Research on the Opportunity and Development of Fiat Digital Currency in Cross-Border Payment

Zhenao Huang[1][a], Jiayuan Wang*[2][b] and Jiahao Zhang[3][c]
[1]*Qingteng Alcanta International College, Guangzhou, 510000, China*
[2] *School of Economics, Huazhong University of Science and Technology, Wuhan, 430074, China*
[3]*Sanya Fenghe School, Sanya 572000, China*

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Abstract: The rapid development of the digital economy has provided a strong impetus for the rise of cross-border e-commerce, and has also accelerated the process of global cross-border trade's transformation to digitalization. Against this background, the cross-border payment industry's growing demand for legal digital currency has become a hot topic of concern in the industry. This article will deeply analyze the development of legal digital currency in the field of cross-border payments (CBP), and explore its advantages and challenges in practical applications, in order to provide a useful reference for related research and practice. This paper concluded that central bank digital currencies (CBDC) has three different interaction modes in cross-border payment: compatible mode, interconnection mode, and single platform mode. CBP has some potential in improving payment efficiency, reducing transaction costs, enhancing process transparency and ensuring transaction security. This paper points out the technical challenges, international cooperation and governance issues, and monetary policy and financial stability challenges of CBP in cross-border payment, and makes suggestions for improvement. It is hoped that these suggestions can provide reference and inspiration for promoting innovation and development in the field CBP.

1 INTRODUCTION

In recent years, global cross-border trade has grown rapidly. From 2011 to 2021, global commodity trade exports and commercial services exports have increased by 22% and 36%, respectively (Song, 2023). The rapid rise of digital economy has promoted the vigorous development of cross-border e-commerce, promoted the digital transformation of global cross-border trade, and significantly improved trade efficiency. As a key link of international trade and investment, cross-border payment (CBP) is a bridge between the supplier of goods, the demanders of goods and the settlement and payment intermediary (Feng et al., 2022).

The robust development of the global economy relies heavily on the efficiency and security of CBP. Currently, existing CBP systems mainly rely on the agent banking model, which has problems such as higher costs, longer processing times, and lower transparency. In the context of the increasing integration of the global economy, the demand for legal digital currencies in the field of CBPs is rising (Zhu, 2024). As an emerging financial infrastructure for CBPs, legal digital currency is expected to significantly improve the security and efficiency of CBPs through technological innovation (Zhang et al. 2021). CBP also has the characteristics of convenience and privacy, and on the basis of the existing electronic payment, it can make offline payments.

Compared with the development and practice of CBP system, the theoretical research on CBDC of CBP system is still in its infancy. Du (2020) believes that central banks' indecision on interoperability (interoperability) has limited the development of CBP systems. Inozymtsev and Inozemlsev & Nektov (2022) proposed that existing banking laws, antitrust

[a] https://orcid.org/0009-0005-3112-8730
[b] https://orcid.org/0009-0002-1549-6830
[c] https://orcid.org/0009-0008-4742-6419

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laws and personal data protection systems restrict the development of CBP systems. Domestic scholars' research on CBP mainly focuses on discussing the gain of CBP and its CBP system to the international payment system from the macro level (Shen , 2023), and analyzing the difficulties encountered by CBP from the micro level. Among them, the recognition of monetary sovereignty contradiction and extraterritorial effectiveness, the lack of systematic rules and standards in the international monetary system (Yang, 2023), and the lack of innovation of international regulatory rules and coordination mechanisms (Yuan, 2022) are considered as the main reasons restricting the construction of CBP system. In general, although foreign scholars have realized the benefits and functions of building a CBP system (Rainer, 2020) However, most foreign studies on CBP system can only be analyzed from a single perspective. Compared with foreign research, domestic research lacks more necessary summary of the development progress of CBP system, and also lacks detailed exploration and effective response to the challenges faced in the construction of CBP system.

This study aims to explore the application prospect of CBP in CBP and analyze its potential in improving payment efficiency, reducing transaction costs, enhancing process transparency and ensuring transaction security. Reviewing the international multilateral CBP experimental project, this paper further discusses the realization of digital RMB CBP in China. This paper aims to provide reference and inspiration for promoting the innovation and development in the field of CBP.

