

Research on the Economic Impact of Central Bank Digital Currency

Wenbo Zou

School of Economics and Management, Guangxi Normal University, Guangxi, Guilin, 541000, China

Abstract

The research and development of central bank digital currency has become an important area of international currency competition, especially the currency competition of major countries. Through literature review, the basic concept of central bank digital currency is further explained, and the economic impact of central bank digital currency in financial disintermediation, payment system, digital inclusive finance and user privacy protection are analyzed in detail, and comments and prospects are made respectively to provide Promote the practice of central bank digital currency to provide reference and inspiration.

Keywords

Central bank digital currency , payment system , inclusive finance.

1. Introduction

In recent years, private digital currencies such as Bitcoin have brought many challenges to the payment system, financial stability and monetary policy. In addition, the COVID-19 epidemic has greatly promoted the development of electronic payments around the world, and the hegemony of the US dollar has brought Venezuela, Iran and Russia With regard to the economic impact, the design and research and development of central bank digital currencies have received great attention from governments of various countries. The central banks of the world's major economies have begun demonstration and development work on central bank digital currencies, evaluating the macroeconomic effects of central bank digital currencies, and exploring the possibility of CBDC interest rates becoming a monetary policy tool.

2. Definition of Central Bank Digital Currency

Most researchers do not directly give a clear definition of CBDC, but indirectly describe the meaning of CBDC from the perspective of its special properties or differences from other forms of currency. For example, BIS's Payments and Market Infrastructure Committee defines CBDC as a new central bank currency that is distinct from physical cash and reserves[1].David Andolfatto defined it from the perspective of the central bank's balance sheet. He pointed out that in most countries, only financial institutions can hold reserve accounts, and the non-bank sector can only hold cash through to hold central bank debt. Therefore, he defines CBDC as a direct liability of a central bank that can be held directly by the public, similar to today's deposit accounts[2]. Similarly, Todd Kester and Daniel Sanchez argue that technological advances provide the possibility for central banks to issue new types of currency. Therefore, they believe that CBDC is a currency type that combines the characteristics of cash and reserves and can introduce new functions based on new technologies[3].In addition, John Bader and Michael Kunhof believe that the emergence of private digital currency has provided new ideas for electronic accounting and transactions. The central bank sees that the underlying technology contained in digital currency may bring The advantages have accelerated the research and

development of CBDC, so they defined CBDC in the article as a currency or transaction medium in electronic form that is issued by the central bank and has the characteristics of distributed accounting and decentralized payment systems[4].

It can be found that in the above definitions, both indirect descriptions and explicit definitions include some specific characteristics such as "underlying technology" and "storage form". These definitions can be regarded as the definition of CBDC in a narrow sense. These narrow definitions reflect some common characteristics of CBDC, that is, CBDC is a direct liability of the central bank, and it exists in electronic form. Based on these commonalities, Walter Engert and Ben Feng argue that CBDC represents a direct liability of the central bank, which is monetary value stored in electronic form (digitally or in the form of electronic tokens)[5]. Similarly, Jack Minion and others gave a more general and normative definition. They believe that CBDC is a legal liability of the central bank that exists in electronic form and has a payment function or a value storage function[6]. In this definition, CBDC does not include specific technical features, etc., because they believe that these features correspond to the design of CBDC. When researchers give different CBDC design solutions, the scope covered by CBDC will also change accordingly. In other words, all the narrow CBDC definitions mentioned before are subsets of this basic definition, but this basic definition also includes the central bank's reserves into the scope of CBDC. Therefore, this definition can also be regarded as the definition of generalized CBDC. The research and discussion of this article are based on the generalized CBDC. The advantage is that it can comprehensively understand all possible design solutions of CBDC, so as to more clearly grasp the characteristics of CBDC under different designs.

