sifma
Invested in America

May 20, 2022

Ann E. Misback, Secretary
Board of Governors of the Federal Reserve System
20th Street and Constitution Avenue, NW
Washington, D.C. 20551

Submitted via email. Appendix also submitted via: https://www.federalreserve.gov/apps/forms/cbdc

Re: Money and Payments: The U.S. Dollar in the Age of Digital Transformation Discussion Paper on a Potential U.S. Central Bank Digital Currency (CBDC)

Dear Ms. Misback,

The Securities Industry and Financial Markets Association ("SIFMA")[1] appreciates the opportunity to respond to the recent discussion paper published by the Board of Governors of the Federal Reserve System (hereafter "the Board") entitled "The U.S. Dollar in the Age of Digital Transform," which discusses issues related to the potential introduction of a U.S. central bank digital currency ("CBDC").[2]

We welcome the Board's decision to publish this document, which is an important "first step in a public discussion" on whether to adopt a U.S. CBDC. We also welcome the President's recent Executive Order on Digital Assets which, among other things, calls for the U.S. Treasury to produce its own report on this subject[3]. Both the Board's discussion paper and the forthcoming reports from the administration will help

[1] SIFMA is the leading trade association for broker-dealers, investment banks, and asset managers operating in the U.S. and global capital markets. On behalf of our industry's nearly 1 million employees, we advocate on legislation, regulation, and business policy affecting retail and institutional investors, equity and fixed income markets, and related products and services. We serve as an industry coordinating body to promote fair and orderly markets, informed regulatory compliance, and efficient market operations and resiliency. We also provide a forum for industry policy and professional development. SIFMA, with offices in New York and Washington, D.C., is the U.S. regional member of the Global Financial Markets Association.
[2] Board of Governors of the Federal Reserve System, "Money and Payments: The U.S. Dollar in the Age of Digital Transformation," January 2022 (hereafter "Federal Reserve discussion paper"). Available at: Money and Payments: The U.S. Dollar in the Age of Digital Transformation (federalreserve.gov).
[3] The White House, "Executive Order on Ensuring Responsible Development of Digital Assets," March 9, 2022 (hereafter "Executive Order on Digital Assets"). Available at: Executive Order on Ensuring Responsible Development of Digital Assets | The White House.

foster public discussion of this important topic and generate engagement with a wide range of stakeholders that would be impacted by the introduction of a U.S. CBDC.

Before undertaking what would be "a highly significant innovation in American money,"[4] policymakers need to be clear on why a U.S. CBDC is needed and what problems it would address. Much qualitative and quantitative analyses still need to be conducted in the coming years to properly evaluate whether the costs of this significant change to our existing system of money would outweigh the benefits, particularly given the high degree of efficiency and reliability of existing payments systems for both institutional actors and consumers. These analyses should include, but would not be limited to, an evaluation of the effects of different types of CBDC systems on financial stability and the implementation of monetary policy; on key short-term funding markets; on existing payments systems, with which any CBDC would need to be interoperable; on consumer privacy; as well as on anti-money laundering (AML) and sanctions regimes. Given that much more study needs to be undertaken to properly understand these benefits and costs, we do not take a position on the desirability of adopting a U.S. CBDC in this response.

Instead, we seek to highlight the potential impacts of a U.S. CBDC on the capital markets. Given that 73 percent of all U.S. economic activity is funded through capital markets activities, it is vital that capital markets impacts be a central consideration for policymakers considering adoption of a U.S. CBDC.

This focus on the capital markets also leads us to spend more time examining the design and potential use cases for a "limited purpose" or "wholesale" CBDC (referred here to as "wCBDC") that would be used for institutional financial transactions rather than a more widely available public "retail" CBDC ("rCBDC"). As we discuss, there are several potential capital markets use cases for wCBDC, many of which have already been the subject of tests and experimentation. These use cases highlight some of the potential benefits of wCBDC, particularly in the cross-border payments space; they also help us better understand important policy and design tradeoffs that would need to be considered prior to implementation.

While we are not yet able to opine on the desirability of adopting a U.S. CBDC, we do believe that if policymakers were to move forward with adoption at some future point, the primary focus should be on wCBDC, at least initially. This would allow further time to consider and evaluate the risks that a more widely available rCBDC may present. A wCBDC would be less disruptive to the financial system and financial stability than a rCBDC; it would provide a testing ground for experimentation of key systems amongst a small group of sophisticated and established financial actors; and has more proven and obvious use cases than a rCBDC. A wCBDC would also be less politically fraught, raising fewer concerns around issues such as consumer privacy than a rCBDC. A wCBDC may also be helpful in preserving the U.S. dollar's status as a reserve currency and as the predominant currency for international financial transactions in a way that a rCBDC would not.

Beyond these general points, we make the following recommendations in our response:

- ***Access:*** in addition to our view that a wCBDC ought to be the primary focus of policymakers initially, we recommend that direct access to any wCBDC be restricted to institutions that are subject to a framework of regulation and supervision that is comparable to that currently in place for institutions with access to Federal Reserve master accounts and services. The Board could also consider whether the imposition of activities restrictions on non-bank institutions would be warranted.

[4] Federal Reserve discussion paper, p. 3.

- ***Legal Status:*** it is crucial that the legal status and treatment of any U.S. CBDC (whether under statute and/or through regulation) be made equivalent to the legal status of legacy fiat currency, and that both be fungible with one another. There should also be clarity and consistency regarding key terminology, particularly as it pertains to CBDC "tokens."

- ***Prudential Treatment:*** any U.S. CBDC should be treated in an analogous fashion to other central bank money under international prudential standards and domestic rules, particularly with respect to capital, liquidity, and reserve requirements.

- ***Risk Management:*** wCBDCs should be incorporated into existing risk management processes and solutions for clients and policymakers should avoid imposing any new, additional risk charges on financial institutions handling wCBDCs. However, wCBDC design and implementation should bear in mind considerations related to operational risk, credit and liquidity risk and cyber risk, and adopt design features to minimize them.

- ***Domestic and Cross Border Interoperability*:** wCBDCs ought to be able to operate alongside legacy instruments and systems rather than replace them in order to both minimize disruptions to the financial system and given that legacy systems have become significantly more efficient in recent years. Planning for interoperability will require coordination with market participants, infrastructure providers, and the regulators who oversee them domestically. International coordination between regulators will be vital in order to realize the potential benefits of multi-CBDC ("mCBDC") arrangements, which *may* include faster, cheaper and more reliable cross-border payments.

- ***Programmability*:** the potential for wCBDCs to be embedded with logic, or programmability, offers the potential for innovation and new functionality. However, programmability features need to be developed so they do not impair the fungibility of central bank money or introduce operational risk.

- ***Public-Private Partnerships:*** it is crucial that policy making in this area occur in close collaboration between financial institutions, the Federal Reserve and other important government actors whose supervisory functions and regulations could be impacted by a wCBDC. This partnership with market participants and infrastructure providers should extend from the research and decision-making phases through the design and testing of any future wCBDC.

- ***Privacy:*** a wholesale environment does not raise the same sorts of privacy concerns that a rCBDC would. However, privacy concerns are not completely absent from the design of a wCBDC and privacy oriented mitigants need to be embedded from the outset even in a wCBDC system.

- ***Product Specific Considerations*:** it is crucial that not only the general impacts of CBDC be considered, but also the impact of different types of CBDC on specific capital markets products and processes. The review and analysis and potential design process should closely examine how CBDCs (particularly wCBDC) would impact products and process such as securities settlement, the mechanics of monetary policy operation, FX markets and infrastructure, funding models, and cross-border payments.

- ***Securities Settlement*:** wCBDCs have the potential to allow for new settlement models and potentially faster settlement for some transactions. However, the potential impacts of wCBDCs on securities settlement must not be viewed insolation from broader settlement processes and securities markets operations. wCBDC would be neither necessary nor sufficient for the development of new settlement models, and the experiences of pilot programs for faster settlement cannot be generalized

to the markets as a whole, where major challenges exist for settlements on timeframes shorter than T+1.

