

Central Bank Digital Currency in Historical Perspective: Another Crossroad in Monetary History

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WE ARE AT a crossroad in monetary history. Advances in technology—digitalization—have led to the development of new forms of financial assets (fintech) and new forms of money (money-like assets). These include virtual (crypto) currencies like bitcoin, stable coins like libra/diem, and central bank digital currencies (CBDC) like the Bahamian sand dollar. The innovations in money (money-like assets) resonate with earlier major shifts in monetary history.¹ Three stand out:

- 1) The shift in the eighteenth and nineteenth centuries from commodity money (specie), that is, gold and silver coins, to convertible-into-specie fiduciary money issued by banks of issue (commercial banks and central banks)² as well as inconvertible government-issued fiat money;
- 2) The shift in the nineteenth and twentieth centuries from commercial bank notes (often issued in competitive markets) to a central bank monopoly; and
- 3) The evolution since the seventeenth century (and even earlier) of central banks and the tools of monetary policy.

Here I examine the case for central bank–provided digital currency through the lens of monetary history and the history of monetary thought. After my historical overview, I will focus on the modern case for central

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¹Innovations in money and payments did not just occur in earlier centuries. Since World War II innovations like ATMs, credit and debit cards have been transformational.

²The public banks in Naples in the Middle Ages may be the pioneers in bank notes issue, long before the Riksbank and Bank of England. Velde, “Money Doctors.”

banks issuing digital currencies. Then I will discuss the implementation and design of CBDC followed by consideration of how CBDC can influence monetary policy, including at the international level.

The history of transformations in monetary systems suggests that technological change in money and finance is inevitable, driven by the financial incentives of a market economy. Government has always had a key role in the provision of currency (outside money) which is a public good. It has also regulated inside money provided by the private banking system.³ This government role has held for fiduciary money and will likely hold for digital money. CBDC could make monetary policy more efficient and, if interest is paid on it and that rate is used as a policy instrument, the issues of the Effective Lower Bound (ELB) can be eliminated. Moreover, varying the interest rate on CBDC can provide true macro and price stability. Finally, CBDC could have a great impact on the global economy by facilitating international payments. It also may transform the international monetary system.

Monetary Transformations in History⁴

Monetary transformations in history have been driven by changing technology, changing tastes, economic growth, and the demands to effectively satisfy the functions of money. Money (and finance) has evolved along with human history.⁵ Coinage (and paper money in China) can be traced back over two millennia. Three transformations in the modern era set the stage for the current digital transformation.

First, in the eighteenth and nineteenth centuries new financial technology led to the advent of fiduciary money (convertible bank notes) which greatly reduced the resource costs of specie. As Adam Smith put it,

The gold and silver which circulates in any country may very properly be compared to a highway, which, while it circulates and carries to market all the grass and corn of the country, produces itself not a single pile of either. The judicious operations of banking, by providing, if I may be allowed so violent a metaphor, a sort of wagon-way through the air, enable the country to convert as it were, a great part of its highways into good pastures and corn-

³Inside money refers to monies (notes and deposits) issued by commercial banks.

⁴For an earlier treatment of monetary transformations, see Bordo and Capie, *Monetary Regimes in Transition*.

⁵Goetzmann, *Money Changes Everything*.

fields, and thereby to increase very considerably the annual produce of its land and labor. The commerce and industry of the country, however, it must be acknowledged, though they may be augmented, cannot be altogether so secure when they are thus, as it were, suspended on the Daedelian wings of paper money as when they travel upon the solid ground of gold and silver. Over and above the accidents to which they are exposed from the unskillfulness of the conductors of this paper money, they are liable to several others, from which no prudence or skill of these conductors can guard them.⁶

Commercial banks originated with the issuing of warehouse receipts for deposited gold by goldsmiths in medieval Italy. This led to the evolution of fractional reserve banking. The social saving of fiduciary money had to be balanced by the credit risk from potential runs.

In addition, the exigencies of rising costs of war finance in the early modern period led to the issue by governments of inconvertible fiat money. The Swedish Riksbank issued fiat money to finance the Seven Years' War in an earlier use of the inflation tax.⁷ Other early examples include the issue of continentals in the American Revolutionary War and the assignats in the French Revolution which led to a hyperinflation.⁸ Until late in the twentieth century fiat money was associated with high inflation and instability. Only in the last few decades have monetary authorities learned the technology to operate credible low-inflation fiat money regimes.⁹ CBDC, as a social saving over fiat currency, promises to be the next generation in this progression.

