

Research on the application of blockchain technology in the green credit evaluation system of commercial banks

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Abstract: With the increasing global attention to environmental protection, green finance has become a hot topic in the current financial industry. Green bank is an important part of green finance, and green credit is an important business of commercial banks in the context of sustainable development. Its evaluation system plays a key role in promoting sustainable development and environmental protection. In view of the traditional evaluation system, there are problems such as information asymmetry and data tampering. As a decentralized, transparent and immutable distributed ledger technology, blockchain technology provides a new solution for the green credit evaluation system of commercial banks. This paper will deeply study the application of blockchain technology in the green credit evaluation system of commercial banks, and explore its advantages and challenges.

Key words: blockchain technology; Commercial bank; Green credit; Evaluation system; Sustainable development

I. Concept and principle of green credit evaluation system

The green credit evaluation system is a set of evaluation standards and methods formulated by commercial banks in order to promote sustainable development and environmental protection. Its main purpose is to assess the environmental impact and sustainability of loan projects to determine whether they meet the requirements of green credit. The following are the concepts and principles of the green credit evaluation system:

1. Concept: The green credit evaluation system is a method to quantify and evaluate the environmental impact of loan projects by collecting, analyzing and evaluating relevant data. It considers factors such as the environmental benefit, resource utilization efficiency and social impact of the loan project to determine whether the project conforms to green credit principles and standards.

2. Principles

(1) Environmental friendly principle: The green credit evaluation system should be based on the principle of environmental friendliness, that is, assessing the impact of the loan project on the environment, including reducing carbon emissions, saving energy, optimizing resource utilization and so on.

(2) Sustainability principle: The green credit evaluation system should pay attention to the sustainability of the loan project, that is, evaluate whether the project has long-term stable economic and environmental benefits, to ensure that the project is operated on the basis of sustainable development.

(3) Scientific principle: The green credit evaluation system should be based on scientific methods and technologies, and use quantitative and qualitative analysis means to accurately assess the environmental impact of the loan projects, and provide scientific basis for decision-making.

(4) Transparency principle: The green credit evaluation system should be transparent, that is, the evaluation process, methods and data should be open and transparent, so as to facilitate relevant parties to understand the basis and results of the evaluation.

(5) Risk management principle: The green credit evaluation system should take risk management as an important content, assess the potential risks of the project in terms of environment and sustainability, and provide reasonable control measures and management suggestions.

(6) Principle of continuous improvement: The green credit evaluation system shall be continuously monitored and improved, track the environmental benefits and sustainability of the project, and timely adjust the evaluation indicators and standards to adapt to environmental changes and technological progress.

The above principles aim to ensure the scientific nature, fairness and effectiveness of the green credit evaluation system, which has guiding significance for both commercial banks and borrowers, and promote the realization of sustainable development and environmental protection.

II. The Green bank credit rating system

refers to the bank's credit rating system for green credit projects. On the domestic front, the People's Bank of China has issued the Green Finance Policy Guidelines (2016-2020), in which it proposes to promote banks and other financial institutions to establish green finance credit rating mechanisms. Meanwhile, the China Banking Regulatory Commission (CBRC) has also issued a series of regulations to compel commercial banks to establish a green credit business management system, including credit rating and risk management.

Overseas, the European Investment Bank (EIB), the World Bank and other international financial institutions are one of the pioneers of green credit rating. The EIB established the "Green Credit Program" in 2007 and introduced the green credit rating mechanism to provide borrowers with evaluation and financing support. The World Bank, in turn, has gradually improved its rating criteria and methodology for green credit projects.

Many domestic and foreign commercial banks have also established green bank credit rating systems, such as Industrial and Commercial Bank of China, China Construction Bank, China Merchants Bank, HSBC and so on. When these banks set up green credit rating systems, they usually develop a series of rating indicators and criteria based on green finance standards and regulations to quantify and assess the environmental impact and sustainability of borrowed projects.

Rating indicators usually include environmental benefits, resource utilization efficiency, social impact and other aspects, while rating standards set corresponding rating levels according to different types and scales of projects, so as to judge the risk level and credit rating of the projects. At the same time, the green bank credit rating system also needs to be scientific, transparent, objective and operable, so as to provide effective evaluation and decision-making support for banks and borrowers.

