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Research on the Application Scenarios of Central Bank Digital Currency

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ABSTRACT

Central Bank Digital Currency (CBDC), as a new form of legal tender, has attracted widespread attention worldwide. From the theoretical and empirical perspectives, this paper systematically analyzes the potential of CBDC in different application scenarios, its implementation effects and the challenges it faces, and puts forward corresponding suggestions. It is found that CBDC has a wide range of application prospects in the fields of cross-border payment, real-time payment, offline payment, securities settlement, etc., but it also faces challenges in technical implementation, legal regulation, privacy protection and financial stability.

KEYWORDS

Digital currency; Cross-border payment; Real-time payment; Offline payment; Securities settlement

1. INTRODUCTION

With the continuous progress of science and technology and the acceleration of global digitalization trend, central bank digital currency (CBDC) has gradually become an important part of the international financial system. As a legal tender in digital form issued and supervised by national central banks, CBDC shows great potential in improving the efficiency of payment systems, enhancing financial inclusion, and reducing transaction costs, and may have a far-reaching impact on the implementation of monetary policy and financial stability. Domestic and international research on CBDC mainly focuses on technical realization, payment efficiency and financial inclusion. Jing Xin (Literature [6]) prospectively analyzed the payment scenarios of legal digital currencies and discussed how to optimize these scenarios to improve efficiency and user acceptance. Jianjun Li and Shichao Jiang (Literature [5]) studied the commercial sustainability of bank fintech and financial inclusion, providing micro evidence of the financial enhancement effect. Their study has a positive effect on fintech in enhancing the commercial sustainability of financial inclusion. Jiao Jinpu et al. (Literature [3]) constructed a theoretical framework of digital currency and inclusive financial development and analyzed international practices and regulatory systems, and the study pointed out the role of digital currency in promoting inclusive financial development and the existing regulatory challenges. A report by the BIS Hong Kong Innovation Center (literature [7]) describes the development from the Inthanon-LionRock project to the mBridge project, which aims to build a multi-CBDC platform for international payments, demonstrating the potential of CBDC applications in cross-border payments and the technical path towards interoperability. A review of the interim report of the Multi-CBDC Bridge (mBridge) by the National Financial and Development Laboratory (Literature [8]) provides insights into the current progress and future direction of the project.

The study of CBDC is not only of theoretical significance, but also of important practical significance. By systematically studying the application scenarios of CBDC, it can provide reference for central banks and help them formulate and optimize their CBDC implementation strategies. At the same time, studying the potential risks and challenges of CBDC in different scenarios can help identify and prevent possible financial risks and maintain the stability of the financial system. Based on this, this paper aims to provide references for policy makers, financial institutions and academic research by studying CBDC in different application scenarios.

2. APPLICATION OF DIGITAL CURRENCY IN CROSS-BORDER PAYMENT

2.1. Application of Cross-Border Payment Scenarios

Compared with the traditional cross-border branch of the current global cross-border payment mainly relies on the agent bank + SWIFT model, subject to regional economic development and strict regulation and other reasons, the agent bank continues to withdraw from the market, resulting in cross-border payment costs rise. At the same time, agent banks will choose to withdraw from less developed regions first, cross-border payment demand to rely on the underground, insecure, unregulated mode to complete, is a huge challenge to financial stability. mBridge project is CBDC based on the cross-border payment interconnection of an attempt.

Jointly constructed by the BIS (Hong Kong) Innovation Center, the Bank of Thailand (Thailand's central bank), the Central Bank of the UAE, the People's Bank of China's Digital Currency Research Institute, and the Hong Kong Monetary Authority, the mBridge project has gone through several stages since the project was launched in February 2021, including model testing and pilot testing of real transactions through the MVP platform. The project aims to explore the application of central bank digital currencies in cross-border payments by developing pilot prototypes, further researching distributed ledger technology (DLT), and realizing 24/7 simultaneous settlement (PvP) settlement of cross-border transactions of central bank digital currency pairs, so as to facilitate the exchange of local and foreign currencies in cross-border trade scenarios.2024 In June 2024, the Central Bank of Saudi Arabia released a statement saying that it had joined the mBridge program.

2.2. Problems of Cross-Border Payment System

(1) Slow speed. Cross-border payments via SWIFT often take 2 to 3 working days, and such payment efficiency has been far from meeting the needs of international finance and trade development.

(2) High cost. The cost of cross-border payment mainly includes exchange rate fee, handling fee, transit fee and so on. The World Bank survey report shows that the average cost of global cross-border remittances rose to 6.2% in the three months ending June 2023, up from 6% a year earlier. High-cost cross-border payments affect financial inclusion and may also cause some transactions to turn into the underground economy, which is not conducive to international financial regulation.

