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Research on the Application and Model Optimization of Blockchain Technology in Green Supply Chain Finance

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Abstract

In recent years, China's green finance has become increasingly important in economic transformation and ecological civilization strategy construction. At the same time, the innovation and development of China's green financial system also needs the help of blockchain technology. However, based on the current research situation, there are still problems such as slow processing and insufficient experience in the application of blockchain technology to green supply chain finance development. This project aims to explore the possibilities of blockchain technology application and integration innovation in the field of green supply chain finance on the basis of systematically reviewing the development model of green supply chain finance, and propose model optimization suggestions, in order to provide reference for the market to solve financing demand related problems.

Keywords

Supply Chain Finance; Blockchain Technology; Green Finance; Model Optimization.

1. Introduction

As global environmental issues become increasingly serious, the concept of green development and sustainable development has gained increasing attention from more and more countries. In China, green supply chain finance, as an effective means to promote green development and sustainable development, has been widely applied and promoted. However, traditional green supply chain finance faces problems such as information asymmetry and difficulty in building trust, which limit its further development. However, according to recent research findings, the emergence of blockchain technology also provides new ideas and methods to solve these problems. It is hoped that through the research of this article, it can provide some ideas and references for the application and model optimization of blockchain technology in green supply chain finance, promote the development of green supply chain finance, and contribute to China's green development.

2. Pain Points in the Development of Green Supply Chain Finance

2.1. The Financial Service System of Green Supply Chain is Not Perfect Enough

Banking financial institutions are the core force in the development of green supply chain finance. Currently, some commercial banks in China have begun to explore it, but there is still a lack of powerful efficiency in large-scale promotion. At present, the banking industry still

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focuses on traditional supply chain finance products, and the homogenization of financial products is serious, which fails to fully reflect the "green" advantage, and the product structure needs to be upgraded urgently. In March 2021, the "14th Five-Year Plan" clearly proposed to "vigorously develop green finance". It can be seen that the development time of the green finance standard system in China's banking industry is relatively short, and it is still in the exploratory stage. Moreover, the formulation of the green finance standard system in China's banking industry mainly focuses on green credit, so there are certain differences in the understanding of green supply chain finance among different financial institutions in China, which makes it difficult to ensure the timeliness and accuracy of risk detection in the operation of the supply chain finance system. Due to the lack of unified and standardized standards and information disclosure and sharing mechanisms, financial institutions are difficult to play their role through environmental information evaluation, multi-party supervision, and third-party assessment.

2.2. The Financial Operation Mode of Green Supply Chain Needs to Be Optimized Urgently

Qian Lihua and other scholars in Three Development Models of Green Supply Chain Finance divided the green supply chain finance model into three fusion models: "supply chain finance + green finance", "green supply chain + supply chain finance" and "green supply chain + green finance". Their main focus is whether the operation and management activities of small and medium-sized enterprises in the upstream and downstream of the supply chain meet the environmental protection requirements of the core enterprise. The "green supply chain + green finance" fusion model allows banks to directly provide financial support for projects that integrate environmental protection concepts throughout the entire industrial chain, from product design to raw material procurement, production, transportation, sales, and recycling, in order to achieve the effective integration of green supply chain and green finance. In the process of promoting green supply chain finance in China, even though some financial institutions pay attention to evaluating and sampling the upstream and downstream enterprises of their own supply chain, due to considerations of cost and other factors, some financial institutions do not have enough time and manpower in the later stage, resulting in inadequate supervision and supervision of the upstream and downstream enterprises of the supply chain.

2.3. Lack of Unified Standards and Evaluation System for Green Supply Chain Finance

As one of the important means to promote the development of global green economy, the green finance evaluation system promotes the sustainable development of financial institutions and financial products. It mainly includes environmental evaluation, social evaluation, and governance evaluation. The core of green finance is to promote capital towards green enterprises and projects. However, the evaluation standards for the environmental benefits of investment entities are not clearly unified, and there are multiple standards for the recognition of green finance projects. Various provinces and cities have successively announced some policies on green supply chain finance, such as the Beijing Municipal Bureau of Ecology and Environment issued the "Beijing Enterprise and Project Green Performance Evaluation Guide (Trial Implementation)" and other related documents, but there is still a need to improve the situation as there is no unified national standard.

