

SOME THOUGHTS ON CENTRAL BANK DIGITAL CURRENCY

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The literature examining the question of central bank digital currency (CBDC) has grown immensely in a very short time. Much progress has been made since I first learned of the idea in a blogpost authored by J. P. Koning in 2014. That modest article soon led me to openly speculate on the merits of a central bank cryptocurrency in a talk I delivered at the International Workshop on P2P Financial Systems in Frankfurt (Andolfatto 2015). My audience, which consisted mainly of entrepreneurs, seemed to receive my talk with a polite mixture of bemusement and anxiety. Surely, I couldn't be serious? To be honest, I'm not sure that I was. But then the threat of Facebook's Libra came along, and central bankers around the world suddenly began to take the idea very seriously indeed.

In this article, I will share some of my thoughts on CBDC—what it is, the rationale behind the endeavor, and how it might be implemented in broad terms. I'll also address some of the concerns expressed by skeptics—in particular, the possible impact on banks and the implications for financial stability. I discuss these issues primarily in the context of the United States.

Before I begin, let me provide a sketch of the way money and payments work in the United States today. As is well known, the largest

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component of the money supply by far is created and managed by U.S. depository institutions. All of this money is already in digital form; that is, as checkable deposits. But if this is the case, then what is all the fuss about digital currency in general and CBDC in particular?

As it turns out, CBDC already exists in the United States in the form of Federal Reserve accounts. These accounts are fully insured and (since 2008) bear interest. Payments across these accounts occur through Fedwire, a real-time gross settlement system operated by the Federal Reserve. This service is only available to U.S. depository institutions, the U.S. Treasury, and a select number of foreign agencies. The services often cost less than a dollar per transaction, which, for an average transaction size of about \$4M, is practically free.¹ For individuals and nonbank businesses, small-value electronic payments are typically cleared through the ACH net settlement payment system. The interchange fees faced by merchants are typically in the range of 3–5 percent and can take up to three business days to settle.

This is normally the place where one provides a laundry list of the problems associated with making payments in the United States. Instead of doing this, I want to acknowledge the tremendous advancements that have been made in the past few decades. Whatever problems and inconveniences people experience today, believe me, were much worse a generation ago. It seems likely, to me, that technological developments and competition will continue to improve the payment experience for most Americans going forward. Nevertheless, I think some version of a retail-level CBDC remains desirable, even if it is not essential.

Central Bank Digital Currency vs. Central Bank Private Currency

All the money we use today consists of bank liabilities, either private or central. As I've already mentioned, private banks provide us with digital currency in the form of demand deposit liabilities. Let me

¹This is not a subsidized rate. Since the Monetary Control Act of 1980, the Federal Reserve is required to recoup the cost of services rendered to outside agencies.

label this *private bank digital currency* (PBDC). I've also mentioned that CBDC exists in the form of reserves held in accounts with the central bank. Reserves are counted as a liability of the Federal Reserve. The third type of money takes the form of small-denomination paper bills issued by the Federal Reserve. Let me label this *central bank paper currency* (CBPC). These too are counted as liabilities of the Fed.

The way things presently stand, everyone in the world is permitted access to CBPC, the paper component of the Fed's balance sheet. However, only banks (and a few other agencies) are permitted access to CBDC, the digital component of the Fed's balance sheet. Why is this the case?

One reason has to do with the manner in which payments are cleared and settled. When two parties use CBPC, no intermediary is needed to clear and settle payments—it is all done on a peer-to-peer (P2P) basis. In contrast, debiting and crediting central bank accounts requires the aid of an intermediary—in this case, the central bank. Because central banks are not specialized in delivering retail services, the task is delegated to the private bank sector, with a limited number of banks using the central bank as their own bank.

This hierarchical banking structure is likely to prevail for some time if for no other reason than people seem to value intermediated transactions. Even in the fabled cryptocurrency space, where digital assets can be managed like cash, many people prefer to hold such assets through intermediaries. Nevertheless, with the advent of the internet and technologies that permit secure communications with electronic databases, perhaps it is time to reassess the rationale for partitioning access to the Federal Reserve's balance sheet in this manner. Online U.S. Treasury accounts are presently available to all U.S. persons at Treasury Direct, so it is clearly possible to expand access to CBDC or have the Treasury return to its old practice of issuing money.

Of course, processing a massive volume of payment requests in a secure, rapid (possibly real-time), accurate, and low-cost manner on a 24x7x365 basis is another thing altogether. In what follows, I assume that standard SQL-based relational database management systems will suffice for this task and that the important questions relate mainly to implementation. In particular, I see little reason to consider for this application database management systems based on

“blockchain” principles—where write-privileges are open and the salaries paid to self-appointed accountants are determined by the outcome of a noncooperative game (Andolfatto 2018).

CBDC for All

The underlying philosophy behind cryptocurrencies like bitcoin is to permit a digital value-transfer system to operate with minimal third-party intermediation. In this spirit, I think the most direct way to offer CBDC is to permit direct access to reserve accounts with the Fed, consistent with how direct access is permitted with CBPC. Some have called this a one-tier approach.

