International Journal of Business Marketing and Management (IJBMM)
Volume 9 Issue 4 July-Aug 2024, P.P. 73-79
ISSN: 2456-4559
www.ijbmm.com

CENTRAL BANK DIGITAL CURRENCY– evidence regarding benefits and risks –

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Abstract. *The paper presents preliminary conclusions regarding the impact of central bank digital currency (CBDC) and the potential benefits and risks associated with CBDCs. It also presents the proposed CBDC regulation in the European Union. Lastly, the paper offers thoughts for potential future research in areas such as the actual designs of CBDCs and their uses. The paper contribute to the actual academic research presenting the European project on digital euro and the regulatory framework to govern the issuance of digital euro.*

General views regarding the two models of CBDCs are presented, focusing on the benefits and risks and how should policy makers address the risks.

The paper can be complemented with information on other approaches taken in United States and Asia, and with other possible scenarios for the distributed ledger technology (such as DeFI).

Keywords*: CBDC, retail CBDC, Wholesale CBDC, financial inclusion, financial stability*

JEL Classification: E50, F30, F31, G15, G18, G23

I. Introduction

In the recent years the objectives of the central banks across the world changed, in the sense they evolved and diversified in line with the latest technological developments, such as distributed ledger technology. Nowadays central banks have to look at the market and in the economy taking into consideration the new risks associated to the new form of money (crypto-assets, central bank digital currencies). So, even though price and financial stability are the core objectives of central banks, these new technologies – central bank digital currencies - gained the attention of the central banks in the new era of programmable money (Auer et al. 2021; Chiu and Keister 2023). Consequently, central banks are focusing on researching the costs and benefits of CBDCs. These efforts are a response to the declining importance of cash as means of payment and the challenges associated with the proliferation of new forms of private digital money such as *stablecoins*. While CBDC aims to preserve the role of public money and fend off threats to monetary sovereignty, some policy makers are concerned about its potentially adverse effects on the financial system. Unlike cash, CBDC can be remunerated, which could render it particularly attractive in crisis times and increase the risk of bank runs (Ahnert et al. 2022). In addition, the recent episode regarding the U.S. regional banks showed that bank runs continue to be an important real-world problem.

According to www.statista.com, in June 2023, 11 countries have already adopted the CBDC, 53 being in planning stages and 46 researching the topic. Also, the European Central Bank decided to look into the possible issuance of a digital euro. It would be a central bank digital currency, an electronic equivalent to cash. And it would complement banknotes and coins, giving people an additional choice about how to pay. However, they remain very cautious (Elsayed and Nasir 2022), as they realize the magnitude of the underlying task, which entails allowing households and firms to directly transact in money issued by the central bank (BOE 2020) and the possibility that CBDCs will eventually replace the existing reserve money systems. It is vital that the implications of CBDCs are well thought through so that any unintended consequences are avoided or at least minimized.

The Bank for International Settlements (BIS) defined the CBDC as "a form of digital money, denominated in the national unit of account, which is a direct liability of the central bank" (Bank for International Settlements BIS, 2020). A CBDC can be designed for retail with general scope and use, which would function as a digital currency, or for wholesale use, which would be made available to financial institutions only "for use in wholesale payment and settlement systems".

The challenge of implementing CBDCs has technological, economic, social, political, legal, environmental and ethical dimensions (Bossu et al. 2020; Carapella and Flemming 2020; Soderberg et al. 2022).

The adoption of CBDC implies the technological infrastructure, social acceptance, and implementation will have to meet social norms and political objectives, be environmentally sustainable and adhere to ethical values.

All the considerations expressed, make a big question mark on what are the implications of such an expansion in the role of central banks.

CBDCs will also be required to contribute to the functions of central banks. A report from a group of central banks set out three principles, including "a central bank should not compromise monetary or financial stability by issuing a CBDC" (BIS 2020). Bank of International Settlement (BIS) identified three major concerns: (i) the future structure of the financial system; (ii) the design of CBDCs and (iii) the magnitude of adoption by users (BIS 2020).

Our paper presents some opportunities and challenges associated with the issuance of CBDCs. We looked at some of the potential benefits and risks of CBDCs then we identified the proposed regulations of CBDCs in the European Union.

A limitation of this paper is that we didn't consider the consumers skills on financial literacy/capability. Also the work can be continued by adding elements related to internet, electricity access and financial exclusion that can be generated by promoting CBDC as payment method.

