



The Digital Dollar Project

White Paper 2.0 - January 2023

*Revisiting the Digital Dollar Project's exploration
of a U.S. central bank digital currency*

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Introduction

The Digital Dollar Project is a non-profit organization devoted to catalyzing private sector research and exploration of the potential advantages and challenges of a U.S. central bank digital currency (CBDC), or “digital dollar.” It works to convene and incorporate the diverse perspectives and expertise of private sector, academic, and non-profit leaders to inform the national consideration of a digital dollar and to understand the implications of global CBDC developments for Americans.

When the Digital Dollar Project published its initial white paper, “*Exploring a U.S. CBDC*,”^[1] in May 2020, the world was engulfed by a global pandemic and corresponding economic recession. As the U.S. government struggled to efficiently distribute emergency relief funds to citizens, it confirmed that the United States’ financial infrastructure had become just as outdated as its physical infrastructure and that far too many Americans are excluded from the existing financial system.

The pandemic also added a new sense of urgency to already accelerating waves of digital innovation. Public and private entities across the globe expedited their research and experimentation into tokenized assets, including digital commodities, contracts, and legal titles. In the years that followed, companies and investors have poured money into developing new digital worlds made accessible via immersive technologies. Novel classes of digital assets underpinned by technologies such as blockchain and distributed ledgers dominated headlines and captured public attention as crypto market swings – with towering highs followed by staggering losses – demonstrated that a new digital age was unfolding and that public awareness of digital currencies was rising.

Central banks were watching and have moved to utilize these new technologies – in part because of thoughtful private sector-led education and exploration efforts. At the time of publication in January 2023, the central banks of 114 countries or currency unions are at various stages of active CBDC exploration – a significant uptick from May 2020, when just 35 countries were exploring CBDC.^[2] The rise of CBDC is no longer hypothetical – it is real, and it is happening now. Several central banks have already deployed a CBDC, and major players on the global stage, such as the European Central Bank, have stated a goal of issuing a CBDC this decade. Notably, China has issued its pilot CBDC to 260 million digital wallets and is actively engaging with other countries and international organizations to begin shaping global standards for the future of money.

[1] “[Exploring a U.S. CBDC](#).” The Digital Dollar Project. May 2020.

[2] [Central Bank Digital Currency Tracker](#). The Atlantic Council GeoEconomics Center. Accessed January 4, 2023.

In this context of unparalleled technological change, the mission of the Digital Dollar Project has crystallized and helped inform public discussion regarding CBDCs. The Digital Dollar Project continues to provide a neutral place for private sector actors and thought leaders to explore the technical and policy choices and challenges for a tokenized digital dollar across various use cases.

The Digital Dollar Project’s inaugural 2020 white paper urged the United States to accelerate consideration of a digital dollar through real-world experimentation and proposed a “champion model” of a digital dollar for public consideration. In this 2023 paper, we revisit our champion model and encourage the United States to continue research into the benefits and challenges of CBDC. Furthermore, given developments over the past few years, we have an even stronger conviction that the United States has an important role to play in setting international standards for digital currencies, particularly as other major economies are already beginning to exert leadership in setting global standards. To be clear, U.S. engagement in standards setting is critical and independent of the decision of whether or not to deploy a U.S. CBDC. The United States must ensure that the democratic values of a free society, including financial privacy and economic freedom, are enshrined in the future of money. As global CBDC developments progress, it is also more important than ever for American stakeholders, including U.S. commercial entities that operate in jurisdictions that have deployed or will deploy CBDCs, as well as academic, non-profit, and public policy institutions, to understand and inform these developments.

To that end, we offer three high-level recommendations to the U.S. government and U.S. private sector:

- 1** The U.S. government should increase investment and activity in researching and exploring the benefits and challenges of a tokenized digital dollar, including leveraging transparent and innovative public-private partnerships to reimagine the potential “rails” of such a system and evaluate solutions to preserve all forms of privacy while balancing security needs.
- 2** The U.S. government should provide leadership in international digital currency standards setting, regardless of whether it decides to deploy a digital dollar.
- 3** The U.S. private sector – including U.S. commercial entities operating in foreign jurisdictions and policy-based academic and non-profit institutions – must understand and consider the strategic and operational impacts of rapidly progressing CBDC deployments abroad.

The following *2023 Update* provides a snapshot of the global CBDC landscape, revisits the Digital Dollar Project’s “champion model” of a potential digital dollar, and looks ahead to the next stage in the evolution of CBDC development.

Refresh: What is the Digital Dollar Project?

The Digital Dollar Project (DDP) is a non-profit, non-governmental organization devoted to catalyzing research, exploration, and real-world experimentation of a potential digital dollar. The DDP believes that the dynamism and innovation of the private sector has a crucial role to play in the consideration of a digital dollar. Transparent private sector research and experimentation conducted in a neutral space is beneficial to policymakers, academics, technologists, economists, and the broader national interest. The decision of whether to digitize the dollar is no different than past U.S.-led technological innovations – including the space race and the creation of the Internet – in which both the public and private sectors contributed significantly.

To ensure that its work is guided by a diversity of experiences, perspectives, and expertise, the DDP assembled an Advisory Group^[3] that includes economists, business leaders, technologists, innovators, lawyers, academics, consumer advocacy and human rights experts, and ethicists. The Advisory Group aims to help explore design options and approaches for evaluating a digital dollar and contributes to stakeholder meetings, roundtable discussions, open forums, and white papers.

The DDP’s initial May 2020 white paper proposed a champion model of a potential digital dollar for public consideration to test and evaluate through a series of pilots and other research initiatives. The DDP believes that conducting U.S. CBDC pilots under real-world conditions with industry participants best generates the empirical data necessary to adequately inform the potential design and deployment of a U.S. CBDC. The DDP’s pilot projects and working groups test hypotheses that we hold related to the champion model. The DDP routinely explores “challenger models” of alternative CBDC designs.

The DDP is an entirely private sector-funded initiative and consequently not related to the recently completed “Project Hamilton” by the Federal Reserve Bank of Boston and MIT’s Digital Currency Initiative^[4] or ongoing CBDC-related exploration at the Federal Reserve Board or Federal Reserve

[3] DDP’s current [Advisory Group members](#).

[4] More information on Project Hamilton can be accessed [here](#). Project Hamilton focused on better understanding the capabilities and limitations of different technologies that might be used to manage and transfer CBDCs. Project Hamilton also published its research on a transaction processor for a theoretical high-performance and resilient CBDC. The processor was developed as open-source research software, called OpenCBDC, and can be accessed [here](#).

Bank of New York.[5] DDP's research is intended to complement government projects rather than compete with them.[6]

As the U.S. government continues to evaluate U.S. CBDC technical and design choices, DDP believes that the private sector should have a voice in the design of a digital dollar that meets the needs and requirements of the industries and people that would use it.

The DDP has made significant progress so far, including:

Creating an initial **pilot program** to explore potential use cases for a digital dollar under real-world conditions. In November 2022, the DDP completed its first private sector-initiated simulated U.S. CBDC pilot in partnership with the Depository Trust & Clearing Corporation (DTCC) and with technical support from Accenture. The pilot explored how a digital dollar might operate in the U.S. clearing and settlement infrastructure by leveraging distributed ledger technology.[7] The report on the pilot can be accessed here: [DDP-DTCC-Pilot-Report.pdf](#).

Establishing the **Open Digital Currency Initiative (ODCI)** alongside partners from the Linux Foundation, Hyperledger, and Finos.[8] The ODCI is an open community dedicated to experimentation, information sharing, and public discussion on CBDCs to ensure that central banks develop and deploy digital currencies with the best available technology.

Launching a **Technical Sandbox Program**,[9] a technology-neutral environment for the private sector to explore potential technical design choices for a U.S. CBDC. The program serves as a collaborative space for DDP participants to examine real-world technologies and explore potential implications for business strategies and operations.

Convening **high-level subject matter expert working groups** to address important and impactful issues that must be addressed as the U.S. considers a digital dollar, including privacy and risk. The DDP and its Privacy Working Group published privacy principles for a digital dollar in October 2021.[10]

[5] Project Cedar is a multiphase research effort to develop a technical framework for a theoretical wholesale U.S. CBDC. Phase I of Project Cedar, a prototype for a wholesale CBDC to improve speed, cost, and access to an FX spot transaction, was completed in November 2022. More information can be accessed [here](#).

[6] DDP supports collaborative approaches, including the sharing of learnings and best practices, with trusted institutions, such as the Bank for International Settlements (BIS), International Monetary Fund (IMF), Bank of England, Sweden's Riksbank, and others.

[7] The Depository Trust & Clearing Corporation and Digital Dollar Project. "[Exploring Post-Trade Security Settlement with a U.S. Central Bank Digital Currency](#)." November 30, 2022.

[8] More information on the Open Digital Currency Initiative can be accessed [here](#).