Second, the early record of unregulated (or under- or misregulated) commercial banks issuing notes, ostensibly convertible into specie, has had a checkered history. It has been used to make the case for government regulation of commercial banking and for a government monopoly of the note issue.¹⁰

⁶Smith, *Inquiry*, vol. 2, pt. 2, sec. 86, p. 321.

⁷Bordo and Levy, "Do Enlarged Fiscal Deficits Cause Inflation?"

⁸White, "French Revolution and the Politics of Government Finance," 227–55; Capie, "Conditions in Which Very Rapid Inflation Has Appeared."

⁹Bordo and Flandreau, "Core, Periphery, Exchange Rate Regimes and Globalization."

¹⁰The debate over free banking versus central banking goes back to the classical economists and Walter Bagehot. The case for free banking was revived by Vera Smith with her 1934 *Rationale of Central Banking* and by the modern Austrian school with Friederich Hayek's 1976 (*Denationalization of Money*) case for currency competition as well as the historical and theoretical work on free banking by Lawrence White (1984, *Free Banking in Britain*), George Selgin (1988, *Theory of Free Banking*) and Roland Vaubel (1984, "Government's Money Monopoly") and others. Charles Goodhart (1988, *Evolution of Central Banks*) championed the classical case. Benjamin Klein (1974,

Milton Friedman succinctly made the case:

So long as the fiduciary currency has a market value greater than its cost of production—which under favorable conditions can be compressed close to the cost of paper on which it is printed—any individual issuer has an incentive to issue additional amounts. A fiduciary currency would thus probably tend through increased issue to degenerate into a commodity standard—there being no stable equilibrium price short of that at which the money value of currency is no greater than that of the paper it contains. And in view of the negligible cost of adding zeros, it is not clear that there is any finite price level for which this is the case.¹¹

The classic case of instability was the free banking experience of the United States between 1836 and 1863, after the demise of the Second Bank of the United States.¹² Many states allowed groups of citizens to set up note-issuing banks with minimal regulation (convertibility into specie on demand, low capital requirements, low reserve requirements, backing by state government bonds, some at market and some at par value). The record was one of considerable instability with frequent failures, occasional fraud (wildcat banks), and notes circulating at a discount determined by the distance to the originating bank for redemption.¹³ Counterfeit detectors did provide information on counterfeits, broken notes, and discount rates. But the high asymmetric information costs of a multiple currency system created an inefficient payments system and led to reform with the federal government's bond-backed national banking system providing a uniform currency in 1863.¹⁴

The experience of many other countries with free banking and competing currencies is similar: country banks in England, competing coins and notes

“Competitive Supply of Money”) buttressed the Austrian case by arguing that the classical proposition that leaving the provision of bank notes to perfectly competitive private firms would lead to an indeterminate price level by introducing the concept of brand names and imperfect competition into the market for bank notes. With brand names, banking firms would have an incentive not to overissue notes and capture all of the seigniorage revenue as under the classical case for regulating the issue of bank notes by a government authority.

¹¹ Friedman, *Program for Monetary Stability*, 7.

¹² Hammond, *Banks and Politics in America*.

¹³ Gorton and Zhang, “Taming Wildcat Stablecoins.”

¹⁴ Modern research suggests that the free banking experience was not as bad as the consensus view argues. See, e.g., Rockoff, “New Evidence on Free Banking in the United States,” and Rolnick and Weber, “Causes of the Free Bank Failures.” The debate continues.

in Switzerland, and so on.¹⁵ Some notable exceptions included Scotland in the eighteenth and early nineteenth century, although Goodhart attributed this to the Scottish banks being an oligopoly, the bank owners subject to unlimited liability, and the presence of the Bank of England as a lender of last resort.¹⁶ The US national banking system (1863–1913) created a safe note system based on 110 percent backing by US government bonds and a note redemption fund. The Canadian chartered banks after 1867 also had a good record, and losses on bank notes were prevented by the establishment of a note redemption fund. Nevertheless, in both the United States and Canada, credit risk from bank failures introduced a significant transactions cost.

In all these cases the note issue eventually gravitated toward a central bank/government monopoly. Thus, just as the history of multiple competing currencies led to central bank provision of currency, the present day rise of cryptocurrencies and stable coins suggests that the outcome may also be a process of consolidation toward a CBDC.

Third, central banks evolved from the seventeenth to the twentieth centuries to satisfy several important public needs:¹⁷

1) In the seventeenth and eighteenth centuries, it was war finance, to aid the government in funding and marketing its debt, for example, the Riksbank established in 1667 and the Bank of England in 1694;

2) In the early twentieth century, a number of central banks were established to provide an efficient payments system, correcting the deficiencies of multiple competing currencies, for example, the Swiss National Bank in 1907;¹⁸

3) Related to the above, many central banks were established to provide financial stability. The classic case is the Federal Reserve System, founded in 1913, to provide an elastic currency and to act as a lender of

¹⁵Presnell, *Country Banking in the Industrial Revolution*; Baltensperger and Kugler, *Swiss Monetary History*.

