



Insights | March 2021

Money 3.0: Central Bank Digital Currencies (CBDC)

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- During the past two years, CBDC has progressed from a bold speculative concept to a seeming inevitability and will soon be a core feature of our financial ecosystem.
- Catalysts include the rapid decline in cash usage relative to digital payments, and the rise of private digital currencies that operate without any involvement by central banks or financial institutions.
- Aside from improving existing payment systems and promoting greater financial inclusion, a key advantage of CBDCs is that they could dramatically increase the speed and effectiveness of monetary policy while mitigating the onset of recessions.
- One noteworthy disadvantage is that CBDCs could disintermediate significant swaths of the commercial banking system. A second concern relates to privacy issues.
- China is the clear frontrunner when it comes to CBDCs as it has already run three successful pilots and could launch as early as February during the Beijing Winter Olympics.
- Europe is two or three years behind China. The U.S. has been slower to outline its CBDC strategy, although Jerome Powell recently promised to accelerate efforts this year.
- The rollout of CBDCs will further accelerate the digitization of the economy favoring those companies who can demonstrate they have a business strategy for the digital age. This is clearly evident in the FinTech and payments space.
- As this paper demonstrates, even central banks must have a strategy for the Digital Age, or they too face the existential risks of policy tool obsolescence.

The Evolution of Money: From Metallic Coins to Paper Notes to Digital Dollars

“Bitcoin grabs the headlines, but the real action on digital currencies is at central banks.”

—The Economist

Early societies employed a host of “commodity currencies,” including whale’s teeth in Fiji, rice in Japan, cowrie shells in Africa, cattle in Colombia, and wampum beads in North America. However, they only partially fulfilled the three core functions of money (unit of account, means of payment, and store of value), and were eventually displaced by standardized metallic coins. This form of money initially appeared on the scene during the seventh century BC in Lydia (the western part of contemporary Turkey), which had developed a shrewd mercantile culture, famous for trading between East and West. Shortly thereafter, as metallurgical and minting technologies improved, the first true gold coins were issued by Lydia’s King

Croesus, whose name has long been synonymous with immense wealth.

The next critical innovation was paper money, which was probably invented in China during the seventh century AD. However, it wasn't until the Mongol regime in the thirteenth century that "flying money" reached something close to its modern form. In the 1270s Marco Polo visited and was so astonished he devoted an entire chapter of his famous travelogue to China's paper currency system. Europe was centuries behind, and it wasn't until 1694 that the Bank of England became the first public bank to regularly issue notes, although they didn't become legal tender until 1844.¹

It is worth noting that metallic coins and banknotes resulted from major technological innovations in their day. Fast forwarding to the modern digital economy, it is clear that, outside of wholesale markets, central banks haven't kept up with many of the latest tech developments. Recent events, though, have demonstrated to them, forcefully and unequivocally, that the status quo is no longer tenable. Their response has been CBDC, which is just fiat money, but in digital form and, at least initially, it will complement already circulating coins and banknotes.

Reinventing 17th Century Money to Meet the Needs of the Digital Economy

"Central banks collectively representing a fifth of the world's population are likely to issue a retail CBDC in the next three years."

—Bank for International Settlements

During the past few years CBDC has progressed from a bold speculative concept to a seeming inevitability. According to a recent BIS survey, a full 80% of central banks are engaged in the

development of a CBDC, work which includes analyzing architectural issues (e.g., centralized vs. decentralized, and token- vs account-based) and running pilot projects to test feasibility and scalability. While there remain several outstanding design questions, it is clear CBDCs will soon be a core feature of our financial ecosystem.

The remainder of this paper begins by discussing four reasons why government interest in CBDCs has escalated during the last couple years: the sharp decline in cash usage; the rising prominence of Bitcoin and other cryptocurrencies; the shock created by the Libra announcement; and the aggressive timeline adopted by China. We next examine three potential advantages of a CBDC, specifically a more efficient payments system, improved implementation of monetary policy, and greater financial inclusion. We then discuss two potential disadvantages, the disintermediation of the banking system and the possible loss of privacy for households. Finally, we examine three outstanding architectural issues, outline a timeline for launch by major central banks, and conclude with implications for investors.

The Barbarous Relic: The Case Against Cash

"We are in the middle of a revolution in payments. Banknotes are being used less frequently to make payments. At the same time, fintech firms have begun to alter the market by offering new forms of money and new ways to pay with it."

—Mark Carney, BoE Governor, 2020

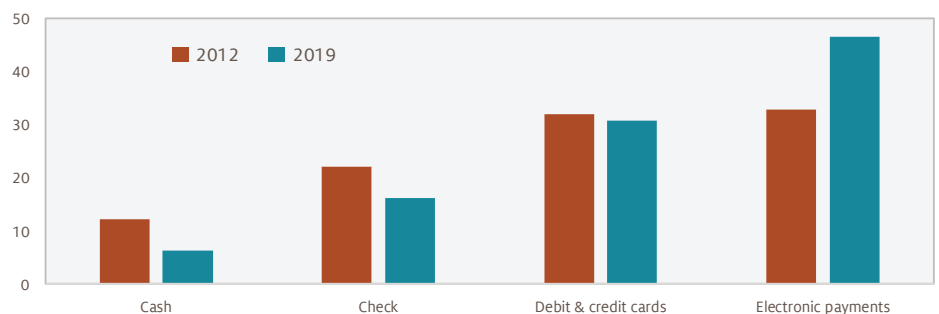
Although the concept of a CBDC was proposed decades ago² the attitude of central banks has changed drastically over the past couple years reflecting four developments, the first of which is the rapid decline in cash usage. Central banks have a mandate to promote a safe and efficient payment system and, therefore, a responsibility to address the marginalization of cash. Digital methods of payment have been gaining ground on cash (**Figures 1 and 2**), manifesting the emergence of innovative payment solutions.