[9] More information on the Digital Dollar Project's Technical Sandbox Program can be accessed [here](#).

[10] "Privacy Principles for a Digital Dollar." The Digital Dollar Project with [expert insight](#) from the DDP Privacy Sub-committee. October 2021.

Providing **public policy thought leadership** in support of neutral private sector experimentation grounded in empirical data. The DDP has been invited to testify before the U.S. Congress[11] on the topic of CBDC multiple times, most recently by the Senate Banking Committee Subcommittee on Economic Policy in June 2021.[12] DDP has also responded to requests for comment from the Federal Reserve Board,[13] the Department of Commerce,[14] and the Department of the Treasury.[15]

Hosting **public discussions and events** with other thought leaders, including those pursuing “challenger models” of a potential U.S. CBDC and exploring alternative approaches to modernizing the U.S. financial system.

[11] The testimony of DDP Executive Chairman, the Hon. J. Christopher Giancarlo, can be accessed [here](#).

[12] Senate Committee on Banking, Housing, and Urban Affairs. “[Building a Stronger Financial System: Opportunities of a Central Bank Digital Currency](#).” June 9, 2021.

[13] The DDP’s response to the Federal Reserve Board’s CBDC discussion paper can be accessed here: “[Money and Payments: the U.S. Dollar in the Age of Digital Transformation](#).”

[14] The DDP’s response to the Department of Commerce on Developing a Framework on Competitiveness of Digital Assets can be accessed [here](#).

[15] The DDP’s response to the Department of the Treasury on Ensuring Responsible Development of Digital Assets can be found [here](#).

(Re)introduction to CBDC

A CBDC is a digital form of a country's national currency that is issued and backed by the country's central bank. CBDCs are used in a manner similar to physical cash but exist in a digital format. In the context of the United States, a digital dollar would be issued by the Fed with the U.S. government's full faith and credit. Importantly, the DDP views a potential digital dollar as a complement to and not a replacement for physical cash.

CBDCs can be used for a wide range of transactions, including retail purchases, peer-to-peer payments, and business-to-business payments. They may also be used to facilitate the efficient clearing and settlement of financial transactions and to support the operations of payment systems. One of the main goals that central banks seek to utilize CBDC to achieve is to provide the general public with a safer and potentially more inclusive and accessible payment option. CBDCs could also be used to foster financial stability and support monetary policy.

When discussing CBDC, it is crucial to understand its two main forms: retail and wholesale. Retail CBDC^[16] refers to a CBDC accessible to individual consumers and can be used for everyday purchases and peer-to-peer payments. Wholesale CBDC is a type of CBDC utilized by financial institutions or other major entities rather than individuals and can be used for interbank settlements and other large financial transactions.^[17]

The fundamental benefit of the concept of a tokenized digital dollar is that there is no better, riskless settlement medium than U.S. central bank money, which must be codified for continued relevance and accessibility. The DDP believes that a digital dollar could upgrade the infrastructure of money – the ultimate public good – and future-proof the dollar for the increasingly digitized 21st century.

A CBDC is distinct from other forms of existing digital payment instruments, such as credit cards and payments apps, as it would be a direct claim on a central bank instead of a liability of a private financial institution. A tokenized digital dollar would be a bearer instrument that would represent

[16] Among the multitude of highly effective payment options in the US (e.g., cash payment, credit, debit, etc.), a digital dollar could offer a new choice for digital transactions, instantaneous peer-to-peer payments, and in-person transactions. It could also potentially lower costs and further diversify payment rails. A digital dollar could be distributed to the end user through commercial banks and trusted payment intermediaries while facilitating financial inclusion by broadening access to services via additional mechanisms, such as digital wallets.

[17] Today, wholesale payments rest on national payment systems, and they are typically conducted through interbank clearing using central bank money to settle securities and other large value payments in real time gross settlement (RTGS) systems like Fedwire. Current wholesale large value transactions are account-based and predominantly executed by banking and payment providers who have accounts with the Federal Reserve. Due to the nature of the prevailing account-based system, only organizations with accounts can transact in central bank money. Just like a physical dollar, a tokenized digital dollar would provide alternative access to central bank money outside of accounts. Accordingly, it could facilitate broader, more diverse access for institutions to large value payments and support the emergence of digital financial market infrastructures.

a significant technical upgrade over the outdated and time-consuming account-based financial system. We explore the potential benefits offered by tokenization, including recent research on the topic, later in the paper.

There are many different technical design and public policy choices that countries must make as they consider developing a CBDC. Consequently, no two CBDCs are the same. The DDP believes that a digital dollar must retain and enhance American ideals and values on some topics, such as privacy.

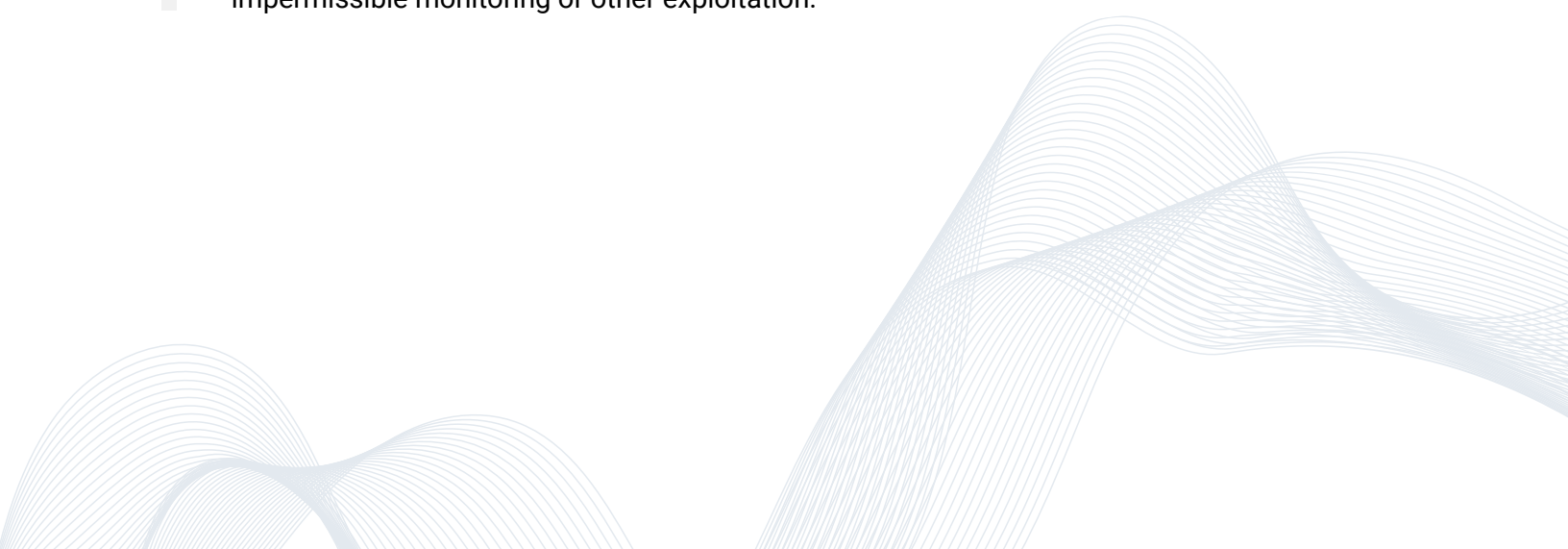
We believe that an ideal digital dollar should be private, secure, accessible, and transparent:

Private: A U.S. CBDC should avoid subjecting users to undue corporate tracking or government surveillance and should allow users the ability to limit having their information shared with financial services providers. U.S. law should strictly control law enforcement and broader government access to public data.

Secure: A U.S. CBDC should provide robust security against theft, hacking, illegal seizure, and fraud. As such, it should provide a new way for people to handle money individually, utilizing a system that is both secure against attacks and legally protected.

Accessible: A U.S. CBDC should improve Americans' and global dollar users' access to financial services by increasing efficiency and lowering the cost of transacting. Widespread CBDC usage should spur competition in financial services to produce better services at lower costs. Additionally, accessible and low-cost digital wallets could serve as an on-ramp into the financial system for the un-and-under-banked.

Transparent: A U.S. CBDC system should have transparent operations to enable stakeholders to independently gain assurance about its technical functioning, security, and resistance to impermissible monitoring or other exploitation.



Moreover, the DDP believes that the United States should explore the opportunities and challenges of a digital dollar that is anchored in the core characteristics of our “**champion model**” detailed below:

Tokenization: A U.S. CBDC will be a tokenized form of the U.S. dollar.

Third format of currency: A U.S. CBDC will operate alongside existing fiat currency and commercial bank money. It will mirror many properties of physical money, including its ability to work alongside existing account-based systems.

