial banks are also facing many challenges. For example, how to accurately assess the risks and benefits of green projects, and how to achieve sustainable development while meeting regulatory requirements. Therefore, studying the impact of green credit on the operating performance of commercial banks is of great practical significance for commercial banks to better adapt to the requirements of green financial development and enhance their competitiveness. This paper not only reveals the positive role of green credit in improving the profitability of commercial banks, optimizing the credit structure and reducing environmental risks, but also provides a new perspective and empirical support for the development of green finance theory. This research is helpful to deepen the understanding of the relationship between green finance and the sustainable development of commercial banks. It has certain reference value for the academic research in the field of green finance, and also provides a new theoretical basis for

the improvement of the performance evaluation system of commercial banks.

2. Literature Review

As the core tool for commercial banks to practice the concept of sustainable development, the impact of green credit on the operational consequences of the banking industry has gone beyond a single performance dimension, showing a multi-dimensional and multi-path complex mechanism. The academic community has carried out extensive discussions on risk-taking, reputation effect, competitiveness and financial performance, which provides a rich perspective for understanding the comprehensive impact of green credit.

In terms of risk-taking, green credit has been proved to have the dual role of risk mitigation and structural optimization. Sun et al. (2017), utilizing quarterly data from China's five major state-owned banks from 2008 to 2016, found that the expansion of green credit significantly reduces non-performing loan ratios by curbing credit flows to heavy-polluting, high-energy-consuming, and overcapacity industries, thereby effectively controlling credit risk. Wang et al. (2022) further revealed that green credit lowers banks' risk-taking through a profitability channel that enhances net profit and non-interest income and a risk channel that strengthens risk identification capabilities, with the effect being more pronounced for large banks with higher capital adequacy ratios. Song et al. (2025) uncovered a nonlinear relationship, demonstrating that the risk-reducing benefit of green credit materializes only after its scale exceeds a critical threshold. Reputation effects constitute a crucial implicit channel through which green credit influences bank operations. Ding et al. (2020) argued that green credit policies generate a reputation insurance effect by improving banks' relationships with governments and the public, cushioning the impact of adverse events on brand value. Luo et al. (2021) similarly emphasized that banks adopting green credit standards such as the Equator Principles enhance their social

reputation, helping to attract long-term investors and premium clients and thus establishing differentiated competitive advantages. Al frijat et al. (2025) confirmed that green credit policies, when aligned with climate-conscious practices, strengthen organizational legitimacy and stakeholder relationships, highlighting the strategic mediating role of reputation. Regarding competitiveness, green credit reshapes banks' market positioning by spurring product innovation and strategic reorientation. Hoque and Le (2024) showed that banks with more diverse and independent boards are more inclined to leverage green credit to enhance their market influence.

Regarding financial performance, some literature believes that green credit has a positive impact by improving resource allocation and enhancing social reputation. Luo et al. (2021) found that green credit significantly improves commercial banks' operational performance by supporting green industry growth and boosting brand value. Hoque and Le (2024), in a study of Vietnamese listed banks, demonstrated that banks with higher government ownership are more likely to extend green loans, indirectly signalling a positive association between green credit and profitability. Lin et al. (2024) further observed that by channeling capital toward low-carbon and environmentally sound sectors, green credit not only creates new profit growth avenues but also strengthens long-term competitiveness via enhanced market recognition, thus positively influencing operational performance.

However, due to the short-term cost burden and risk premium, other studies have concluded that green credit has a negative or uncertain impact on financial performance. Using data from 16 Chinese listed banks, Zhang and Zhang (2019) found that in the early stage, green credit significantly reduced the rate of return on assets due to the increase in the cost of pre-loan evaluation and post-loan monitoring; although the mediating effect of green reputation can alleviate this negative impact in the long run, short-term financial pressure is still obvious. Hu and Zhang (2016) pointed out that the increase in operating and management costs caused by green credit will reduce unit operating profits. Ryati et al. (2025) provided evidence through cross-country research on traditional Indonesian banks that the presence of green loans has a negative impact on profitability measured by return on assets, return on equity, and net interest margin. Zhou et al. (2024) confirmed that the green loan balance significantly reduced the net profit of commercial banks. Based on these diversified research results, this paper further explores the impact of green credit on bank performance, which has both theoretical significance and practical implications.