"With the growth of debit cards, electronic transfers, and mobile payments, the use of cash has long been declining in the legal economy."

—Kenneth Rogoff, "The Case Against Cash"

Cash is Quickly Being Displaced by Electronic Payments

Figure 1: Value of U.S. consumer transactions (share, %)



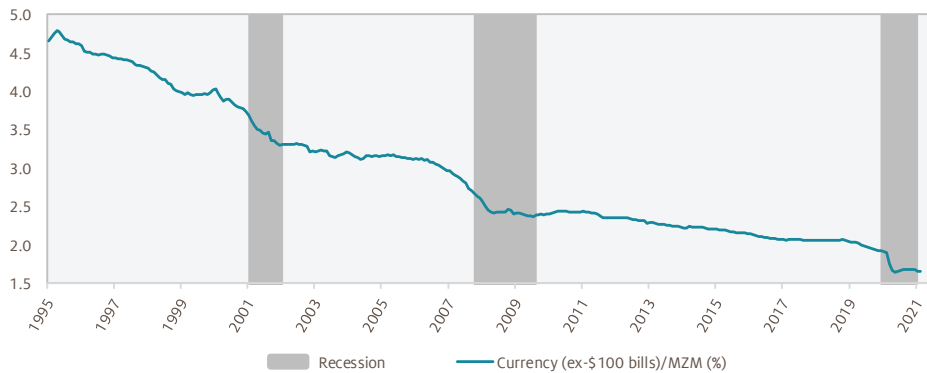
Source: Survey of Consumer Payment Choice, Federal Reserve Board

1. Detailed histories of money are provided in Niall Ferguson's "The Ascent of Money", as well as Kenneth Rogoff's "The Curse of Cash" and Jacob Goldstein's "Money: The True Story of a Made-up Thing."

2. Most notably, in 1985 by Nobel laureate James Tobin

On current trend, especially excluding \$100 bills (which largely circulate in the underground economy), cash appears destined to all but disappear within the next decade

Figure 2: Currency is declining as a percentage of the broad money supply



Source: Bloomberg, NBER, Federal Reserve Board, Epoch Investment Partners

Harvard's Kenneth Rogoff takes the argument further, making the case for eliminating physical cash altogether. He emphasizes that large-denomination notes, which constitute 80%-90% of the global hard currency supply, largely circulate in the underground economy, helping facilitate tax evasion, crime, and corruption. The value of U.S. currency has roughly tripled over the last two decades, but this is almost entirely due to the large denomination bills preferred by criminals (**Figure 3**). To illustrate, there is about \$5,400 U.S. currency in circulation for every American, but surveys show the median holding is only \$37. This massive discrepancy suggests something is terribly amiss, adding to the case for a digital dollar. Further, over 50% of U.S. currency is held abroad, so it is not just domestic crime that is being facilitated.

Bitcoin: Digital Gold or a Purely Speculative Asset?

"I don't think that bitcoin ... is widely used as a transaction mechanism. To the extent it is used I fear it's often for illicit finance."

—Janet Yellen, U.S. Treasury Secretary

A second reason why so many countries have accelerated their CBDC activities is the rise of private digital currencies that operate without any involvement by central banks or financial institutions. The 2008 white paper that introduced the canonical cryptocurrency, described Bitcoin as "a peer-to-peer electronic cash system" that is entirely independent of the government. Initially it was ignored or ridiculed, but as it has become increasingly mainstream, now with a market cap just over one trillion

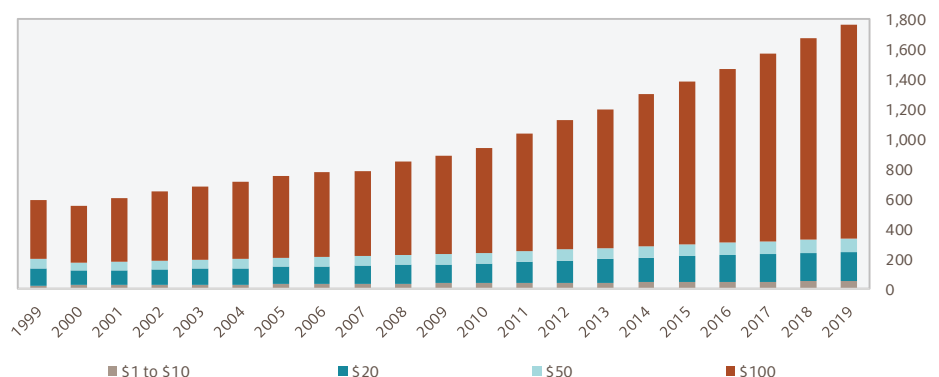
dollars, Bitcoin has sparked intense soul-searching by central banks. Their acute worry is that, if they don't soon innovate and create a new type of money, one that better meets the needs of the digital economy, central banks could gradually slip into irrelevance.

Bitcoin, with over a decade of operational success, has demonstrated it is possible for households and businesses to make payments entirely outside the existing financial infrastructure. With little government intervention and a high degree of privacy, the libertarian aspect is a key attraction for many Bitcoin zealots. Further, and similar to gold, it cannot be devalued by central bank printing and roughly 90% of its total supply (21 million coins) has already been mined. With most central banks actively seeking to depreciate their currencies in a "lower for longer" MMT world, it seems entirely reasonable to look for alternative storeholds of wealth.

