

# Digital Currencies: Emerging Trends, Challenges and the Future of the Monetary System

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## I. Introduction

The contemporary monetary system is made up of central bank money such as banknotes (cash), referred to as "fiat currency" issued by a central bank and backed by the credibility of a government, and private money (or private sector-issued money) like bank deposits (Shirai, 2020). Under this system, the central bank is tasked with the responsibility of issuing money with the primary objective of maintaining price stability. However, the Fintech-led evolution in payments systems had seen an unprecedented transformation in the concept of currency (Forster et al., 2021). This technological revolution that saw the emergence of digital ledger, blockchain, and other technological developments, as well as the advent of private virtual currencies, "stablecoins", have forced the central banks to actively pursue the merits of issuing so-called "central bank digital currency"<sup>2</sup>, "CBDC" (Bossu et al., 2020). Similarly, a number of global trends and some jurisdiction-specific motivations have influenced the interest of central banks and accelerated their works in CBDC (Auer et al., 2022). These global trends are, first, the rapid increase in interest in Bitcoin and other cryptocurrencies that compete with traditional forms of money; second, the advent of private sector-issued stablecoins, which are distinct from other cryptocurrencies as they are designed to maintain a stable value through their backing of assets with major currencies; third, the entry of big technology companies, and the several challenges that the huge volume of personal data that is collected and processed as an input into their business activities pose for central banks, and fourth, impact of the COVID-19 pandemic.

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<sup>2</sup> Carstens (2021) explained "Digitisation" as the process of changing information from analogue to digital form. In the context of money, it implies creating a digital representation of money, or moving it to digital form using digital technologies.

This paper discusses the relevance and significance of digital currencies within the context of the monetary system. The next section presents a global picture of the emerging trends followed by challenges from different jurisdictions. The final section discusses the future of the monetary system as shaped by digital currencies.

## II. Emerging Trends

Bitcoin is a foremost cryptocurrency, launched in 2009. It markedly changed the concept of "virtual currency" by introducing a cryptographic form of electronic cash employing a blockchain protocol – a peer-to-peer distributed ledger technology (DLT) that securely records transactions across computers (Forster et al, 2021). Carstens (2021) referred to Bitcoin as a speculative asset rather than money since it is based on decentralised consensus among network of participants to determine what constitutes valid payments and that it poses its own unit of account, but fluctuations in value mean it is unrealistic to set prices in bitcoin which reduces its usefulness as a means of exchange and makes it a poor store of value. The so-called "stablecoins" are another form of emerging "digital currency" discussed in Carstens (2021). They were described as cryptocurrencies that sought to stabilise their value against sovereign fiat currencies offering more credibility than Bitcoin. Nevertheless, Carstens (2021) pointed out that it raises grave "governance concerns if a private entity issues its currency and is responsible for maintaining its asset backing". Consequently, private stablecoins cannot serve as the basis for a sound monetary system, and to remain credible and part of the existing financial system, they need to be heavily regulated and supervised. Nonetheless, Facebook's proposal of "Libra" with its massive global reach among users introduced the prospect of creating a widely available alternative monetary instrument to be used across a range of payments platforms, posed a potential threat to the "sovereignty" aspect of money, which elicited responses and backlash from regulators worldwide (Forster et al., 2021). As a result, Facebook backtracked from its original plan of a multi-currency asset-pegged Libra to issuing a single currency US\$-backed coin "Diem".

For there to be digital money, therefore, Carstens (2021) stressed the need for the central bank to play "a pivotal role, guaranteeing the stability of value, ensuring the elasticity of the aggregate supply of such money, and overseeing the overall security of the system. Such a system must not fail and cannot tolerate any serious mistakes". These developments led to the prospect of central bank digital currency. Central bank digital currency has

been defined as “a new form of money, issued digitally by the central bank and intended to serve as legal tender” (Mancini-Griffoli et al., 2018).

