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The Digitization of Money

Risks and Opportunities of CBDCs

RAMU THIAGARAJAN

Senior Investment Advisor
at State Street

SWEN WERNER

Head of Digital Custody and
Payments for State Street Digital

Global central banks are developing a framework for issuing digital currencies to the public. This urgency is partly driven by the astronomic growth of digital currencies that led to the creation of private payment models in the form of stablecoins.

Ramu Thiagarajan and Swen Werner explore the risks and opportunities presented by general- purpose (retail) central bank-issued digital currency (CBDC), and highlight the challenges in creating a comprehensive, balanced and efficient system to help reap the various benefits of the digitization of money.

We live in a digitized world. As the use of physical cash has declined over the years,[1] fast and convenient digital payments have grown in volume and diversity. This trend occurred in tandem with the increasing interest of central banks in providing a resilient and robust platform for offering a digital currency that preserves the fundamental purposes of central banks — namely, ensuring monetary and financial stability and promoting wide access to secure and efficient payments.

One of the most pressing projects on the agenda of central banks is a study of the feasibility of a central bank-sponsored digital currency (CBDC). A 2020 survey found that 80 percent of central banks are engaged in investigating CBDCs[2] with several having progressed beyond research to conducting pilots. Those collectively representing 20 percent of the world's population deem it likely that they would offer a general-purpose CBDC within three years.

The Fed recently published a research study examining the feasibility of issuing a digital dollar.[3] The Bank of England (BoE) is also exploring the issuance of digital currency for use in households and businesses for everyday payments.[4] Next to the role of monetary policy in maintaining financial stability, CBDC is the most important topic in central banks' agendas. While the first CBDC was launched in 2020 in the Bahamas, there is no major currency area with a live solution.

While the term is relatively new, central bank digital money has existed for years in the form of bank deposits at a central bank available exclusively to qualifying financial institutions.

What Are Central Bank Digital Currencies?

CBDCs are a digital form of money, denominated in the national unit of account, issued by a central bank as a direct liability. CBDC is the virtual or digital asset equivalent of a country's fiat currency, such as the United States dollar. While the term is relatively new, central bank digital money has existed for years in the form of bank deposits at a central bank available exclusively to qualifying financial institutions.[5]

What is potentially transformative about many recent CBDC initiatives is their retail focus allowing households and businesses to directly access central bank holdings. Though regulated financial institutions can currently access digital central bank money through reserve accounts held by commercial banks, the only central bank money available to the public is cash. Retail CBDCs would dramatically change this by making central bank digital money available to the general public, which they can use to make digital payments. Further, given that CBDCs are a direct liability of the central bank, neither deposit insurance (to maintain public confidence) nor backing by a pool of assets (to maintain value) would be required under a CBDC system. As a result, retail CBDCs would be the safest digital asset available to the public, free from both credit risk and liquidity risk.

80%

of central banks are engaged in investigating CBDCs*

*Boar, C., Holden, H., and Wadsworth, A., **"Impending Arrival – A Sequel to the Survey on Central Bank Digital Currency"**, BIS Paper No. 107, January 23, 2020.

Why the Urgency?

Concurrent with the decline in the use of cash, there has been a proliferation in the issuance of cryptocurrencies and stablecoins, which are backed by fiat currencies or other assets.[6] According to a 2020 survey conducted by the San Francisco Fed, use of cash fell from 40 percent in 2012 to 19 percent in 2020.[7] Other countries have seen similar declines. Against this backdrop wherein the use of cash has declined, there has been a meteoric rise in cryptocurrencies, some of which, like Bitcoin, Ethereum and the stablecoin Tether, continue to garner wider adoption. For central banks, the rise in cryptocurrencies, which have been subject to light-touch regulation, or none at all, has triggered mounting concerns about both the security of digital assets and, importantly, the lack of global standards governing the crypto ecosystem. For these reasons, central banks see a need to explore offering digital currency to ensure that the proliferation of private forms of money does not impede their ability to support monetary and financial stability.