At present, the green bank credit rating system mainly adopts the traditional credit rating method, through the evaluation of the loan applicant's credit history, financial status, business status and other aspects to determine their credit rating and repayment ability. However, the traditional credit rating method has problems such as information asymmetry and data falsification, which can not cope well with the needs of green finance.

III. Problems and challenges faced by the green credit evaluation system

1. Problems and limitations of the traditional evaluation system

There are some problems and limitations in the traditional evaluation system of green credit evaluation, including the following aspects:

(1) Difficulty in obtaining data: The traditional evaluation system requires a large amount of environmental data to assess the environmental impact of loan projects. However, it is very difficult to obtain accurate and comprehensive environmental data, which often requires the use of various investigation and monitoring means, which consumes time and resources.

(2) Subjectivity and inconsistency: The evaluation results in the traditional evaluation system are easily affected by the subjective consciousness and experience of the evaluators, leading to the inconsistency of the evaluation results. Different evaluators may give different evaluation opinions on the same project, which lacks objectivity and comparability.

(3) Lack of standards and indicators: In the traditional evaluation system of green credit, there is a lack of a uniform set of standards and indicators to measure the environmental impact of borrowed projects. Different evaluation institutions or banks may use different standards and indicators, resulting in incomparable and unreliable evaluation results.

(4) Data reliability and authenticity: the environmental data in the traditional evaluation system often comes from the information provided by the borrower or third-party data, and its reliability and authenticity are difficult to guarantee. Borrowers may exaggerate their environmental benefits or conceal adverse factors, leading to the inaccuracy of the assessment results.

(5) Lack of dynamic and real-time performance: the traditional evaluation system is often a one-time evaluation, unable to reflect the environmental impact changes of loan projects in time. During the operation of the project, the environmental situation may change, but the traditional evaluation system can not carry out real-time monitoring and evaluation.

(6) High evaluation cost: the traditional evaluation system needs to invest a lot of manpower, material resources and time to carry out the evaluation work, and the evaluation cost is relatively high. This may be a huge burden for small and medium-sized enterprises or financial institutions.

There are many problems and limitations in the traditional evaluation system in the evaluation of green credit, which not only limits the accuracy and credibility of the evaluation, but also increases the cost and complexity of the evaluation. Therefore, it is necessary to continuously improve the evaluation system through the introduction of new technologies and methods to improve the scientific, standardized and efficient evaluation.

2. Challenges faced by the green credit evaluation system

(1) Environmental benefit assessment: The core of green credit is to assess the environmental benefits of loan projects, including energy conservation, emission reduction, resource utilization efficiency, etc. However, the assessment of environmental benefits is a complex process, which requires the collection and analysis of a large amount of environmental data, and also needs to consider the reliability and authenticity of the data.

(2) Information asymmetry: From borrowers to banks, there is an asymmetry in information transmission. It is often difficult for banks to know the true environmental performance and potential risks of borrowers, while borrowers may also exaggerate or conceal their environmental impact. This leads to inaccuracies and a lack of trust in assessments.

(3) Data credibility: In the traditional assessment system, the credibility and authenticity of environmental data cannot be guaranteed. Data may be tampered with or falsified, thus affecting the accuracy of assessment results and decision-making.

(4) Determination of benchmark standards: Green credit evaluation requires clear benchmark standards and evaluation indicators in order to assess whether the project meets the green credit requirements. However, developing these standards and reaching a consensus is a difficult task, which requires a comprehensive consideration of scientific, operational and adaptive factors.

(5) Regulatory and compliance requirements: The green credit evaluation system needs to comply with relevant regulatory and compliance requirements. This involves the formulation and implementation of laws and regulations, as well as the supervision and management of evaluation institutions and commercial banks to ensure the fairness and reliability of the evaluation results.

To overcome these challenges, the application of blockchain technology in the green credit evaluation system should be actively explored. Blockchain technology can provide a reliable data traceability, information sharing and verification mechanism, and enhance the

transparency and credibility of the evaluation. At the same time, establishing a multi-stakeholder cooperation mechanism and strengthening supervision and risk management are also key to addressing these challenges.

IV. Application of Blockchain technology in Green Bank credit rating System

1. Overview of blockchain technology

Blockchain technology is a distributed ledger technology that enables participants to interact and record information without intermediaries by creating a decentralized, secure and scalable database.