¹⁶White, *Free Banking in Britain*; Goodhart, *Evolution of Central Banks*.

¹⁷Roberds and Velde, “Early Public Banks I” and “Early Public Banks II,” Ugolini, *Evolution of Central Banking*, and Bindseil, *Central Banking before 1800*, consider the experience of earlier proto-central banks in the late Middle Ages and the early modern period in Europe. These banks, e.g., the Bank of Amsterdam (Quinn and Roberds, “Policy Framework for the Bank of Amsterdam”), were usually municipal or public-private enterprises, which were able to use their balance sheets to create an efficient payments system. The Bank of Amsterdam was successful for several centuries because both its ledger money could be predictably swapped for specie and there was an implicit guarantee of the unbacked portion of its liability. It collapsed in 1795 because it had diluted its balance sheet through loans to the Dutch East India Company.

¹⁸Bordo and James, “From 1907 to 1946.”

last resort to solve the ongoing problem of banking panics.¹⁹ The lender of last resort function was developed in Great Britain in the nineteenth century with Bagehot's Rule,²⁰ as was the case in the other advanced European countries.

4) To ensure stability in the value of money. Most early central banks operated under the classical gold standard whose basic rule was to adhere to the fixed price of gold. With monetary evolution toward a mixed currency (specie and convertible Bank of England and other bank notes), the pioneering Bank of England learned through the nineteenth century to stabilize the economy and maintain convertibility into gold in the face of both external and internal shocks.²¹ The key to its relative success was credibility maintained by the submission of internal to external goals. Its credibility allowed it a modicum of flexibility to follow limited stabilization policies within the target zone of the gold points.²² Other advanced European countries followed suit.

During the evolution of central banking, a set of monetary policy tools were developed which carried forward to the present. The Bank of England through the nineteenth century perfected the use of "Bank rate" (the discount rate) to guide the economy through the vicissitudes of external and internal shocks. Sayers described how the Bank of England learned to make Bank rate effective in the 1870s and 1880s, when its market power was weak relative to the discount houses, by using open market operations.²³ Other European central banks developed similar tools. In the twentieth century additional tools were added in different countries: changing reserve requirements, Lombard facilities, repo, and, in the twenty-first century, quantitative easing and forward guidance in face of the ELB.

5) Since World War II, central banks have been encouraged by government and the public to provide macro stability—stabilizing the business cycle and maintaining full employment and price stability. Through a slow and painful learning process, this policy has evolved into the present-day flexible inflation targeting based on credibility for low inflation. Central bank digital currency would follow in this tradition, with

¹⁹Bordo and Wheelock, "The Promise and Performance of the Federal Reserve."

²⁰Bagehot, *Lombard Street*.

²¹Viner, *Studies in the Theory of International Trade*.

²²Bordo and MacDonald, *Credibility and the International Monetary Regime*.

²³Sayers, *Central Banking after Bagehot*.

the interest rate on CBDC (positive or negative) as the policy tool to stabilize the economy.

The Case for CBDC

A number of central banks are considering adopting CBDC. Five key factors are driving their interest:

First, CBDC would be the twenty-first century version of Adam Smith's social saving of fiduciary money. CBDC would reduce the cost of issuing and operating physical currency by between 0.5 and 1.0 percent of GDP.²⁴ As well, by providing a direct peer-to-peer interface via access to the central bank's balance sheet, a CBDC could reduce the monopoly rents earned by the commercial banking system, which in most countries administers access to cash and the payments system.²⁵

Second, digitalization has reduced the use of cash in several countries, for example, Sweden and Norway, to the point where it may disappear altogether. A CBDC could provide a payments media which has virtually all of the attributes of physical cash and be less subject to theft and loss. Moreover, it could allow central banks to continue to perform their monetary and lender of last resort policies.

Third, a CBDC would increase financial inclusion. In many countries, introduction of a CBDC could provide access to the financial system for disadvantaged groups who do not have bank accounts. In less developed and emerging countries this is a crucial reason for creating a CBDC. It could also be a way to make fiscal transfers quickly and efficiently in a national emergency such as the recent pandemic by depositing these funds into CBDC accounts.²⁶

Fourth, CBDC may head off the threat to monetary sovereignty posed by stable coins. Central banks are concerned that a global digital services company like Facebook, which has a network covering billions of people,

²⁴IMF, "Digital Money across Borders."

