

Staff Working Paper

Central Bank Digital Currencies: Costs, Benefits and Major Implications for the U.S. Economic System

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Central Bank Digital Currencies: Costs, Benefits and Major Implications for the U.S. Economic System

Gregory Baer¹

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Executive Summary

This note analyzes the benefits and costs of issuing a central bank digital currency, or CBDC. A central bank digital currency is not simply paper currency in digital form: its adoption would have profound consequences for the U.S. financial system and economy. It could transform the place of the central bank, and the government more generally, in our society. As an IMF analysis explains, “Launching a CBDC is a multidimensional undertaking that extends beyond the central bank’s normal information technology project management frameworks The new currency could lead to major disruptions affecting monetary policy transmission, financial stability, financial sector intermediation, the exchange rate channel, and the operation of the payment system.”²

The most significant impact would be a diminishment of the fractional reserve banking system in the United States, under which banks engage in maturity transformation by taking deposits and making loans. That system provides depositors a secure place to put their money with the right to withdraw it immediately, while allowing borrowers access to stable, low-cost, long-term funding. As some of those bank deposits moved to the central bank in the form of CBDC, the impact on economic growth could be significant – unless the central bank also assumed responsibility for lending or became a regular source of funding for banks.

A CBDC could come with benefits, potentially including a more efficient payments system and financial inclusion. This note includes a discussion of those benefits, and how they vary based on program design. Notably, many discussions of CBDCs list a variety of putative benefits, without acknowledging that many of them are mutually exclusive (because they are predicated on different program designs) or effectively non-existent (because the program design that produces them comes with costs that are for other reasons unbearable). Thus, for example, if one concludes that a decentralized, tokenized system (akin to present-day cash) is a dead option because it would mark the end of governmental actions to prevent money laundering and sanctions evasions, then key benefits of a CBDC – privacy, for example – disappear. As another example, the drag of a CBDC on lending and economic activity could be reduced by capping the amount of CBDC and using intermediaries rather than the central bank to transfer

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² Kiff et al. “IMF Working Paper WP/20/104)” *International Monetary Fund* at 19 (2020). The Governor of the Bank of England has noted, “CBDC, whilst offering much potential, also raises profound questions about the shape of the financial system and the implications for monetary and financial stability and the role of the central bank.” Bailey, Andrew, “Reinventing the Wheel (With More Automation),” Brookings Virtual Event (September 3, 2020).

it, but any cap would necessarily reduce a CBDC's benefits for efficiency and financial inclusion. Yet in some analyses, a "greatest hits" approach to CBDC benefits is presented.

The path forward is currently uncertain, and design choices could drive very different outcomes. In the United States, the Federal Reserve has expressed caution in this area, expressly noting the high stakes and need for Congressional consideration.³ This approach contrasts with a more precipitate approach at the European Central Bank, which has effectively announced its intention to issue a CBDC⁴ even as its potential consequences remain under study.⁵ This note describes a wide range of policy issues that merit consideration prior to a decision on whether to adopt a dollar CBDC.

Outline of the note:

- [What is a CBDC, and How is It Different from Currency?](#)
- [CBDC Design](#)
- [Brief Inventory of Existing U.S. Payment Systems](#)
- [Costs and Benefits of a CBDC](#)
- [Motivation for a CBDC](#)
- [Whose decision is it?](#)

³ Powell, "Closing Remarks at Conference on Pushing the Frontiers of Payments" (March 18, 2021) "...it is only by engaging all stakeholders—policymakers, private-sector participants, and academia—as this conference is doing, that we will achieve the improved payments ecosystem we are striving toward." <https://www.federalreserve.gov/newsevents/speech/powell20210318a.htm>; Quarles, Randal K., "The benefits in a country like the US of CBDC, they certainly – they may exist, and we should be active in looking into them, but I don't see an urgent flaw in our system that a CBDC would fix," Q&A at the Peterson Institute for International Economics (March 30, 2021). Cheng, Lawson and Wong, "Preconditions for a general-purpose central bank digital currency," *FEDS Notes* (February 24, 2021); <https://www.reuters.com/article/us-usa-fed-powell-digitalcurrency/feds-powell-more-important-for-u-s-to-get-digital-currency-right-than-be-first-idUSKBN27410I>; <https://www.reuters.com/article/us-usa-fed-powell-dollar-idUSKBN2AO24V>

⁴ See Neumann, Jeannette and Lacqua, Francine, "Lagarde Says ECB Could Have Digital Currency Within Four Years" *Bloomberg* (March 31, 2021). In November 2020, with work ongoing, ECB President Lagarde stated that her "hunch" was that the ECB would decide to issue a digital euro. Her hunch was consistent with earlier remarks noting that "a digital euro would allow the Eurosystem to be at the cutting edge of innovation," noting potential benefits and dismissing potential costs. Lagarde, Christine, "Payments in a Digital World" *Speech at the Deutsche Bundesbank online conference on banking and payments in a digital world* (September 10, 2020).

⁵ See, e.g., Bindseil, Ulrick, "Tiered CBDC and the Financial System: Working Paper 2351," *European Central Bank* (January 2020); see also Haldane, Andrew, "Seizing the Opportunities from Digital Finance," *Bank of England* (November 18, 2020).

What is a CBDC, and How is It Different from Currency?

INTRODUCTION

A brief glossary:

Currently, the *currency* of the United States takes the form of notes and coins, better known as cash. For purposes of the discussion below, it is helpful to think of cash as “token-based” – that is, it is a bearer instrument that is self-authenticating regardless of who holds it.

- *Central bank money* includes cash but mostly takes digital form as reserves held at the Federal Reserve Banks. These reserves are used by banks to clear and settle obligations between each other, and are used by the Federal Reserve to implement monetary policy.
- *Commercial bank money (sometimes called private money)* is also digital in form and takes the form of deposits at insured depository institutions (which this note will just call banks). Thus, debit card transactions at point of sale, Zelle or Venmo payments, and electronic payroll deposits are all examples of transfers of commercial bank money.
- A *CBDC* is a digital payment instrument, denominated in the national unit of account, that is a direct liability of the central bank.⁶
- *Digital money* includes commercial bank money, central bank money, and any future CBDC.

Thus, while some describe a CBDC as modernizing from physical to digital money – in this country, to a “digital dollar” – a large and growing majority of transactions already are conducted with digital money. This also includes credit card transactions, which are solely digital. Vault cash aside, every dollar on deposit at a U.S. bank is a “digital dollar.”

CBDC Design

In all designs, the central bank is the only party issuing CBDC, but the form that the CBDC takes and how the consumer or business accesses and transfers it could vary. The following summary of potential CBDC designs follows the general outline set forth in the leading publication from the BIS, which notes three major design choices: (1) *architecture* (direct or indirect model); (2) *infrastructure* (conventional central bank infrastructure or distributed ledger technology); and (3) *access and authentication* (tokenized or account-based).⁷

ARCHITECTURE: DIRECT OR INDIRECT MODEL

Direct model

In a direct model, the central bank would hold the consumer’s account and provide all payment services relating to the use of CBDCs in commerce. As the BIS analysis notes succinctly, “The direct CBDC is attractive for its simplicity, as it eliminates dependence on intermediaries by doing away with them.”⁸

A necessary consequence of this model would be a reduction in bank deposits as that money moved to a CBDC.

A direct model would require the central bank to take on responsibility for account administration – for example, account services (including providing ongoing balances), AML/KYC monitoring, transaction verification, dispute resolution and provision of any mobile banking applications. For some perspective on the workforce required, the 17 largest banks employ over 14,000 people in AML/KYC compliance alone; the industry total is likely closer to

⁶ See Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Federal Reserve Board, Bank for International Settlements, “Central Bank Digital Currencies: Foundational Principles and Core Features, Report No. 1” *Bank for International Settlements at 3* (2020) (hereafter “BIS 2020 Report”).

⁷ Auer, Raphael & Böhme, Rainer, “The technology of retail central bank digital currency,” *BIS Quarterly Review* (March 2020).

⁸ Auer & Böhme at 90. The authors also hypothesize a hybrid model with a claim on the central bank but with administration done by intermediaries. For our policy purposes here, that is effectively an indirect model.

20,000. If nationalized, this workforce would constitute a government agency roughly the size of the Department of Energy or the Environmental Protection Agency.⁹ And that is only AML/KYC.

