# An Empirical Study on the Impact of Green Credit on the Profitability of Commercial Banks

**Suyue Chen, Zhongming Ding**
**Anhui University of Finance and Economics, Bengbu 233000, China**.

***Abstract*:** By studying the impact of green credit issuance on the profitability of commercial banks, this paper uses the panel data of five domestic listed commercial banks from 2010 to 2020, and based on a fixed-effect model through empirical analysis, it is concluded that the implementation of green credit business will help improve the profitability of commercial banks. 1. Improve the incentive and guidance system for green credit; 2. Create an external environment conducive to the development of green credit by commercial banks; 3. Improve the internal mechanism for commercial banks to develop green credit; 4. Cultivate Professional green credit talents.

***Keywords*:** Green Credit; Commercial Bank; Profitability

## 1. Introduction

At the same time as China's rapid economic development, a series of climate change and resource shortage problems also arise. The report of the 19th National Congress of the Communist Party of China clearly stated that the economic development strategy in the new era is to shift from high-speed economic development to high-quality development, and environmental governance issues have been put on the agenda. my country pays more attention to energy conservation and emission reduction, and focuses on green environmental protection. With the hot discussion of "carbon neutrality" and "carbon peaking", the issue of carbon emissions has also become the focus of attention. In order to steadily promote "carbon peaking" and "carbon neutrality", financial regulators and financial institutions have successively launched a series of financial policies and financial tools: the People's Bank of China and the China Banking and Insurance Regulatory Commission encourage the steady optimization of the financial structure, implement prudential policies, and highlight green development; As the most important financial institutions, commercial banks have actively responded to the call of tasks and successively launched a variety of green financial tools, gradually reducing the flow of funds to high-polluting industries, and instead supporting environment-friendly enterprises to promote the development of green finance.

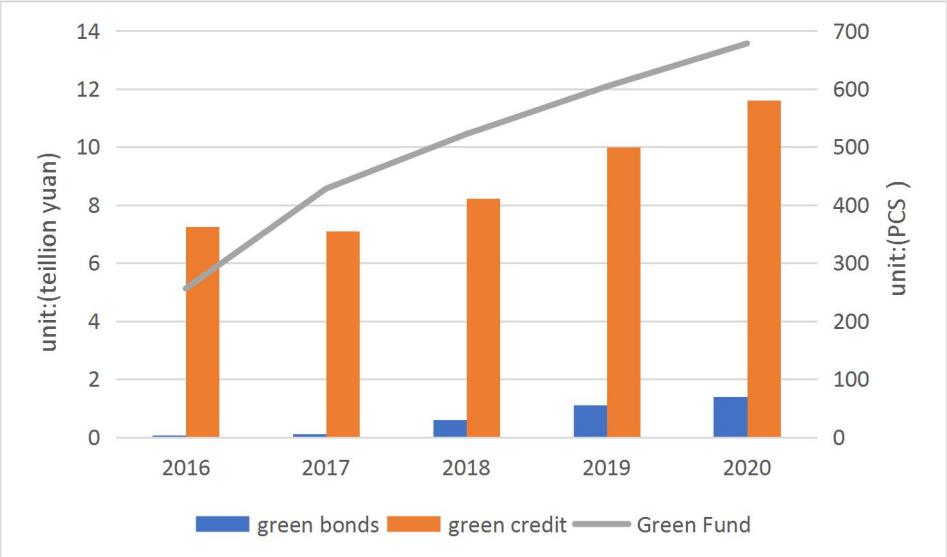

Figure 1 Development status of three main green financial instruments

Data source: Guoyan Network (www.drcnet.com.cn)

