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Research on the Mechanism of Fintech on Green Credit

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Abstract

China's green credit has gone through three stages of enlightenment, rapid development and standardized development, and by the end of 2023, the balance of green loans had reached RMB 30.08 trillion, showing strong growth momentum. However, the development of green credit still faces challenges such as structural imbalance, inaccurate measurement of environmental benefits, difficulty in adapting traditional credit-granting models to emerging areas and uneven development among banks. This paper focuses on how FinTech empowers green credit, pointing out that FinTech can optimize the pre-lending review process of green credit, improve the efficiency of approval, and comprehensively identify enterprises with green innovation potential; at the same time, FinTech can also strengthen post-credit supervision, achieve the dynamic tracking of the whole life cycle of green funds, and prevent the misuse of funds. Therefore, FinTech has become a key tool to alleviate the information asymmetry between green credit investment and financing parties and improve financing efficiency. This study not only enriches the theoretical system of the integration and development of fintech and green credit, but also provides practical guidance for government departments and commercial banks.

Keywords: Fintech, green credit

1. Introduction

On 22 September 2020, General Secretary Xi Jinping, on behalf of the Chinese Government, clearly stated in the General Debate of the 75th session of the United Nations General Assembly the goal of 'striving to peak carbon dioxide emissions by 2030 and striving to achieve carbon neutrality by 2060'. The 'dual-carbon' goal epitomizes the Chinese government's determination to promote green development. Since the 18th CPC National Congress, the Chinese government has put the construction of ecological civilization in a prominent position, learnt profoundly from the lessons of history, transformed its development mode, firmly established the concept that green water and green mountains are golden mountains, and planned its development from the perspective of harmonious coexistence between human beings and nature, in an effort to build a beautiful China. The reports of the 19th and 20th CPC Central Committees have clearly proposed to promote green development, accelerate the adjustment and optimization of the industrial structure, energy structure, transport structure, etc., deeply promote the prevention and control of environmental pollution, and enhance the diversity, stability and sustainability of the ecosystem. The Third Plenary Session of the 20th CPC Central Committee decided to implement fiscal, taxation, financial, investment and pricing policies and standard systems that support green and low-carbon development.

Green finance is a financial service provided to support economic activities such as addressing climate change, environmental improvement, economical and efficient use of resources and ecosystem protection. Green finance is a new type of supply and demand relationship formed by green development in the financial field and is an

important initiative to support the construction of a beautiful China. Specifically, it includes green credit, green investment, green bonds and green insurance. Based on the structural characteristics of China's financial industry, green credit is the main component of green finance, and is an important tool for guiding the flow of funds to environmentally friendly enterprises, optimizing the green allocation of funds, and assisting in the green transformation of enterprises. In June 2012, China's Banking and Insurance Regulatory Commission (CBIRC) issued its Guidelines for Green Finance in the Banking and Insurance Sectors, emphasizing that banks, insurance companies and other financial institutions should, according to their respective characteristics, actively use digital intelligence to improve the development of products, sales operations, investment and financing, in order to improve their green financial management and service level. The healthy development of green finance in the future will rely more on the innovative application of fintech and technological changes.

2. History and Current Status of Green Credit Development

2.1 History of Green Credit Development

The development of green credit in China can be broadly divided into three stages: enlightenment (1995 to 2011), rapid development (2012 to 2020) and standardized development (2021 to present). In 1995, the People's Bank of China (PBoC) issued the Circular on Issues Related to the Implementation of Credit Policies and the Strengthening of Environmental Protection, which required banking financial institutions to incorporate support for the prevention and control of environmental pollution and the protection of the ecological environment into the credit review conditions, which was the first time that financial means were used to restrict and guide the business activities of enterprises in China, and was also the prototype of the development of green credit. However, in the context of pursuing the speed of economic development, this document was not effectively implemented at that time.