60

Near-instant final settlement of funds is available to consumers through instant payment systems in more than 60 markets.

How Are CBDCs Different from Other Forms of Electronic Cash?

Currently, central bank-issued currencies take physical (notes and coins, for the public) as well as digital forms (reserves, for commercial banks). The idea is to replace central bank-issued physical notes with their digital counterparts. Unlike existing electronic payment instruments used by individuals and corporates, which serve as direct claims on commercial banks, CBDCs are direct claims on the balance sheets of central banks. In effect, CBDCs are fiat currencies issued in digital form either in place of or as a complement to bank notes and coins. The goal of introducing CBDC is to provide a universal means of secure payments for the digital era, while preserving the monetary sovereignty of central banks. Other important factors often cited with respect to CBDC include the near-instant final settlement of funds to end users on a 24/7 basis. Currently, this is available to the consumer via instant payment systems in more than 60 markets, however, it is based on credit intermediation. The differentiating factor is the removal of credit from the payment activity by moving from a commercial bank liability to a pre-funded central bank liability arrangement.

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How Would Retail CBDCs Be Structured?[8]

A crucial consideration for central banks is how CBDCs will be structured and what roles the central bank and private sector intermediaries should play. The Bank for International Settlements (BIS) has identified three alternative models by which CBDCs[9] could be structured:

- **Direct CBDC** — Under this model, the central bank issues CBDCs to end consumers directly, handles all retail payments in real time and maintains a record of all retail holdings. This model is designed for disintermediation and shifts the burden and costs of managing customer on-boarding, account maintenance, know your customer (KYC) verification, and anti-money laundering (AML) as well as combating the financing of terrorism (CFT) compliance checks from commercial banks to central banks. In addition to requiring a substantial build-out of the necessary infrastructure at the central bank level, this model marginalizes private sector involvement, potentially hinders innovation and may not be a practical solution for most central banks.
- **Hybrid Model** — This model runs on two engines, the private sector handles customer on-boarding, oversee AML/CFT enforcement and conducts all retail payments in real time. While the central bank maintains a central ledger of retail balances and operates a backup infrastructure in case of technical or financial failures on the intermediaries' end. Under this model, the end customers' CBDCs also represent a direct legal claim on the central bank.
- **Intermediated Model** — This is also a two-tier structure like the hybrid model, but rather than recording retail transactions, the central bank maintains a wholesale ledger only. Further, an intermediated model reduces many data protection and privacy concerns associated with centrally managed data collection. Additionally, it would enable central banks to leverage the existing privacy and identity management tools of commercial banks, and payment solutions providers. However, a major downside of this model is that the central bank would have no record of the very claims it is legally required to honor. As a consequence, the central bank would need to continuously ensure that all the wholesale holdings communicated to it equaled the sum of all retail accounts — a costly and technically challenging obligation.

Not all central bank charters permit issuance of a direct CBDC in the first place. For example, in the US, the Federal Reserve Act does not authorize direct accounts for individuals, so a hybrid or intermediated model are the only viable options in such situations and appear to be the models most central banks are rallying around in any event.

How Would Retail CBDCs Be Distributed?

Another design issue concerns how CBDCs should be distributed. There are two models under consideration. Under a single-tier model, the central bank issues CBDCs directly to financial institutions, consumers and businesses. Though a single-tier structure can reduce transaction frictions, it could also trigger a digital deposit run from commercial banks to central banks. As a result, CBDC plans for most central banks seem to be gravitating toward a two-tier architecture with central banks being the base layer issuing digital currencies to commercial banks. Existing financial institutions are managing the second, user-interfacing and CBDC-distributing layer.

In What Form Would Retail CBDCs Be Held?

The third design question focuses on whether retail CBDCs should be implemented using a token- or account-based approach. Similar to the anonymity cash affords, a token-based approach would allow individuals, who hold the password-like digital signature or token, to perform actions such as moving funds without requiring disclosure of their personal identification. Account-based systems, predicated on verifying a user's identity, are what we have today. While likely less complex to implement, they may carry higher privacy costs, depending on the nature of the authentication process involved. Who verifies the identity of a person seeking to join an accounted-based CBDC platform remains an open question.