²⁵According to Barrdear and Kumhof ("Macroeconomics of Central Bank Digital Currencies), introducing a CBDC could raise real GDP in the United States by 3 percent; Andolfatto, "Assessing the Impact of Central Bank Digital Currency"; Barrdear and Kumhof, "Macroeconomics of Central Bank Digital Currencies."

²⁶These operations are similar to the "helicopter money" first discussed by Friedman, *Optimum Quantity of Money*. Such a policy conflates monetary and fiscal policy, which may threaten the independence of the central bank.

could issue a virtual international currency which is fully backed by hard currency assets (e.g., libra/diem), so that it would be a stable unit of account (unlike cryptocurrencies like bitcoin). Network externalities could then let it serve as a medium of exchange and a store of value: it would then compete with sovereign currency and threaten central banks' ability to conduct monetary policy to satisfy their mandates. However, the key issue is the backing of stable coins' liabilities. Unlike central banks, which are insulated from credit risk by their indirect access to the power of the fisc, they are subject to credit risk and can fail, as did the Bank of Amsterdam in the eighteenth century.²⁷

Finally, CBDC would provide a secure, reliable currency, free from the dangers of fraud, hacking, money laundering, and the financing of terrorism. These concerns have become more apparent with the advent of the internet and digitalization.²⁸

The basic case for CBDC—defined as an asset in electronic form which serves the basic functions of paper currency, with universal access and as legal tender—can be traced back to the classical economists' argument that currency is a public good that would appropriately be provided and regulated by the government.

Friedman and Schwartz make the case for government control of outside money.

We continue to believe that the possibility that private issuers can provide competitive, efficient and safe fiduciary currencies with no role for governmental monetary authorities remains to be demonstrated.²⁹

They also concluded that it would be appropriate for inside money to be issued by commercial banks and regulated by an impartial government authority.

Central bank money satisfies the three functions of money, first, as a unit of account which serves as a measure of real value for economic agents, analogous to the meter or yard; second, as a medium of exchange—monetary transactions exhibit very strong network externalities (like water or electricity); and third, as a store of value; central bank money is not subject to

²⁷Frost, Shin, and Wiertz, "An Early Stablecoin?"

²⁸BIS, *CBDC: Foundational Principles and Core Features*.

²⁹Friedman and Schwartz, "Has Government Any Role in Money?," 58.

default risk, and general use of its liabilities enables the central bank to serve as a lender of last resort to commercial banks.³⁰

A central bank digital currency would also satisfy the three basic functions of money by providing an efficient medium of exchange. Instant clearing and settlement on the central bank's platform would involve negligible cost per transaction, ensuring a secure store of value. An interest-bearing CBDC with essentially the same rate of return as other short-term risk-free assets would also provide minimal opportunity cost; and, as a stable unit of account, a CBDC would facilitate the planning of economic actors.

Bordo and Levin lay out a stylized ideal CBDC arrangement that can be used as a template to consider how it might be implemented in the real world.³¹ In our framework, the CBDC would be a direct liability of the central bank, giving the nonbank public direct access to its balance sheet. It would serve as legal tender. The nonbank public could conceivably access it by having accounts at the central bank, as was the case with the Bank of England and other central banks in the past. Alternatively, CBDC could be provided through deposits at commercial banks or other financial intermediaries in a public private partnership.

CBDC would be interest-bearing, paying the market rate of interest on short-term securities to provide an efficient monetary system.³² The interest rate on CBDC would become the central bank's primary tool of monetary policy. Similar to the Bank of England's practice in the nineteenth century, this rate would serve as the floor for rates in the economy, and adjustments in this interest rate would naturally influence a wide array of other short-term interest rates and hence ensure the effectiveness of monetary policy.

In addition, with the introduction of CBDC, the central bank could eliminate the ELB as a constraint on monetary policy. Paper cash would not need to be abolished, but the central bank would impose fees on very large transfers between paper cash and CBDC. This would be like "sand in the wheels" to disincentivize large flows into paper cash in circumstances where the central bank cuts the CBDC interest rate below zero.

In this ideal scheme CBDC would be welfare improving.³³ Using the interest rate on CBDC as a policy tool would allow the policy makers to follow

³⁰Bordo and Levin, "Central Bank Digital Currency and the Future of Monetary Policy."

³¹Bordo and Levin, "Central Bank Digital Currency and the Future of Monetary Policy."

³²Friedman, *Optimum Quantity of Money*.