However, Bitcoin faces numerous challenges to broader adoption. For a start, it is a fundamentally speculative asset (**Figure 4**). Moreover, compared to established storeholds of wealth, such as gold, real estate, or safe-haven

Over 80% of the value of U.S. currency is held in \$100 bills (up from 25% in 1960)

Figure 3: Value of U.S. currency in circulation (USD bn) by note denomination



Source: Federal Reserve Board

fiat currencies, Bitcoin is exceptionally volatile and its future value faces a much wider range of outcomes (Figure 5). It is also a poor unit of account and, while inherently difficult to verify, most estimates indicate only 1% or so of BTC transactions come from merchants accepting it as a means of payment. Additionally, as the U.S. Treasury Secretary suggests, it is likely used extensively in the underground economy.

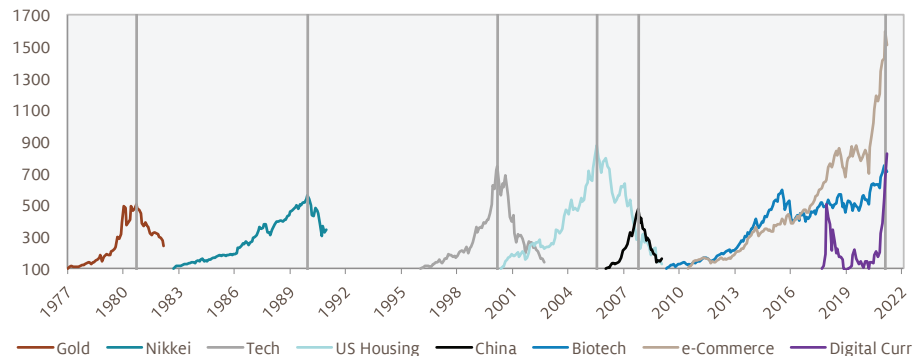
“It’s an extremely inefficient way of conducting transactions, and the amount of energy that’s consumed in processing those transactions is staggering.”

—Janet Yellen, U.S. Treasury Secretary

An additional problem is that Bitcoin requires a hugely energy-intensive protocol, called “proof of work,” to safely process transactions. Currently, so-called miners sustain the system’s security, and are rewarded with newly minted coins. A staggering and scandalous side effect is that the system uses more electricity than all of Argentina and its 45 million citizens (Figure 6). As a sidebar, about 65% of all Bitcoin mining takes place in China, mainly in the north-east close to the Mongolian coal fields. However, this could soon change dramatically, as the South China Morning Post recently reported that all Bitcoin mining operations in Inner Mongolia will cease during coming months.

A final concern about Bitcoin is that it faces meaningful regulatory tail risks. In fact, some commentators have argued Bitcoin’s biggest risk is being successful. That is, if it does prosper and become mainstream, competing with the USD and other currencies, the government will try to kill it and they have a lot of power and many tools at their disposal to succeed.

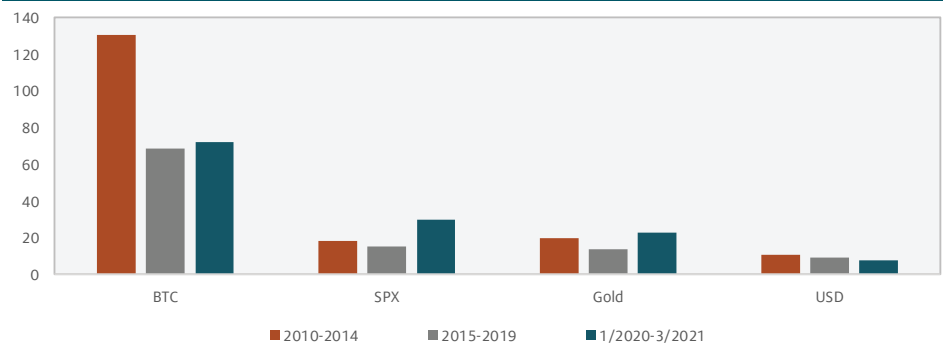
Figure 4: Are digital currencies just the latest speculative bubble?



Source: Bloomberg, Epoch Investment Partners

Bitcoin’s purchasing power is wildly unstable: It remains far too volatile to act as a unit of account, store of value or medium of exchange

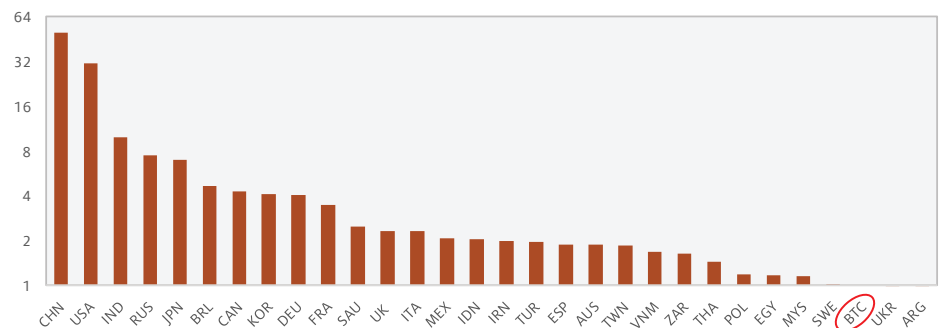
Figure 5: Annualized volatility comparisons (%)



Source: Bloomberg, Epoch Investment Partners

If Bitcoin were a country, it would rank #28 in energy consumption, ahead of Ukraine and Argentina. On current usage trends, in 2030 it will rank 11th, slightly ahead of the UK.