Lastly, the financial sector also would lose access to data that comes with processing transactions; the effect on FinTech firms that count on monetizing that data would be particularly significant. The government would hold that data. Thus, consumers and businesses would gain privacy vis-à-vis the private sector and lose it vis-à-vis the government.

Thus, there is a strong consensus among central banks and other analysts that a direct model is unworkable and a dead option. As an Executive Board member of the ECB has put it, “[T]he ECB does not plan to interact directly with potentially hundreds of millions of users of a digital euro. We simply would not have the capacity or resources to do so. Financial intermediaries – in particular banks would provide the front-end services, as they do today for cash-related operations.”¹⁰

Indirect or two-tier model

In an indirect model, consumers would hold their CBDC at an account at a bank or other intermediary (e.g., a non-bank FinTech) – for example, in a “digital wallet.” The obligation to provide CBDC on demand would fall to the intermediary rather than the central bank. The central bank would track only the wholesale CBDC balances of the intermediaries.

To guarantee that in all cases the customer’s CBDC would be honored – in other words, that the intermediary would not default to the consumer or business – the intermediary would have to hold an equal amount of CBDC at the central bank. As a result, a bank or other intermediary would have no ability to leverage a consumer’s holding of CBDC in one of its accounts. In contrast, a bank that currently takes on a deposit as a liability must on the asset side hold high quality liquid assets to satisfy liquidity rules (and responsible risk management) but generally can lend out the rest;¹¹ in other words, it can leverage the deposit and transform a short-term liability into a long-term asset. CBDCs on deposit at a bank would provide no funding for that bank to make loans or provide other forms of credit intermediation; therefore, just as with the direct model, the availability of bank credit would be reduced and its price increased.

An indirect model would relieve the central bank of the obligation to provide banking services. As the BIS describes it, “Users could pay with a CBDC just as today, with a debit card, online banking tool or smartphone-based app, all operated by a bank or other private sector payment provider. However, instead of these intermediaries booking transactions on their own balance sheets as is the case today, they would simply update the record of who owns which CBDC balance.... In this way, the central bank avoids the operational tasks of opening accounts and administering payments for users, as private sector intermediaries would continue to perform retail payment services.”¹² In effect, the intermediaries would be an agent of the central bank.

Left unexplained, however, is why or how a bank would continue to perform those extraordinarily expensive and burdensome agency functions when it no longer received the low-cost funding benefit that comes with carrying a deposit; it would also lose the revenue benefit that comes from interchange fees. And interchange fees are a core part of the business model of FinTechs, which generally partner with banks not subject to price caps on interchange fees.¹³

They would need to shift to a model where they charged significant account fees. Such fees, however, would undermine putative financial inclusion benefits of a CBDC, discussed below.

⁹ <https://www.opm.gov/about-us/open-government/Data/Apps/Agencies/>

¹⁰ Panetta “Evolution or Revolution? The Impact of the Digital Euro on the Financial System,” *Bruegel Online Seminar* (February 10, 2021). Carstens, “Digital currencies and the future of the monetary system,” Bank for International Settlements (January 27, 2021), <https://www.bis.org/review/r210211d.pdf>, <https://www.bis.org/speeches/sp210127.pdf>.

¹¹ The deposit might also be subject to reserve requirements, but those requirements are currently set to zero in the United States.

¹² Carstens at 10. See also Auer & Böhme at 89.

¹³ See, e.g., Andreessen Horowitz, *Fintech Newsletter September 2019* (“This month, challenger bank Chime announced that it had surpassed [5 million](#) active accounts. Like its neobank competitors, Chime charges no overdraft fees, monthly service fees, or foreign transaction fees. How, then, does the company make money? And why aren’t incumbents following suit? The short answer is that these challenger banks are exploiting a regulatory asymmetry in the interchange fees that they are legally allowed to charge.”)

There is also the considerable potential for consumer confusion, as a choice would have to be made about whether a given payment was coming from a CBDC or a deposit account, or some combination of both.

INFRASTRUCTURE: CONVENTIONAL CENTRAL BANK INFRASTRUCTURE OR DISTRIBUTED-LEDGER TECHNOLOGY

To transfer ownership of CBDC, the central bank could choose a centrally controlled database, akin to the process for central bank money, or a distributed ledger technology (DLT). While much central bank and other research time is being spent on the technological changes here, the technological outcome does not appear to change materially the policy costs and benefits of a CBDC in the way that the choice between a direct or indirect architecture does.

Central database. A central database would be very similar to central bank money in today's system. In a direct infrastructure, the central bank would hold an account for each business and consumer and credit or debit that account for each transaction. In an indirect infrastructure, intermediaries would handle that function for their customers; the central bank would settle only wholesale accounts for the intermediaries at the central bank.

DLT. The Bank of England and others have been exploring the use of distributed-ledger technology for a CBDC. This option comes with challenges, as the BIS notes, "The overhead needed to operate a consensus mechanism is the main reason why DLTs have lower transaction throughput than conventional architectures. Specifically, these limits imply that current DLT could not be used for the direct CBDC except in very small jurisdictions, given the probable volume of data throughput. However, DLT could be used for the indirect CBDC architecture, as the number of transactions in many wholesale payment systems is comparable with that handled by existing blockchain platforms, as also demonstrated in several wholesale CBDC experiments conducted by central banks."¹⁴ It seems technologically feasible for a central bank to move from a "proof of work" model to a "proof of stake" model, with a limited number of large firms confirming transaction.¹⁵ Such a model would be significantly less labor- and energy-intensive; while settlement would still be probabilistic rather than final, settlement times could be reduced significantly from the current times required for Bitcoin.

In sum, as noted above, an indirect architecture appears far most likely, and could be supported either by a traditional central bank infrastructure or, less likely but still feasible, a wholesale DLT.

ACCESS: TOKENIZED OR ACCOUNT-BASED

Whether a direct or indirect infrastructure is chosen, and whether CBDC is transferred using a centralized or distributed technology, there will be a need for those holding and spending the CBDC to access the system – that is, to authenticate themselves as the owner of the CBDC. Of course, this is not an issue with banknotes, as possession of physical cash is 100 percent of the law.

The main choice here is between a token-based or account-based system. A token-based system is akin to banknotes, as the cash, not the owner, is being authenticated. An account-based system is very similar to current commercial bank money; one demonstrates ownership of an account and therefore all the money in it. Each option raises policy issues.

Token-based

A token-based system would make the CBDC most equivalent to "digital cash" because, like a banknote, it would be a bearer instrument and could be transferred with anonymity (or, as some would put it, with privacy). A token-based system could take the form of a general-purpose token targeted at retail transactions, or a wholesale token used only for wholesale and settlement transactions.¹⁶ Either would be based on public key cryptography, with the

¹⁴ Auer and Böhme at 92-93.

¹⁵ As the Reserve Bank of Australia recently observed, "It seems unlikely that there would be any serious consideration of public blockchain platforms for a CBDC. Instead, any DLT system considered for a CBDC would likely be permissioned, with access limited to payment system providers or other regulated entities, and with a consensus mechanism that could achieve immediate, final and irrevocable settlement, probably with some degree of centralization." Richards et al.

¹⁶ CPMI Report at 4

owner holding the private key; possession of the private key means possession of the CBDC. Tokens could be held in digital wallets or accounts.

In the public mind, this is likely what a CBDC is. However, such a system comes with fatal flaws and has been widely dismissed as unworkable.

First, full anonymity would effectively destroy the existing AML/CFT and sanctions regimes. The existing regime depends on physical cash being bulky and difficult to move and store securely; hence the need to convert it into commercial bank money in order to spend it; banks then assume the duty of monitoring or blocking its movement.¹⁷ Anonymous digital cash would present no such obstacle. As the Reserve Bank of Australia has observed, “Most central banks and other observers have . . . noted that the potential for anonymous digital currency to facilitate shadow-economy and illegal transactions makes it highly unlikely that any CBDC would be designed to fully match the levels of anonymity and privacy currently available with physical cash.”¹⁸

Second, private key security would be a major issue for consumers. Loss or theft of the private key would allow a criminal to take all of a consumer’s money irrevocably and to use it untraceably. There would be no recourse for the holder. Again, this is a major reason people historically have wished to hold commercial bank money in lieu of physical cash.

A token-based system might have more promise for a smaller, wholesale system, but as discussed below, the current wholesale system operates with digital, central bank money at extremely low cost and extremely high efficiency. Of course, another option would be to superimpose a second layer of controls, but that would effectively get you to the second option....