³³Barrdear and Kumhof, "Macroeconomics of Central Bank Digital Currencies"; Fernandez-Villaverde et al., "Central Bank Digital Currency."

true price stability through a price-level target following a Taylor Rule. The transmission mechanism could be simplified to return to a bills-only type policy and, because the ELB will be eliminated as an issue, the inefficient usage of quantitative easing and forward guidance could be jettisoned.³⁴

Implementation of CBDC in the Real World

In today's world, technology is sufficiently advanced that some form of digital currency is inevitable. What is the best way forward? Implementation of a CBDC raises a number of important questions about its design. Considerable research on these questions has been undertaken in central banks, international financial institutions, and academia, most notably at the Bank of England, Riksbank, Bank of Canada, the Bank for International Settlements (BIS), and the International Monetary Fund (IMF). Research is underway in the Federal Reserve but so far not much of it has seen the light of day.

Wholesale or Retail CBDC?

In a sense this question has already been answered: commercial bank reserves are digitized and banks have access to the central bank's balance sheet. Improvements in the wholesale clearing mechanism with digitalization are already taking place in most countries, moving them in the direction of instant and virtually costless Real Gross Time Settlement (RTGS). The real controversy is over retail CBDC: Should central banks provide digital currency with virtually all of the features of cash to the public, or should this be left to the private sector?³⁵

As argued above, the public good aspect of currency provides a strong rationale for either direct provision or at least close regulation and supervision by government.

A second issue is whether to implement CBDC using accounts (similar to a debit card) or tokens (similar to a stored value card). In the case of tokens, the central bank would determine the supply of tokens, which would be fixed in nominal terms and serve as legal tender. The argument for tokens is that they are most cash-like and they would be anonymous. The down-

³⁴Bordo and Levin, "Improving the Monetary Regime."

³⁵An early excursion into a retail payments instrument was the Bank of England's issue of one pound notes during the Restriction period 1797–1821. It was not very successful. It led to widespread fraud and execution of the perpetrators. The bank was not popular. Clapham, *Bank of England*.

side is they can be stolen or lost. Moreover, there is a cost of verification to token-based digital systems because of the verification in the distributed ledger systems behind them. And, just like cash, they can also be used for money laundering and other illicit activity.³⁶

Thus, account-based systems are generally viewed as more secure but at the cost of some privacy, as exists today with the identification requirements for opening a bank account.³⁷ Still, token systems can be used for small transactions. A key advantage of the account-based system is that CBDC payments could be practically instantaneous and costless.

CBDC Accounts at the Central Bank or Private Financial Institutions?

The simplest way of implementing an account-based system is via accounts held directly at the central bank, as was the case in earlier times. With today's immense data storage and high-speed data capacities, providing CBDC via accounts at the central bank is eminently feasible. However, central banks do not have a comparative advantage at financial innovation, so the case for private sector involvement may be stronger, at least in advanced countries with well-developed banking and financial systems. Also, there may be objections on privacy grounds to having accounts at the central bank.

A compromise solution that is gaining increased traction is for a public-private partnership whereby designated financial institutions could offer CBDC accounts to the public. This could be done by financial institutions serving as conduits for the central bank, as Tobin suggested.³⁸ These firms would hold a corresponding amount of CBDC funds in segregated reserve accounts at the central bank.³⁹ The Bank of England refers to these institutions as payment interface companies. This approach is very close to the 100 percent reserves scheme proposed by Henry Simons and Milton Friedman to deal with the frequent banking panics in the United States.⁴⁰ Commercial banks would be divided into a narrow bank for holding CBDC, backed 100 percent by reserves in CBDC, and an investment bank which would engage in financial intermediation. The narrow bank, similar to a regulated

³⁶Rogoff, "Curse of Cash."

³⁷Meaning et al., "Broadening Narrow Money."

³⁸Tobin, "Case for Preserving Regulatory Distinctions."

³⁹Dyson and Hodgson, "Digital Cash."

⁴⁰Simons, "Rules versus Authorities in Monetary Policy"; Friedman, *Program for Monetary Stability*.

utility, could either charge a fee for providing this service or pay the CBDC interest on deposits as determined by the central bank, with a deduction for the cost of operation plus a small profit.⁴¹

Other public-private arrangements that built upon the expertise of the private financial sector in digital technology could also be fruitful.⁴²

Mitigating the Risk of Disintermediation from Commercial Banks

One concern by prominent current and former officials that has driven much research is whether the introduction of account-based CBDC at commercial banks would lead to disintermediation from the commercial banking system, since CBDC accounts which are a direct liability of the central bank would be more secure than non-CBDC accounts.⁴³ The shift from non-CBDC accounts to CBDC, it is argued, would lead to an increase in funding costs for the banks and harm their competitive position.⁴⁴ Related to this is the possibility that disintermediation would make the commercial banks more prone to runs, creating financial instability. Keister and Sanchez directly answer this question.⁴⁵ Using a new monetarist model,

⁴¹Mancini-Grifoli et al., “Casting Light on Central Bank Digital Currency,” distinguish between a financial institution that is given a license to operate the CBDC deposit system which is just a conduit to the central bank’s balance sheet, as proposed by the Bank of England, and an sCBDC (synthetic CBDC), which is a liability of the narrow bank and which holds CBDC reserves and is closely supervised by the central bank. The sCBDC is not as secure as the payment interface company because its liabilities are not the direct liabilities of the central bank so that conceivably it could fail.