Figure 6: Country ranking, annual energy consumption, multiple of Bitcoin’s usage (log scale)



Source: University of Cambridge, Centre for Alternative Finance, Epoch Investment Partners

Lighting a Fire at the Fed: Not Going After Bitcoin, Going After the Dollar

“Frankly, [it] really lit a fire, and was a bit of a wakeup call that this is coming fast and could come in a way that is quite widespread and systemically important fairly quickly.”

—Jerome Powell, Federal Reserve Chair

In addition to the declining role of cash and rising prominence of Bitcoin, the third catalyst for central banks to accelerate their CBDC plans was the 2019 announcement of a social media company's payment network.³ It is difficult to overstate the threat perceived by central bankers who worried a private digital currency could undermine their monetary sovereignty. Within weeks of the announcement, the Jerome Powell warned: the currency raises serious concerns regarding privacy, money laundering, consumer protection, and financial stability.

Further, in early 2020 the Bank of Canada (BoC) cautioned: it could gain a substantial share of the global payments market and thus establish itself as a global standard for payments. The BoC was especially worried that a social media company's e-wallet would be integrated with its apps, which would give the currency unprecedented consumer reach. The concern was that, in a scale business like payments, this would allow it to build a dominant and insurmountable lead, a truly alarming prospect for any central bank.

The second reason the currency announcement attracted so much controversy was that it promised a much more efficient global payment infrastructure. That might sound like a good thing but, whereas banks are central to the dispensing of money in our current payment ecosystem, the tech payment service providers become pivotal in this one. Such a

radical change, one that threatens to disintermediate the existing financial system, naturally sets off alarm bells at central banks.

Still, the project has evolved significantly from the original proposal and now differs from a regulatory, compliance and capital perspective. In particular, it will focus on single currency stablecoins, with the tokens fully backed by reserves, concentrating initially on the USD, EUR, and GBP.⁴ Also, and in contrast to Bitcoin which is permissionless, the currency is not decentralized, relying instead on a central source to process transactions via a permissioned blockchain.

“When confronted with the choice between the status quo and a new financial architecture with CBDC, most central banks have responded cautiously. But [this currency] takes this choice off the table—the status quo ceases to be an option. The new choice is between central bank managed CBDC on the one hand and —riskier—private digital tokens on the other.”

—Dirk Niepelt, University of Bern

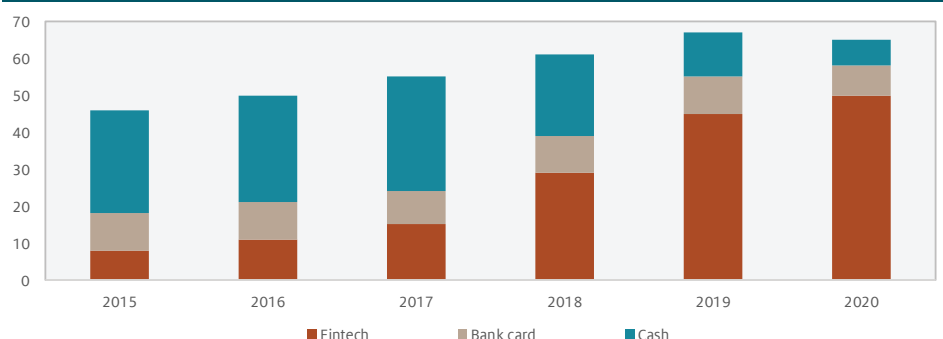
China's DC/EP: Challenging the USD's Hegemony

Turning to the fourth catalyst, China's program is now the most advanced CBDC initiative of any major economy. It is at least three years ahead of Europe and the U.S., which are now scrambling to catch up. While China began exploring “legal digital tender” way back in 2014, its efforts accelerated after the social media company unveiled its currency, an event which shocked the PBOC even more than it did the Fed and ECB. China quickly began conducting real-world trials of its Digital Currency for Electronic Payments (DC/EP) and cracking down on payment services to reassert supremacy over its currency.

China's efforts to introduce a digital currency are truly impressive and last month it completed its third pilot scheme. Each pilot typically involves the four major state-owned banks and 50,000 residents who are selected by lottery. Each person has RMB200 credited to an app-based digital wallet that offers payments by QR code at 3,000 outlets (retail, transportation, medical care, and education). While the PBOC has not yet released a timetable

Leapfrogging 20th Century payments infrastructure: Credit cards were never prevalent in China. The country skipped over a generation of finance and went straight to smartphone-based digital payments.

Figure 7: Chinese consumption payments (RMB tn)



Source: Bloomberg, Peoples' Bank of China

3. In November 2020, the currency announced a rebranding, to distance itself from the social media company and the initial regulatory backlash it evoked.

4. A stablecoin is pegged, typically to a major fiat currency, which makes it much less volatile than cryptocurrencies like Bitcoin.

for the official launch of the DC/EP, it has confirmed the pilot schemes will run for another year and may include the Beijing Winter Olympics in February 2022.

“The PBOC’s main motivation for issuing a digital renminbi is to create a government-controlled alternative to two very large and loosely regulated digital payment platforms...”

—Barry Eichengreen, *Berkeley*

One reason why China is the clear frontrunner when it comes to CBDC is the nature of its mobile payments market (**Figure 7**). It is by far the world’s largest and most advanced, with more than 1.2 billion active users. Moreover, the mobile payments landscape is dominated by two giants,, with market shares of 55% and 39%, respectively. In contrast to the Western, bank-centric, card-based model, China’s payments system is founded on non-bank platforms and their smartphone apps. This allows most businesses, from the fanciest hotels to pop-up fruit stands, to display a QR code that people scan with a smartphone to pay.