In 2012, the 18th CPC National Congress put the construction of ecological civilization in a prominent position, emphasizing the need to build a beautiful China, and under the guidance of regulators, the scale of green credit investment by commercial banks rose rapidly. Since the 18th CPC National Congress, financial regulators have successively issued green credit policies such as Green Credit Guidelines, Key Evaluation Indicators for Green Credit Implementation, and Energy Efficiency Credit Guidelines, which require banking financial institutions to take green credit as a hand to actively adjust their credit structure in many aspects, and set social responsibility type indicators in performance evaluation, and make disclosure of the business of banking financial institutions to provide financial services, support energy conservation. In 2016, the People's Bank of China and seven other ministries and commissions jointly issued the Guiding Opinions on Building a Green Financial System. All banking and financial institutions actively implemented the requirements, firmly established the concept of green credit and made it an important part of their own strategic development, continuously strengthened the construction of green credit-related systems, processes, organizations and capabilities, and increased their conscientiousness and initiative in promoting the construction of ecological civilization with green credit, and the scale of green credit continued to grow rapidly. According to the disclosure of the People's Bank of China, as of the end of 2020, the balance of green loans in China was nearly RMB 12 trillion, the largest stock in the world; the stock of green bonds was RMB 813.2 billion, ranking second in the world.

Since 2021, various policy guidelines on green credit have become more complete, the evaluation system has become more mature, and the development of business has become increasingly standardized October 2021, the CPC Central Committee and the State Council issued the 'Opinions on the Complete and Accurate Implementation of the New Development Idea and Doing a Good Job in Carbon Peak and Carbon Neutral Work' and the State Council clarified the 'Action Plan for Carbon Peak by 2030'. Based on the guidelines of these two documents, relevant state ministries and commissions and local governments at all levels have constructed a relatively complete '1+N' policy system for carbon peak attainment and carbon neutrality. In particular, in 2021, the Ministry of Finance issued the Measures for Performance Evaluation of Commercial Banks, which explicitly included green credit as part of the performance evaluation of commercial banks. The People's Bank of China issued the Green Finance Evaluation Programme for Banking Financial Institutions to formulate assessment standards and incentive mechanisms related to green credit. Under the guidance of a series of policy frameworks, green credit has gradually become the most well-established area of systematic construction in China's green financial system.

2.2 Current Status of Green Credit Development

In terms of total amount, according to the disclosure of the State Financial Supervision Administration and other institutions, as of the end of 2023, the balance of RMB local and foreign currency green loans in China reached 30.08 trillion yuan, up 36.5% year-on-year, higher than the growth rate of all loans by 26.4 percentage points. Green loans increased by RMB 8.48 trillion for the year, totaling over RMB 30 trillion and accounting for 13.4% of the balance of all loans. By the end of 2023, 25 commercial banks in China had joined the Principles of Responsible Banking.

Specifically, from the point of view of the projects to which financial institutions' loans were directed, the loans directed to projects with direct and indirect carbon emission reduction benefits amounted to 10.43 trillion yuan and 9.81 trillion yuan, respectively, accounting for a total of 67.3 per cent of green loans. In terms of the uses of green loans, the balances of loans for infrastructure green upgrading industry, clean energy industry and energy conservation and environmental protection industry were RMB 13.09 trillion, RMB 7.87 trillion and RMB 4.21 trillion respectively, with a year-on-year growth of 33.2%, 38.5% and 36.5% respectively. The proportion was 43.16%, 26.16% and 14.00% respectively, an increase of 3.38 trillion yuan, 2.33 trillion yuan and 1.23 trillion yuan respectively from the beginning of the year. From the perspective of industries to which green loans were invested, the balance of green loans in the electricity, heat, gas and water production and supply industry was RMB 7.32 trillion, up 30.3% year-on-year, an increase of RMB 1.82 trillion from the beginning of the year, accounting for 24.34%; and the balance of green loans in the transportation, warehousing and postal service industry was RMB 5.31 trillion, up 15.9% year-on-year, an increase of RMB 776.7 billion from the beginning of the year, accounting for 17.65% of the total. The total green credit balance of these two categories fell further to 41.99%, while the balance of green credit in the remaining green and low-carbon areas grew to 58.01%, further expanding the scope of green credit investment.