⁴²The history of the US Federal Reserve system established in 1914, based upon a public-private partnership, may have some resonance. The twelve regional Reserve banks were largely governed by the local member commercial banks, and the Federal Reserve Board in Washington had limited powers. It took two turbulent decades to demarcate the public good–private interests responsibilities of the system achieved with the passage of the Banking Act of 1935. The act gave the Board of Governors the ultimate power over monetary and financial stability policy and the Reserve banks important supporting roles. The influence of the member commercial banks in the corporate governance of the Reserve banks was to be overseen by the Board of Governors. Bordo and Prescott, “Federal Reserve Structure”.

⁴³Cecchetti and Shoenholtz, “Central Bank Digital Currency”; Carstens, “Digital Currencies and the Future of the Monetary System.”

⁴⁴This research assumes that commercial banks will have both CBDC accounts and regular accounts denominated in non-digital currency. Bordo and Levin, “Central Bank Digital Currency and the Future of Monetary Policy,” posited that with the disappearance of cash that there would be no difference between CBDC and non-CBDC accounts. Moreover, they assumed that the interest rate paid on CBDC accounts would be close to the central bank policy rate.

⁴⁵Keister and Sanchez, “Should Central Banks Issue Digital Currency?”

they show that whether commercial banks will face these threats depends on the extent to which CBDC is closer to being a medium of exchange or a store of value. This in turn is determined by the extent to which competitive interest is paid on the CBDC accounts. Moreover, according to them and Brunnermeier and Niepelt, disintermediation could be offset by central bank expansionary balance sheet policy.⁴⁶ Relatedly, Kumhof and Noone posit that disintermediation could be offset by imposing quantitative limits on CBDC holdings, whereas Bindseil argues that the problem could be more efficiently solved by tiering the interest rates paid on CBDC and non-CBDC deposits.⁴⁷

Regardless of CBDC, modern central banks have several lines of defense to effectively head off disintermediation and runs: Supervision and regulation are the first line of defense in boosting public confidence in the commercial banking system. Deposit insurance is the second line of defense, especially for retail deposits. The central bank's role as lender of last resort is the third line of defense, which may be particularly relevant for commercial banks that rely heavily on wholesale funding markets. Given these stabilizing factors, the risk of a massive run seems quite remote. Additionally, strains on the financial system are reflected in credit spreads. Thus, the most effective way for the central bank to prevent disintermediation is to be able to implement a negative interest rate on large holdings of risk-free assets. This approach will ensure that private credit rates remain at moderate positive levels, thereby preventing a huge wave of defaults and bankruptcies and fostering the stability of the real economy, which in turn boosts confidence in commercial banks and again mitigates the risk of a run.

Facilitating Security

Considerable effort by central banks has been going into ensuring that proposed CBDC facilities be secure from cybercrime and would satisfy anti-money laundering and terrorist requirements (AML and KYC). Also of great concern is whether to implement CBDC by establishing a centralized platform at the central bank or by initiating a decentralized digital ledger (DLT) using blockchain methods. A number of central banks, such as the Bank of England, seem to prefer the centralized platform, which is viewed as more secure than the DLT, although the Bahamian central bank is using a

⁴⁶Brunnermeier and Niepelt, "On the Equivalence of Private and Public Money."

⁴⁷Kumhof and Noone, "Central Bank Digital Currencies—Design Principles"; Bindseil, "Tiered CBDC and the Financial System."

permitted DLT technology. Finally, Siklos argues that the introduction of CBDC will require changes in regulations and laws with respect to security and legal tender.⁴⁸

Implications for Monetary Policy

Debate swirls over whether introducing a CBDC would improve monetary policy. Bordo and Levin, following Goodfriend, argued that using the interest rate on CBDC as its policy tool, along with a reduction in cash holding, would eliminate the ELB as a constraint on monetary policy.⁴⁹ This would allow the central bank to always maintain macro and price stability. Allowing the interest rate on CBDC to go as negative as needed to offset a major negative shock to aggregate demand would solve the problem faced by Japan since the 1990s and other advanced countries since the global financial crisis (GFC). Raising the interest rate on CBDC may facilitate the exit from inflation, if the present recovery from the COVID-19 pandemic continues on a permanent inflationary trajectory. Using the interest rate on CBDC as the policy tool would also obviate the use of quantitative easing and forward guidance, which have not performed as well as the policy rate performed before the GFC.⁵⁰ Moreover, returning to the practices of the pre-GFC period, when central banks held short-term securities as their principal asset, would allow central banks to greatly reduce and make their balance sheets more transparent. Also using the interest rate on CBDC as the policy rate could allow central banks to move from the current “floor system” that they have been following since the GFC to a “corridor” system.⁵¹