Maintenance of the two-tiered banking system: A U.S. CBDC will be distributed through the existing two-tiered architecture of commercial banks and regulated financial technology and payments intermediaries.

Privacy: The U.S. CBDC will support a balance between individual privacy rights and necessary compliance and regulatory processes, decided upon by policymakers and ultimately reflecting the jurisprudence around the Fourth Amendment.

Monetary policy-neutral: A U.S. CBDC will not impact the Federal Reserve's ability to affect monetary policy and control inflation.

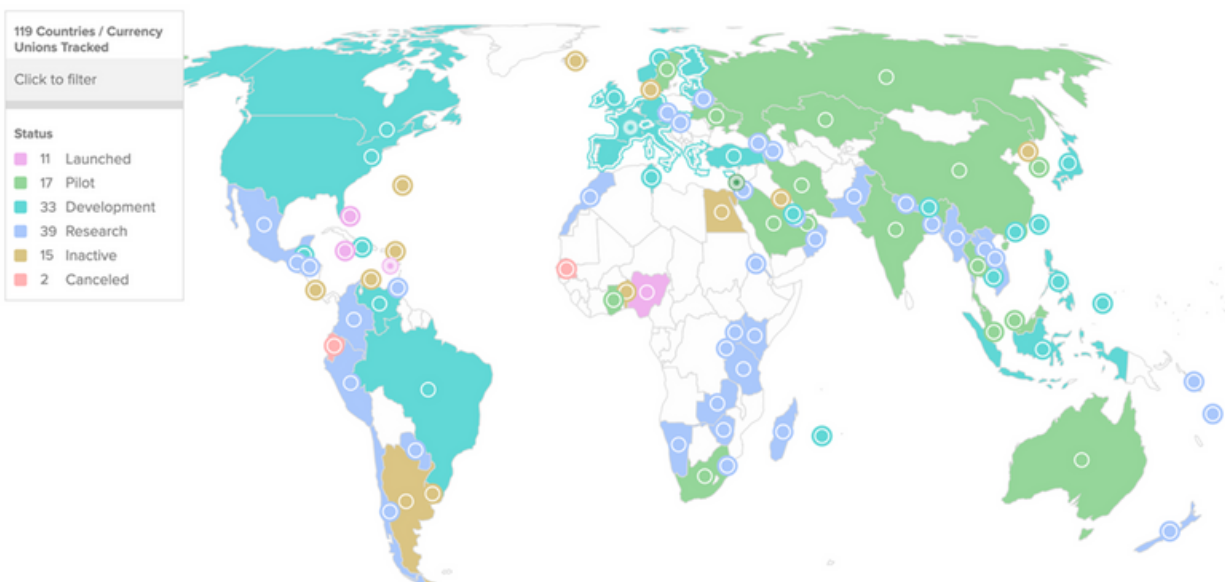
Technology decisions and design choices driven by functional needs: The policy and economic requirements of a U.S. CBDC will inform both the underlying technology and ultimate design choices.

Future-proofing the architecture through flexibility: The chosen technological architecture will offer the flexibility to adapt configurability based on policy and economic considerations.

Continued private sector innovation: A U.S. CBDC will act as a catalyst for innovation and will not be antithetical to the development of private sector initiatives.

Status of Global CBDC Research and Development – Key Trends and Contrasts

According to the Atlantic Council GeoEconomics Center, 114 countries are at various stages of CBDC exploration, and 11 countries have issued a CBDC as of January 2023. This is a significant increase from May 2020, when just 35 countries were exploring, and none had deployed a CBDC.[18]



Global CBDC deployments are likely to increase exponentially in the next 12-24 months. The Atlantic Council GeoEconomics Center also found that a new high of 60 countries are in advanced phases of exploration (developing, piloting, or launching CBDCs). The Official Monetary and Financial Institutions Forum (OMFIF) found that two-thirds of central banks surveyed in November 2022 said they would issue a CBDC within 10 years and 24 central banks responded that they would issue a CBDC within just 1-2 years.[19] As of January 2023, the central banks of 11 countries or currency unions – the Bahamas, Nigeria, Jamaica, and the Eastern Caribbean Central Bank – have deployed a CBDC.

[18] Atlantic Council GeoEconomics Center, [Central Bank Digital Currency Tracker](#). Accessed January 4, 2023.

[19] Future OMFIF Digital Monetary Institute. [“Future of Payments 2022: Turning the Cross-Border Payments Roadmap into Reality.”](#) December 8, 2022.

It is more important than ever for the U.S. private sector to understand global CBDC trends. As the above chart from the Atlantic Council GeoEconomics Center and data from the OMFIF illustrate, CBDCs are already in deployment in several jurisdictions and will become increasingly commonplace in the next few years. To that end, we offer three observations on trends and contrasts in current CBDC developments:

Observation 1: Central banks are laser-focused on improving domestic payments efficiency with a growing emphasis on cross-border payments that could lead to a new global financial order.

Observation 2: Research suggests CBDCs could benefit financial stability.

Observation 3: CBDCs hold promise for bolstering financial inclusion, but more data and bolder leadership in pursuing ways to expand access are needed.

Observation 1: Central banks are laser-focused on improving domestic payments efficiency with a growing emphasis on cross-border payments that could lead to a new global financial order.

According to the Bank for International Settlements (BIS), improving domestic payments is the top priority for central banks exploring CBDC in both advanced economies (AEs) and emerging market and developing economies (EMDEs). A BIS survey of central banks found that “payment-related motivations, such as domestic payments efficiency and payments safety, remain at the heart of both AEs’ and EMDEs’ motivations for issuing general purpose CBDCs.”[20]

In the United States, President Biden’s March 2022 *Executive Order (EO) on Ensuring Responsible Development of Digital Assets* outlined the first U.S. whole-of-government approach to addressing risks and harnessing the benefits of digital assets. The EO identified six key priorities: consumer and investor protection, promoting financial stability, countering illicit finance, U.S. leadership in the global financial system and economic competitiveness, financial inclusion, and responsible innovation.[21] Five of the six priorities laid out by the Biden Administration focus on domestic concerns. Similarly, the Federal Reserve Board has indicated its “key focus is on whether and how a CBDC could improve on an already safe and efficient U.S. domestic payments system” in its January 2022 discussion paper on a potential U.S. CBDC.[22]

[20] Boar, Codruta and Wehrli, Andreas. “BIS Papers No. 114 ‘Ready, steady, go? – Results on the third BIS survey on central bank digital currency.” The Bank for International Settlements Monetary and Economic Department. January 2021.

[21] The White House. [Executive Order on Ensuring Responsible Development of Digital Assets](#). March 9, 2022.

[22] The Federal Reserve Board. [“Central Bank Digital Currency \(CBDC\).”](#) Accessed January 4, 2023.

Early U.S. CBDC research, in both the public and private sectors, has explored various aspects related to domestic CBDC applications. The Federal Reserve Bank of Boston and MIT's Digital Currency Initiative explored U.S. CBDC design choices with a focus on technical challenges and opportunities to develop a fast, highly scalable, and resilient CBDC architecture.[23] The DDP is contributing to ongoing U.S.-focused research through initiatives such as the Security Settlement Pilot with DTCC, which tested real-time delivery-versus-payment (DVP) settlement using cash tokens to explore the potential benefits of a U.S. CBDC in increasing payments efficiency while reducing counterparty risk and trapped liquidity.[24]

The United States is not the only country that has prioritized improving domestic payments. The first four central banks to deploy CBDCs (Bahamas, Jamaica, Nigeria, and the Eastern Caribbean) have each done so with domestic payments improvements in mind. In a working paper, the European Central Bank cited domestic retail payments as the primary motivator for its exploration of a digital euro, and the Chinese e-CNY has been largely domestic-focused, although that focus is already shifting to a more international perspective.

Despite this initial focus on domestic CBDC applications, more central banks are turning their attention to cross-border payments. This trend is particularly important for the United States as global cross-border developments may have significant implications for the U.S. dollar's position as the global reserve currency of choice. As of December 2022, there are nine wholesale cross-border CBDC pilots and seven cross-border retail CBDC pilots globally.

Several countries have increased research and piloting to explore how CBDC could solve the problem of slow and expensive cross-border payments. The European Central Bank has hailed CBDCs' potential as the "holy grail" of cross-border payments by allowing these transactions to be "immediate, cheap, universal, and settled in a secure settlement medium." [25] In a major development that largely flew under the radar, several central banks completed the initial phase of Project mBridge, a BIS-led collaboration that experiments with cross-border payments using a custom-built common platform based on DLT upon which multiple central banks can issue and exchange their respective CBDCs. Project mBridge participants include the central banks of China, Hong Kong, Thailand, and the United Arab Emirates, whom each contributed to the testing of "real-time, peer-to-peer, cross-border payments and foreign exchange transactions using CBDCs." [26] The transactions in Project mBridge are wholesale, which, as discussed above, are large-value transactions predominantly executed by banking and payment providers.