In the Appendix to this document we also provide direct answers to most of the questions posed by the Board in the discussion paper, which we have submitted separately via the web form the Board has provided.

SIFMA looks forward to engaging with the Board on this subject in the coming months. We also look forward to engaging with the U.S. Treasury and other government departments as they conduct their own CBDC reports as part of the President's Executive Order, and stand ready to engage with other key policymakers, including members of Congress. In particular, we hope that we can act as a resource on capital markets specific impacts of a U.S. CBDC and on the design considerations necessary to implement a wCBDC.

Should you have any questions, please contact Peter Ryan (pryan@sifma.org) or Charles DeSimone (cdesimone@sifma.org).

Sincerely,

Kenneth E. Bentsen, Jr.
President and CEO

cc: Matthew J. Eichner
Michael S. Gibson
Andreas W. Lehnert
Trevor A. Reeve
Mark E. Van Der Weide
David C. Mills
Kavita Jain

1. Scope of Response

CBDC has generally been defined as "a digital form of central bank money that is different from balances in traditional reserve or settlement accounts."[5] Using this definition, CBDC could be employed in two distinct ways: as an alternative to physical currency, allowing members of the public to pay for goods and services (a retail CBDC or "rCBDC"), or as a mechanism for settling financial market transactions between financial institutions (a wholesale CBDC or "wCBDC"). In its discussion paper, the Board defines CBDC in retail terms, envisioning it as "a digital liability of the Federal Reserve that is *widely available to the general public*"[6] (emphasis added). At the same time, the Board invites comment on the potential uses for "narrower purpose CBDCs" such as a CBDC "designed primarily for large-value institutional payments and not widely available to the public" (i.e., a wCBDC).[7]

As noted in our cover letter, in this response, we will concentrate on the impact of CBDC on the institutional capital markets. More specifically, we will focus more on the potential use cases and design considerations related to a wCBDC, while remaining attentive to the implications of a variety of CBDC models for the capital markets and institutional actors. We take this approach for several reasons.

First, SIFMA's membership and expertise are focused on institutional capital markets issues; therefore, we are principally concerned with how different types of CBDC would impact settlement and payments between financial institutions, and what knock-on impacts that would have for specific product classes, funding markets, and the overall stability of the capital markets. This focus inevitably leads to a greater focus on wCBDC design issues instead of those affecting rCBDC.

Second, while much of the debate on CBDCs has been focused on the implications for bank funding models and lending[8], it is important to remember that the U.S. capital markets are critical to financing the real economy and economic growth; indeed, U.S. capital markets fund 73 percent of all economic activity, in terms of equity and debt financing of nonfinancial corporations.[9] It is therefore crucial that we consider the effects of different CBDC design choices (including a range of wCBDC and rCBDC approaches) on the capital markets as part of the broader CBDC debate.

Third, as we will discuss, a wCBDC could have several important potential use cases in areas ranging from securities settlement, cross-border FX transactions, and liquidity and collateral management. As some regulators have noted[10], wCBDC could also help to improve the speed, reliability and costs

---

[5] Committee on Payments and Market Infrastructures Markets Committee, "Central Bank Digital Currencies," March 2018, p. 4. Available at: Central bank digital currencies (bis.org).

[6] Board of Governors of the Federal Reserve System, "Money and Payments: The U.S. Dollar in the Age of Digital Transformation," January 2022, p. 13. Available at: Money and Payments: The U.S. Dollar in the Age of Digital Transformation (federalreserve.gov) – hereafter "Federal Reserve Discussion Paper."

[7] Another way of defining the distinction between these two forms of CBDC is provided in the Bank for International Settlements (BIS) Innovation Hub's Project Dunbar report: "in simple terms, a CBDC is a digital banknote. It could be used by individuals to pay businesses or other individuals (a retail CBDC) or other wholesale market participants in order to settle trades in financial markets or other transactions (a wholesale CBDC)." See BIS Innovation Hub, "Project Dunbar: International Settlements Using Multi-CBDCs," March 2022, p. 3. Available at: Project Dunbar - International settlements using multi-CBDCs (bis.org) – hereafter "Project Dunbar Report."

[8] For example, see Bank for International Settlements, "Central Bank Digital Currencies: Financial Stability Implications," September 2021. Available at: CBDC - User needs and adoption (bis.org) – hereafter "BIS CBDC Financial Stability Implications Report."

[9] SIFMA, *2022 Capital Markets Outlook*, p. 8. Available at: SIFMA 2022 Capital Markets Outlook.

[10] For example, see Ravi Menon, Managing Director of the Monetary Authority of Singapore, "Money at a crossroads – public or private digital money?," remarks at the IMF Seminar on Money at a Crossroads, April 18, 2022. Available at: Ravi Menon: Money at a crossroads - public or private digital money? (bis.org).

associated with cross-border payments, particularly if jurisdictions were to create a multi-CBDC ("mCBDC") platform for commercial banks (though, as we note, the introduction of a wCBDC would be neither necessary nor sufficient to increase efficiency in the system)[11]. We believe it is important to highlight these potential use cases as part of this debate, as well as outline the factors that would need to be considered prior to implementing a wCBDC in different areas of the market.

Finally, we focus principally on wCBDC in this response because it could provide important benefits on a standalone basis; we also believe focusing on wCBDC initially would allow policymakers further time to consider and evaluate the risks that a more widely available rCBDC may present. A wCBDC would be less disruptive to the financial system and financial stability; it would provide a testing ground for experimentation prior to the introduction of a rCBDC amongst a small group of sophisticated and established financial actors; and has more obvious and proven use cases than do rCBDC models given the efficiency and speed of the existing digital payments system for consumers[12]. A wCBDC would also be less politically fraught, raising fewer concerns around consumer privacy than a rCBDC. As such, we believe that the primary focus of policymakers, should they decide to move forward with adoption of a U.S. CBDC, ought to be focused on the design and implementation of a wCBDC, at least initially.

Nonetheless, we are still at the very earliest stages of debate on what would be undoubtedly "a highly significant innovation in American money."[13] Policymakers need to be clear on what problems they are trying to solve for in adopting a U.S. CBDC. In addition, much qualitative and quantitative analyses will need to be conducted in the coming years to properly evaluate whether the costs of this innovation would outweigh the benefits, particularly given that the existing payments system is relatively efficient for both institutional and consumer users. We do not, therefore, take a position on the desirability of adopting a U.S. CBDC (in any form) at this time. Rather, we are focused on the considerations for policymakers as they continue to study this issue – in particular, highlighting design issues related to wCBDC and how different forms of CBDC would impact the capital markets.

[11] See Project Dunbar Report for a more extensive discussion of mCBDC design considerations.
[12] See Menon remarks.
[13] Federal Reserve Discussion Paper, p. 3.

2. CBDC Design Considerations

2.1: Access

Access should begin with wholesale use, at least initially:
As noted above, if policymakers do decide to adopt a U.S. CBDC in the future, we believe their primary focus should be on wCBDC, at least initially. There are several reasons that adopting a wCBDC *could* be beneficial, though further study is needed to fully assess the costs and benefits before moving forward with adoption.

First, at a conceptual level, a wCBDC could serve as a form of central bank money that helps serve as a bridge between an "on-chain" financial system and the traditional financial system. That is, if the financial system evolves such that more transactions and interactions move into a blockchain-based environment and there are new forms of payments and financial services in that system, a wCBDC could serve as means for payments services providers to transfer funds on a wholesale basis within a blockchain environment (*e.g.*, to other payment services providers on behalf of underlying customers) and from a blockchain environment to the legacy financial system (*e.g.*, a transfer of a wCBDC to a traditional central bank reserve balance, which can then be used in the traditional financial system).