As shown in Figure 1, common green financial instruments include green bonds, green credit, green funds, etc., and green credit has become an important part of green finance because of its long issuance time and large amount. With the emergence of the "dual carbon" goal, commercial banks clearly recognize that only green development can usher in opportunities. In order to achieve the goal of sustainable development, promote the high-quality development of business structure, and better participate in industry competition, commercial banks vigorously promote Green credit business, the balance of green credit has increased from 7.26 trillion yuan in 2016 to 11.6 trillion yuan in 2020, which can support the saving of more than 320 million tons of standard coal and 730 million tons of carbon dioxide equivalent each year. Commercial banks vigorously promote green credit, so that funds flow to environmental protection enterprises, so as to avoid pollution after the fact. The development of green economy is the general trend. However, although commercial banks actively respond to green credit policies and innovative measures emerge one after another, it is undeniable that the development of green credit will also bring some problems to commercial banks[i]. Commercial banks are for-profit financial institutions, andChina's green credit is still in the initial stage of development. How will it affect the profitability of commercial banks? How to reasonably carry out green credit business will be beneficial to the development of oneself and the country and it is worth studying.

# 2. Literature review

## 2.1 The meaning and research status of green credit

The concept of green credit was put forward in my country in 2007, and it is also called sustainable financing abroad. The purpose is to correctly handle the relationship between the financial industry and sustainable development, cut off the disorderly development and blind expansion of polluting industries from the source, and protect the ecology. , ecological construction and green industry financing to build a new system. Marco Migliorelli (2021), based on observations of the current industry and policy context, argues that sustainable finance should be seen today as an independent factor in efforts to achieve a sustainable society, starting with the identification of possible sustainability dimensions, which include but are not limited to Protect the environment and ecosystems, protect biodiversity, combat climate change, eradicate poverty and hunger. The second is to assess the contribution of each economic sector or activity to achieving or improving at least one relevant sustainability dimension. This must be done to identify areas worthy of "sustainable" financing. Taking these two elements into consideration is sufficient to construct a workable definition of sustainable finance that fits the actual industry and policy context. In this regard, sustainable finance can be defined as "finance that supports sectors or activities that contribute to the achievement or improvement of at least one relevant dimension of sustainability"[ii]. Paul Thompson, Christopher et al. (2004) defined green credit as a loan behavior in which banks incorporate environmental factors into the scope of inspection to judge whether the project and company meet the inspection mechanism. The proposal of "green credit" has raised the loan threshold for enterprises, achieved prior treatment, rectified the previous consistent style of "pollution first, treatment later", and used economic leverage to guide environmental protection.

## 2.2 The impact of green credit on the profitability of commercial banks

The academic community has not reached the same conclusion on the impact of green credit on the profitability of commercial banks. Some studies believe that the implementation of green credit will lead to an increase in profits. Zhang Yanjiao (2008) believes that China's economic development has not paid enough attention to environmental resource issues, and now the development of green credit is not only a responsibility, but also brings multiple benefits to banks[iii]. Zhang Lin, Lian Yonghui et al. (2019) found that the development of green credit can help improve the future financial performance of commercial banks by studying the lagging effect of green credit, and the positive effect will become stronger as time goes on[iv]. Sun Hongmei et al. (2021) found through the DID model that the development of green business can help to obtain

long-term performance[v]. Scholtens and Dam (2007) found that the social responsibility evaluation of commercial banks that implemented green credit policies was significantly better than that of banks that did not implement green credit policies and had a positive impact on their operating conditions. Magdalena ZIOLO, Iwona BAK, etc. (2021) believe that adhering to the sustainable development model is helpful to achieve sustainable development goals[vi]. Irena Pyka, Aleksandra Nocon (2021) found that issuing green credits subject credit institutions to strict supervision, leading to an increase in the level and quality of bank capital[vii].

Some literatures argue that green credit policies will reduce the profitability of commercial banks. Marcel Jeucken ( 2001 ) pointed out that the sustainable development of banks is to resist first, then avoid and then become active and finally achieve sustainable development, while most of the banks are in the first two stages, when the income decreases. Ding Ning et al. (2020) concluded that the cost of implementing green credit in the short term is greater than the benefit it brings through the double difference method, which has a negative impact on the short-term profitability of commercial banks. Zhang Wenzhong and Dou Rui (2020) believe that green credit requires a long period to see results, while bank performance is staged, so in a short period of time, green credit will reduce bank efficiency[viii]. There are also articles that under the conditions of diverse financial products and investment needs, social responsibility will not have a significant impact on the risk and return of commercial banks (Galema, 2008).