[23] The Federal Reserve Bank of Boston and Massachusetts Institute of Technology Digital Currency Initiative. "[Project Hamilton Phase 1 A High Performance Payment Processing System Designed for Central Bank Digital Currencies.](#)" February 3, 2022.

[24] The Depository Trust & Clearing Corporation and Digital Dollar Project. "[Exploring Post-Trade Security Settlement with a U.S. Central Bank Digital Currency.](#)" November 30, 2022.

[25] "Bindseil, Ulrich & Pantelopoulos, George. "[Towards the holy grail of cross-border payments.](#)" The European Central Bank. August 2022.

[26] BIS Innovation Hub. "[Project mBridge – Connecting economies through CBDC.](#)" October 2022.

Project mBridge is an early example of how global trade could be conducted outside of the existing global financial system that is led by the United States and its affiliated institutions. In some of the scenarios tested by Project mBridge, transactions were settled instantly across borders – a substantial increase in efficiency over the existing system in which transactions often take multiple days to pass through the correspondent banking system.[27]

Importantly, Project mBridge developed a system in which one bank can pay a bank in a different country, and the receiving bank is enabled to receive the payment in its own currency. If a Thai bank sent funds to a Chinese bank in its own CBDC, the Chinese bank would receive funds in its own currency – the e-CNY, in this example. The influential role of the People’s Bank of China and the clear potential for a new global financial order that sidesteps U.S.-aligned conventional banking channels makes Project mBridge among the key cross-border CBDC initiatives to follow.

Project mBridge, however, is not the only cross-border project to watch. Project Dunbar is testing the use of CBDC for international settlements, with participation from the Reserve Bank of Australia, Bank Negara Malaysia, the Monetary Authority of Singapore, the South African Reserve Bank, and the BIS Innovation Hub. Additionally, the Banque de France demonstrated the ability to settle in a foreign currency outside of the issuing nation while still providing transaction data to the issuing central bank.[28]

Observation 2: Research suggests CBDCs could aid central banks in maintaining financial stability.

Ensuring responsible stability remains another common motivation for central banks exploring CBDC. Recent research has found several possible benefits for financial stability stemming from CBDC deployment. The U.S. Office of Financial Research found that CBDC “may enhance rather than weaken financial stability.”[29]

For example, a CBDC could ensure that sovereign money continues to underpin confidence in money and payments in an increasingly cashless society and serves as a point of reference for private money in the economy. By reducing transaction costs and frictions in credit provision, a CBDC could improve capital allocation. Finally, introducing a CBDC could ultimately promote and facilitate innovations in the banking and payments sector – for the betterment of all consumers.

[27] Fanusie, Yaya J. [“The mBridge to Somewhere: Central Banking is Having Its Sputnik Moment.”](#) Lawfare. November 30, 2022.

[28] Banque de France. [“Banque de France, Bank for International Settlements and Swiss National Bank conclude successful cross-border wholesale CBDC experiment.”](#) December 8, 2021.

[29] Keister, Todd. [“How would a Central Bank Digital Currency Affect Financial Stability?”](#) The Office of Financial Research.

However, the impact of CBDC on financial stability will generally depend on how a CBDC is designed and deployed. The DDP believes that a digital dollar should not include features that would hinder the U.S. dollar as a store of value and safe-haven asset. There are appropriate concerns that a CBDC might decrease the money supply held in commercial banks, but there is a lack of data or empirical evidence to suggest any significant change in commercial bank usage. Conversely, it is possible that the deployment of a U.S. CBDC distributed through the existing two-tier system could actually lead to an increase in the money supply held in commercial banks, given the potential increase in financial inclusion and access.

Observation 3: CBDC holds promise for bolstering financial inclusion, but more data and bold leadership are needed.

Financial inclusion is often touted as a potential benefit offered by CBDC.[30] Developing nations, such as the Bahamas, have either deployed or researched CBDCs with a primary focus on enhancing financial inclusion for un-and-under-banked populations.[31] Some developed economies, such as the United States, have also posited that CBDCs could bolster financial inclusion. President Biden's March 2022 *EO on Ensuring Responsible Development of Digital Assets* stated that enhancing financial inclusion is a primary policy objective for the United States when considering digital assets, including CBDCs. Financial inclusion is an important priority to consider when deciding whether and how to develop a U.S. CBDC.

However, more data is needed to support the hypothesis, particularly in the context of the United States, that a CBDC would bolster financial inclusion. First, it is essential to understand the various reasons why people are un-or-under-banked, ranging from a lack of trust in the current financial system to an inability to meet certain minimum balance requirements. Other un-or-underbanked people do not possess the necessary identification documentation to open a traditional commercial bank account. According to a Federal Deposit Insurance Corporation (FDIC) report, "2021 National Survey of Unbanked and Underbanked Households,"[32] 5.9 million U.S. households are unbanked, and 18.7 million households are underbanked, meaning they have a bank or credit union account but rely largely on nonbank financial products and services.

[30] Auer, Raphael et al. "FSI Insights on policy implementation No. 41: Central bank digital currencies: a new tool in the financial inclusion toolkit?" The Bank for International Settlements & The World Bank Group. April 2022.

[31] Wright et al. "Financial Inclusion and Central Bank Digital Currency in the Bahamas." Central Bank of the Bahamas. July 26, 2022.

[32] The Federal Deposit Insurance Corporation. "FDIC National Survey of Unbanked and Underbanked Households." November 14, 2022. [2021 FDIC National Survey of Unbanked and Underbanked Households](#)

The DDP believes that CBDC could provide financial institutions and financial technology companies – in partnership with community outreach efforts – with the underlying technology to build more inclusive payments and banking services. Regulated institutions could develop digital wallets that provide unique services and cater to different user bases. The DDP believes that lower operational, technology, and regulatory costs related to offering digital wallet solutions for the custody of tokenized digital dollars may hold advantages over traditional bank accounts in expanding access to currently underserved populations. For example, if designed with assured privacy and accessible onboarding, a digital dollar could provide a more accessible and less expensive option for traditionally underbanked communities who pay high fees to access the digital payments ecosystem. The DDP believes that a digital dollar distributed through innovative and well-regulated fintech companies (in addition to banks), would benefit from robust private sector experimentation, including in the domain of financial inclusion.

Financial inclusion benefits will also depend on design considerations such as maintaining a model similar to cash that could provide offline payment abilities, privacy protections, tiered identity verification requirements, and a two-tier distribution system that includes banks and well-regulated fintech companies. Similarly, the BIS recently posited that although not a panacea, central banks could use CBDC as a tool to further financial inclusion in "promoting innovation in the two-tiered payment system, offering a robust and low-cost public sector technological basis and novel interfaces, facilitating enrollment and education on CBDC, and fostering interoperability among multiple dimensions."^[33]

Privacy will be critical to realizing the potential inclusion benefits of CBDC. Some underserved people avoid depositing money in banks due to privacy concerns. It is reasonable to posit that these communities are unlikely to transact heavily in a CBDC unless they are confident that their financial privacy is assured. While it is vital to ensure robust know-your-customer (KYC) and other financial crime protections, it will also be critical to ensure that these processes do not come at the cost of preventing CBDC access due to privacy concerns.

The United States must explore a CBDC that addresses the barriers preventing the un-and-underbanked from accessing the financial system. Most global CBDCs in deployment or development replicate the existing account-based financial system, which is unlikely to be the best approach to expanding access and inclusion. The DDP is working to lay the groundwork for bold U.S. exploration of a tokenized CBDC by collaborating with private sector stakeholders to bridge communication and data gaps between policymakers and minority depository institutions (MDIs), community development financial institutions (CDFIs), and other local initiatives.

[33] Auer, Raphael et al. "FSI Insights on policy implementation No. 41: Central bank digital currencies: a new tool in the financial inclusion toolkit?" The Bank for International Settlements & The World Bank Group. April 2022.

Revisiting the original DDP tenets for a digital dollar

CBDC was a relatively new concept when the DDP published its initial white paper in May 2020. Still, there was enough research, global evidence, and experiential perspective to develop a “champion-challenger” approach to DDP’s piloting and experimentation. Through a range of expert interviews and with input from the Advisory Group, DDP proposed for public consideration a “champion model” of a U.S. CBDC that we hypothesized could provide significant economic and societal benefits.

Public comments^[34] and recent research and development efforts, as discussed below, confirm the tenets’ continued relevance. We, therefore, plan to continue to anchor our private sector exploration of a digital dollar in these tenets and recommend that the U.S. government explore a digital dollar in a similar manner:

Tokenization

A core tenet of the DDP’s champion model is tokenized architecture. We hypothesize that a token-based digital dollar would not require third-party intervention to be verified and transferred – a significant departure from today’s account-based transactions as described below. This is because a digital dollar would be actual money in the form of a digital token, a bearer instrument.