(3) Non-transparent. One, cross-border payments involve numerous correspondent banking institutions, and it is almost impossible for both the recipient and the payer to predict the cost and time of the payment process, and it is also difficult to obtain real-time information about the exchange rate, which increases the uncertainty of cross-border payments, and affects the cost of hedging and insurance. Second, cross-border payments have low traceability and transparency, and there are deficiencies in anti-money laundering and other behavioral checks, exacerbating the risk of illegal financing. Third, the over-reliance of cross-border payments on third-party correspondent banking institutions may lead to problems such as difficulty in controlling the payment process, inability to track the status of payments and resolve disputes.

(4) "Weaponization". Financial sanctions and other means make cross-border payments politically risky, exacerbate the current crisis of trust in the cross-border payment system, and easily form a trust deficit in the financial sector.

2.3. Advantages of CBDC in Cross-Border Payment

(1) Cost reduction. By directly settling between central banks, intermediaries are eliminated, and handling and transit fees are reduced. Specific data show that the handling fee for cross-border payments using CBDC is only 30% of the traditional method, greatly reducing transaction costs.

(2) Enhancement of speed. Real-time settlement greatly shortens the cycle of cross-border payment from the traditional 3-5 days to a few seconds, making cross-border payment more efficient and convenient. The traditional agent bank cross-border payment mode in multilateral transactions needs to go through multiple nodes, which is also the current SWIFT operation mode. Although in recent years SWIFT launched SWIFT GPI, SWIFT Go, etc. to enhance the settlement efficiency, from the original days to minutes, but the transaction efficiency is still poor. mbridge transaction eliminates the intermediary links, and the transaction speed is able to reach the second level. To a digital RMB from China's mainland banks to the UAE banks through the digital currency bridge to see, from China's mainland banks in the bridge to initiate payment, until the digital person confined to reach the UAE commercial banks, the entire settlement process only took 6-9 seconds.

(3) Improve security and transparency. Blockchain technology and smart contracts can improve the transparency and security of transactions and reduce the risk of fraud. Each record is recorded on a distributed ledger, ensuring transparency and traceability of transactions.

(4) Improve cross-border trade autonomy. Bilateral transactions do not pass through the CHIPS system and SWIFT system, which can avoid possible financial blockades and sanctions.

(5) Effectively combat money laundering. CBDC can more accurately combat money laundering and tax evasion and other behaviors by strengthening international cooperation and applying more information traceable technology, and controlled anonymity is more effective than cash in combating crime.

3. APPLICATION OF DIGITAL CURRENCY IN REAL-TIME PAYMENT

CBDC users can make instant personal-to-person payments directly through the account or e-wallet system, which is of great significance for countries lacking a perfect payment system, and also provides a solution to the short-term payment needs of cross-border tourists. For example, during major international events such as the Beijing Winter Olympics, when tourists from all over the world come together, the demand for payments increases dramatically. Traditional payment methods such as credit cards, cash and international remittance often face problems such as complicated procedures, high costs and lack of security. It is taken the central bank digital RMB as an example to analyze the application of CBDC in large international events, which will provide valuable experience and reference for more scenarios to promote the application in the future.

3.1. Arrival and Accommodation

International tourists need to pay for accommodation, such as hotels and B&Bs, upon arrival. Through mobile apps or digital wallets, tourists can use CBDC to pay for accommodation instantly, without the need to carry large amounts of cash or use international credit cards. In the pilot of China's digital RMB (e-CNY), tourists realized a seamless check-in experience by scanning the payment code

3.2. Food and Beverage Consumption

Visitors need fast and convenient payment methods for food and beverage consumption inside and outside the Olympic venues. Through NFC or QR code scanning, visitors can use CBDC to make quick payments, avoiding the inconvenience caused by cash change or credit card fees. Pilot data show that digital RMB is widely used in catering consumption, with a high transaction success rate and fast payment speed.

3.3. Transportation

Visitors need to use public transportation or rent transportation to travel to various competition venues and tourist attractions. Paying for transportation using CBDC eliminates the need to exchange local currency or purchase a transportation card. Paying for subway and bus tickets through digital RMB can be done directly through cell phones, which is convenient and fast.

3.4. Tournament Tickets and Souvenir Purchase

Visitors pay for tickets and souvenirs through CBDC, avoiding the risk of carrying a large amount of cash while improving payment efficiency. In the digital RMB pilot, the ticket and souvenir sales points support digital payment, which enhances visitors' consumption experience.

3.5. Emergency Medical and Other Services

In an emergency, tourists may need to pay for medical expenses or other services. The use of CBDC allows for quick payment of medical expenses, protects financial needs in emergencies, simplifies the payment process, and enhances tourists' sense of security and satisfaction.