II. Literature review

Many central banks are evaluating the adoption of CBDCs in the context of their mandate on not only price stability but also economic, financial and (most recently) environmental stability (BOE 2020).

The adoption of CBDCs is a very important topic and our understanding of the underlying challenges is very limited. The present study is focused on the implications for the banking sector of the adoption of CBDCs.

As announced by the BOE (2020), if introduced in the UK, CBDCs will be denominated in pound sterling and complement cash and bank deposits rather than replace them, similar with the digital euro project announced by the European Central Bank and negotiated with EU and national authorities and central banks. The notion of extending the digital currencies' role as "money" is indeed stepping into the territory of public money (that held by the sovereign state) and, hence, CBDCs might be seen as an effort by central banks to claim that ground.

Nevertheless, it is also stepping into the territory of private money. As a CBDC would make electronic money issued by the central bank available to all households and businesses, it would allow everyone to make electronic payments in central bank money (Agur et al. 2022).

The central banks stability and trust might lead to deposit-taking through CBDCs and affect the monetary policy transmission (Fernandez-Villaverde et al. 2021). However, there is also a good argument that regardless of the financial instability, CBDCs are emerging as the priorities of the central banks. On this aspect, Waliczek and Buonocore (2023) argued that "during periods of macroeconomic fragility, there is heightening pressure on central banks to improve economic conditions. Nevertheless, their steadfast commitment to CBDC exploration remains in place, because of the potential benefits during this turbulent period".

Mancini-Griffoli et al. (2018) presented a positive opinion on the fact that CBDC could strengthen the benefits and reduce some of the costs and risks to the payment system, and could encourage financial inclusion. Chiu et al. (2019) considered that CBDCs would enhance competition among banks, and according to Andolfatto (2020), a CBDC might have no detrimental effect on bank lending activity as competitive pressure would expand deposit funding through greater financial inclusion and desired saving.

Keister and Monnet (2022) suggested that a CBDC system will make it easier for policymakers to monitor banks and detect weaknesses, which in the end could contribute to increase financial stability. Schilling et al. (2020) argue that there is a CBDC trilemma, meaning that central banks cannot achieve three goals at the same time: efficiency, financial stability, and price stability.

For countries like Romania, increasing financial inclusion is one of the main objectives regarding retail CBDCs, about 60 percent of emerging and low-income countries see financial inclusion as one of the top three motivations for issuing CBDC (Kosse and Mattei, 2023). Issuing retail CBDCs might be justified by different reasons, including maintaining monetary sovereignty, strengthening monetary policy, combating the illicit use of money, strengthening competition for payment providers, and improving payments efficiency and safety (Bank of Denmark, 2017; Riksbank, 2018; Bank of Israel, 2018; Bank, 2019; European Central Bank, 2020, and Bank of England, 2021).

The paper continues the academic research on CBDCs (Infante et al., 2022; IMF, 2021; Soderberg et al., 2022; Adrian and Mancini-Griffoli, 2019; Adrian et al., 2022), we a big focus on the impact of CBDC on the banking sector, especially regarding the financial inclusion.

Our paper presents the implications of CBDC on financial inclusion and how consumers can be incentivized to open bank accounts. We decide to focus on this topic as financial inclusion is a crucial prerequisite to economic growth and poverty reduction (Demirguc-Kunt et al., 2017). Auer et al. (2020) argue that while CBDCs could offer an opportunity for governments and central banks to promote universal access of

financial services, they should be complemented with public policies to address other key reasons for financial exclusion.

Maniff (2020) observed several design features for a CBDC in order to improve financial inclusion. Wang and Hu (2022) finds that CBDCs can be useful for promoting financial inclusion only in smaller economies where are not present other form of digital/electronic money. Murakami et al. (2022) focuses on the monetary policy implications of CBDC providing a savings vehicle to allow unbanked households to smooth consumption.

Ahnert et al. (2022) analyzes the interconnections of payments and privacy in a set up where merchants have to borrow from a bank and the bank can learn about the merchants from CBDC payment flows to extract rents.

III. Potential benefits and risks associated with the issuance and use of CBDC

The global interest in CBDCs is very high, central banks are exploring them from different perspectives and reasons (Boar et al., 2020). For example, BIS identified a number of issues (Bank for International Settlements BIS, 2023), which include:

• "Increasing financial inclusion, or more generally, broadening access to the financial system to serve the unbanked and under-banked population.