3. Theoretical Analysis and Research Hypotheses

Based on the legitimacy theory, we regard the adoption of green credit by commercial banks as a strategic response to the pressure of institutional isomorphism, aiming to ensure the legitimacy of the organization by complying with regulatory requirements and meeting social environmental expectations (Suchman, 1995; Al-Shboul et al., 2023). However, in the short term, this pursuit of legitimacy will generate a large number of compliance costs, including environmental due diligence, human capital retraining, and the opportunity cost of redistributing credit from high-yield 'brown' industries to green projects, while green projects usually provide lower immediate returns (Luo et al., 2021). In

the initial stage of the implementation of green credit, the cost burden and income transfer effect jointly erode profitability, because the immediate cost shock often exceeds the reputational benefits that have not yet been fully realized. Therefore, green credit is expected to have a negative impact on the financial performance of banks. Cross-country empirical evidence confirms this expectation. Yin et al. (2021) Using the panel data of Chinese commercial banks, found that there is a significant negative correlation between green credit and bank performance, indicating that the cost effect overwhelms the income of the same period. Zhou et al. (2024) further confirmed that green loan balances will significantly reduce the net profit of commercial banks. Based on a sample of traditional Indonesian banks, Riyanti et al. (2025) also proved that green loans have a negative impact on return on assets (ROA), return on equity (ROE) and net interest margin. Accordingly, we propose the following hypothesis:

the hypothesis H1: green credit has a negative impact on the performance of commercial banks.

4. Empirical Research Design

4.1. Sample Selection and Data Sources

This study takes China's listed commercial banks as the research object. Considering the availability and integrity of data, the annual panel data of 23 commercial banks from 2012 to 2023 are selected, covering three types of institutions: large state-owned commercial banks, joint-stock commercial banks and city commercial banks. Select 2012 and later data, because the original CBRC issued the "green credit guidelines" in 2012 to promote the systematic disclosure of green credit information by commercial banks, there is a big lack of previous data. The final sample contains a total of 276 observations, including 72 of the six major state-owned banks, joint-stock banks and city commercial banks, such as Ping An Bank and other 204. For very few missing data, the linear interpolation method is used to supplement the data to maintain the continuity and availability of the data.

The research data are mainly derived from CSMAR database, RESSET financial research database, and some missing data are manually sorted out from the annual reports and social responsibility reports of banks.

4.2. Variables Definition

In the study of the impact of green credit on the performance of commercial banks, the reasonable selection and accurate measurement of variables is the key to ensure the accuracy and reliability of the research results. Based on the research purpose and referring to the research methods of the existing literature, the variables in this study are selected and set as follows.

For the main measure of operational performance, this study uses return on assets (ROA). ROA is calculated by dividing net profit by average total assets, providing a clear picture of how well a bank generates profits from its assets. A higher ROA indicates better profitability from asset use (Yin & Li, 2024). Additionally, return on equity (ROE) is included as an alternative measure to validate the findings (Li, Ma, & Cheng, 2025). Through these two indicators, the business performance of commercial banks is comprehensively evaluated from different perspectives, and the robustness of the research conclusions is enhanced.

For the explanatory variable, this study follows Hu and

Wang (2021) in using the green credit balance. The balance of green credit can directly reflect the scale of capital investment of commercial banks in green credit business, which is of great significance to study the relationship between green credit and the performance of commercial banks. Considering the large absolute value of the data, the natural logarithm of the green credit balance is taken.

The control variables are non-performing loan ratio (NPL), capital adequacy ratio (CAR), cost-to-income ratio (CIR), provision coverage ratio (PCR) and total bank assets (TA).

4.3. Model Building

In order to deeply explore the impact of green credit on the business performance of commercial banks, it is very important to construct an appropriate measurement model on the basis of fully considering the selection and measurement of variables. Referring to the modeling ideas of relevant research literature, combined with the actual situation of this study, the following model is established:

$$ROA_{it} = \beta_0 + \beta_1 \text{LnGCB}_{it} + \beta_2 \text{NPL}_{it} + \beta_3 \text{CAR}_{it} + \beta_4 \text{CIR}_{it} + \beta_5 \text{PCR}_{it} + \beta_6 \text{LnTA}_{it} + \varepsilon_{it} \quad (1)$$

Benchmark regression model : In order to test the impact of green credit on the operating performance of commercial banks, the return on total assets (ROA) is used as the explained variable, the green credit balance (LnGCB) is the core explanatory variable, and the non-performing loan ratio (NPL), capital adequacy ratio (CAR), cost-to-income ratio (CIR), provision coverage ratio (PCR) and total bank assets (LnTA) are included.