## 2.3 Literature summary

Based on the above viewpoints, there is no unified view on the impact of green credit on the profitability of commercial banks. In addition to different research methods, different research objects are also an important reason. [ix]This paper will use the two indicators of "total profit" and "earnings per share" to comprehensively analyze the impact of green credit on the profitability of commercial banks. Combined with the relevant data of Industrial Bank, China Merchants Bank, Bank of Communications, China Construction Bank, and China CITIC Bank from 2010 to 2020, a panel model was constructed, and the impact of green credit on the profitability of commercial banks was clarified based on the fixed effect model, so as to vigorously developChina’s Green credit provides empirical evidence for the realization of high-quality development of banks while promoting high-quality economic development.

# 3. Research Design

## 3.1 Theoretical assumptions

In the long run, first of all, the issuance of green credit will bring about a reputational intermediary effect, which will help improve the bank's reputation, reflect the bank's social responsibility, maintain the bank's external image, and bring a source of profit to the bank. Second, the effect of structural transformation. Green credit promotes the development of environmental protection enterprises and optimizes the social industrial structure. On the one hand, banks can obtain customers from low-carbon industries, and on the other hand, a good industrial structure helps banks create a better development environment. Based on the above analysis, this paper puts forward the hypothesis that the implementation of green credit has a positive effect on the profitability of commercial banks.

## 3.2 Data sources and variable selection

### 3.2.1 Data sources

Considering the time issue of green credit development by commercial banks and the availability and accuracy of data, this paper studies the profitability of commercial banks through the relevant data of Industrial Bank, China Merchants Bank, Bank of Communications, China Construction Bank, and China CITIC Bank. Impact. The data comes from the 2010-2020

annual reports, social responsibility reports and sustainable development reports of the five major banks mentioned above, with a total of 55 sample data, and stata15 is used to analyze the collected sample data.

## 3.2.2 Variable selection

(1) Explained variable

Select the natural logarithm of total profit and EPS as explained variables. Total profit is the final financial result achieved by an enterprise through production and operation activities within a certain period of time, and it is the main indicator to measure the operating efficiency of an enterprise. Logarithmizing it reduces the effect of heteroscedasticity. Earnings per share EPS reflects the operating results of a company.

(2) Explanatory variables

At present, most commercial banks use the green credit balance to evaluate the green degree of bank credit, so the green credit balance is used as an explanatory variable and logarithmic processing is performed.

(3) Control variables

The profitability of commercial banks is also related to the macro environment, capital structure, and bank scale. Taking into account changes in the external environment, the consumer price index and broad money supply are selected as control variables. The consumer price index measures the level of inflation, and the money supply reflects changes in social aggregate demand and future inflationary pressures, taking the natural logarithm to reduce the impact of heteroscedasticity. The capital structure of a bank is also related to its profitability, and the cost-to-income ratio and the provision coverage ratio are selected as control variables. The cost-to-income ratio reflects the cost of the bank's expenditure per unit of income, which directly reflects the bank's operating efficiency, while the provision coverage ratio reflects the bank's loan difficulty and is an important indicator of the bank. Taking into account the previous articles, the bank size affects the profitability of commercial banks to a certain extent, and the natural logarithm of the total assets of commercial banks is taken as a control variable to measure the bank size.

Table 1 Variable names and definitions

| variable name | variable symbol | Variable definitions |
|---|---|---|
| Total profit | LNI | Natural logarithm of total profit |
| EPS | EPS | Ratio of after-tax profit to total share capital |
| green credit balance | LnGR | Natural logarithm of green credit balances |
| Provision coverage | PC | Ratio of actual provision for loan loss to non-performing loans |
| Cost to income ratio | CIR | Operating Expenses / Operating Income |
| Bank size | SIZE | Natural logarithm of total assets |
| inflation level | CPI | Consumer Price Index |
| currency supply | LNY | The natural logarithm of the money supply (unit: trillion yuan) |