Second, although wholesale payments make up the vast majority of payments by value, it would still be significantly less disruptive to monetary policy and financial stability than a more widely accessible rCBDC (with its potential to disintermediate the banking industry and disrupt short-term funding markets)[14], particularly if a wCBDC were confined initially to institutions that already have direct access to central bank money (see discussion later in this section).

Third and related, a wCBDC provides policymakers with the opportunity to study and test a new payments system amongst a relatively small group of sophisticated and experienced financial institutions. This would enable policymakers to address operational issues prior to more widespread adoption.

Fourth, wCBDCs have already been shown in existing experiments to be viable and there are several important use cases where they could improve existing securities markets processes and infrastructure (as outlined later in the document). Moreover, successes in these areas could help with future expansion into the retail space. For example, one of the most-discussed benefits of a wCBDC is its potential to deliver faster, cheaper and safer cross-border payments. While that would have little immediate impact on consumers, the payment rails developed to facilitate cross-border wCBDC applications could lead to improvements in the cross-border payments infrastructure available to retail end-users, which may make it easier for the public to make remittances and other payments across borders.

Fifth, as the Board's discussion paper notes, one of the rationales for adopting a U.S. CBDC would be maintaining the U.S. dollar's status is the most widely used currency for payments and investments, as well its status as the world's reserve currency. A U.S. wCBDC would be well positioned to maintain the currency's reserve status and its predominance in financial markets transactions. In particular, it would support U.S. participation in mCBDC arrangements in the areas where U.S. capital markets play a key role internationally, such as through foreign participation in Treasury auctions, FX markets, cross border

[14] Concerns about the potential negative impacts of a rCBDC on financial stability, particularly concerns about systemic bank runs or abrupt money market fund withdrawals, have been widely discussed. We discuss some of these issues in later sections. See also BIS CBDC Financial Stability Implications Report for a more comprehensive overview of this topic.

payments – both for financial institutions and their corporate clients, as well as cross border investment. It could also be used to support swap line arrangements with other countries that may also adopt a wCBDC, thereby helping to maintain the dollar's reserve currency status. In contrast, a retail-only U.S. CBDC would not support the use of the U.S. Dollar in these markets.

Finally, it would be politically easier to implement as an initial step. A wCBDC would not, for example, incur the same sorts of individual privacy concerns that could arise in a rCBDC context or require the same sorts of considerations of how to allocate risk and liability between the private sector and government with respect to operational and cyber issues.

Institutions with access to wCBDC should be similarly regulated:

Who exactly would have access to central bank money for settlement purposes in a wholesale environment? Direct access to central bank money today is generally restricted to banking organizations and, in certain jurisdictions outside of the United States, a limited number of non-bank, regulated payment systems providers. Limiting access to prudentially regulated institutions has been seen as important for a number of reasons: it allows the central bank to better fulfil its monetary policy objectives, promote financial stability, and ensure the safety and soundness of the banking system.

In a wCBDC context, however, demand for direct access to wCBDC from other, non-bank market participants could grow as those institutions seek to settle transactions directly in wCBDC using their own accounts or wallets (as opposed to the current indirect model, with settlement occurring via a limited number of financial institutions with accounts held at the central bank)[15]. Policymakers would then need to decide whether to expand access to these institutions, and if so, what type of rules and oversight ought to apply to those entities – including whether to impose activities restrictions on nonbank institutions that have direct wCBDC access. And if access is granted, they would also need to settle a variety of important design questions, such as whether CBDCs can be created without pre-funding (i.e., can current central bank money be exchanged for wCBDC rather than increasing the money supply by issuing new wCBDC); whether intraday and end-of-day credit should be available to all participants or selected participants; and whether wCBDC would be recorded as on or off intermediaries' balance sheets (see more on this latter point in Section 2.4 below).

Given these potential challenges, and for a range of practical reasons, we recommend that direct access to wCBDC be restricted to institutions that are subject to a framework of regulation and supervision that is comparable to that currently in place for institutions with access to Federal Reserve master accounts and services. The Board could also consider whether the imposition of activities restrictions on non-bank institutions participating in this system would be warranted.

[15] See Denis Beau, First Deputy Governor, Banque de France, "Wholesale Central Bank Money in Digital Times," Speech at the OMFIF DMI Conference, April 29, 2021. Available at: Wholesale Central Bank Money in Digital Times | Banque de France (banque-france.fr). This issue is also closely related to the current debate around Federal Reserve master account and services access – specifically whether uninsured special purpose depository institutions (*e.g.,* a category that could potentially include a non-bank stablecoin issuer) ought to be able to have access to master accounts. For a discussion of this issue, see SIFMA, "SIFMA Comment on Proposed Guidelines for Evaluating Account and Services Requests (Docket No. OP-1747), July 12, 2021. Available at: Proposed Guidelines for Evaluating Account and Services (sifma.org). Both the Bank of England and the Swiss National Bank have expanded access to, respectively, non-bank payment service providers and regulated fintech companies in recent years. See BIS Innovation Hub, Banque de France, and Swiss National Bank, "Project Jura – Cross-Border settlement using wholesale CBDC", December 2021, p. 21. Available at: Project Jura - Cross-border settlement using wholesale CBDC (bis.org).

Policymakers could also consider whether to phase-in access for non-banks during an initial launch period. There would be a few possible advantages of this approach. The roles and responsibilities of central banks, intermediaries and payment service providers would remain largely the same as today, thereby minimizing risks and potential disruptions to the system. From an operational point of view, it would enable the wCBDC infrastructure to be tested among a limited number of experienced and sophisticated participants whose functions are well known and understood. This would make testing and experimentation easier, and would allow policymakers to study how the wCBDC interacted with legacy payment systems. And there would be other potential advantages: for example, these institutions already have well established anti-money laundering/know-your-customer ("AML/KYC") processes in place, which would better allow supervisors to assess best practice compliance processes and procedures.

2.2: Legal Status

The legal status and treatment of any CBDC should be equivalent to the legal status of legacy fiat currency:

We recognize that there is an ongoing process underway to address the question of the existing legal permissibility of a U.S. CBDC, as mandated by President Biden's "Executive Order on Ensuring Responsible Development of Digital Assets"[16]. Regardless of the outcome of that process, it is crucial that the legal status and treatment of any CBDC (whether under statute and/or through regulation) be made equivalent to the legal status of legacy fiat currency, and that both be fungible with one another. Clearly defining CBDCs as equivalent to legacy fiat currency is necessary for the effective implementation of a wCBDC, and to prevent a range of unintended consequences which could increase costs and risks in the system. These costs and risks would include negative liquidity impacts owing to a bifurcation between activities in CBDC and traditional fiat money markets and infrastructure; it would also reduce the interoperability of infrastructure and create the risk of funding mismatches.

There is a need for clarity and consistency around terminology:

There should also be clarity and consistency regarding key terminology. One area for clarity is the distinction between an "account-based" and "token-based" CBDC system. Many central bank speeches and papers, informed by the existing distinction between bank accounts and cash, have argued that these are distinct types of CBDC systems[17]. An account-based system would operate in much the same way that central bank settlement accounts do today and is rooted in the concept of identity verification; that is, the payment from the account could be verified by knowing the identity of the account holder. By contrast, a token-based CBDC would be based on the ability of the users of the system to verify that the digital store of value (i.e., token) is genuine (others have defined CBDC tokens as "digital representations of value that are not recorded in accounts" – essentially digital banknotes).[18]

---

[16] Executive Order on Digital Assets.

[17] See, for example, Auer, Raphael, and Rainer Böhme, "The technology of retail central bank digital currency," *BIS Quarterly Review*, March 1, 2020. Available at: The technology of retail central bank digital currency (bis.org). See also, Yves Mersch, "An ECB digital currency – a flight of fancy?" Consensus 2020 Virtual Conference, May 11, 2020. Available at: An ECB digital currency – a flight of fancy? (europa.eu). See also, Kahn, Charles M., Francisco Rivadeneyra, and Tsz-Nga Wong, "Should the Central Bank Issue E-money?" Bank of Canada Staff Working Paper 2018-58, December 2018. Available at: Should the Central Bank Issue E-money? (bankofcanada.ca).