• Extending public access to safe central bank money (as opposed to private digital currencies).

• Safely meeting future needs and demands for payment services, including ensuring competition, data privacy and the integrity of the payment system.

• Reducing costs and improving access to domestic and cross-border payments.

• Contingency planning in case cash use suddenly declines or a private digital currency is widely adopted.

• Countering tax evasion and criminal uses of currency.

• Avoiding currency substitution and preparing for potential competition from other CBDCs.

• Creating a payment foundation to better support innovation (e.g., smart contracts, internet of things).

• Facilitating the distribution of central bank money and government benefits, particularly in remote areas."

Even though each central bank has its own objectives, Kosse and Mattei (2023) observed that the incentives for issuing retail CBDC converge over time also in the case of advanced, emerging and developing economies. This can be justified by the fact that over the years, domestic payments efficiency and payments safety have become nearly equally important in all the countries around the world. In the case of wholesale CBDC, central banks are driven mainly "by the desire to enhance cross-border payments." In this case we noted the decision of the Group of Twenty (G20), which in October 2020, declared the enhancement of cross-border payments a priority. They assessed the high cost, slow speeds, poor transparency, and declining accessibility (Financial Stability Board (FSB) (FSB), 2023). A large number of central banks have begun to work together on projects using CBDC to improve cross-border payments systems.

As reported by the Bank for International Settlements BIS (2023), an example is Project mBridge, a joint initiative of the BIS Innovation Hub, Hong Kong Monetary Authority, Central Bank of the United Arab Emirates, Digital Currency Institute of the People's Bank of China, and Bank of Thailand. Project mBridge objective is to explore how a common platform for multi-CBDCs could improve the speed, cost, and safety of cross-border payments (Bank for International Settlements BIS, 2023). A wholesale CBDC could provide several benefits for cross-border payments by increasing the operating hours of current payment systems (e.g., by making CBDC infrastructures available 24/7), shortening the length of payment chains, and improving the efficiency of compliance checks.

CBDCs present an opportunity for authorities to develop innovative tools to monitor illicit transactions while protecting user privacy.

Although CBDCs offer a number of benefits, they also present risks, especially in the case of retail CBDC. As Bank for International Settlements BIS (2023) states, the most important one is related to financial stability, as is very important not to generate disintermediation. In this context, central banks are evaluating a range of design options in order to mitigate the many risks related to CBDC, such as operational, technology, third-party, and legal risks. Is very important to mention that, there is no standard design for a CBDC, so the central banks can choose the design that best serve the needs of their national markets.

Regarding financial stability risk in relation with the issuance of CBDC, the focus is on how to control/address the risk of bank disintermediation, not to understand the retail CBDC as a store of value and migrate the deposits form the commercial banks to CBDC— and the resultant reduction in the availability of bank credit, as pointed out by Infante et al. (2023). According to the studies performed by the European Central Bank, (https://www.ecb.europa.eu/euro/digital_euro), this risk can be minimized through the CBDC architecture design and imposing holding limits (in the case of digital euro the proposal is for 3000 euro). Another element

in the design might be related to the expiration period of the account so the users to be demotivated to use the CBDC as a store of value and not as a payment method.

Financial Stability Journal, www.elsevier.com/locate/jfs, presents another solution for addressing this risks by opting for a hybrid model, which is a two-tiered retail CBDC model where intermediaries' onboard clients, performing compliance checks and managing customer payments in real time, with the central bank's role limited to recording retail balances periodically. The same model is proposed by the European Central Bank in the case of digital euro project. This model contrasts with a direct model, which is "a single-tier retail CBDC in which the central bank directly handles all payments performed by the users and manages the accounts" (Bank for International Settlements BIS, 2023).

Central banks might consider additional measures to influence or control CBDC adoption or use such as the remuneration policy for CBDC. The last solution might be to have an open approach and let the banking sector to manage the risk on bank disintermediation and lending (Bank for International Settlements BIS, 2021).

Although its analysis suggested that "a significant shift from bank deposits into CBDCs (or even into certain new forms of privately issued digital money) could have implications for lending and intermediation by the banking sector", it also noted that "these impacts would likely be limited for many plausible levels of CBDC take-up, if the system had the time and flexibility to adjust" (Bank for International Settlements BIS, 2021b). Canepa (2023) highlights a variety of options can be taken to support this; for example, the digital euro is likely to impose a cap of 3,000 euros (about $3,250), confirming the approach of the European Central Bank.

