Research on the Cross-border Payment Model of Central Bank Digital Currency Based on Blockchain Technology

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Keywords: Blockchain technology; Central bank digital currencies; Cross-border payment; Technical challenges; Financial governance

Abstract: Continuing innovations in blockchain technology and central bank digital currencies are ushering in a new era for cross-border payments. This paper discusses the changes brought about by combining blockchain technology and central bank digital currencies, analyzing user needs and market trends of digital currencies, and the expansion of the blockchain industry. However, this process is also accompanied by a series of challenges, including the excessive application of technology, which may lead to the imbalance of the financial system, the lack of supervision, which may lead to financial operation, and the birth of risks under blockchain domination. To solve these problems efficiently, we propose three major coping strategies: technological upgrading to achieve high-quality migration of central bank digital currency, institutional optimization and financial governance of central bank digital currency, and financial recovery. Finally, this paper emphasizes strengthening internal circulation quality control, building interaction and perception mechanisms, and establishing an evaluation system to achieve high-quality development of the central bank's digital currency, thereby boosting cross-border payments to meet user needs.

1. Introduction

The development of central bank digital currencies is one of the responsibilities in the financial sector and one of the achievements of digital currency development. It can be divided into basic digital currency and non-basic digital currency, which are issued by central banks and commercial banks, respectively. To promote financial innovation, managers of central banks use blockchain technology for cross-border payment of digital currency. Since the emergence of blockchain technology, it has become the key to the financial sector, and the central bank's digital currency has become an important evaluation indicator. Compared to the traditional financial system, the central bank's digital currency attaches importance to blockchain technology, digital payment, and cross-border financial transactions. Therefore, we propose the issue of cross-border payment of central bank digital currency based on blockchain technology, and blockchain provides technical support for the financial sector [1].

Blockchain technology originates from the idea of a distributed ledger as the core. Its technical architecture contains decentralization and is also one of the tools of central bank digital currency [2]. From the perspective of the structure of blockchain technology, it pursues decentralization and combines distributed ledgers with cryptography to modernize digital currencies. Today, blockchain technology has implemented a unique path of digital finance. The comprehensive advancement of blockchain has not only changed the ways of financial transactions but also outlined the future of the digital economy. In addition, it will change the development trajectory of digital currency and have a profound impact on cross-border payments. Therefore, discussing cross-border payment by digital currency must have innovative thinking and international patterns. For the rapid development of blockchain technology, we put forward the proposition of cross-border payment of central bank digital currency.

To sum up, blockchain technology is the technical condition and guarantee of central bank digital currency. From a development perspective, blockchain technology has progressed, but some things

  DOI: 10.25236/ieesasm.2023.034

could be improved. Relevant personnel must still find an effective path to high-quality development and continue working hard. Therefore, blockchain technology requires continuous innovation, which not only promotes the development of finance but also is the future development direction of central bank digital currency.

Based on the above background analysis, this paper proposes a central bank digital currency cross-border payment model based on blockchain, aiming to solve problems in cross-border payments. We used theoretical analysis and practice to address the technical challenges of cross-border payment of central bank digital currency [3]. The main content of this paper is a discussion on the application of blockchain technology in central bank digital currency, which effectively addresses cross-border payment risks and has important practical and policy significance.

2. Blockchain Technology and New Changes in Central Bank Digital Currency

2.1 Innovation of Blockchain Technology

Blockchain technology is a concept developed with the central bank's digital currencies. It shows distribution and decentralization, highlights the future orientation of digital finance, and reflects the innovative strategies in the financial sector since the digital revolution. However, when we use some traditional financial standards to construct the definition and essence of blockchain technology, it is still difficult to get a clear conclusion.

The core of blockchain technology lies in decentralized ledger records and smart contract functions, which provide a new technical approach for realizing central bank digital currency. The centralized structure and complex intermediary links in the traditional financial system often lead to high transaction costs and low efficiency. The innovation of blockchain technology lies in the completion of fast and low-cost transactions through decentralized and secure distributed ledger records, providing unprecedented opportunities for cross-border payment of central bank digital currencies.

The innovation of blockchain technology content also means that the financial sector must re-examine its model and strategy to adapt to the new era of digital finance. This innovation involves not only the technical level but also the comprehensive reform of the financial system, regulatory policy, and financial business model, which brings great challenges and opportunities for realizing the central bank's digital currency.