A two-tier approach is also possible. In this version, direct access to CBDC is restricted to a set of intermediaries—presumably banks, but possibly other entities—that essentially intermediate the communications that occur between users and the Fed. In this scenario, there is no asset transformation—deposits remain liabilities of the Fed. There is the question of why this intermediate layer is needed. It is possible that intermediaries performing this function offer a suite of complementary services that depositors find useful. But if this is the case, it seems desirable to let depositors choose whether they want to manage their accounts directly (one tier) or with the aid of an intermediary (two tier). Offering a one-tier system permits a two-tier system to develop along with the demands of the community. Restricting CBDC to operate solely as a two-tier system seems difficult to rationalize. In particular, why restrict direct access to CBDC when there are no restrictions on direct access for CBPC?

A less radical approach is to offer a so-called synthetic CBDC. This is essentially a proposal to implement the old idea of narrow banks. A version of this would entail the creation of segregated bank accounts at existing depository institutions (see Garratt et al. 2015). It is not entirely clear what benefits small depositors would realize from this setup. But as deposit insurance is limited to \$250,000 per account, it is possible that large depositors would find this arrangement of some use. For large depositors, the same thing could be accomplished today through government money market funds with access to a standing repo facility at the Fed. There is also the possibility of having money accounts set up through Treasury Direct with

designated Treasury liabilities serving as a perfect substitute for Federal Reserve liabilities.²

Before I go on, let me make a brief comment on whether the product to be offered should exist as a standard registered account or whether it should have the property of a bearer instrument. While it is true that paper bills are bearer instruments, it is worth pointing out that their maximum denomination is only \$100. Large denomination bearer instruments are no longer legal. As well, numbered accounts are largely a thing of the past. The reasons for this are well known.

A token-based CBDC is, of course, subject to the same concerns. One rationale for issuing such a product is that it would serve to discourage the competitive threat of privately issued cryptocurrencies. But it seems more reasonable and practical, to me, at least, to let private cryptocurrencies serve their niche markets, the way local nonstate currencies have done for centuries.

CBDC as a Basic Public Option

Some economists have proposed offering a one-tier CBDC as a basic public option in the manner of a basic public utility (see Ricks, Crawford, and Menand 2021). This version would feature no minimum balance requirements and no fees; at least, for retail users. There would be no overdraft privileges, but the accounts would be fully insured and payments would occur in real time. As well, the accounts could earn interest commensurate with the yield on Treasury bills or some other money market rate.

There is the question of what might justify a zero user-cost policy for retail users. A payment system has the property of a natural monopoly. That is, while a large fixed cost is needed to set up and maintain the underlying infrastructure, the marginal resource costs of receiving messages and debiting/crediting accounts in a ledger are minuscule; at least, given the technology we have available today and

²The U.S. Treasury has the legal authority to issue money and, indeed, does so today in the form of coins. But it has also issued fiat money in the form of bills in the past. For example, the U.S. Note was issued from 1862 to 1971. It would be a simple matter for the Treasury to issue digital U.S. Notes with the Fed and Treasury fixing the exchange rate between their respective liabilities at par.

what we expect to have available in the near future. An optimal pricing structure in this case would entail something like a fixed monthly fee for access to the system together with a small (close to zero) fee per transaction.

The problem here is in how to administer the fixed fee in a fair and efficient manner. It is perhaps too much to ask of private-sector agencies to consider broader social objectives in their pricing practices. Small-value accounts are money-losing propositions for banks, which explains the extensive use of minimum balance requirements. According to a 2019 survey by the FDIC, nearly half of the unbanked households in the United States cited minimum balance requirements as a reason for remaining unbanked (see FDIC 2020). The high interchange fees faced by small business owners is also a significant problem. From a social perspective, what justifies having these fees set higher than the fees charged to banks for using Fedwire?

My own view is that there are both economic and political benefits to be had with a zero user-cost policy for CBDC retail accounts. Fees associated with simple record-keeping exercises serve as a tax on economic transactions. As Senator Carter Glass once remarked, policy should endeavor to remove all toll gates set upon the highways of commerce (Glass 1917). A basic payment system is very much like a public highway system. Sure, we could erect toll booths every five miles. We might even erect toll booths on public sidewalks, public parks, and so on. At some point, the practice of attempting to recover every nickel and dime of user cost at its source seems not only impractical, but also ridiculous. The solution is to provide a basic public service for free and to finance its cost through some combination of fees on wholesale users and general tax revenue. Apart from the economic benefits that would accrue from such a facility, it would also yield political dividends. Wealthy individuals and large corporations enjoy several special privileges in the world of finance. It would be politically astute, I think, to extend some of these privileges to the broader population. Moreover, it's important to keep in mind that these privileges are designed to promote general economic prosperity.

Impact on Banks and Financial Stability

Banks can be expected to resist the adoption of CBDC for all since it is likely to increase their funding costs. But what individual banks believe to be good for themselves and what ends up being good from

the broader perspective of society (including banks themselves) are not always the same thing. As I mentioned above, it is perhaps too much to ask that individual banks internalize the societal benefits of CBDC.