Account-based (also known as identity-based)

The alternative to a token-based system is an account-based system more akin to commercial banking, where the CBDC is attached to a particular owner and tracked as it passes from one owner to the other. Banks and other companies – think PayPal or Amazon or Apple – would retain relationships with clients and intermediate payments, albeit in CBDC rather than commercial bank money. The costs and benefits of this approach mirror those of an indirect architecture, with which it would likely be coupled.

As noted below, an account-based model would appear to reduce benefits to financial inclusion from a CBDC, as consumers would still need a private sector account in order to receive or send money, and such an account would come with fees.¹⁹

INTEREST-BEARING AND, IF SO, AT WHAT RATE

Whether a CBDC were account- or token-based, the central bank could choose to pay (or charge) interest. This would be a fundamental change to the U.S. currency; a distinguishing feature of cash is that it is not interest-bearing.

The first ramification of an interest-rate decision is monetary policy, beyond the scope of this note. More to come, though.

The second ramification is for the relative attraction of a CBDC to commercial bank money. Currently, banks compete for deposits by varying the interest rates they pay. That competition occurs not only among banks with regard to deposits but between banks and other entities offering money-like obligations, such as money market

¹⁷ See, e.g., <https://www.imdb.com/title/tt5071412/>

¹⁸ Richards et al., *supra*; see also Central Bank Joint Report at 6 (“Full anonymity is not plausible. While anti-money laundering and combating the financing of terrorism (AML/CFT) requirements are not a core central bank objective and will not be the primary motivation to issue a CBDC, central banks are expected to design CBDCs that conform to these requirements (along with any other regulatory expectations or disclosure laws).”)

¹⁹ See Auer and Bohme at 93 (“[An identity-based regime] depends on ‘strong identities’ for all account holders – schemes that map each individual to one and only one identifier across the entire payment system. Such schemes can present a challenge in some jurisdictions, thus impairing universal access.”)

funds. Each bank's strategy in setting its deposit rates is a key component of how banks manage risk and price loans.

If the Fed provided an interest-bearing CBDC, the Federal Reserve's chosen rate would largely determine the interest rates that banks would charge on customer deposits. (The Fed's monetary policy already has a significant, indirect influence on deposit rates, but the influence here would be more direct and stronger.) Because bank deposits and CBDC would be such close substitutes, a bank that offered a rate much below the CBDC rate would probably experience significant deposit outflows. Conversely, a bank could probably attract deposits by offering an interest rate only slightly above the CBDC rate, absent other competitive pressures. Thus, the CBDC rate would serve as a floor and suggest a ceiling for bank deposit rates.²⁰

The ability of banks to compete on rate against a CBDC would be diminished in times of economic crisis, when businesses and consumers prioritize liquidity and absolute safety over rate. Just as investors sold Treasuries in favor of holding cash in March 2020, businesses and consumers in a future crisis could be expected to transfer existing bank deposits to CBDC.

Forced to anticipate this possibility, banks would be less able to engage in business planning, significantly reducing the benefits of maturity transformation, as long-term loans could not be made on the assurance of stable deposits. For example, banks could not offer committed lines of credit on the assumption that some percentage of that borrowing would be redeposited, as opposed to held as CBDC.

Indeed, in a central bank *coup de grace*, this instability likely would be reflected in banks' liquidity requirements, which would require them to hold high quality liquid assets (cash or cash-like assets) against their now more unstable deposits. These low-risk but low-yielding assets would displace higher-yielding loans on bank balance sheets, raising the costs of borrowing for businesses and consumers and potentially continuing a doom loop for bank viability.

Absent a compelling benefit to monetary policy, it is difficult to see a justification for an interest-bearing CBDC.

LIMITED OR UNLIMITED

Some have suggested mitigating the impact of a CBDC on the commercial banking system, and thus on private sector allocation of capital, by limiting the amount that could be held at the central bank.²¹ Such a cap would not only limit the impact on bank lending in normal times but also prevent a run towards CBDC and away from banks in crisis.

As discussed in greater detail below, such a limitation would appear to forfeit many of the putative benefits of a CBDC. First, any consumer or business that expected to maintain a balance in excess of the limit at any time would still need to establish and hold a bank account, reducing efficiency and financial inclusion arguments for a CBDC. Second, many central banks view a CBDC as a vital answer to the competitive threat posed by cryptocurrencies, stablecoins or a Chinese CBDC; however, a quantitative limit would place the CBDC at a major competitive disadvantage in any such competition, as those instruments would allow unlimited holdings. (As discussed below, though, there are strong reasons to believe that a CBDC is unnecessary for this purpose.)

There would also be the practical problem of policing the cap – easier in a centralized solution at the central bank, which for the reasons above seems unlikely, but difficult in a system where a consumer might have numerous “wallets” in which to place the cash.²²

²⁰ See Gross, Marco and Siebenbrunner, Christoph, “On CBDCs and Sorcerers,” *FT Alphaville (February 14, 2020)* (with a CBDC, “central bank policy has the potential to become significantly more influential, even if people don't transfer any of their money into CBDC, or small amounts only. That's because the mere presence of a CBDC might let banks set their deposit rebates in a more tightly connected way to future CBDC interest rates — at a margin above the CBDC rate — to avoid significant outflows of people's bank deposits to their CBDC accounts. Up until now, when people have had no alternative interest-bearing form of money, deposit rates have regularly sat below policy rates.”

²¹ See Panetta at 9

²² See Bindseil at 21.

Lastly, even with a cap, a CBDC would have a significant impact on maturity transformation. The ECB has suggested a €3,000 per citizen cap, but with 340 million citizens, that would equate to a €1 trillion deposit withdrawal from EU banks, less any physical euros that converted to digital form.

Brief Inventory of Existing U.S. Payment Systems

Evaluating the marginal benefits and many of the costs of a U.S. CBDC requires an understanding of the payments *status quo* and how a CBDC would change it. So, below is a concise look at each aspect of the current regime.

LARGE DOLLAR WHOLESAL PAYMENTS

Currently in the United States, large-dollar payments are cleared and settled using a variety of systems.

Fedwire. Fedwire is a real-time gross settlement system operated by the Federal Reserve Banks by which banks settle obligations between them in central bank money. Transfers are immediate, final, and irrevocable once processed. In 2020, Fedwire processed over 180 million payments with a total value of over \$840 trillion.²³

CHIPS. The second system, used primarily for cross-border payments, is CHIPS, the Clearing House Interbank Payment System, a private sector network. (The Clearing House is owned by 23 banks and operated as a non-profit utility.) The CHIPS wire system in 2020 processed over 120 million payments with a total value of \$530 trillion. As with Fedwire, payments are final and irrevocable once processed. Banks pre-fund their CHIPS account at the Federal Reserve, and payments settle throughout the day; final positions are settled at the end of the day in central bank money, using Fedwire. CHIPS minimizes liquidity costs for users through netting.

RTP. The Clearing House Payments Company launched a real-time payments system (which it calls “RTP”) in November 2017. The RTP network clears and settles payments in real time – meaning, a few seconds. The RTP system operates among banks and is not customer-facing; it is plumbing. The RTP network’s real-time payment capabilities currently are accessible to financial institutions that hold 70 percent of U.S. demand deposit accounts, and the network currently reaches 56 percent of U.S. DDAs. Banks can integrate the RTP network directly or through a third-party service provider (e.g., Jack Henry, FIS). The Federal Reserve has stated that it will offer a competing system at some point in the future.

AUTOMATED CLEARING HOUSE PAYMENTS.

Currently, direct deposit of wages, recurring bill payments by consumers and many commercial payments occur through the Automated Clearing House system. ACH transactions clear and settle in batch. Traditionally, ACH transactions have taken three business days to clear and settle, but the operators have recently introduced a Same Day ACH program.

The ACH system is administered by The Clearing House and the Federal Reserve, in competition, and with each holding around half the market. In 2020, there were approximately 26 billion ACH transactions.