[18] Note that there is some debate about whether the distinction between accounts and tokens makes sense in the digital context, principally because cryptocurrency tokens are stored on a blockchain, meaning there is an electronic record showing transfers between users (even if the identities of the users cannot be verified). For example, see Rod

For example, to the extent any CBDC regime is indeed based on a token-based model, it would raise legal questions that an account-based approach (one that is essentially is identical to the current system) would not.[19] As noted, the digital token cannot be stored locally, but the private key that allows for the transfer of the tokens on the blockchain is stored locally. Should the legal framework then be updated so that the private key is considered the bearer instrument rather than the digital object/token? That is, should the key be rated as equivalent to physically holding the token or asset? Related to this is the question of who ought to be responsible for the loss of the private keys: should it be the owner or would it be a third-party service provider if one was used? These and likely other questions would need to be resolved in any legal framework, ideally in a manner that was consistent with other major jurisdictions across the globe.

2.3: Prudential Treatment

Any U.S. CBDC be treated in an analogous fashion to other central bank money under prudential rules:

Consistent with the discussion above on legal status, we recommend that any U.S. CBDC be treated in an analogous fashion to other central bank money under international prudential standards and domestic rules, particularly with respect to capital, liquidity and reserve requirements. That means that CBDCs ought to be generally considered as risk free assets. More specifically, this would involve treating them as Level 1 High-Quality Liquid Assets ("HQLA"); classifying them as central bank cash for the purposes of the Net stable Funding Ratio ("NSFR") Available Stable Funding ("ASF") measure; and treating them in like manner to central bank reserves for the purposes of exemptions to the Supplementary Leverage Ratio (SLR; this only would apply in certain jurisdictions). Were CBDCs to be given a less favorable prudential treatment than central bank reserves, their usability for regulated firms that comprise the core of the wholesale market would be significantly reduced, impacting participation in the system and market efficiency.

Separately, we support the Basel Committee's decision in its 2021 Consultation on the Prudential Treatment of Crypto Assets to exclude CBDCs from the scope of its proposed prudential framework[20]. We believe that CBDCs should remain out-of-scope in the final Basel framework as well as under any domestic prudential rules governing banks' involvement in cryptoassets.

Garratt, Michael Lee, Brendan Malone, and Antoine Martin, "Token- or Account-Based? A Digital Currency Can Be Both," Liberty Street Economics, Federal Reserve Bank of New York, August 12, 2020. Available at: Token- or Account-Based? A Digital Currency Can Be Both - Liberty Street Economics (newyorkfed.org).

[19] See discussion in Alexander Lee, Brendan Malone, and Paul Wong, "Tokens and accounts in the context of digital currencies," *FEDS Notes*, December 23, 2020. Available at: The Fed - Tokens and accounts in the context of digital currencies (federalreserve.gov).

[20] As articulated in the joint trades letter to the Basel Committee. See the Global Financial Markets Association (GFMA), Financial Services Forum, Futures Industry Association (FIA), Institute of International Finance (IIF), International Swaps and Derivatives Association (ISDA), and Chamber of Digital Commerce Joint Letter in response to the Basel Committee on Banking Supervision's Consultative Document on the Prudential Treatment of Cryptoasset Exposures, September 20, 2021, p. 11. Available at: joint-trades-bcbs-prudential-treatment-of-cryptoasset-exposures-response.pdf (gfma.org).

2.4: Implications for Institutions Acting as "Distributors" versus "Intermediaries"

Financial institutions acting as distributors will have different incentives and responsibilities than those acting as intermediaries:

There would be distinct implications arising from financial institutions acting as CBDC "intermediaries" (which would be more common in the wCBDC context) versus them playing a narrower "distributor" role (which would occur more often in a rCBDC context). This distinction is certainly important when considering potential disintermediation effects of different CBDC operating models (an issue we do not discuss in length here). It is also crucial in evaluating who bears financial responsibility for key risks associated with CBDC, and therefore, how likely financial institutions would be to participate in any CBDC system.

Banks (and other financial institutions with direct access to a wCBDC) would be acting as intermediaries when they receive wCBDC from another institution with direct access to the wCBDC system. They would also be acting as intermediaries if they were to issue CBDC-like instruments that have sometimes been referred to as "synthetic CBDC" backed on a one-to-one basis by central bank reserves – essentially a form of stablecoin[21]. In either scenario, the responsibility for various operational, cyber, and compliance risks associated with the wCBDC or CBDC-like instruments would clearly lie with the financial institution acting in an intermediated capacity.

When acting as "distributors" of rCBDC, financial institutions would provide rCBDC accounts or digital wallets and charge fees for ancillary services, but the rCBDC itself would be a liability of the central bank rather than the financial institution. [22] Since the rCBDC would not be a liability of the intermediary, it could not be used to support revenue generating trading or lending activity. At the same time, there would be numerous potential operational and cyber risks attached to providing these accounts, plus a variety of compliance costs (see more on this below).

Would banks be responsible for all of these costs when acting as a distributor of rCBDC? And if so, would the limited revenue and high costs lead banks and other financial institutions to opt out of participating in a rCBDC system, thereby undermining its effectiveness? Are there mitigants to this potential problem and how would they work (*e.g.,* perhaps through some form of cost sharing between the central bank and financial institutions)? Those are all crucial questions for policymakers to consider before moving forward with adoption of CBDC, particularly if they were to ultimately adopt a rCBDC.

2.5: Risk Management

wCBDC applications should fall within the existing risk management frameworks for financial institutions without the need for new risk frameworks or the imposition of risk capital charges:

[21] This model would be very similar to the current system of commercial bank deposits: banks would issue the synthetic CBDCs as liabilities on their balance sheet, though unlike commercial bank deposits, they would essentially be "narrow-bank" money i.e., they would have to be fully matched by funds at the central bank.

[22] Although banks and other financial institutions are referred to as CBDC "intermediaries" in the Board's discussion paper, the model put forward in the Board's Discussion Paper essentially would essentially follow this distribution approach. See, in particular, p. 13.

wCBDCs should be able to be incorporated into existing risk management processes and solutions for clients. Broadly wCBDC applications should fall within the existing risk management frameworks for financial institutions without the need to create new risk frameworks to accommodate wCBDC infrastructure.

Likewise, policymakers should avoid imposing additional risk charges on financial institutions handling wCBDCs. There is no reason why wCBDCs should incur an additional operational risk charge or any other technology risk factor. While the technology that a future wCBDC uses is still an open question, this technological uncertainty is not a reason to impose new capital charges on banks. Instead, policymakers would be better advised to be adopt an approach to these issues that is technology neutral and based on underlying risk. Doing so would not only reflect the emerging international principle of "same risk, same treatment" in this space[23], it would also avoid discouraging bank participation in the system.

While any future wCBDC should generally be incorporated into existing risk management processes, there are several areas where its impact on particular risk factors ought to be studied, with an eye to minimizing risk impacts through the design and implementation of the wCBDC itself. These include the following:

Credit and liquidity risks:
Policymakers should bear in mind potential opportunities for credit and liquidity risk to emerge based on the design features of the wCBDC. These risks could emerge if a wCBDC were not easily convertible into other forms of central bank money or treated as equivalent to other fiat money. Any differentiation between wCBDCs and other forms of central bank money could create fragmentation between markets supported by the two forms of money, resulting in reduced liquidity because financial institutions would need to maintain balances across two differentiated systems.

An example of this could be if there were parallel repo markets for settlement systems supported by wCBDC and traditional central bank money respectively, each of which required separate liquidity from market participants. However, assuming these factors were addressed, we would not expect a wCBDC to create major credit and liquidity risks for institutional markets.