The BIS surveys revealed that central banks were increasingly considering the digitisation of their currencies. Boar and Wehrli (2021) observed that in the last four years, the share of central banks actively engaged in different forms of CBDC projects grew by about one-third to 86.0 per cent of 65 sampled central banks as of late 2020. This had risen to 90.0 per cent of 81 central banks representing 94.0 per cent of the global economic output in the latest survey of 2021, including already issued retail CBDCs, the Sand Dollars by Bahamas in 2020 and the eNaira by Nigeria, as well as released pilot projects by the Eastern Caribbean and China, DCash and e-CNY, respectively (Kosse & Mattei, 2022)<sup>3</sup>. The number of central banks in the advanced stages of CBDC projects increased remarkably in the last one year. According to Kosse and Mattei (2022), the share of central banks currently developing a CBDC or running a pilot was 26.0 per cent, almost double the share of 14.0 per cent in Boar and Wehrli (2021). In addition, 62.0 per cent were conducting experiments or proofs-of-concept compared to 60.0 per cent in the previous year. Both surveys showed that while some of the central banks were primarily engaged in the wholesale side, some were primarily in retail, but the largest number were working on both<sup>4</sup>. However, Kosse and Mattei (2022) found that about one-fifth of central banks are developing or testing a retail CBDC, which is twice the share of central banks building or piloting a wholesale CBDC.

International Monetary Fund (2022) evaluated six (6) advanced CBDC projects at various stages through collaboration and exchanges with the respective central banks to obtain insights into their projects. Of the six, which included Bahamas, China, Uruguay, Eastern Caribbean, Sweden and Canada, only Bahamas has actually issued a CBDC. Seven main policy goals of the CBDC projects whose level of importance differs from one jurisdiction to another were identified by International Monetary Fund (2022) as (i) financial inclusion, by ensuring access to appropriate and affordable services, which is linked to poverty reduction; (ii) access to payments, especially with declining cash usage or in time of crisis or in a remote area with low-income

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<sup>3</sup> This share has risen to 105 countries representing 95.0 per cent of global GDP, with 10 countries having fully launched a digital currency according to Atlantic Council (2022)

<sup>4</sup> While the retail CBDC are general purpose, targeting the public, wholesale CBDC targets the financial institutions.

earners, low presence of financial institution, and with different forms of impairments; (iii) making payments more efficient, by offering digital forms of payment that have lower operational costs than both physical and existing digital payments; (iv) ensuring the resilience of payments, such as in ensuring urgency in the payment and extension of government transfers to people under severe circumstances where cash is not available. Likewise, it assuages the fear of disruption in digital services in the event of failure of dominant operators by serving as a backup; (v) reducing illicit use of money, by addressing the undesirable features of cash, such as anonymity and lack of an audit trail, which make it attractive for illegal acts that include tax evasion, money laundering, and terrorist financing; (vi) monetary sovereignty, which will be difficult if a sufficiently large portion of the population adopts a foreign digital currency or a global stablecoin, thus, CBDC helps ensure that important central bank functions like monetary policy and lender of last resort are not adversely affected; (vii) competition, as it offers increased competition in a country's payments sector by competing directly with existing forms of payments and indirectly, by providing a platform open to private payment service providers, if designed for such. This, it was noted makes it less difficult for new entrants into the payment sector.

Kosse and Mattei (2022), in addition, identified financial stability and enhancing of cross-border payments as growing reasons for CBDC. They also noted that financial stability was of greater importance in an advanced economy, especially in the last year, probably driven by concerns of regulatory and supervisory authorities of the potential systemic risks of the emergence of stablecoins and other cryptocurrencies, which has also accelerated the interest in CBDC. While the emphasis on enhancing cross-border payment had declined in advanced economies, its importance had risen in emerging markets and developing economies.

In addressing the issue of the roles of a central bank and the private sector CBDC or the operational architecture of the CBDC, three operating models were described in International Monetary Fund (2022) in relation to the allocation of the functions of issuing, validation of transactions, ledger update, KYC-AML/CFT<sup>5</sup>, user interface, user data, and customer service. They were a) unilateral (tier-1) CBDC, in which the central bank performs all functions in the payments systems like issuance and distribution of CBDC, ledger update, and

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<sup>5</sup> KYC is know your customer; ledger update while, AML/CFT is anti-money laundering/combating the financing of terrorism.

interaction with end-users; b) intermediated (tier-2) CBDC, where the intermediaries can be financial institutions, payment service providers and mobile phone operators with the central bank saddled with functions such as issuing the digital currency, and regulation and supervisory functions; c) synthetic CBDC, in which case, digital currency is issued by private firms rather than the central bank, but is backed by holding central bank liabilities. International Monetary Fund (2022) observed that while the last model is not necessarily a CBDC but a stablecoin, or a special type of e-money, it can be viewed as an alternative to CBDC since it is backed one-to-one by central bank-issued assets.

