THE DIGITAL DOLLAR PROJECT

Modernizing the U.S. Dollar for the Future of Digital Networks

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The Digital Dollar Project (DDP) is a privately funded, non-profit, non-governmental organization devoted to catalyzing research, exploration, and real-world experimentation of digital modernization of the U.S. 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 that includes economists, business leaders, technologists, innovators, lawyers, academics, consumer advocacy and human rights experts, and ethicists. DDP aims to explore design options and approaches for evaluating various forms of a digital dollar through various means including convening topic-focused working groups from the Advisory Board. Working group results are released in working paper form, for broad public consideration and are meant to guide a public discourse on digital modernization of the U.S. Digital Dollar, often highlighting competing ideas and concepts for further exploration. Working papers are non-exhaustive and do not endorse final conclusions or solutions.

This working paper was prepared by The Digital Dollar Project, Inc. (DDP) in collaboration with Accenture, LLP (Accenture), David Kretz Consulting, Inc. (David Kretz Consulting), and Oliver Wyman, LLC (Oliver Wyman) and is being published in accordance with the aforementioned intentions. This working paper is not intended to bind DDP, Accenture, David Kretz Consulting, or Oliver Wyman in any manner, and it is made freely available “as-is” without any express or implied warranties. This working paper is for informational purposes only and does not constitute legal or investment advice and you should not rely on any information or views contained in this white paper in evaluating any specific legal or investment needs you may have. DDP, Accenture, David Kretz Consulting, and Oliver Wyman cannot anticipate how a regulator would assess compliance with applicable laws and regulations, and as such, DDP, Accenture, David Kretz Consulting, and Oliver Wyman make no representations regarding the acceptability or sufficiency of this working paper from a regulatory perspective. This working paper is not authored by, is not funded by, and does not reflect the views of any governmental agency.

Foreword

Nike®, McDonalds® and Coca-Cola® are some of the world's greatest brands. Yet, compared to such distinguished marks, the U.S. dollar (USD) (including its famous $ symbol) is likely the most recognized brand humanity has ever known. It is seen worldwide as the world's most important money, a global investment, the world's reserve currency. The U.S. dollar stands for American values of economic success, national strength and financial freedom.

At the same time, the U.S. dollar is also the world's premier instrument for payments and trade across a wide range of interconnected global infrastructures and networks. This "U.S. dollar network" is perhaps the most extensive network in human history. The reach of the U.S. dollar network into every corner of the globe is far greater than even the vaunted social networks of Facebook and Twitter. More monetary and economic value moves through the U.S. dollar network than any other system ever.

The U.S. Dollar: Peerless Reach, Imperiled Underpinnings

Currently, the U.S. dollar network is peerless. Yet, the technology on which the global dollar network operates is quickly approaching obsolescence. Moving value through the network today is reliant on outdated twentieth century technology, expensive to conduct and slow to operate. Evidence of the venerableness of the U.S. dollar network and the antiquity of its core functionality is the almost overnight success of USD-backed stablecoins, that are essentially faster, more efficient overlays of the USD network. Stablecoins move akin to a hyperloop transportation system hurtling above slow diesel trains chugging along old railroad corridors.

Despite the emergence of stablecoins, however, far too much movement of value on the U.S. dollar network remains the work of woefully out-of-date technologies that undermine the value of the network itself. And it is not just outmoded technology that threatens the value of the global U.S. dollar network, it is also direct competition from entirely new and standalone digital networks built for modern digital asset technologies.[1]

The strength of the U.S. dollar network, however, is not only its extent and reach, but the relative freedom of transit upon it: freedom for lawful transit without government or commercial censorship.[2] And because of that, the Digital Dollar Project's call to action to preserve the U.S. dollar standard includes not only to upgrading the global U.S. dollar network with modern digital technology but, also, and as importantly, to reassert of the values of freedom of movement – free from undue surveillance, censorship, and control whether by governments, banks or technology platforms.

[1] The BRICS nations (BRICS), originally composed of Brazil, Russia, India, China, and South Africa, have been working towards reducing dependence on the U.S. dollar in international trade and finance and potentially creating a new currency to replace it. When threatening to move away from the U.S. dollar, the BRICS are essentially saying that they not only seek to avoid traveling on the existing U.S. dollar network but to also build a new right of way utilizing new digital technology.

[2] Freedom for lawful transaction has been a salient feature of the U.S. dollar until recent decades. Many commentators have observed erosion of financial privacy for U.S. dollar-based transactions beginning in 1970 with the Bank Secrecy Act and its subsequent amendments and more recent concerns about de-banking. Such commentary is beyond the scope of this paper.

The Vision and Work of the Digital Dollar Project

As we move into the second quarter of the 21st Century, it is increasingly clear that money[3] will not only be recorded and transferred though a variety of digital networks, including those designed for bank-operated tokenized deposits, commercially-operated stablecoins, and sovereign-operated central bank digital currencies called "CBDCs". No more diesel trains on analog networks, but now we will experience an array of digital tokens flying alongside entirely new networks, operated by both commercial tech providers and governments of major economic powers.

In 2020, the Digital Dollar Project foresaw this coming 21st century kaleidoscope of digital networks of money: decentralized and centralized, sovereign and commercial. Since then, the Digital Dollar Project has consistently asked three simple, but hard to answer, questions: how to "future-proof" the U.S. dollar for a coming world of competing digital networks of value; how to maintain the U.S. dollar's world reserve currency status in the 21st Century and, perhaps most importantly, how to preserve the universal values for which the U.S. dollar has historically stood: free enterprise, free trade, and free (economic) expression against both government and commercial digital surveillance, censorship, and control.

This paper, **"Modernizing the U.S. Dollar for the Future of Digital Networks",** reflects the Digital Dollar Project's five years in examining these three questions. It is the work of many members of its distinguished Advisory Group. It develops the business case for enhancement of the U.S. dollar network and modernization of its infrastructure to accommodate various forms of digital tokens, defining its use of the term "Digital Dollar" to be inclusive of instruments beyond CBDCs, including private sector-sponsored stablecoins and tokenized deposits. The paper reviews a range of issues and concerns in the emergence of Digital Dollars, including risks to the stability of the traditional financial system, as well as areas for broad collaboration, such as infrastructure-level standards and interoperability, regulatory requirements, and deposit base management. It also considers issues of law enforcement, cybersecurity and, importantly, privacy.

Cognizant of the January 23, 2025 Executive Order prohibiting U.S. Executive Branch agencies from undertaking any action to establish, issue or promote CBDCs, the Digital Dollar Project seeks to avoid championing any particular Digital Dollar Instrument, but to fairly analyze the major contenders. There is no stopping technological evolution, and the global future will be "all of the above" with current efforts bearing this out. Stablecoins and tokenized deposits are based on the enabling technologies of the DDP's Champion Model; these technologies underpin tangible benefits to financial market utilities, financial institutions, corporations, and consumers.

Through cross-industry interviews, research, and collaboration synthesis, this paper also presents the elements required to develop a roadmap specific to USD-denominated digital currencies and networks, akin to the G20 Roadmap for Enhancing Cross-border Payments.

Modernization of the dollar is important for numerous reasons, including maintenance of U.S. leadership in innovation, interoperability, risk management and standards development. Longer-term dollar modernization will support continued dollar primacy and reserve currency status.

[3] as well as and other forms of value from government securities, e.g., home mortgages, automobile titles, personal identity.

Upgrade U.S. Dollar Network Infrastructure for the Sake of Humanity

The Digital Dollar Project believes that, when it comes to digital systems of value, a primary U.S. policy focus should be squarely on the dollar - the foundation of the U.S. economy and American prosperity - and how best to transition it and its reserve currency status to a new digital future and, perhaps most importantly, to preserve the classical liberal values for which the dollar has historically stood.

Thirty years ago, the first wave of the internet rolled across the globe: an Internet of Information. Then, the U.S. and other leading democratic societies made sure that the Internet that we know today reflected the values of open and free societies, rather than closed and repressive ones. In that remarkable effort, the public sector and the private sector worked together to set global internet standards and create key governing institutions: the Internet Society, ICANN, and others. The results not only for the United States but also the free world have been transformational both economically and socially.

Today, thirty years later, we are amidst a new wave of the Internet that is similarly unstoppable and inevitable: an Internet of Value. The question is whether the United States will show similar leadership and conviction. As of this writing, the U.S. official sector has been an inconsistent participant in global conclaves determining basic standards for digital currency. Instead, we see focused attention by economic competitors and economic adversaries. Fortunately, the American private sector is strong and active. U.S. stablecoin operators and banks are doing important work in furthering global U.S. dollar influence. The world now eagerly waits to see how the U.S. official sector will support it.

It is time to recognize this opportunity for Americans and other free peoples to work together again to ensure that the U.S. dollar networks of the 21st Century are not only on the cutting edge of speed, reliability, accessibility and inclusion, but also reflect enduring virtues of financial freedom and economic liberty. Let's work together as our enlightened predecessors did and ensure that the future of Digital Dollars protects the viability of the U.S. dollar and its reserve currency status but also enhances universal values of free enterprise and free economic expression against both government and commercial digital surveillance, censorship, and control.

Chairman J. Christopher Giancarlo
& the Board of Directors, the Digital Dollar Project
February 2025

From the Authors

The Digital Dollar Project believes dollar modernization is critical to US competitiveness and dollar primacy. To support modernization, we sought to:

- Establish a clearinghouse of learning and development. Central Bank Digital Currency (CBDC) efforts, including the European Central Bank serve as such clearinghouses. U.S. efforts are developed in a competitive manner by the private sector, so we saw need for a similar clearinghouse.
- Advocate for collaboration within and across the private and public sectors. If new instruments and networks are to achieve adoption on par with current methods, private sector innovation must be accompanied by network development.

Our scope is stable digital currencies: tokenized deposits, collateralized stablecoins and non-U.S. central bank digital currencies. There is a simple reason: using an instrument as a "dollar" implies it satisfies core expectations of money, i.e., a unit of account and a medium of exchange. Having stable value allows these expectations to be satisfied.

Currently, U.S. money is issued predominantly by the private sector. We believe that model will and should continue, due to considerations including financial stability. We also believe that private sector competition is the best facilitator of innovation. However, as mentioned above, a competitive approach may impede network development. Therefore, we believe key stakeholders (users, providers, regulators, legislators, Financial Market Utilities (FMU)) will benefit from greater cooperation in specific areas. We have three sets of recommendations:

- **Financial Institutions and Non-Bank Financial Institutions** should drive broader (enterprise-level) business cases and foster stronger industry commitment to innovative products and services. As an example, large institutions should respond to the efforts of highly-focused new entrants. There are leaders today, but we wish to see greater investment across the ecosystem.
- **Financial Market Utilities and Consortiums** are responsible for interoperability, which facilitates acceptance. You won't hold a "cash equivalent" if it isn't accepted by a payee. As such, FMUs and consortiums need to develop new potential settlement models to ensure that new dollars are accepted as readily as existing dollars. An example would be how to treat stablecoins or large / uninsured tokenized deposits with slight variances from $1.00.
- **Legislators should work together with Trade Associations** to address regulatory ambiguity and advance legislation that creates equal opportunities for responsible innovation. These current ambiguities impede investment, acceptance, and innovation.

We believe this paper is the first to survey U.S. private sector efforts and provide an end-to-end view of development, adoption, and risk management. With this information consolidated, we hope to jumpstart efforts by those who may have been hindered by current fragmentation of the literature. We look forward to feedback, discussion, and progress.

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Contents

Executive Summary

To ensure the U.S. dollar's (dollar, USD) continued prominence in the evolving digital economy and its status as the global reserve currency, it is crucial that the United States modernize the dollar and its infrastructure and do so in keeping with the values for which the U.S. dollar has historically stood.[1] Today's payment systems face operational and technical challenges that affect efficiency, security, and capacity for innovation. Primary examples include:

- **Trapped Liquidity**: Domestic and cross-border payment systems often have disparate operating hours which can trap liquidity creating pools of money sitting idle, uninvested.
- **Elevated Settlement and Credit Risk:** There is a significant risk associated with the asynchronous settlement of transactions, which occurs when the transfer of funds and/or assets does not happen simultaneously and therefore creates credit exposure while one party waits for payment.
- **Lack of Resilience:** U.S. payment systems and infrastructure do not fail over to each other in case of disruptions, increasing the financial system's vulnerability to outages and failures, and potentially impacting economic activity.
- **Operational Inefficiencies:** Existing systems rely on a series of messages passed between payors, banks, beneficiary banks, and intermediaries, creating inefficiencies, such as the need for reconciliation of messages and financial entries, which can require considerable resources.

Considering the extensive progress in Central Bank Digital Currency (CBDC) initiatives of the European Central Bank and People's Bank of China, one might conclude that the United States is lagging. However, the U.S. private sector, often collaborating with the public sector and Non-Governmental Organizations (NGOs), is actively pursuing numerous avenues to dollar modernization, including through privately-issued stablecoins and tokenized deposits.

Stablecoins are digital tokens that aim to maintain a stable value relative to a reference asset, such as a national fiat currency.[2] As of late 2024, U.S. dollar-denominated stablecoins in circulation exceed $200 billion.[3] Notable examples include: Circle's stablecoin[4] (USDC) and Paxos's stablecoin[5] (USDP). Both were launched in 2018, designed for retail payments, leverage a public distributed ledger, and allow for potential integration with various payment systems and digital financial markets. In addition, Paxos partnered with PayPal in 2023 to issue a PayPal branded stablecoin[6] (PYUSD), which can be accessed and transmitted via existing PayPal accounts.

Tokenized deposits, which are tokenized representations of traditional bank deposits, offer another illustration of how the U.S. private sector is modernizing the dollar. For example, Kinexys by J.P. Morgan enables institutional clients to tokenize their deposits for payments on a blockchain-based platform. The platform is handling $2 billion in transactions daily, demonstrating its significant utility for corporate clients.[7]

While these private-sector financial instruments are distinct from central bank money, they leverage a modern technology foundation that underpins a myriad of benefits. The Digital Dollar Project Champion Model, also introduced in 2020, stated that "a Digital Dollar will be a tokenized form of the U.S. dollar".[8] Tokenization involves creating a digital representation of an asset on a programmable platform, such as a distributed ledger technology (DLT) network with smart contract capability.

The benefits enabled by tokenization, DLT, and smart contracts range from reductions in cost and risk to improvements in efficiency. Primary examples include:

- **Improved Use of Financial Resources and Liquidity:** DLT enables 24/7/365 payment capability, effectively overcoming the limitations of disparate operating hours that currently restrict liquidity and elevate risks in traditional payment networks.
- **Reduced Settlement Risk:** The use of smart contracts enables increased automation and simultaneous settlement, addressing the credit and operational risks associated with manual and asynchronous processes.
- **Enhanced Resilience:** New payment rails and networks can enhance the resilience of the financial system by providing alternative payment options and reducing reliance on legacy infrastructure. Additionally, DLT's inherent resilience, stemming from its distributed nature, provides a distinct advantage over site-specific approaches that are vulnerable to disruptions.
- **Improved Operational Efficiency and Reduced Risk:** By operating on a shared, synchronized database, DLT eliminates the need for serial messaging, thus reducing operational inefficiencies and the risk of errors.

These benefits will accrue to three key populations in our global financial system: Financial Market Utilities (FMU) and Financial Institutions (FI), Corporations, and Consumers. These populations also reflect the current adoptions, starting with specialized entities managing significant financial flows and slower overall adoption by individual consumers in the U.S. As a result, the FMU / FI population is foundational to defining the initial business case for Digital Dollar development. However, it is paramount that business cases be created to capture the benefits at the enterprise and infrastructure level, rather than at the segment or business unit level.

Perhaps the most important benefit associated with the modernization of the U.S. dollar relates to the positive impact it is likely to have in promoting the dollar's status as the world's reserve currency. Reserve currency status affords the United States significant benefits, including the ability for U.S. households, businesses, and the government to access credit at comparatively low interest rates. In addition, the dollar's dominance provides the U.S. with considerable influence over the architecture of the international financial system, allowing the U.S. to shape global financial regulations and promote stability and transparency in the financial system. In introducing recent legislation known as the GENIUS Act to establish U.S. stablecoin regulatory framework, Senator Tim Scott, Chairman of the Senate Banking Committee explained, "Stablecoins enable faster, cheaper, and competitive transactions in our digital world and facilitate seamless cross-border payments."[9] The Bill's lead sponsor, U.S. Senator Bill Hagerty stated: "From enhancing transaction efficiency to driving demand for U.S. Treasuries, the potential benefits of strong stablecoin innovation are immense."[10] In the House of Representatives, House Financial Services Committee Chairman French Hill and Digital Assets, Financial Technology, and Artificial Intelligence Subcommittee Chairman Bryan Steil released a discussion draft for a companion bill, the STABLE Act of 2025.[11] Subcommittee Chairman Steil highlighted the bill's implications for the global role of the dollar, stating, "By implementing a clear regulatory structure for payment stablecoins, we can support continued innovation, bolster the U.S. dollar's position as the world's reserve currency, and protect consumers and investors".[12]

For Digital Dollar instruments to function effectively and be accepted as money, they must exhibit the core characteristics of money (store of value, unit of account, and medium of exchange) and be broadly accepted in financial transactions. Fulfilling these roles in a digital context, requires that focus be given to four key attributes:

- **Stable Value:** Digital Dollars must maintain stable value to ensure that purchasing power is preserved.
- **Ease of Settlement**: Digital Dollars should settle at or near par value, guaranteeing consistent and predictable exchange rates with comparable forms of money.
- **Broad Interoperability**: Digital Dollars must remain fungible and seamlessly interoperable with existing forms of money and payment systems, facilitating smooth and efficient transactions across various platforms and networks.
- **Acceptance**: Digital Dollars require broad acceptance at points of sale (POS), as payroll, in foreign exchange (FX) settlement, as vendor payments, and in other financial transactions.

To achieve and maintain stable value for Digital Dollars, two essential prerequisites must be met: quality backing and regulatory clarity. Quality backing can be achieved by backing via a Central Bank (e.g., CBDCs), commercial bank creditworthiness (e.g., tokenized deposits), or transparent, high-quality collateral, such as verifiable, liquid U.S. Treasuries (e.g., stablecoins). Regulatory clarity instills confidence among market participants, mitigates risks, and encourages broader engagement within the financial ecosystem. The current landscape for Digital Dollars in the United States presents several areas where regulatory clarity is needed. For example, the Office of the Comptroller of the Currency (OCC) published interpretive letters confirming that national banks had the authority to issue stablecoins and engage in related activities, such as tokenizing deposits and facilitating payments using these new technologies.[13,14,15] However, in late 2021, the OCC imposed a pre-launch approval requirement on all digital asset activities, including the tokenization of deposits.[16] These challenges may soon be addressed. On March 7th, the OCC rescinded Interpretative Letter 1179, removing the pre-approval requirement for banks engaging in certain activities, including "hold[ing] dollar deposits serving as reserves backing stablecoins in certain circumstances."[17] The Interpretive Letter also reaffirmed that national banks and federal savings associations are permitted to engage in crypto-asset activities, including crypto-asset custody, distributed ledger, and stablecoin activities.[18]

Ease of settlement supports the preservation of the "singleness of money" among and between new and existing dollar instruments. The singleness concept addresses both slight and significant variances from par value, which would otherwise challenge payee acceptance and thus user confidence. Par value is assured in the existing financial system through the presence of a riskless settlement asset, in the form of central bank reserves. Private sector participants are exploring solutions for tokenized assets, including Regulated Settlement Network (RSN)[19] and Fnality[20], the latter of which offers a riskless settlement asset via a digital representation of central bank reserves.