Operational risks:
Although further study needs to be conducted, there is no reason to believe that wCBDCs ought to have greater operational risk than current central bank money operating models. In fact, it is possible that the unique features of distributed ledger technology ("DLT") could result in *lower* operational risk in some areas, though again that proposition would need to be subject to extensive testing. Regardless, there is no doubt that wCBDCs would require new and different infrastructure. While existing central bank and payments infrastructure is highly resilient and can draw upon decades of industry experience in operational resilience planning, this process would need to start afresh for a new wCBDC-based infrastructure.

[23] See Basel Committee on Banking Supervision, "Consultative Document on Prudential Treatment of Cryptoasset Exposures," June 2021. Available at: Consultative document - Prudential treatment of crypto-asset exposures (bis.org).

Operational risk considerations would need to be forefront in the design, development, implementation, and testing of any new wCBDC based infrastructure. Close collaboration between the Federal Reserve, other participating infrastructure providers, and market participants would be critical to have a 360° view of operational risk and to help ensure that the appropriate controls and risk management features are embedded from the outset. As noted above, these different and evolving approaches to the operational risk for users of wCBDCs should not be treated as grounds for the imposition of any supplemental risk changes.

Cyber risks - general cybersecurity concerns:

Cybersecurity considerations need to be front and center in the design of any future wCBDC platform. Given the digital nature of a wCBDC and its reliance on a range of new technology platforms to support the wCBDC, securing the technology infrastructure that supports the wCBDC would be critical.

Cyber-attacks on wCBDC infrastructure could be driven by a range of motivations and carried out by many different types of threat actors. Cyber-attacks could be aimed at stealing non-public information on market participants, introducing inefficiencies in market infrastructure that they could profit from, potentially illicitly moving funds, or simply degrading the performance or availability of wCBDC infrastructure, such as by a hostile geopolitical actor or a “hacktivist” group.

Regardless of motivation, scale, or type, a successful cyber-attack on wCBDC infrastructure would not only impact specific users but reduce confidence in the wCBDC itself and potentially the security of the central bank more broadly. While embedding cybersecurity in the design of the wCBDC from the outset is critically important, the specific features of cyber defense programs will depend on a range of other design considerations which shape the access points to the infrastructure and data it stores. These include access models, interoperability features, and any degree of programmability.

Cyber risks for banks serving as CBDC distributors would be different:

Cyber risk associated with CBDCs should be differentiated into two levels – risk which exists at the level of the central bank and risk at the level of an institution which serves as the wallet provider (in distribution models). The degree of cyber risk at the level of the financial institution serving as the wallet provider will vary substantially depending on different distribution models for the CBDC. This level of risk will be critically important in understanding who bears the cyber risk, and as a result, the risks and incentives for financial institutions to take part in a CBDC program.

For example, there could be differences in cyber risk levels to participating financial institutions in models where rCBDCs are distributed by banks versus wCBDC (or a synthetic CBDC) that is held on a bank’s balance sheet. However, these different operating models not only have different distribution of responsibility for cyber risk, but also different incentive structures for participating institutions. The intersection of these two factors could result in situations where participating banks are exposed to substantial cyber risk without adequate compensation.

In a distribution model in which banks are serving as wallet providers, institutions would potentially be exposed to financial risk if its clients’ CBDC holdings were affected by a cyber-attack at the level of the participating bank that resulted in clients’ CBDC holdings being lost, otherwise inaccessible, or their private information being disclosed.

While financial institutions are currently exposed to cyber risks, the cost of protecting against these risks can be compensated for by the revenues associated with holding client assets. However, in models where the CBDC is not held on balance sheet by the participating bank (most commonly in a rCBDC model), a bank would be exposed to risks and costs of potential cyber-attacks while not receiving revenue associated with holding these assets to offset these costs, since the CBDC would not be on-balance sheet and so could not support revenue generating trading or lending activity. Similarly, under this model, financial institutions would also be exposed to the costs and risks associated with AML and KYC functions without offsetting revenues. While banks could potentially generate additional revenue from offering ancillary services to clients who hold CBDCs in wallets they provide, institutions may find this does not offset cyber risk exposure and associated costs.

We encourage the Board to bear these considerations in mind when developing operating models for CBDC programs and reviewing where cyber risk is in the CBDC infrastructure and what institutions are ultimately responsible for it. There should be a clear allocation of legal risk and liability among the various participants. Failure to appropriately allocate these risks and liabilities may result in a situation where financial institutions are reluctant to participate in CBDC programs (with the potential costs outweighing any benefits in terms of revenue from ancillary account services).

Potential solutions to this question could be technological (such as by developing an operating model and technology platform that minimizes risks to banks participating as wallet providers rather than intermediaries), incentives-based (similar to how some crypto-asset infrastructure provides "gas fees" to infrastructure), and legal (such as allocating risk by law). Of course, these problems can also largely be avoided by opting not to move forward with a rCBDC distribution-style system.

2.6: Domestic Interoperability

Any U.S. CBDC ought to be able to operate alongside legacy instruments and systems to minimize disruptions to the financial system:
SIFMA supports the Board's view that any CBDC ought to be able to operate alongside legacy instruments and systems rather than replace them in order to minimize disruptions to the financial system and given that legacy systems have become significantly more efficient in recent years.

The potential gains in efficiency and risk reduction from development of wCBDCs would be easier to realize if there is smooth interoperability with existing infrastructure, such as the ability to transfer balances between a wCBDC and traditional central bank reserve balances. This of course recognizes that new processes and infrastructure which build on the functionality offered by wCBDCs will likely gradually expand from smaller pilots in specific market segments. These pilots will often occur in partnership with existing infrastructure providers, who may handle multiple parts of the process using existing infrastructure even as new features are added.

Interoperability will need to be built across multiple dimensions, including in the design of the wCBDC framework, its operating standards and protocols, and its technology architecture. wCBDC design needs to consider interoperability with a broad range of existing systems and infrastructure platforms. These must include, but are not limited to, existing and new wholesale payment instruments and systems; the

broader capital market ecosystem and financial market utilities; cross-border foreign exchange systems; local rCBDC systems and local wCBDC systems; and ideally, cross-border and mCBDC arrangements.

As we note later in our response, this will require both coordination with domestic regulators who oversee these infrastructure venues and markets as well as internationally, with foreign central banks and monetary authorities as they implement their own CBDC projects and with infrastructure venues in those jurisdictions as CBDC functionality is embedded in them.

We recommend the Board and other policymakers look to the lessons provided by a variety of international wCBDC pilot programs, which have explored how wCBDC can be connected to existing payment and settlement infrastructure. For example, Project Helvetia is a joint experiment by the BIS, SNB, SIX and five commercial banks (i.e., Citi, Credit Suisse, Goldman Sachs, Hypothekarbank Lenzburg, and UBS). Although additional study is needed, this project suggests that a wCBDC could offer safe and efficient settlement on a tokenized asset platform and identified issues regarding the operational, legal and policy questions necessary for wCBDC issuance. Additionally, the Board should explore how existing infrastructure platforms have been able to create interoperability with an expanding range of adjacent payment and settlement services, such as the experiences of the Depository Trust and Clearing Corp (DTCC).

2.7: Programmability

Programmability offers the potential for innovation and new functionality. However, these features should not impair the fungibility of a wCBDC or introduce operational risk:
CBDCs offer the potential for including some degree of programmability within the CBDC itself or associated with it. Programmability would allow users to embed logic for a predefined purpose within the money itself. The restrictions created by the programming could be either open ended or limited – in dimensions such as time (permanent vs time limited), venue (programmability within a specific infrastructure platform vs across all uses), and others.

While some elements of traditional fiat money have limited programmability (such as the restrictions around checks or letters of credit), CBDCs would in theory allow for much greater programmability, both in terms of range of applications and the flexibility of the logic associated with the programming. It is possible that future DLT platforms could be designed to offer a broad range of new features building on programmable wCBDCs.