Kosse and Mattei's (2022) findings indicated that more than 70.0 per cent of central banks engaged in some form of CBDC work were considering a two-tiered (or intermediated CBDC model), where functions such as onboarding of clients (including the performance of know-your-customer (KYC) processes and anti-money laundering/combating the financing of terrorism (AML/CFT) procedures), as well as the handling of retail payments, were left in the hands of private firms. The findings also showed that recording of retail transactions or ledger updates could also be handled by the private sector according to many central banks, however, a third would prefer it to be left in the hands of central banks. Besides, 76.0 per cent of the central banks working on a retail CBDC were exploring interoperability with existing payment system(s).

According to Kosse and Mattei (2022), interoperability can encourage the adoption of CBDCs and enable the coexistence of central banks and commercial banks as well as facilitate payments across systems by banks and other payment service providers without participating in multiple systems. As a result, end users can easily move their money in and out of their CBDC accounts.

In a business model of CBDC also described in International Monetary Fund (2022), there was an emphasis on the need for private firms to make a profit if they are to perform function(s) in the CBDC ecosystem. In the CBDC projects reviewed, there was almost a consensus, according to International Monetary Fund (2022), that, the main business model for private intermediaries is fees on payment, but none of the central banks (CBs) allowed intermediaries to gather payment data that may be used for commercial purposes.

Another question is on whether CBs should charge intermediaries for using the CBDC system. This depends on whether they desire recovering the

expenditures on development of the system. According to the study, the risk is that, if the CBs collect fees, intermediaries will pass price of payments on, which may be contrary to the initial policy goals.

There is also the issue of subsidising the functions that the private intermediaries might not find profitable, in order to increase resilience and adoption of the CBDC. This can be in the area of increasing payment resilience and developing payment solutions for minorities.

Recent literature points to the importance of optimal technology underpinning the CBDC. International Monetary Fund (2022) observed that **while “the centralised ledger, owned and updated by a single entity, is still the standard approach among central banks”, the distributed ledger technology (DLT), a decentralised technology, the best known of which is blockchain, has recently emerged as a promising alternative to centralised ledger technologies.** There are three alternatives of DLT explained in International Monetary Fund (2022): The first involves the central bank owning the infrastructure of the entire ledger and updating it (for example, the Bahamas Sand Dollar). Second, the central bank owns the ledger, but private intermediaries update it. The third requires a private intermediary to own part of the ledger and update that same part of the ledger, conditional on the central bank’s approval. **Also, there are two forms of DLT: the permissionless technology that is used in cryptocurrencies, and the permission form, in which a network of known and vetted validators jointly augment a ledger (Auer et al., 2022).** The “permissionless” ledger which is based on “proof-of-work”, whereby unknown validators perform the updating of transactions, is inefficient, environmentally harmful, and can lead to multiple equilibria. Consequently, a number of central banks are considering decentralisation in the form of “permissioned” DLT, in which a network of preselected entities that do not trust each other’s data jointly perform the updating and management of the ledger, by independently verifying each new transaction (Auer et al., 2022). Auer et al. (2022), however, showed that both permissioned DLT and centralised validation can be optimal under different conditions. The traditional centralised system can fare better only when validators are sufficiently trustworthy.

A number of features have been incorporated into the design of CBDC projects by different central banks. These are the characteristics and functions of the CBDC designs. The International Monetary Fund (2022) identified these as:

## 1. Restrictions Aimed at Ensuring Financial Stability

A growing literature has pointed out the potential risk that the introduction of CBDCs pose to commercial banks' aggregate lending or investment, financial stability, and as a new monetary policy tool (Auer et al., 2022). Central banks engaged in CBDC projects have committed to not jeopardising financial stability and avoiding any sudden shifts in the structure of the financial system, and the effects that include crowding out banks and facilitating bank runs can be mitigated through limits on CBDC (International Monetary Fund, 2022). These limits fall under two main categories: restrictions on the remuneration of CBDCs and quantitative restrictions on holdings and transactions of CBDC.

In the case of restrictions on the remuneration of CBDCs, the no interest on CBDC will reduce its attractiveness as a savings instrument, but, it remains attractive as means of payment. International Monetary Fund (2022) noted that there is a potential policy trade-off between limiting competition with bank deposits and ensuring an effective transmission mechanism of monetary policy because a 0.0 per cent interest rate on CBDC could reduce the ability to carry out a negative interest rate monetary policy. In addition, the attractiveness of bank deposits versus CBDC would diminish with lower policy rates. A possible solution suggested is a CBDC with an interest rate that is consistently lower than the policy rate. Alternatively, fees can be imposed on transactions above a certain threshold. Quantitative restrictions are aimed at limiting competition with bank deposits but also to foster financial inclusion. To lower the threshold for new users, small CBDC holdings are allowed without the need for identification or other KYC procedures. However, it becomes impossible to send money to a wallet that has reached its specified limit. To overcome this, CBDC holdings, according to International Monetary Fund (2022), may also be connected to a bank account to which excess holdings of CBDC may automatically be transferred.