As for the practice of each commercial bank, according to the statistical calculation of each bank's 2023 annual report, the number of banks with green credit balance exceeding one trillion yuan at the end of 2023 was four, which were ICBC, Agricultural Bank of China, Construction Bank of China, and Bank of China, in that order. As for the six major state-owned banks, the green credit balance of ICBC and Agricultural Bank of China has exceeded 4 trillion yuan, with ICBC taking the first place with 540 million yuan, and the year-on-year growth rate of Bank of China and Agricultural Bank of China has exceeded 50%, at 56.34% and 50.10% respectively. Joint-stock banks, Industrial Bank, China Merchants Bank, CITIC Bank green credit balance of more than 300 billion yuan, of which Industrial Bank has the highest green credit balance, has exceeded 800 billion yuan, Everbright Bank and Minsheng Bank year-on-year growth rate of more than 40 per cent, respectively, 57.44% and 46.87%. City banks, agricultural banks and other local legal person banks, with the national pace of rural revitalization and beautiful countryside construction accelerated, the local level in the comprehensive management of rural land, human settlements and other projects such as green financing demand is increasing, but also for the development of local city banks in green finance to provide a good soil. For example, the balance of green credit of Bank of Jiangsu has reached 287 billion yuan, and the green credit balance of Bank of Shanghai has increased by more than 50% year-on-year, showing a rapid growth rate and broad market potential.

In terms of policy, the Green Industry Guidance Catalogue has continued to expand, expanding from the original six categories to seven categories: energy-saving and carbon reduction industry, environmental protection industry, resource recycling industry, clean energy industry, ecological protection, restoration and use, green upgrading of infrastructure, and green services, involving new energy vehicles, hydrogen energy, and energy storage, etc., in order to adapt to the changes in the national resource and environmental conditions, and the development of the industry, and to ensure that the support policies continue to focus on industries that are critical to the development of a green economy. The People's Bank of China (PBOC) has continued two structural monetary policies related to green finance: the Carbon Emission Reduction Support Tool (CERS) and the Coal Clean and Efficient Utilization Refinance (CCEUR). Local governments have actively issued special documents on green credit to refine the direction of green credit development, promote typical green credit practices, and incentivize the allocation of resources for products in the green credit sector.

Generally speaking, after continuous development and improvement, China's green credit has gradually become the most well-constructed area in the systematic construction of China's green financial system, and the total scale of credit continues to rank at the forefront of the world. However, there are still some problems and challenges in the development of green credit that need to be solved.

3. Challenges to the Development of Green Credit

First, green loan investment is structurally imbalanced, and the coverage of emerging areas is still limited. From the point of view of the use of green loan investment, a large number of green credit funds for infrastructure green upgrading, energy saving and environmental protection, as well as the clean energy industry, the rest of the industry is limited by the green fund support. Specifically, electric power, new energy and other industries green loan scale, especially in the field of photovoltaic, wind power and other areas to a certain extent, green capital overheating, competition is too aggressive and so on, not only caused the problem of poor inter-bank green project profitability, but also caused the inefficiency of the use of green funds, waste of resources and other phenomena. However, green sustainable development is a deep change in the whole field, and the green industry also includes new energy freight transport, carbon capture technology and other emerging industries, as well as technology renewal and equipment upgrading in the chemical and construction industries. As the current relevant industries are still emerging fields or traditional industries, green credit support for these gaps is limited,

especially under the traditional credit mechanism is difficult to cope with the financing needs of emerging fields, the investment of green fund-raising is still to be further expanded.