Interoperability refers to the ability to make something happen in one payment system based on something happening in another payment system. Current U.S. payment systems typically do not interoperate, meaning payments are unique to each network with bank accounts serving as hubs. The Bank for International Settlements (BIS) highlights reasons why payment systems may not be interoperable with each other, including technical differences, differences in data formats and semantic

meaning, and business rule variations.[21] Lack of interoperability in digital assets creates new problems, including trapped liquidity, known as "fragmentation".[22] There are multiple technical approaches to interoperability solutions for the DLT networks that enable Digital Dollar use cases, including token swaps, bridges, and contract calls. Further, institutional solutions (e.g., new clearinghouses and FMUs), may be explored.

In addition to acceptance as money (through demonstrated stable value, ease of settlement, and broad interoperability), Digital Dollar adoption requires broad acceptance at points of sale (POS), as well as in payroll, foreign exchange (FX) settlement, vendor payments, and other financial transactions. Each of these use cases requires the ability to issue Digital Dollar tokens efficiently and effectively. Private sector solutions such as the Visa Tokenized Asset Platform (VTAP) are emerging to meet this need.[23] It will also be necessary for Digital Dollars on distributed ledgers to "off-ramp" back into traditional financial systems and non-DLT networks. This is true not only because many payees do not currently accept tokens, but also because the ability to "off-ramp" ensures end users can choose the instrument in which they store money. Here too, the private sector has already developed innovative solutions. For example, PayPal provides the ability to check-out and pay with its PYUSD stablecoin. The stablecoin is converted into fiat currency at the moment of the purchase, which is received by the merchant in a manner consistent with any other PayPal transaction.[24]

While Digital Dollars and the technologies that enable them offer numerous potential benefits, their implementation and adoption are not without significant risks. Specifically, risks to the stability of the financial system and risks related to the use and misuse of the financial system's services and user data merit careful exploration and potential mitigation.

Risks to the stability of the financial system pose potential disruptions to the overall functioning of the financial system. Primary examples include:

- **Impacts to Deposit Bases & Lending**: In the event consumers or businesses purchase CBDC or stablecoins instead of depositing funds at banks, the ability to lend and spur economic growth may be impaired. It is worth noting that while there are numerous studies evaluating these risks, there is not yet a consensus on the magnitude of the risks. Potential mitigants largely focus on capping holdings and interest or yield payments as well as ensuring integration into the existing two-tier banking model.
- **Balancing Settlement & Liquidity Risks:** Settlement risk can be reduced through the instant and automated payments enabled by smart contracts. However, this capability introduces the need for additional liquidity at payment origination points. Mitigants include relaxation of instant mandates and utilization of Liquidity Savings Mechanisms (LSMs).

Risks related to the use and misuse of the financial system's services and user data include challenges related to keeping services available and compliant, while protecting privacy and keeping data secure. Primary examples include:

- **Financial Crimes**: The U.S. government acknowledges that illicit finance threatens U.S. national security, prosperity, and the viability of democracy in the *2024 National Strategy for Combatting Terror and Other Illicit Financing*. Specific areas of financial crimes risk include money laundering, drug trafficking, terrorist financing, sanctions evasion, counterfeiting, fraud, and tax evasion.[25]

Mitigants include, but are not limited to, digital ID credentials, permissioned infrastructure, DLT tracing and analytics, and participation requirements for wholesale network access.

- **Privacy**: Privacy in the digital age extends beyond physical seclusion, to include personal autonomy and freedom from surveillance. Specifically, privacy in the digital age can be defined as the capacity for individuals to exert control over the collection, utilization, disclosure, and sharing of their personal information with third parties. Privacy requires a democratically acceptable balance among individual rights, law enforcement, and national security. Mitigants largely focus on developing Digital Dollar use cases under existing laws and regulations requiring regulated financial institutions and non-bank financial institutions to detect and prevent money laundering and other financial crimes, while also considering privacy-preserving design choices.
- **Cybersecurity:** Digital Dollar instruments and use cases are subject to several cyber risks, including tail risks such as quantum computing hacks. These risks increase the likelihood of bad actors finding weak points, resulting in stolen funds, fraud, and other crimes. Specific attention is warranted to as it relates to private key management, smart contract code auditing, the use of bridges to facilitate the transfer of assets between DLT infrastructures, the use of wallet infrastructure connected to the internet (e.g., hot wallets), and the prevention of quantum attacks. Mitigants include multi-signature wallets, external audits / assessments, secure token transfer mechanisms, and updating cryptographic algorithms to post-quantum security standards.

This paper addresses these topics with specific and actionable recommendations. To ensure the U.S. dollar's continued leadership, the United States---both public and private sectors---must actively participate and collaboratively develop a comprehensive strategy. There are several levers that we recommend be utilized:

- Financial institutions and non-bank financial institutions should drive broader (enterprise-level) business cases and foster stronger industry commitment to innovative products and services. Such institutions should also consider the introduction of an FMU to lead the development and implementation of Digital Dollar infrastructure.
- Financial market utilities and consortiums should align on new potential settlement and loss-mutualization models along with broader risk and operational frameworks, while also driving interoperability initiatives and developing common standards.
- Legislators should work together with trade associations and policy institutes to address regulatory ambiguity and advance legislation that creates equal opportunities for responsible innovation.

Each section that follows aims to foster collaborative dialogue and encourage investment and participation in the development of a robust Digital Dollar ecosystem, inclusive of the tokenization, DLT and smart contract technologies that enable it, and the digital networks that surround it.

Digital Dollar Instruments and Enabling Technologies

While the modern financial system in the United States operates effectively in numerous respects, liquidity management and payments utilizing Digital Dollars offer unique and powerful advantages. The emergence of tokenization and programmable platforms has sparked a paradigm shift in the forms of money. These forms, which this paper references as Digital Dollar "instruments" include tokenized deposits, stablecoins, and CBDCs. Although a U.S. CBDC is unlikely to be issued given the recent Executive Order from the White House[26], this paper discusses the characteristics, potential benefits, and risks associated with all the aforementioned instruments. It is important to recognize that Digital Dollar instruments currently differ along dimensions such as their issuer, the rights of transferability, and the level of authentication required to utilize them. These differences affect the breadth and depth of benefits, as the next section will discuss in detail. These differences also play a role in the risks posed by the instrument, including risks related to financial stability and the use or misuse of the financial system's services and user data, which will be explored later in the paper. Just as money today exists in various forms, it is crucial to consider the coexistence of additional forms of money in the future. Innovations in payment types increase optionality and competition which benefits users and creates incentives across both public and private sectors to provide money that is private, secure, and trusted.

A shared understanding of the technologies that enable Digital Dollars, tokenization, smart contracts, and distributed ledger technology, is an essential starting point.[27] Each of these enabling technologies are explained in this section. It is important to recognize that these technologies underpin the potential benefits that Digital Dollar instruments can offer financial market utilities, financial institutions, corporations and consumers, each detailed in the next section. These benefits include improved efficiency and transparency, reduced operational and settlement risk, and the interoperability and composability to support ongoing innovation. However, it is equally important to note that these technologies may introduce new risks and challenges that must be carefully considered and addressed, as detailed further in this paper.[28]

Digital Dollar Instruments

Digital Dollar instruments may include the following forms, each of which has distinct features and characteristics:

- **Tokenized Deposits:** Tokenized Deposits are a form of commercial bank money represented on a distributed ledger.[29] They are envisioned as being held by customers of regulated depositories, such as banks.[30] These are designed to maintain stability, primarily due to the capitalization of individual banks and the broader safety net provided by deposit insurance schemes. Similar to traditional deposits, tokenized deposits are backed by the financial health of the issuing bank and the regulatory frameworks that protect depositors. Two of the largest banks by market capitalization in the U.S., J.P. Morgan and Citigroup, are offering tokenized deposit products for global intrabank transactions, with J.P. Morgan surpassing $2 billion in daily transaction volume.[31,32]
- **Stablecoins:** Stablecoins represent a privately issued form of Digital Dollar designed to maintain a stable value relative to a fiat currency.[33] This form of Digital Dollar may be collateralized by various types of assets, including government securities and private sector commercial paper. To date, stablecoins pegged to the U.S. dollar are primarily backed by U.S. Treasuries.[34,35] Collateralization is

intended to provide assurance to users that the value of stablecoins will remain at or near par with the fiat currency they represent, making them suitable for transactions and as a store of value in the digital economy. The market capitalization of stablecoins has surged significantly, increasing from less than $5 billion in 2019 to more than $200 billion currently.[36] Additionally, the use of stablecoins to facilitate transactions has grown rapidly reaching $5 trillion in payments volume during 2024.[37]

-  **Central Bank Digital Currencies (CBDCs):** CBDCs are a form of Digital Dollars that could be issued by the Federal Reserve System and enjoy the full faith and credit of the U.S. government.[38] They could serve as a third format of central bank money alongside physical Federal Reserve (Fed) banknotes and the reserve balances held by commercial banks at the Fed, and as such would be another risk-free form of money.[39] While 134 countries, representing over 98% of global GDP, are exploring issuance of CBDC[40], exploration in the U.S. has been comparatively limited. Domestic exploration has primarily involved tests and limited prototypes, such as Project Hamilton (retail CBDC)[41] and Project Cedar (wholesale CBDC)[42] led by the Federal Reserve Banks of Boston and New York respectively. The Fed has also participated in Project Agorá (wholesale CBDC and tokenized deposits).[43] As noted, the recent Executive Order from the White House prohibits U.S. executive branch agencies from undertaking any action to establish, issue or promote CBDCs.[44]

    - A retail CBDC (rCBDC) is a form of central bank digital currency accessible to the public.[45] It could be used domestically or potentially cross-border for transactions ranging from purchases of goods and services to vendor payments and payroll.[46] As such, this is inclusive of use by corporations and consumers.

    - A wholesale CBDC (wCBDC) is an instrument designed for use among banks and other licensed financial institutions.[47] Eligible institutions could hold wCBDCs and use them for financial market payments, like interbank payments, settling securities, and foreign exchange (FX) transactions.[48]

All three Digital Dollar instruments are denominated in U.S. dollars. Stablecoins and tokenized deposits are intended to maintain a stable value relative to a reference asset: $1 worth of high-quality liquid assets for stablecoins (e.g., U.S. Treasuries), and $1 of bank deposits at the issuing institution for tokenized deposits.

Despite these similarities, there are significant distinctions among the three Digital Dollar instruments. Perhaps the most important difference is the issuer: CBDCs are issued by central banks, stablecoins, as of 2024, are issued by non-bank private entities, and tokenized deposits are issued by commercial banks. Another fundamental distinction lies in their transfer methods. Tokenized deposits, as of 2024, are implemented as account-based instruments at the individual bank level, whereas stablecoins operate as a digital bearer instrument.

Within and outside the U.S., there are emerging instruments with subtle variations to those described above. Fnality utilizes a privately issued central bank reserve backed currency to facilitate wholesale payments.[49] The Swiss Bankers Association proposes three different deposit token models.[50] Blackrock[51] and Franklin Templeton[52] have issued interest-bearing tokenized Money Market Funds (MMF), which are seeing rapid adoption among institutional investors. These will be discussed in future sections in the context of the unique benefits and risks that each approach introduces.

Enabling Technologies

The Digital Dollar Project Champion Model, introduced in 2020, described a tokenized form of the U.S. dollar, which relies on three key technological elements: tokenization, distributed ledger technology (DLT), and smart contracts[53]:

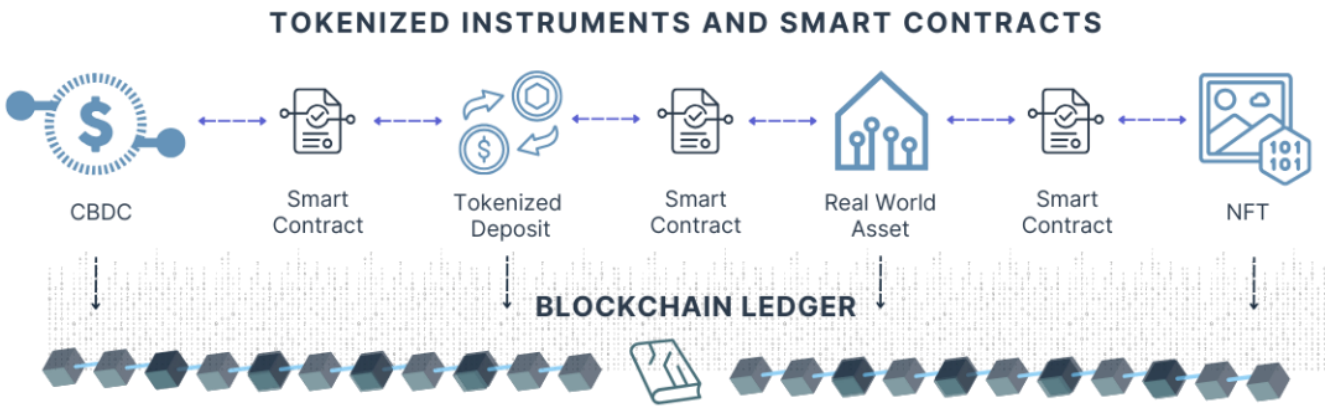
-  **Tokenization:** Tokenization is the process of creating a digital representation of an asset.[54] In this model, tokenization is used to create digital forms of U.S. dollars, which could then be used for payments, savings (store of value), and other transactions.

-  **Distributed Ledger Technology (DLT):** DLT refers to the protocols and supporting infrastructure that allow computers in different locations to propose, validate, and record state changes or updates to a synchronized ledger that is distributed across the network's nodes.[55] In the context of payments, clearing, and settlement, DLT enables entities to carry out their operations using established procedures and protocols.[56]

-  **Smart Contracts:** Smart contracts are automated agreements that are executed when predetermined terms and conditions are met.[57] Smart contracts are used to automate a variety of transactions, including payments, FX trading, escrow, and delivery of goods and services.[58]

Tokenization, DLT, and smart contracts are inextricably linked. A recent paper by J.P. Morgan and Bain & Company explained this linkage in their definition of tokenization, stating "Tokenization refers to representing ownership and properties of an asset as a programmable piece of code—known as a smart contract—on a distributed ledger or blockchain".[59] Therefore, in the context of this paper, we refer to the application of these technologies collectively as tokenization. As further elaborated in the next section, tokenization has the potential to greatly improve the financial system by increasing operational efficiency, enhancing availability of funds, and promoting programmability and interoperability. Efficiency can be improved through the automation of processes, reducing friction in payments and settlements. Availability of funds can be enhanced by enabling continuous (24/7) operation and synchronized record-keeping in a distributed network. Automation can be achieved through the use of smart contracts. And interoperability can be promoted by using a common set of protocols and standards across different platforms and payment systems.

Aligning to a common understanding of Digital Dollar instruments and tokenization creates a foundational vocabulary for a more in-depth examination of the benefits of Digital Dollars to various stakeholders, including FMUs, FIs, Corporations, and Consumers. Similarly, this shared understanding will be essential to jointly explore ways to promote Digital Dollar adoption and avoid or mitigate risks and obstacles in critical areas such as financial crimes, privacy, cybersecurity, and financial stability.



Source: Digital Dollar Project, Feb. 2025.

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Building the Business Case

Digital Dollar instruments, and their enabling technologies, can provide a broad range of benefits for FMUs, FIs, Corporations, and Consumers. Further, it is important to recognize that the potential benefits of Digital Dollars extend beyond segment-level use cases to include broader systemic benefits that will strengthen the financial system. These systemic benefits will support the U.S. dollar's status as the global reserve currency, while also providing important infrastructure-level improvements for all participants.

Global Payment Industry Issues & Challenges

Payment systems and infrastructure have evolved significantly over time with broader connectivity, faster settlement and increased accessibility for users. **However, the payment industry, despite its advancements, still faces operational and technical challenges that affect efficiency, security, and capacity for innovation.** The enabling technologies of Digital Dollar instruments can help reduce, mitigate or eliminate:

- **Trapped Liquidity:** Domestic and cross-border payment systems often have disparate operating hours which can trap liquidity, creating pools of money sitting idle and uninvested. These asynchronous operations also lead to delays in settlement, impeding the efficient flow of funds, particularly noticeable in cross-border transactions where time zone differences exacerbate the issue.[60] While real time, 24/7 payment systems have emerged, many legacy systems, such as check, wire, and ACH, still operate within limited timeframes.
- **Elevated Settlement and Credit Risk:** There is a significant risk associated with the asynchronous settlement of transactions, particularly in cross-border payments. Asynchronous settlement occurs when mutual transfer of funds and/or assets does not happen simultaneously, thus creating credit exposure while one party waits for payment. There are three scenarios where risk is introduced when facilitating settlement:
    - *Interbank Intra-day*: This risk arises when financial institutions extend large intraday credit lines to facilitate transactions.[61] If remitting (debtor) institutions fail to repay such credit by the end of the day, it can lead to significant losses for the paying (creditor) institution.
    - *Fed Extensions to Banks*: The Federal Reserve extends wire-related credit lines to banks, for reasons similar to those cited immediately above, creating risk that the borrowing banks may default.[62]
    - *FX Trading*: In foreign exchange (FX) transactions, Payment versus Payment (PvP) mechanisms ensure that the final transfer of a payment in one currency occurs if and only if the final transfer of a payment in another currency takes place.[63] However, when PvP is not employed, there is a risk that one party will deliver the currency it sold but not receive the currency it bought. The proportion of FX transactions settled on a PvP basis has dropped below 40 percent in recent years, which has increased settlement risk exposure across the FX market.[64]
- **Lack of Resilience:** Most U.S. payment systems and infrastructure have internal resiliency programs.[65,66] However, they do not fail over to each other in case of disruptions. This approach increases the overall system's vulnerability to outages and failures, potentially disrupting financial transactions and impacting economic activity. Although major payment services often operate without critical issues or prolonged periods of downtime, there have been incidents in recent years

that highlight the need for backup and/or complementary systems**.** In February 2021, nearly all Federal Reserve Bank Services were unavailable or significantly limited for four hours, effectively stopping transaction flow between banks due to a human error that kicked off an automated data center maintenance process.[67]

- **Innovation Inhibitors:** Legacy shared infrastructure and bank-specific systems impede innovation in the U.S. payment industry. For example, many systems are inadequate for real-time processing, hindering the adoption of new technologies and the development of more efficient payment solutions.
- **Operational Inefficiencies:** Existing systems rely on a series of messages passed between payors, banks, beneficiary banks, and intermediaries. This model creates inefficiencies such as the need for reconciliation of messages and internal financial entries, which can require considerable resources. This sequential process is prone to errors, which can lead to payment delays, increased costs, and client dissatisfaction.
- **Lack of Real-Time Visibility**: Current systems may lack real-time visibility, making it difficult for users, regulators, and intermediaries to optimally monitor transactions. Monitoring and identifying illicit activity continues to be a challenge, with global financial institutions continuing to face record fines due to failures in their processes.[68]

It can be argued existing systems and related improvements solve for some of these challenges. For example, the Regulated Liability Network (RLN) acknowledges in its November 2022 whitepaper that current U.S. payment systems already offer availability, efficiency, security, and interoperability.[69] This also suggests that existing systems like CHIPS, RTP, and Fedwire could be expanded to achieve similar benefits.[70] However, tokenization offers unique advantages over existing infrastructure, with the potential to improve liquidity, resilience, innovation, efficiency, and transparency, while also reducing risk. These unique benefits are detailed immediately below.