In the institutional capital markets, researchers and pilot programs have identified a range of applications where programmability could increase the efficiency of capital markets products and infrastructure. For example, certain transactions could be programmed to be self-settling, or to embed features allowing payment on confirmation of transactions. However, these potential benefits of programmability in wCBDCs would require a range of changes at market infrastructure providers beyond the wCBDC itself.

International pilots:
The application of programmability to support securities settlement would require either an integrated platform covering both settlement and payment legs, or interoperability across those platforms. Internationally, wCBDC pilots have explored how programmability can be combined with ledger-based settlement to create efficiencies in the capital markets. Examples of these projects include:

The Jasper-Ubin project organized by the Monetary Authority of Singapore and the Bank of Canada completed cross border transactions supported by different, interoperable ledgers. Project Inathon, organized by the Bank of Thailand, explored delivery versus payment ("DvP") settlement for tokenized bonds in interbank market trading and in repo markets against cash tokens issued by the Bank of Thailand, using a single ledger for both cash and securities.

Project Jura, organized by the Banque de France, the Swiss National Bank, and their private sector partners explores the direct transfer of Euro and Swiss franc wCBDCs between French and Swiss commercial banks on a single DLT platform operated by a third party, together with the settlement of tokenized asset and foreign exchange trades using payment versus payment ("PvP") and DvP mechanisms.

Concerns with programmability – fungibility impacts:
Despite the potential benefits offered by programmability, policymakers need to consider the potential consequences of programmability more broadly, particularly for the fungibility of CBDCs with conventional fiat currency.

There is a risk that wCBDCs could be treated as non-fungible with traditional fiat currency if they have programmability features that effectively place restrictions on their transferability or returns. As a result, holdings of these wCBDCs with these programmable features could be valued differently, and potentially traded separately, from "vanilla" currency without these restrictions.

If the restrictions created by programmability lead to it being recognized in legal terms as a different product than traditional fiat currency, then questions would arise about whether these wCBDCs could be netted against legacy fiat, and the wCBDCs' treatment under settlement conventions and regulatory regimes more broadly. Restrictions on fungibility could also limit the interoperability of wCBDC across platforms, one of the key concerns for effective institutional applications.

Technological and design mitigants to address fungibility concerns:
These concerns about the unintended consequences of programmability can potentially be offset by designing wCBDC so that programmability features are at an appropriate level within the technology stack supporting the wCBDC, so that specific applications can offer the benefits of programmability while avoiding the concerns on fungibility impacts.

For example, programmability could be distinguished between programmability which is embedded in the wCBDC itself as opposed the ability for it to support a layer of external programmability (such as on a third-party platform or utility environment). However, these configurations could ultimately result in situations where wCBDCs programmed for use in a given utility or application could result in challenges in legacy USD being used within the utility, thereby impairing fungibility of funds at the utility. Alternatively, a programmable narrow purpose wCBDC, which can only be used at specific utilities or platforms but is not usable for other financial transactions, could achieve the same goals.

Risk and cyber concerns:
Programmability features also raise a number of operational and cyber risk concerns which must be accounted for before it can be realized for any large-scale capital markets applications. Users of programmable wCBDCs would need to develop a broad range of operational and cyber risk mitigants including: access and cyber controls for those who interact with the programming, procedures to reduce

risk and prevent hacking or tampering, verification procedures, procedures for maintaining the integrity of programmed features, compatibility of pre-established programmability features with later changes to operational procedure or regulatory requirements, and controls for suspicious transactions. Similarly, if multiple platforms or infrastructure providers support transactions using programmable wCBDCs, they would need to have a baseline of interoperability and harmonized standards.

2.8: Privacy

A wholesale environment does not raise the same sorts of privacy concerns that a rCBDC would. However, privacy mitigants need to be embedded from the outset even in a wCBDC system:
The Board's discussion paper rightly raises privacy as a key consideration in the design of any CBDC and the decision-making process on its viability and desirability. While privacy concerns are particularly important in a retail CBDC, a wholesale environment does not raise the same sorts of privacy concerns that a rCBDC would. Compared with rCBDC, wCBDC applications would likely hold substantially less personally identifiable information and have less information related to individual transactions.

We expect that under most wCBDC design models, individual clients and their transactions would be aggregated under the accounts of the financial institutions they work with, provided that direct access to central bank money by individual clients is not allowed. This would reduce the scope of personal and transactional information which is captured by the wCBDC platform.

However, privacy concerns are not completely absent from the design of a wCBDC. Depending on the architecture of the CBDC infrastructure and the role that intermediaries play in it, if it is possible to follow the transactions through the chain of the wCBDC infrastructure and if there is considerable transparency into what is visible and explorable, it could potentially trace transactions back to their originators as can be done on some public chains. This potential auditability of transactions by outside users ought to be avoided.

Additionally, there are likely to be some institutional transactions and client types where privacy considerations need to be addressed. For example, many wholesale customers would be very sensitive to information on their transaction history being accessible *e.g.,* if it led to investment strategies being revealed. More broadly, wCBDC design must not allow any transparency into individual transactions carried out by institutions, whether purchases by retail or wholesale securities clients, or purchases of goods or services by participating financial institutions themselves. Existing confidentiality regulations govern the protection of information on client transactions held at firms – any new CBDC infrastructure needs to be consistent with these confidentiality protections. The personally identifiable information ("PII") of employees at financial institutions who are authorized to work with the wCBDC infrastructure on behalf of their firms also needs to be protected, given the contractual requirements for the protection of this PII.

Therefore, privacy oriented mitigants need to be embedded from the outset even in a wCBDC system. Additionally, if a wCBDC eventually existing alongside a rCBDC, there will arise a new class of wholesale/retail interactions where policymakers need to be aware of privacy concerns, such as the aggregation of wholesale flows. As these issues are evaluated, policymakers should also consider whether new privacy standards need to be codified into law.

2.9: Public-Private Partnerships

There should be close policy collaboration on this issue between financial institutions, the Federal Reserve and other important government actors:
It is crucial that policy making in this area occur in close collaboration between financial institutions, the Federal Reserve and other important government actors whose supervisory functions and regulations could be impacted by a wCBDC. This partnership with market participants and infrastructure providers should extend from the research and decision-making phases through the design and testing of any future CBDC.

Exploration of a potential wCBDC and any implementation would also require close coordination with the regulators who are responsible for oversight of individual markets and market infrastructure providers. A wCBDC could impact a range of wholesale capital markets products and processes and would need to be integrated into existing infrastructure. Engagement between industry and regulators responsible for these areas will be crucial to implementation of the wCBDC. These include, but are by not limited to the handling of CBDCs under prudential, capital, and accounting rules, financial market infrastructure (FMI) regulations as infrastructure providers embed CBDCs in their processes, and the rulesets governing specific products and processes that could see enhancements from CBDCs, such as securities settlement.

2.10: Implications of international CBDCs

Policymakers need to consider the impacts on U.S. capital markets if other jurisdictions adopt CBDC while the U.S. does not:
Policymakers need to consider the impacts on U.S. capital markets if other major jurisdictions move to adopt their own CBDC and the U.S. does not. This is particularly the case for wCBDC, as it is unclear whether the adoption of rCBDC by other jurisdictions would have major implications on the U.S. capital markets or their competitiveness. At the same time, it is important *not to overemphasize* the importance of foreign CBDC adoption on the decision-making process for any future U.S. CBDC. While there are a number of areas where connections with foreign CBDCs could potentially drive market efficiencies or where the absence of a U.S. wCBDC could impact investment flows, ultimately these are far less significant considerations than the effects of a wCBDC on U.S. financial markets and infrastructure.

There has been speculation that the U.S. dollar's status as a reserve currency could be threatened if it also does not move forward with a wCBDC. There are also questions around whether early adopters could enjoy significant first-mover advantages, which some have suggested should speed up adoption in the U.S. (though it is questionable whether rCBDC focused initiatives – for example, like that being implemented in China – would confer any significant advantages in this regard). While the U.S. dollar's preeminent role in the international system is undoubtedly driven by a range of factors, this will be an important consideration for policymakers considering adoption of a U.S. CBDC.