DEBIT CARD PAYMENTS

Debit payments are frequently made at point of sale, and can be authorized either by PIN or signature. PIN transactions run on the ACH rails, described above, while signatures run on the rails operated by the credit card networks (VISA and Mastercard). These transactions operate under a price-fixing regime administered by the Federal Reserve pursuant to the so-called Durbin Amendment to the Dodd-Frank Act.²⁴

²³ <https://www.frbservices.org/resources/fees/wires-2020.html>

²⁴ For banks with more than \$10 billion in assets, the fee is currently set at 21 cents plus 0.05 percent multiplied by the value of the transaction, plus a 1-cent fraud-prevention adjustment, if eligible. Banks under \$10 billion in assets are free to charge any price, and, increasingly, FinTech firms have partnered with such banks to earn interchange fees on the transactions they process, receiving a kickback from the bank with which they contract to process the transaction.

PERSON-TO-PERSON PAYMENTS

Increasingly, person-to-person payments occur online or by mobile phone, generally through an app such as Venmo or Zelle. Neither Venmo (a closed loop network) nor Zelle generally charges consumers a fee for a transfer.²⁵ Venmo uses ACH, card or RTP to move money into or out of its ecosystem. Zelle transacts directly to a customer's bank DDA, generally settles using ACH or card, and is migrating to RTP.²⁶

In 2020, Venmo processed 15.4 billion transactions with a total value of \$159 billion;²⁷ Zelle processed 1.2 billion transactions with a total value of \$309 billion.²⁸ Venmo is wholly owned by PayPal; Zelle is owned by Early Warning Services, a bank-owned utility. Zelle reports that it can reach 97 percent of U.S. demand deposit accounts.

CROSS-BORDER PAYMENTS

The most costly and time-consuming types of payment in the current U.S. system are cross-border payments (other than wholesale payments using CHIPS) – most notably, remittances from one person to another or wires between consumers and businesses or between businesses. Banks have withdrawn from the remittance business and shrunk their correspondent banking networks. Indeed, the main business case for Facebook's Libra (now Diem) was – and the continuing business case for Western Union still is – cross-border remittances.

These inefficiencies generally are the direct result of a strict liability, zero-tolerance enforcement approach towards AML/CFT and economic sanctions by FinCEN and the federal banking agencies that has effectively blocked any attempt to modernize cross-border payments and led to the dismantling of correspondent banking networks.²⁹ Resolution planning requirements also heavily disincentivize global and correspondent banking, as the Federal Reserve and FDIC have strongly favored the importance of easy resolution of a failed multinational bank over global trade,³⁰ humanitarian assistance, and the hegemony of the dollar. Lastly, on the European side of the equation, privacy laws currently complicate any efforts to transmit data cross-border.

RECONCILIATION

For businesses, the greatest inefficiency in the current payment system does not involve the payment *per se* but rather the associated reconciliation of the item for which payment is made. Indeed, one reason checks continue in use for business transactions is the ability to literally attach the check to the invoice (via paperclip), preventing them from being separated by the company's back office in processing. A central feature of the RTP system is a data field that allows the invoice to travel in the same digital transmission as the payment.

This area is one where distributed ledger and related technologies have the potential for extraordinary efficiency gains and cost reductions. Banks and technology companies are developing a wide range of technologies in this area.³¹ It is important to note, though, that this technology does not depend on the existence of a CBDC. A distributed ledger could reconcile inventory in the back-office without a CBDC; a CBDC could be created with no capacity to reconcile inventory.

²⁵ <https://fin.plaid.com/articles/how-venmo-does-p2p-without-fees/>; <https://www.zellepay.com/support/are-there-any-fees-to-send-money-using-zelle#:~:text=Zelle%20doesn%27t%20charge%20a,there%20are%20no%20additional%20fees>. Note that Venmo does pass along higher debit charge fees charged in the event that the customer's bank holds less than \$10 billion in assets and thus can charge higher fees than those fixed for larger banks. See note ___ *supra*. The Clearing House, "A New Paradigm: Redesigning the U.S. AML/CFT Framework to Protect National Security and Aid Law Enforcement" (February 2017), https://www.theclearinghouse.org/~media/TCH/Documents/TCH%20WEEKLY/2017/20170216_TCH_Report_AML_CFT_Framework_Redesign.pdf.

²⁶ <https://www.earlywarning.com/press-release/early-warning-and-clearing-house-complete-critical-integration-milestone-zeller-and>

²⁷ https://s1.q4cdn.com/633035571/files/doc_financials/2020/q4/Q4-FY-20-PayPal-Earnings-Release.pdf

²⁸ <https://www.zellepay.com/press-releases/zeller-closes-2020-record-307-billion-sent-12-billion-transactions>

²⁹ For a discussion of this trend and efforts by regulators to deny and reverse it, see Coelho, Fishman, Hassan Y Rstko, "FSI Insights on policy implementation No 28 Closing the loop: AML/CFT supervision of correspondent banking" *Bank for International Settlements* (September 2020). For a graphical illustration of how those efforts are working, see https://www.bis.org/cpmi/paysysinfo/corr_bank_data/chartpack_2008.pdf

³⁰ See Baer, Greg, "The Post-Crisis Regulatory Tariff Regime," *Banking Perspectives* (October 2018), available at <https://www.bankingperspectives.com/the-post-crisis-regulatory-tariff-regime/>

³¹ JP Morgan at 8. <https://www.jpmorgan.com/solutions/cib/investment-banking/corporate-finance-advisory/blockchain>

It is also worth noting that distributed ledger technology has large promise in other areas of finance – for example, post-trade securities settlement, and managing collateral and margin at central clearing parties and other financial market utilities. Again, none of this work requires a CBDC.

SUMMARY

In sum, the current U.S. payment system:

- Allows banks to make large-dollar wholesale payments at practically no risk and no cost.
- Allows consumers to make mobile payments to one another at no risk and generally no cost. While banks incur some credit risk in giving consumers real-time availability of transfers in process, adoption of RTP will soon eliminate that risk.
- Allows for direct deposit of payroll and recurring payment of mortgage, rent, utility and other significant payments at extremely low cost – soon, on a one-day settlement cycle, but in the near future in real time.
- Is inefficient in processing cross-border payments, particularly remittances, primarily as a result of regulation.

It is important to note that in order to participate fully in the U.S. payment system, one must have a bank account. Thus, proponents of a CBDC argue that creating a new currency is a more effective way of getting low-income people access to the benefits of a payments system. That proposition is also evaluated below.

Costs and Benefits of a CBDC

Set forth below are potential costs and benefits of a CBDC, and how they vary based on program design.

Costs

ENDING OR REDUCING FRACTIONAL RESERVE BANKING WITH CONSEQUENT LOWER ECONOMIC GROWTH

The Core Problem

A necessary consequence of any CBDC would be to shift money out of bank deposits and into cash – in this case, digital cash. As a result, those deposits would no longer fund bank loans, which are the primary asset of banks, as well as Treasuries and other assets. Banks' lending would decrease in supply and increase in cost as banks paid higher rates to persuade businesses and consumers to hold deposits rather than CBDC. (The effect would be felt by all banks, as there is no way to "tailor" a CBDC to defund only large banks. Indeed, the effect would probably be felt most keenly by small banks, which rely more on lending to generate returns and thus would have less ability to cross-subsidize higher deposit rates.)

Practically every analysis of CBDC acknowledges this problem.³²

As noted above, this problem would heighten at times of economic uncertainty. Existing depositors might move their money to CBDC, requiring banks to shrink their assets – namely, loans. Such a response would have an immediate, highly procyclical and deflationary effect.

Furthermore, in March 2020, businesses drew hundreds of billions of dollars on committed lines of credit and kept the proceeds on deposit at their banks. Given that banks would have to forecast some percentage of those line

³² See, e.g., BIS 2020 Report at 8; IMF Working Paper WP/20/104) at 15-17; Kim & Kwon, "Central Bank Digital Currency and Financial Stability" Bank of Korea Working Paper No. 2019-6 ("A major potential concern is the financial stability issue associated with the risk of an economy-wide run from bank deposits to CBDC that would leave the banking system 'short of funds.'"); Yanagawa et al. ("Central banks are neither destined to make loans directly to individuals and non-bank private firms, nor superior to commercial banks and other private entities in terms of the capacity to make judgment on risks and returns of various projects. Therefore, if CBDCs replace not only banknotes but also bank deposits substantially, they could distort efficient resource allocation in the economy.")

draws moving to CBDC, their ability to offer committed lines of credit would be reduced at all times, and businesses would be more inclined to look to government for funding in crisis.