Benefits Enabled by Tokenization

Tokenization offers a compelling solution to issues challenging the U.S. Payment Industry. The use of DLT and smart contracts, when implemented within a robust and well-defined framework, has the potential to facilitate a more efficient, secure, and innovative ecosystem:

- **Improved Use of Financial Resources and Liquidity:** DLT enables 24/7/365 payment capability, effectively overcoming the limitations of disparate operating hours that currently restrict liquidity and elevate risks in traditional payment networks.[71] The instant transfer of assets, along with clearer visibility into transactions, allows money to be more readily invested, lent to businesses and individuals, or used as collateral.
- **Reduced Settlement Risk:** The use of smart contracts can enable increased automation and simultaneous settlement, addressing the credit and operational risks associated with manual and asynchronous processes.[72]
- **Enhanced Resilience:** New payment rails and networks can enhance the resilience of the financial system by providing alternative payment options and reducing reliance on legacy infrastructure. Additionally, DLT's inherent resilience, stemming from its distributed nature, provides a distinct advantage over site-specific approaches that are vulnerable to disruptions. This decentralized

architecture ensures that the payment system remains operational even in the face of localized outages (e.g., inoperable nodes), enhancing the overall stability and reliability of the financial infrastructure.[73]

- **Innovation:** DLT, combined with the automation of standardized processes via smart contracts addresses the inefficiencies of current infrastructure and processes.[74] This encourages the development of new payment solutions and accelerates the replacement of legacy systems. As an example, composability of smart contracts enables the creation of new products and services. Composability refers to the ability to combine and reuse existing smart contracts to build new applications.[75]
- **Improved Operational Efficiency and Reduced Risk:** By operating on a shared, synchronized database, DLT eliminates the need for serial messaging, thus reducing operational inefficiencies and related risk of errors.[76]
- **Improved Visibility and Transparency:** DLT can improve transparency and traceability, making it easier to identify and mitigate illicit transactions. This technology could also provide regulators with better tools for monitoring the financial system, facilitating real-time access to transaction data and leading to more adaptive regulatory frameworks in an evolving financial and regulatory landscape. Real-time visibility improves the management of payments for corporates and consumers.

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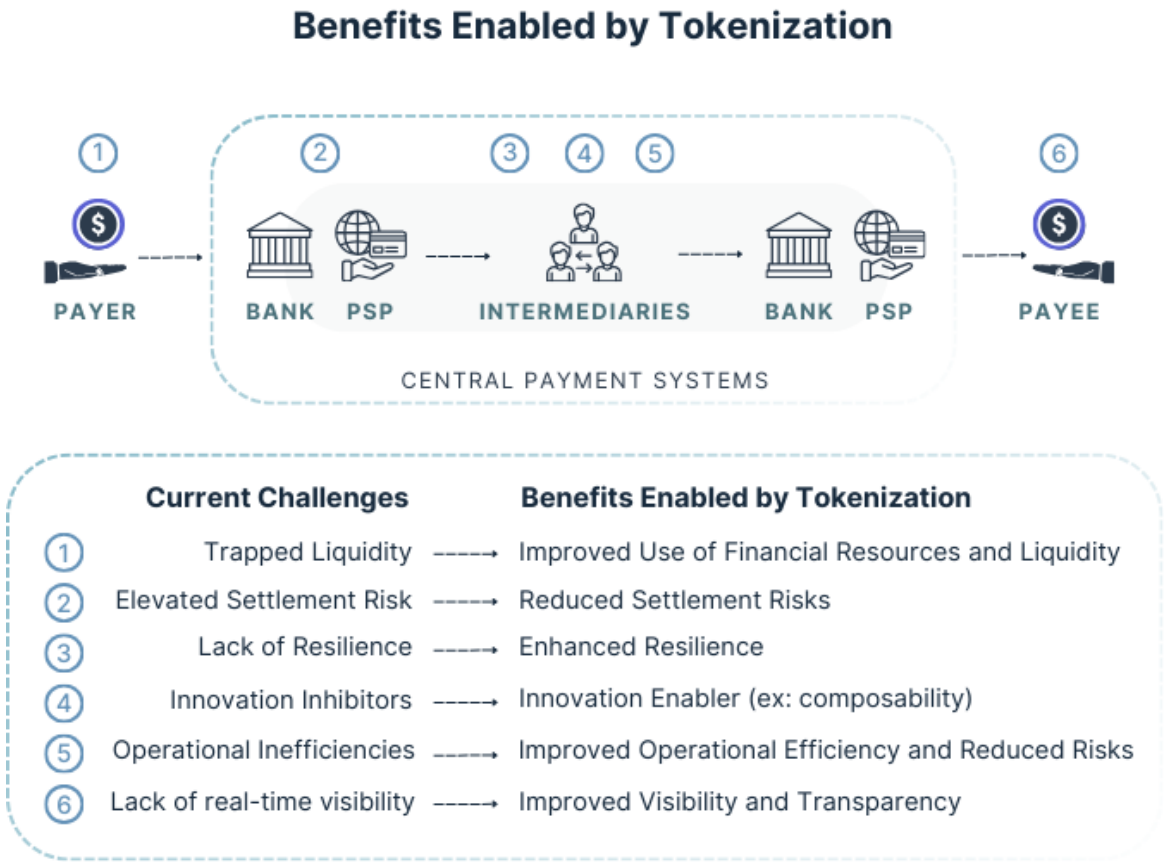


Source: Digital Dollar Project, Feb. 2025.

Tokenization paves the way for a future where payments are faster, less risky, and more efficient. This transformation will not only benefit individual stakeholders but also contribute to the overall strength, resilience, and operational efficiency of the U.S. financial system.

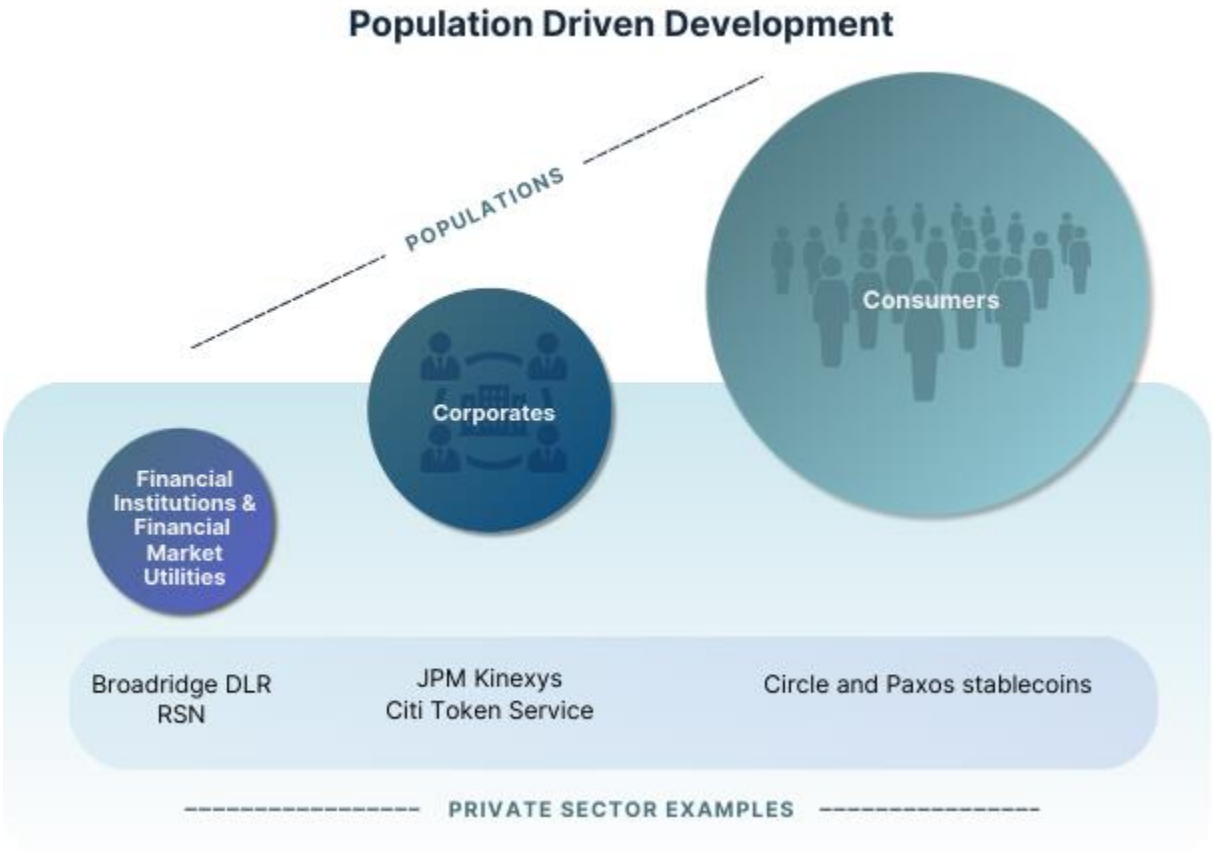
Population Driven Development

The successful introduction of DLT and smart contracts into the U.S. Repo market provides a valuable case study. A repurchase agreement (repo) is a transaction where one party sells a financial asset with an agreement to repurchase it later. Repos can be overnight (one day) or term (up to a year, though most are three months or less). The repo market thus allows participants to provide collateralized loans to each other.[77] The use of DLT and tokenization enhanced the mobility of collateral by enabling the ownership transfer of securities via mutualized workflows without the need to move securities physically, reducing liquidity charges and improving efficiency by reducing reconciliation costs.[78] Smart contracts, through automation and standardization, mitigated operational risks.[79] Platforms like HQLA^{X}, Kinexys, and Broadridge's DLT Repo handle billions in repo volume and can scale further, offering significant operational and capital savings.[80]

The success of DLT-based repo market solutions was facilitated by a relatively small user population managing substantial assets and adequate investment budgets. This allowed for small unit benefits over a significant pool of assets to accumulate into significant overall savings. This example aligns with the

concept of incremental innovation, where new technologies are first introduced to smaller, more receptive user groups. As such, adoption is anticipated to continue to be most rapid among small populations with market concentration (e.g., interbank settlement) and eventually encompassing broad consumer populations. Focusing on specific use cases with demonstrable benefits allows for thorough testing and refinement, showcasing its value before broader implementation and adoption. This targeted approach facilitates the gradual expansion of the user base, fostering network effects and achieving ubiquity over time. As adoption grows, the benefits become more apparent, paving the way for wider acceptance and continued integration into the broader financial ecosystem.

Tokenization, along with Digital Dollar adoption, can enable significant benefits for three key populations in our global financial system: Financial Market Utilities & Financial Institutions, Corporations, and Consumers. This progression exemplifies population driven development, starting with specialized entities managing significant financial flows and culminating in mass adoption by individual consumers.



Source: Digital Dollar Project, Feb. 2025.

Financial Market Utilities and Financial Institutions

Financial institutions (FIs) and financial market utilities (FMUs) are integral and interdependent components of the financial ecosystem. FMUs, which include entities like custodians, depository institutions, exchanges, clearinghouses, central banks and settlement agents, provide the critical infrastructure for transferring, clearing, and settling payments, securities, and other financial transactions among financial institutions. Examples of FMUs include the Depository Trust and Clearing

Corporate (DTCC), The Clearing House (TCH), Federal Reserve Payment Services (FedNow, FedWire, etc.). FIs, such as commercial banks, are often the owners of FMUs and rely heavily on these FMU-provided services to execute various financial transactions, ranging from interbank payments to securities trading. This symbiotic relationship is further strengthened by the adoption of shared technologies that enhance operational efficiency, mitigate risks, and foster innovation.[81]

FMUs and FIs globally continue to accelerate settlement cycles with the U.S. Equities markets moving to a T+1 cycle in 2024 to increase settlement efficiency and reduce risk.[82] Digital Dollars and their underlying technologies can further enable and support the acceleration of settlement cycles in addition to other benefits. While a BIS survey of central banks shows that public sector initiatives exploring tokenization with retail and wholesale CBDCs are motivated by potential benefits such as payments efficiency, financial inclusion, and safety or robustness of payments,[83] **private sector initiatives are generally focused on settlement efficiency and risk reduction, resulting in benefits that include**:

- **Accelerated Cash Settlement and Freed Liquidity**: Tokenization enables near-instant settlement of Digital Dollars through DLT-based networks, drastically reducing settlement times.[84] This model also eliminates the need for multiple intermediaries and manual reconciliation, addressing operational inefficiencies and settlement risks. Faster settlement cycles free up liquidity that would otherwise be tied up, allowing financial institutions to use their capital more effectively.[85] This freeing of trapped liquidity allows financial institutions to more effectively utilize cross-border deposit balances for lending, investment, and revenue generation, enhancing their overall financial agility.[86] This improvement not only enhances liquidity management but also reduces the systemic risk associated with prolonged settlement periods, contributing to a more stable financial system.

- **Mitigated Risk and Lower Exposures**: Smart contracts facilitate atomic settlement, ensuring that the transfer of securities and the corresponding payments occur simultaneously. This significantly reduces counterparty risk and exposure for clearing entities and financial institutions, enhancing the overall stability of financial markets and lowering the need for substantial capital reserves. [87] The transparent and immutable nature of DLT-based platforms ensures all transactions are recorded in a tamper-proof ledger, reducing the risk of fraud and errors, and lowering industry costs. This enhanced security and reliability fosters greater confidence among market participants, encouraging broader adoption of these technologies.

- **Novel Products and Services**: The programmability of smart contracts and the flexibility of DLT-based systems allow FMUs to develop new capabilities, automated compliance mechanisms, and more efficient collateral management solutions. It also enables financial institutions to develop customized financial products tailored to their clients' evolving needs. The ability to innovate and provide value-added services enhances the competitiveness of FMUs and FIs, attracting new clients. For instance, automated compliance mechanisms can streamline regulatory reporting and reduce the burden of manual compliance checks, while efficient collateral management solutions can optimize the use of assets and improve overall market liquidity.

Several compelling examples showcase the benefits of tokenization for FMUs. One example is the collaborative pilot project between the Digital Dollar Project and the DTCC, a leading provider of post-trade market infrastructure for the global financial services industry. DTCC provides post-trade securities services such as clearing, settlement, asset servicing, and transaction reporting.[88] This pilot, designed to explore the implications of a U.S. CBDC on post-trade settlement, successfully demonstrated the feasibility of using a simulated Digital Dollar on a DLT-based network to settle U.S. Equity Securities.[89] The

pilot confirmed the potential for a CBDC-enabled system to provide enhanced security, efficiency, and risk mitigation benefits for post-trade processes.

Tokenization is being applied in a variety of ways to enable demonstrable benefits for FIs and FMUs. In parallel with the experimentation orchestrated by the public sector, **the private sector has continued to invest in tokenization**. Examples include:

Private Sector Developments and Deployments (alphabetical order)

Baton

- **Purpose**: Focus on optimizing post-trade processing in financial markets to provide seamless, real-time settlement solutions that reduce costs, risks, and delays associated with traditional systems in addition to enabling enterprises to prepare for the future of finance.[90]
- **Approach:** Using Distributed Ledger Technology (DLT) for the orchestration of smart, automated, collaborative and real-time workflows, Baton's CORE platform integrates with existing systems to facilitate settlement and manage credit, liquidity, risk, and netting.[91]
- **Settlement Asset:** Multiple fiat currencies settled in accounts at commercial banks (with central bank accounts on the roadmap); this is achieved using a smart contract structure that is the product of collaborative workflows and a participant rulebook.
- **Benefits Demonstrated:** Safely settled more than US$8 trillion in value to date with optimized processes improving operational efficiencies, enhancing transparency, and reducing settlement risks. OSTTRA, a post-trade solutions provider, has partnered with Baton to launch an on-demand payment-versus-payment (PvP) service (powered by Baton's distributed ledger technology), designed to mitigate FX settlement risk.[92] Baton's use of DLT has been able to cut costs and improve operations significantly for their clients, with bilateral FX PvP settlement processes reduced from hours to minutes.[93]

Broadridge DLT Repo

- **Purpose:** Transform repo market infrastructure, increasing efficiency and reducing risk.[94]
- **Approach:** Uses distributed ledger technology and smart contracts to streamline repo agreements by detaching and tokenizing the collateral from the trade agreement and enabling atomic transactions.[95]
- **Settlement Asset:** Currently, tokenized J.P. Morgan deposits[96] and conventional payment rails[97]. Broader vision includes reliable liabilities / cash tokens / payment systems that offer benefits to the specific use case.
- **Benefits Demonstrated:** Increased efficiency through the optimization of traditional processes, with annual savings of $2 to $4M per participant and reduced settlement risks through atomic and automated transaction settlements.[98] The use of financial assets improves with optimized collateral management and reduced financing costs.[99] Broadridge states, "In mid-2021, Broadridge launched its Distributed Ledger Repo (DLR) solution, quickly achieving $31 billion in average weekly volumes. That figure is now (2023) $50 billion daily or a trillion dollars a month."[100]

Fnality

- **Purpose**: Build a new and novel payment infrastructure for wholesale transactions.[101]
- **Approach**: Private sector initiative delivering a wholesale payment system based on DLT technology using a permissioned ledger.[102]
- **Settlement Asset**: Digital representation of entitlement to local currency central bank reserves in each jurisdiction, which has the same credit quality as central bank money.[103]
- **Benefits Demonstrated:** Improves operational efficiency and reduces settlement risk with a DLT system which optimizes processes.[104] A unified domestic and international pool of funds available 24/7 for commercial banks improves the use of financial assets and mitigates trapped liquidity.[105] Resilience is enhanced through a distributed and decentralized infrastructure providing a new rail for wholesale transactions.[106] Banks including UBS, Banco Santander, and Lloyds Banking Group have participated in live payments of the Sterling Fnality Payment System.[107]

J.P. Morgan Kinexys Digital Financing

- **Purpose:** Automate repo transactions and enable near-real time settlement utilizing tokenized securities and cash.[108]
- **Approach:** Utilize a private DLT-based platform and smart contracts to tokenize collateral and cash and enable automated and programmable transactions.[109]
- **Settlement Asset**: Tokenized deposits.
- **Benefits Demonstrated**: Reduces settlement risk through near-simultaneous and real time settlement.[110] Improves efficiency through programmable and automated transactions while enhancing transparency throughout the trade life cycle.[111] J.P. Morgan states, "Since inception, the platform has exceeded $1.5 trillion in notional value, processing an average of more than $2 billion daily in transaction volume."[112]

Partior

- **Purpose**: Transform financial market infrastructure by optimizing the movement of liquidity globally.[113]
- **Solution Overview**: Provides a unified ledger to facilitate real-time, cross-border multi-currency and domestic payments and settlements.[114]
- **Settlement Assets**: Supports multi-currency transactions utilizing tokenized deposits (live) and wCBDC (experimental).[115]
- **Benefits Demonstrated**: Streamlines the settlement process and improves operational efficiency. Offers 24/7 instant payments with atomic settlement reducing settlement risk and improving liquidity management.[116] Provides a single, real-time source of truth for all transactions to improve transparency.[117] Banks including J.P. Morgan[118] and Deutsche Bank are live on the platform[119] and Partior is integrating with payment service providers as well such as Nium, providing real time payments and settlements to over 100 markets.[120] Partior states, "Partior has processed over $1 bn in transaction value, delivering instant liquidity, transparency, and enhanced security while solving the inefficiencies of legacy clearing and settlement systems.[121]

Regulated Settlement Network (RSN)

- **Purpose**: Explore the use of tokenized securities, commercial bank deposits, and central bank deposits within a financial market infrastructure using shared ledger technology to enhance settlement capabilities compared to current systems.[122]
- **Approach**: Shared ledger infrastructure supporting 24/7 availability, programmability, and settlement finality.[123]
- **Settlement Assets**: Tokenized central bank deposits and commercial bank deposits.[124]
- **Benefits Demonstrated:** A shared ledger Financial Market Infrastructure (FMI) for multi-asset, cross-network settlements can provide new opportunities for innovation in financial services. [125] This FMI would offer a continuous, programmable settlement infrastructure that optimizes collateral and liquidity.[126] The 2024 Proof of Concept (PoC) demonstrated successful simulated Delivery versus Payment (DvP) settlement, synchronized balance sheets, and seamless integration across platforms, proving its versatility, and interoperability with other Distributed Ledger Technology (DLT) solutions. [127] Large FIs and FMUs including Citi, J.P. Morgan, Visa, TD Bank, Wells Fargo, and others participated in and/or contributed to the proof of concept. Swift (Society for Worldwide Interbank Financial Telecommunication), through its interlinking prototype and Mastercard through its Multi-Token Network (MTN), enabled interoperability for the PoC by linking and orchestrating transactions across simulated networks.[128]

By embracing tokenization, FMUs and Financial institutions can position themselves at the forefront of the efforts to modernize the financial system and the dollar, harnessing the power of DLT and smart contracts to enhance their operational efficiency, reduce risk exposure, and unlock new avenues for innovation. The creation of new FMUs by financial institutions, as exemplified by the RSN initiative[129], should be considered to drive common standards and develop industry utilities that will enable Digital Dollar adoption. Within U.S. commercial banks, initiatives are often led by transaction banking and enterprise payment groups. These groups should continue to support investments in essential infrastructure, such as wallets, exchanges (account to digital, digital to digital), and depository functions, seeking explicitly to identify the benefits and articulate the value across their wider institutions, e.g., corporate banking, consumer banking, and wealth management.