2 THE RISE AND DEVELOPMENT OF CENTRAL BANK DIGITAL CURRENCY (CBP)

2.1 Basic Concepts and Classification of CBDC

Legal digital currency is a currency issued by the central bank based on national credit and with legal payment ability. It represents the encrypted digital string of the specific amount, with the national credit as the endorsement, is the digital form of paper money, and undertakes the market circulation obligation of money. Functionally, the CBP application of CBDC is divided into three categories: first, as a supplement to small cross-border transactions for local currency; second, widely replacing some countries to become the payment means of cross-border trade and accounting unit, and may even replace the domestic currency; third, it may become a multi-polar international currency, which will serve global transactions and become a common legal digital currency. Monetary internationalization is influenced by economic weight and geopolitics, and the network effect strengthens its international status and is widely recognized to promote more adoption. From the perspective of issuing objects and usage scenarios, there are two categories for CBDC: retail and wholesale. Retail CBDC (rCBDC) is mainly for the general public and merchants, and it wants to replace cash in many small-scale retail transactions on a daily basis. It provides a convenient and efficient means of payment, and can help to promote financial inclusion and reduce transaction costs. Wholesale CBDC (wCBDC). Different from retail CBDC, wholesale CBDC is mainly oriented to commercial banks, financial institutions and some chartered institutions. It is mainly used for large payments and settlement, aiming to lower systemic risk and enhance the financial system's security and efficiency.

In terms of regulation, the management of retail CBDC is relatively complex because a suitable balance must be found between regulatory requirements for anti-money laundering and counter-terrorist financing and user privacy protection. The central bank needs to formulate strict regulatory policies to ensure the legal and compliant use of retail CBDC. Wholesale CBDC is different from retail type. Because wholesale CBDC is mainly oriented to financial institutions, its supervision difficulty is relatively low. Financial institutions usually have higher compliance awareness and risk management capabilities, so the central bank can more centrally monitor the use of wholesale CBDC to ensure that they meet the requirements of financial stability and security.

2.2 Global CBDC Research and Development Status and Trends

By the end of 2022,93% of the central banks had participated in CBDC research, 75% had studied wholesale and retail types, which were progressing even faster, and 25% had been piloted, twice that of the wholesale pilot banks. Emerging economies outpace advanced economies with 29% pilot retail and 16% pilot wholesale; 18% and 10% respectively. The BIS Innovation Center supports the project of exploring CBDC of CBP applications. The BIS

Singapore Innovation Center is in charge of the Dunbar project, which focuses on designing the digital currency platform for multilateral central banks. The central banks of many countries initiated the m-CBDC Bridge project. From August to September 2022, it has successfully carried out the first pilot transaction in a real environment, involving 20 banks, completed more than 160 cross-border businesses, and completed the settlement of more than 22 million US dollars.

3 ADVANTAGES OF CBDC IN CBP

3.1 CBDC

Compatibility mode realizes the interoperability among the digital currency systems of various central banks through unified international standards. These standards include formats for information transmission, encryption techniques, and requirements for information protection, and so on. Independent digital currency infrastructures for central banks will be established by various countries and regions and achieve interoperability through agent banks while adhering to unified standards. This mode is mainly focused on upgrading the domestic payment system in each country digitally, and basically does not involve the construction of new CBP infrastructure or the modification of the CBP process.

Interconnected mode refers to the information, money directly on different block chain platform, different CBP system can be realized through sharing technology interface system direct interconnection, and determine the system settlement final agreement, make the central bank closer connection between digital currency platform. Hash time lock contract technology (HTLC) is a technology that is both mature and common when it comes to cross-chain interaction. The advantage of this model lies in ensuring timeliness and mutual trust, but there are some limitations of low scalability and low compatibility. The interconnection mode necessitates hundreds of thousands of transaction channels secured with hash time locks, and it demands that both blockchains adhere to the same hashing algorithm, with each party maintaining a transaction account on the identical blockchain

The single platform model refers to a method in which central banks of various countries directly implement CBP by collaboratively participating in the same blockchain platform. This model applies the concept of a multilateral payment platform to cross-border payments of CBDC, enabling countries to directly hold and trade CBDC through a unified payment platform (Liu, 2023).