3. Central Bank Digital Currency and Financial Disintermediation

CBDC may reduce bank deposits, and the direct consequence is the disintermediation of commercial banks, that is, financial disintermediation. The financial disintermediation of CBDC means that when CBDC is designed as a two-tier operating structure, the public who widely hold central bank accounts can bypass commercial banks and deposit directly into the central bank when making deposits, or transfer original commercial bank deposits into central bank accounts. CBDC's financial disintermediation can be divided into structural financial disintermediation during economic stability and cyclical financial disintermediation during financial crises. Structural financial disintermediation stems from the public's speculative motives. The key lies in the higher or lower CBDC interest rate and bank deposit interest rate. Engert et al. believe that the main advantage of bank deposits is the ability to obtain income, which can be used as a means of payment and storage of wealth; once CBDC accrues interest, the advantages of bank deposits will no longer exist, and a large number of bank deposits will be replaced by CBDC [7]. Meaning and others pointed out that the risk of financial disintermediation will not occur in the short to medium term for three reasons: First, the above analysis is based on the passive adaptation of commercial banks, which can independently improve their original business to cope with the competition of CBDC; second, the central bank regulates It is dynamic and can be adjusted as the impact of CBDC changes; third, bank deposits will not be completely replaced by CBDC, especially in overdraft and other businesses[8]. Barrdear et al. believe that the role of financial investors in the economic system cannot be ignored. By simulating financial investors as the sole holders of government bonds, and using government bonds to trade with CBDC, the CBDC obtained from the transaction will be quickly converted into bank deposits. Therefore, they believe that a run on CBDC will only reduce government bonds but not bank deposits. As long as an appropriate CBDC interest rate is set, the risk of financial disintermediation can be reduced to a certain extent[9]. Bindseil believes that the introduction of CBDC will produce different results due to different substitution objects: if CBDC is a substitute for banknotes, it will not have an impact on bank deposits; if CBDC

replaces bank deposits, it will increase the cost of deposits of commercial banks, reducing bank deposits will inevitably lead to structural financial disintermediation[10]. Cyclical financial disintermediation stems from the public's precautionary motivation. As a central bank liability, CBDC is safer than commercial bank deposits. The research results of Schilling et al. show that the central bank faces the "triple dilemma" of CBDC, that is, it cannot achieve optimal social allocation, eliminate runs, and price stability at the same time. Therefore, when ensuring resource allocation efficiency and price stability, the occurrence of runs is inevitable[11]. But some scholars are more optimistic. Meaning and others believe that it is not completely certain that the risk of cyclical financial disintermediation will definitely increase, because the triggering of runs often starts from the most sensitive risk-averse depositors. Once these depositors transfer their deposits into safe assets, the remaining depositors will trigger a run. The likelihood will be even smaller. Fernández-Villaverde and others believe that large-scale cyclical financial disintermediation will not occur. The central bank invests in long-term projects through investment banks. Since the central bank cannot withdraw loans to investment banks in advance, even if a run occurs, the amount of funds affected will be limited. It will be strictly limited to the amount of short-term loans it issues; in addition, "punishment-reward" measures can also be implemented, such as not paying interest to depositors who withdraw money early, etc. to curb runs [12].

4. Central Bank Digital Currency and Payment System

CBDC has many impacts on the payment system. One is payment flexibility. In remote areas or villages with weak financial infrastructure, CBDC can more easily allocate funds to users in the area; even when a systemic crisis occurs in the banking industry, it is convenient for the central bank to lend funds in the CBDC account to commercial banks, thereby reducing the bank's industry panic and enhance financial stability. The second is payment efficiency. For example, with the digital RMB (e-CNY) issued by the People's Bank of China, the public can complete transactions by "touching" or "scanning" through mobile smart terminals. In terms of wholesale CBDC, Calle et al. believe that CBDC is conducive to improving the core functions of the RTGS system (real-time gross payment system), improving the liquidity operations of commercial banks, reducing dependence on the central bank, and making complex payment workflows operate efficiently[13]. The third is to pay the cost. In a payment system based on banknotes, all users will bear the costs of storage, transportation and security of banknotes. CBDC using digital technology to replace banknotes can reduce the cost of the entire payment system. The fourth is competition in the payment system. On the one hand, adding new forms to existing payment instruments will boost competition in payment instruments; on the other hand, it will be easier for non-bank financial institutions to obtain central bank liabilities, lowering the threshold for them to enter the payment industry, thereby promoting competition among payment institutions. The fifth is payment innovation. Richards and others said that as a payment tool, CBDC will produce unique payment functions in the payment field if different technical means are used as the underlying technology and relevant payments are triggered through different characteristics or events. Assuming that CBDC uses DLT technology to directly connect payers and payees, it can reduce unnecessary intermediary services and thereby reduce the number of payment financial intermediaries. Sixth is the payment pattern. During the COVID-19 epidemic, the public feared that the use of cash would contribute to the spread of the virus, thereby accelerating the shift to digital payments, superimposing innovations in payment methods, and driving cashless transactions, which may drive more people to use CBDC for transactions, squeezing the use of conventional payment methods. market share. Judging from the impact of the above six aspects, the introduction of CBDC seems to have only benefits, but we should be alert to the two sides of things: while improving payment efficiency, it also increases the speed of financial risk transmission; increasing payment elasticity also means