What Are the Key Functions of Digital Currencies in the Three Primary Roles Played by Money?

Monetary systems are based on an anchor to ensure the public's confidence. Such anchors were commodities in the past (e.g., gold or silver) and then moved to fiat. Issuers of central bank currency offer full and unconditional convertibility. Such convertibility offers the primary features of money, which are a store of value and, importantly, a unit of account. The broad understanding that such a form of currency has unconditional and time-invariant convertibility also gives it its third important feature, namely medium of exchange. Each of these roles enables the monetary system to help overcome a different economic friction. In the current paradigm, all three roles are jointly played by central bank currency.

As a unit of account, central banks maintain their respective currencies as a standard monetary unit of measurement for all transactions and help anchor the monetary system. Various forms of money are currently being used as a means of payment and store of value, including non-bank money and commercial bank money.

A well-designed CBDC helps unbundle the roles of means of payment and store of value, and in the process, introduce efficiency in the payment system.

However, these retain value because of their efficiency and the public confidence that these different forms can be converted into central bank money. CBDCs enable the unbundling of the unit of account and medium of exchange. They also could be programmed such that payments could be triggered automatically at specified times. In essence, CBDCs have features that make it a new form of money. All of this would lead to a different market structure that may be more efficient compared to our current system.

The bundling of the roles of money is deeply embedded within our financial and economic systems and underpins the evolution of the banking sector. In the US, the law provides banks a number of unique privileges and protections including access to the Fed Emergency facilities and the Fed's master accounts, and, hence, the major clearing networks for financial plumbing. In today's world, providing payment services can hardly be contemplated without credit and overdrafts, the roles of money are intertwined with the historic evolution of banks. The protections provided to them principally to ensure that any failures of individual institutions do not metastasize into systemic collapse aims to preserve trust by consumers is using such payment arrangements. The emergence of CBDC is not limited to the optimal design of payment arrangements. It will also require a strategic response on how credit and maturity transformation will take place if the balance sheet of banks is reduced by the impact of CBDC.

A well-designed CBDC helps unbundle the roles of means of payment and store of value, and in the process, introduce efficiency in the payment system. As a result, some of the protections provided to the banking sector may have to be redesigned and rethought, especially how banks can continue providing loans without deposits on their balance sheet. In our view, a carefully designed retail CBDC has the ability to speed up the payment process and reduce costs. It can also improve the transmission of monetary policy while limiting the disruptive potential if the design features of CBDC limit their appeal as a store of value. Wholesale CBDCs will require more careful deliberation as to how they connect to the evolving market of tokenized securities and the decentralized market structures they may create.

How Can CBDC Help Improve the Function of Central Banks and the Financial System?

Many advocates of CBDCs argue they would be cheaper and faster than traditional payment systems, enhance financial inclusion, facilitate efficient cross-border transfers, improve the effectiveness of monetary policy, particularly during a crisis or periods of financial stress, and help strengthen the stability and resilience of the digital payment ecosystem. Each of these benefits is elaborated upon below.

⚠ **A quick caveat:** these advantages, though logical outcomes of a well-designed system, are not empirically observed in any large economy as CBDCs are not yet operational other than in a few small or emerging market economy jurisdictions.

1 CBDC Enables Financial Inclusion

Financial inclusion and ease of access, particularly for lower-income households and other economically vulnerable communities, is a priority of central banks. Many emerging markets with a large unbanked population believe that CBDCs can serve as a gateway to broader access to electronic payment services and potentially other financial products. However, given existing challenges around digital literacy, access to the internet, trust in the government and data privacy, the extent to which CBDCs would increase financial inclusion is not yet clear.