A number of papers examine the transmission mechanism of monetary policy in an environment where interest-bearing CBDC coexists with interest-bearing non-CBDC deposits and the ELB has not been eliminated. They find that adding the interest rate on CBDC as a new policy tool improves the transmission mechanism and strengthens the lending channel.⁵²

⁴⁸Siklos, “Central Bank Digital Currency and Governance.”

⁴⁹Bordo and Levin, “Central Bank Digital Currency and the Future of Monetary Policy”; Goodfriend, “The Case for Unencumbering Interest Rate Policy at the Zero Lower Bound.”

⁵⁰Bordo and Levin, “Improving the Monetary Regime,” 383–401.

⁵¹Meaning et al., “Broadening Narrow Money.”

⁵²IMF, “Digital Money across Borders”; Barrdear and Kumhof, “Macroeconomics of Central Bank Digital Currencies,” 41–48; Williamson, “Central Bank Digital Currency,” 386; Meaning et al., “Broadening Narrow Money.”

The interest rate on CBDC could also improve financial stability policy. In a financial crisis, cutting the digital cash interest rate below zero would prevent runs from other assets into digital cash. Moreover, a relatively steep yield curve would foster bank lending and rapid recovery. This is in contrast with the unconventional policy tools that were used after the GFC that flattened the yield curve and impeded the recovery. Finally, as mentioned above, the interest rate on CBDC could help to foster true price stability by using a price level target following a Taylor-type rule.⁵³

Open Economy Considerations

CBDC has very important implications for the open economy. CBDC could greatly improve cross-border payments. Currently such transactions are done through an elaborate network of correspondent banks which has evolved over centuries and is costly and slow.⁵⁴ With digitalization, cross-border payments could be done almost instantly. This innovation echoes the installation of the first Atlantic cable in 1866, which reduced the time it took to make an international payment from several weeks to a matter of hours.⁵⁵ Some of the proposed stable coins promise to arrange peer-to-peer payments through their established networks via blockchain. However, were stable coin providers to dominate these arrangements, they could threaten monetary sovereignty and also be subject to credit risks. This makes the case for some regulation or a CBDC to do the job.⁵⁶ Central bank–provided digital currencies, however, would need to make arrangements for interoperability with their foreign counterparts using new technologies. This could be arranged with the help of the BIS.⁵⁷

A system of CBDCs which closely linked together the monetary and payments systems of different countries could lead to an amplification of the spillover effects of domestic monetary policy on other countries. Small

⁵³Bordo and Levin, “Central Bank Digital Currency and the Future of Monetary Policy.”

⁵⁴The cost of small transactions through the correspondent banking system is up to 10 percent of their value (IMF, “Digital Money across Borders”); Schenk, “Constructing and Deconstructing the Global Payments System.”

⁵⁵Garbade and Silber, “Technology, Communication and the Performance of Financial markets”; Bordo, Irwin, and Eichengreen, “Is Globalization Today Different?”

⁵⁶This analysis is most relevant for advanced countries. Some emerging countries with challenged institutions, poor governance, and underdeveloped financial systems may benefit from the proposed stable coins.

⁵⁷BIS, *CBDC: Foundational Principles and Core Features*.

open economies could face asymmetric threats to their monetary policy independence from shocks in larger economies.⁵⁸ This would work through uncovered arbitrage between the interest rates in countries with CBDCs.⁵⁹ Spillover effects after monetary shocks can lead to amplified exchange rate movements. As is the case today, these can be mitigated by the pursuit of rule-like policies and monetary policy coordination.⁶⁰

CBDC (and stable coins) could lead to currency substitution. Currency substitution—dollar digitalization—could impact the monetary sovereignty and monetary policy capabilities of small open economies, especially those with weak monetary and fiscal institutions. Again, this is the case today, and digitalization would just amplify it.⁶¹ Brunnermeier and Niepelt argue that stable coins like libra/diem, because they are based on extensive global networks and to the extent that they are fully and credibly backed by safe assets, could compete with official currencies and hence fulfill Hayek’s vision of currency competition.⁶²

The advent of CBDC (stable coins) could in turn, it is argued, alter the international monetary system, which at present is dominated by the US dollar as the predominant invoicing currency.⁶³ Brunnermeier, James, and Landau argue that stable coins (and possibly CBDCs from other countries like China) could eventually subvert the dollar’s dominance because of the superiority of their networks.⁶⁴ Effective currency competition could occur because of the ability of stable coins to separate the functions of money. However, currency competition from private platforms would run into the problems of interoperability and coordination and, just as in the

⁵⁸ See Edwards, “Central Bank Digital Currencies,” for the case of emerging market economies.