It is possible that new forms of digital currency may have competitive advantages relative to older forms of currencies and may be appealing as holding for foreigners whose home country does not have a native wCBDC. However, these potential benefits should also be weighed against the degree to which mature and sophisticated capital markets infrastructure in the U.S. currently delivers these services to investors

even without a wCBDC, in contrast to other jurisdictions which have explored a wCBDC as a solution to long standing challenges for their payments and investment infrastructure.

Later in this paper we discuss the possible impacts on U.S. capital markets if wCBDCs are adopted in other major capital markets (*e.g.,* on FX, cross-border payments and investment flows, international demand for U.S. Treasuries, etc.). An analysis of the impact of the presence or absence of a U.S. wCBDC needs to be grounded in the specifics of these markets and their supporting infrastructure.

Policymakers should also bear in mind the potential for foreign CBDCs to develop a broader international role outside their home jurisdictions, which could potentially displace the role of the U.S. Dollar in some transactions, such as in trade finance. For example, the Export Import Bank of China has explored how the electronic Yuan ("eRMB") could be used to support the internationalization of the Yuan, pointing to the potential for the eRMB to support trade finance transactions and eventually to potentially enable overseas corporates to hold eRMB to facilitate their trade with Chinese entities directly in Yuan.[24]

Coordination with jurisdictions that have not yet launched wCBDC projects will be important as well, both to help share experiences that will help the design process for any future wCBDCs so they are more likely to develop in a compatible way, and also potentially to ensure that points of interaction between clients and institutions in their markets and platforms and institutions using any future U.S. wCBDC are incorporated in their regulatory frameworks with a minimum of disruption.

Wholesale CBDC could support the role of the U.S. Dollar internationally, while retail would not:
As policymakers consider the impact of a potential CBDC on the role of the U.S. Dollar in the global financial system as other markets look to adopt CBDCs, we believe that a rCBDC would have only limited impact in supporting the preeminent role of the USD. By contrast, a U.S. wCBDC may support U.S. participation in mCBDC arrangements in the areas where U.S. capital markets play a key role internationally, such as through foreign participation in Treasury auctions, FX markets, cross border payments – both for financial institutions and their corporate clients, as well as cross border investment. However, once again, it is important to recognize that the U.S. Dollar's role in global markets will be determined by a wide range of factors and would not necessarily be dependent on adoption of a wCBDC.

Cross-border interoperability will require some form of mCBDC system:
Any potential wCBDC should be designed with the goal of interoperability with other jurisdictional wCBDCs. Cross border interoperability is critical for wCBDC users in international markets and needs to be supported by an operating model which effectively deals with the range of multi-sovereign dynamics of an mCBDC network. Without this cross-border functionality, a purely domestic wCBDC would not be well positioned to support international business.

With this overarching policy goal of international wCBDC interoperability in mind, there are a number of open design questions and considerations which will need to be considered in developing models for any US wCBDC and how it could interact with other jurisdictions. As outlined in the Project Dunbar report, in a mCBDC system, each participating central bank would issue wCBDC in its own domestic currency[25]. Commercial banks would be able to hold wCBDCs of any jurisdiction participating in the mCBDC system,

[24] Remarks of Liu Yihua of the Export-Import Bank of China at the 2021 Taihe Civilization Forum. Available at: 专家：中国数字人民币可以在境外使用 具有较强的国际竞争力_货币 (sohu.com).
[25] See Project Dunbar Report.

without the need to hold accounts at correspondent banks. These banks could trade directly with each other in the participating currencies.

A mCBDC could potentially change the process for cross border payments, which could make some trades and payments faster and lower cost. These benefits could arise from a reduced reliance on intermediaries; simplification of settlement processes; efficiency gains arising from the ability to centralize duplicative processes (*e.g.,* performing AML/CFT and sanctions screening functions centrally using a common platform rather than at the level of individual banks in different jurisdictions); and employment of smart contracts to automate parts of the payments process (*e.g.,* automating liquidity checks, technical validations and other business requirements).

However, it will be critical to distinguish potential gains in retail payments efficiency from broader assertions about cross border payments using wCBDCs, and to bear in mind the broader systemic implications if new payments models result in trades settling on a gross (as opposed to net) basis, and the resulting impacts on liquidity management and netting. We explore a number of these potential impacts in our discussion of wCBDCs and the FX market in Section 4.3 below.

Challenges to develop interoperability include questions around access (whether to pursue a "direct" approach, whereby non-resident commercial banks have access to foreign wCBDC directly, or a "hybrid" model for wCBDC access, which would be intermediated by resident commercial banks – not dissimilar from the conventional correspondent banking model); legal differences between settlement and non-settlement processes by jurisdiction; and governance of a mCBDC platform. There are also questions about the comparability of privacy rules, AML/sanctions and other transaction monitoring and security processes. All of these issues would need to be addressed through close international coordination. Some of these challenges could also potentially be addressed through programmability associated with a narrow purpose wCBDC; these issues were explored by the Jasper-Ubin project noted above.

Several projects have demonstrated the feasibility of developing a mCBDC system, including:

- Project Dunbar, which brings together the Reserve Bank of Australia, Bank Negara Malaysia, Monetary Authority of Singapore, South African Reserve Bank with the BIS innovation Hub to test the use of mCBDC for international settlements.
- Project Jura, a public-private collaboration between French and Swiss commercial banks. The project examined the direct transfer of Euro and Swiss franc wCBDC by the banks onto a single DLT platform operated by a third party, as well as settlement of tokenized assets and FX trades using PvP and DvP mechanisms.
- Project "InthanonLionrock to mBridge," again led by the BIS Innovation Hub, with participation by Hong Kong Monetary Authority, the Bank of Thailand, People's Bank of China and The Central Bank of the United Arab Emirates.

Planning for potential future interactions between a U.S. wCBDC and other CBDC programs should also bear in mind that some jurisdictions are planning to implement rCBDC systems first. For example, all of the existing live CBDC programs are rCBDC initiatives (the Bank of China's eRMB, the Central Bank of The Bahamas' digital Bahamian dollar, and Eastern Caribbean Central Bank's DCash, and the eNaira in Nigeria.) Several other markets have announced that they plan to focus on retail applications as they move forward with their CBDC development, including the ECB's digital euro and the Swedish e-krona. However, many other CBDC programs (such as the Banque de France, and projects in Saudi Arabia, the United Arab Emirates, Malaysia, and Singapore) are focusing primarily on wholesale applications.

U.S. policymakers and institutions will need to be conscious that the emerging CBDC landscape internationally will be a mix of retail-focused and wholesale-focused programs, particularly in the early years as policymakers in different jurisdictions are expanding from their pilot launch programs which are likely to be focused on one of the two models (retail vs. wholesale). In the expected landscape of mixed rCBDC and wCBDC applications internationally, communicating and coordinating with policymakers in other jurisdictions will be crucial in delivering the value proposition of wCBDC.

The fact that there is an emerging patchwork landscape of CBDC projects does not change our recommendation that policymakers – should they decide to move forward with a U.S. CBDC after extensive study of the benefits and costs - adopt a wCBDC on either a standalone basis or as a first step towards more widespread adoption. As we have outlined, a retail-focused CBDC would not achieve the benefits of faster and cheaper cross-border payments and would do little to maintain the U.S. dollar's competitive global position.