## 3.3 Model Construction

Taking the natural logarithm LNI and EPS of the total profit as the explained variables, the natural logarithm LnGR of the green credit balance as the explanatory variable, and the remaining variables as the control variables, the regression analysis is carried out to construct a model:

$$LNI_{it}=a_0 + a_1 LnGR_{it} + a_2 CIR_{it} + a_3 PC_{it} + a_4 SIZE_{it} + a_5 CPI_{it} + a_6 LNY_{it} + \varepsilon_{it}$$

$$EPS_{it}=\beta_0 + \beta_1 LnGR_{it} + \beta_2 CIR_{it} + \beta_3 PC_{it} + \beta_4 SIZE_{it} + \beta_5 CPI_{it} + \beta_6 LNY_{it} + \varepsilon_{it}$$

where a_0 and β_0 are constant terms, and ε_it is a random disturbance term

## 3.4 Descriptive Statistics

The variable descriptive statistics are shown in Table 2. The article selects the relevant data of 5 commercial banks from 2010 to 2020, a total of 55 observations. From the overall situation of the data, the total profits and earnings per share of the five banks showed an overall upward trend from 2010 to 2020; the overall green credit balance also showed an upward trend year by year, showing that commercial banks have invested more in green credit in recent years. Large, green business development is on the rise. Among the control variables, the bank size and provision coverage ratio are quite different, and the remaining control variables are not significantly different.

Table 2 Descriptive statistics of variables

| | **EXPLAINED VARIABLE** | | **EXPLANATORY VARIABLE** | **CONTROL VARIABLE** | | | | |
|---|---|---|---|---|---|---|---|---|
| | LNI | EPS | LnGR | CIR | PC | SIZE | CPI | LNY |
| **N** | 55.00 | 55.00 | 55.00 | 55.00 | 55.00 | 55.00 | 55.00 | 55.00 |
| **MEAN** | 6.74 | 1.53 | 6.97 | 29.48 | 235.88 | 8.29 | 2.58 | 4.89 |
| **SD** | 0.68 | 0.91 | 7.78 | 3.32 | 80.60 | 3.71 | 1.05 | 0.35 |
| **MIN** | 5.48 | 0.53 | 0.89 | 21.59 | 143.87 | 2.92 | 1.40 | 4.28 |
| **P50** | 6.61 | 0.96 | 4.58 | 29.86 | 213.51 | 10.58 | 2.50 | 4.94 |
| **MAX** | 8.12 | 3.79 | 29.37 | 39.90 | 465.82 | 12.55 | 5.40 | 5.39 |

# 4. Empirical Results and Analysis

## 4.1 Correlation analysis

The test results of the coefficients of each variable are shown in Table 3. Although the level of green credit and total profits are not significant, they are positively correlated, and are positively correlated with earnings per share at a significant level of 1%. The hypothesis has been preliminarily verified.

*Table 3 Correlation coefficients of main variables*

| | **EPS** | **LNI** | **LNGR** | **CIR** | **PC** | **SIZE** | **CPI** | **LNY** |
|---|---|---|---|---|---|---|---|---|
| **EPS** | 1 | | | | | | | |
| **LNI** | -0.151 | 1 | | | | | | |
| **LNGR** | 0.505*** | 0.0210 | 1 | | | | | |
| **CIR** | -0.153 | -0.308** | -0.599*** | 1 | | | | |
| **PC** | 0.504*** | -0.191 | -0.0880 | 0.359*** | 1 | | | |
| **SIZE** | -0.859*** | 0.460*** | -0.368*** | -0.0880 | -0.598*** | | | |
| **CPI** | -0.128 | -0.214 | -0.181 | 0.376*** | 0.440*** | -0.0520 | 1 | |
| **LNY** | 0.311** | 0.342** | 0.302** | -0.491*** | -0.326** | 0.0900 | -0.535*** | 1 |

*Note： *** p<0.01, ** p<0.05, * p<0.1*

## 4.2 Regression Analysis

Before the regression, firstly, according to the unit root test, it is judged whether the panel data is a stationary series to avoid the appearance of false regression, and the results show that they all pass the unit root test. The Hausman test is used to judge whether the fixed-effect model or the random-effect model should be selected for regression analysis. The P value of the test result is 0, and the null hypothesis is rejected, and the fixed-effect model should be selected for regression analysis.