## 2. Anonymity

There is a policy trade-off between anonymity/financial inclusion and AML/CFT compliance. International Monetary Fund's (2022) findings revealed that the approach was to provide a tiered selection of wallets with different levels of thresholds. Hence, wallets with lower thresholds are allowed for greater anonymity. Consequently, CBDC transactions can seamlessly be carried out in rural or disadvantaged areas where virtual identification can be difficult. Therefore, the utilisation of tiered CBDC wallets will lead to "policy

synergies" between anonymity, risk-reduction (of bank runs), and financial inclusion.

### 3. Off-Line Capacity

According to the International Monetary Fund (2022), some central banks have noted the importance of ensuring payments even when not connected to the main communication system. This helps to ensure resilience, especially in times of crisis or in areas of poor connectivity. Although, it was pointed out that achieving that had been difficult.

### 4. Cross-Border Payments Using CBDC

International Monetary Fund (2022) noted that although CBDC is generally carried out with the domestic economy in mind, discussions on the potential use of CBDC in cross-border payments – including the adverse macroeconomic implications, such as increased currency substitution and vulnerability to financial shocks and ways of mitigating – were ongoing. The six jurisdictions in the IMF study examined the issues of cross-border payment carefully but largely on the side of their domestic considerations.

## III. Challenges

In International Monetary Fund (2022) study, a number of challenges were raised by the different jurisdictions in the course of the investigation, testing, and launching of CBDC. These were:

- i. Lack of precedents: The lack of adequate experience in the design of the CBDC projects, or the availability of established standards is a challenge.
- ii. Lack of resources: CBDC projects are resource-intensive and become even more so as their scale increases. Thus, the Peoples Bank of China (PBOC) identified inadequate resources as a constraint. Resource constraints constitute a major obstacle.
- iii. Unwillingness to adopt digital payments by the population: One major challenge is the unwillingness of the populace to adopt the payment system due to trust and privacy issues. Carstens (2021) noted that in Europe and the United States, surveys showed that people are more worried about their privacy.
- iv. Legal issues: difficulty in amendments of existing laws and regulations were one of the major obstacles identified by most central banks in

International Monetary Fund (2022). This is considered in detail in Bossu et al. (2020).

- v. Cyber security: One of the main challenges in implementing the CBDC project is ensuring an acceptable level of cyber security.
- vi. Technological uncertainty: The decision to choose the best technology still developing is deemed challenging.

Zamora-Perez et al. (2022), also, argued that central banks might, in some cases, be faced with difficult decisions in terms of balancing the following three aspects: (i) keeping the current order of priority for policy goals, (ii) opting for designs and strategies that could increase the likelihood of adoption, and (iii) using designs that avoid negative economic effects.

#### IV. Future of the Monetary System

Carstens (2021) pointed out that money is an instance of a public-private partnership, hence, CBDC should take advantage of private sector innovation and fashion out a role for both the private sector and the central bank or other public authorities. This can be either two-tier "Intermediated" CBDC architectures or its "Hybrid" variant. Therefore, if CBDCs are properly designed and widely adopted, they could serve as a complementary means of payment that addresses distinct use cases and market failures and can spur continued innovation and competition in payments, finance, and, commerce at large (Carstens, 2021).

There are potential risks of CBDC for commercial banks, financial stability, and monetary policy as pointed out under restrictions aimed at financial stability. These potential risks and the actions being (or that will be) taken to address them will also shape the future of monetary policy. The risk of CBDCs on commercial banks such as heightened volatility of their funding sources, bank runs, and the potential for disintermediation can be addressed with limits on the size of CBDC holdings, or the use of variable interest rates that act as a disincentive for very large holdings by users, and quick intervention to provide liquidity back to commercial banks if depositors temporarily moved funds from bank deposits to CBDCs during a crisis (Carstens, 2021; see also, International Monetary Fund, 2022). As suggested by International Monetary Fund (2022) and noted above, CBDCs could be interest-bearing with a rate consistently lower than the policy rate, not only for effective monetary policy but also to increase its attractiveness as a store of value. Carstens (2021), also pointed out that retail CBDCs could be interest-bearing, thereby influencing monetary