Corporations

Corporate treasurers spend most of their time on treasury operations and controls, as well as capital and liquidity management.[130] Payments are made in large volumes, at relatively low cost, often via ACH.[131] Planning and control are enabled by banks and Enterprise Resource Planning (ERP) providers. Significant focus goes to addressing inefficiencies, e.g., accounting reconcilement, reduction of paper checks and invoices.[132] Key pain points also include the speed and transparency of cross border payments and trapped liquidity.[133]

Smart contracts and distributed ledger technology (DLT) are transformative technologies that address many of the aforementioned priorities and enable Digital Dollar use cases. By embracing the use of Digital Dollars and the technologies that underpin them, **corporations can unlock a wide range of benefits:**

- **Enhanced Liquidity Management**: The use of Digital Dollars, such as stablecoins and tokenized deposits on DLT networks allows corporations to capitalize on near-instant settlement. This efficiency reduces the need for large local cash buffers, thus freeing up additional liquidity for strategic investments and operational needs. By accessing and utilizing funds more efficiently, corporations can improve shareholder returns.

- **Optimized Cross-Border Payments**: Traditional cross-border transactions often involve high fees, opaque processes, and extended settlement times, which complicate the management of cross-border deposit balances.[134] The use of Digital Dollars on DLT networks facilitates faster, more transparent, and cost-effective transactions.[135] The streamlined process enhances the efficiency of global financial operations, improving profitability and shareholder returns.

- **Enhanced Security and Transparency**: Utilizing Digital Dollars on DLT networks provides corporations with increased visibility into transaction lifecycles due to the inherent transparency of DLT. Enhanced security measures ensure that all transactions are recorded in a tamper-proof ledger, fostering greater trust and reliability in financial operations. This increased security and transparency helps corporations maintain robust compliance and risk management practices.

Private sector participants are actively exploring tokenization to offer solutions that enable their corporate clients. Two efforts are particularly notable:

- **Kinexys by J.P. Morgan** provides a blockchain-based system that facilitates instantaneous payments and settlements optimizing liquidity management and streamlining cross-border transactions for institutional clients.[136] Kinexys Digital Payments processes over $2 billion in transactions daily, showcasing the scalability and real-world applicability of tokenization and DLT-based solutions for corporations.[137]

- **Citi Token Services** leverages blockchain and smart contract technologies to offer cash management and trade finance solutions to institutional clients.[138] By integrating tokenized deposits and smart contracts into Citi's global network, the service facilitates real-time, 24/7 cross-border payments and liquidity management for corporate treasurers.[139]

Corporations that embrace Digital Dollar instruments such as stablecoins and tokenized deposits stand to experience an array of benefits across treasury management, including reduced costs, improved operational efficiency, and increased transparency.

Consumers

While the safety of, and access to, deposit accounts are increasingly ubiquitous, consumer payments vary widely by use case and method. In 2023, U.S. consumers made an average of 37 purchases and nine bill payments per month.[140] With the diversity of payment methods, no single method accounts for more than 32% of the value or volume of payments.[141] Challenges exist across payment use cases and methods. Currently, only two-thirds of billers provide website payment options, and 40% enable consumers to utilize their banks' systems for payments.[142] The use of physical cash in retail payments is mostly free of charge, however it introduces challenges such as money laundering, tax evasion, and operational inefficiencies.[143] Cross-border payments and remittances are particularly inefficient and costly. International retail purchases often incur significant foreign exchange spread charges[144] and remittances are still expensive even though costs have decreased over the last 15 years.[145] **Consumers stand to benefit significantly from adopting Digital Dollar instruments and use cases**:

- **Lower Transaction Costs**: Stablecoins offer a cost-effective alternative to traditional payment systems, particularly for cross-border transfers.[146] Traditional remittances often involve high fees, which can be a significant burden for consumers sending money internationally. This cost efficiency is especially beneficial for individuals who rely on remittances to support family members abroad.
- **Faster and More Efficient Payments:** Consumers using stablecoins benefit from near-instant settlement of transactions, which is significantly faster than most traditional payments such as ACH which can take up to three days to settle. This speed enhances the efficiency of everyday transactions, allowing consumers to access their funds more quickly and manage their finances more effectively.
- **Increased Transparency and Security**: Stablecoins on DLT networks offer enhanced transparency and security for consumers. The immutable nature of DLT ensures that all transactions are recorded in a tamper-proof ledger, reducing the risk of errors. This transparency provides consumers with greater confidence in their financial transactions, knowing that funds are secure, and their transaction history is easily verifiable.

Consumers also benefit from the increased competition among solution providers and stablecoin issuers. **Real-world examples from the private sector illustrate how stablecoins operating on DLT networks are already delivering tangible benefits to consumers** with over $5 trillion in payments volume during 2024[147]:

- **PayPal's PYUSD** stablecoin, issued by Paxos, allows consumers to make faster payments at lower costs, especially for remittances.[148] Consumers can send PYUSD to friends in the U.S. via PayPal with no fees, and PayPal supports cross-border transfers for stablecoin users in about 160 countries.[149]
- **Circle**, the issuer of USDC, **and VISA,** have partnered to enable USDC payments, initiated by a Visa card transaction at the point of sale.[150] This collaboration aims to provide consumers with the convenience of paying with USDC everywhere Visa cards are accepted.[151]

Digital Dollars in the form of stablecoins are already enabling consumers to benefit from faster, cheaper, and more efficient payments. The private sector is rapidly innovating, providing consumers with additional utility in the form of new use cases and increasing interoperability with existing payment networks.

Benefits of Reserve Currency Status

The U.S. enjoys significant economic and strategic advantages from the U.S. dollar's status as the world's reserve currency.[152] Lower transaction and borrowing costs are a significant economic benefit.[153] Due to the high global demand for dollar-denominated assets, U.S. households, businesses, and the government can access credit at lower interest rates compared to countries without reserve currency status.[154] This lower cost of capital stimulates investment and economic growth within the U.S. Additionally, the widespread use of the U.S. dollar in international transactions reduces exchange rate risks and transaction costs for U.S. businesses engaged in global trade.[155]

From a strategic perspective, the U.S. dollar's dominance provides the U.S. with considerable influence over the architecture of the international financial system.[156] This influence allows the U.S. to shape global financial standards and regulations, promoting stability and transparency in the global financial

system. Moreover, the central role of the U.S. dollar in global finance provides the U.S. with a degree of economic and geopolitical leverage, as seen in its ability to implement financial sanctions.[157]

Paul Ryan and Timothy Massad, among others, have highlighted the emerging role of stablecoins backed by U.S. Treasuries in maintaining the dollar's preeminence in the evolving digital landscape.[158] They argue that promoting dollar-backed stablecoins could bolster demand for U.S. Debt, thereby reducing borrowing costs and strengthening the dollar's position in the global financial system.[159] President Trump's executive order, *Strengthening American Leadership in Digital Financial Technology* concurs, stating that it is the administration's policy to support "promoting and protecting the sovereignty of the United States dollar, including through actions to promote the development and growth of lawful and legitimate dollar-backed stablecoins worldwide".[160]

U.S. Treasury Demand

As of late 2024, there are over $200 billion of stablecoins circulating globally. 99% of stablecoins are denominated in dollars[161], far exceeding the next largest denomination, the Euro, at a mere 0.20%.[162] To maintain their peg to the U.S. dollar, stablecoin issuers hold substantial reserves in U.S. Treasuries. This practice creates direct demand for U.S. Government Debt, as stablecoin issuers actively purchase these securities to back their digital tokens. Stablecoin issuers have become significant holders of U.S. Treasuries, surpassing countries like Germany and collectively becoming one of the top 20 holders of U.S. Debt.[163] This growing demand from stablecoin issuers provides a stable source of financing for the U.S. Government, potentially contributing to lower borrowing costs and supporting the overall strength of the U.S. Economy.

Furthermore, stablecoins are facilitating trade settlement in U.S. dollars within the digital asset ecosystem. Traders and investors use stablecoins to move value quickly and efficiently between different digital assets and platforms. The stability and U.S. dollar-pegging of these tokens make them ideal for settlement and avoiding the price volatility inherent in some digital assets. As stablecoin usage in trade settlement expands, it further promotes the use of the U.S. dollar within this rapidly growing sector, extending its reach and influence in the digital economy.

This growing integration of stablecoins into the digital asset ecosystem strengthens the U.S. dollar's role as money globally. The widespread use of U.S. dollar-denominated stablecoins in trading, lending, and other financial activities implicitly promotes the U.S. dollar as the preferred unit of account and medium of exchange within this emerging financial landscape.

As stablecoins become more integrated into global commerce and finance, they will contribute to a more seamless flow of U.S. dollar-denominated transactions, potentially leading to greater efficiency and lower costs for businesses and consumers worldwide. This increased efficiency, coupled with the stability and trustworthiness associated with the U.S. dollar, have the potential to further solidify the U.S. dollar's position as the foundation of the global digital economy.

Recommendations to Develop the Business Case

- **Expand the Business Case Scope:** Financial institutions and FMUs should develop the business case for Digital Dollar adoption at the enterprise and infrastructure level, rather than at the business unit level.

- **Consider Introducing a New FMU:** Financial institutions should also consider the introduction of an FMU to lead the development and implementation of Digital Dollar infrastructure, involving major banks for innovation whose mission will include promoting adoption and mitigating risks, as articulated in the following sections.

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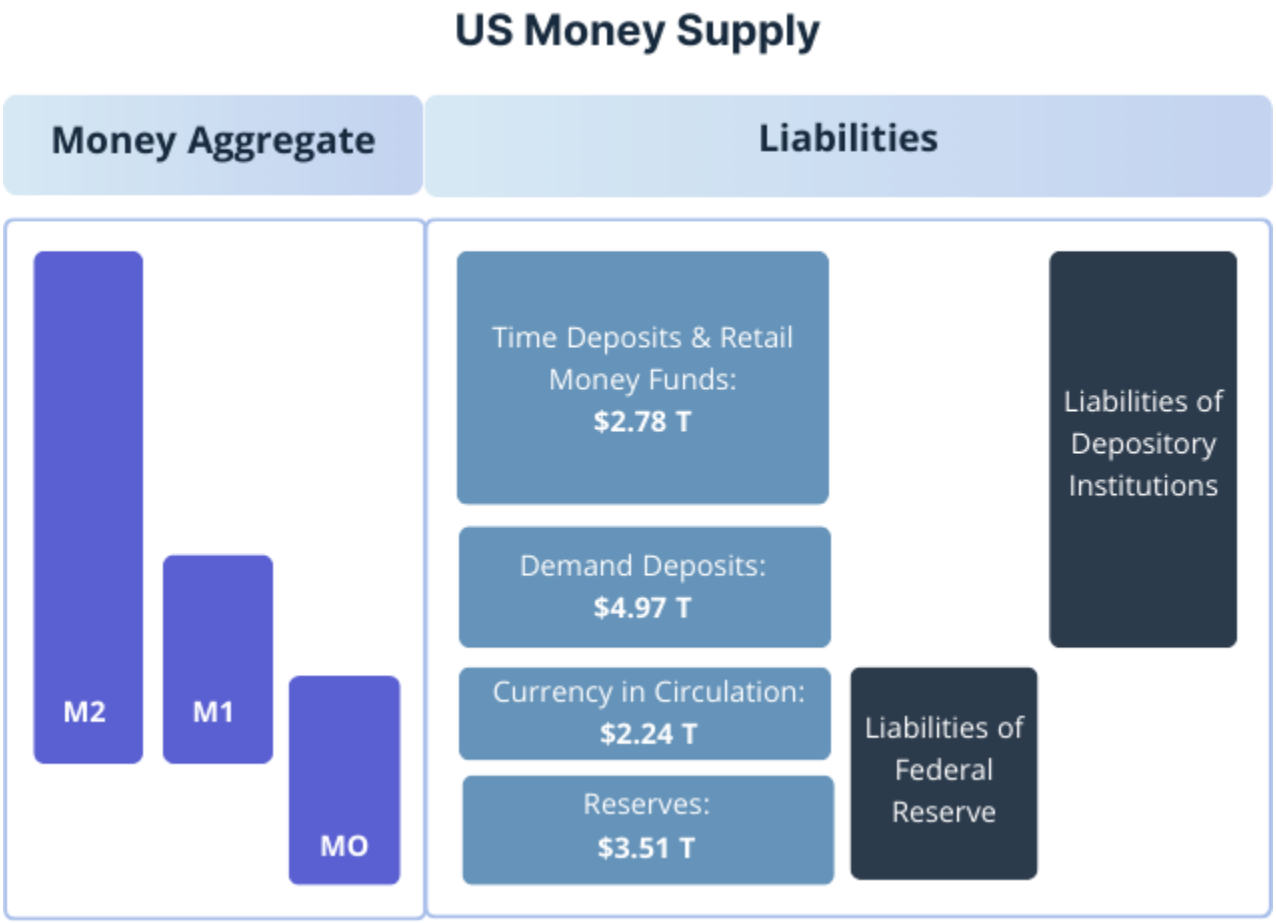
Promoting Adoption

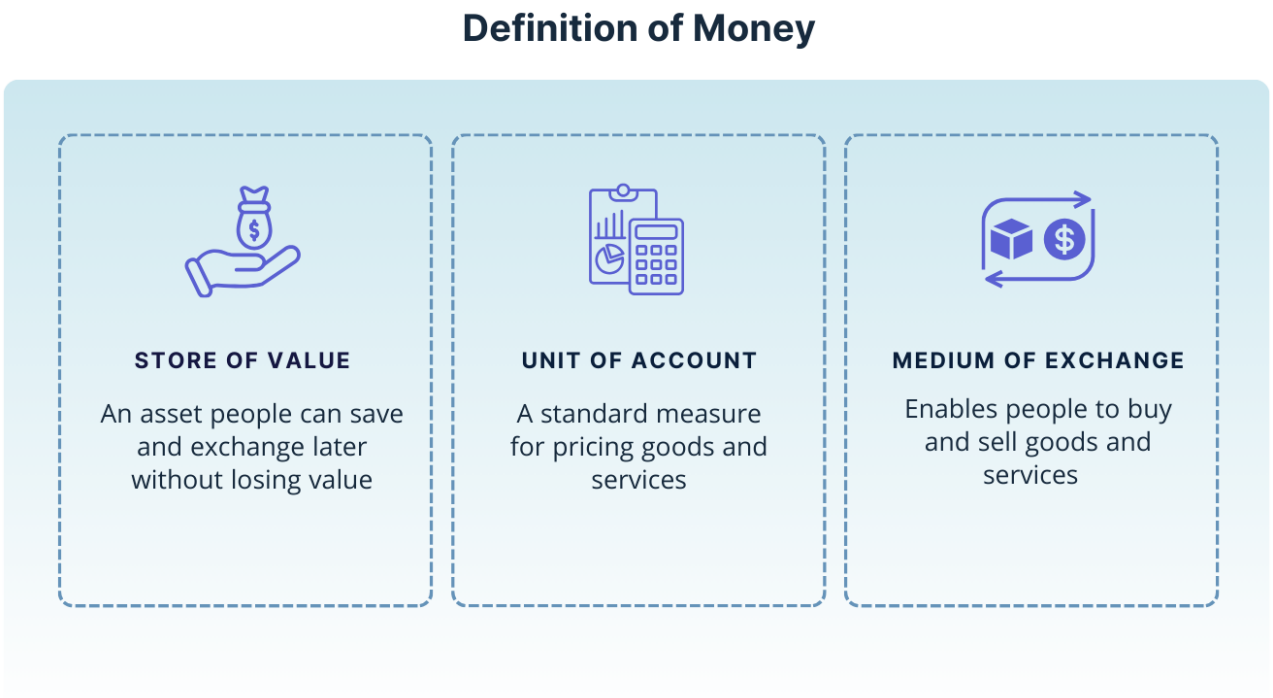
Unless users across populations exhibit a significant change in their desired money issuer (central banks, commercial banks, regulated non-banks), the development of Digital Dollar instruments will follow the current U.S. money supply distribution, which is centered in commercial bank money.



Source: "Money Stock Measures – H.6 Release." Board of Governors of the Federal Reserve, 28 Jan. 2025.

That said, adoption necessarily follows development - there must be a product to adopt. This section describes certain barriers, and the actions required to overcome those barriers. To state the obvious, CBDC is dependent on government action, which appears unlikely in today's U.S. political environment.[164] Stablecoins are growing rapidly, and regulatory clarity should support continued growth. Tokenized deposits have the potential of being based on commercial bank money (again, the bulk of U.S. money supply), but faces challenges in terms of investment and specific regulatory ambiguity, not least of which is the Know Your Customer (KYC) boundary, described below.

For any Digital Dollar Instrument to function effectively and be accepted as money, it must exhibit the core characteristics of money (store of value, unit of account, and medium of exchange)[165] and be broadly accepted in financial transactions.