## 4.2.1 Regression results

The results of regression estimation using fixed effects are shown in Table 4.

*Table 4 fixed effects regression*

| | (1) | (2) |
|---|---|---|
| VARIABLES | EPS | LNI |
| LnGR | 0.0274** | 0.0185*** |
| | (0.0110) | (0.00445) |
| CIR | -0.0260 | -0.0361*** |
| | (0.0176) | (0.00708) |
| PC | 0.00301*** | 0.00167*** |
| | (0.000732) | (0.000295) |
| SIZE | 0.119 | 0.0803* |
| | (0.105) | (0.0425) |
| CPI | -0.0184 | -0.0519*** |
| | (0.0423) | (0.0170) |
| LNY | 0.599*** | 0.343*** |
| | (0.168) | (0.0677) |
| Constant | -2.469** | 5.070*** |
| | (1.137) | (0.458) |
| Observations | 55 | 55 |
| Number of BANK | 5 | 5 |
| R-squared | 0.683 | 0.893 |

Note： *** p<0.01, ** p<0.05, * p<0.1

## 4.2.2 Analysis of regression results

According to Table 4, from the regression results of the EPS model, the explained variable is the natural logarithm of the total profit (LNI), and the explanatory variable is the natural logarithm of the green credit balance (LnGR). It can be seen that green credit has a positive correlation with the total profit at a significant level of 1%, indicating that the development of green credit business by commercial banks will increase their total profit. Among the control variables, the cost-income ratio and the consumer price index are inversely proportional to the total profit at the 1% significant level, the provision coverage ratio and the broad money supply are positively proportional at the 1% significant level, and the bank scale is at the 10% level. Positive impact on total profit.

From the regression results of the LNI model, the explanatory variable is earnings per share (EPS), and the explanatory variable is the natural logarithm of green credit balance (LnGR). It can be seen that green credit has a positive correlation with earnings per share at a significant level of 5%, indicating that the development of green credit business by commercial banks will increase earnings per share of common shares. Among the control variables, provision coverage ratio and broad money supply are proportional to it at a significant level of 1%. Cost-to-income ratio, bank size and consumer price index have no significant impact on earnings per share.

According to the above analysis, it is concluded that the implementation of green credit policy by commercial banks will enhance their profitability.

# 5. Conclusion

## 5.1 Summary

This paper takes 5 commercial banks as research objects, and collects and analyzes data from 2010 to 2020 through their annual public reports and social responsibility reports. In this paper, the natural logarithm of the green credit balance of commercial banks is used as an indicator to measure the green loan degree of commercial banks, and the total bank profits and earnings per share are used to measure commercial banks' profitability. The following conclusions are drawn: From the empirical results, the impact of green credit is significantly positive, indicating that the development of green credit has a positive effect on the profitability of banks. This shows that commercial banks actively carry out green credit business, undertake social responsibilities, convey a positive social image to the market, generate a good reputation, and help improve profitability. On the one hand, commercial banks have deepened social public trust and improved commercial banks competitive advantage and differentiated value, enabling it to obtain higher profits. On the other hand, encourage commercial banks to optimize the green credit mechanism, urge them to regulate the development of green credit, and promote its sustainable development. These positive effects are enough to offset the cost effect of green credit and improve the profitability of commercial banks.