4. APPLICATION OF DIGITAL CURRENCY IN OFFLINE PAYMENT

Offline payment refers to the realization of a fast and convenient payment experience through near field communication (NFC) technology or similar technology in the absence of an internet connection or poor signal, which reduces CBDC's dependence on the internet and provides more inclusive financial services for people who do not have access to the traditional financial system. The digital Chinese Yuan (e-CNY) launched in China not only supports online payment, but is also specially designed with an offline payment function. The realization of this feature relies heavily on Near Field Communication (NFC) technology, which enables users to complete payments even without an internet connection. This feature greatly enhances the flexibility and convenience of payment, and is especially suitable for remote areas, emergency scenarios and unstable network environments. At the same time, digital RMB transaction records based on blockchain technology are transparent and tamper-proof, and offline transactions are equally secured against fraud and theft.

4.1. Shopping in Remote Areas

In rural or remote areas with poor network signals, residents or tourists need to make daily purchases and payments. With Digital RMB's NFC function, users can complete payments through their cell phones or other smart devices without network connectivity. Specific data shows that in these areas, using NFC technology for payment greatly improves the success rate and efficiency of transactions.

4.2. Emergency Payment

During natural disasters or other emergencies, network connectivity may be interrupted, but people still need to make purchases and payments for basic necessities. Using Digital RMB's NFC offline payment function, users can complete payments without network connectivity, ensuring that payment

needs are met during emergencies. This feature has shown its importance and reliability in many emergency drills and real-life scenarios.

4.3. Large Events and Conferences

During large sporting events, music festivals or conferences, the network usually becomes unstable due to too many users. Using Digital RMB's NFC technology, attendees and spectators can complete transactions such as ticket purchases and food and beverage payments without a network connection, avoiding payment delays or failures due to network problems.

4.4. Transportation Payment

When taking public transportation such as subway and bus, the network signal may be poor, but passengers need to complete the payment quickly. For example, in Suzhou, Wuhan, Qingdao and other places, through the NFC function of digital RMB, passengers can quickly pass through the gate in the absence of network, complete the transportation payment, realize the digital RMB SIM card hard wallet rail transportation line landing, improve the efficiency of the public transportation system and user experience.

5. APPLICATION OF DIGITAL CURRENCY IN SECURITIES SETTLEMENT

CBDC not only has a wide range of application prospects in the payment field, but also shows great potential in the field of securities settlement. CBDC combined with blockchain technology can realize a more efficient, secure and transparent securities settlement system. Digital currencies can assist the natural trading platform for securities settlement, realizing T+0 settlement, helping to improve trading efficiency and liquidity, reducing the need for custodianship, and greatly enhancing trading efficiency and liquidity. It is taken the blockchain settlement system of the Australian Stock Exchange (ASX) as an example to explore the specific application of CBDC in securities settlement.

The Australian Stock Exchange (ASX) is one of the first exchanges in the world to adopt blockchain technology for securities settlement. Traditional securities settlement usually takes T+2 or T+3 time, i.e., the next day or the third day after the transaction, to complete the settlement. ASX's blockchain settlement system is designed to replace its existing Clearing House Electronic Subregister System (CHESS), which realizes instantaneous settlement of trades by means of smart contracts and distributed ledger technology. The application of CBDC in this enables the transfer of funds and securities to be completed at the same time, further reducing settlement time.

In stock trading, settlement immediately after the completion of the transaction can reduce the credit risk of both parties to the transaction and improve market liquidity. Through the use of CBDC, stock transactions can be settled immediately upon completion of the transaction, eliminating the delays and risks associated with traditional settlement cycles. In bond trading, which usually involves large amounts of capital and complex settlement processes, the traditional settlement cycle is long and prone to market risks. Immediate settlement of bond trades through CBDC reduces the time funds are in transit and lowers market risk. Derivatives transactions are high-risk and highly complex, and the application of CBDC enables real-time settlement of derivatives transactions, reducing risk exposure due to market fluctuations. CBDC integrated within the blockchain platform enables payments and corresponding assets to be exchanged at the same time, reducing settlement risk.

Traditional securities settlement involves multiple intermediaries, such as banks and clearing houses, increasing settlement costs. ASX's blockchain settlement system reduces reliance on intermediaries by automatically executing settlement instructions through smart contracts. CBDC and blockchain technology can streamline the settlement process, reduce intermediary links and lower settlement

costs. According to ASX's estimates, the use of blockchain technology can reduce settlement costs by approximately 50%, and when combined with CBDC, costs are expected to be further reduced. In ASX's blockchain system, the status of each transaction and the flow of funds can be monitored and verified in real time, greatly enhancing the transparency and security of the system.

6. RESEARCH CONCLUSION

This paper studies the application of central bank digital currency in cross-border payment, real-time payment, offline payment, securities settlement, etc. The study finds that central bank digital currency shows broad prospects in multiple application scenarios, which can not only improve payment efficiency and reduce costs, but also enhance financial inclusion and transparency. However, its widespread application still faces challenges in technical realization, legal regulation and privacy protection. Through technological innovation and policy support, the application of central bank digital currency in various fields can be further promoted to provide strong support for economic development.

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