Source: Hennerich, Heather. "Here's What Makes Money, Money." Federal Reserve Bank of St. Louis, 15 Dec. 2021.

To fulfill these roles in a digital context, **focus must be given to four key attributes**:

- **Stable Value:** Digital Dollars must maintain stable value to ensure that purchasing power is preserved.
- **Ease of Settlement**: Digital Dollars should settle at or near par value, guaranteeing consistent and predictable exchange rates with comparable forms of money.
- **Broad Interoperability**: Digital Dollars must remain fungible and seamlessly interoperable with existing forms of money and payment systems, facilitating smooth and efficient transactions across various platforms and networks.
- **Acceptance**: Digital Dollars require broad acceptance at points of sale (POS), as payroll, in foreign exchange (FX) settlement, as vendor payments, and in other financial transactions.

Stable Value

Stable value is a fundamental attribute of money, as it ensures that the currency reliably maintains its purchasing power. Without stable value, its utility as a unit of account is diminished. To achieve and maintain stable value for Digital Dollars, two essential prerequisites must be met: quality backing and regulatory clarity.

Quality backing is crucial for instilling confidence in the value of Digital Dollars. There are several ways to achieve this, each providing a different level of assurance and stability.

- **Commercial Bank Creditworthiness:** Digital Dollars can be backed by the creditworthiness of commercial banks, relying on their strong balance sheets and regulatory compliance.[166] Government

programs (deposit insurance, lender of last resort facilities) also contribute to commercial bank liquidity. Redemption at par value relies on the issuing bank's ability to meet its obligations.

- **High-Quality Collateral:** Another approach involves backing Digital Dollars with high-quality, liquid assets like U.S. Treasuries.[167] This collateralization approach, as exemplified by stablecoins, provides a direct link to stable and widely recognized assets, enhancing confidence in the value of the Digital Dollar.

- **Backing by a Central Bank:** This approach offers the highest level of confidence, leveraging the full faith and credit of the government.[168] This is the quality of backing inherent in a Central Bank Digital Currency (CBDC) issued by the Federal Reserve, meaning its value is directly tied to the stability and credit worthiness of the U.S. government.[169] While this suggests a high level of stability, offshore activity could potentially influence the supply of CBDCs and impact their value.

Regulatory clarity is paramount in fostering the adoption of Digital Dollars. A well-defined and transparent regulatory framework instills confidence among market participants, mitigates risks, and encourages broader engagement within the financial ecosystem. The absence of such clarity can lead to uncertainty and hesitancy among potential users and investors, hindering the widespread adoption of this transformative technology.

The current landscape for Digital Dollars in the United States presents several areas where regulatory clarity is needed. For instance, the OCC issued interpretive letters in 2020 and 2021, including 1170, 1172, and 1174, confirming that national banks had the authority to issue stablecoins and engage in related activities, such as tokenizing deposits and facilitating payments using these new technologies.[170,171,172] However, in late 2021, the OCC issued Interpretive Letter 1179, imposing a pre-launch approval requirement on all digital asset activities, including the tokenization of deposits.[173] The Federal Deposit Insurance Corporation (FDIC) subsequently adopted similar pre-approval requirements.[174] The process under which institutions must engage with their regulator before engaging in any activities related to digital assets is confidential.[175] This means there is a lack of public information available on what types of activities the FDIC might be open to approving. In a 2024 speech, FDIC Vice Chancellor Travis Hill acknowledged the lack of regulatory clarity surrounding tokenized forms of money, stating that there is inadequate public information available to determine what the FDIC considers “safe and sound”.[176] Hill also emphasized the shortcomings of the bank-by-bank approval process, noting that it does not consistently offer timely feedback on what practices meet the “safe and sound” standard.[177] Additionally, the distinction between tokenized deposits and traditional deposits remains unclear.[178]

These challenges may soon be addressed. On March 7th, the OCC rescinded Interpretative Letter 1179, removing the pre-approval requirement for banks engaging in certain activities, including “hold[ing] dollar deposits serving as reserves backing stablecoins in certain circumstances.”[179] The Interpretive Letter also reaffirmed that national banks and federal savings associations are permitted to engage in crypto-asset activities, including crypto-asset custody, distributed ledger, and stablecoin activities.[180] In addition, the recent Executive Order from the White House aims to establish clear regulations and frameworks that enable and promote the lawful use of tokenization and digital dollars.[181] The newly formed President’s Working Group on Digital Asset Markets has been tasked with proposing regulations and legislation to establish clear frameworks for the issuance and operation of digital assets, including stablecoins.[182] Additionally the Department of Treasury, Department of Justice, and the Securities and Exchange Commission are directed to review and recommend revisions to existing regulations and orders that do not support the responsible growth and use of digital assets and tokenization.[183] The

Order bans the creation, use, or promotion of CBDC in the U.S.[184] likely ending debates on its legal status.[185] A primary focus for currently proposed stablecoin legislation, and perhaps the Working Group, is governance. Stablecoins currently operate within a fragmented regulatory environment, and there is no dedicated federal regulatory framework for stablecoins.[186] In fact, the role of a federal prudential regulator is a central point of policy discussion.[187] Stablecoins are currently governed by a variety of federal and state laws applied in a context-specific manner.[188] For example, while general money transmission laws apply, states like New York have specific frameworks such as the BitLicense which requires stablecoin issuers to obtain a license and adhere to guidelines on redeemability, reserves, and attestation.[189]

Legislation currently under consideration addresses regulatory oversight.

> Key similarities between the [STABLE Act of 2025 and the GENIUS Act of 2025] include….Giving issuers the choice between a federal or state licensing option.[190] [However], the bills also differ in important ways [including] [T]he GENIUS Act places a $10 billion cap on state-qualified issuers before needing to transfer to federal oversight, unless the appropriate federal regulator waives the requirement for a particular issuer. The STABLE Act contains no cap on state-qualified issuance.[191]

Another major focus for currently proposed legislation is required stablecoin backing. Currently, New York's Department of Financial Services (NYDFS) mandates that U.S. dollar–backed stablecoin issuers maintain a 1:1 reserve ratio with highly liquid assets.[192] Some regulatory bodies are also starting to introduce or propose consistent federal standards, such as, for example, the Financial Stability Board's proposed stablecoin guidelines.[193] Although consistent regulation is not yet in place, some issuers voluntarily adopt reserve practices that mirror legislation such as Circle which discloses reserve assets weekly and conducts third party reserve audits monthly.[194]

Key similarities between the GENIUS and STABLE bills include:

> Requiring a reserve with an aggregate value at least equal to the amount of the stablecoins in circulation and enumerate a list of asset classes that issuers may hold in that reserve. ….[And] [m]andating that issuers publish monthly attestations performed by an independent auditor confirming the adequacy of the reserves. [195]

The bills also differ in important ways:

> Broadly speaking, the GENIUS Act is lengthier…. More specifically, The GENIUS Act includes an annual certification process for states to complete with the secretary of the Department of the Treasury….[And], [t]he GENIUS Act contains a provision granting priority to stablecoin holders over all other claims if an issuer becomes insolvent. The STABLE Act does not discuss insolvency.[196]

The currently proposed stablecoin legislation aims to enhance transparency, promote responsible risk management practices, and bolster confidence in the stablecoin ecosystem, ultimately contributing to their ability to maintain stable value.

Digital Dollar Instruments and Regulatory Challenges

Instrument	Regulatory Challenge	
Stablecoins	Federal Requirements, Frameworks, and Approval Processes.	Lack of a clear, transparent, and consistent framework and process to review, approve, and regulate activities related to digital assets (ex: issuer requirements, reserve backing requirements)
	State by State Regulation Differences	State regulators have created their own unique frameworks and requirements (ex: NYDFS)
CBDC	Legal Basis for CBDC	The recent Executive Order from the White House bans the use, creation, or promotion of CBDC in the US
Tokenized Deposits	KYC Boundary	Lack of rules governing, and currently preventing, the ability for tokenized deposits to be utilized for interbank transactions

Source: Hill, Travis. "Banking's Next Chapter? Remarks on Tokenization and Other Issues". FDIC, 11 March 2024; Garratt, Rodney, et al. "Stablecoins Versus Tokenised Deposits: Implications for the Singleness of Money." Bank for International Settlements, 11 April 2023; Harris, Adrienne A. "Guidance on the Issuance of U.S. Dollar-Backed Stablecoin." New York State Department of Financial Services, 8 June 2022; "Strengthening American Leadership In Digital Financial Technology." The White House, 23 Jan. 2025.

Ease of Settlement

Digital Dollar instruments can be exchanged in secondary markets (e.g., as payments or in FX trading) or redeemed with the original issuers.[197] Convertibility refers to the exchange of Digital Dollar instruments for other USD instruments in secondary markets, keeping tokens in circulation.[198] Redemption involves returning Digital Dollars to the issuer for fiat currency or deposit account credits, removing tokens from circulation.[199]

Settlement of transactions with Digital Dollars includes the risk of deviation from par value ($1) especially in times of market crises.[200] Put simply, users should not have to worry whether their dollar is worth as much as their counterparty's dollar. As such, the "singleness of money" is essential. The Bank for International Settlements (BIS), referencing the work of the Committee on Payment and Settlement

Systems, stated, "Singleness ensures that monetary exchange is not subject to fluctuating exchange rates between different forms of money, whether they be privately issued money (e.g., deposits or stablecoins) or publicly issued money (e.g., cash). With singleness of money, there is an unambiguous unit of account that underpins all economic transactions in society.[201] Traditional systems ensure singleness through policy interventions and public infrastructure like regulations, liquidity facilities, and payment systems.[202] As the universe of dollars expands, new policies may be needed to ensure stability due to differing business models and risks.[203]

Different forms of Digital Dollars carry varying degrees of risk that can impact their ability to consistently maintain par value. These risks can materialize in two forms impacting par value settlement: slight variances from their par value ($0.99) and significant variances causing the inability to use or access funds:

- **Slight Variances from Par Value:** This occurs when the Digital Dollar instrument's value drops from its intended price of $1 to $0.99. This can temporarily impact the ability to utilize the instrument for settlement and can generate friction and modest losses for the issuers and/or holders of the instrument.

- **Significant Variances from Par Value:** This occurs when the Digital Dollar instrument's value drops significantly below its intended price of $1, which can generate significant losses for holders of the instrument and adversely impacts fungibility. When a stablecoin's price falls below $0.99, daily outflows increase by 3.4 percentage points.[204] Investors see it as de-pegged once it drops below a certain threshold, similar to 'break-the-buck' dynamics in MMFs.[205]

Several factors can contribute to the deviation from par value settlement:

- **Loss of Value in Reserve Assets:** During periods of market stress, the value of the collateral backing stablecoins, such as bank deposits or government debt instruments, or the asset base of banks which includes cash reserves, could decline. If this decline is significant, it can lead to the stablecoin or tokenized deposit losing its peg and potentially triggering a run as holders lose confidence in its ability to maintain a stable value.[206]
- **Lack of Transparency and Inconsistent Risk-Management Standards**: One of the key challenges facing the stablecoin ecosystem is a lack of transparency and consistent standards regarding reserve asset composition, redemption rights, and overall risk management practices among different stablecoin issuers.[207] This lack of clarity can undermine confidence in stablecoins and increase the risk of runs.
- **Lack of Secondary Market Liquidity:** Liquid markets enable efficient price discovery helping secondary market prices stabilize decreasing the risk of significant variances from par value and the length of time during which a Digital Dollar is being exchanged below or above its par value.

Tokenized deposits are also subject to risks. However, the implementation of consistent and stringent regulatory requirements for banks, along with government programs such as deposit insurance, helps mitigate these risks. Additionally, several methods support daily payments involving commercial bank money to settle at par, such as using Fed master accounts (central bank money settlement), Fed intraday lending[208], and lender of last resort programs.[209] Nonetheless, uninsured deposits can create significant risk as illustrated by the Silicon Valley Bank (SVB) collapse in March 2023. Government programs should consider adaptions to support tokenized deposits.

There are various solutions being considered globally to mitigate exchange-related risks for tokenized deposits and stablecoins, including (1) use of central bank money in settlement, and (2) private sector approaches to token variances and loss apportionment.

BIS suggests a first approach with CBDC as the solution in a tokenized world, emphasizing that settlement with central bank money ensures settlement at par value.[210] However, the Federal Reserve has been skeptical of the necessity of a wholesale CBDC[211]:

> *Although the technological features and potential arrangements of tokenized platforms could potentially prove useful, a new settlement asset in the form of wCBDC is not essential for these platforms to transfer central bank money. Should arrangements exist that involve private-sector participants, they may increase risk across all central bank payment services and may therefore require a different type of account.* ***New central bank money is not the only solution, since legal agreements can designate accounts on another payment system as being legally comparable to master accounts. Thus, questions surrounding the necessity of a new settlement asset specifically for wholesale payment transactions should instead be framed as questions regarding risk appetite for how the private sector can use central bank money****.(emphasis added)*

As discussed earlier, the recent executive order from the White House prohibits the creation and use of a CBDC:[212]

> *The digital asset industry plays a crucial role in innovation and economic development in the United States, as well as our Nation's international leadership. It is therefore the policy of my Administration to support the responsible growth and use of digital assets, blockchain technology, and related technologies across all sectors of the economy, including by….taking measures to protect Americans from the risks of Central Bank Digital Currencies (CBDCs), which threaten the stability of the financial system, individual privacy, and the sovereignty of the United States, including by* ***prohibiting the establishment, issuance, circulation, and use of a CBDC within the jurisdiction of the United States****. (emphasis added)*

A hybrid solution is Fnality , which offers access to a riskless settlement asset as an alternative to CBDCs.[213] By leveraging DLT and a permissioned ledger, Fnality provides a digital representation of central bank reserves, ensuring the same credit quality as central bank money.[214] This ensures instant, final settlement of transactions, reducing settlement risk, and enhancing efficiency.[215]

Nonetheless, lack of access to central bank accounts necessitates the exploration of the second approach including private solutions provided by FMUs to ensure the singleness of money. FMUs currently use several mechanisms to manage the various risks they and their members face, including membership standards, collateral and margin, and close out and allocation procedures to facilitate liquidation in the event of a member default.[216] Management of losses varies depending on the FMU, from allocation across remaining members to direct allocation to the failing party.[217]

The Swiss Bankers Association articulated three Deposit Token backing models[218]:

- **Standardized Token:** Any interested commercial bank can issue its own deposit token, which must comply with technical norms and be fully backed by secure and highly liquid reserves.
- **Joint Token:** A special-purpose vehicle (SPV) jointly owned by the participating commercial banks issues a single deposit token that is fully or partially backed by secure and highly liquid reserves.

- **Coloured Token:** Each commercial bank issues its own deposit token and is free to determine its technological basis and the underlying reserves. The only common feature in this scenario is that all issuers are regulated.

Of the three models, the Swiss Bankers Association favors the Joint Token.[219] Economically, it allows choice in reserve backing without compromising value retention. This freedom aids money creation and reduces the need to charge for deposit token settlement services, enhancing its public good nature. The Joint Token can earn interest if bank-held and simplifies reserve segregation compared to the Standardized Token. However, such proposals would require discussion among a broad set of commercial banks, whose liquidity and credit profiles may vary significantly.

Broad Interoperability

In a 2021 speech, BIS General Manager Agustin Carstens stated: “In its simplest terms, interoperability refers to the ability to make something happen in one payment system based on something happening in another payment system”.[220] The introduction of digital currencies raises critical interoperability issues, each of which challenge adoption. First, with the integration of digital currencies, money will have an additional repository – digital wallets. These wallets will hold tokens and/or entries on blockchains and ledgers, thus exchange mechanisms between bank accounts and wallets are necessary.

Second, while current payment systems do not interoperate (ACH transactions are not delivered as wires), bank and non-bank accounts are equipped to handle most payment forms. Digital currencies do not currently have that luxury, and adoption is further challenged by the fact that some currencies cannot transit across blockchains. We describe this challenge in the remainder of this subsection.

A reflection of the success of U.S. payment systems is their ubiquity, meaning they can reach a vast majority of users. Widespread accessibility is achieved because most banks (and thus bank accounts) are connected to the primary payment networks. Even exceptions such as real time payments (RTP) will soon achieve this level of ubiquity.

However, current payment systems typically don't interoperate, meaning payments are unique to each “rail”. [221] Globally, there are over 425 payment systems, including RTGS, ACH, Check Clearing, RTP, and Local Card Switches.[222] There are also government payment systems, FX mechanisms, and securities settlement systems. New systems like FedNow and RTP still lack interoperability.[223] Traditionally, these systems do not interoperate but instead connect separately to banks and bank accounts.

According to the BIS, **there are many reasons why payment systems may not be interoperable with each other**[224]:

- **Technical Differences:** Payment systems frequently rely on different technical standards, communication protocols, and underlying hardware and software infrastructure. These inconsistencies make it difficult for them to seamlessly exchange information and process transactions.

- **Data and Semantic Meaning:** A significant hurdle arises from the "different languages" spoken by various payment systems. This refers to inconsistencies in data formats, terminology, and interpretations. While translation mechanisms can be employed, inaccuracies can lead to data loss or corruption, hindering smooth communication between systems and creating potential compliance

infractions (for example, violations of the Travel Rule, which requires financial institutions to pass on certain information to the next financial institution).[225]

- **Business Rule Variations:** Each payment system operates under specific business rules that govern aspects such as platform access, settlement procedures, and participant obligations. Discrepancies in these rules between systems can create significant barriers to interoperability.

The success achieved thus far by current payment systems has occurred without interoperability between payment rails. Instead, users make rail selections through their bank accounts and wallets (for electronic money). This approach has provided users with choice, although it sacrifices certain attributes such as system failover capabilities.

Interoperability can increase the efficacy of payment systems. Research by SWIFT has shown that interoperability can significantly reduce costs and increase efficiency in cross-border payments, particularly when combined with other innovative technologies such as instant payment systems. Conversely, lack of interoperability has consequences, (e.g., reduced adoption and higher overhead for banks and non-banks).On the other hand, interoperability also carries risks, (e.g., broadening the cyber-attack surface).

Digital wallets will hold tokens and/or entries on blockchains and ledgers. **The creation of this (digital wallets) additional repository introduces greater complexity and challenges to overcome concerning interoperability**:

- **Liquidity Fragmentation**: Numerous public and private DLT networks operate simultaneously, each with their own rules, security models, consensus mechanisms, and development environments, which create isolated ecosystems.[226] This isolation hinders the seamless flow of value and data between networks, trapping liquidity.

- **Diverse Regulatory Regimes**: Various DLT networks operate globally and span jurisdictions with different rules. The Markets in Crypto-Assets Regulation (MiCA) establishes uniform EU market rules for crypto-assets not currently regulated by existing financial services legislation[227], while the U.S. does not yet have a uniform federal regulatory framework. This discrepancy presents a challenge for DLT systems that need to comply with multiple concurrent sets of rules.

- **Difficulty Integrating with Legacy Payment Systems:** Traditional payment systems often rely on complex messaging between independent databases for reconciliation and settlement, leading to frictions and delays.[228] Integrating these systems with DLT-based infrastructure requires addressing challenges related to security, transaction atomicity, and real-time authorization. Given the breadth of existing payment systems, and the costs of integration, interactions between traditional payment and distributed ledger technology systems pose further delivery challenges.