The core features of this model are multi-center monetary control and distributed operation architecture. Specifically, the central bank maintains specific nodes on the blockchain to facilitate supervision of the issuance, redemption and circulation of CBDC within its jurisdiction. At the same time, commercial banks still bear the actual operation and operation of CBP. The main advantage of this single platform model is that it avoids cross-chain problems and saves the time and cost required to involve different blockchain intermediaries, thereby performing well in economic efficiency and compatibility.

In summary, the single platform model not only provides an efficient and controllable solution for cross-border payments, but also improves the flexibility and reliability of the entire payment system through a combination of centralized management and distributed operations. This enables countries to enjoy the convenience brought by the digital economy while maintaining monetary sovereignty.

3.2 CBDC Mechanisms to Improve the Efficiency of CBP

CBDC adopts a centralized management mode, which is under the direct supervision of national institutions, which significantly improves the transaction speed of CBDC in CBP. Traditional CBP involve multiple intermediary agencies, including banks, clearing houses and so on, resulting in a complex and time-consuming transaction process. CBDC can conduct transactions directly between sender and receiver, directly between central banks or between central banks and commercial banks, without going through multiple intermediaries, that is, supporting peer-to-peer payments. Peer-to-peer transactions shorten the payment chain as a whole, reduce unnecessary costs and capital circulation time, thus simplifying the process, and accelerating the speed of capital transfer (Zhong, 2023). This payment method greatly reduces the transaction time, allowing CBP to be paid in seconds. At the same time, the CBDC of CBP system can rely on decentralized trusted verifiers to complete the settlement, who ensure the accuracy and imtamability of transactions through the consensus mechanism (Wang , 2023). In this way, CBDC can have "24 hours 7 days" access, which not only improves the clearing efficiency, but

also reduces the dependence on a single centralized clearing institution, and enhances the stability and risk resistance of the system..

3.3 CBDC Ways to Reduce the Cost of CBP

The peer-to-peer payment mentioned above not only improves efficiency, but also greatly reduces the number of agent banks and the overall settlement cycle in the process of cross-border transactions, thus reducing the cost of cross-border transaction settlement (Zhang, 2023). This design makes CBP more economical and efficient, especially for small cross-border transactions, which can significantly reduce fees. Due to the CBDC of CBP system can reduce the dependence on external accounts, and trade account deposit funds is the main part of the CBP costs, CBDC help Banks one implementation with other Banks, can significantly reduce the number of foreign trade accounts and required money, the current account of liquidity costs is further reduced (Wang, 2023). Concurrently, the cross-border usability of fiat digital currencies can lower the expenses associated with acquiring, storing, and transacting in foreign currencies (Pan, 2022).

3.4 CBP's Potential to Enhance the Security and Transparency of Payment Systems

CBDC of CBP systems widely adopt blockchain technologies and encryption technologies, and the application of these technologies greatly improves the security of payment systems. The immutability of blockchain and the security mechanism of encryption technology ensure the security of transactions and the integrity of data. Since all transaction records are stored on the blockchain, the transparency of CBDC of CBP has been significantly improved, and anyone can query and verify them. Related practice shows that in a single platform mode of multilateral central bank digital currency system, the central bank digital currency system can through a higher degree of interoperability to improve the traditional CBP model, information flow and capital flow included in the same system, expand the operating time and access scope, for different countries or regions do not match, lack of timeliness, transparency, has a significant improvement effect (Song, 2022). The direct supervision of state institutions controls the digital currency of the central bank, the operation process is smooth, the openness and neutrality, the liquidity risk is greatly reduced, the security is guaranteed, and the reserve force is strong (Zhang, 2022). By enhancing transparency and security, CBP not only enhances users' trust but also provides effective regulatory tools for regulators. Legal digital currencies show unique advantages in CBP, such as supporting the principles of anti-money laundering, anti-terrorist financing and anti-tax evasion, to ensure the stability and sustainability of the payment system (Zhang, 2021).

With the progress of the multilateral central bank Digital Currency Bridge project (m-CBDCBridge) mentioned above, the advantages of CBDC in CBP have been reflected. According to the 2021 Bank for International Settlements report, the multilateral bridge project is more efficient in cross-border trade, with CBP operations completed within 10s, which will save 50% of cross-border fees (Liang, 2022).