2.4. The Guiding Role of Core Enterprises and Financial Institutions in the Green Supply Chain is Not Sufficient

In the process of green supply chain finance abroad, most of the core enterprises actively cooperate with commercial banks, put forward green development requirements for small and

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medium-sized enterprises, and decide whether to meet the procurement and financing needs of small and medium-sized enterprises based on the relevant green information feedback from institutions. At present, some domestic enterprises still have insufficient understanding of green supply chain finance, and due to the information asymmetry between the supply and demand sides of green supply chain finance, some core enterprises consider providing guarantees for small and medium-sized enterprises on the key points in order to promote green supply chain finance. At the same time, for some financial institutions, promoting green supply chain finance business also has the characteristics of low interest rate and slow return, which leads to adverse selection and affects the market innovation of green supply chain finance.

3. Features and Advantages of Blockchain Technology

Blockchain technology is a distributed ledger technology with the following characteristics and advantages:

3.1. High Reliability

Security is also higher because the blockchain protocol mechanism ensures the consistency and reliability of information, encrypting all data into hundreds of billions of nodes. There is no commonly used multi-copy method, which is the most advanced redundancy coding method. Because all nodes need to reach consensus before joining their own blocks, it can avoid information loss caused by single point failure, effectively reducing the impact of single point failure. In terms of hard disk failure alone, the comprehensive security of blockchain technology is 1064 times higher than cloud technology, and the comprehensive security is at least 10,000 times higher. In addition, due to the use of cryptographic encryption technology in blockchain, it can improve the stability of data and stored information. In addition, due to the decentralized principle of blockchain, there is no central department managing all information and transaction data. Each node must have a complete copy of the information and use consensus methods to achieve consistency, ensuring the security and reliability of information. It is difficult for attackers to destroy the entire system through single point attack.

3.2. Higher Availability of Services

The blockchain technology can also be used to transfer business load to nodes around the world, thereby enhancing flexibility. In terms of business flexibility, blockchain computing may be 100 million times more powerful than cloud computing. And all trade data and information are recorded on the blockchain, which can be viewed and verified by everyone. Through such transparency, it can enhance corporate credit and reduce fraudulent activities. In addition, the use of blockchain for trade can be direct peer-to-peer, rather than middlemen or intermediaries, which can reduce the time and cost of trade. Blockchain can achieve intelligent contracts, automate the execution of contract conditions, and improve the efficiency of transactions. Secondly, blockchain uses cryptographic methods to ensure the immutability of data. Each block contains the hash value of the previous block, and any tampering with the data will lead to a change in the hash value, which will be rejected by other nodes.

3.3. Lower Cost

The fundamental reason for the low cost of blockchain lies in the fact that blockchain technology has good processing capabilities in removing the problem of duplication in large amounts of data. By de-duplicating data, the production cost can be reduced by five to ten times. At the same time, blockchain technology also uses encrypted consensus algorithms to form a trustless system. Participants do not need to trust each other, but only trust the system's algorithms and protocols, thus reducing the risk and cost of transactions. At the same time, blockchain design can also reduce information redundancy, thereby reducing costs. In addition,

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the construction cost of each information node is very low. According to reports, the edge information node structure used in blockchain design has low requirements for hardware equipment. In addition, industry experts said that the blockchain edge technology system does not need special refrigeration. Because the cooling of centralized technology nodes requires specific central air conditioning equipment, and the cost of using such a cooling system is generally 0.5 to 1 times the server cost, which results in a huge energy expenditure. However, blockchain edge nodes can be used as technical mining machines for special refrigeration.