(1) Fundamentals: A blockchain is a chain structure made up of individual blocks of data. Each data block contains some transactions or information and is connected to the previous data block through cryptographic algorithms to form an immutable chain. This guarantees the security and integrity of the data.

(2) Core features:

① Decentralization: there is no central authority or authority to control and manage the blockchain. Data and transactions are held on various nodes of the network, each with the same copy of the data and authority.

② Distributed ledger: Participants jointly maintain and update the ledger, and each node keeps a complete copy of the ledger. When a new transaction occurs, it needs to be agreed upon by a consensus algorithm, and the transaction record is added to the chain.

③ Immutability: Once the data is recorded on the blockchain, it is difficult to modify or delete it. This is due to the fact that each data block contains the hash value of the previous data block, making the data on the chain an immutable history.

④ Transparency: Participants in the blockchain network can view and verify all transactions and data. This transparency increases trust and reduces the risk of fraud.

⑤ Security: Blockchain uses cryptography to keep data safe. Transactions need to be verified with encryption and digital signatures, ensuring that only legitimate users can access and modify the data.

(3) Application areas:

① Cryptocurrency: The most famous application is Bitcoin, blockchain as its underlying technology to achieve decentralized digital currency transactions.

② Supply chain management: Blockchain can track and record the production, transportation and sales process of items, improving the transparency and efficiency of the supply chain.

③ Identity authentication: Blockchain can be used to create a reliable identity verification system, eliminate middlemen and reduce the risk of identity theft.

④ Copyright protection: By storing the copyright information of the work on the blockchain, the ownership and use rights of the work can be traced and proved.

⑤ Medical and health care: Blockchain can be used to securely store and share medical records data, strengthening the protection and interoperability of medical data.

Blockchain technology provides innovative solutions for various industries through the characteristics of decentralization, distributed ledger, immutability, transparency and security. However, blockchain technology also faces challenges such as scalability, performance and privacy protection, which require further research and development to achieve a wider application.

2. Application scenarios of blockchain technology in the financial sector

Blockchain technology has multiple application scenarios in the financial sector, and the following are some common applications:

(1) Cryptocurrencies: The most well-known applications of blockchain are Bitcoin and other cryptocurrencies. As the underlying technology of cryptocurrencies, blockchain enables decentralized digital currency transactions, reduces intermediaries in the traditional financial system, and provides higher security and privacy protection.

(2) Cross-border payments and remittances: Blockchain technology can simplify and speed up the process of cross-border payments and remittances. By using blockchain, direct peer-to-peer transfers can be achieved, avoiding intermediate banks and cumbersome settlement processes in the traditional banking system, and reducing fees and time costs.

(3) Securities issuance and trading: Blockchain can be used for the whole process management of securities issuance and trading. With the immutability and transparency of blockchain, the effectiveness and authenticity of securities transactions can be ensured, the risk of manipulation and fraud can be reduced, and the efficiency of transactions can be improved.

(4) Inter-bank clearing and settlement: Blockchain technology can improve the inter-bank clearing and settlement system and improve the speed and accuracy of fund settlement. Through the use of blockchain, real-time settlement can be achieved and intermediary links can be reduced, reducing operational risks and operating costs.

(5) Supply chain finance: Blockchain can be applied in the field of supply chain finance to provide more efficient, transparent and secure transaction and financing services. Through blockchain technology, it is possible to track the flow of goods, verify supply chain data, and provide financial services such as financing and insurance to supply chain participants based on this information.

(6) Electronic signatures and authentication: Blockchain technology can be used to create reliable identity authentication and electronic signature systems to enhance identity verification and data protection in financial transactions. Through cryptographic algorithms and digital signatures on the blockchain, the security and legality of transactions can be ensured.

These are just some of the application scenarios of blockchain technology in the financial sector, and more applications will emerge as

the technology continues to develop and innovate. However, it is important to note that in the course of practical application, challenges such as performance scaling, privacy protection and regulatory compliance of blockchain technology need to be addressed.

3. The application of blockchain technology in the green credit evaluation system

Blockchain technology has a wide range of potential applications in the green bank credit rating system, which can provide improvements in the transparency, security and efficiency of the rating system.