2.2 Central Bank Digital Currencies, Blockchain and Cross-border Payment

2.2.1 Analysis of Central Bank Digital Currency and User Demand

User demand for digital currency is an important benchmark representing the demand for digital currency. Scientists have defined central bank digital currency from multiple perspectives, such as user needs and expectations. In addition, some scholars believe that user needs are a degree or an application field. Because user needs are diverse to some extent, it is a multi-dimensional science based on user experience. The evolution history of user demand can even be traced back to the establishment of the financial system, and its main activities include payment, savings, and investment. The concept and technology of digital currency are closely related to the development of financial innovation. Through digital currency, the central bank has become an important responsible party. The main contribution of user needs theory to different stages of financial system development is to improve the convenience of financial transactions. Therefore, user demand initially focused on the payment experience based on the standard attributes of financial transactions [4].

User demand analysis plays a key role in developing central bank digital currency. Managers not only need to pay attention to the user's payment, settlement, savings, and other needs but also need to investigate the characteristics and preferences of various user groups to provide a wide range of financial services. Therefore, the design and implementation of central bank digital currency must comprehensively consider users' needs to ensure its successful application and promotion.

2.2.2 Central Bank Digital Currency Decisions Driven by the Blockchain Market

Unlike traditional finance, blockchain technology has innovative characteristics, emphasizing the

relationship between decentralization and distributed ledgers. Although some scholars have questioned that the blockchain may not be directly related to the central bank's digital currency, most experts advocate that the blockchain can make a rational evaluation of the development of the central bank's digital currency. Nakamoto et al. proposed the classic consensus model of blockchain that includes decentralization, distributed ledger, and other elements. Since then, this model has become a typical tool of blockchain, and the concept of blockchain has been developed from this [5]. Scholars believe that the blockchain is highly secure and is a "trust machine". Only when the participants reach a consensus will the blockchain operate effectively. Therefore, blockchain technology is an important support tool for central bank digital currency.

Furthermore, blockchain boils down to a consensus-based public chain model and a permission-based alliance chain model. The former focuses on openness and transparency, while the latter focuses on authorization management, that is, the management of diverse blockchain application scenarios. Blockchain technology has experienced some practical failures, but from the perspective of a financial system innovation, it can drive changes in the financial sector. Subsequently, blockchain has gradually become the consensus of research and practice in the financial sector. The development and innovation of the blockchain market have promoted the decision-making of the central bank's digital currency. They are more in line with the future needs of the financial sector [6].

2.2.3 Extension of the Blockchain Industry Chain

The essence of the extension of industrial blockchain focuses on the application extension of blockchain technology. It is the application of distributed ledger thinking in various fields. It aims to overcome the shortcomings of the previous centralized model and enter the research field as an alternative model-blockchain framework. The basic idea of the framework is as follows. First, blockchain technology should ensure the security and credibility of data. Second, set professional standards for applications in different fields. Third, collect data and transaction information through technologies such as decentralization. Fourth, smart contracts are used to verify the legitimacy of transactions. The blockchain framework reconstructs the traditional industrial chain, attaches importance to data security, and improves the credibility, transparency, and traceability of data. The emergence of scalability will provide new ideas and methodologies for innovation in this field, facilitating the expansion of the scope of blockchain technology from finance to supply chain, healthcare, logistics, and other fields. In summary, it strongly supports achieving digital transformation and improving data security.

3. The Challenges Posed by Central Bank Digital Currency and Blockchain

3.1 Central Bank Digital Currency: Overuse of Technology Causes Financial System Imbalance

The chaos of central bank digital currency is the main challenge brought by the application of central bank digital currency and blockchain technology, which reflects that excessive application of technology may lead to the imbalance of the financial system. Through them, we can observe the changes and challenges of the financial system. Some constituent elements of the development of the central bank's digital currency are gradually being formed, and various evaluation systems have gradually received attention. However, from the application perspective, the practice of some central bank digital currencies remains experimental, which is inconsistent with the logical framework and generation mechanism of central bank digital currencies. As a result, there is confusion and uncertainty.

These issues concern not only the technical level but also the stability of the financial system and the rationality of regulatory policies. The rapid development and application of central bank digital currencies could have a significant impact on financial institutions, payment systems, and monetary policy. Therefore, a clear policy and regulatory framework must be developed to address this challenge and ensure financial system stability and sustainable development.