expanding the spread of financial risks. Scope; The reduction in payment costs is due to the reduction of human participation in the middleman, but all is completed by the system itself, which will bring new problems in terms of security; promoting competition in the payment system may lead to unfair competition and aggravate the potential shock of the financial system. Stimulating payment innovation will bring challenges to the existing regulatory model, and changes in the payment pattern will also bring additional instability factors to the market.

5. Central Bank Digital Currency and Digital Inclusive Finance

Lagarde, the former president of the International Monetary Fund, believes that one of the potential benefits of issuing CBDC is to promote the development of inclusive finance. In a sense, CBDC can become a cheap and safe payment method. Barontini et al believe that promoting inclusive finance is mainly the goal of retail CBDC, not wholesale CBDC[14]. Most residents in economically developed areas have bank debit cards, credit cards and other payment instruments and are not sensitive to marginal increases in financial services. Therefore, inclusive finance is more of the main motivation for emerging economies to develop CBDC. Research by Sahay and others found that increasing digital financial inclusion in the payment field will push annual economic growth to more than 2.2%, and advocated emerging economies to use digital means such as financial technology to solve the problem of financial exclusion [15] CBDC naturally has the attributes of financial technology. Researchers generally agree that CBDC can be helpful to inclusive finance and have explained it from different angles. Allen and others regard CBDC as an opportunity to promote inclusive finance, allowing users to access the electronic payment system through CBDC and then obtain other financial services and products[16]. Ba Shusong and others believe that a digital account system suitable for the country's CBDC should be developed to improve the applicability of CBDC and increase users' opportunities to obtain financial services[17]. In addition, after the central bank issues CBDC, it may introduce the private sector in services such as post-account maintenance. These private sectors have sufficient incentives to expand customers from financially excluded groups and provide them with financial services. Regarding how to use CBDC to promote digital inclusive financial services, Crawford et al. gave two suggestions: First, regard the development of CBDC as an important part of public infrastructure construction, and charge very low account management fees for CBDC accounts, or directly charge them for free. use, so that users will not give up keeping bank accounts due to financial and other objective factors; second, regulatory authorities force commercial banks and other financial institutions to open CBDC accounts for groups who lack accounts[18].

6. Central Bank Digital Currency Anonymity Strength and User Privacy

The privacy protection discussed in this section is aimed at residential users, therefore, the CBDC is retail type. Privacy security is directly related to the anonymity of CBDC. Transaction anonymity is divided from strong to weak into completely anonymous, semi-anonymous and completely non-anonymous. Among them, the first two are the most discussed. Currently, complete anonymity mainly discusses third-party anonymity, which means that the payer's transaction information is invisible to all objects, including the central bank and intermediary service providers. A completely anonymous CBDC would raise concerns about its use in illegal economic activities, so CPMI has a negative attitude. Through case analysis, Berentsen and others predict that central banks will not issue digital currencies that allow users to remain completely anonymous[19]. Carstens even bluntly said that complete anonymity is a "fantasy"[20]. Although Kiff and others do not endorse complete anonymity, they do not completely deny the possibility of a completely anonymous payment system in the future market. Semi-anonymous is a compromise between complete anonymity and complete non-

anonymity, and is a practical design. Its anonymity methods include counterparty anonymity, partial transaction anonymity and controllable anonymity. Counterparty anonymity means that the payee cannot know the identity of the payer. Partial transaction anonymity, as the name suggests, means that the payer selectively anonymizes part of the transaction, which can prevent the payer's transaction information from being used for other purposes by intermediaries. Gao Zhongshao advocates that except for major public interest events, use data desensitization technology to make user transaction data anonymized to a level that cannot lock specific users and cannot be restored [21]. The above two types of anonymity methods belong to the level of trading strategies, while anonymity at the technical level mainly refers to controllable anonymity. Users sign up for the first time to verify their identity, and only the central bank has access to their transaction information. Users can remain anonymous to third parties. This is also what the Chinese people Bank and technical solutions adopted by the Bank of England.