2 Facilitate Cross-Border Payments

Most CBDC projects started by focusing on domestic needs. But they have potential to streamline cross-border remittance payments if they are subject to well-designed interoperability and foreign exchange (FX) protocols. That said, in addition to minimizing tax avoidance risk, attention should be paid to mitigate against the risk of currency substitution; that is, with increased use of a CBDC for cross-border payments, domestic currency may be supplanted by a more popular foreign digital currency and thereby undermine monetary sovereignty. More work will be needed to agree on common international standards, which will be no easy feat given the number and diversity of different payment systems, and legal and regulatory frameworks.

3 Efficiency and Resilience

Printing and disbursement of physical cash is an expensive endeavor. CBDC would reduce the cost of issuing and operating physical currency by 0.5-1 percent of GDP,[10] resulting in greater process efficiency. Further, during crises or periods of financial stress, it is important to get resources to individuals without reliance on fiscal transfers or the banking system. CBDC, as an additional payment method that is more efficient and secure than existing solutions, would contribute to greater resilience in payments.

4 Improve Effectiveness of Monetary Policy

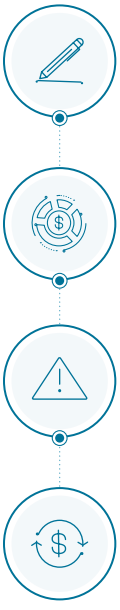
The direct distribution of funds under the CARES Act in the US and its impact on aggregate consumption is an illustration of the efficacy of direct disbursement as a transmission vehicle of monetary policy. A well-designed CBDC can help with the implementation of non-discretionary 'helicopter drops,' wherein governments can make direct transfers of CBDC to the public to alleviate negative impacts arising from natural disasters or public health crises. Further, CBDC has the potential to mitigate the impact of effective lower bound (ELB) interest rate policy in implementing monetary policy. In principle, ELB can be relaxed with a central bank instituting a negative nominal rate by reducing CBDC balances at a pre-announced rate. ELB frequently results in large flows into paper cash when central banks cut interest rates below zero. By imposing fees on large transfers between cash and CBDC, monetary policy can be made more effective.

5 Improve Stability and Regulation of Digital Ecosystem

The race for some uniformity in the structure and design of CBDCs is principally motivated to help head off the threat posed to monetary sovereignty by stablecoins and other forms of nonbank money. Unlike stablecoins, which are subject to credit and liquidity risk, CBDCs, suitably designed, are not subject to credit or liquidity risk by construction.

Real-World Challenges

While CBDCs have many potential benefits, significant challenges need to be addressed before they can be effectively designed and implemented. In fact, there is **a growing debate** whether any of the expected benefits of CBDC are real or can be achieved through other means. In our view, CBDC are a disruptive technology and thus, the user experience gained will be different (and thereby shift user expectations) and this is what should drive its appeal.



Design Challenges

As noted earlier, design questions regarding who should issue CBDC (direct, indirect or hybrid), how they should be distributed (one-tier or two-tier) and in what form they should be held (account versus token) remain. There are a number of additional design questions, which will need to be addressed, including how a user's identity is to be verified (for both domestic and cross-jurisdictional purposes); whether accounts should be interest-bearing or not; whether there should be limits on the amount of CBDC an individual or business can hold or accumulate over a specified time frame; and what privacy rules and data governance frameworks are most indicated (including what data is to be protected, by whom and from whom).

Disintermediation of Banking System

One of the biggest concerns posed by retail CBDCs is whether their introduction would lead to disintermediation of the commercial banking system. This is because retail depositors, who can directly hold funds in central banks under the direct CBDC model, would be incentivized to transfer their commercial bank deposits to a central bank, where their holdings could potentially earn interest, while having zero insolvency and illiquidity risks. As a result, bank deposits, a significant funding source and credit creator for commercial banks, would likely decline, or dry up altogether. Further, the "digital run" to CBDCs would likely be most severe during times of financial crises, where consumer confidence in traditional safeguards like government deposit insurance may be insufficient.

CBDCs could also lead to an increase in funding costs for banks, while reducing the availability of credit or raising the cost of credit for the private sector. In the case of interest-bearing CBDCs, there could be a shift away from low-risk assets, such as shares in money market mutual funds or sovereign bonds, to central bank holdings, which would reduce the credit supply in the economy. The design of CBDC should therefore be carefully calibrated to help avoid these unintended consequences and to enable commercial banks to continue their intermediation role to help ensure monetary and financial stability.

