Should the Fed Issue Digital Currency?

Article by: Jessie Romero, Zhu Wang and Russell Wong

The United States might benefit from eventually replacing most physical cash with central bank digital currency (CBCD), but first the Federal Reserve must resolve several key policy and implementation issues, such as establishing comparative advantage over private issuers and ensuring safety and soundness.

As physical cash transactions decline and new digital currencies emerge, central banks around the world are actively analyzing the costs and benefits of creating central bank digital currencies, or CBDCs. In February, for example, China began piloting a digital renminbi in several cities. The same month, Federal Reserve Chair Jerome Powell called CBDC "a very high priority project" for the Fed. "We are looking carefully — very carefully — at the question of whether we should issue a digital dollar."

The questions to be answered — both technical and existential — are numerous. Should a CBDC be account-based or token-based? What role would private sector intermediaries play? What additional value would a CBDC add to the U.S. payments landscape? And would the benefits outweigh the costs? In this brief, we do not attempt to answer these questions fully but rather highlight them for discussion. Recent research suggests the Fed's cautious approach toward introducing a CBDC is well-advised.

What is CBDC, and Why Would the Fed Issue One?

Physical currency in circulation is a liability of the central bank. So most simply, central bank digital currency is central bank liability issued in electronic form. In a sense, the Federal Reserve already offers a digital currency in the form of electronic central bank deposits, also known as reserves. One might think of these reserves as wholesale CBDC since access to them is limited to qualifying financial intuitions. For retail payments, central banks have avoided dealing directly with the general public, relying instead on tiered arrangements in which commercial banks provide direct retail payment activities and services. At present, the only direct connection between the public and the central bank are the Federal Reserve...
Notes (paper money) people carry in their wallets. However, new technological advances, such as distributed ledger technology and mobile computing, have made it possible, on the one hand, for private parties to develop payments systems that bypass central banks and, on the other hand, for central banks to provide new forms of retail payments that bypass intermediaries.

A central bank could have multiple reasons to issue a digital currency but would need to tackle new challenges along the way. One practical reason might be to conserve resources: The Fed has budgeted more than $1 billion in 2021 to reimburse the Bureau of Engraving and Printing for printing currency. On top of that, using cash requires society to expend many additional resources on handling, safekeeping and counterfeit prevention. Moving to a digital currency could substantially reduce those costs, although it could also entail new costs, such as maintaining cybersecurity and resilience after cyberattacks.

Another reason might be to increase the effectiveness of monetary policy by replacing physical cash with CBDC, as physical cash in theory imposes a zero lower bound on interest rates. Given that stopping physical cash from circulating in the United States is unlikely, however, it's not clear how feasible this benefit would be. Plus, if market participants anticipate that the CBDC could have a negative interest rate, they might be reluctant to adopt it in the first place. Furthermore, some central banks, such as the European Central Bank and the Bank of Japan, already have broken through the zero lower bound because in practice, the cost of holding cash (especially large-denomination notes) deters the flight to cash in the event of a negative interest rate.

A CBDC also could improve financial stability by serving as a safe means of payment and store of value. Privately issued digital currencies have been very volatile; the value of Bitcoin, for example, is much more volatile than any other major currency or gold. A counter to this argument is that a CBDC could make financial markets more "runable." In other words, during times of stress, market participants could withdraw bank deposits or liquidate other assets en masse and quickly run to the CBDC. In the current paper money system, running to cash on such a large scale would be much more costly to market participants and therefore less likely to occur. Therefore, some mechanisms may need to be put in place to prevent or stop possible runs to the CBDC.

Another reason might be to improve payment efficiency. Electronic payment markets are highly concentrated. In the United States, for example, the vast majority of card payments are facilitated by just a few major networks, which have developed complicated pricing mechanisms for both merchants and consumers. The United States also lags behind many developing countries in adopting mobile-payment technologies, in part because it was an early adopter of card payments, as one of the authors of this brief (Wang) explores in a 2021 working paper with Pengfei Han of Peking University. A CBDC could provide an
alternative electronic payment method to potentially enhance the contestability of payment markets. It also could increase financial inclusion by offering another way for unbanked and underbanked consumers to make electronic payments.

Central banks also might want to enhance banking competition. An interest-bearing CBDC could potentially make deposit rates more competitive and increase the supply of deposit funding to the banking system.\textsuperscript{8} But this effect would be limited if CBDC and bank deposits are not close substitutes. Additionally, a CBDC may crowd out bank-based intermediation by raising bank-funding costs if the CBDC interest rate is set too high. More research is needed to evaluate the effects of a CBDC on banking markets.