The DDP believes that a tokenized digital dollar could provide new levels of portability, efficiency, and accessibility. Much of today’s global economy is based on electronic transactions such as Automated Clearing House (ACH) payments, wire transfers, and app-based transfers. While these transactions are undoubtedly electronic, the money being exchanged is very different from a tokenized digital dollar. The money being exchanged in today’s electronic transactions is actually “account-based” money that financial institutions hold on behalf of the money’s owners.

Account-based transactions are a series of messages from one participant’s bank to the other’s bank verifying the transaction. The two banks must act on behalf of both parties for the transaction to take place, and one or both institutions are likely charging a fee to conduct this outdated and time-consuming process.

[34] The Chamber of Digital Commerce. [“Response of the Chamber of Digital Commerce to ‘The Digital Dollar Project: Exploring a US CBDC.’”](#) October 2, 2020.

There is a popular view that the two major architecture choices for CBDC are “token-based” and “account-based.” This dichotomy, however, is not entirely accurate. An account-based CBDC system could include elements of tokenization (i.e., tokens inside of accounts) but this design would be unlikely to offer significant benefits from an access and inclusion perspective over the status quo. Others have noted that these two categorizations are insufficient to address the complexity and nuances of CBDC design choices. Project Hamilton, for example, took the view that there is no clear binary choice between token and account, and a team at the Federal Reserve Bank of New York argued that a CBDC could maintain the characteristics of both account-based and token-based architecture.[35]

Technical work to explore a tokenized digital dollar is underway. The team behind Project Hamilton, the Boston Fed/MIT collaboration that concluded in December 2022, created a core transaction processor using two architectures, both of which were based on the unspent tokens (UTXO) model. The token-based model allows researchers to create a secure CBDC transaction format that prevents double spending, is non-malleable (transaction details cannot be changed after it has occurred), and is non-replayable (confirmed transactions cannot be re-submitted in hopes of effectuating another transfer).[36] Project Hamilton’s results demonstrated the security benefits offered by a tokenized CBDC architecture. Still, other areas of research, including the potential benefits of a token-based CBDC for retail consumers, have yet to be explored.

As other tokenized currencies emerge, a natively tokenized U.S. dollar could complement the account-based FedNow and Fedwire services and provide a modernized payments system. Although there are diverse payment solutions in the United States, a digital dollar would be the only medium that could provide both a digital and cash-like bearer token issued by the central bank. It is, however, possible that some CBDC benefits could be idiosyncratically addressed by other solutions, but these would be point solutions, whereas a tokenized digital dollar would offer the potential for an extensible system that could provide the transactional benefits of a digital currency combined with the stability, trust, and low risk of central bank money.

Further questions on tokenization include:

- Which operational processes would need to be transformed to handle token- and account-based models simultaneously?
- How important is the messaging about tokenization to consumers and other end-users?

[35] Garratt, Rob et al. “[Token- or Account-Based? A Digital Currency Can Be Both.](#)” The Federal Reserve Bank of New York. Liberty Street Economics. August 12, 2020.

[36] “The Federal Reserve Bank of Boston and Massachusetts Institute of Technology Digital Currency Initiative. “[Project Hamilton Phase 1 A High Performance Payment Processing System Designed for Central Bank Digital Currencies.](#)” February 3, 2022.

Third Format of Currency

The DDP's champion model of a digital dollar would operate alongside the two existing types of central bank money – physical currency issued by the Fed and digital balances – or reserves – held by commercial banks with accounts at the Fed. DDP's champion model hypothesizes that a tokenized digital dollar would complement, rather than replace, either of the two existing formats of central bank money.

This perspective largely aligns with the Federal Reserve Board's view as described in its *Money and Payments* discussion paper published in January 2022. In its paper, the Federal Reserve Board outlined its current position that a potential U.S. CBDC would serve as a means of extending, rather than reducing or replacing, public access to safe central bank money.

Physical cash is vital in a natural disaster or other events that disrupt our increasingly digital economy. The Federal Emergency Management Agency (FEMA) recommended that Americans keep a store of physical cash in their homes in case of a blackout or related disaster.[37]

In addition to serving as a useful backup in the event of a disaster, DDP believes that cash serves an important function for societal norms, and its use should be preserved. Still, the use of physical cash is declining at a faster pace than it was when the DDP first published its white paper in 2020. A CBDC may be the best way to preserve broad public access to central bank money – the safest and most riskless settlement medium available today.[38]

Further questions about the third format of central bank currency include:

- How might the private sector manage a U.S. CBDC so that it co-exists alongside other forms of money and value?
- Will there be a difference in consumer perception between CBDC and commercial bank money?
- How can network security be strengthened to further reduce the likelihood of future digital disruption?

[37] FEMA. "FEMA Encourages Communities Nationwide to Prepare Ahead of Winter Storm." December 22, 2022.

[38] The Riksbank, Sweden's central bank, is exploring a Swedish CBDC or e-Krona largely to address the falling use of cash. More information can be found [here](#).

Maintenance of the two-tiered banking system

The DDP's champion model of a digital dollar would be distributed to the general public by commercial banks *and* other regulated payments and financial technology entities. These firms, including regulated non-banks, would exchange reserves for digital dollars to be distributed to end users similar to how ATMs function today.

The vast majority of central banks that are exploring a CBDC as of January 2023 generally share the view of this tenet, as reflected by research from the BIS. A BIS survey found that over 70 percent of central banks that are exploring CBDC are considering a two-tiered distribution model instead of a direct model that would essentially establish direct retail banking accounts for consumers at the central bank. Many of these central banks have stated their view that the private sector should continue to provide customary procedures such as KYC and anti-money laundering (AML) checks and be responsible for onboarding customers into a CBDC system.[39]

Central banks are evaluating various policy and design choices to minimize potential impacts on the banking system. For example, some central banks have decided that users' CBDC holdings would be non-interest bearing. Others are exploring the concept of limits on users' CBDC balances, with any excess funds spilling over automatically into bank accounts. In the United States, policymakers may consider excluding digital dollars from Federal Deposit Insurance Corporation (FDIC) insurance as an additional measure to maintain the health of the banking system.

In the context of the United States, the Federal Reserve Board outlined that an "intermediated" CBDC "would best serve the needs" of the country. The Board suggested that commercial banks and regulated nonbank financial services providers would facilitate the management of customers' CBDC holdings and payments by offering wallet and account services. The CBDC itself, distributed through these intermediaries, would remain a liability of the Fed and therefore a third format of central bank money.[40]

Not only would a two-tiered distribution model benefit from adopting some existing private sector services and identity verification capabilities, but it would also enable private sector innovation while minimizing any potential destabilizing effects on the existing financial system.

The DDP notes that the impact of CBDC on the financial sector will largely depend on the design and deployment of the CBDC network. Decisions such as issuing a non-interest-bearing CBDC and not providing FDIC insurance over CBDC tokens could mitigate any adverse impacts of CBDC and maintain the existing cash usage model.

[39] Kosse, Anneke & Mattei, Illaria. "BIS Papers No 125." BIS Monetary and Economy Department. May 2022.

[40] The Federal Reserve Board. "Money and Payments: The U.S. Dollar in the Age of Digital Transformation." January 2022.

Further questions about the maintenance of the two-tiered banking system include:

- How might a U.S. CBDC benefit from existing intermediated banking system efficiencies such as KYC/AML and password recovery?
- Are there alternative KYC/AML designs that better safeguard privacy?
- Where are the gaps that would require new regulation?
- How can payments and financial technology companies expand access and inclusion through digital wallet products and services?
- How might the two-tier distribution model offer stronger privacy protections for consumers using CBDC?

Privacy

The DDP unequivocally believes that privacy – a fundamental democratic ideal – is among the core principles underlying the potential success and adoption of a digital dollar. In 2021, the DDP and its Privacy Working Group published Privacy Principles for a Digital Dollar, which sought to begin the evaluation of the technical design and public policy choices that must be understood to ensure that any CBDC system is built with privacy in mind.

China's e-CNY has loomed large in the global CBDC discussion. The United States should act to address the geopolitical and economic challenges posed by the rise of China's e-CNY; however, it should only do so in a way that maintains and enhances the values of a free society. The challenges posed by the e-CNY call for the United States to lead in setting global standards for CBDC, just as it was a leader in setting standards for the first wave of the Internet. The United States should continue its CBDC exploration in a way that promotes democratic values of individual liberty, freedom of speech, personal privacy, limited government, and the rule of law.

Some of those ideals are set out in the U.S. Constitution, including freedom of speech, assembly, and worship and the Fourth Amendment's right to personal privacy. From that amendment stems a body of jurisprudence defining the balance between an individual's right to privacy and the federal government's limited ability to abridge that privacy in pursuit of legitimate law enforcement, national defense, or other overriding objectives.