Potential impacts extend beyond lending. As the Committee on Payments and Market Infrastructures (CPMI) at the Bank for International Settlements has explained:

With CBDCs, there could be a larger role for central banks in financial intermediation.... [C]entral banks might need to acquire (or accept as collateral) additional sovereign claims and, depending on size, private assets (e.g. securitized mortgages, exchange-traded funds and others). If demand becomes very large, central banks may [also] need to hold less liquid and riskier securities, thereby influencing the prices of such securities, and potentially affecting market functioning. Central banks may also need to provide substantial maturity, liquidity and credit risk transformation at times to both banks and markets. Since central banks could assume more important roles, they could have a larger impact on lending financial conditions.... A greater role for central banks in credit allocation entails overall economic losses if central banks are less efficient than the private sector at resource allocation (e.g. as it impedes the efficient use of centralized knowledge in society).³³

Further:

While a CBDC would by itself be very liquid, it could result in reduced liquidity and increased “specialness” in collateral (repo) markets. The depth of repo and short-term government bill markets could decline as demand was redirected to the wholesale market use of CBDC.... This expanded role of central banks in wholesale markets could also reduce interbank activity and the price discovery role of these markets.³⁴

This analysis was published in 2018, before the Federal Reserve intervened to support most U.S. fixed-income markets in 2020.

Mitigating Steps and Their Limits

There are ways to prevent a transfer from bank deposits to CBDC from reducing aggregate lending, other types of financial intermediation, and therefore economic growth, but each comes with heavy costs.

First, to mitigate the effect of any lost deposits on lending and economic growth, the Federal Reserve could become a direct commercial or consumer lender, replacing the loss of lending by commercial banks with its own. The drawbacks here are obvious, and central bankers have noted but indicated no interest in this option.

Second, to replace lost deposits and boost economic growth, the Federal Reserve could lend back to banks the amount of lost deposits – that is, all or part of the value of outstanding CBDC – for the banks in turn to lend or use for lending or other types of financial intermediation.³⁵ In effect, the Federal Reserve would become the lender of first resort rather than last resort.

Such a system would raise difficult questions. Unless the Federal Reserve differentiated based on the credit quality of the bank, it would be taking on massive credit risk. So, would the Federal Reserve hire a large force of credit underwriters and become effectively a commercial lender (albeit to only one type of company)? Or would the

³³ Committee on Payments and Market Infrastructures, Market Committee, “Central Bank Digital Currencies,” *Bank for International Settlements* (March 2018) (hereafter “CPMI Report”) 14 (citation omitted).

³⁴ *Id.*

³⁵ This option is discussed in Bank of Korea, *supra* (“[O]nce the central bank is allowed to lend all the deposits in CBDC account to commercial banks, the introduction of CBDC can improve financial stability by reducing the likelihood of bank panic.”)

Federal Reserve disregard credit risk and simply auction off its deposits to the highest-bidding banks?³⁶ Or would there be (potentially politicized) criteria to determine which banks are most deserving of deposits? Or would the Federal Home Loan Banks, which operate with implicit government backing and are unquestionably now too big to fail, take on an even larger role in funding banks? Obviously, under any of these permutations, it would be very difficult for banks to engage in business planning, as they would have little control over, or thus little ability to predict, their future funding levels or rates; thus, what had heretofore been their most stable source of funds would become highly unstable. Banks' cost of capital would likely rise significantly, as their funding source would no longer be reliable. Nonetheless, at least some at the ECB at least appears to view a lender-of-first-resort system as a viable option.³⁷

Third, as noted above, banks could minimize the deposits lost to a CBDC by offering higher interest rates. If the government did not pay interest on or otherwise subsidize use of a CBDC, then CBDC would probably end up as a relatively unattractive alternative except in crisis. There are two problems here. First, the increase in banks' cost of funds would necessarily translate into higher rates for loans, with a resulting reduction in economic activity. Second, as noted above, at times of financial instability, depositors may be insensitive to rate

Similarly, non-bank intermediaries could construct programs to sweep CBDC into higher-yielding liabilities overnight – most likely a money market account. But that means the customer buying money market shares in exchange for CBDC; at that point, the money market fund is holding CBDC, which presumably it would use to purchase higher yielding assets (e.g., commercial paper). So, in other words, maturity transformation would be transferred from the banking system to the shadow banking system.

The analysis above assumes that the Federal Reserve did not subsidize CBDC on financial inclusion or other grounds – most likely, by paying an interest rate. Such a subsidy would be extraordinarily regressive in effect, as interest income would correlate with how much CBDC one had – there would be no way to limit that subsidy only to those previously unbanked, or to low- and moderate-income people. (Of course, Congress could simply give such people CBDC, but it could give them commercial bank money now.)

In sum, the potential impact is shifting to an economic system where the government rather than the private sector determines the cost and availability of deposits, and thus of credit.³⁸

SANCTIONS ENFORCEMENT AND ANTI-MONEY LAUNDERING AND COUNTERING THE FINANCING OF TERRORISM (AML/CFT)

As described above, an anonymized, token-based CBDC would end the monitoring of financial transactions as a tool for generating leads for law enforcement, and – to the extent it was used cross-border – end the use of economic sanctions as a foreign policy tool. That is one reason it is universally considered a non-viable option.

Thus, most CBDC analyses simply presume that this work would be left with the banking system, but as described in detail above, such a regime would require them to charge high account or transaction fees that (in addition to the fees for other types of account administration) would negate financial inclusion benefits.

DATA PRIVACY

Under an account-based, indirect CBDC – the most likely and perhaps only viable regime – financial intermediaries would continue to see the same types of transactional data that they do currently. The main difference is that banks might be forced to harvest and monetize that data in the way that some FinTechs currently do, as they would not be earning net interest income on a CBDC in the way they do with a deposit (and associated loan). There is also the question of how much customer data the central bank would see. A governmental repository of all personal transaction data would obviously raise privacy questions.

³⁶ One model could be the Term Auction Facility is a discount window lending facility the Fed used during the Global Financial Crisis to price regular discount window loans through an auction mechanism. Although it was used during the crisis, it is authorized under the Fed's regular, not emergency, lending authority and remains listed in Regulation A as a discount window facility.

³⁷ Panetta, "Evolution or Revolution?" ("[A] shift from bank deposits into CBDC would merely change the composition of banks' funding sources, with fewer private sector deposits and more central bank funding.")

³⁸ <https://www.ft.com/content/7736bc74-f0ac-3acd-84e0-ecac75c7c51a>

CONCENTRATION OF RISK

Currently, the U.S. payment system presents various ways of making payments and is thus resilient to any particular point of failure. Depending on how dominant it became as a method of payment, a CBDC would come with concentration risk. Under most designs, however, a CBDC is unlikely to replace entirely existing payment rails, so this concern should be minimal.

NATIONAL SECURITY

Any CBDC would be an attractive target for both state and non-state actors seeking to harm or extort the United States. National security would depend on the viability of that technology, as the ability of a rival nation state or terrorist group to create or destroy money – or even to create uncertainty about which digital dollars are real and which are counterfeit – would threaten the U.S. economy. Of course, a sophisticated state or non-state actor could also attack existing payment rails, and the best defense there is diversification.

GOVERNMENTAL POWER

Under every version of CBDC design, the Federal Reserve would gain extraordinary power.

As described above, in one way or another, the commercial banking system would be reliant on the Federal Reserve for its lifeblood: low-cost deposits. The Fed likely would be able to increase or decrease the availability of deposits in its sole discretion. That important part of the business of banking would be absorbed by the state.

This power over commercial banking would parallel and reinforce power that the Federal Reserve has already asserted over capital markets, and which some are urging it to expand further.³⁹

Of course, this assumes that the Federal Reserve would be able to retain sole authority for determining the terms on which each bank was able to access deposits. It seems possible, however, that once the Fed established deposits as a public, not a private, good, then Congress would wish to legislate to whom deposits were appropriated. Depending on the Administration, those deposits might flow to banks who lent to one industry or another.