“E-yuan enable complete surveillance of transactions and also cut out any potential challenge to the regime’s authority by electronic payment giants like Ant Group and Tencent.”

—Adam Tooze, *Columbia University*

Although public pronouncements by Chinese leadership emphasize DC/EP as a tool for anti-money laundering (AML), counter-terrorist financing (CTF) and eliminating tax avoidance, an equally important reason is wresting control of the payments infrastructure. While U.S. cryptocurrencies are steeped in the language of libertarianism, China’s

digital currency project is tied up in the Chinese Communist Party’s (CCP) drive to maintain control over society and the economy. That is, the technology is being implemented at least partly because it reinforces the CCP’s surveillance state. The DC/EP system will provide the government with unprecedented access to information about Chinese consumers and businesses, allowing it to wield punitive power over its citizens in tandem with the social credit system.

Consequently, and in sharp contrast to cybercurrencies like Bitcoin, the digital yuan is hyper-centralized, controlled by the PBOC and integrated into China’s current banking system. That is, China will adopt a two-layer architecture, with the PBOC managing the back-end infrastructure, overseeing the digital ledger, and issuing digital cash to the big state-owned banks and dominant payments firms. In the second layer, financial institutions and payment providers will distribute digital yuan to individuals and businesses through digital wallets, which are smartphone-based mobile apps.

There are three features of the PBOC’s system that are instructive for understanding the design issues facing the Fed, ECB, and others. First, despite much initial discussion about blockchains and distributed ledger technology (DLT), the DC/EP will be built on centralized ledger technology. Second, regarding privacy, the PBOC promises “controllable anonymity” via an “anonymous front-end, real name back-end” structure (so person-to-person or person-to-business transfers will be anonymous at the user level, but not to the PBOC). Finally, reflecting compliance requirements (such as KYC, AML and CTF), some variant of the two-layer system is likely to prove a feature of all CBDCs.

“DCEP is also part of China’s geopolitical ambitions, and CCP officials frame the progress of DCEP as similar to advancements in other strategically important emerging technologies, such as AI and robotics. DCEP’s development also comes against a backdrop of China’s broader push to internationalize the renminbi.”

—Y. Fanusie et al, “China’s Digital Currency: Adding Financial Data to Digital Authoritarianism,” *Center for a New American Security*

It is also envisioned that the DC/EP will create opportunities for China to increase the global role of the RMB, which currently accounts for just 2% of the world’s FX reserves (**Figure 8**). Global usage of its currency has been steadily rising, and China has been pushing to increase the proportion of its own trade that is denominated in RMB. However, its currency’s global role is tiny relative to China’s towering heft in international trade and its share of worldwide GDP. Moreover, China has strong incentives to bypass the U.S.-led financial system, especially SWIFT which dominates international financial flows and is a tool frequently used by the U.S. to enforce sanctions.

“The advent of digital currencies will degrade the efficacy of U.S. sanctions, limiting the country’s options to respond to national security threats from Iran, North Korea, Russia, and others.”

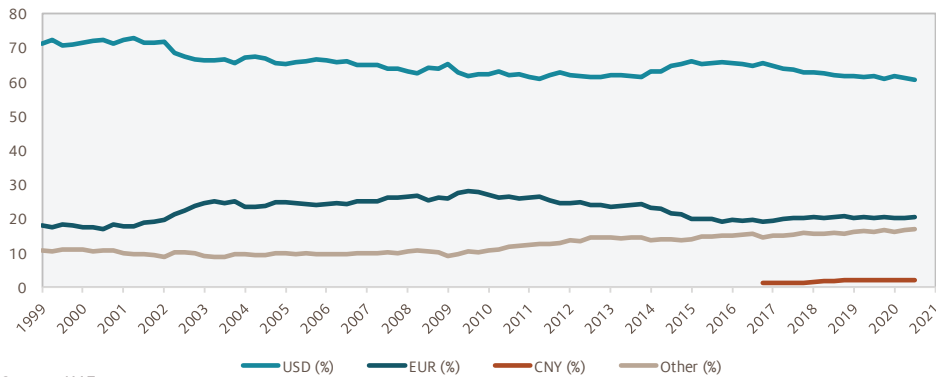
—*Foreign Affairs*, “Could China’s Digital Currency Unseat the Dollar?”

Potential Advantages of CBDC

Moving on from our discussion of the four catalysts for accelerating progress on CBDCs, the Bank for International Settlements (BIS) recently undertook a survey in which sixty central banks were asked about their motivations for working on digital

The RMB's share of global reserves is tiny, at around 2%: A successful DC/EP might help its global role begin to match China's towering economic heft

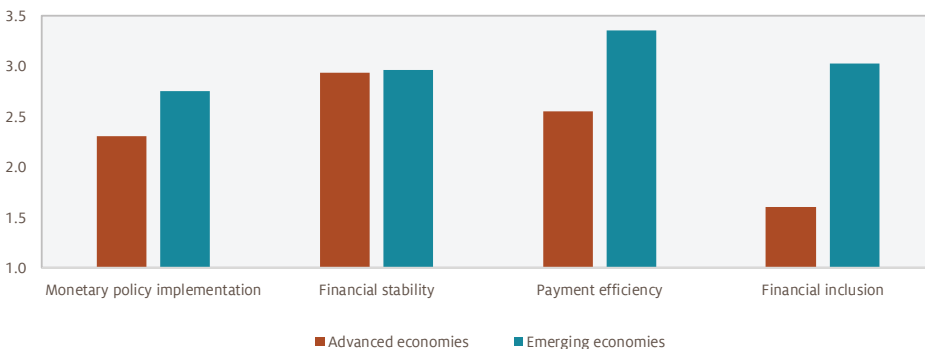
Figure 8: Currency Composition of Global Foreign Exchange Reserves (%)



Source: IMF

Emerging economies report stronger motivations for issuing CBDC than advanced economies

Figure 9: Motivations for issuing a retail CBDC



Source: "Ready, steady, go? – Results of the Third BIS Survey on CBDC," BIS, Jan 2021

Scale: (1) = "Not so important"; (2) = "Somewhat important"; (3) = "Important"; (4) = "Very important"

currencies (**Figure 9**). Given that emerging economies typically have less developed banking and payment systems, it is unsurprising they report greater potential benefits across a host of criteria. The next few paragraphs explore two of these motivations in a bit more detail, before we examine some of the potential disadvantages associated with a CBDC.