Although a right to financial and information privacy is not explicitly established by the Fourth Amendment, for the last half-century, courts have generally protected privacy using a doctrine called "reasonable expectation of privacy." Even so, Fourth Amendment privacy protections have been eroded considerably since the attacks of September 11, 2001. In fact, no account-based financial transactions are truly private because, in every case, they require personal identity as a prerequisite. The consideration of a U.S. CBDC presents a once-in-a-generation opportunity for Americans to

reconsider the state of their financial privacy. Privacy protections, constitutional or otherwise, must clearly apply to data generated by all legal use, not just consumer use, of a U.S. CBDC if it is to enjoy broad societal support.

The DDP believes a well-functioning tokenized digital dollar should be private, secure, accessible, and transparent. Without inviolable protections for such civil liberties as freedom of speech, assembly, free enterprise, and individual economic privacy, a U.S. CBDC would be no more worthy of a democratic society than the currency of an authoritarian one. The American people – and free people everywhere – have everything to gain by encoding into a U.S. CBDC robust protection for individual liberty and privacy. The United States has everything to lose by neglecting it.

With the proper Fourth Amendment jurisprudence and thoughtful design choices relating to anonymity and individual privacy, a U.S. CBDC could well enjoy superior privacy protections than many competing instruments—whether provided by commercial interests or other sovereigns. A U.S. CBDC may have certain advantages over private stablecoins if it is properly and affirmatively bound by constitutional Fourth Amendment protections, to which private stablecoins would not be subject. Coding traditional democratic ideals of economic liberty and privacy into a U.S. CBDC will greatly enhance its global appeal. Hundreds of millions of people here and abroad may well be reluctant to surrender their economic security and autonomy to authoritarian state surveillance simply for the convenience of digital payments.

The United States has the opportunity to lead in a way consistent with its core ideals. A U.S. CBDC could be constructed to provide privacy to citizens by maintaining a two-tiered banking system where banks, fintechs, and other service providers conduct identity verifications, just as they do in today's model. Identity verifications could be tiered and specific to the type of activity that customers are conducting. Identity management can leverage zero-knowledge-proofs, verifiable credentials, and other technologies to maintain data privacy. Criminal activity enforcement should follow today's existing legal model where financial institutions have oversight over their customers, and the government can only access customer user information through a subpoena.

The DDP's view that privacy is a fundamental tenet of a digital dollar has been shared by some in the U.S. government but bold leadership is needed to ensure that a U.S. CBDC preserves all forms of privacy. The Federal Reserve Board stated that privacy protection is "critical" in its consideration of a U.S. CBDC and noted that a digital dollar would need to "strike an appropriate balance" between preserving individual privacy rights and deterring criminal activities.[41] Members of the U.S. Congress have strongly voiced support not only for privacy protections in a potential CBDC system but also for protections of civil liberties and other rights.[42]

[41] The Federal Reserve. "[Money and Payments: The U.S. Dollar in the Age of Digital Transformation.](#)" January 2022.

[42] House Financial Services Committee. "[Committee Republicans release Central Bank Digital Currency Principles.](#)" November 15, 2022.

The DDP's first pilot found that individual privacy, which is the focus of the original privacy tenet, is not the only form of privacy that must be protected. In a wholesale settlement model, transactions are executed at the organizational level, not an individual one. Instead of preserving an individual's privacy, a CBDC network would need to ensure the confidentiality of data relating to the transactions of participating organizations.

Research on technology design choices to enable a CBDC system with privacy-protecting features from day one is promising.

In November 2022, the BIS Innovation Hub Swiss Centre announced the launch of Project Tourbillon in coordination with David Chaum, a noted cryptographer and founder of “eCash,” which was a form of privacy-protecting digital cash that was piloted in the 1990s. Chaum is a computer scientist and cryptographer who made significant contributions in the fields of cryptography and privacy. Project Tourbillon aims to reconcile trade-offs between privacy, cyber resiliency, and scalability in CBDC systems by combining techniques such as blind-signatures and mix networks.[43]

DDP co-founder Daniel Gorfine and former acting Financial Crimes Enforcement Network (FinCEN) director Michael Mosier co-wrote an article that introduced a greater degree of nuance to the current discussion on juxtaposing individual privacy with national security.[44] The authors point to technological innovations, namely privacy-enhancing technologies (PETs) that enable the confirmation of critical identity information while continuing to mask other pieces of sensitive and personally identifiable information. These cryptographic techniques, such as zero-knowledge proofs, homomorphic encryption, and multi-party computation, can verify encrypted propositions without revealing the underlying information.

Some cryptographic techniques that hold promise in the context of CBDCs include:

- **Zero-knowledge proofs (ZKPs)** are a type of cryptographic protocol that allows one party (the prover) to prove to another party (the verifier) that they know a certain piece of information, without revealing any information about the actual content of that information. ZKPs are useful for many applications where it is important to preserve privacy, such as secure automation.
- **Homomorphic Encryption** is a type of encryption that allows mathematical operations to be performed on encrypted data, without the need to decrypt it first.
- **Multi-party computation** is a type of distributed computing in which multiple parties with their own private data can jointly compute a function over their inputs, without revealing their inputs to each other.
- **Differential privacy** is a system for publicly sharing dataset information by describing patterns of groups within the dataset while withholding information about individuals in the dataset.

[43] “Project Tourbillon explores cyber resiliency, scalability, and privacy in a new prototype CBDC.” The Bank for International Settlements. [Project Tourbillon explores cyber resiliency, scalability and privacy in a prototype CBDC \(bis.org\)](https://www.bis.org/press/pr220901.htm)

[44] Gorfine, Daniel & Mosier, Michael. “[Stablecoin and other digital assets are falsely framed as a choice between personal privacy and national security. We can have both.](#)” MarketWatch. July 19, 2022.

Additional research is needed to understand the potential trade-offs between privacy and security concerns. Furthermore, additional specific discussions are necessary regarding the different types of privacy and the design choices necessary to achieve them.

Further questions about the privacy tenet include:

- Which innovative data privacy techniques (e.g., ZKPs, homomorphic encryption) may be employed to enable U.S. CBDC privacy without sacrificing necessary oversight and anti-crime measures?
- How might commercial banks leverage existing data privacy processes to comply with laws like the EU's General Data Protection Regulation (GDPR) and California's California Consumer Privacy Act (CCPA)?

Monetary policy-neutral

The DDP previously stated and stands by our tenet that a U.S. CBDC will not impact the Federal Reserve's ability to affect monetary policy and control inflation. A CBDC could be a tool to enable the Federal Reserve to monitor the economy's health and detect when the economy needs to be stimulated, although this level of monitoring would need to be balanced against strong data privacy and protection policies. The high levels of inflation facing the United States and the global economy in 2022 have further underscored the importance of a digital dollar being monetary policy-neutral. Implementation of a digital dollar should not have any bearing on issues of money supply. It is reasonable to expect that the Federal Reserve will be no less prudent in deploying and managing CBDC than it is in respect to the existing money supply.

Further questions about the monetary policy-neutral tenet include:

- Are there opportunities for a digital dollar to enable real-time analytics and deeper economic analyses on the health of the U.S. economy?
- How would a digital dollar impact the transmission effectiveness of monetary and fiscal policy objectives?

Continued private sector innovation

The DDP strongly believes that a digital dollar could (and should) act as a catalyst for innovation. A digital dollar should not be antithetical to the development of private sector initiatives such as stablecoins. A tokenized digital dollar could serve as an underlying asset network upon which industry participants could provide unique and customized services (e.g., digital wallets, banking capabilities, stablecoins, and automated payment information). Moreover, fintechs and other well-regulated nonbanks would have an opportunity to develop a variety of services layered on top of digital dollar distribution.

One important potential use for a digital dollar is to serve as the currency for the metaverse. The metaverse, a term coined by Neal Stephenson in his 1992 novel "Snow Crash," refers to a virtual shared space, which is typically created by the convergence of multiple virtual worlds, augmented reality, and the internet. When considering the growing popularity of the metaverse as a concept among the general public and investors, it is crucial to highlight the potential for a digital dollar to serve as the cash of the metaverse and a fundamental building block for new payment infrastructure built for a web3 future.

Further questions about the continued private sector innovation tenet include:

- Which collaboration model should the private sector embrace to build a robust U.S. CBDC network?
- What is the role of central bank money in establishing new payment rails for the metaverse?

More research is needed

The Digital Dollar Project will continue to evaluate its champion model as CBDC research and experimentation evolve. Many questions related to DDP tenets, such as privacy and financial inclusion, require more research. The DDP will continue to support a data-driven decision-making process for a digital dollar by executing research and facilitating conversations with the private sector, policymakers, academics, and other relevant stakeholders.

The tenets of "technology decisions and design choices driven by functional needs" and "future-proofing the architecture through flexibility" both require significantly deeper exploration.