(1) Data credibility and transparency: Blockchain technology can ensure the immutability and transparency of data. By storing all kinds of data and information in the rating system on the blockchain, it can ensure the truth, trust and openness of the data. The environmental data, rating results and evaluation reports of loan projects can all be fully recorded for relevant parties to inquire and verify at any time. This can increase the transparency of the rating system and reduce the possibility of data falsification and improper manipulation.

(2) Decentralization and trust mechanism: The decentralized characteristics of blockchain technology can eliminate the control and manipulation of a single entity and achieve a more just rating process. All parties involved, such as rating agencies, banks and borrowers, can share rating data and participate in rating decisions, forming a multi-party trust mechanism and improving the fairness and objectivity of rating results.

(3) Smart contract execution and automation: Smart contracts on the blockchain can automatically execute pre-set rules and conditions, improving the efficiency and effectiveness of the rating process. Smart contracts can automatically trigger operations such as rating, verifying data and calculating rating results according to the rules of the green credit rating system, avoiding human intervention and errors. This can speed up the rating cycle, reduce the rating cost, and improve the accuracy and credibility of the rating results.

(4) Privacy protection and sharing control: Blockchain technology can realize the privacy protection and sharing control of data. The sensitive information of the borrower can be protected by encryption algorithms in the blockchain, and only authorized users can access and use it. At the same time, participants can share the required data on the blockchain without having to pass it directly to other parties, thus improving the security and privacy of the data.

(5) Audit and regulatory facilitation: Blockchain technology can provide complete transaction recording and audit trail functions, which can help regulators to supervise and audit the green bank credit rating system. Through the data and information on the blockchain, regulators can monitor the operation status of the rating system and the environmental impact of borrowing projects in real time, so as to better perform their supervisory duties.

4. A green credit evaluation system based on blockchain technology

Based on the traditional credit rating model, add the specific factors of green finance, such as environmental impact assessment, social responsibility assessment, etc., to establish a blockchain green credit rating system model, which can not only improve the transparency, security and efficiency of the rating system, but also automate the implementation, avoiding the interference of human factors and data fraud problems.

The model design process is shown in FIG. 1:

(1) Determine the rating criteria and indicators: determine the indicators and criteria required for rating, including the types of green loans, types of green projects and other indicators, as well as the loan amount, loan interest rate and other standards.

(2) Collect data

Gather data on relevant green credit operations, including:

① Data on green projects: data related to the type, scale, investment cost and operation mode of green projects.

② Operation data of green projects: including the operation time, operation status, environmental benefits, social benefits and other aspects of green projects.

③ Green loan interest rate: the interest rate of different green loans is different, and it is necessary to consider the loan interest rate and other data when making the rating.

④ Amount of green loan: the amount of different green loans is also different, and the loan amount and other data need to be considered in the rating process.

⑤ Enterprise credit status: The credit status of loan enterprises is also one of the important indicators of green credit rating, and relevant data need to be collected.

⑥ Policies and regulations: Policies and regulations also have a certain impact on the development and rating of green credit, and it is necessary to collect changes in policies and regulations in a timely manner.

⑦ Social and environmental data: social and environmental data include climate, environmental protection status, public attitude, etc. These data are also related to green credit rating.

(3) Store the data on the blockchain: Store the collected green credit data on the blockchain to ensure that the data is safe, transparent and immutable.

(4) Rating according to rating standards: The data stored on the blockchain will be rated according to the rating standards, and smart contracts can be set up to automatically perform ratings.

(5) Publish the rating results: Publish the rating results publicly on the blockchain for the use of external institutions, investors, etc.

(6) Supervision and management: Establish a regulatory mechanism to supervise and manage the blockchain green credit rating system to ensure the fairness and effectiveness of the rating.

(7) Continuous improvement: The blockchain green credit rating system shall be continuously improved, and the accuracy and

scientific nature of the rating shall be continuously enhanced to meet the needs of society and the market.

The above is the general process of establishing the blockchain green credit rating system model, and the specific process needs to be adjusted and modified according to the actual situation.