Lukonga (2023) pointed out another important concern for emerging market and developing economies, that is the risk of dollarization or currency substitution through CBDCs. Auer et al. (2021) argued that through cooperation between countries that leads to geographic controls on CBDC this risks can be managed, but still remain big concerns for the potential to destabilize economies.

Going further with our study, we understood that CBDCs are presented with a trade-off between managing user privacy and monitoring transactions to ensure compliance. Soderberg et al. (2022) in their report explains how anonymity is one of the key traits of cash, for example anonymity is also connected to financial inclusion, but also to illicit purposes/use of the CBDC.

IV. Legal proposals for CBDC in the European Union

Countries are at different stages of research regarding the CBDC, not being very clear the direction of each country regarding the issuance of CBDC. Nevertheless, all agree that CBDCs must be regulated to manage the potential risks. From this perspective, we assess the EU legal framework and the section provides an overview of literature on regulation in the European Union the digital euro.

In October 2023, the European Union completed its two-year investigation phase, which considered the potential design and distribution of a digital euro. After that, they started the preparation phase of the project, which involves, as mentioned by the European Central Bank (2023). Their intention is to finalize the digital euro rulebook and select providers that could develop a digital euro platform and infrastructure. The objectives are to design a CBDC that meets the expectations of the market and address the risks identified, in terms of user experience, privacy, financial inclusion and environmental footprint. The European Central Bank expects this phase to last two years, after which the Governing Council will decide whether to proceed to the next stage for the possible issuance of a digital euro.

With the scope to regulate the digital euro, the European Commission (2023) has released a 'Single Currency Package', which proposes taking the following steps:

- Regulating the digital euro and its legal status and role - the Proposal for a Regulation of the European Parliament and of the Council on the Establishment of a Digital Euro - with the objective of ensuring "that central bank money with the status of legal tender remains available to the general public, while offering a state-of-the-art and cost-efficient payment means, ensuring a high level of privacy in digital payments, maintaining financial stability and promoting accessibility and financial inclusion" (European Commission 2023). This means that a digital euro will be given the status of legal tender, "with an obligation for all payees to accept it, though with justified and proportional exceptions", such as for microenterprises or not-for-profit enterprises (European Commission 2023). The proposal further states that the digital euro is mainly intended as a means of payment rather than as a store of value. So, the ECB "should develop instruments to limit the use of the digital euro as a store of value, including holding limits" (European Commission 2023). This approach will allow the central bank to address possible risks posed to financial stability. The digital euro is not regulated as "programmable money". Payments made in digital euros will instant.
- Payment service providers in the Eurozone will have to provide digital euro to their users, such as enabling access to and use of the digital euro, enabling digital euro payments to be made and received and managing digital euro payment accounts.

- Data privacy - the proposal sets out clear conditions on how and who may process different categories of personal data. The scope is to ensure user privacy but also to allow transaction monitoring.
- The proposal establishes that the digital euro would primarily be available and have legal tender status within the euro area and includes restrictions on the distribution the digital euro outside the Eurozone, meaning that the central banks form the countries outside Eurozone will have to sign arrangements with the European Central Bank in order to issue digital euro.

V. Conclusions

This paper indicates that there is no one-size fits-all approach to CBDC design. Different forms of engagement, such as bilateral exchanges, forums, and open consultations, should be organized for gathering input, updates and practical insights, while open consultations can gather views from a broader range of industry and the public.

In addition, private sector innovation is crucial for the long-term success of any CBDC. Central banks may adopt different approaches in shaping and guiding private sector propositions for CBDC services and use cases. Some central banks may define a clear scope and practical use case, while others may allow the private sector to innovate within a set of principles and objectives.

Legislators and authorities must remain engaged in developing CBDCs. National authorities can explore different CBDC business models to understand their potential benefits and risks in relation to their national markets.

Central banks need to consider the optimal design of CBDC in order to achieve their public policy objectives. The issuance and design of CBDCs are ultimately sovereign decisions that rest with the relevant authorities based on their own assessments and the specific circumstances of their jurisdiction. Yet, there is value in working collectively on common issues. Some jurisdictions considering CBDCs aim to enable cross-border payments between them. Achieving this goal would require collaboration between central banks and substantial decision-making regarding the connection of CBDCs across jurisdictions and approaches to nonresident access.

Finally, exploring governance frameworks and establishing common standards may be necessary to maximize the potential benefits of CBDCs for cross-border payments.

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