It seems clear enough that CBDC, even as a public option, is likely to increase bank funding costs. But what impact might this have on the willingness and ability of banks to lend? Critics of CBDC have pointed to the prospect of diminished bank-financed capital investment. And because CBDC provides everyone with an ultra-safe store of value, there is a fear that the widespread availability of such a product is likely to promote bank runs.

For what it is worth, I have considered both of these issues in the context of (an admittedly abstract) theoretical model (Andolfatto 2020). In that model, I assumed that the CBDC rate would be set below the interest on reserves (IOR) earned by banks and that the IOR rate is a policy rate the central bank is willing to defend by manipulating the supply of reserves. I also assumed that banks possessed some market power. The introduction of CBDC in this world had the following effects.

First, because banks make a profit on the IOR–deposit rate spread, if the CBDC rate is higher than the initial deposit rate, banks are compelled to match it. In other words, deposits need not flow into CBDC if banks are willing to compete more aggressively for this cheap source of funding. And because it remains a relatively cheap source of funding even after CBDC, we should expect deposit rates to rise and for funds to mostly remain in the banking system (in reality, individuals and businesses are likely to hold both private- and public-sector accounts). Second, the effect of rising deposit rates is to attract new deposits. In the model, this occurs as individuals substitute out of physical cash into (now more attractive) digital currency (PBDC and CBDC). To the extent that cash users are outside of the banking system, this serves to promote financial inclusion. Third, there is absolutely no impact on the willingness and ability of banks to lend. This is because the opportunity cost of lending (in the model) is the IOR rate, not the CBDC rate. By the way, this latter statement continues to be true even if the CBDC rate is set above the IOR rate, but only if the central bank is willing to lend reserves to banks at the IOR rate. This latter point serves to demonstrate that the predicted impact of CBDC is likely to depend on broader aspects of central bank policy.

The concerns expressed over the potentially destabilizing effects of a CBDC also seem overblown to me. Of course, much will depend on how policy is designed. I imagine that banks will continue to possess lender-of-last-resort privileges with the central bank. If a central bank stands ready to lend against good collateral, it seems hard to imagine how a run on the banking system would have a material impact on the ability of banks to fund their assets. As well, there is the possibility of adjusting the CBDC rate in response to a run. The CBDC rate could even be sent into negative territory, effectively eliminating it as a competing store of value. In any case, I recall similar concerns being raised when the Fed introduced its overnight reverse repo facility in 2015. That facility permitted the Fed to set up a deposit facility for an expanded set of counterparties. The feared instability did not materialize. Indeed, to the extent that CBDC might disintermediate some money market funds operating in the shadow bank sector, one could make the case that CBDC is likely to have a stabilizing effect on the financial system.

Conclusion

Recent technological developments in data storage, data processing, cryptography, and communications have had a profound effect on many aspects of society. And because money and payments are all about data management and communication, it should come as no surprise to witness the pressure such developments are exerting on the banking system. While our present system and the protocols it employs have evolved over time, its basic structure is rooted in a pre-internet era. So while digital currency may not be new, it is right to take the time to reexamine our institutional arrangements and to assess whether and how they need to evolve with the changing landscape and, of course, the needs of society.

References

- Andolfatto, D. (2015) "On the Desirability of a Government Cryptocurrency: Fedcoin." Available at www.youtube.com/watch?v=W7rTsVg7V31Y. Link to blogpost: <http://andolfatto.blogspot.com/2015/02/fedcoin-on-desirability-of-government.html>.
- _____ (2018) "Blockchain: What It Is, What It Does, and Why You Probably Don't Need One." *Federal Reserve Bank of St. Louis Review* 100 (2).

- _____ (2020) “Assessing the Impact of Central Bank Digital Currency on Private Banks.” *The Economic Journal* (forthcoming). See <https://doi.org/10.1093/ej/ueaa073>.
- Federal Deposit Insurance Corporation (2020) “FDIC Survey Shows 95 Percent of U.S. Households Were Banked in 2019.” FDIC Press Release (October 19). Available at www.fdic.gov/news/press-releases/2020/pr20113.html.
- Garratt, R.; Martin, A.; McAndrews, J.; and Nosal, E. (2015) “Segregated Balance Accounts.” Federal Reserve Bank of New York Staff Report No. 730.
- Glass, C. (1917) “Amending the Federal Reserve Act: Speech in the House of Representatives” (June 14). Available at <https://fraser.stlouisfed.org/title/statements-speeches-carter-glass-3773/amending-federal-reserve-act-475386>.
- Koning, J. P. (2014) “Fedcoin.” *Moneyness* (October 19). Available at <http://jpkoning.blogspot.com/2014/10/fedcoin.html>.
- Ricks, M.; Crawford, J.; and Menand, L. (2021) “FedAccounts: Digital Dollars.” *George Washington Law Review* 89 (1): 113–72.