Additional questions around the **technology decisions and design choices driven by functional needs** tenet include:

- How will data gathered by the DDP and similar initiatives be effectively shared with the public sector to define and prioritize functional needs?
- How might the DDP help regulators understand and evaluate the rapidly innovating landscape that is DLT, blockchain, and tokenized payment mediums as part of the broader effort to consider an effective digital dollar?

Additional questions around the tenet of **future-proofing the architecture through flexibility** include:

- How might the private sector collaborate to establish a digital asset foundation that can manage dynamic policy and design decisions on an ongoing basis?
- How could we guard against security risks and threats from the advent of improved computing technologies?

Global CBDC standards – will the United States lead?

Global standards are critical to ensure international interoperability, transferability, consistency, and safety across various industries. In the technology field, for example, global standards help ensure that different devices and systems operate seamlessly while meeting agreed-upon safety and performance levels. Global standards can reduce barriers and enhance international cooperation in other fields, such as trade and finance. In each of these fields, global standards often promote societal values, including democratic values such as privacy, free enterprise, and economic liberty.

The United States has been a leader in developing global standards for the fields of technology, trade, and finance, among others. Its crucial role in the global financial system dates back to the enactment of the Bretton Woods agreement in 1944, where representatives from 44 countries signed an agreement that established rules and principles that guided international financial relations for several decades following World War II.

Importantly, the U.S. dollar is the global reserve currency. Central banks worldwide hold dollars as part of their foreign exchange reserves and benefit from its liquidity and stability. They can use these reserves to stabilize their own currencies and to facilitate international trade and finance. The dollar's role is further bolstered by the influence of U.S. financial institutions. In recent years, we have seen some countries develop alternative payment rails that could be used to circumvent sanctions imposed by the United States and its allies, as well as other rules and norms that govern the current financial system.^[45] It is possible that CBDCs could be used to avoid financial sanctions, depending on how they are designed and implemented, making it imperative that the U.S. government consider ways to maintain the use of the dollar in digital global payment systems and develop a strategy related to the use of alternative payment systems.

However, the United States should not engage globally from a purely defensive posture. The United States should offer forward-thinking leadership on issues such as interoperability that will play a large role in the future of money. Interoperability is particularly important when designing CBDCs. CBDC interoperability can prevent market fragmentation, increase payment provider competition and achieve broad adoption. While many countries are developing CBDCs in silos (likewise for

^[45] Financial sanctions are measures taken by governments, international organizations, or other regulatory bodies to restrict or prohibit financial transactions or other financial activities with the aim of achieving specific foreign policy or national security objectives. The United States uses financial sanctions as a tool to achieve a variety of foreign policy and national security objectives, including promoting human rights, combatting terrorism, and curtailing the proliferation of weapons of mass destruction. The U.S. government imposes financial sanctions through the issuance of executive orders or regulations, which are issued by the President or other authorized individuals and implemented through OFAC. These sanctions may target specific individuals, organizations, or countries, or may be imposed on a broader basis to address certain types of activities or sectors.

private sector companies developing stablecoins), the United States should consider the dollar's global utility when designing a CBDC to achieve global economic efficiencies, as the dollar is a payment mechanism that underpins and provides liquidity across international markets. As of January 2023, it is increasingly clear that global CBDC developments are heading in the direction of siloes - a concerning trend.

A CBDC could enable a translation layer between multiple CBDC networks and technology platforms, creating a shared language domestically and globally. This transferability across traditional and DLT-based networks would streamline transaction data sharing across many use cases. In order to achieve this level of interoperability, CBDC development should consider emerging token standards to connect future CBDC networks. The United States can collaborate with corporations, regulators, government agencies, and academics globally to advance technology standards and other layered facets such as identity frameworks and consumer protections. By taking a leading role in interoperability, the U.S. will be able to set global standards in the internationalization of CBDCs and protect against countries that do not serve U.S. interests.

If other countries develop widely-adopted CBDCs that become the de facto standard for international wholesale and retail payments, they may have a head start in setting global standards for the future of money.

China may be well-positioned to begin setting the global CBDC standards agenda following its large role in driving Project mBridge. If Project mBridge marks the start of a renewed effort to redirect the global financial order away from the current U.S.-led system, it may constitute a critical inflection point that necessitates a dynamic response.^[46] The United States today largely relies on its ability to leverage the dollar's outsized global role and the position of its banking system. If the U.S.-led global financial infrastructure is perceived as too slow and expensive in comparison to foreign alternatives, it is not unreasonable to anticipate that countries around the world will begin, and in some cases continue, the process of "de-dollarization."

In 2022, a working group of distinguished experts in national security, finance, economics, central banking, technology policy, and computer science from the Hoover Institution studied the global implications of China's CBDC, the e-CNY. The working group's report^[47] analyzed and detailed the degree to which China has established a first-mover advantage in not only the deployment but also the technical underpinnings of CBDCs.

The study also notes that the e-CNY enhances China's ability to cement its international leadership of payment technology and innovation and adoption, set economic norms and technical standards that align with its authoritarian governance system, and increase its ability to undercut the traditional dominance of the U.S. dollar as a source of geo-economic and strategic influence.

[46] Fanusie, Yaya J. "The mBridge to Somewhere: Central Banking is Having Its Sputnik Moment." *Lawfare*. November 30, 2022.

[47] Duffie, Darrell & Economy, Elizabeth et al. "Digital Currencies: The US, China, and the World at a Crossroads." The Hoover Institution. March 4, 2022; (Digital Dollar Project Executive Chairman, J. Christopher Giancarlo, served as a member of the study's working group).

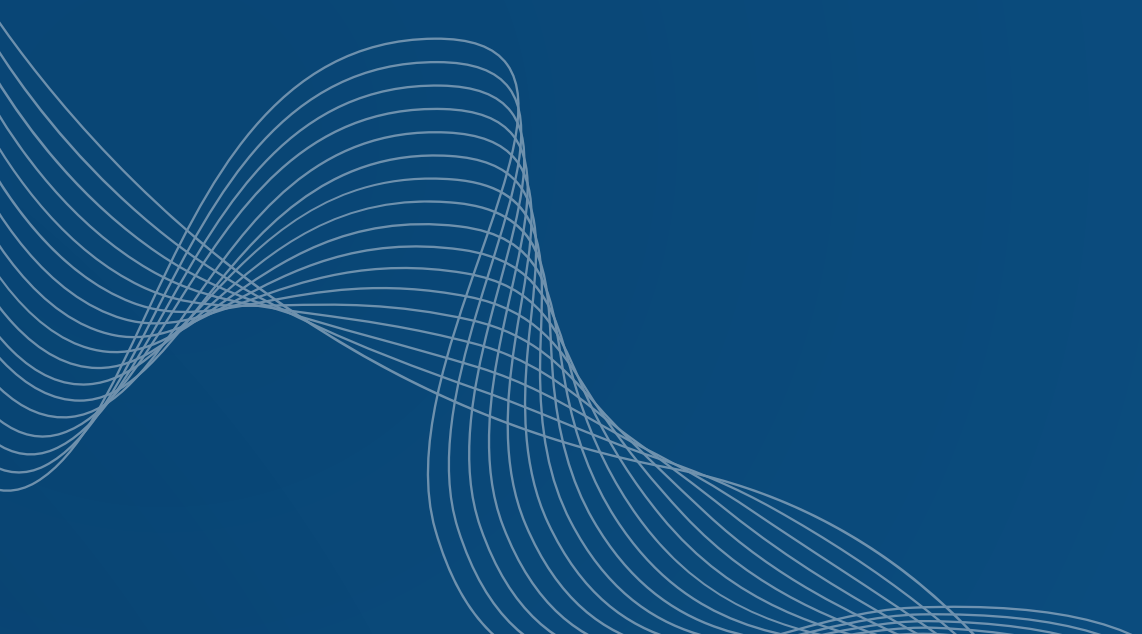
Conclusion – a call to action

Until 2022, the United States had been conspicuously absent from global CBDC discussions – an unsustainable position as the issuance of CBDCs by foreign nations will significantly impact the domestic U.S. economy.

As foreign countries develop CBDC systems that replace traditional payment rails and provide CBDC as a service to international financial participants, U.S. policymakers should develop a strategy to preserve the dollar's central role in the global digital economy and consider how best to future-proof the dollar in a way that is consistent with American ideals and values and grounded in empirical data and research.

Global leaders of CBDC exploration will play an outsized role in setting the standards for the future of money as these technological developments continue to advance. The Digital Dollar Project is focused on supporting the United States in taking a leadership role in exploring and designing a CBDC that upholds American democratic values of freedom, economic stability, and personal privacy.

In the coming CBDC future, the United States should actively lead global discussions on governance, interoperability, security, privacy, and scalability standards, rather than reacting to foreign CBDC decisions. Independent of a decision to deploy a U.S. CBDC or not, the United States should lead the development of an international regulatory framework around digital currencies, including CBDCs, that prioritizes privacy, consumer protection, financial anti-crime compliance, financial stability, and the protection of monetary sovereignty.