Secondly, the accuracy and standardization of the environmental benefit measurement of green loans are insufficient. As an important guarantee for the healthy development of the green credit market, the environmental information disclosure system for green credit products still needs to be further improved. At present, although China has established relevant guidelines for the disclosure of environmental information by financial institutions, but in the measurement of environmental information, especially carbon emission reduction measurement, the current requirements for professionalism is high, in the data capture, methodology approval and other aspects of the difficulty of the manual measurement of the efficiency and accuracy of the lower, so that the accuracy of the data, the comparability of the information will be negatively impacted. In addition, there is still the problem of inconsistent sources of environmental benefit information, and the sources of environmental information collected by financial institutions include internal systems, external platforms, and third-party organizations, etc., with differences in data formats and processing methods, leading to higher difficulties in data integration, further reducing the overall quality of environmental information, and possibly resulting in the 'greenwashing' and 'green bleaching' of green credit products. Insufficient standardization of information disclosure may also increase the difficulty of product innovation and hinder market expansion. For example, the internalization of environmental benefits is an important direction for green credit product innovation, in which the innovation of financial products based on environmental rights and benefits requires the support of accurate data, and the lack of real and reliable market-oriented data makes it difficult for banks to assess the risk level of credit products using environmental benefits as collateral, which may make the relevant innovation a mere formality.

Third, the traditional credit model is difficult to adapt to emerging areas, and internal barriers make it more difficult to invest. The traditional credit model relies more on fixed assets and risk management mechanisms based on financial data, which may have a negative impact on increasing support for emerging areas. Especially in the early stage of development, there may not be a large number of fixed assets for collateral, coupled with long-term financial data has not yet been formed, resulting in the traditional credit model of the relevant industry financing constraints, external project development and internal project compliance management may encounter conflicts. At the same time, under the deepening economic and social change, the financial for the project to carry out the market risk, technology risk, policy risk and other risks of the transition of insufficient understanding, coupled with the green project risk cycle is longer, ESG and other green risk factors have not yet appeared in the short term, so that the bank to carry out the green credit business faced with the increase in the uncertainty of the factors. The existing risk management system is difficult to cover the long-term risks of the project, which implies development risks in the long run.

Fourthly, the development of green finance among banks is uneven, and the level of green finance development of joint-stock banks, city commercial banks and agricultural commercial banks is relatively weak, making it difficult for them to respond quickly to the emerging green market. From the point of view of the proportion of green credit business, the proportion of green credit loans in the total loan balance of state-owned banks is relatively high, while the proportion in most joint-stock banks and local city commercial banks and agricultural commercial banks is still at a low level. Meanwhile, in terms of green financial infrastructure, the six major state-owned banks have established green financial information technology platforms to lay the foundation for green credit business from the perspectives of risk management, environmental information integration and disclosure, and industry-finance docking, etc., while only a few banks of other natures have established information technology platforms. In addition, state-owned banks and a small number of joint-stock banks have taken the lead in forming a more complete system of environmental information disclosure, and have made more comprehensive disclosure of environmental benefits and measures to address environmental risks in accordance with their own internal standards and external regulatory requirements, and have gradually carried out initiatives related to the adjustment and optimization of their capital structure based on such disclosure, whereas most other banks have not taken effective action on their climate-related risks and initiatives to address climate change, which may affect future risk identification and management.

4. Analysis the Mechanism of Fintech on Green Credit

4.1 Perspective of Commercial Banks

In terms of bank business processes, compared with traditional credit business, the research and development cycle and capital recovery period of the projects served by green credit are longer and more uncertain, and enterprises are subject to more restrictions in financing. This exacerbates the problem of more uncertainty and information asymmetry in green credit, which is mainly manifested in the high cost of pre-lending financing for green credit, inefficient credit allocation, as well as non-transparent use of funds after lending and difficult supervision.

Fintech can optimism the pre-credit review process of green credit and improve the efficiency of green credit allocation. In the pre-credit period, on the one hand, the imperfect disclosure of corporate environmental information makes it difficult for financial institutions to judge their environmental risks and provide financial support in a timely manner; on the other hand, due to the lack of sufficient collateral and guarantee measures, green projects are often regarded as high-risk projects by banks and excluded from traditional loans, which not only prevents high-quality green projects from obtaining financing due to 'adverse selection', but also makes it difficult for financial institutions to provide financial support to green projects.