In the model specified above, *i* denotes individual commercial banks and *t* denotes different years; β_0 is the constant term, while β_1 - β_6 represent the coefficients on the explanatory and control variables, respectively; ε_{it} is the random disturbance term. The model aims to examine the direct impact of green credit balance on the return on total assets of commercial banks and control the interference of other factors, so as to accurately evaluate the role of green credit in improving the operating performance of commercial banks.

5. Empirical Analysis

5.1. Descriptive Statistical Analysis

The descriptive statistical results of this study are shown in

Table 1, based on 276 observations of 23 commercial banks from 2012 to 2023. The core variables include the explained variable return on total assets (ROA), the explanatory variable green credit balance logarithm (LnGCB) and the control variables (non-performing loan ratio, capital adequacy ratio, provision coverage ratio, cost-income ratio, etc.). The specific analysis is as follows. In terms of operating performance, the average return on total assets (ROA) is 0.953 %, and the standard deviation is 0.237 %, indicating that the overall profitability of the sample banks is relatively stable, but there are still significant individual differences between different banks. In terms of green credit scale, the average logarithm of green credit balance is 6.53, the standard deviation is 2.044, and the range is 10.723 (corresponding to the original value from about 119 million yuan to 5.4 trillion yuan), which significantly reveals the heterogeneity of green credit business among different banks. In terms of risk indicators, the average non-performing loan ratio (NPL) is 1.251 %. Although it is lower than the industry warning line of 2 %, the maximum value reaches 2.39 %, indicating that the potential credit risk cannot be ignored. The average capital adequacy ratio (CAR) is as high as 13.466 %, far exceeding the regulatory requirements of 8 %, reflecting that the sample banks have sufficient capital buffers and strong ability to resist risks. The mean value of provision coverage (PCR) is 263.202 %, and the maximum value is 615.93 %, which further indicates that banks generally adopt prudent risk management strategies. In terms of cost and efficiency, the average cost-to-income ratio (CIR) is 30.75 %, the standard deviation is 7.303 %, and some banks are even as high as 66.47 %, which reflects the significant differences in operational efficiency among different banks. The mean value of the logarithm of total assets (LnTA) of banks is 10.461, the standard deviation is 1.341, and the difference between the minimum value and the maximum value is nearly 44 times, which highlights the scale differentiation between banks.

In summary, the descriptive statistical results not only show the basic situation of the sample banks in terms of business performance, green credit scale, risk indicators, cost and efficiency, but also provide important data support for the subsequent in-depth analysis of the impact mechanism and heterogeneity effect of green credit on the business performance of commercial banks.

Table 1. Descriptive statistics results of the main variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	276	0.953	0.237	0.42	1.757
LnGCB	276	6.53	2.044	0.174	10.897
NPL	276	1.251	0.354	0.36	2.39
CAR	276	13.466	1.834	8.84	19.26
CIR	276	30.75	7.303	18.93	66.47
PCR	276	263.202	104.891	132.44	615.93
LnTA	276	10.461	1.341	6.924	13.01
ROE	276	14.023	4.503	0.65	27.795

5.2. Base Regression Analysis

This study uses a fixed-effect model to conduct a regression

analysis of the relationship between green credit and the performance of commercial banks. The results are as follows: Table 2

In the model (1), the control variables are not added, and only the core explanatory variable green credit balance (LnGCB) is regressed to focus on the direct relationship between green credit and business performance. The results show that the green credit balance (LnGCB) is significantly negatively correlated with the return on total assets (ROA), that is, for every 1 % increase in the scale of green credit, ROA will decrease by 0.122 %. This result directly supports the hypothesis H1, indicating that green credit business will have a significant inhibitory effect on the profitability of banks in the short term due to its large initial investment and long return cycle. In model (2), control variables including non-performing loan ratio (NPL), capital adequacy ratio (CAR), cost-to-income ratio (CIR), etc. are included to more fully reveal the impact of green credit on ROA. The results show that even if these control variables are added, the negative impact of green credit on ROA is still significant, but the absolute value of the coefficient is reduced. This shows that factors such as risk, cost, and scale mediate the relationship between green credit and performance to a certain extent. The R² of the model increased from 0.52 to 0.70, and the explanatory power was significantly enhanced, indicating that multi-dimensional factors work together on the impact of green credit on bank performance.