7. Summary and Outlook

First, the mechanism by which CBDC leads to financial disintermediation is relatively complex, with three key points: comparative interest rates, usage scenarios, and transfer freedom. Whether it is CBDC interest rates or bank deposit interest rates, their determination is the result of a dynamic game between commercial banks, end users and the central bank. Commercial banks have strong market power in the deposit market and can have a greater say in interest rate decisions. Nonetheless, user funds have new options after the introduction of CBDC, which gives users a certain weight in interest rate decisions through asset selection. The central bank is the institution that sets benchmark interest rates and can also influence interest rates to a considerable extent. There has always been controversy about which scenario or traffic comes first, but no matter what, the establishment and improvement of CBDC usage scenarios will take time, and full coverage of bank deposits cannot be achieved in the short term. The best approach is to distinguish CBDC from bank deposits from the beginning of its design. The direct exchange of CBDC with cash, commercial bank deposits and central bank reserves is only part of the freedom of transfer. The other part is also reflected in the ability to liquidate without loss after purchasing other assets. If the former belongs to explicit financial disintermediation, then the latter belongs to implicit financial disintermediation. Therefore, restricting the direct exchange of CBDC with other forms of currency cannot completely curb financial disintermediation. Only from the perspective of multiple market entities can we regulate the comparative interest rates of CBDC and bank deposits, properly arrange the use scenarios of CBDC and bank deposits, and determine appropriate conditions based on the national conditions of the country. Only with a higher degree of CBDC transfer freedom can financial disintermediation be effectively avoided.

Second, the payment potential of CBDC should be more reflected in cross-border payments. The current cross-border payment system has many shortcomings, including long-term transaction delays, high-cost cross-time zone payments, low traceability, low transparency, and insufficient number of correspondent banks leading to financial exclusion. In order to alleviate the difficulties, Auer et al. envisioned a composite CBDC (Multi-CBDC) based on interactivity. This design can promote the cross-border use of CBDC in multiple countries[22]. In practice, the Digital Currency Research Institute of the People's Bank of China, the Central Bank of Thailand, the Central Bank of the United Arab Emirates, etc. jointly launched the Multilateral Central Bank Digital Currency Bridge Research Project (m-CBDC Bridge). This project aims to tap the potential of DLT and study CBDC Applications in strengthening financial infrastructure to support multi-currency cross-border payments. On September 28, 2021, the multilateral central bank digital currency bridge project team released an interim report, stating that the

prototype of a universal platform for composite CBDC settlement can significantly improve transaction efficiency and cross-border transaction time compared with the currently popular agency bank model. It has been shortened from the original 3 to 5 days to 2 to 10 seconds, and the cost has been halved. It is foreseeable that CBDC's cross-border payment will still be in a state of research and development in the short term, but it has broad room for development in the internationalization of the RMB.

Third, is the prospect of CBDC promoting inclusive finance necessarily optimistic? Existing research discusses that CBDC can help inclusive finance mainly by reducing transaction costs and enhancing access to digital payments, which requires residents to have high financial literacy, not reject new technologies, and have an urgent need for asset diversification. CBDC should be positive and beneficial to people with higher financial literacy, but whether it can improve financial services for people with lower financial literacy is open to question. In addition, people with lower education and risk aversion will be suspicious of new technologies and may not operate them even if they trust them. Only when transactions in society are generally completed through digital payments and the value of their own assets increases to a certain extent, creating diversified demand, will they have sufficient reasons to hold CBDC.