**What Form Should a CBDC Take?**

If a central bank decides that issuing a CBDC is desirable, what should it look like? Unlike cash, which is always a piece of paper or polymer, a CBDC could take infinitely many possible forms. An important consideration in designing a CBDC is whether it should be account-based or token-based.

Account- and token-based payment systems are largely distinguished by their identification requirements. In an account-based system, the payor has to be identified as the holder of the account from which the payment will be made. In contrast, in a token-based system, the authenticity of the object being transferred is what needs to be verified. Both types of payments systems can be operated in either a centralized manner, in which a single trusted party is responsible for recordkeeping, or in a decentralized manner, in which the records are maintained collectively and accessible to the public.

Cash is a typical token system. As cash changes hands, the change in possession of the paper notes amounts to an updating of the records in the system. This system is decentralized because there is no single repository for the records and no single party responsible for updating them. Cryptocurrencies, such as Bitcoin, are also token systems, in which the records are decentralized as the coins are distributed in the network.

The systems have tradeoffs in their levels of access, privacy and security. For a given cost, no system can simultaneously have universal access, perfect security and complete privacy. Expanding access to a system is accompanied either by less security (from admitting potentially dishonest participants) or less privacy (relinquished by participants to control the risks).

The tradeoff between access and security is determined in part by who bears the liability for fraudulent transactions and erroneous records. In an account-based system, this liability falls on the account provider or the party tasked with verifying the message that initiated a payment. This arrangement aligns incentives for the account providers or system operators to try to control the risks of fraudulent transactions. In a token system, the
liability falls on the receiver, who runs the risk of receiving a counterfeit token or a token that has already been spent. The counterfeiting risk is determined by the relative costs of verifying and falsifying tokens. In the case of cash, with its easily recognizable security features, verification is cheap and instantaneous — so much so that the physical exchange is automatically a sign of accepting the token's authenticity. In open systems, such as Bitcoin, the use of cryptography keeps the cost of verifying the authenticity of tokens low. Open systems prevent counterfeiting by tracking tokens' creation through a record called the blockchain, which is stored in a ledger that is distributed throughout the computer network. For tokens to be valuable, it has to be prohibitively costly to alter the ledger.

The tradeoff between access and privacy is determined in part by the identification requirements. In a token system, the payor does not need to know anything about the payee's identity and does not have to reveal anything to the payee beyond the information associated with the specific token. In an account-based system, either the payor knows the payee's account number or the payee knows the payor's account number. In addition, in the current environment, the banks that hold the accounts are required to have information regarding the individuals' identities for a variety of legal reasons, including anti-money-laundering restrictions.

One of the authors of this brief (Wong) evaluates various designs and arguments for a CBDC in a 2020 article with Charles Kahn of University of Illinois at Urbana-Champaign and Francisco Rivadeneyra of the Bank of Canada. In addition to thinking about "what a desirable digital currency would look like," they consider the important question of "whether digital currency should be issued by the central bank instead of private issuers." They conclude that even with new technologies, an account-based system to issue CBDC to the public directly is unlikely a central bank's comparative advantage over private issuers in the near future. But by offering a token-based system to a wider set of participants, which could include individuals but most likely new financial firms, central banks could increase competition in the payment services market and spur innovation. Certainly, new cryptocurrency technologies make the entrance of the central bank to the market of retail digital payment a real possibility.

Taking a Cautious Approach

The above discussion suggests that central banks may want to move cautiously toward issuing CBDCs. The Federal Reserve, in particular, would need to tackle several key policy and implementation issues. For example, the safety and soundness of digital currency is of the utmost importance, given that the consequences of cyberattacks or operation failures could spread much faster and wider with a CBDC than with physical cash. Also, it would be a challenge in the CBDC design and operation to strike the right balance between fighting payment-related crime and protecting users' privacy. In addition, the value added of introducing a digital currency to the domestic payments system needs to be evaluated.
carefully. The United States already has a variety of electronic systems in place for wholesale and retail payments, so the contribution of a digital currency to addressing unmet demand might be limited. Looking beyond domestic use, however, digital currency could help ease the pain of cross-border payments. At the same time, the central bank may not want to discourage the private sector from developing new payment services in this area by issuing CBDC.

In sum, there are numerous potential benefits to issuing a CBDC, and in the long run, it may be desirable and feasible to eventually replace most physical cash with CBDC. But both recent research and the questions we have raised point toward the wisdom of taking a measured approach.

Jessie Romero is director of research publications, Zhu Wang is vice president for research in financial and payments systems, and Russell Wong is a senior economist in the Research Department at the Federal Reserve Bank of Richmond.


3 Board of Governors of the Federal Reserve System, Division of Reserve Bank Operations and Payment Systems, "2021 Currency Budget."