4 EXISTING CHALLENGES AND PROBLEMS OF CBDC OF CBP

Based on CBDC of CBP system research and development practice and trend, CBDC of CBP system construction process will face some countries forced monopoly and refused to cooperate, lack of international standards lead to the lack of system interoperability, domestic regulatory system difference system friction, lack of system governance rules, advanced technology, affect the international social and economic stability and other challenges.

4.1 Technical Challenges

The debate and game of international standards has gradually risen from the technical to the strategic level, and from the institutional to the national level (Liu, 2021]). The upgrading of the scope and level of the game has led to further increased difficulty in formulating and implementing international standards.

Digital technology presents the characteristics of rapid iteration, dynamic upgrade, the longer the international technical standards, the more likely to appear for the old technology standard has not generated but new technology has appeared, the international standards cannot effectively respond to the CBDC of CBP system construction and development requirements.

In addition, blockchain technology, as a decentralized infrastructure and distributed

computing model, integrates multiple technological innovations such as distributed ledger technology, asymmetric encryption technology, and smart contracts (Guo, 2020). At present, blockchain technology is increasingly used in CBDC in cross-border payment systems. However, in the future, hackers may exploit digital technology or loopholes in the CBDC of the CBP system to package CBDC and exchange counterfeit currency for real currency, thereby causing the assets of participants on the chain to depreciate. This warning shows that the potential blockchain technology risks of CBDC in the CBP system in the future mainly come from security risks caused by technical loopholes.

4.2 International Cooperation and Governance

The imperfect financial data exit and user privacy protection systems in various countries restrict the circulation of data in CBDC and CBP systems. Cross-border monetary payment is bound to lead to the cross-border flow of financial data, but the current debate about the localization of financial data and the exit of financial data in various countries has not been properly resolved. In terms of international cooperation and governance, strict restrictions on the cross-border flow of financial data, while protecting privacy, have hindered the globalization of the CBDC system (Wen, 2021). In addition, the SWIFT system under the current international system may restrict the CBP of the non-US dollar system because to its deep binding to the United States and the US dollar (Shen et al., 2022).

4.2 Monetary Policy and Financial Stability

Cross-border use of fiat digital currencies may pose macro-financial risks. Countries' concerns about CBDC of CBP mainly come from the possibility that CBDC may undermine domestic monetary liquidity while disrupting the independence of currency issuing countries' monetary policy. Because in the traditional CBP transactions, strong currency has a "currency substitution effect" on weak currencies. In countries with high inflation and large exchange rate fluctuations, their own currency may be replaced by the legal digital currency of other countries, forming currency substitution, thus partially losing the independent monetary policy (Feng et al. 2022).

5 CONCLUSIONS

This paper mainly discusses the application prospects of CBDC in CBP. This paper concluded that CBDC faced technical and policy challenges in CBP. Its cross-border application should deal with different monetary policies, foreign trade policies, foreign exchange regulatory requirements, cross-border settlement mode and living habits of different countries. In addition, despite the potential of distributed ledger technology, its large daily volume of transaction processing requires high storage and computing capabilities, and no unified technology architecture has been developed around the world, affecting the wide application of CBDC. The application of digital technology may also lead to changes in the financial infrastructure, changing the form of risk. In traditional financial cross-border services, the desynchronization of clearing and settlement may cause risks, which also exist in the CBP system of CBDC.

In order to promote the development of CBDC of CBP, this paper suggests establishing a perfect legal framework, clarifying the legal status and application scope of digital RMB, and strengthening transaction security, privacy protection and traceability of funds. At the same time, it can enhance the adaptability of digital RMB in the existing CBP network, and improve its efficiency in CBP by analyzing and improving its design framework. Finally, the international competitiveness of CBDC can be enhanced by reducing intermediate links, reducing costs and improving transparency. Use blockchain and smart contract technology to improve system security, and strengthen international cooperation, to explore the application scenarios of CBDC.

AUTHORS CONTRIBUTION

All the authors contributed equally and their names were listed in alphabetical order.

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