A worst-case scenario here is not hard to imagine. The Center for a New American Security, a non-partisan think tank, recently issued a report on the CBDC (called Digital Currency Electronic Payment, or DCEP) planned by the People's Bank of China:

The PBOC is seeking a digital currency to harness the market share and technological innovation of private financial firms and to gain better access to information about the financial activities of Chinese consumers.... It is also clear that the Chinese government hopes to leverage DCEP for the CCP's domestic political agenda. Whereas PBOC officials have indicated that they will harness huge amounts of DCEP data to enhance monetary policy and monitor for illegal activity, officials higher in the Chinese government have stressed DCEP's value as a tool for enforcing party discipline. PBOC officials also have said that DCEP will have "controllable anonymity," allowing the central bank to see all of the transactions taking place while maintaining privacy among transacting parties. However, the system will also enable the CCP to exercise greater control over private transactions, as well as to wield punitive power over Chinese citizens in tandem with the social credit system.⁴⁰

(As discussed below, these authoritarian ambitions for DCEP may reduce its allure as a global currency.)

³⁹ <https://medium.com/bank-policy-institute/the-fsocs-looming-challenge-un-ringing-a-very-large-bell-48ddcdb93c96>

⁴⁰ Fanusiee, Yaya and Jin, Emily, "China's Digital Currency: Adding Financial Data to Digital Authoritarianism," *Center for a New American Security* (January 26, 2021) at 1.

COSTS TO DEVELOP AND IMPLEMENT

There are currently no estimates of what it would cost to develop or implement a CBDC. Ongoing costs would be offset to some extent by reduced costs for maintaining paper currency. The net costs would be borne by the taxpayer in the form of a lower remittance to the Treasury from the Federal Reserve. Work by other agencies would have to be appropriated.

Benefits

An analysis of the benefits identified in various reports follows.

“CASH-LIKE SAFETY AND CONVENIENCE FOR PEER-TO-PEER PAYMENTS”⁴¹

A March 2020 joint central bank report states, “Today, even consumers who normally prefer to pay electronically are confident that, if an episode of financial turmoil were to threaten, they could shift their electronic money holdings into cash. This flight to cash has been seen in many crisis episodes, including recent ones.”⁴² This assertion comes without a supporting citation and appears demonstrably false, at least in the United States and the United Kingdom. There is no record during the Global Financial Crisis of consumers abandoning FDIC-insured deposits – commercial bank digital money – for banknotes. During the COVID crisis, whose singular feature was a demand for liquidity, there is again no record of consumers wishing to hold that liquidity in banknotes rather than commercial bank money. To the contrary, U.S. banks experienced massive deposit inflows, and the Bank of England reports that ATM withdrawals fell sharply during the COVID crisis.⁴³ Thus, consumers now consider commercial-bank, digital money synonymous with cash in terms of its safety and reliability, and a CBDC seemingly would do nothing to enhance their confidence in the payment system.

The calculus may be different with respect to corporate depositors, who often hold deposits substantially above the FDIC limit of \$250,000. These deposits are prone to running in a crisis, and as a result, regulations (most notably, the Liquidity Coverage Ratio) require banks to use wholesale deposits to fund only highly liquid assets.⁴⁴ But, witness the quotation above, CBDC proponents do not pitch a CBDC as providing enhanced security to multinational corporations that currently hold wholesale deposits. And of course acknowledging that a corporate would be more secure with a CBDC than an uninsured wholesale deposit is another way of saying that concerns about a destabilizing run in a crisis, with disastrous procyclical economic effects, are quite real and serious.

“CONTINUED ACCESS TO CENTRAL BANK MONEY”⁴⁵

As the same central bank report puts it, “In jurisdictions where access to cash is in decline, there is a danger that households and businesses will no longer have access to risk-free central bank money. Some central banks consider it an obligation to provide public access and that this access could be crucial for confidence in a currency. A CBDC could act like a ‘digital banknote’ and could fulfil this obligation.”⁴⁶

At least in the United States, this danger appears nonexistent. Consumers now routinely and reflexively make payments with a debit card or Venmo transaction, either oblivious or indifferent to the fact that they are doing so in commercial bank money rather than cash; the same is true with respect to business payments on ACH, which will migrate to RTP. There is no behavioral or anecdotal evidence that consumers checking the balance of their (federally insured) deposits at their banks wish that their commercial bank money could take the form of a more direct obligation of the central bank – in other words that they feel the concern that the world’s central banks wish

⁴¹ Auer and Boehme at 1.

⁴² Auer and Boehme at 86.

⁴³ <https://www.bankofengland.co.uk/quarterly-bulletin/2020/2020-q4/cash-in-the-time-of-covid>

⁴⁴ The LCR further distinguishes between operational deposits (those regularly used by a corporate for business purposes) and non-operational deposits, which are basically an investment and thus more likely to run based on rate or economic conditions.

⁴⁵ Joint Central Bank 2020 Report at 5

⁴⁶ *Id.*

to impute to them. And of course, most tellingly, the use of cash as a payment mechanism in the United States has been declining for decades – again, without anyone observing that they are losing economic security.

Indeed, the CPMI has observed, “While specifics will vary according to a country’s circumstance and economic conditions, these payments-related motivations for issuing CBDC appear at this time not to be compelling for most jurisdictions. The growing use of electronic means of payment has not generally resulted in a substantial reduction in the demand for cash.... In many countries, current retail payments solutions are convenient, efficient and reliable, and have earned public trust and confidence over time.”⁴⁷

WHOLESALE PAYMENTS

The CPMI summarizes, “In terms of wholesale markets, the main argument made is that settlement systems for financial transactions could be made more efficient – in terms of operational costs and use of collateral and liquidity – and more secure by using wholesale CBDC.”⁴⁸

As described above, however, at least in the United States, Fedwire is a real-time gross settlement system with infinitesimal operational costs and zero demands for collateral or liquidity. CHIPS is not an RTGS system but uses a sophisticated netting system that makes demands for collateral extremely small. While other jurisdictions may have different demands, there appears to be no need for a CBDC in wholesale payments in the United States. As the CPMI observes, “[C]entral banks have been conducting experiments involving CBDC and its evolving underlying technology (in particular DLT). Early experimentation, however, has not shown benefits for wholesale payments. The design of an infrastructure using such technology would look similar to the one currently in place in terms of legal, operational and securities requirements.”⁴⁹

Likely as a result, a review of central bank work on CBDCs shows a greater focus on retail rather than wholesale applications.

“FINANCIAL INCLUSION”⁵⁰

Many central banks studies refer to the financial inclusion benefits of a CBDC in theory. Less clear is how a CBDC would achieve these benefits in practice.

What do we know about the unbanked population? According to a 2019 FDIC study, 5.4 percent of U.S. households (approximately 7.1 million households) are unbanked, a percentage that has been steadily falling and is currently at an all-time low.⁵¹

When asked to provide the main reason they do not have a bank account, respondents to an FDIC survey answered: Don't Have Enough Money to Meet Minimum Balance Requirements (29%); Don't Trust Banks (16%); Personal Identification, Credit or Former Bank Account Problems (8%); Avoiding a Bank Gives More Privacy (7%); Bank Account Fees Too High (7%); Bank Account Fees Too Unpredictable (2%); Banks Do Not Offer Needed Products and Services (2%); Bank Locations are Inconvenient (2%); Bank Hours Are Inconvenient (2%). It is worth considering a CBDC with those responses in mind.

Since a CBDC would come with fewer services than a traditional bank account and no branches, it would seem to offer no attraction to the 6 percent of respondents who wanted more services or branches.

For the 16 percent of people who do not trust banks and the 7 percent who seek privacy, they would likely be attracted to an anonymous, tokenized version of CBDC, but as described above, that option has no chance of being chosen. As for the only viable alternative – an account-based, indirect model – it seems unlikely that those currently unbanked given distrust of banks and concerns about privacy would adopt a digital wallet provided by either a bank or a technology company,⁵² perhaps with the government also having direct access to their spending

⁴⁷ CPMI Report at 7.

⁴⁸ CPMI at 8.

⁴⁹ Id. at 8.

⁵⁰ Lagarde (2018).

⁵¹ <https://www.fdic.gov/analysis/household-survey/index.html>

⁵² Data shows that consumers are far more trusting of banks to safeguard their data than technology companies. <https://bpi.com/wp-content/uploads/2019/04/5d-BPI-Data-Privacy-Poll-Results.pdf>

habits as well. Anecdotally, many of the unbanked fear engagement with the banking system because they are undocumented or are paid in cash, lest the bank report their status or transactions to the government; those people would presumably be more concerned with banking with the government as an additional party. So, regardless of its features, this 23 percent of the unbanked likely would be wholly unsatisfied with a CBDC.