Monetary Policy for the Digital Age: The Death of Recessions?

CBDCs disseminated through electronic wallets would improve the efficacy of monetary policy in at least two ways. First, the zero lower bound, which was a binding constraint for many central banks during the last two recessions, would no longer be a hindrance. To illustrate, a central bank could implement a negative interest rate simply by reducing balances

in electronic wallets at some pre-announced rate.

Monetary policy could also be implemented through "helicopter drops" of digital dollars. While previously just a theoretical thought experiment for bored economists, with CBDC and digital wallets it could become quite easy to make lump sum transfers to all eligible households and businesses (including the unbanked). It would also become much simpler to target specific groups, for example if an earthquake struck a particular region, and to ensure the transfers were spent rather than saved. As an illustration, one of China's pilot programs set a six-day expiration on the RMB handouts.

One enduring lesson of the COVID-19 crisis and the global financial crisis (GFC), is the difficulty in getting government payments to needy households and businesses in a timely manner. Monetary policy effectiveness is greatly reduced because of its long and variable lags, a problem that is even more pronounced for fiscal policy. A CBDC could dramatically increase the speed and effectiveness of counter-cyclical policies and, with that, possibly assign recessions to the dustbin of history.⁵ Additionally, a CBDC could further erode the distinction between monetary and fiscal policy, a confluence that holds particular appeal to MMT acolytes.

It is also likely that CBDC will reduce friction in existing payment systems, lowering costs and increasing the speed of transactions. As it stands today, the flow of money between central banks, commercial banks, merchants, and customers is highly convoluted and inefficient. There is enormous opportunity to simplify this process and vastly improve the transaction time for making payments. Additionally, there could be potential financial stability

5. Of course, the law of unintended consequences will come into play. As an example of moral hazard, investors may take on even more risk if they perceive protracted slumps have become extinct and downside risks largely eliminated.

benefits that would arise from real-time monitoring (for example, of an excessive concentration of risk which could result in a default massive enough to trigger a cascade and lead to market seizure); hence the speculation by some that recessions as a result of malfunctions in credit creation could be better anticipated and controlled thereby lessening the likelihood of recession.

Financial Inclusion

“The soundest justification (to create a digital dollar) is financial inclusion. Americans without credit cards and bank accounts, who rely entirely on cash, are denied not just financial services but other services as well (such as access to rideshare companies).”

—Barry Eichengreen, Berkeley

Another potential advantage is financial inclusion, as universal access should be a key feature of any CBDC. For example, central banks could prepopulate individual accounts with funds, which would be an important first step in enrolling consumers in the financial system. This approach could be particularly transformative in lower income countries where, in many cases, half the population does not have easy access to bank accounts (**Figure 10**).

Disintermediating the Banking System

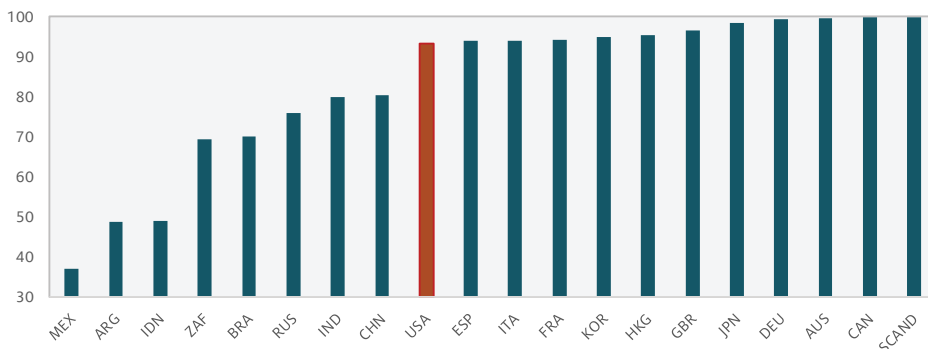
“You want to avoid creating things (CBDC) that might be destabilizing or might draw funds away from the banking system.”

—Jerome Powell, Fed Chair

Having examined the possible advantages of CBDC, we now explore two potential disadvantages, the first of which concerns the potential impact on commercial banks. Most CBDC plans are gravitating toward a two-layer

Roughly 14 million American adults lack a bank account: Reasons cited include it's too expensive, their funds are insufficient, or they lack necessary documentation.

Figure 10: Percentage of those 15 years and older with a bank account



Source: World Bank, *The Global Findex Database 2017: Measuring Financial Inclusion*
SCAND: Denmark, Finland, Norway, Sweden, all at 100%

architecture, in which the central bank operates the basic functional layer that issues the digital currency, while commercial banks manage a second layer that interfaces with households and businesses.