Security Issues

Will the proposed CBDC be secure from cybercrime and satisfy KYC, AML and CFT requirements? In particular, should efforts to counter money laundering, prevent fraud or other illicit activities be implemented via a centralized platform or a decentralized digital ledger using blockchain technology? And how would such rules be enforced during so-called off-line transactions whereby CBDCs are moved between holders without screening at the time of payment? Some central banks seem to favor a centralized platform while the Bahamian Central Bank is using a permissioned distributed ledger technology (DLT). The ability to ensure security while fostering technological innovation is critical in the design of an effective CBDC platform.

Impact on Reserve Currency

It is argued that CBDCs and stablecoins could alter the international monetary system by limiting the hegemonic role of the US dollar as the world's dominant currency. This would be accomplished by introducing effective competition for the dollar through a widely adopted CBDC that transcends national boundaries. Hence, a successful CBDC may be viewed as a beneficial outcome particularly by emerging markets. The pernicious effects of the hegemonic role of the dollar are explored **in our companion paper.**

Additional Design Considerations

We have invested considerable energy in dialogue around digital currency with central banks and private sector industry leaders. We believe that any design of CBDC should also consider the following:

- The principles developed for retail CBDCs have productive implications for wholesale CBDC that are created for use among financial intermediaries only. With the right infrastructure, CBDCs could become a payment solution for wholesale markets with relative ease. In effect, wholesale CBDCs can readily function as a payment solution in wholesale markets — for instance, as a cash settlement asset for securities transactions. This will require their adoption by central securities depositories or new security token networks that are being created.

- We believe that private sector involvement is key in the journey to a successful wholesale or retail CBDC. However, there are other ways central banks can support digital payment solutions today even if their decision concerning CBDC is a few years away. For example, certain central banks have decided to allow the private sector to develop wholesale cash token payment systems using blockchain technology.[11] This can be a productive first step in the CBDC journey. A recent decision by the BoE to allow for omnibus accounts is an important example of how central banks can support token-based solutions.[12]

- The success of CBDC in the global payment process would critically depend on a multi-currency capability so that business platforms in tokenized markets can directly access multiple currencies. A multiple central bank digital currency (mCBDC) network could potentially generate billions in annual savings by eliminating the high transaction costs historically charged in cross-border and cross-currency exchanges.[13] Establishing a well-designed CBDC would be best accomplished with coordinated action across different central banks and in partnership with the private sector. Such collaboration would be beneficial from technological and operational resilience perspectives. In fact, the lack of broader coordination among stakeholders has been a key factor why progress toward efficient cross-border payments is lagging.[14]

- It will be important for any CBDC-related solution to be technology-agnostic to accommodate further innovation. In addition to requiring technology to support 'extensibility', we believe interoperability is crucial to ensure future proofing of any CBDC solution. Along the same lines, open system solutions, which communicate seamlessly with external applications will be important for both resilience and wider adoption, and to facilitate future innovations in the payments space.

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What's Next?

Central banks face an important conundrum as the world's digital ecosystem continues to evolve rapidly and shows no sign of abating. Even with the introduction of a CBDC, private sector stablecoins are likely to continue in the digital economy. Both the International Monetary Fund (IMF)[15] and the Swiss National Bank[16] have indicated caution given concerns about the impact on monetary policy and macro-financial stability from the introduction of CBDCs. Geographic boundaries melt away in monetary policy when a phenomenon like bitcoin becomes legal tender.

Despite these challenges, the advantages of general purpose CBDCs in unlocking the potential for cheaper, faster, higher-quality and more inclusive financial services should not be overlooked. The key consideration is the ability to preserve macroeconomic stability. It is advisable to proceed with caution and consider viable private partnerships to harness the potential benefits of digital currency while preserving the monetary sovereignty of central banks.

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State Street Corporation
One Congress Street, Boston, MA 02114-2016

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