Thus, the greatest potential benefit is with those concerned with minimum balance requirements (29 percent) or fees (7 percent). As described above, there is every likelihood that administration of a digital wallet would have to come with substantial fees, as a CBDC would deprive intermediaries of their principal current sources of revenue. Moreover, low-cost banking accounts are becoming prevalent. The non-profit Cities for Financial Empowerment Fund has created the Bank On basic banking account, which is now offered by over 60 banks comprising 28,000 branches around the country. The account comes with a minimum balance of only \$25 and monthly fees of \$5 or less; account opening is free, as is in-market ATM usage, and there are no overdraft charges.⁵³ It remains to be seen whether consumers concerned with high minimum balances and fees will adopt a banking product that imposes neither. (Of course, an education campaign by public sector leaders would be helpful in this regard, and presumably would require less work than attempting to educate consumers about what a central bank digital currency is, and how to access it through a digital wallet.)

For regulators or legislators looking to improve financial inclusion, there are options for encouraging even greater offering of that account or similar ones, for example through pending Community Reinvestment Act reform (where the treatment of Bank On-certified accounts is currently unclear). Of course, Congress could also simply mandate the offering of Bank On or some other low-cost account, perhaps along with some CRA or other (tax-based) reward for doing so. Such a requirement would come with costs, but trivial in comparison to those that appear to come with a CBDC.

There is also the potential for increasing demand for basic banking accounts as well as supply; the government could announce that recipients of any future EIP payments or other government benefits would have to be electronic, which would certainly cause people to establish accounts. With the growing prevalence of low-cost accounts, this step would seem to be quite practical. Such a requirement would also reduce consumer demand for high-cost alternatives such as check cashers and payday lenders. While Congress might have been hesitant to adopt such a requirement if doing so required LMI customers to establish a high-cost account, that is no longer a problem. And the cost savings to consumers from not having to use a check-casher to convert the benefits to spendable money would be extraordinary.

In short, the creation of a digital currency, might traverse some but likely not most of the “last mile” in terms of serving the nation’s remaining unbanked, but at seemingly higher costs than other options.

It is important to note that the equation may be quite different in countries that have never developed a mature banking system. As note report notes, “CBDCs can be transformative in countries with large un- and under-banked populations by reducing the barriers to entry relative to more traditional financial services. This is unsurprisingly much more relevant to lower income countries, where roughly half of the population does not have easy access to bank and bank-like accounts, than developed markets like the United States, Europe, and other G10 countries.”⁵⁴

ELECTRONIC BENEFITS PAYMENTS

Part of the COVID response was Economic Impact Payments authorized by Congress to get cash into the hands of Americans. That process was a difficult one, as electronic transfers via ACH required verification of customer accounts and therefore took days or weeks, and paper checks were cumbersome to process and took still longer; both processes came with significant fraud. Thus, some have stated that a CBDC would have allowed for instantaneous payments.⁵⁵

⁵³ <https://2wvkof1mfraz2etgea1p8kiy-wpengine.netdna-ssl.com/wp-content/uploads/2020/10/Bank-On-National-Account-Standards-2021-2022.pdf>

⁵⁴ JP Morgan, *Blockchain and the Decentralization Revolution* 38 (2017), available at <https://www.jpmorgan.com/solutions/cib/investment-banking/corporate-finance-advisory/blockchain>

⁵⁵ <https://www.kansascityfed.org/publications/ten/articles/2020/summer/presidents-message-payments-challenge-of-reaching-all-americans>; <https://www.kansascityfed.org/en/publications/research/rwp/psrb/articles/2020/inclusion-by-design-crafting-central-bank-digital-currency>; JP Morgan at 36.

It is notable, though, that through the RTP system, the Treasury could have made real-time payments to 56 percent of Americans. That number is likely to grow significantly in the next year or two, well ahead of any CBDC option, and include the option of Zelle or Venmo. EIP distributions were not made in real time because the Treasury Department has repeatedly declined to participate in or even pilot the RTP program, and instead chosen to continue using the Federal Reserve's ACH network as its exclusive payments provider. Thus, for a growing majority of Americans to receive real-time EIP payments – and Social Security payments and tax rebates – the country does not need a CBDC but rather a change of policy at Bureau of the Fiscal Service at the Treasury Department.

Finally, even if a payment were somehow made in CBDC, an off-ramp for that money would be necessary; a recipient would need to be able to spend that digital dollar at a grocery store or pay it to a landlord without converting it to banknotes and paying in person. In all likelihood, as described above, that would necessitate a payments infrastructure much like the one we have currently. For example, in an indirect, account-based regime, the money would have to flow to a digital wallet with the intermediary conducting the same AML/CFT and sanctions processes that banks do currently. Thus, a CBDC would provide little to no marginal benefit for immediate benefits payments when compared to a real-time payment to a traditional bank account.

IMPROVING CROSS-BORDER PAYMENTS

The BIS has noted, “Cross-border payments are vital for global trade and for migrants who send remittances home, yet they are generally slower, more expensive and more opaque than domestic payments. Most cross-border payments flow through the “correspondent banking network” - a network that is reportedly shrinking and becoming more concentrated.”⁵⁶

It is very difficult to understand how adoption of cross-border CBDCs would solve or simplify current problems with cross-border payments. A token-based access system would seem to make matters even worse. Central banks could agree to exempt transfers of CBDC from all the regulatory and compliance requirements that currently complicate them, but they could take the same action under the current payments regime – and understandably have decided not to do so.

The solution to revitalizing correspondent networks and speeding cross-border transactions has always been obvious: establishing objective, pre-defined criteria for AML/CFT and sanctions compliance and granting banks a safe harbor from enforcement if they meet them. That is true whether the payment is in commercial bank money or in a CBDC.

In October 2020, the G20 announced a new effort to enhance cross-border payment services, with the FSB and CPMI leading work on the effort.⁵⁷

“RESILIENCE”⁵⁸

The central banks again: “Cash serves as a backup payment method to electronic systems if those networks cease to function. However, if access to cash is marginalized, it will be less useful as a backup method if the need arises. A CBDC system could act as an additional payment method, improving operational resilience.”⁵⁹ This is a remarkable assertion.

First, a CBDC itself would be an electronic system. Second, multiple governmental and central bank payments systems — CHAPS, ECB Target 2 and Fedwire — have experienced significant technical outages in recent years. There is to put it mildly no record of banks seeking to settle the trillions of dollars of pending transactions in physical cash – no immediate orders for the armored cars to roll out from the Federal Reserve Banks. Rather, a diverse payment system reverted to other forms of electronic payment. The greatest threat to payments resilience would be a dominant CBDC with a lot of eggs in one digital basket.

⁵⁶ https://www.bis.org/cpmi/paysysinfo/corr_bank_data/corr_bank_data_commentary_1905.htm

⁵⁷ <https://www.fsb.org/wp-content/uploads/P131020-1.pdf>

⁵⁸ *Id.* At 5.

⁵⁹ Joint Central Bank Report at 5.

RELATIONSHIP BETWEEN COSTS AND BENEFITS

Design choices can severely diminish some putative benefits of a CBDC. Thus, for example, benefits to financial inclusion are maximized in a direct, token-based model where low- and moderate-income people can avoid dealing with financial intermediaries and transact with privacy; however, the great weight of opinion is that any U.S. CBDC in fact would be indirect and account-based.⁶⁰ Because most preliminary analyses of CBDCs are exploratory and lay out all options, they rarely present the net costs and benefits of any single approach – instead assembling a “greatest hits” of benefits.

One exception is a joint 2020 report, which notes the tensions:

The trade-offs between an interest-bearing CBDC and the potential financial stability impact on the banking system are discussed [elsewhere]. Significantly more work is required to really understand the trade-offs. A further practical consideration here is that it is currently easier to calculate and pay interest using a centralised ledger. Using only a centralised ledger potentially reduces the payments convenience of a CBDC (e.g. making peer-to-peer and offline payments more difficult, or subject to caps) and using a combination of centralised and decentralised ledgers adds complexity to the system.

Even if it adds complexity, a variety of payment options with different functionalities may be needed to support heterogeneous use cases, e.g. a CBDC that could be stored in both a digital wallet and on a dedicated device. Offering multiple user experiences and functionalities will need to be considered in the wider business model of the system, including which services are provided by the public or private sector. A basic CBDC offering will still need features that make it convenient and attractive enough to drive adoption.