## 5.2 Questions and suggestions

The traditional extensive economic growth model and the highly polluting industrial structure are the key to the problems of environmental pollution and resource shortage in my country. With the increasing attention of the society to environmental and climate issues, green finance has also ushered in a new wave of development.[x] In 2007,China’s green credit system was formally established, which helps guide the flow of funds to green enterprises. On the one hand, it can reduce the financing cost of green enterprises and support their growth, and on the other hand, restrict the flow of funds to high-polluting enterprises, thereby advocating energy conservation and emission reduction for enterprises. To achieve green development[xi]. However, there are still deficiencies in the implementation of green credit: First, the relevant legal system is not perfect and social supervision is limited. At present, most of China’s commercial banks voluntarily abide by the Equator Principles, and the actual implementation of policies and measures varies. In addition, the public and regulatory authorities lack strong supervision or even special channels for the development of green credit in commercial banks. Second, commercial banks are the recipients of news in the chain of discovering, supervising, and managing environmental protection enterprises, and cannot get news in a timely manner. When an enterprise violates laws and regulations such as environmental protection and safety production, due to information asymmetry, the bank has less information on the enterprise and cannot respond effectively in a timely manner, which makes it difficult for the bank to meet the requirements of the customer's environmental and social risk information. Third, there are currently many green and low-carbon industries with large differences, while commercial banks are relatively unfamiliar with the technological paths of some emerging green industries such as hydrogen energy and wind power, and cannot make timely judgments about their industrial markets and technological changes. The tools used to quantify the project are also difficult to estimate its risks. The following suggestions are made to

address the above issues:

First of all, it is necessary to improve the incentive and guidance system for green credit, encourage financial enterprises to participate in green financial activities, and regulate industry behavior. The government should provide financial support and improve the financial support system. The second is to create an external environment conducive to the development of green credit by commercial banks, improve specific laws and regulations[xii], and strengthen the identification, monitoring, management and severe punishment of polluting enterprises. Secondly, improve the internal mechanism of commercial banks to develop green credit, actively develop green financial products, improve the financial efficiency of enterprises, formulate long-term development strategies, and improve the loan and credit process. Give full play to the role of relevant regulatory authorities. Urge commercial banks to actively respond to the requirements of national environmental protection policies. Finally, cultivate professional green credit talents and establish a talent pool.

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# References

[1] Yu, B., Chen, H., Zhou, N., Green Credit, Fintech and Profitability of Commercial Banks[J]. Statistics and Decision-Making,2021,37(14):161-164.DOI:10.13546/ j.cnki.tjyjc. 2021.14.038.

[2] Migliorelli M., What Do We Mean by Sustainable Finance? Assessing Existing Frameworks and Policy Risks[J]. Post-Print, 2021.

[3] Zhang, YJ., Green Credit: Strategic Choice of Commercial Banks[J]. China Finance, 2008(10): 71-72.

[4] Zhang, L., Lian, YH., Cao, H., How Green Credit Affects Bank Profitability——Based on the Perspective of Regional Green Development Heterogeneity[J]. Journal of Guizhou University of Finance and Economics,2020 (03): 22-32.

[5] Sun, HM., Yao, SQ., Operational Risk and Profitability of Commercial Banks——Based on the Perspective of Green Business Impact [J]. Financial Forum,2021, 26(02): 37-46.

[6] Ziolo M, Bak I, Cheba K. THE ROLE OF SUSTAINABLE FINANCE IN ACHIEVING SUSTAINABLE DEVELOPMENT GOALS: DOES IT WORK? [J]. Technological and Economic Development of Economy, 2020, 27(1):1-26.

[7] Pyka I., Banks' Capital Requirements in Terms of Implementation of the Concept of Sustainable Finance[J]. Sustainability, 2021, 13(6): 3499.

[8] Zhang, WZ., Dou, R., Research on the impact of green credit on the efficiency of Chinese commercial banks——Based on the SBM-GMM model [J]. Investment Research, 2020, 39(11):17-28.

[9] Hu, RC., Zhang, WQ., Will the development of green credit affect the profitability of commercial banks? [J] Financial Supervision Research, 2016(07): 92-110.

[10] Zhang, H., Zhu, WW., Xu, YY., Yu, Y., Does green credit really reduce the performance of commercial banks? [J]. Research in Financial Economics,2021,36(01):94-107.

[11] He, LY., Wu, C., Zhong, ZQ., Zhu, JR., Green Credit, Internal and External Policies and Competitiveness of Commercial Banks: An Empirical Study Based on Nine Listed Commercial Banks [J]. Research in Financial Economics,2018,33(01):91-103.

[12] Song, YW., Analysis of the impact mechanism of green credit on the profitability of commercial banks [J]. New Finance, 2019(09): 42-47.