Among the control variables, the non-performing loan ratio (NPL) is significantly negatively correlated with ROA, reflecting the negative impact of credit risk on business performance-low risk management capabilities may lead to an increase in the non-performing loan ratio of green credit projects, directly eroding bank profits. The provision coverage (PCR) is significantly positively correlated with ROA, reflecting that banks build a risk buffer mechanism by providing sufficient provisions, which means that banks with high risk management capabilities tend to have higher provision coverage and can more effectively resist.

Table 2. Base regression results.

	(1) ROA	(2) ROA
LnGCB	-0.122*** (-16.530)	-0.051*** (-3.021)
NPL	—	-0.097** (-2.332)
CAR	—	-0.010* (-1.746)
CIR	—	0.002 (1.302)
PCR	—	0.001*** (3.778)
LnTA	—	-0.147*** (-3.238)
_cons	1.751*** (35.831)	2.851*** (8.140)
N	276	276
R ²	0.52	0.70
Adj.R ²	0.48	0.67

5.3. Robustness Tests

In the part of robustness test, in order to verify the reliability and universality of the benchmark regression conclusion, this study adopts two methods to test the robustness of the model : the first method is to replace the explained variable by the return on total assets (ROA) with the return on net assets (ROE), and the second method is to lag the explanatory variable green credit balance (LnGCB) by one period for regression. The results are shown in Table 3.

In the first method, ROE is selected as an alternative indicator. Although ROA and ROE have different emphases, that is, the former measures the efficiency of asset operation and the latter reflects the return ability of shareholders, they are both core performance indicators and have internal consistency. Secondly, through cross-validation of different indicators, the conclusion deviation caused by single indicator selection can be avoided. The empirical results show that the coefficient of green credit balance (LnGCB) to ROE is -0.717, which is significantly negative. This result is consistent with the negative impact of ROA in the benchmark regression, that is, green credit has a significant negative impact on the performance of commercial banks.

In the second method, the robustness test of the explanatory variable lagging one period is based on the characteristics of the long return period of green credit projects and the consideration of endogenous problems. Green credit is usually invested in environmental protection, new energy and other fields. The benefits of these projects often take a long time to show, so the impact of green credit on business performance may have a lag effect. The empirical results show that the lagging green credit balance is still significantly negative. This result verifies the sustainability of the negative impact of green credit on business performance. This conclusion further supports the core view of hypothesis H1.

In summary, by replacing the two robustness test methods of the explained variable and the explanatory variable lagging one period, we verify that the conclusion that green credit has a significant negative impact on the operating performance of commercial banks is robust.

Table 3. Robustness tests.

	Replacement of the dependent variable:ROE	One-period lag of the explanatory variable:ROA
LnGCB	-0.717*** (-2.645)	-0.027* (-1.660)
NPL	-3.078*** (-4.551)	-0.054 (-1.310)
CAR	-0.906*** (-10.125)	-0.009 (-1.433)
CIR	-0.118*** (-3.812)	0.002 (1.270)
PCR	0.009*** (3.858)	0.001*** (5.490)
LnTA	-4.207*** (-5.710)	-0.228*** (-4.834)
_cons	79.988*** (14.077)	3.403*** (9.201)
N	276	253
R ²	0.86	0.67
Adj.R ²	0.84	0.62

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

6. Heterogeneity Analysis

6.1. Heterogeneity Analysis based on Bank Size

The purpose of this study is to explore whether the impact of green credit on the performance of commercial banks varies with the size of banks. To this end, the samples are divided into large-scale banks and small and medium-sized banks, among which small and medium-sized banks include joint-stock commercial banks and city commercial banks.

The empirical results show that green credit has a significantly different impact on the operating performance of the two types of banks, and is highly consistent with the theoretical expectations. The results are shown in table 4. The impact of bank size on green credit performance is different. That is, the impact of green credit on the performance of commercial banks has bank type heterogeneity. The green credit coefficient of small and medium-sized banks is significantly negative, and the coefficient of large-scale banks is not significant. It may be because large-scale banks reduce the cost of project screening through special approval channels (such as ICBC 's green credit rapid approval) and government cooperation. However, small and medium-sized banks are difficult to bear high-cost environmental risk assessment due to scale constraints, resulting in negative green credit to business performance.