The feasibility of using new instant instruments on older, non-instant rails is currently questionable. Expecting batch systems to become real-time is likely unrealistic. And yet, ensuring interoperability between digital instruments and rails is more crucial to avoid unnecessary complexity that could hinder adoption. **Key factors for enabling Digital Dollar adoption include**:

- **Standardization:** Developing common standards for Digital Dollar tokens, smart contracts, and digital identities can play a critical role in promoting interoperability.[229] Standardized token representations can streamline distribution and management, enabling tokens and data to move seamlessly across

various DLT networks.[230] These standards can reduce fragmentation by ensuring that different systems can understand and interact with each other effectively.[231]

- **Open-Source Technology:** Open-Source software is publicly accessible, which allows for a larger population to review code for potential issues, increasing quality and transparency.[232]
- **Modularity:** A modular platform is one where components perform specific tasks. Modular programmable platforms "boast high adaptability with specialized DLT infrastructure for specific tasks, offering greater design flexibility", a recent report with contributions from Mastercard, Citi, et al. states.[233]
- **Risk Assessment Frameworks**: Robust risk assessment frameworks are essential for financial institutions to safely integrate DLT based systems. Such frameworks can help identify and manage the security and compliance risks associated with the introduction of Digital Dollars and DLT infrastructure.
- **Rule and Regulation Harmonization:** Harmonizing Anti-Money Laundering (AML) and KYC standards and ensuring the consistent application of AML and CFT (Combating the Financing of Terrorism standards could prevent financial crimes, while also reducing regulatory arbitrage.[234] In addition, expanding the KYC boundary has the potential to be a catalyst for adoption and innovation, while also reducing operational cost.

There are multiple approaches to interoperability solutions for the underlying DLT networks, which aim to enable seamless communication and interaction between different DLT networks through different validation methods and capabilities, including token swaps, bridges, and contract calls.[235]

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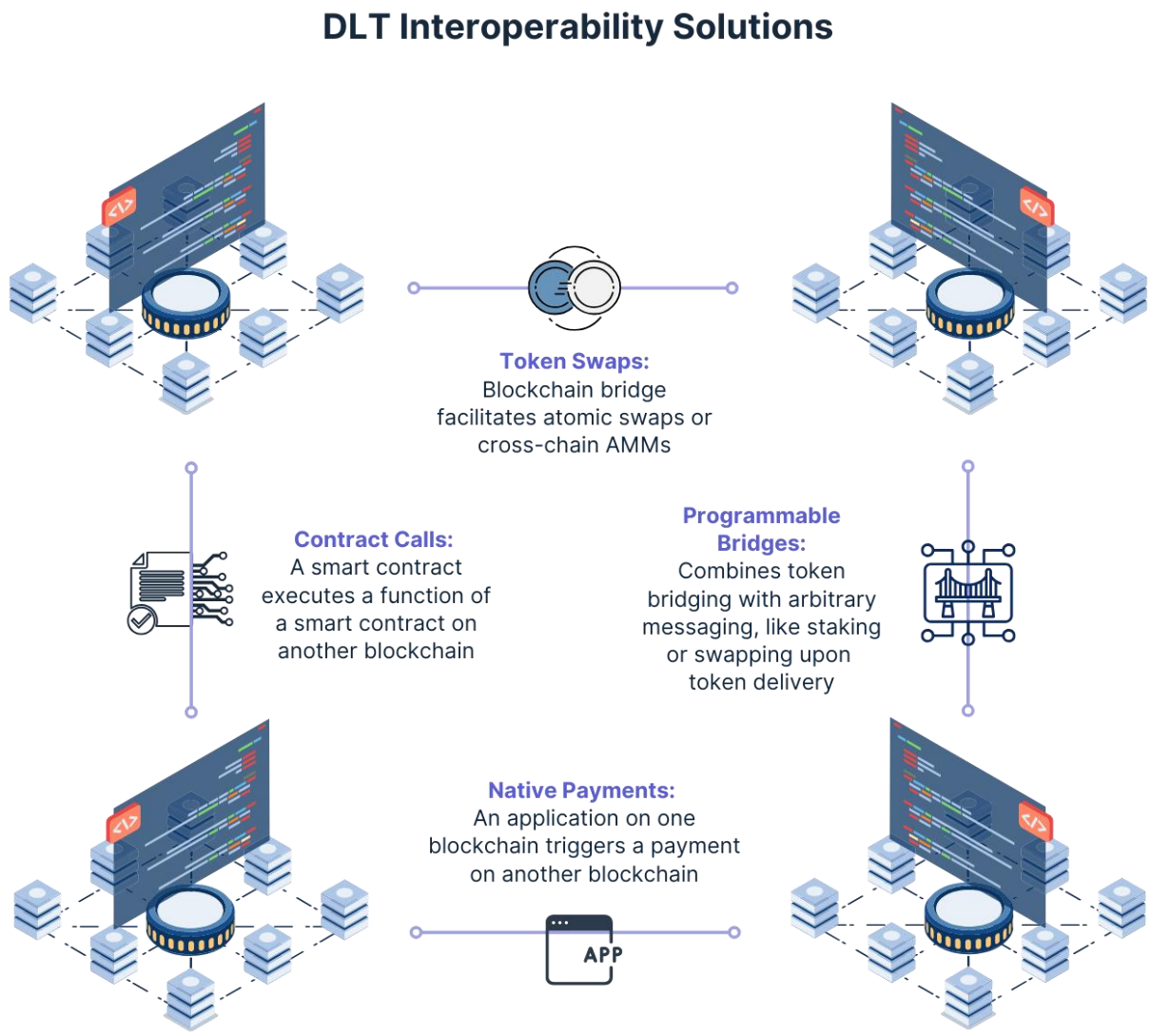

Source: "What Is Blockchain Interoperability." Chainlink, 9 Aug. 2023.

Another example is the Monetary Authority of Singapore (MAS) proposed interlinked Network Model (INM) where independent DLT networks are connected through cross-network protocols, allowing for the verified transfer of assets and messages between them.[236] This approach could mitigate liquidity fragmentation by connecting isolated ecosystems and enabling seamless money movement across networks.

The BIS in its exploration with large institutions and central banks has conceptualized three models for broad consensus and CBDC interoperability[237]:

- **Compatible Systems**: This approach emphasizes building national CBDC systems with standardized technologies and data structures, supporting common frameworks, but requiring bespoke interoperability solutions.
- **Interlinked Systems:** This model connects distinct national CBDC systems via technical interfaces or common clearing mechanisms, enabling direct cross-border payments between different systems through agreements and coordination, or utilizing settlement accounts distributed among central banks or centralized via an intermediary. An example of this model is SWIFT's CBDC Connector which

successfully established interoperability between different CBDC networks and connections to traditional payment systems for cross-border transactions.[238] This was accomplished by developing a "Connector Gateway" that acts as a standardized interface, translating messages and facilitating seamless communication between distinct systems.[239]

- **Single Multi-Currency System (mCBDC):** This model suggests one system for multiple CBDCs, with a unified rulebook and access criteria, possibly on a shared ledger. An example of this model is Project mBridge, which successfully developed a prototype for a multi-CBDC platform to facilitate cheaper, faster, and more transparent cross-border payments.[240] These patterns can be extrapolated for Digital Dollar instruments.

Realizing the full potential of Digital Dollars requires overcoming the challenges of interoperability, likely through the implementation of Digital Dollar networks that leverage one of these patterns.

Acceptance of Digital Dollars

The adoption and usage of Digital Dollar instruments requires broad acceptance at points of sale (POS), as payroll, in foreign exchange (FX) settlement, as vendor payments, and in other financial transactions. Acceptance is a multifaceted issue that ties directly into our population-driven hypothesis. This hypothesis posits that different user groups have varying motivations and challenges when it comes to adopting digital financial tools. Sophisticated users, such as those in the repo market, are typically well-funded and motivated to leverage digital instruments for their efficiency and potential cost savings. In contrast, corporate users often face significant considerations, including the complexities of maintaining favorable bank relationships, where lending spreads are, at times, influenced by the size of deposit balances. Consumers, on the other hand, are primarily driven by the potential for lower FX spreads and faster transaction speeds.

One commonality across all use cases and populations is the need for the issuance of Digital Dollar tokens. The private sector has made material contributions to this function, including the issuance of Digital Dollars in the form of Tokenized Deposits and Stablecoins. The examples in the prior section (Developing the Business Case) demonstrated this, including Kinexys by J.P. Morgan, Citi Token Services and the Regulated Settlement Network. As an additional example, Visa is helping migrate fiat currencies onto blockchains with Visa Tokenized Asset Platform (VTAP). VTAP enables financial institutions to issue and manage fiat-backed tokens on blockchain networks. BBVA is testing VTAP to create tokens on the public Ethereum blockchain and expects to launch a live pilot with customers in 2025.[241]

It is also necessary for Digital Dollars on distributed ledgers to “off-ramp” back into traditional financial systems and non-DLT networks. This is true not only because many payees do not currently accept tokens, but also because the ability to “off-ramp” ensures end users can choose between accounts or wallets to store money. Here too, the private sector has already developed innovative solutions. For example, PayPal provides the ability to check-out and pay with its PYUSD stablecoin. The stablecoin is converted into fiat currency at the moment of the purchase, which is received by the merchant in a manner consistent with any other PayPal transaction.[242] More broadly, stablecoins can be converted into fiat currency via robust secondary markets as highlighted previously. S&P Global recently wrote, “Secondary market liquidity for USDC is strong, with significant liquidity on several centralized exchanges.”[243] Existing RTGS systems and ACH are commonly utilized to transfer fiat dollars from exchanges into the traditional banking system.

The efforts of the private sector demonstrate readiness for value migration into Digital Dollar instruments in the form of tokenized deposits and stablecoins. Similarly, novel solutions to return Digital Dollars to the ledgers of the traditional financial system provide further comfort for Digital Dollar end users. Also, as discussed earlier in this section and in later sections, harmonized and transparent regulations and standards across the U.S. will enable clarity and confidence in the models and processes required to accept and transact with Digital Dollar instruments.

Recommendations to Promote Adoption

- **Stable Value:** Trade associations, legislators, and policy institutes should advance legislation and provide regulatory clarity on licensing requirements, reserves requirements, disclosure standards and governance models for stablecoins and tokenized deposits, balancing innovation and investor protection objectives.
- **Ease of Settlement:** Financial institutions and FMUs should conduct further research on the relative trade-offs between, and feasibility of, the main loss absorption approaches.
- **Broad Interoperability:** Industry leadership should be at the forefront of interoperability standards and approaches, with trade associations and market utilities, especially those with clearing and settlement functions, taking a leading role in domestic interoperability efforts. These organizations have the necessary resources and influence to drive consensus and standardization across the financial landscape globally. However, it is important to expand beyond established associations and include a broader range of participants, such as fintech companies and stablecoin operators, to ensure comprehensive and forward-looking solutions.
- **Acceptance**: Financial institutions and FMUs should continue to prepare for the migration of value into Digital Dollar instruments, while also encouraging the development and adoption of innovative solutions for off-ramping Digital Dollars back into traditional financial systems. Additionally, FIs and FMUs should promote the use of stablecoins and tokenized deposits for retail and high value payments by highlighting the benefits they provide.

Mitigating Risks

While Digital Dollars and the technologies that enable them offer numerous potential benefits, their implementation and adoption are not without inherent risks. It is essential to acknowledge and address these risks proactively to mitigate potential negative consequences and ensure a stable, secure, and compliant financial system. **There are two broad areas of risk**:

- **Risks to the Stability of the Financial System:** These risks pose potential disruptions to the overall functioning of the financial system. They include impacts on lending activities and increased liquidity demands.
- **Risks Related to the Use and Misuse of the Financial System's Services and User Data:** These risks include challenges related to keeping services available and compliant, while protecting privacy and keeping data secure.

Risks to the Stability of the Financial System

Financial stability is a broad concept. The Federal Reserve offers the following definition of financial stability:

> *Financial stability is about building a financial system that can function in good times and bad and can absorb all the good and bad things that happen in the U.S. economy at any moment; it isn't about preventing failure or stopping people or businesses from making or losing money. It is just helping to create conditions where the system keeps working effectively even with such events….A financial system is considered stable when financial institutions--banks, savings and loans, and other financial product and service providers--and financial markets are able to provide households, communities, and businesses with the resources, services, and products they need to invest, grow, and participate in a well-functioning economy…..Consumers and businesses just know that they can finance large expenses like the construction of a factory, or that their savings are safe, or that they'll be able to get short-term loans to make payroll.*[244]

Based on this definition, **two risks emerge for exploration and potential mitigation**:

- First, the potential impact to deposit bases, and thus lending, resulting from the introduction and widespread adoption of the various Digital Dollar instruments. For example, if consumers or businesses purchase CBDC or stablecoins instead of depositing funds at banks, the ability to lend and spur economic growth may be impaired. Mitigants to this example largely focus on caps on holdings as well as limiting their use cases to dealings among financial institutions, i.e., wholesale transactions.
- Second, the tension between the reduction of settlement risk (enabled by instant payments and smart contracts) and resulting liquidity risks. Mitigants include relaxation of instant mandates and utilization of Liquidity Savings Mechanisms (LSMs).

Impacts to Lending Activities

In this section, the risk to deposit bases and lending are analyzed for each Digital Dollar instrument. It is worth noting that while there are numerous such studies, there is not yet a consensus on the magnitude of the risks.

Tokenized Deposits

Tokenized deposits could have a neutral or even positive impact on credit provision.[245] This is because, from the perspective of the issuing bank, tokenized deposits are simply a different mechanism for recording existing deposit liabilities. They do not fundamentally change the bank's asset composition or its ability to engage in fractional-reserve lending.[246]

Stablecoins

Risks posed by stablecoins vary based on the source of backing and source of inflow. Research published by the Federal Reserve considers **two scenarios that could negatively impact credit intermediation**:[247]

- **Deposits Flowing to Stablecoins Backed by Central Bank Reserves:** This could reduce banks' lending capacity and lead to higher interest rates.[248]
- **Deposits Flowing to Stablecoins Backed by Cash-Equivalent Securities:** Depending on the source of inflow and mechanics of securities transactions, this could lead to a change in bank deposit bases and thus loan portfolios.[249]

Stablecoins also introduce other risks:

- **Potential Shortages of Safe and Liquid Assets:** Stablecoins could unnecessarily tie up liquidity by using safe and liquid assets such as cash and treasuries as collateral backing, potentially creating a shortage of these assets for other purposes, such as helping banks meet regulatory liquidity requirements.[250]
- **Run Risk:** During periods of market stress, the value of the collateral backing stablecoins, such as bank deposits or treasury securities, could decline. If this decline is significant, it can lead to the stablecoin losing its peg and potentially triggering a run as holders lose confidence in its ability to maintain a stable value.[251]

Central Bank Digital Currencies

CBDCs pose several risks to the deposit bases of commercial banks. There are three broad ways in which a CBDC may affect financial stability. First, a CBDC may increase the financial sector’s vulnerability to destabilizing runs. Second, a CBDC may weaken financial stability by reducing the ability of banks to extend credit during times of stress. Third, to the extent a CBDC is made more broadly available than other digital central bank liabilities (e.g., traditional reserves), it could make the financial system more unstable by providing a perfectly safe asset to all depositors.[252]

CBDC substitution risk is not limited to bank deposits. “[T]he systemic risks are not limited to banks: A CBDC could be an attractive place to quickly move funds from nonbank financial intermediaries, such as money market funds (MMFs).[253]

The recently issued executive order supports the thesis that CBDC poses risks to the stability of the financial system.[254] Given the directive, the issuance and use of a CBDC within the U.S. will be prohibited for the foreseeable future.[255]

Mitigants to Lending Activity Risk

Several possible mitigants are being considered in other jurisdictions to address potential impacts to lending activity. Consideration in future U.S. efforts to mitigate this risk may be prudent. These potential mitigants include:

- **Developing a Stablecoin Reserve Framework:** Asset-backed stablecoins could be integrated into a two-tiered, fractional reserve banking system without negatively impacting credit intermediation.[256] In this setup, stablecoin reserves are held as commercial bank deposits, allowing banks to continue fractional reserve lending and maturity transformation as they do with traditional deposits.[257] A narrow banking framework, where stablecoin issuers must back their coins with central bank reserves, could minimize the risk of runs but might reduce credit intermediation.[258]
- **Ensuring Proper Disclosure:** While novel SEC-registered arrangements, such as Figure's YLDS, offer yield, they are not FDIC-Insured, nor are the issuers Insured Depository Institutions.[259] Similar to the decision whether to hold excess cash in a money market fund or in a deposit account, product features and risks present trade-offs. Ensuring proper disclosure facilitates decision making based on natural incentives and moderates the risk of destabilizing shifts in holdings that could impact financial stability.
- **Imposing Interest Rate Caps and Holding Limits**: Preventing stablecoins from offering yield or interest payments to holders is being considered as part of the recently proposed stablecoin legislation known as the GENIUS act.[260] This could reduce the attractiveness of substituting bank deposits with stablecoins. Holding limits can control the pace of adoption and help prevent a sudden and massive influx into CBDCs or stablecoins, which could disrupt the stability of banks. This could also reduce the risk of a run, as limiting individual holdings can mitigate the risk of large-scale redemptions that could destabilize the financial system.[261] The European Central Bank (ECB) proposes a 3,000 EUR individual holding limit for its digital euro.[262] Similarly, the United Kingdom is actively discussing the implementation of holding limits for CBDC and stablecoins, recognizing the potential for CBDCs and stablecoins to scale rapidly and destabilize banks.[263]

Increased Liquidity Demands

The use of DLT and smart contracts enables atomic settlement, simultaneous, irreversible asset, and funds transfers between parties. Atomic settlement mitigates settlement risk (the risk of non-delivery of cash or securities), but may create a different risk, the demand for increased liquidity and thus the risk of inability to raise such quantities of cash. This subsection discusses settlement risk and illustrates how atomic settlement mitigates that risk, while serving as a potential catalyst for increased liquidity risk. Mitigants for the resulting liquidity risk conclude this subsection.

Settlement Risk

Settlement risk describes the potential for two parties in a financial transaction to agree to trade, but one then fails to deliver, causing monetary harm in the form of credit and/or replacement loss (e.g., buying the same security at a subsequently higher price).

Given the sheer volume of financial transactions, daily liquidity demands and settlement risks are considerable. "[I]ntraday liquidity needs can be sizeable and usually much larger than participants' net daily obligations, especially during times of stress."[264] Although intraday credit demand has recently

declined, from 2003 to 2020, U.S. FedWire Fund Transfer Participants collectively used an average of $630 billion of intraday liquidity every business day.[265]

A separate but related risk stems from the reliance on a small number of large institutions for intraday credit. Specifically, a high degree of inequality in liquidity provision indicates that the large value payment system (LVPS) is overly reliant on a small number of participants to ensure the smooth functioning of the system.[266] This reliance on a few key liquidity providers creates a vulnerability. If those specific participants choose to hoard liquidity, or face circumstances that prevent them from supplying it, particularly during times of stress, it could disrupt the ability of other participants to settle their obligations.[267] This could potentially cascade and disrupt the broader financial system.[268]

In payments, especially cross border payments, FX settlement risks must also be considered. One party to a currency trade may fail to deliver the currency owed, resulting in significant losses. FX spot transactions typically take around two days to settle. During this period, both payment senders and recipients face settlement and credit risks. Some of this is mitigated by trading arrangements known as payment-versus-payment (PvP). However, the proportion of transactions settled on a payment-versus-payment (PvP) basis has dropped below 40 percent in recent years, which has heightened settlement risk exposure across the FX market.[269]

Mitigating Settlement Risk While Increasing Liquidity Risk

Traditional payment systems and processes, such as wires, afford the option of delaying payments during a business day.[270] In contrast, atomic settlement does not have that flexibility, which can increase liquidity requirements.