⁵⁹ Mehl, Stracca, and Ferrari, “Central Bank Digital Currency in an Open Economy.”

⁶⁰ Taylor, “International Coordination in the Design of Macroeconomic Policy Rules,” 53–81.

⁶¹ IMF, “Digital Money across Borders.”

⁶² Brunnermeier and Niepelt, “On the Equivalence of Private and Public Money,” 27–41. Hayek’s solution in *Denationalization of Money* (1976) to the currency mismanagement of the inflationary 1970s was currency competition by currencies with superior stores of value (lower inflation rates). However, that did not happen because of the high costs of switching between currencies with different units of account (like learning a new language). But today’s digital technology makes it easier for currency competition to be successful because switching costs are lower. Stable coin platforms can operate currencies across countries because they are based on a common network, e.g., Facebook. Stable coins can unbundle the functions of money because a common unit of account is not needed. Currencies can compete on the medium of exchange function or standard of value function depending on the currency platform’s comparative advantage (Brunnermeier, James, and Landau, “Digitalization of Money”).

⁶³ Gopinath, “International Price System.”

⁶⁴ Brunnermeier, James, and Landau, “Digitalization of Money.”

case of nineteenth-century currency competition, information asymmetry would make the case for CBDC. A system of convertible CBDCs would eliminate the imperfect substitutability of private digital currencies.⁶⁵

Finally, the key reason why the dollar is the dominant currency, as was the pound before it, is its economic and political power, its extensive trade and payments networks, its deep and liquid financial markets, and its track record of stable and credible monetary policy that took decades to create. It seems far-fetched that a stable coin or even a CBDC from China, which lacks most of these attributes, could supplant it in the foreseeable future.

Lessons from a Historical Perspective

Four key lessons follow from history on the case for central bank–provided digital currencies.

Technical change in money/financial innovation which improves the efficiency of the monetary/financial system is inevitable. It is driven by the financial incentives of a market economy. This process goes back to the beginning of civilization but has increased since the early modern period, preceding the industrial revolution. This can be seen in the development of banks and fiduciary money, advances in war finance, and in central banking and monetary policy. The timing of adoption of these new technologies is strongly influenced by large shocks: big and expensive wars; the Great Depression and, today, the COVID-19 pandemic. CBDC may be an innovation whose time has come.

Government has a key role in the provision of money. Because outside money is a public good, it will be necessary for the central bank to provide it. This holds for fiat as well as digital currency. However, the ability to effectively provide fiat/digital currency depends on the credibility of the issuer. If that falters, currency competition from other CBDCs or stable coins will erode monetary sovereignty. However, as Friedman and Schwartz argued, the private sector may be most efficient at providing inside money, as long as there is an impartial government authority to maintain financial stability.⁶⁶ This principle holds for digital deposits.

Interest-bearing CBDC could improve the transmission mechanism and transparency of monetary policy. This approach could greatly simplify central banks' balance sheets and help them move back to the simpler framework

⁶⁵Eichengreen, "From Commodity to Fiat to Crypto."

⁶⁶Friedman and Schwartz, "Has Government Any Role in Money?," 37–62.

that existed before the GFC. Moreover CBDC could revolutionize monetary policy if the interest rate on CBDC is used as the policy rate. If the ELB is eliminated, as cash becomes obsolete or is reduced by charging variable fees on its holding, then the interest rate on CBDC could be used to always maintain both price level and macro stability in a rule-like manner as well as to maintain financial stability.

CBDC is a global innovation. It will revolutionize international payments in the way that the first Atlantic cable did for capital flows and international payments in 1866. It could exacerbate currency substitution/currency competition and could, as in the present international monetary system (IMS), require international monetary cooperation. CBDC (and stable coins) could also challenge the IMS. The fundamental forces leading to currency domination are unlikely to change, but digitalization could accelerate shifts driven by them, as occurred in the twentieth century when the dollar eclipsed the pound.

In sum, digitalization in money and finance may promise to be the future. Central banks could learn the lessons from history and provide digital currency (likely in partnership with private sector financial institutions) to effectively fulfill their mandates.

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