Table 4. Heterogeneity analysis I: By Bank Size

	Large Banks ROA	Small Banks ROA
NPL	0.012 (0.199)	-0.190*** (-3.789)
CAR	-0.004 (-0.314)	-0.005 (-0.769)
CIR	0.015*** (6.629)	-0.003 (-1.276)
PCR	0.000 (1.006)	0.000** (2.144)
LnTA	-0.663*** (-6.020)	-0.104** (-2.109)
LnGCB	0.110** (2.590)	-0.063*** (-3.499)
_cons	7.439*** (7.474)	2.641*** (7.226)
N	72	204
R ²	0.84	0.71
Adj.R ²	0.81	0.68

6.2. Heterogeneity Analysis based on Risk Management Capability

In order to further study whether the impact of green credit on the performance of commercial banks is different due to the differences in risk management capabilities, the study takes the average provision coverage (PCR) in 2023 as the threshold, and defines the high-risk management ability group above the threshold, otherwise, the low-risk management ability group.

The empirical results show that the level of risk management ability does significantly affect the effect of

green credit on the performance of commercial banks. The empirical results are shown in table 5 below. The results show that the green credit coefficient of the low risk management ability group is significantly negative, while the coefficient of the high risk management ability group is not significant. It may be because banks with low risk management capabilities are difficult to undertake high-cost environmental risk assessment and risk control system construction due to small capital scale and lagging technology investment, so green credit is negative for business performance. High-risk management ability banks can spread risk through diversified financial products (such as green bond underwriting), and restrain the negative impact of green credit on business performance.

Table 5. Heterogeneity analysisII: by Risk Management Capacity

	High Risk Management Capacity Banks ROA	Low Risk Management Capacity Banks ROA
NPL	-0.076 (-1.323)	-0.220*** (-4.198)
CAR	0.007 (0.900)	-0.023*** (-3.472)
CIR	0.014*** (5.328)	-0.008*** (-3.486)
PCR	0.001*** (3.536)	-0.000 (-0.871)
LnTA	-0.295*** (-4.037)	-0.160*** (-3.192)
LnGCB	0.020 (0.670)	-0.063*** (-3.639)
_cons	3.122*** (5.859)	3.967*** (9.313)
N	96	180
R ²	0.68	0.80
Adj.R ²	0.63	0.78

7. Conclusion

Based on the panel data of 23 listed commercial banks from 2012 to 2023, this study systematically examines the impact of green credit on business performance and its heterogeneity mechanism. The empirical results show that green credit has a significant negative impact on the overall performance of commercial banks, that is, green credit has limited short-term profitability due to high cost, long cycle and information asymmetry. The robustness test further supports this conclusion by replacing business performance indicators and lagging variable methods. In further heterogeneity analysis, it is found that the impact of green credit on business performance of large-scale banks is not significant due to policy support, financial strength and scale effect. However, due to resource constraints and risk control shortcomings of small and medium-sized banks, the negative impact of green credit on business performance is more significant. This conclusion shows that the difference in business scale makes the impact of green credit on the economic performance of commercial banks different. From the heterogeneity analysis of the bank 's risk management ability, it is concluded that the negative impact of green credit on business performance in the high-risk management group is not significant, because the high-risk management bank alleviates the negative impact through adequate provision and dynamic monitoring ; the green credit of low-risk management banks has a significantly

negative impact on business performance. Because low-risk management banks have small capital scale and lagging technology investment, it is difficult to bear high-cost environmental risk assessment, resulting in significantly negative business performance.

This research conclusion has clear policy and practical significance. At the regulatory level, we should pay attention to the asymmetric impact of green credit on different types of banks, avoid "one-size-fits-all" assessment, and give differentiated transition arrangements and technical incentives to small and medium-sized banks to reduce their compliance costs. For commercial banks, especially small and medium-sized banks, it is necessary to improve environmental risk management capabilities, improve provisioning mechanisms and digital risk control as preconditions for promoting green credit, so as to alleviate short-term profit pressure and achieve a balance between environmental responsibility and financial sustainability.

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