To address the allocation efficiency of green credit pre-credit, fintech can be used to enhance the efficiency of green credit pre-credit approval and reduce the financing constraints of enterprises. On the one hand, fintech can incentive banks to issue green credit more efficiently. It can use a variety of technical means to collect a large amount of customer data and convert it into actionable 'soft' data, thereby improving the efficiency of the use of information. The introduction of fintech not only reduces the cost of acquiring information, but also improves their risk identification and control capabilities, so that they can more actively provide credit services to enterprises with green innovation potential. On the other hand, the use of financial technology can more comprehensively identify those enterprises with green innovation potential, so as to better meet their credit needs. Fintech can fully explore the historical information and real-time data of enterprises, and comprehensively assess their green development status, so as to better guide the green credit of banks and more accurately allocate green credit resources.

Fintech can strengthen the post-lending supervision of green credit and improve the efficiency of enterprises' green investment. At the post-lending stage, the CBIRC requires that the actual use of green credit funds be subject to the strict rule of "earmarking for specific purposes". However, under the traditional credit model, it is difficult for financial institutions to monitor in real time the flow of funds, the efficiency of the use of funds and the environmental performance of enterprises. At the same time, green projects are often difficult to innovate, have high project risks, uncertain returns, and are subject to traditional environmental regulations, which can easily lead to enterprises no longer actively carrying out green technology research after obtaining the funds, but rather investing them in low-cost, easy-to-imitate end-of-pipe technologies and other more attractive projects.

With regard to the effectiveness of the use of green credit post-loan funds, the use of green credit funds can be better regulated through the application of financial technology, preventing the misuse and misappropriation of funds, reducing the information asymmetry of financial institutions, and thus enhancing the efficiency of investment. On the one hand, the use of blockchain, big data and other cutting-edge technologies can provide financial institutions with accurate and timely corporate environmental information, as well as real-time tracking of fund flows, effectively detecting and preventing corporate environmental risks and promoting sustainable development of enterprises. On the other hand, through the application of financial technology, financial institutions can realize dynamic tracking of the whole life cycle of green funds. Once enterprises are found to misuse green credit funds, they will promptly disclose the risks to financial institutions and restrict their use of funds and financing behaviors. Thus, financial science and technology can achieve the 'counterforce' of green credit to banks, inhibit the improper behaviors of borrowers, create a good environment for the use of funds, and provide enterprises with more incentives to carry out green investment and improve the efficiency of green investment, so as to reduce the adverse impact caused by the restriction of funds.

4.2 Fintech Technology Perspective

In terms of the underlying technology of financial technology, the financial industry is highly dependent on the effective application and value mining of information and data, especially in green credit, which also involves the conversion of information from the physical world to the digital world, as well as the determination of whether it meets the definition of 'green'. This is precisely where the core technology of the fintech industry excels.

Green credit is a multi-party dynamic and complex business system, involving data on ecological protection, safe production and environmental penalty information. This kind of data needs to be processed through a series of processes in order to become truly valuable information, and the difficulty of processing lies in the following four points: first, environmental information needs to be converted into digital information that can be used by the real world after fixed-point measurement and standard calculation using perception collection and other technical means; second, due to the many sources of data, inconsistent data types, non-standardized and unstructured data structure, the data need to be cleaned through ETL and other technologies; third, the data measurement and accounting standards are inconsistent, and the same data in different scenarios and different organizations under the calculation results will be biased. For example, for the green upgrading project of steel enterprises, some banks believe that the weight of green technology upgrading is more important than the weight of direct carbon dioxide emission reduction, while other banks hold the opposite view, believing that focusing on direct emission reduction will be more convenient for measuring the effect of green projects; fourth, the raw data

volume of this type of unstructured data is very large, and it is estimated that on average, a green project has to store more than IT of the raw data volume, even if the structured data is stored.