Appendix: status of global CBDC research and development

United States

The United States has significantly increased its research and exploration of a U.S. CBDC but remains undecided on whether to issue a digital dollar.

In March 2022, President Joe Biden issued an *EO on Ensuring Responsible Development of Digital Assets*. The EO directed a whole-of-government approach to a potential U.S. CBDC. As the EO required, government agencies and offices such as the Department of the Treasury, the Department of Commerce, and the White House Office of Science and Technology Policy (OSTP) have published reports and frameworks related to a potential U.S. CBDC.

Earlier in 2022, the Federal Reserve Board issued a discussion paper for public comment titled "Money and Payments: The U.S. Dollar in the Age of Digital Transformation," which outlined the Fed's view on the benefits, risks, and policy considerations that must be explored before deploying a digital dollar. The paper included an initial outline of what the Fed views as a "well-designed" CBDC model, which it believes should be "privacy-protected, intermediated, widely transferrable, and identity-verified." The Fed paper intended to complement ongoing work by the regional Federal Reserve Banks, including the Boston Fed's Project Hamilton and the New York Fed's Project Cedar.

The United States Congress has been more actively engaged on CBDC than other legislative bodies worldwide. Federal Reserve Board Chairman Jerome Powell has stated that the Fed will not proceed with issuing a U.S. CBDC without approval from the Executive Branch and sign-off from Congress "ideally in the form of authorizing legislation." While Chairman Powell's statement is not entirely clear, Members of Congress, particularly senior Members of the House Financial Services Committee, which oversees the Fed, have been clear that Congress must authorize a U.S. CBDC. Congressional interest in CBDC is increasing, as evidenced by a white paper from Rep. Jim Himes (D-CT), who outlined his perspective on the potential benefits and challenges posed by a digital dollar in 2022.^[48] Legal considerations and analysis are outside the scope of the Digital Dollar Project and this paper, but the interaction between the Federal Reserve System, Congress, and the Administration is a crucial dynamic to watch.

[48] Himes, Rep. Jim. "Winning the Future of Money: A Proposal for a U.S. Central Bank Digital Currency." U.S. House of Representatives.

Europe

The European Central Bank (ECB) is significantly further along than the United States in its CBDC exploration process. The ECB published its second progress report on the investigation phase of a digital euro^[49] in December 2022 and announced its intention to begin piloting a digital euro in 2023. A previous ECB working paper stated that retail payments are the primary use case motivating the development of a digital euro.

The United Kingdom is often considered to be lagging behind the other G7 countries in its CBDC development. Nonetheless, the United Kingdom continues to work with both the public- and private-sector on CBDC research. Of note is the recent launch of the Digital Financial Market Infrastructure (FMI) Consortium,^[50] a cross-industry group that is running retail CBDC pilots to provide data to the Bank of England (BOE). Within the Bank of England, the CBDC unit is growing. In addition to a CBDC task force ^[51] and discussion forums to study CBDC engagement and technology, the Bank of England is also partnering with the Digital Currency Initiative (DCI) at MIT to explore design choices within a CBDC system.^[52]

In addition to the ECB and Bank of England, Sweden’s central bank – the Riksbank – has been a leader in CBDC research. The Riksbank is largely motivated to explore an e-krona to combat the declining use of cash (and, therefore, the declining role of central bank money) among retail users. ^[53]

Asia – Pacific

China is unquestionably the most significant economy to have made material progress toward issuing a CBDC, the e-CNY. Recently, Mu Changchun, who leads China’s e-CNY initiative, announced an acceleration in implementing e-CNY smart contracts. Various pilot scenarios have been testing the combination of e-CNY, smart contracts, and blockchain technologies to achieve broader technical capabilities such as conditional and automatic payments. The third batch of pilot cities was announced earlier this spring, amounting to a total of 23 cities currently engaged in the pilot program. More than 260 million e-CNY wallets have been opened, although doubts persist as to the rate of active e-CNY users. Given the rapid advance of China’s CBDC technology, questions remain about its impact on shaping the global rules and standards for digital finance.

[49] “The European Central Bank. “Progress on the investigative phase of a digital euro – second report. December 2022.

[50] [The Digital FMI Consortium](#).

[51] More information on the Bank of England’s CBDC Task Force can be accessed [here](#).

[52] The Bank of England & Massachusetts Institute of Technology. “[Bank of England and Massachusetts Institute of Technology, joint Central Bank Digital Currency collaboration](#).” March 25, 2022.

[53] Sveriges Riksbank. “[Pandemic hastening development towards digital payments](#).” November 3, 2021.

According to an extensive report by the Hoover Institution, one security implication of China's first-mover advantage is the opportunity to advance norms, such as those around privacy, internationally through the design of its CBDC.[54]

Elsewhere in the Asia-Pacific region, Japan has announced that it will start CBDC trials in spring 2023 and will spend two years analyzing the results and deciding whether to issue a CBDC in 2026. This announcement was a departure from previous statements in which the Bank of Japan sounded somewhat skeptical of the potential uses of a digital yen.[55]

Australia, in collaboration with the Digital Finance CRC, has outlined technical and policy requirements for an Australian CBDC and invited public comment. Australia intends to pilot a retail CBDC in early 2023.[56]

The Reserve Bank of India outlined the objectives of a potential digital rupee and launched a wholesale CBDC pilot program with Indian banks.[57]

The Bank of Indonesia utilized its G20 presidency to advance international cooperation on digital assets. In November 2022, the Bank of Indonesia published a white paper that outlined its plans for launching a digital rupiah, which it referred to as a "tool of the future." [58]

However, not all jurisdictions in the region are as optimistic about the potential of CBDC as Indonesia. The Monetary Authority of Singapore (MAS) "does not see a compelling case" for retail CBDC in Singapore given broad current levels of financial inclusion and fast and cheap existing digital payment options. The MAS does, however, see "good potential" for wholesale CBDC based on its ability to achieve atomic settlement using distributed ledger technology.[59]

[54] Duffie, Darrell & Economy, Elizabeth et al. "[Digital Currencies: The US, China, and the World at a Crossroads.](#)" The Hoover Institution. March 4, 2022.

[55] Partz, Helen. "[Bank of Japan to trial digital yen with three megabanks.](#)" November 23, 2022.

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Africa

Many African countries are exploring CBDCs due to the potential for significant gains to be made on issues such as financial inclusion and expensive remittance payments in the current system. As the second country in the world and the first country in Africa to launch a CBDC, Nigeria has made progress in rolling out its digital currency, the eNaira.[60] Whereas the eNaira was only available to those with bank accounts and smartphones during the first phase of the launch, the second phase is focused more actively on inclusion efforts, with eNaira access extended to feature phones. So far, the eNaira wallet has received over 840,000 downloads and has over 270,000 active users.[61]

In Ghana, the e-Cedi is currently in the pilot phase as a retail CBDC. The Bank of Ghana is testing CBDC use both through a digital wallet as well as offline, such as using a contactless smart card. Like Nigeria, the e-Cedi is accessible on feature phones through a USSD code that operates similarly to SMS.

South Africa is piloting a wholesale CBDC to test the feasibility of an interbank payments settlement system using a tokenized rand on a private ledger. It is also participating in the Bank for International Settlements' (BIS) Project Dunbar to test international CBDC settlement on a multi-CBDC platform.

Americas

Three of the four CBDCs first deployed were issued by central banks in the Caribbean. The Bahamas became the first country to launch a CBDC, the sand dollar, in October 2020. The goal of the sand dollar is to expand financial inclusion, particularly in the Bahamas' outer islands.[62] The Eastern Caribbean Central Bank, which serves several eastern Caribbean states, launched its CBDC, DCash, on a rolling basis beginning in Antigua and Barbuda, Grenada, Saint Kitts and Nevis, and Saint Lucia in March 2021 and ending in Anguilla in June 2022.[63] Jamaica followed suit shortly thereafter with the launch of JAM-DEX in July 2021.[64]

Similar to the United States, the Bank of Canada has no plans to issue a CBDC but has been conducting research and development and launched a public consultation process in November 2022.[65]

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About The Digital Dollar Project

A nonprofit organization, The Digital Dollar Project was created to encourage research and public discussion on the potential advantages and challenges of a U.S. CBDC — or a "digital dollar." The DDP will identify options for a CBDC solution to help enhance monetary policy effectiveness and financial stability; provide needed scalability, security and privacy in retail, wholesale and international payments; and integrate with existing financial infrastructures. The DDP believes it is key and will facilitate opportunities for the U.S. to engage in international standard-setting regardless of whether the U.S. eventually issues a CBDC or not.

For more information on The Digital Dollar Project, please visit <https://digitaldollarproject.org>