policy transmission and clearing the path for more negative policy rates in some advanced countries (Carstens, 2021). However, Carstens did not believe these issues will negatively affect the monetary system in the future. The author noted that it should be borne “in mind that since CBDC would complement cash rather than replace it, and since another policy objective is to limit the central bank's systemic footprint, these monetary policy effects might be contained in practice”. Also, as cash holdings and even total central bank assets are currently moderate to bank deposits, he expected that CBDC holdings will not become very large, implying that the central bank toolkit will remain largely unaffected (Carstens, 2021).

In terms of the international monetary system, CBDC is expected to pose a threat to international currency competition. It is believed that foreign CBDC issuance will make it easier for users to adopt a foreign (digital) alternative (Carstens, 2021). There is even an argument that China's digital currency could upstage or challenge the US dollar as a global reserve currency (Chorzempa, 2021; Huang & Mayer, 2022). However, Carstens (2021) was of the opinion that CBDC cannot tip the balance in favour of China's currency for the main reason that the attractiveness of a reserve currency is related to the macro economy, hence, the dollar is the world's reserve currency because of its stable value (low inflation), a large supply of safe assets and the credibility of the US economic and legal system. In addition, US's deep and efficient capital markets can be accessed by investors without the fear of capital controls. Therefore, global reserve currency status will still be driven by these factors.

On the implications of CBDC for cross-border payment, Auer et al. (2022) noted that cross-border payments suffer from four primary challenges: they are generally costly, slow, have low traceability and transparency, and largely inaccessible to some people. Hence, many central banks see CBDCs as an opportunity to address these persistent challenges. Also, Carstens (2021) remarked that beyond currency competition, there are opportunities for CBDCs to enhance the efficiency of cross-border payments.

## References

- Atlantic Council. (2022). *Central bank digital currency tracker*.  
<https://www.atlanticcouncil.org/cbdctracker>.
- Auer, R., Frost, J., Gambacorta, L., Monnet, C., Rice, T. & Shin, H. S. (2022). Central bank digital currencies: Motives, economic implications and the research frontier. *Annual Review of Economics*, 14, 697-721.
- Boar, C., & Wehrli, A. (2021). Ready, steady, go? – Results of the third BIS Survey on central bank digital currency. *BIS Papers*, 114.
- Bossu, W., Itatani, M., Margulis, C., Rossi, A., Weenink, H. & Yoshinaga, A. (2020). *Legal aspects of central bank digital currency: Central bank and monetary law considerations*. *IMF Working Paper*, 20/254.
- Carstens, A. (2021). Digital currencies and the future of the monetary system. Presented at the Hoover Institution Policy Seminar, Basel. *Policy Commons*. <https://policycommons.net/artifacts/3708812/digital-currencies-and-the-future-of-the-monetary-system/4514678/>.
- Chorzempa, M. (2021). China, the United States, and central bank digital currencies: How important is it to be first? *China Economic Journal*, 14(1), 102-115, DOI: <http://10.1080/17538963.2020.1870278>.
- Foster, K., Blakstad, S., Gazi, S., & Bos, M. (2021). Digital currencies and CBDC impacts on least developed countries (LDCs). *The Dialogue on Global Digital Finance Governance Paper Series*.
- Huang, Y., & Mayer, M. (2022). Digital currencies, monetary sovereignty, and US–China power competition. *Policy & Internet*, 14(2), 324-347.
- International Monetary Fund. (2022). *Behind the scenes of central bank digital currency emerging trends, insights, and policy lessons*. *IMF Fintech Note* 2022/004.
- Kosse, A., & Mattei, I. (2022). Gaining momentum—Results of the 2021 BIS survey on central bank digital currencies. *BIS papers* 125.
- Mancini-Griffoli, T., Peria, M. S. M., Agur, I., Ari, A., Kiff, J., Popescu, A., & Rochon, C. (2018). Casting light on central bank digital currency. *IMF staff discussion note*, 8(18), 1-39.
- Shirai, S. (2020). *Growing central bank challenges in the world and Japan: Low inflation, monetary policy, and digital currency*. Asian Development Bank Institute.
- Zamora-Pérez, A., Coschignano, E., & Barreiro, L. (2022). Ensuring adoption of central bank digital currencies—An easy task or a Gordian knot? *ECB Occasional Paper*, 2022/307.