Within this framework, the least disruptive approach involves central banks disseminating CBDC to commercial banks, which in turn distribute the digital cash to individuals and businesses via digital wallets they set up and manage. This is quite similar to the current system with physical cash. Under a second approach, central banks offer their own digital wallets or mobile apps, with users able to leave their digital cash there or transfer it to their account at a commercial bank. While households and businesses could continue to use their preferred payment apps, they could also have all or part of their digital cash in an account at the central bank, rather than sitting on a commercial bank's balance-sheet.

Another way to think about this is: Will the Fed be a banker's bank or a people's bank? The Fed's interaction with businesses and households has always been mediated through the

banking sector, but this could change with CBDC. If users are provided with direct access to the Fed's balance sheet, it would create a strong incentive for them to shift their money from commercial banks to the Fed's balance sheet. Even with FDIC-insurance, such transfers could accelerate during periods of market panic, possibly creating a "digital bank run."

“If people shift their savings from banks to digital wallets, banks' ability to lend will be hamstrung. Some banks will close, and small businesses that rely on banks for credit will have to look elsewhere.”

—Barry Eichengreen, Berkeley

Even during normal times, CBDCs could disintermediate significant swaths of the commercial banking system. With reduced access to deposits, banks' funding costs would rise, and they would respond by changing terms of the loans they offer to borrowers. Further accentuating this trend is the likelihood that, with the rising importance of digital cash, commercial banks will lose market share to payment service providers which have proven to be

extremely agile, innovative and tech savvy.

Balancing Privacy vs. KYC Requirements

A second potential disadvantage concerns the balance between individual privacy rights and compliance processes, a balancing act that is likely to become even more challenging with a CBDC. It seems likely commercial banks will remain responsible for know your customer (KYC) requirements, including customer due diligence (CDD), to ensure compliance with anti money laundering (AML), counter terrorist financing (CTF), and other laws. However, in some instances the central bank will have access to the digital transactions ledger, which would allow them to become more effective at monitoring and enforcing compliance efforts. Further, with such access, authorities could also potentially bring more economic activity into the tax net, limiting tax evasion and boosting tax revenues.

“If I cannot buy you a coffee without the government knowing about it, I do worry about what this could mean.”

—Eswar Prasad, Cornell University

This suggests, under some CBDC designs, individual privacy could be dramatically curtailed, as “following the money” becomes a much easier exercise. This even includes pseudonymous accounts, as it might be possible for the central bank to deanonymize the underlying holder. We expect the legal confidentiality protections associated with digital ledgers to prove extremely controversial in places like the U.S., UK, and Europe.

Three Outstanding Design Issues

We now turn to a brief discussion of some issues that need to be addressed when designing a CBDC. Although there is a broad perception that a CBDC necessitates a particular architecture or technology, that’s definitely not the case. A successful CBDC must necessarily be secure, safeguard privacy and offer cash-like convenience. However, there are many technical approaches that satisfy these criteria to various degrees, so we can be certain that CBDC architectures will vary significantly across economies. This section focuses on three design issues and relies heavily on a recent paper by the head of the BIS and a second from the NBER.⁶

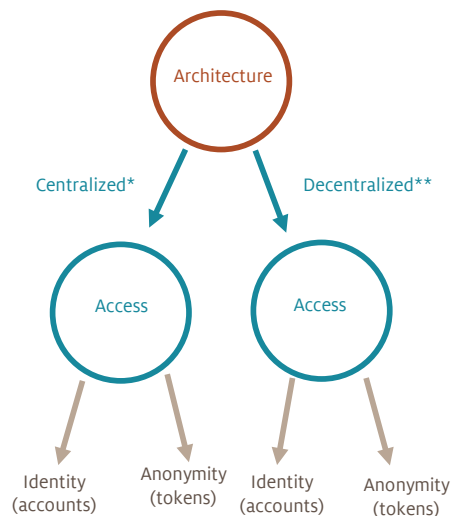
“A moderately stable monetary framework seems an essential prerequisite for the effective operation of a private market economy. It is dubious that the market can by itself provide such a framework. Hence, the function of providing one is an essential governmental function on a par with the provision of a stable legal framework.”

—Milton Friedman, 1960

The first issue is whether the CBDC should be decentralized like Bitcoin or centralized like China’s DC/EP (Figure 11). Clearly, a fully-open, permissionless, design is not feasible, due to its lack of central control, with key concerns including compliance provisions and the lack of due diligence. Moreover, all central banks deem it essential, a matter of sovereignty, to retain tight control over the issuance and management of their currencies. Centralized architecture also replicates the way interbank payment systems have been managed for decades.

For the second fork in the road, the question is whether access should

Figure 11: Two forks in the road for CBDCs



Source: Carstens, A. “Digital currencies and the future of the monetary system,” BIS, 2021.

* The central bank authority maintains trust and stability

** Purely decentralized governance (e.g., DLT like Bitcoin)

be account- or token-based. As the head of the BIS, Agustín Carstens, explains: “In the former, ownership is tied to an identity, and transactions are authorized via identification, as in bank accounts. Token-based claims are anonymous and based solely on demonstrated knowledge of the token, for example with a digital signature or private key.” It is not yet clear which approach will be chosen by most CBDCs, as the efficiency and speed advantages of a token-based approach are weighed against scalability and flexibility concerns, as well as banks’ lack of experience with DLT. Consequently, some central banks are examining hybrid systems.

Third, the publicly revealed plans of central banks to date focus on two-layer architectures in which a user would have the ability to hold digital dollars in either their digital wallets or deposit them into a traditional bank account. The BIS clearly favors two-layers, as recently explained by Agustín Carstens:

6. Carstens, A. “Digital Currencies and the Future of the Monetary System,” BIS, 2021 and Allen, S. et al. “Design Choices for Central Bank Digital Currency,” NBER, 2020.