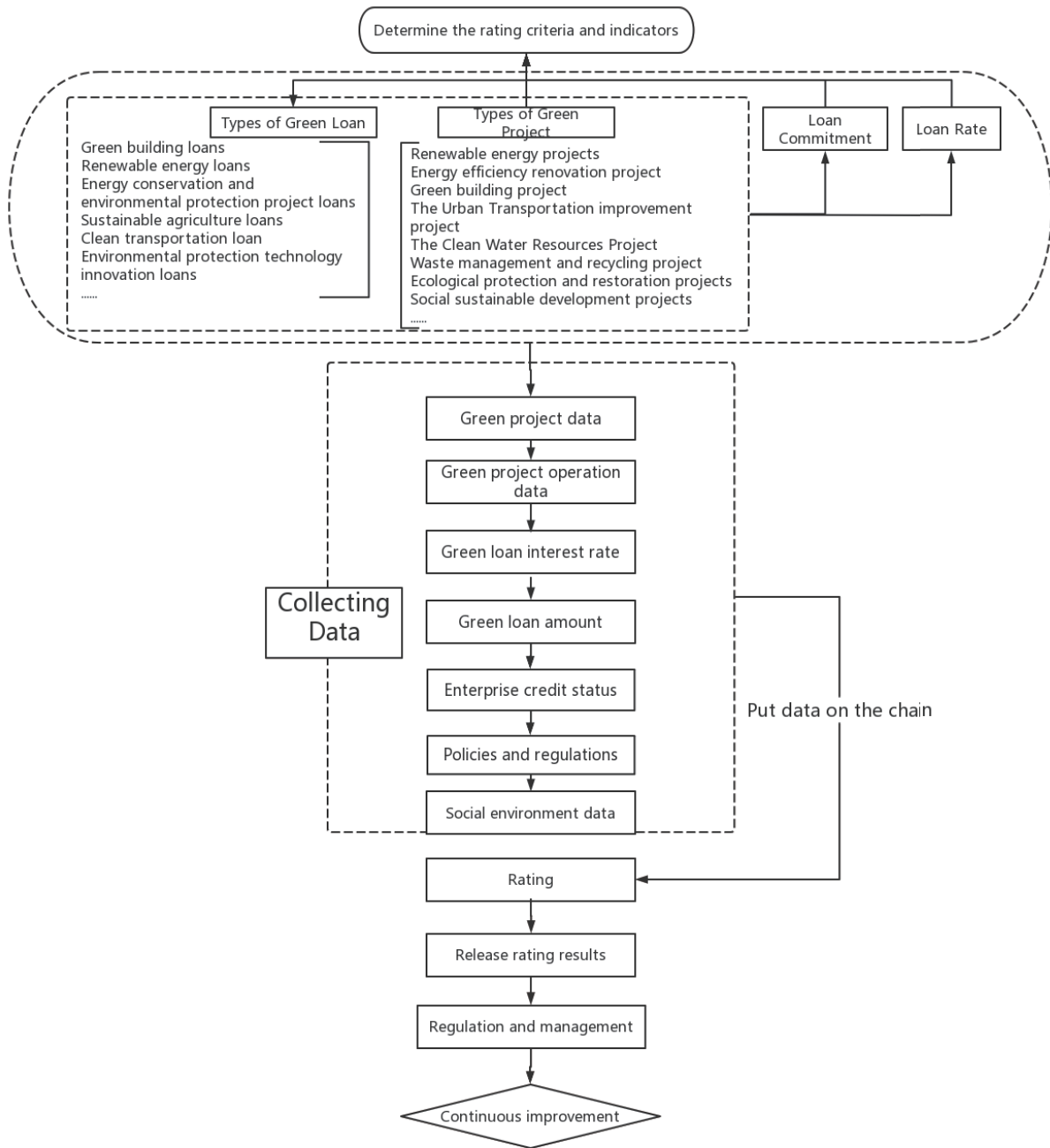


Figure 1 Green credit rating system model design process

V. Summary

The green bank credit rating system is an important part of green finance, and its rating accuracy and fairness are crucial to promote the development of green finance. A green bank credit rating model is established on the basis of blockchain technology to determine the credit rating and repayment ability of loan applicants. Blockchain technology can enhance the credibility, transparency, efficiency and security of the green bank credit rating system, as well as facilitate the sharing of data and information among all parties to form a more open, just and sustainable rating mechanism. However, blockchain technology still faces some challenges in practical application, such as performance expansion, standardization, compliance and other issues, which need to be further studied and explored.

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