3.4. Stronger Remote Disaster Tolerance

For general centralized storage, usually two regions and three centers form a horizontal total disaster recovery, and the construction has a relatively high cost, which is also the main reason why many large enterprises and institutions in the world have a very low total disaster recovery rate. However, based on the "thousands of centers" feature of blockchain storage, it can significantly improve the level of disaster recovery, turning the "disaster recovery" that is a luxury in centralized storage into a standard configuration.

It should be noted that in centralized logistics, companies can use internal controls to keep big data confidential. However, in blockchain logistics, due to the global distribution of big data, companies cannot solve confidentiality issues through internal controls, so it is necessary to achieve big data confidentiality. The technical foundation of blockchain storage lies in distributed architecture technology and cryptography technology. In his view, if the two seemingly contradictory technologies of cryptography and deduplication are combined, it will constitute a decisive advantage for Chinese blockchain projects to break through in the world.

At the same time, we should also consider the challenges that 5G networks may pose on blockchain storage. Centralized storage is significantly more secure than blockchain storage. At the same time, with the advent of 5G, the high efficiency and low latency advantages of 5G networks can greatly enhance blockchain stability and solve the stability problems caused by blockchain storage.

4. Application and Development of Blockchain Technology in Green Supply Chain Finance

At present, the application and development of blockchain technology in green supply chain finance are very compelling. As a decentralized distributed ledger technology, blockchain brings many advantages to green supply chain finance, including improvements in transparency, traceability, data security, and trust establishment. Below, we will explore its application and development in green supply chain finance from different perspectives.

Firstly, blockchain technology brings higher transparency and traceability to green supply chain finance. As transaction information on the blockchain is immutable, every transaction can be recorded and stored on the blockchain, and all links in the supply chain can be viewed and verified at any time, ensuring the authenticity and accuracy of information. This transparency and traceability helps to supervise and manage environmentally friendly practices in the supply chain, thereby promoting enterprises to adopt more green and sustainable practices. Secondly, blockchain technology can also improve data security in green supply chain finance. In traditional supply chain finance, a large amount of transaction data and sensitive information are stored in centralized databases, which are vulnerable to hacking and data leakage threats. However, blockchain uses encryption technology and decentralization features, making data more secure and reducing the risk of data being tampered with or leaked, thereby increasing the confidence of participants. In addition, blockchain technology builds a trust mechanism for green supply chain finance. As data on the blockchain is public and immutable, all participants can share the same data and trust its authenticity. This trust mechanism helps to solve

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information asymmetry problems in supply chain finance, reduce risks in the supply chain, and reduce the cost of financial transactions. At the same time, blockchain technology can be used for social impact assessment, that is, to evaluate the actual impact of green supply chain finance projects on the environment and society. By recording and analyzing data on the blockchain, the environmental protection effect and social benefits of the project can be more accurately measured, providing investors and decision makers with more comprehensive information. This technology provides a platform for different stakeholders to share information, promoting joint cooperation and information sharing. At the same time, blockchain can also help establish standards and norms for green supply chain finance, strengthen industry supervision and self-discipline, and ensure the sustainable development of green supply chain.

At present, many companies and organizations around the world have begun to try to apply blockchain technology to green supply chain finance. For example, some large retailers such as Alibaba use blockchain technology to track the source of raw materials and production process of products to ensure the environmental protection of products and the transparency of the supply chain. At the same time, some financial institutions have also begun to use blockchain technology to improve the financing and settlement process of green supply chain finance, and improve the efficiency and reliability of financial services. For example, Foshan Rural Commercial Bank actively applies blockchain technology to innovate order financing model through independently developing supply chain finance system.

Despite the promising prospects of blockchain technology in green supply chain finance, there are still some challenges and unresolved issues. For example, blockchain scalability and performance remain a challenge, especially when the supply chain scale is large, blockchain may face transaction speed and throughput limitations. In addition, the popularization and promotion of blockchain technology requires the support of more standards and regulations, as well as the collaboration and consensus of all parties to ensure the compliance and sustainability of blockchain technology, and to establish a sustainable ecosystem. These challenges also include the potential energy consumption and environmental impact as blockchain technology is widely applied, which requires the search for more energy-efficient solutions.