FinTech can meet the historical data storage needs of the green credit industry. Green credit is a data-intensive industry, and much of its underlying data has long-term storage value. After years of accumulation, the amount of data with storage needs will be very impressive. In the face of such a large amount of historical data, how to effectively store, manage and analyze the data, so that the historical data can still serve the present and the future, is a difficult problem in front of all the banking industry. The development of cloud computing platforms and big data analytics can meet this need. By building distributed databases and cloud server clusters, real-time processing and analysis of massive data can be achieved, improving efficiency while reducing data redundancy and further tapping the potential value of data.

Fintech can meet the demand for multi-dimensional information aggregation in the green credit industry. In the approval process of green credit business, it is often necessary to comprehensively measure and evaluate from multiple dimensions such as macro policies, industry trends, credit of the main body, and whether it meets the definition of ‘green’, and finally form the corresponding financial support strategy, which creates high requirements for the ability to quickly obtain data. The Internet of Things, big data and blockchain technologies provide strong support in data collection, transmission, storage and sharing, respectively, and can realize multi-dimensional data cross-validation and mutual corroboration, thus enhancing the scientific and accuracy of green credit decision-making.

Fintech can meet the demand for intelligent analysis of data in the green credit industry. When financial institutions are confronted with huge amounts of data, how to quickly and effectively find valuable information that can really form help for investment decisions is the next problem and pain point faced. Big data and artificial intelligence technology can precisely fulfil this demand. For example, for the identification and determination of green projects, AI technology can be used to build a green industry knowledge base based on the Green Industry Guidance Catalogue, construct a green intelligent identification model based on multiple green standards issued by the state and industry, and apply NLP (natural language processing) technology to make comprehensive judgments on the use of loan funds. The core key data of green enterprises or projects are screened and analyzed and evaluated in massive data through big data technology, and then green identification results are given in accordance with green standards, helping financial institutions identify green enterprises/projects scientifically, accurately and quickly and improving the efficiency of identification and evaluation.

Fintech can meet the business prediction needs of the green credit industry. The essence of financial investment analysis is to make outlook and judgement on the future based on existing data and historical experience. The use of big data and artificial intelligence technology can help financial institutions to dig out effective data and sum up successful experience according to preset rules in the massive data, so as to make inferential prediction on future business trends. For example, by modelling and analyzing data such as a customer’s electricity consumption, production process and logistics track, it is possible to predict the customer’s willingness to repay and the probability of default, and then decide whether or not to grant a credit line or take other risk control measures.

5. Conclusion and Recommendations

In summary, from the perspective of banks, fintech can alleviate the information asymmetry between investment and financing parties through the effective management of pre- and post-lending, reduce transaction costs, improve financing efficiency, and promote the transformation of the green economy; from the perspective of fintech, fintech is naturally good at dealing with the technical characteristics of the data and the nature of the business of green credit can be accurately matched, and there is a necessity for the integration of the two.

For government departments, firstly, improve the top-level planning of green financial technology and encourage financial institutions to use technology to carry out green credit business innovation; secondly, establish a ‘regulatory sandbox’ trial and error mechanism and a ‘help’ mechanism for financial technology to provide regulatory soil for green credit innovation; thirdly, set up a cross-sectoral regulatory framework to promote green credit innovation.

For commercial banks, firstly, they should formulate a digital transformation strategy and deepen the construction of green financial technology infrastructure for financial institutions; secondly, they should improve the green credit management system and the effectiveness of the credit resource allocation mechanism; and thirdly, they should set up an intelligent management platform for green credit and improve the convenience of green credit data interaction.

Fund Project

Guangzhou Huashang College 2022 Youth Academic Research Projects: A study of fintech, corporate social responsibility and corporate innovation in the context of economic digitalization (Project number: 2022HSXS042).

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