3.2 Financial Operations under Overreaching Supervision

Central bank digital currency involves the interaction between regulation and financial operation. Supervision is the basic link of the central bank's digital currency and the core manifestation of financial operations. Therefore, managers take supervision as the primary generation logic. Supervision is the control of the central bank's digital currency, and it is also one of the ways of financial operation [7]. At this stage, relevant managers strengthen the control of central bank digital currency from multiple dimensions. There are three main forms: The first is regulation transparency. Clarify the role of supervision in the issuance and circulation of digital currency. The second is regulatory standardization. By formulating regulatory policies, regulatory standards, and disclosure to the market, standardized supervision control is achieved. The third is the internal process reengineering of supervision. In recent years, regulatory agencies have used digital means to improve regulatory efficiency and their level of intelligence. However, compared with financial operations, the transparency and efficiency of regulation need to be further improved [8].

There is tension between the development of central bank digital currency and the operation and supervision of financial operations. In the development of central bank digital currency, we need to balance regulatory and financial innovation to ensure the stability of the financial system and fair competition in the market. Therefore, building a flexible, efficient, and transparent regulatory mechanism is essential for the sustainable development of the central bank's digital currency to avoid the problems caused by regulatory overstepping. A central bank cross-border digital currency payment model based on blockchain technology is shown in Figure 1.

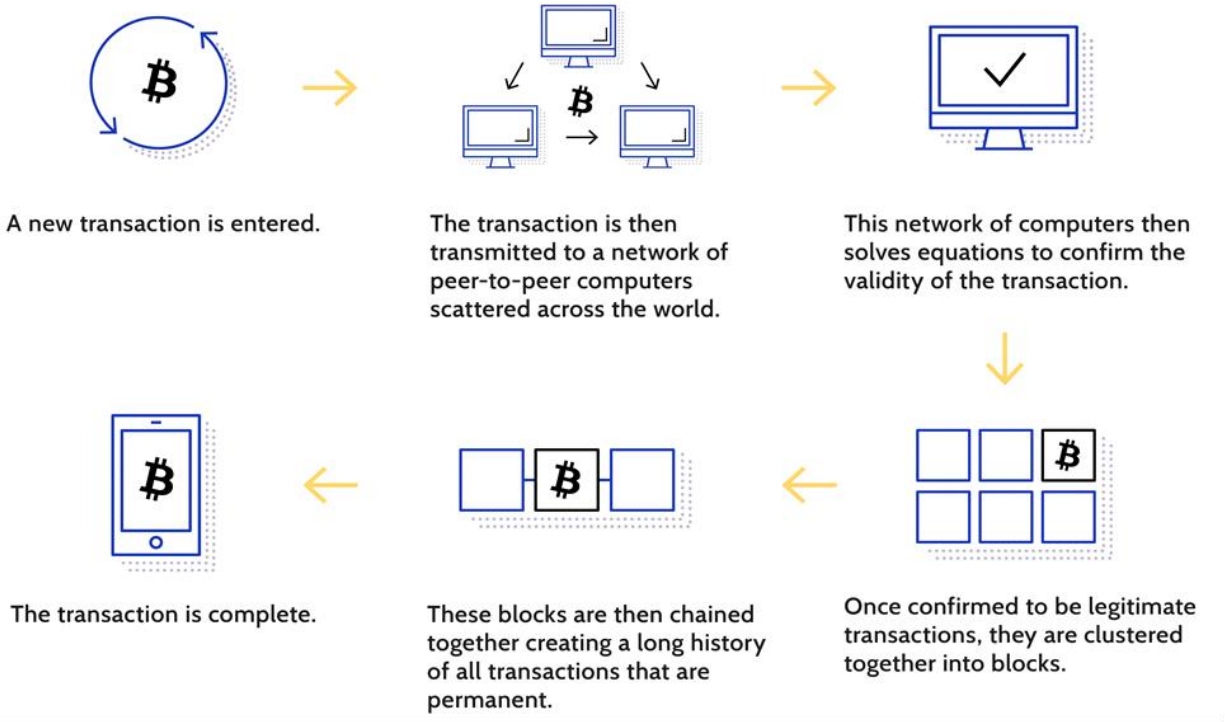

Figure 1 A central bank cross-border digital currency payment model based on blockchain technology

3.3 Derivative Risks under the Rule of Blockchain

The fundamental difference between blockchain technology and traditional finance lies in its decentralization. The transaction standards and financial standards of the blockchain aim to eliminate intermediaries, and their development mainly embodies decentralization and traceability. For blockchain innovation, accurate recording, transparency, traceability, and non-tampering are the core values and highest standards for blockchain development. Currently, the diversity of blockchain types and application fields has led to a diversified trend in the field of blockchain. Blockchain technology has great potential, and the blockchain lacks a unified governance mechanism due to imperfect standards. Therefore, the shortboard is generated, which affects the sustainable development of

blockchain.

