



Research on the Application of Blockchain Technology Based on the Credit Mechanism for the Issuance of Green Bonds

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Abstract. Green finance has gradually become a mainstream global investment trend in recent years. Green bonds provide flexible and cost-effective financing solutions. Issues of green bonds face many obstacles, including a lack of credit, incomplete information disclosure among different sectors, information asymmetry, and “greenwashing”, so exploring the credit problem of green bonds is important. This paper will use the theory of information asymmetry and integrate blockchain with monitoring of “greenwashing”. By implementing blockchain technology, green bonds can be issued without being greenwashed, namely how a technical framework for implementing green bonds can be built using blockchain technology.

Keywords: Blockchain · green bonds · information asymmetry

1 Introduction

In recent years, green finance has gradually become a mainstream global investment trend and is highly recognised by global market participants. Green bonds, as a debt-based financial product with flexible financing terms and cost advantages, provide a solution for green finance financing. However, there are many obstacles in the process of issuing green bonds, such as a serious lack of credit, insufficient information disclosure among different sectors, information asymmetry, and the phenomenon of “greenwashing”. How to solve the credit problem caused by insufficient information disclosure is currently a major concern of the society. Blockchain technology plays a key role as a technological tool to enhance credit records and information disclosure and sharing. At present, the research on blockchain in the field of finance has been extremely extensive, and the related research on green bonds at home and abroad mainly focuses on the comparison of green bond certification and standards, the development path and prospect of green bond market, the comparison of Chinese and foreign standards for green bonds, the research on the application of green bond issuance and risk measurement, the research on the credit risk problem of green finance based on blockchain technology and the monitoring of green bonds. The problem of “greenwashing” is relatively rare. For green bonds, which involve more third-party intermediaries and various ratings and policies,

there are problems caused by information asymmetry, and it remains to be explored how to apply blockchain technology to improve such problems [1]. In view of this, this paper examines how blockchain technology can improve the problem of “greenwashing” of green bonds, specifically how blockchain technology will build a technical framework and how it will work.

2 Information Asymmetry Theory

The theory of information asymmetry, which was first studied in the 1970s, argues that there are differences in the degree of information available to subjects in a market economy, i.e. there is a clear information asymmetry between subjects, and the party with less information is often at a disadvantage in transactions. Information asymmetries are widespread among all actors in green finance, including financial institutions, governments, enterprises and individual residents [1].

Firstly, the financiers, including the borrowers and issuers of green bonds, are in an absolutely advantageous position in terms of information, while the lenders of green bonds or the approvers and purchasers of green bonds are in a disadvantageous position in terms of information. Secondly, compared to the direct participants in the green finance market, the regulators are at a disadvantage in terms of information, and have insufficient access to information on the green bond approval process, the management of funds at a later stage, and the effects of environmental improvements, which directly undermines the efficiency of government supervision and opens up a gap for “greenwashing” [2]. Finally, the information disadvantage of the public, the media and NGOs reduce the effectiveness of external supervision of green finance, making it impossible to detect and correct greenwashing practices in a timely manner [3].

In general, the key to preventing greenwashing is to reduce the level of information asymmetry and to establish an effective information linkage mechanism. In view of this, the following section will focus on solving the information asymmetry problem to improve the “greenwashing” monitoring problem [4].

3 Blockchain

Blockchain, an underlying technology of Bitcoin, and the essence of blockchain is a decentralised distributed ledger. The advantages of blockchain technology have a high fit with the development of the financial market.

One of the main features of blockchain is decentralisation. There is no central management body in blockchain, each node has equal rights, and the whole network is maintained by each node together. Blockchain technology simplifies the transaction process, improves the efficiency of transactions, reduces transaction costs and enables direct connection of various nodes in the entire network. Each node can participate in the production of blocks and share the contents of the blocks, while ensuring the accuracy and consistency of the block contents.

Blockchain also offers information traceability and immutability. Blockchain is a chain structure consisting of multiple blocks, and each block is time-stamped so that users can easily trace all the information. Each node has full reciprocal rights to the

same ledger, the information in the ledger is highly transparent and the system identifies the ledger with the highest number of identical blocks as the true ledger, making it meaningless for a single user to tamper with the ledger.

Blockchain also has the advantage of being de-trusted. The trust between the two parties in a blockchain is derived from a common algorithm, and any malicious deception will be rejected by the system through the technology to establish trust.

4 Application of Blockchain Technology to Green Bond

The operational mechanism of green bonds consists of three main components: issuance, circulation and redemption. Firstly, at the issuance stage, the bond issuance audit department will judge the “green” nature of the projects to be raised and whether the green projects to be raised fall within the scope of green industry projects. The issuer is required to engage a consultant to quantify the “greenness” of the proposed green bond issue and issue a green certification report. During the payment phase, the issuer will set up a separate account for the special management of the funds raised, regularly disclose the specific use of the bond funds to investors and regulatory authorities, the third-party authoritative green certification bodies will authenticate and certify the use of the funds raised from the proposed green bond issue, and a credit rating agency will continuously track the rating of the green bond and its issuing entity. Finally, the issuer will make timely repayment of principal and interest to bond investors.