Households and businesses could pay with a CBDC just as they do today, with a debit card, online banking tool or smartphone-based app, all operated by a bank. However, instead of the banks booking transactions on their own balance sheets as is the case today, they would simply update the record of who owns which CBDC balance. The CBDC itself would be a cash-like claim on the central bank. In this way, the central bank avoids the operational tasks of opening accounts (including KYC and AML/CTF) and administering payments, as private sector banks would continue to perform retail payment services.

Central Bankers are Famously Cautious and Risk Averse: Can They Innovate?

Having just discussed three design issues, we now ask whether central bankers are indeed capable of implementing the revolution in money and payments that CBDCs represent. Market gurus like Jim Grant enjoy reminding us that central bankers, despite all their intellectual pretension, are nothing more than price-fixing bureaucrats. They are also famously risk-averse, objecting to anything that could prove disruptive to financial markets or jeopardize financial stability.

In a Project Syndicate article last year, Huw Van Steenis recalled that Steve Jobs had only one business book on his must-read list: *The Innovator's Dilemma*, by Harvard's Clayton Christensen. This classic showed that incumbents often fail to harness the next wave of innovation because they are too focused on short-term (urgent but not important) issues and maintaining the status quo. Van Steenis argues central bankers would do well to absorb Christensen's lessons. Writing a library's worth of weighty, technical tomes on CBDCs just isn't enough, especially when a new wave of private

sector innovators, in cybercurrencies and payments, is impatiently chomping at the bit.

The Future is Now: Launching a CBDC Will Take More than Token Efforts

In the BIS's most recent survey of 65 central banks (representing 91% of global GDP), 60% disclosed they were engaged in CBDC experiments or proofs of concept in 2020 (up from 43% in 2019). The same survey reported a large number of central banks anticipate launching a CBDC within the next three years. That strikes us as quixotically ambitious and we believe most major central banks, aside from the PBOC, will take somewhat longer.

"The ECB is driven by the increasing digitalization of the economy, the growing prevalence of cashless payments and the possibility of private digital currencies undermining monetary sovereignty."

—Digital Monetary Institute

When asked four months ago about her CBDC timeline, ECB President Christine Lagarde responded, "This is a project that will probably take us two, three or four years before it is launched." However, forging a consensus in Europe, even on minor technical issues, can take years and years. Its public consultation process, seeking views on the desirable features of CBDCs, concluded in January and garnered over 8,000 responses. The ECB has committed to presenting a preliminary analysis in early summer, after which the 25-person Governing Council will decide in principle on whether to proceed. Assuming a green light, a digital

euro could be trialed across different cities in 2023, leaving open the possibility of a full-scale launch by the end of 2025.

Among smaller countries, Sweden's Riksbank has been particularly proactive and is currently conducting a pilot which is scheduled to end in February 2022. The objective is to develop a token-based platform, with digital wallets integrated into commercial banks' mobile apps, so that users can make peer-to-peer payments "as easily as sending a text." The technical platform is a permissioned DLT blockchain, accessible by institutions approved by the Riksbank. Regarding privacy, the platform is designed to ensure users remain anonymous vis-à-vis the Riksbank. Commercial banks are responsible for KYC and ongoing due diligence, with the Riksbank only receiving information on individual account balances and payments, but no information on the actual account holders.

"We are the world's reserve currency, and we have the responsibility to get this right. We don't need to be the first. We need to get it right."

—Jerome Powell, Fed Chair

The U.S. Fed has been a bit slower to outline its CBDC strategy than other central banks. This strikes us as unfortunate as the U.S. has long been the pioneer in payment innovations, including the credit card, the real-time gross settlement system, and online money transfers. The U.S. should also endeavor be a leader rather than a follower in this new wave of digital innovation. Fortunately, the Fed is beginning to recognize this and last month, when asked about the digital dollar, Powell responded, "This is going to be an important year. This is going

to be the year that we engage with the public pretty actively.”

Digital Dollars: Investment Implications

During the past two years, CBDC has progressed from a bold speculative concept to a seeming inevitability and will soon be a core feature of our financial ecosystem. Central banks are now acutely aware that, if they don't soon innovate and create a new type of money, one that better meets the needs of the digital economy, they could gradually slip into irrelevance.

Aside from improving existing payment systems, a key advantage of a CBDC is that it could dramatically increase the speed and effectiveness of monetary policy, possibly assigning recessions to the dustbin of history. One disadvantage is that it could disintermediate significant swaths of the commercial banking system. Further, with the rising importance of digital cash, commercial banks may lose market share to Fintech companies and payment service providers that have proven to be extremely agile and innovative.

China is the clear frontrunner when it comes to CBDCs and could launch as early as February during the Beijing

Winter Olympics. Europe is two or three years behind China. The U.S. has been slower to outline its CBDC strategy, although Jerome Powell recently promised to accelerate efforts this year.

The rollout of CBDCs will further accelerate the digitization of the economy, which we believe is still in its early innings. As we have emphasized in a series of papers under our “Tech is the New Macro” banner, we believe asset-light business models (particularly in the tech, health care, and communications sectors, but also in Fintech and payments) are most likely to be the future investment winners. Digital platforms feature low marginal costs and increasing returns to scale, which creates winner-takes-all markets and favors global champions.

Understanding how companies will adapt their business models is central to assessing their ability to produce free cash flow on a sustainable basis. In light of this, “What is your business strategy in the digital age?” has become one of our favorite questions to ask management teams. If a company cannot provide a convincing response, we believe it will likely flounder and ultimately disappear. As this paper has demonstrated, this inevitability even applies to central banks.

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