The simultaneous, irreversible asset or fund transfers between parties facilitated by atomic settlements function as an automated form of Payment versus Payment (PvP) settlement. The entire transaction either succeeds or fails, eliminating the risk of partial transactions. This boosts efficiency, reduces counterparty risk, and could revolutionize transactions, making it a key area for innovation.[271] Furthermore, eliminating settlement periods via atomic settlement is a straightforward approach to eliminating credit extensions and related dependencies.

While simultaneous settlement is probably always desirable, instant settlement may not be. First, it can significantly restrict the set of permissible trades. As stated by the Fed, “For a trade to be instantly settled, all legs of the transaction must be “settle-able” at the moment the trade is executed, which makes netting of settlement obligations difficult”.[272] Whether a trade involves securities or cash, this rules out a significant portion of today’s financial activity in which traders enter trades with the expectation of obtaining the security or the cash necessary for settlement later. In other words, only trades in which cash and securities are pre-positioned can be executed which can increase liquidity demands for both banks and non-banks. This can pose challenges for liquidity management, as participants may not always have immediate access to the required funds. The requirement for costly collateral to secure intraday credit can incentivize participants to delay payments while waiting for incoming funds.[273]

In addition to the greater liquidity burden, instant settlement can fundamentally alter the information environment in which traders operate. The decoupling between trading and settlement enables traders to negotiate trades without revealing any information about their past activities. With instant settlement, traders can only sell securities they already hold, which reveals information about past trades. This can result in various issues. Knowing that a trader must own the asset she is trying to sell

reveals information that can be exploited by buyers. Thus, instant settlement requires advance disclosure of ownership, itself creating risks, known as a "hold-up problem".[274]

Mitigants for Increased Liquidity Risk

Liquidity risk, specifically the potential for a bank or non-bank to lack adequate cash and/or marketable securities to fulfill obligations, has multiple potential mitigants. Mitigants include liquidity savings mechanisms ("LSMs", e.g., netting of payment obligations prior to settlement) and the adoption of enabling technologies. LSMs are designed to optimize the flow of payments within a system, reducing the immediate liquidity demands of atomic settlement. Project Jasper implemented an LSM in the form of a central queue successfully improving liquidity efficiency.[275] Participants submit non-urgent payments into this queue, where they are netted and offset, minimizing the need for instant liquidity.

Recommendations to Reduce Risks

- **Collaborative Dialogue on Atomic Settlement and Liquidity Requirements:** Financial institutions and non-bank financial institutions, and their trade associations should engage collectively to measure and understand the potential effects of atomic settlement on liquidity requirements and its implications for existing liquidity risk management frameworks, such as the Liquidity Coverage Ratio (LCR). Collaborative dialogue would help identify key issues and potential solutions.
- **Developing Liquidity Saving Tools for Real Time Gross Settlement:** FMUs and their users would also benefit from exploring and developing liquidity-saving tools to mitigate liquidity risks in real time gross settlement scenarios. These innovations could help mitigate the increased liquidity demands that may arise from atomic settlement, ensuring that the benefits can be realized without compromising the overall stability and efficiency of the financial system.

Risks Related to the Use and Misuse of the Financial System's Services and User Data

Financial Crimes

In the *2024 National Strategy for Combatting Terror and Other Illicit Financing*, the U.S. government acknowledges that illicit finance threatens U.S. national security, prosperity, and the viability of democracy.[276] Protecting these tenets requires monitoring and evaluating the evolving threats and vulnerabilities to the U.S. financial system—across both traditional bank and nonbank services and the increasing evolution of alternative, decentralized and web-native financial activities—the most consequential of which includes:

- **Money Laundering**: The criminal practice of processing ill-gotten (delineated by specified 'predicate offences') gains through a series of transactions (or occasionally a single transaction) so that they appear to be proceeds from legal activities.[277]
- **Drug Trafficking**: The illegal transporting of or transacting in controlled substances.[278]
- **Terrorist Financing**: The provision of funds or financial support to individual terrorists, terrorist groups, or other maligned non-state actors.[279]
- **Sanctions Evasion**: The deliberate attempt to remove or conceal the involvement of places, entities, or individuals sanctioned by national or international authorities in a transaction or series of transactions.[280]

- **Counterfeiting**: Creating fake currency that imitates the original pursuant to deceiving individuals or the financial system at large to believe the fake is of equal value to the real thing.[281]
- **Fraud**: The intentional misrepresentation of information or identity to deceive others, the unlawful use of a credit or debit card or ATM, or the use of electronic means to transmit deceptive information, to obtain money or other things of value.[282]
- **Tax Evasion**: The failure to pay or a deliberate underpayment of taxes.[283]

The AML / Financial Crimes Compliance (FCC) risks of Digital Dollars are not substantially different than for other financial products, and the current regulatory framework, with some adjustments, can mitigate that risk to acceptable levels. In fact, tokenization presents additional opportunities for mitigation not present in traditional financial products.

The BIS discusses two different design options for stablecoins and tokenized deposits: (1) the Digital Bearer Instrument Model (“Bearer Model"); and (2) the Non-Bearer Instrument Model (“Non-Bearer Model”).[284] From a financial crime perspective, these models present different levels of risk.

From a financial crimes perspective, the bearer model poses a greater inherent threat than the non-bearer model. Evaluation of the financial crime risk arising from each model hinges on the differences in the transfer process; specifically, the ability to transact electronically outside of the visibility, or KYC boundary, of a Bank Secrecy Act (BSA) regulated financial institution. In the bearer model, tokens are transferable without the issuer's involvement.[285] This lack of engaged awareness may pose a KYC challenge. Once a token is transferred by the customer to whom it was issued, the issuer may not know the identity of the recipient. These challenges were raised by BIS and are known as the "KYC Boundary" issue, a source of regulatory ambiguity.[286,287]

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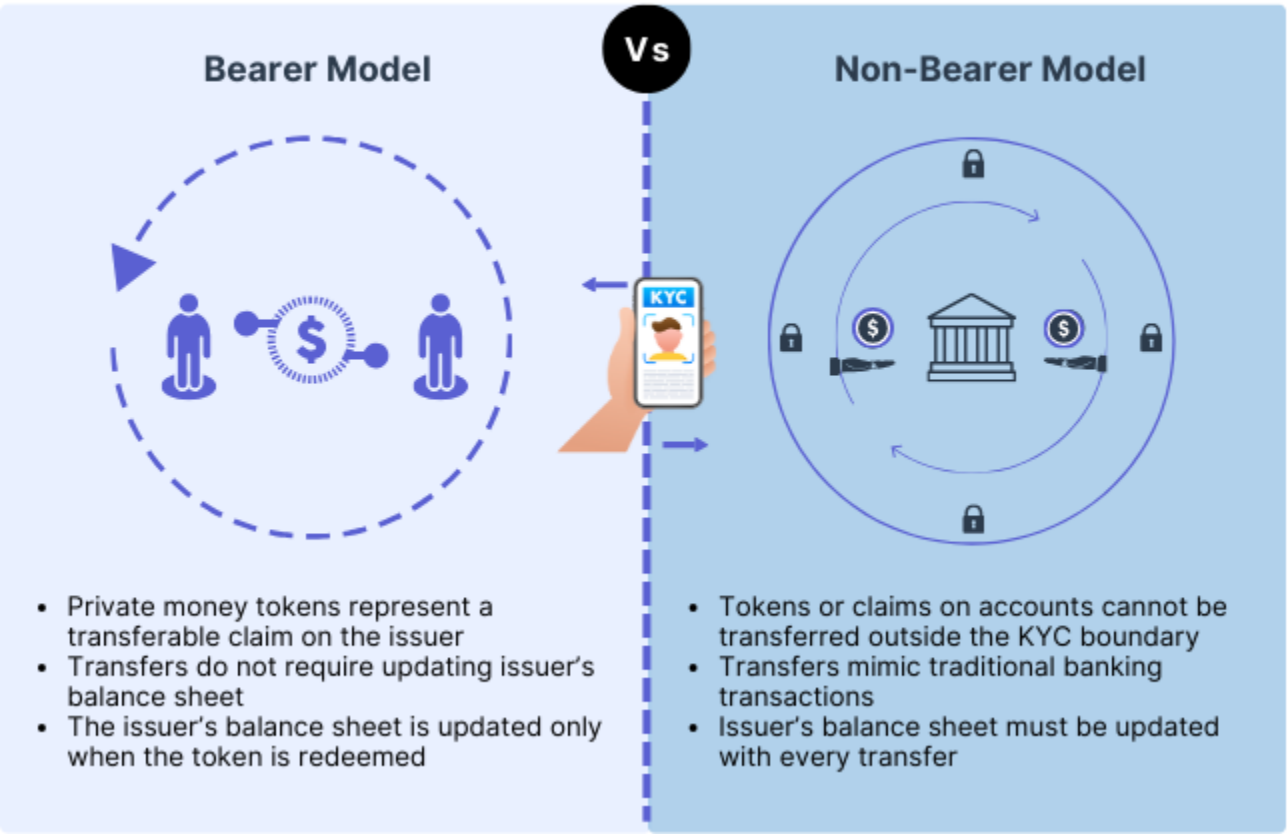
Comparison of Bearer and Non-Bearer Models



Source: Garratt, Rodney, et al. "Stablecoins Versus Tokenised Deposits: Implications for the Singleness of Money." Bank for International Settlements, 11 April 2023.

Despite the higher risks of the Bearer Model, regulators can apply appropriate technological mitigants and safeguards to reduce financial crime risks. The Non-Bearer Model can also leverage existing AML controls and structures given that the risk is similar to other products that offer stored value and transfer; however, regulators should consider targeted legislative and technological controls. Today's financial system includes numerous financial integrity mitigants that protect consumers against identity theft and fraud. As the enabling technologies evolve, so do the tools for embedding essential AML/FCC compliance controls. These innovations aim to address evolving financial crime threats and modernize financial system integrity controls in an increasingly tokenized, internet-native, and global financial services ecosystem.

Mitigants for Financial Crimes Risk

Tokenization facilitates capabilities and attributes that contribute to stronger controls and provide an opportunity for legal and regulatory frameworks to equally modernize. Mitigation opportunities include:

- **Digital ID**: Modernizing identity credentials and verification will help financial market infrastructure providers comply with Personal Financial Data Rights policy objectives[288] in the digital financial services economy as recently emphasized by the Consumer Financial Protection Bureau (CFPB) and the White House in 2024.[289,290]

- **Technological Infrastructure**: Developing industry perspective and consensus on the risks and benefits of non-permissioned DLT networks enhances risk management strategies and aligns regulatory frameworks.
- **Blockchain Tracing and Analytics:** Promoting user awareness of blockchain tracing techniques (including know your wallet/token) and their relationship to privacy considerations will enhance users' understanding of how their data is tracked and protected, support the prevention and monitoring of financial crime, and foster more informed and secure participation in the digital financial ecosystem.
- **Wholesale Network Access:** Exploring a KYC registry (allow list) and establishing minimum participation requirements, similar to the SWIFT Customer Security Programme[291], will enhance the security and integrity of wholesale network access by ensuring that only verified and compliant entities participate, thereby reducing the risk of financial crimes and facilitating trust among network participants.

There are additional safeguards that central banks could explore to mitigate the financial crime threats associated with the emergence of Digital Dollars:

- **Transaction and Volume Limitations:** Implementing transaction and volume limits enhances security by setting predefined thresholds for token issuance, distribution, and custody, as well as transaction limits at points of sale or P2P, and deposit/reload limits. These measures help prevent individuals from circumventing limits by acquiring multiple accounts or devices.
- **Self-Hosted Wallet Safeguards:** To mitigate financial crime risks associated with transactions outside the KYC boundary using bearer tokens, regulators should establish safeguards for self-hosted wallets, such as limits on the number of wallets per device, storage and transaction limits, and geographic restrictions. Conversely, non-bearer tokens, which remain within the KYC boundary, pose similar risks to other regulated financial products like prepaid access. With appropriate guidance, regulators can rely on financial institutions to implement their own risk-based controls for these tokens.
- **Intermediary Obligations:** The mitigating effect that an intermediary may have on financial crime risk will increase with its regulated status. Unregulated intermediaries are less likely to have regulatory oversight and internal controls to deter, detect, and report illicit use. Regulators may consider safeguards that include requiring intermediaries to implement some form of compliance program.

Privacy

Privacy is a fundamental human value that has evolved with societal norms, technology, law, and security.[292] Traditionally linked to physical seclusion, the concept of privacy now includes personal autonomy and freedom from surveillance.[293] The digital age has introduced new issues such as online privacy and aggregation and sale of personal information, requiring a balance between individual rights and national security.

This era of innovation provides a unique chance to refocus on privacy, raising the bar beyond the norms individuals have grown accustomed to in a data-driven economy. In the context of this paper, privacy is defined as the capacity for individuals to exert control over the collection, utilization, disclosure, and sharing of their personal information with third parties.

Distinguishing Privacy and Anonymity

As explained in the Digital Dollar Project's inaugural 2020 White Paper, a completely anonymous, untraceable payment system would indeed protect personal privacy, but would also facilitate illegal and illicit behavior.[294] Rather than focusing on complete anonymity, decisions about privacy should be framed using a set of fundamental questions, addressing from whom should one's information be kept private, what aspects require protection, how long shared information should persist, and for what explicit purposes such information may be used. This perspective underscores the significance of responsible management of personal data, rather than pursuing complete obscurity, and allows us to better understand what privacy means under which specified conditions and to better define objectives and core requirements for Digital Dollars. Ultimately, privacy will be optimally preserved by a Digital Dollar design that is private by default, preserves cash-like characteristics, improves the financial privacy of the account-based status quo, promotes accessibility, protects against undue surveillance, and is secure at every layer.[295]

Existing Financial Privacy Regulatory Landscape in the United States

The United States has yet to enact a comprehensive federal data privacy law; instead, it relies on a complex web of industry, audience, and data-specific federal privacy and data security laws and regulations (e.g., health care, banking and financial services, children's data, biometric data), as well as state privacy laws aimed at consumer protection (e.g., the California Consumer Privacy Act and similar recently-enacted state laws).

The U.S. financial privacy regulatory framework is administered and overseen by various government agencies, such as the Federal Trade Commission (FTC) and the Consumer Financial Protection Bureau (CFPB). While financial institutions do have significant control over their services and contractual terms with clients, they are also subject to regulations designed to protect consumer data. For example, the Gramm Leach Bliley Act (GLBA) requires financial institutions to explain their information-sharing practices to their customers and to safeguard sensitive data.[296] Although financial institutions operate within a framework that aims to foster innovation and protect consumer information, some limitations exist:

- **Consent-Based Regulation*:*** U.S. financial institutions' requirements with respect to the privacy of financial information are generally limited to informing individuals of their rights and any changes to the institutions policies and procedures. The absence of robust privacy regulations leaves commercial data brokers free to exploit consumer financial information and to collect and sell vast amounts of detailed transactional and precise geolocation data.[297] Privacy concerns raised by these practices include the unrestricted availability of such data for purchase by a wide variety of entities, including U.S. and foreign law enforcement and national security agencies, with little oversight or protection against the circumvention of existing constitutional protections against unreasonable searches and seizures.[298,299]

- **Data-Heavy AML Regulation*:*** AML protocols, integral to modern financial institutions, have evolved into highly data-intensive systems. These mechanisms, rooted in the objective of thwarting illicit financial activities, necessitate vast tranches of transactional and personal data to identify suspicious patterns and behaviors. The Bank Secrecy Act (BSA), often regarded as the cornerstone of U.S. AML legislation, mandates financial institutions to maintain meticulous records of specific transactions and promptly report potentially questionable activities.[300] Through tools such as Currency Transaction Reports (CTRs)[301] and Suspicious Activity Reports (SARs)[302], the BSA ensures that a steady

stream of data flows from financial institutions to governmental agencies. While meaningful in curbing money laundering and financial fraud, this data-intensive approach has sparked concerns around individual privacy, data security, and operational overheads for institutions.[303]

- **Limits of Fourth Amendment Protections Against Unreasonable Governmental Searches and Seizures*:*** Institutions managing electronic payments products such as tokenized deposits and stablecoins have commercial interests and are not subject to the Fourth Amendment privacy protections.[304]

Mitigants to Privacy Risk

Given the unlikelihood of a near-term overhaul of the current U.S. privacy framework, it is crucial to consider the potential integration of Digital Dollars into the current framework. As indicated by the recent executive order related to digital financial technology, Digital Dollars should not pose new risks to the privacy of individuals.[305] Digital Dollars should be developed under existing laws and regulations requiring regulated financial institutions and non-bank financial institutions to detect and prevent money laundering and other financial crimes. To foster widespread acceptance both among users and within governmental structures, Digital Dollar instruments must consider the privacy-preserving design choices discussed above, seeking to maintain or improve upon existing individual privacy standards and the prevention of financial crime. Well-designed Digital Dollars present a unique opportunity to reassess Americans' rights to financial privacy while developing a strong and secure complement to existing payment methods in the U.S.

Cybersecurity

An inconsistent approach to cybersecurity, including tail risks such as quantum computing hacks, increases the likelihood of bad actors finding weak points, resulting in stolen funds, fraud, and other financial crimes.

Cyber Risks

Implementations involving DLT and smart contracts are subject to several cyber risks. Cyber risks manifest in various forms, including wallet hacking, digital key compromise, 51% takeovers of distributed ledger technology systems, and sophisticated quantum computing attacks. **Key points of vulnerability include smart contract code, cross-chain bridges, and both software and hardware infrastructure.** Among the three Digital Dollar instruments, these risks are most prevalent today in stablecoins, where non-bank issuers leverage distributed ledgers that are connected to the open internet.

- **Private key management**, the processes and practices used to securely generate, store, use, and dispose of cryptographic private keys, remains a critical vulnerability in blockchain infrastructure. Poor handling of private keys can lead to significant financial losses, as seen in multiple high-profile events. For instance, private key compromises accounted for nearly half of the total financial losses in 2023, despite representing only 6.3 percent of all incidents.[306] Phishing attacks, a common social engineering tactic, target users to reveal their wallet's "recovery seed" or trick them into performing fraudulent transactions.[307] While often reported to be related to distributed ledger technology infrastructure, it should be noted that these attacks can occur in both decentralized and centralized systems.