Fourth, anonymity requires both supervision and efficiency. How to achieve a balance between anonymity, supervision, and efficiency? Starting from the transaction object, the European Central Bank designed a proof of concept (PoC) and planned to introduce "anonymous certificates". This certificate can transfer a limited amount of CBDC within a specified period, and no third party except the central bank and designated intermediaries have the right to view the user's transaction information, thereby controlling the amount of anonymous use of CBDC within the scope of the anonymous certificate. In addition, it can also be considered from the transaction process: for a single user, private information can be divided, the CBDC account balance information is mastered by the central bank, and the transaction information is mastered by the authorized service provider. The advantage is that even if the service provider leaks the user information, the user's Privacy implications are also limited. For group users, you can pay attention to the user's transaction characteristics and set their transaction frequency and transaction size thresholds. When the threshold is exceeded, the central bank will be triggered to automatically obtain the transaction information. Anonymous design is only the first part of privacy protection, but not the whole story. The protection of user privacy is not only a technical issue, but also a policy issue. Regulatory agencies should introduce strict penalties for intermediary service providers to prevent user information from being leaked and abused.

References

- [1] CPMI, "Central Bank Digital Currencies", BIS Papers, 2018.
- [2] Andolfatto, D., "Assessing the Impact of Central Bank Digital Currency on Private Banks", FRB of St. Louis Working Paper, 2018.
- [3] Keister, T. and Sanches D.R., "Should Central Banks Issue Digital Currency?", FRB of Philadelphia Working Paper, 2019.
- [4] Barrdear, J. and Kumhof M., "The Macroeconomics of Central Bank Issued Digital Currencies", Bank of England Working Paper, 2016.
- [5] Engert, W. and Fung B.S.C., "Central Bank Digital Currency: Motivations and Implications", Bank of Canada Staff Discussion Paper, 2017.
- [6] Meaning, J., Dyson B., Barker J. and Clayton E., "Broadening Narrow Money: Monetary Policy with a Central Bank Digital Currency", Bank of England Staff Working Paper, 2018.

- [7] Engert W.,Fung B.Central Bank Digital Currency: Motivations and Implication [sR].Bank of Canada,2017.
- [8] Meaning J.,Dyson B.,Barker J.,et al.Broadening Narrow Money: Monetary Policy with a Central BankDigital Currency [J].International Journal of CentralBanking,2021,17 (2): 1-42.
- [9] Barrdear J.,Kumhof M.The Macroeconomics of CentralBank Digital Currencies [J].Journal of EconomicDynamics and Control,Available online 15 May 2021: 104148.
- [10] Bindseil U.Central Bank Digital Currency: FinancialSystem Implications and Contro [J].International Journalof Political Economy,2019,48 (4): 303-335.
- [11] Schilling L.,Fernández-Villaverde J.,Uhlig H.CentralBank Digital Currency: When Price and Bank StabilityCollide [R].NBER Working Paper 28237,2021.
- [12] Fernández-Villaverde J.,Sanches D.,Schilling L.,etal.Central Bank Digital Currency: Central Banking forAll? [J].Review of Economic Dynamics,2021,41: 225-242.
- [13] alle G.,Eidan D.Central Bank Digital Currency: AnInnovation in Payments [R].R3 White Paper,April2020.
- [14] Barontini C.,Holden H.Proceeding with Caution-ASurvey on Central Bank Digital Currency [R].BIS Paper101,2019.
- [15] Sahay M.R,Ogawa M.S,Khera P.,et al.Is DigitalFinancial Inclusion Unlocking Growth? [R].InternationalMonetary Fund,2021.
- [16] Allen S.,Apkun S.,Eyal I.,et al.Design Choices forCentral Bank Digital Currency: Policy and TechnicalConsideration [sR].NBER Working Paper 27634,2020.
- [17] Ba Shusong, Yao Shunda. The impact of the construction of the central bank's digital currency system on the financial system [J]. Financial Forum, 2021 (4): 3-10.
- [18] Crawford J.,Menand L.,Ricks M.Fed Accounts: DigitalDollars [J].George Washington Law Review, 2021, 89 (1): 113.
- [19] Berentsen A.,Schar F.The Case for Central BankElectronic Money and the Non-case for Central BankCryptocurrencies [J].Federal Reserve Bank of St.LouisReview,2018,100 (2): 97-106.
- [20] Carstens A.Digital Currencies and the Future of theMonetary System [C].Hoover Institution Policy Seminar,2021.
- [21] Gao Zhongshao. Risks and legal governance of personal information in digital RMB operations: focusing on the processing of users' personal information [J]. Credit Information, 2022 (5): 42-48.
- [22] Auer R.,Haene P.,Holden H.Multi-CBDC Arrangementsand the Future of Cross-border Payments [R].BIS Report,2021.