4.1 “Blockchain and Green Bonds” Framework Design

Firstly, the parties involved in green bond issuance can follow the progress in real time through the platform, which reduces manual intervention, safeguards the security of repayment and effectively controls the risk of default. Coupled with the automatic clearing function based on smart contracts, debt issuers and third-party institutions only need to record information into shared blocks, and the individual blocks can transfer information to each other and achieve interoperability. Secondly, each chain is updated in real time with the progress of work generated by the debt issuer, financial regulator, environmental regulator and each subject, including investment returns, economic value, environmental benefits, the specific flow of funds raised and the amount used. The use of data from the same source by different entities on the blockchain facilitates the flow of information between all parties, alleviating the problem of “greenwashing” and other credit problems caused by information asymmetry. Finally, a bond information sharing platform under the blockchain architecture is able to involve regulators as nodes in the operation of the platform, thereby achieving penetrating supervision of the entire chain (Fig. 1).

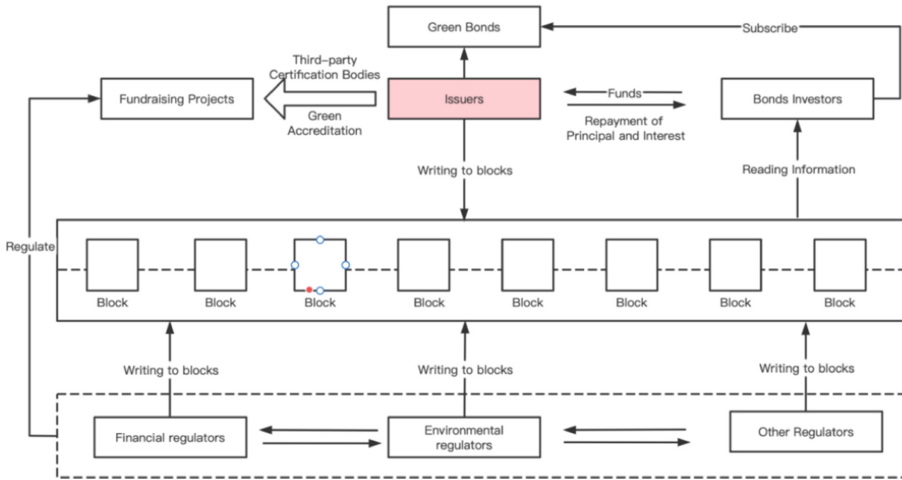


Fig. 1. New green bond process with Blockchain (Owner-draw)

4.2 Analysis of the Advantages of “Blockchain + Green Bond” Information Disclosure

The public disclosure of information and the introduction of blockchain jinx in the green bond issuance platform can improve the situation of information silos and data opacity in the issuance process, realize the information sharing of the whole green bond issuance process, solve the problem of untrustworthy information on the capital side and data of the bond issuer, and let the core enterprises gain trust from the bond issuer, and also reassure the investors. It helps investors to accurately grasp the financial status, asset income and expenditure and operational capacity of the bond issuer, avoiding the problem of adverse selection caused by information asymmetry and playing a positive role in increasing investors’ willingness to invest.

On the basis of the traditional single green bond operation, the business function of the blockchain distributed ledger makes it possible for all information (changes) to be stored and backed up at participating nodes, which ensures the security of transactions and the accuracy of ratings while also alleviating the problem of green project SMEs having difficulty in raising funds due to the lack of their own data. On the other hand, based on the traceability of the blockchain, the regulator is able to track the inflow and outflow of the debt issuer, which urges the debt issuer to regulate the use of funds, improves the efficiency of the use of funds, and realises the visualisation of the flow of funds throughout the chain. At the same time, regulators can automatically track and monitor the risks associated with the chain, reducing the compliance burden on financial institutions and environmental regulators, improving the efficiency and accuracy of regulators’ supervision of green bonds, and greatly reducing regulatory costs.

5 Conclusion

The green finance sector has made remarkable achievements in countries around the world, but there are still many problems caused by information asymmetry, one of which is the phenomenon of “greenwashing”. Blockchain technology has shown disruptive potential in the financial sector. Using blockchain technology to help the development of green finance can solve a series of problems in green bond issuance, such as low enthusiasm for participation, low efficiency, high transaction costs, lack of information sharing mechanism, and difficulty in supervision [5]. At present, the problem of consistency of standards of various third parties in constructing credit risk assessment, using blockchain technology still has certain limitations. The research in this paper aims to study the framework design of blockchain technology applied to green bonds from the theory of information asymmetry in order to break the development bottleneck of green bonds, and research is still pending on how to quantify the information that needs to be stored so as to promote better synchronisation of information.

References

1. Xia Yuemei., Zhao Huawei. (2020). Research on Credit Risk Prevention Mechanism of Agricultural Supply Chain Finance Based on Blockchain. *Hainan Finance*, (5), 82-87.
2. Katten, G. (2021). Issuing Green Bonds on the Algorand Blockchain. arXiv preprint [arXiv: 2108.10344](https://arxiv.org/abs/2108.10344).
3. Malamas, V., Dasaklis, T., Arakelian, V., & Chondrokoukis, G. (2020). A Block-Chain Framework for Increased Trust in Green Bonds Issuance. Available at SSRN 3693638.
4. Zhao, W. (2022, April). Greenwashing Behavior in China’s Green Bond Market and Countermeasures. In *2022 7th International Conference on Social Sciences and Economic Development (ICSSSED 2022)* (pp. 1097–1101). Atlantis Press.
5. Jin, J. Y., & Zhao, R.. (2019). Research dynamics of blockchain technology in green finance. *Finance and Accounting Monthly*, (13), 172-176.

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