Overall, the application and development of blockchain technology in the field of green supply chain finance provides new possibilities for the realization of environmentally friendly economy. With the continuous advancement of technology and the active participation of all sectors of society, we have reason to believe that blockchain is expected to bring more innovation and opportunities to green supply chain finance, play an increasingly important role in promoting the transformation and development of global green supply chain finance, and promote the sustainable development of the global green economy.

5. Suggestions

5.1. Company

As enterprises continue to develop, their financing needs are increasing, and they are facing the development bottleneck of financing constraints for a long time. Against this background, demand supply chain has become an effective means to solve the financing difficulties of enterprises. However, while the supply chain is rapidly developing, its risk problems are also becoming increasingly prominent, including the characteristics of difficult application and strong professionalism of the supply chain. Therefore, the application of blockchain technology in green supply chain finance requires companies to make corresponding improvements.

Rely on technological development to improve the efficiency of supply chain financial services. Digital supply chain financing is the mainstream trend of future industrial development, and its financial characteristics based on blockchain technology make it advantageous in business

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models. However, existing technologies are not yet perfect, and it is difficult to effectively solve the problems of authenticity of off-chain data and validity of transaction contracts based on smart contracts in practice. Therefore, it is necessary to increase research and development efforts on these technologies to improve the ability to provide services on the chain. At the same time, we must strive to combine technologies such as Internet of Things, artificial intelligence, cloud computing and big data, integrate the advantages of each technology, and solve the problems that blockchain technology itself cannot overcome.

Strengthening data security and achieving precise risk control. Blockchain technology can achieve the traceability and transparency of fund flow, which can effectively prevent the risks of fund embezzlement, money laundering, etc., and improve the trust of users. At the same time, improving enterprise risk control measures, establishing a strict risk warning mechanism, and timely discovering and handling risk events can further ensure the security of funds. By realizing the traceability and transparency of fund flow, in addition to basic risk control indicators such as enterprise balance sheet, cash flow statement, cash flow statement, and owner's equity change statement, it is also possible to establish a more comprehensive and precise risk control model by collecting transaction data and logistics data from various links of the supply chain. This helps to reduce loan default rates and improve the sustainability of financing.

In addition, credit investigation is an essential task before conducting transactions and financing processes. With the widespread application of blockchain technology, the problem of information asymmetry has been improved to some extent. However, in this process, the platform still needs to strengthen credit investigation work to ensure the authenticity and openness of enterprise information. Especially for small enterprises in the downstream link, due to incomplete registration information, credit investigation is particularly important. In the future, the platform can integrate the information of the People's Bank of China's credit investigation system with its own platform's credit investigation system information, so as to obtain the credit status information of the enterprises on the chain more comprehensively and conveniently, and dynamically adjust it to promote the smooth development of both parties' businesses. While ensuring the privacy of users, the authenticity of the credit rating system should also be identified to ensure its correctness and reliability.

5.2. Government

The government should also play a role in promoting and guiding the application of blockchain technology. On the one hand, local governments should provide innovative policies, promote basic research and technological innovation, and provide special funding support for promising projects of enterprises. On the other hand, they should continue to create an entrepreneurial environment, rationally plan industrial parks, provide more platforms for school-enterprise cooperation, facilitate the integration of blockchain technology with production, learning, and research, facilitate further cooperation and exchanges, and promote breakthroughs in key technologies.

5.3. Financial Institutions

Financial institutions should establish a sense of innovation, optimize the supply of supply chain financial products, and develop platforms. On the one hand, financial institutions can use platforms to help them accumulate customers, better carry out business with the help of platforms, and enhance the competitiveness of enterprises. On the other hand, financial institutions should form a competitive momentum of chasing each other, constantly optimize the development model in the competition, promote blockchain technology to better serve the supply chain financial platform, enhance the influence of blockchain technology, and constantly promote the platform.

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