- **Smart contracts** have proven to be prone to several types of vulnerabilities. For example, when a malicious contract repeatedly calls a function in another contract before the first function call is

completed, it is called a "**r**eentrancy attack" and it may lead to unauthorized fund drains.[308] Smart contracts also often rely on oracles, which are used to access data from other sources. If an oracle is compromised, it can lead to incorrect data being fed into the contract, resulting in financial losses.[309] Errors in the design and coding of a smart contract can also lead to vulnerabilities. For example, Euler Finance suffered a reported $197 million loss due to a vulnerability in its smart contract logic.[310]

- **Cross-chain bridges**, inherently complex systems that facilitate the transfer of assets between different blockchain networks, are particularly vulnerable. Their complexity increases the attack surface, providing opportunities for attackers to exploit vulnerabilities. The more components and interactions involved, the higher the likelihood of bugs or security flaws. Breaches in cross-chain interoperability led to $799 million in losses from 35 incidents in 2023.[311] These bridges often suffer from issues related to proof generation and verification, making them prime targets for attackers.
- **Internet infrastructure-related vulnerabilities,** such as those involving cloud service providers and internet-connected (hot) wallets, are significant. For example, the Mixin Network lost $200 million due to a breach in its cloud service provider's database. Similarly, compromised hot wallets have led to substantial losses, as seen in the 2023 CoinEx hack.[312]

Quantum Computing Risk

Quantum computing represents a transformative advancement in technology, leveraging the principles of quantum mechanics to solve complex mathematical problems exponentially faster than classical computers. This capability poses a significant threat to the cryptographic foundations of tokenized assets. As quantum computers develop, they could render widely used encryption methods insecure, leading to potential security breaches in modernized financial systems. **There are three types of quantum attacks**[313]:

- **Network Interception:** Quantum computers could intercept information transmitted via networked and wireless communications, posing a significant threat to the security of transactions.[314]
- **Identity Impersonation:** Quantum computing could enable bad actors to break cryptographic encryption of digital signatures and impersonate individuals on a DLT network, bypassing verification checks and performing unauthorized actions.[315]
- **Harvest Now, Decrypt Later:** This method involves intercepting and storing encrypted data with the intention of decrypting it later once quantum computers become more advanced. This poses a long-term threat to the security of data that is currently considered safe under classical encryption methods.[316]

Broadly, quantum computers increase the potential of attacks that rely on computing power, such as with 51% takeover attacks. These attacks could have significant implications. This risk exists today in traditional finance. Given the ability of quantum to break cryptographic encryption, this risk extends to the distributed ledger technology infrastructure likely to underpin Digital Dollar use cases.

Mitigants to Cybersecurity Risk

There are numerous mitigants to cyber and quantum computing risks, including multi-signature wallets, external audits / assessments, secure token transfer mechanisms, and more. Across all activities, general risk management frameworks play a vital role in establishing a comprehensive approach to security. The

NIST Risk Management Framework (NIST RMF) is a widely adopted methodology used by both public and private sector organizations. It outlines a seven-step process for managing security and privacy risks: Prepare, Categorize, Select, Implement, Assess, Authorize, and Monitor[317]. This iterative approach helps organizations continuously evaluate and improve their security posture throughout the lifecycle of their information systems. The NIST Cybersecurity Framework (NIST CSF) further complements the NIST RMF by offering a set of guidelines specifically tailored for managing cybersecurity risks in critical infrastructure.[318]

Specific design choices and controls can help address cyber and quantum computing vulnerabilities and threats:

- **Robust Key Management**: Implementing multi-signature wallets, which require multiple parties to authorize transactions, significantly reduces the risk of single points of failure and enhances overall security. Utilizing hardware security modules (HSMs) ensures that private keys are stored in a secure, tamper-resistant environment, further protecting against unauthorized access. Adhering to encryption key standards such as "NIST Special Publication 800-57 Part 2"[319] and "Federal Information Processing Standards Publication 140-3 (FIPS 140-3)"[320] helps maintain the security and integrity of cryptographic keys, providing a robust foundation for digital asset security. Implementing new measures as computing power and capabilities evolve will also be crucial.

- **Smart Contract Security:** Conducting regular and thorough audits of smart contracts by reputable security firms can identify and fix vulnerabilities before deployment, minimizing the risk of exploits. These audits should include comprehensive code reviews, security analysis (such as threat modeling and vulnerability identification), and functional testing to ensure the robustness of the smart contract code. By addressing potential weaknesses proactively, these measures help safeguard the integrity and functionality of smart contracts.

- **Cross-Chain Protocol Security:** Developing more secure and reliable cross-chain protocols and performing regular security assessments can mitigate risks associated with cross-chain interoperability. Security assessments should involve thorough security audits and code reviews to identify vulnerabilities, logical errors, and potential attack vectors, as well as threat modeling to assess the impact of different types of attacks. Implementing a decentralized infrastructure with multiple nodes eliminates single points of failure, making cross-chain protocols more resilient and secure. This approach ensures that no centralized party can control the network or gain unfair advantages such as front running transactions.

- **Secure Token Transfer Mechanisms:** Implementing secure token transfer methods such as burn-and-mint, lock-and-mint, or lock-and-unlock reduces the risks associated with transactions on DLT networks. These approaches provide defense-in-depth security through decentralized oracle networks and advanced cryptographic techniques, protecting user assets from unauthorized access, theft, or manipulation during cross-chain transfers. They also ensure transparency and provability, as transactions can be cryptographically verified and the history of token transfers is immutably recorded, providing a high degree of transparency and auditability.

- **Robust Monitoring and Rate Limiting:** Implementing independent risk management networks to monitor transactions and halt suspicious activity is an effective mitigation strategy. Establishing rate limits on token transfers helps manage the amount of value flowing across chains over time, mimicking current securities exchange controls and reducing the potential for loss in a responsible

manner. These measures help maintain the integrity and security of transactions by preventing excessive or suspicious activity.

- **Cryptographic Agility:** Updating cryptographic algorithms in response to real-time threats helps to counter evolving attack techniques enabled by quantum computing.[321] For instance, current encryption methods such as Rivest-Shamir-Adleman (RSA), a public-key encryption algorithm that uses a private and public key pair to secure data, should be supplemented with new algorithms, particularly as computing power evolves. Key encapsulation mechanisms (KEM) and digital signature algorithms (DSA) are expected to be implemented to enhance the security of communication protocols and verify electronic signatures.[322]

Overall, mitigating cybersecurity risks in relation to the use of distributed ledger technology infrastructure requires a multifaceted approach that combines robust risk management frameworks, comprehensive security controls, and proactive measures to address emerging threats.

Recommendations to Reduce Risks

Financial Crimes

As it relates to financial crimes, regulators, along with industry leaders, should review certain regulations and oversight processes.

- **Activities and Practice Approaches for AML/FCC Regulation:** Comprehensive application of AML/FCC regulation related to Digital Dollar use cases should be predicated on an 'activities and practices' approach. This is consistent with the approach of international standard setters in AML/FCC compliance. For example, this is consistent with the Financial Action Task Force (FATF) and the Financial Stability Board (FSB) Recommendations for the Regulation, Supervision and Oversight of Crypto-asset Activities and Markets, which stipulated that regulatory frameworks should be applied based on the principle of "same activity, same risk, same regulation".[323]

- **Promoting Best Practices and Regulatory Guidance:** Further clarity can be provided through the promotion of best practices, no-action letters, regulator-supported testing, administrative rulings, and other guidance. Such efforts would enable transparent innovation and market deployment, consistent with essential financial system integrity and consumer protection objectives, while also using a risk-based approach and targeting 'covered' activities and practices.

- **Evaluating FCC Regime for Financial Inclusion:** An effective FCC regime should also be explicitly evaluated on the manner in which an institution securely and compliantly engages those financially underserved, excluded, or poorly served from the traditional financial sector. FATF explicitly stated that financial inclusion "...also expands the scope of traceable transactions, facilitating the detection, reporting and investigation of suspicious transactions, thereby reducing overall money laundering (ML) and terrorist financing (TF) risks. Financial inclusion and financial integrity are thus mutually reinforcing."[324]

Privacy

The Digital Dollar Project published its Privacy Principles for a Digital Dollar in 2021.[325] At the time, the principles focused on one Digital Dollar instrument, CBDCs. The principles resonate today, in the broader context of the Digital Dollar and the conversation related to privacy. They should be referenced as the engagement and design of Digital Dollars advances. **The privacy principles state that a Digital Dollar should**:

- **Improve the Account-Based Financial Privacy Status Quo**: A Digital Dollar should improve the level of financial privacy offered today by digital payment mechanisms. A Digital Dollar must provide tangible benefits compared to existing digital payment alternatives and should be evaluated against current levels of financial privacy.
- **Exhibit Cash-Like Characteristics for Digital Commerce**: A Digital Dollar should play a role similar to cash – a private, safe, and censorship-resistant transaction medium – for digital commerce. Physical cash transactions today generally do not require authorization or approval and are free from surveillance under certain dollar thresholds – qualities that a Digital Dollar should share.
- **Protect Against Undue Corporate Tracking and Government Surveillance:** A Digital Dollar should be designed not to require the sharing of identifiers that readily tie transactions to individuals. Law enforcement and other governmental access to Digital Dollar usage data should be limited by policy and technology, consistent with Fourth Amendment precedent.
- **Be Private by Design:** Privacy should be built into the code of a Digital Dollar. A Digital Dollar should leverage encryption techniques and privacy-enhancing technologies to the greatest extent feasible to ensure that it is free of undue surveillance. A Digital Dollar should strive to maintain significant separation between users' information and transaction data to minimize reliance on personal identifiers.
- **Facilitate Accessible and Transparent Design and Policy Choices:** A Digital Dollar should improve users' access to financial services. Legal and regulatory structures should enable an inclusive level of onboarding. The Digital Dollar system should be open, transparent, and interoperable, drawing competition into financial services that produce better services at lower costs.
- **Be Secure by Design:** Every layer of the Digital Dollar system, from the base transaction infrastructure through user interfaces to the users themselves, must be secure. A Digital Dollar must be secure against alteration, counterfeiting, theft, and other cyber-attacks.

Cybersecurity

To better protect against cyber and quantum computing risks associated with Digital Dollar use cases, public and private sector leaders, together with industry consortia such as the Financial Services Information Sharing and Analysis Center (FS-ISAC), may be well served to **consider several key protection measures**:

- **Security Features**: Implement multi-signature wallets and hardware security modules (HSMs) for robust key management. Develop secure cross-chain protocols and use secure token transfer methods like burn-and-mint to protect digital asset transactions.
- **Controls**: Conduct regular audits of smart contracts to identify and fix vulnerabilities. Establish independent networks to monitor transactions and halt suspicious activity and implement rate limits on token transfers. Maintain cryptographic agility by updating algorithms in response to real-time threats to counter evolving attack techniques.
- **Frameworks**: Review the NIST Risk Management Framework (NIST RMF) and the NIST Cybersecurity Framework (NIST CSF) to continuously evaluate and improve security measures, creating a comprehensive approach to managing cybersecurity risks in digital currencies.

Areas for Collaboration

It is imperative that the U.S. continue leading the modernization of money. To do so, the public and private sectors must actively participate and work collaboratively to build the business case, promote adoption, and mitigate risks. To this end, we recommend the following actions:

Financial Institutions and Non-bank Financial Institutions

Financial institutions (FIs) and non-bank financial institutions (NBFIs) should drive broader (enterprise-level) business cases and foster stronger industry commitment to innovative products and services. Strong enterprise business cases will spur foundational, infrastructure-level support of Digital Dollars across banking and payment systems, incorporating end user benefits across numerous segments. Areas for collaboration include:

- **Fostering Commitment:** Generating institution-wide support for Digital Dollars and the underlying technology. This commitment will pave the way for a more robust and innovative financial ecosystem.
- **Identifying Differentiated Opportunities**: Exploring segment level client needs to identify opportunities for innovative and differentiated products and services utilizing Digital Dollars.
- **Incenting Client Behavior:** Delivering and articulating clear value for utilization of new products and services.
- **Expanding Addressable Market:** By mitigating risks, such as settlement risks, and offering products and services to previously underserved segments (e.g., those with higher risk profiles).
- **Promoting Internal Cross-Functional Awareness:** Informing and supporting internal teams in business, operations, and technology to understand the benefits and implications for existing processes and operations (e.g., new financial crime mitigation techniques). Strong cross-functional awareness will ensure smooth integration and promote the adoption of Digital Dollars and the underlying technologies.

FMUs and Consortiums

FMUs and consortiums should align on new potential settlement and loss-mutualization models along with broader risk and operational frameworks. These organizations also play a crucial role in driving interoperability initiatives and developing common standards. By fostering collaboration among industry participants, they can help improve adoption rates and lower the costs of integration. Areas for collaboration include:

- **Exploring New Settlement Models**: Investigating and developing new models for settling transactions that leverage the benefits of DLT and smart contracts. This includes exploring atomic settlement techniques, usage of liquidity-saving mechanisms (LSMs) to manage liquidity risks, and loss-mutualization approaches to address variability in instrument values.
- **Standardizing Operational Frameworks and Building Resilient Systems:** Developing standardized operational procedures and frameworks to ensure industry-wide consistency and security. This includes creating guidelines for secure token transfer mechanisms and robust key management practices. Additionally, build robust and secure systems capable of withstanding cyber threats and

operational disruptions by implementing advanced cryptographic techniques and quantum-resistant cryptographic methods to safeguard digital assets against future quantum attacks.

- **Facilitating Interoperability**: Leading the development of common standards and approaches to enable interoperability. This includes developing observable cross-chain protocols and performing regular assessments to mitigate risks associated with cross-chain interoperability.
- **Implementing Systems**: Ensuring systems provide the optimal balance between individual privacy and the prevention of financial crimes.
- **Advocating for Industry Needs**: Representing the interests of the industry in discussions with regulators and policymakers can help to ensure that the regulatory environment supports innovation and growth. This includes advocating for clear and consistent regulations that address the unique challenges of Digital Dollars, such as privacy and cybersecurity concerns.

Legislators, Trade Associations, and Policy Institutes

Legislators must work together with trade associations and policy institutes to address regulatory ambiguity and advance legislation that creates opportunities for responsible innovation. Clear and consistent regulations are essential for fostering trust and encouraging investment in new technologies. Areas for collaboration include:

- **Clarifying Regulatory Frameworks**: Providing clear guidelines on how existing regulations apply to new technologies and developing new regulations where necessary to address gaps. This includes defining and standardizing federal regulatory requirements for tokenized deposits and stablecoins, ensuring transparency, security, and consumer protection while fostering innovation. Specifically, this entails:
    - *Resolving KYC Boundary Challenges:* Define the implementation and governance of KYC processes for bearer token models. Regulators should clarify if the transferee becomes an account holder of the transferor's institution upon transfer, or mandate that all tokens be burned upon transfer, with value exclusively held by the transferee. Clear governance must be established to ensure confidence in value transfer to enable adoption.
    - *Clarifying Tokenized Deposit Issuance for Banks:* Provide clear guidelines, regulations, and regulatory approval processes for banks to ensure secure and compliant practices for the issuance and use of tokenized deposits (e.g., interbank transfers).
    - *Establishing Stablecoin Governance:* Harmonize state regulations and clarify the role of, and need for, federal prudential regulators to eliminate regulatory conflicts, enable robust risk management practices, and ensure the transparency of stablecoin reserves.
- **Protecting Consumers**: Implementing regulations that protect consumers from fraud and abuse, while allowing for innovation and growth in the financial sector. This includes establishing robust privacy standards and ensuring that financial institutions continue to implement effective AML and financial crimes compliance (FCC) measures.
- **Ensuring Financial Stability While Encouraging Competition:** Preserve the health of the deposit base and banks' ability to lend by incorporating safeguards and establishing a thoughtful stablecoin

reserve framework that contemplates potential impacts to bank deposits, while fostering innovation and market competitiveness.

By working together to modernize the dollar, we not only preserve the dollar's strength in the evolving digital economy, but we also make our financial system more resilient and efficient.

Your feedback and collaborative engagement are essential to our collective ability to navigate the transformative, and crucially important, path to modernizing the dollar for the future of digital networks.

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Conclusion

Modern money is changing and changing rapidly in the evolving Twenty-First Century. It is expanding from fungible cash bills and electronic notations on the balance sheets of central and commercial banks to unique digital notations on new digital infrastructure operated by global decentralized collectives, national sovereign governments, and private sector entities. Tokenized deposits are increasing, stablecoins are multiplying, and CBDCs (non-U.S.) will continue to be deployed and, even, exported as "CBDCs in a box" for the developing world.

Thus, whether or not any one country deploys central bank digital currencies, the world's citizens will be dealing with: tokenized deposits, stablecoins, and CBDCs in the century to come. The future is all of the above. It is a coming kaleidoscope of interconnected digital networks of value.

The Digital Dollar Project serves to ask three questions: how best to modernize the U.S. dollar for this rapidly emerging future of digital networks of value, how to maintain the dollar's premier reserve currency status amidst it and, perhaps, more critically, how to preserve and enhance the values for which the dollar has historically stood – free enterprise, global commerce, and free economic expression.

This paper addresses these questions by comparing and contrasting the primary emerging forms of Digital Dollars: tokenized deposits and stablecoins. It considers the many advantages that would accrue to the U.S. dollar and the business case for modernizing it with emerging digital technologies of tokenization, distributed ledger technology, and smart contracts. It identifies the range of benefits from reductions in cost and risk to greater improvements in transaction speed and collateral efficiency. It catalogs the numerous private sector developments and innovations providing early demonstration of these benefits. The paper notes that perhaps the most important benefit to come from modernizing the U.S. dollar is in reinforcing its status as the world's reserve currency.

Having developed the use case for U.S. dollar modernization, this paper focuses on specific actions that, when combined, form the basis for a high-level roadmap for private and public sector stakeholders to jointly deliver. Step 1 is to ensure that stakeholders see value in the Digital Dollar journey. Step 2 is to collaborate and execute with imagination, courage, and conviction. Success on this journey will require:

- Development of a target infrastructure, which must be accompanied by retirement of legacy technology and processes. Otherwise, complexity and cost will continue to grow.
- New governance, certainly in terms of specific rules and regulations, and perhaps in terms of entities. Otherwise, new products will be provider-specific, and not part of a robust network.
- Openness to new technologies and methods. This should include mitigants to quantum computing threats and may also include consideration of permissionless networks. Otherwise, the U.S. will follow, not lead, the development of critical standards.
- Respect for user requirements, including privacy. If cash is to be replaced, the rights of ownership inherent in self-custody and the use of non-custodial wallets must be supported. Without respect for key user requirements, adoption will stall.
- Difficult regulatory decisions, not least of which is whether (or not) the "same risk, same rules" approach will apply.

This list is not additive to the roadmap described within the paper. Rather, it illustrates the challenges and tradeoffs that stakeholders face. We have every confidence that the journey will be taken. The opportunity is immense, including improved user experiences, optimized deployment of capital and liquidity, reduced risks and costs, and the ongoing stability of the world's premier financial system in the era of digital networks.

Let's work together to ensure that the future of digital currency not only preserves the viability of the U.S. dollar and its reserve currency status but also enhances universal values of free enterprise and free economic expression against rival instruments characterized by government and commercial digital surveillance, censorship, and control.

It is time to modernize the U.S. dollar for the digital currency networks of the 21st Century. We must do that, not only to put the dollar on the cutting edge of speed, reliability, accessibility, and inclusion, but also so that it reflects its enduring virtues of financial freedom and economic liberty.

Acknowledgements

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The Digital Dollar Project and the authors hereof appreciate the extraordinary support of lawyers affiliated with Willkie Farr & Gallagher LLP in preparation of this Working Paper. Nevertheless, the view expressed herein do not necessarily reflect the views of Willkie Farr & Gallagher LLP.

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