However, improving user convenience by making offline and peer-to-peer payments possible would necessitate additional safeguards to counter the risk of fraud, since security features and centralised controls (e.g. to “lock” stolen funds or query suspicious transactions) are more difficult to implement on a distributed system. A centralised ledger with a cap on allowable offline transactions is a potential compromise. However, an offline cap could limit functionality in the event of a prolonged operational problem (e.g. a natural disaster) and thereby reduce the resilience of the system.

The resilience of a CBDC system’s infrastructure would also depend on how the ledger is designed. A decentralised ledger could bring some operational resilience benefits, although so could a centralised ledger with multiple data centres. A choice that could have more bearing on resilience would be any interdependency or integration with other systems. If a critical function is provided to a CBDC system by another system or supporting infrastructure, then their unavailability could impact the CBDC. In addition to being resilient, a CBDC infrastructure will need to settle instantly a very large number of authenticated payments and potentially increase its capacity substantially as future demand increases. This may require compromises on some features that might otherwise be desirable (such as computationally demanding privacy techniques or programmable payments) as additional complexities could increase the processing demand on the system.⁶¹

To those who have ever worked in business, where rising enthusiasm is not considered proof of concept, this discussion reads like a *post mortem* explanation for why a project was abandoned due to undue complexity and cost, with the project team reassigned or dismissed.

⁶⁰ See Auer and Böhme at 88 (“From a technical perspective there is an underlying trade-off between privacy and ease of access on the one hand and ease of law enforcement on the other.”)

⁶¹ Central Bank Joint 2020 Report at 15.

Motivation for a CBDC

So, why? Given the high potential costs and uncertain and limited benefits of a CBDC, and the extraordinary complexity of the enterprise, one could ask why some European central banks are pursuing it so ardently – at a pace that for central bankers could be called frenzied – even before the technology is solidified and the costs and benefits weighed.

The primary motivation appears to be fear.

FEAR OF CRYPTOCURRENCIES

Almost every central bank speech about CBDCs at some point mentions cryptocurrencies, and a fear that Bitcoin and the like will play a larger role in payments. However, concerns about Bitcoin displacing or even materially diminishing the dollar or other currencies appear overstated. First, most practically, only a finite number of coins – 21 million – can be created. That amount can support a speculative investment, but it's not enough tulip bulbs to support a \$20 trillion U.S. economy. Second, bitcoin varies wildly in price – something that no one is looking for in a currency, even if the variance is generally upward. The Governor of the Bank of England recently noted that Bitcoin and other cryptocurrencies “strike me as unsuited to the world of payments, where certainty of value matters.”⁶² Third, processing of Bitcoin transactions is slow and expensive.

It is true that Bitcoin is becoming more widely held; its valuation has been growing; asset managers are creating funds to invest in it; and banks are acting as custodians for it. But the same could be said of Apple stock. No one considers Apple stock a currency or a threat to the dollar. (Note: Bitcoin market cap as of today's publication⁶³: \$600 billion; Apple market cap: \$2.065 trillion.)

Thus, as one central bank study recently observed. “While the term ‘cryptocurrency’ may suggest that they are a form of money, the consensus is that existing cryptocurrencies do not provide the key attributes of money....[T]hey are rarely used or accepted as a means of payment, they are not commonly used as a unit of account, and their prices can be quite volatile and so they are a poor store of value.”⁶⁴

Put another way, asset classes for investors to consider traditionally have included equities, bonds, commodities and gold. Clearly, Bitcoin and the like have entered that inventory, as it is viewed by some as an uncorrelated asset, akin to the role traditionally played by gold. Even if that were true – and it apparently is not⁶⁵ – assets are not the same as currencies.

FEAR OF STABLECOINS

Stablecoins are cryptocurrencies designed to have a completely stable value by being backed 100 percent by purportedly safe and liquid assets. The most notable example is Facebook's Diem, the rechristened Libra. As one paper paints the picture, “Significant adoption of money not denominated in the sovereign currency could limit the impact of monetary policy or the ability to support financial stability.... In extremis, such a ‘digital dollarisation’ could see a national currency substituted by another with the domestic central bank gradually losing control over monetary matters.”⁶⁶

Again, it is difficult to understand how a stablecoin like Diem could ever assume a significant role as a global currency, as a rival to the dollar (or the euro, et cetera). As the General Manager of the BIS has explained:

⁶² Bailey, “Reinventing the Wheel.

⁶³ The need for this qualifier rather proves the foregoing point.

⁶⁴ Richards, Thompson, and Dark, “Retail Central Bank Digital Currency: Design Considerations, Rationales and Implications,” *Reserve Bank of Australia* (October 14, 2020).

⁶⁵ A JP Morgan analysis notes, “Drawdowns of at least 10% on global equities have occurred almost annually over the past decade, during which cryptocurrencies have proven the least profitable hedges.” https://www.tbstat.com/wp/uploads/2021/02/JPM_Bitcoin_Report.pdf

⁶⁶ Brunnermeier et al (2019); G7 Working Group on Stablecoins (2019)

[T]here are still serious governance concerns if a private entity issues its own currency and is responsible for maintaining its asset backing. Historical examples show us that there may be strong incentives to deviate from an appropriate asset backing, such as pressure to invest in riskier assets to achieve higher returns. Overall, private stablecoins cannot serve as the basis for a sound monetary system. There may yet be meaningful specific use cases for stablecoins. But to remain credible, they need to be heavily regulated and supervised. They need to build on the foundations and trust provided by existing central banks, and thus to be part of the existing financial system.

If anything, this analysis overstates the attraction of a stablecoin, because a stablecoin can break down even if management never succumbs to pressure to invest in riskier assets. One can think of a U.S. prime money market fund circa 2020 as very much like a stablecoin, being listed at par and backed by what was considered a pool of very low-risk assets. But what we learned in 2020 – and 2009 – is that even high-quality liquid assets can go down in value in an economic crisis. Thus, for Diem to lose its credibility, there would be no need for greed or malfeasance; mismanagement or bad luck would do.

Of course, if Diem did threaten the U.S. currency system, there would be a relatively simple alternative to adopting a digital currency and disrupting American market capitalism: outlawing it as a means of payment, or regulating it to the point of non-viability, an outcome likely to be achieved by simply regulating the issuers of stablecoins like the depository institutions they would resemble.

FEAR OF THE UNITED STATES

While obviously not a consideration for the Federal Reserve, other central banks have additional reasons to pursue a CBDC. A major motivation in Europe is U.S. hegemony over the financial system deriving from the fact that the dollar is the global reserve currency.⁶⁷ That motivation appears to assume, though, that the dollar is the reserve currency because the U.S. payment system is the most modern rather than because the U.S. economy is the most productive and stable. Put another way, as described below, it is difficult to see any type of payment where the ECB's adoption of a digital Euro would have the marginal effect of causing an institution or individual to transact in Euro rather than dollars. That equation is driven by economics and, increasingly, by global politics. Again, for the United States, a simpler answer might be less unilateral use of economic sanctions that, through the hegemony of the dollar, effectively bind our allies.

FEAR OF CHINA

Certainly, a major motivation of many foreign central banks is China's plans for DCEP. There is no question that China is the nation most aggressively pursuing a CBDC, and per the discussion above, has the most ambitions for it – not as a way to enhance financial inclusion or speed the payments system but rather as a way to enhance China's power around the world – particularly in developing countries – and further authoritarian control of its own citizenry.

The key question for the United States is whether a U.S. dollar CBDC is useful in reducing Chinese influence in the developing world. First, will those nations adopt the renminbi as their currency, particularly given the data and control that China would gain as a result? (Of course, China could coerce client states into using DCEP, but the existence of a U.S. or European CBDC would do absolutely nothing to prevent that coercion.) Second, as an alternative, does the United States also need to present a CBDC, or is it simply a matter of allowing commercial bank money to flow through existing payment networks and correspondent banking, without the roadblocks currently established by the U.S. government itself? (Again, if concerns about AML/CFT and sanctions are deemed too serious to allow the free flow of commercial bank money, it is very difficult to understand how the U.S. government could be sanguine about a CBDC flowing even more freely.)

⁶⁷ <https://www.economist.com/briefing/2020/01/18/americas-aggressive-use-of-sanctions-endangers-the-dollars-reign>

Conclusion

Issuance of a CBDC in the United States would be a larger policy change for our society than practically any legislation in living memory. Its merits therefore should be evaluated with commensurate scrutiny by serious people.