The decentralization of blockchain has brought a series of new risks, such as data privacy issues, smart contract vulnerabilities, network attacks, and insufficient supervision. These risks may cause confusion in the financial system, damage the rights and interests of users, and cause financial instability. Therefore, managers need to continuously strengthen supervision and standard-setting in the field of blockchain to prevent and respond to the birth of these derivative risks and ensure the sustainable development of blockchain technology.

4. Strategies for the Development of the Central Bank Digital Currency Industry under Technical Challenges

4.1 Technological Improvements to Achieve High-quality Digital Currency Migration

The fundamental difference between blockchain technology and traditional finance is its decentralization. The transaction and financial criteria of blockchain are to eliminate intermediaries, and its development mainly reflects decentralization and traceability. In addition, the diversity of different blockchain types and the differences in application fields lead to the diversification of blockchains. Blockchain technology has great potential, and it needs a unified governance mechanism due to imperfect standards. Therefore, the shortboard is generated, which affects the sustainable development of blockchain.

The decentralization of blockchain has brought a series of new risks, such as data privacy issues, smart contract vulnerabilities, network attacks, and insufficient supervision. They will cause confusion in the financial system, damage the rights and interests of users, and cause financial instability. Hence, managers need to strengthen supervision and standard-setting in the field of blockchain to prevent and respond to derivative risks and ensure the sustainable development of blockchain technology.

4.2 System Optimization and Financial Governance

From the perspective of financial sharing, the central bank's digital currency cannot provide the comprehensive information needed by the financial system. The central bank's digital currency is mainly in the form of satisfaction evaluation of financial operations but needs comprehensive financial information and regulatory mechanisms. The core of this problem may be information asymmetry. In financial sharing, information asymmetry usually brings "moral hazard", which directly reflects the information limitations on the stability and efficiency of financial markets. However, most of the financial information is about transactions, and for others, the information needs to be more comprehensive. Usually, some important financial information is difficult to obtain or measure. Information asymmetry and imperfect regulatory mechanisms directly cause obstacles to financial sharing.

To meet this challenge, we must establish a more comprehensive financial information system and strengthen risk management and supervision mechanisms to address information asymmetry and financial risks. The development of central bank digital currency will optimize the financial system and strengthen financial governance, achieve financial sharing and risk management, and ensure the stability and sustainable development of the financial system.

4.3 Financial Recovery: Restoring Financial Sectors

From the perspective of financial recovery, the complexity of the financial system has affected the stability of the financial system for a long time. Since the 21st century, the new financial system has reshaped the financial industry through financial innovation. However, the shortcomings of the traditional financial system affect financial stability. Due to the introduction of new financial elements and the impact of the global financial crisis, the entire organizational system needs to be upgraded and improved. Under the premise of financial recovery, financial complexity is regarded as a difficulty in solving financial problems. However, the actual effect of financial innovation on financial stability remains to be discussed. At the same time, the difficulties in financial complexity

lead to the need for more effective tools for financial supervision. Therefore, financial recovery does not achieve the goal of financial stability. In conclusion, financial recovery is not just a technical issue but also faces challenges in regulation.

Solving the problem of financial complexity requires comprehensive regulatory and financial governance reforms to restore the essence of finance and ensure the stability and sustainable development of the financial system. Specific measures include establishing a strong management mechanism, strengthening risk management, and transforming the financial sector to serve the real economy to ensure healthy financial development.

5. Conclusion

Blockchain technology has profoundly affected the financial sector, which poses new challenges and requirements for the financial system. Blockchain is not only a symbol of financial innovation but also an important means. It meets the urgent needs of sustainable financial development and financial security and stability. It embodies the inherent requirements of finance. Under the guidance of the financial sector, we have built a financial theoretical analysis framework and practical mechanism for blockchain. In recent years, modern information technologies such as blockchain have promoted innovation in the financial field. Blockchain empowers financial transactions and the accuracy of information, which fits the internal logic of finance. Therefore, blockchain provides a new way for the financial sector. In conclusion, the sustainable development of blockchain will better meet the needs of the financial sector and promote innovation and sustainable development in the financial sector.

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