3. Product Specific Considerations

3.1: Securities Settlement

wCBDCs have the potential to allow for new settlement models and potentially faster settlement. However, wCBDC would be neither necessary nor sufficient for the development of new settlement models, and the experiences of pilot programs for faster settlement cannot be generalized to the markets as a whole:

wCBDC *could* allow for new settlement models and potentially faster settlement for some transactions. Securities settlement involves two legs – a payment leg and a settlement leg. The potential benefits of CBDCs in settlement would potentially come directly from gains in efficiency in the payment leg, as well as enabling enhancements to the settlement leg. Although further study and testing is needed, it is possible that a wCBDC could lead to faster settlement times, enabled by faster payments that would be made possible by key changes to the settlement process. This could include embedding payment instructions within a programmable security or programmable settlement instructions, or allowing for instantaneous or "atomic" settlement.

These gains are likely the greatest in scenarios where a wCBDC based payment leg can interoperate on DLT-based settlement platform. However, that the vast majority of securities today are issued, traded, and settled on traditional infrastructure. Thus, realizing the full benefits of wCBDC-enabled settlement would require either integration of DLT functionality into existing infrastructure.

Regardless of the specifics of the model adopted, these enhancements could potentially offer a range of benefits, such as greater capital efficiency through faster settlement times, reduction in counterparty risk, and other innovative features to allow market participants to better understand and manage the settlement process.

However, the potential benefits of wCBDC for settlement processes cannot be viewed in isolation, but need to be understood in the context of interactions with infrastructure platforms used to support the settlement and payment legs of a transaction, including both connections with existing infrastructure platforms and potential new infrastructure venues as well as the broader context of securities post trade processes, which will shape the environment in which changes to settlement timeframes and models could potentially be adopted.

Critically, innovation in settlement is a broader question that wCBDC development. wCBDCs are neither necessary nor sufficient for new settlement models, and the viability and desirability of faster settlement needs to be understood in the context of the broader securities market and post trade processes. These questions are top of mind for SIFMA and the industry as we work on our planned acceleration of the US securities settlement cycle from T+2 to T+1.

The implementation process for a future wCBDC would also need to include coordination with the SEC and recognition that wCBDC can be used for securities settlement. It will also involve identification and resolution of areas where existing securities markets rulesets could pose impediments to the adoption of wCBDC with existing post-trade market infrastructure.

Pilot Projects for CBDC enabled securities settlement:

As policy makers look to explore the potential impacts of a wCBDC on securities settlement, we recommend they look to the pilot projects that market participants and industry infrastructure providers have organized in the U.S. and internationally.

In the U.S., the DTCC recently launched Project Lithium, which explore how a wCBDC might operate in the U.S. clearing and settlement infrastructure leveraging DLTs.[26] Project Jura, completed in late 2021, explored the direct transfer of Euro and Swiss franc wholesale central bank digital currencies (wCBDCs) between French and Swiss commercial banks on a single DLT platform operated by a third party. The project tested how tokenized asset and FX trades could be settled on CBDC enabled DLT infrastructure using both payment versus payment (PvP) and delivery versus payment (DvP) mechanisms.[27]

Looking at these pilot projects can provide valuable insights into how the abstract benefits of a wCBDC impact the specific configurations of industry post trade infrastructure, how the roles of the counterparties to the transaction could leverage wCBDC, and how wCBDC could potentially change the characteristics of the product itself in question. Understanding these specifics will be critical in ensuring that a potential wCBDC will have the design features needed to support innovation in the post-trade processes.

Securities settlement – limits to the benefits of CBDCs:

While wCBDCs offer the potential for settlement innovation, it is critical to understand that they are neither necessary nor sufficient for changes to settlement models; and the changes to settlement times, and in particular the acceleration of settlement cycles, **must** be understood in a broader context of securities products and operations which are both dependent on the securities settlement timeframe and provide constraints on its duration. While wCBDCs could potentially enable new settlement models and new settlement infrastructure that would drive gains in efficiency, capital reductions and risk reduction, the unique features of wCBDCs are best understood as an *enabler* of these changes and one element of a broader process of innovation and change.

wCBDCs are not necessary for settlement innovation:

Many of the benefits of faster settlement or different settlement models often associated with wCBDCs are not dependent on wCBDCs; they could be developed using other payment infrastructure such as stablecoins or settlement tokens using DLT infrastructure. The industry is already exploring ways where DLT infrastructure can support innovative settlement models and executing clearing and settlement using this pilot infrastructure absent a U.S. wCBDC. However, it is key to note that these pilots occur in focused areas of the markets, based on self-section of market participants and products.

Looking beyond these pilot projects, it is important to consider that there are a range of other blockchain based solutions which could offer new settlement models even absent wCBDC programs. If providing new infrastructure for the payment leg of securities settlement is a key objective for policy makers, they should also consider the degree to which these other solutions could achieve the same goals with less complexity to implement and fewer consequences to the broader financial system.

For example, stablecoins have been explored as providing a ledger-based payment function to support faster settlement. Potential projects would need to be done through stablecoins and supporting infrastructure which are properly regulated and issued by entities covered by the appropriate regulatory

[26] "DTCC building industry's first prototype to support digital U.S. currency in the clearing and settlement process as part of Digital Dollar Project," April 12, 2022. Available at: DTCC Building Industry's First Prototype to Support Digital U.S. | DTCC.

[27] Bank for International Settlements, "Project Jura: cross-border settlement using wholesale CBDC." Available at: Project Jura: cross-border settlement using wholesale CBDC (bis.org).

and prudential standards, consistent with the expectations for resilience and financial stability for anything supporting settlement infrastructure, as laid out in the report on stablecoins released by the President's Working Group on Financial Markets, joined by the Federal Deposit Insurance Corporation ("FDIC") and Office of the Comptroller of the Currency ("OCC").[28]

Similarly, tokenization of existing fiat currency within a ledger-based settlement environment could offer focused benefits for the speed and efficiency of settlement. Somewhat more broadly, a limited purpose CBDC could be developed whose access and use was limited to the infrastructure providers supporting selected markets and functions.

For example, Project Helvetia (involving the BIS Innovation Hub, the Swiss National Bank (SNB) and the financial infrastructure operator SIX) explored the potential for wCBDCs to provide support to central bank interactions with financial institutions as part of the securities settlement process. A narrower scope institutional CBDC could be more easily inserted within the existing infrastructure system, providing new functionality at key points within post-trade processes to while minimizing disruption to the broader financial system.

However, it is key to remember that despite the prospects of these potential ledger-based payment and settlement models, they cannot be extended to imply the general feasibility of faster settlement models for the securities markets as a whole, as discussed below.

Similarly, the creation of a CBDC is not in and of itself sufficient to enable changes in settlement processes. The functionality provided by CBDCs would need to be supported by a range of other changes in settlement infrastructure itself, the participation and responsibilities of the counterparties to the transaction, as well as potential changes to ancillary products and services dependent on current settlement models.

Securities settlement – challenges of T+0 and industry initiatives to shorten the settlement cycle: It is critical to understand that wCBDC in and of itself will not enable faster settlement models, particularly faster than T+1. There is a U.S.-focused industry initiative, led by SIFMA, the Investment Company Institute (ICI), and The Depository Trust & Clearing Corporation (DTCC), planning to shorten the settlement cycle for equities and certain other securities to one business day after the trade is executed (T+1). Currently T+1 is expected to be adopted in U.S. markets by 2024.[29]

While the industry is planning for a transition to T+1, it is critical to understand that further accelerations of the settlement cycle to timeframes shorter than T+1, such as T+0, end of day settlement or other same day or instantaneous settlement models are on another scale of complexity and difficulty.

While some pilot projects have executed successful same day settlement using new infrastructure models or based on bilateral agreement between market participants, these experiences cannot be extended to the imply the viability of same day settlement for securities markets as a whole.

[28] President's Working Group on Financial Markets, the FDIC, and the OCC "Report on Stablecoins" https://home.treasury.gov/system/files/136/StableCoinReport_Nov1_508.pdf

[29] The move to T+1 is expected to cover equities, corporates, municipals, and UITs, while Fed eligible securities would be considered out of scope. See SIFMA, Investment Company Institute (ICI), DTCC and Deloitte, "Accelerating the U.S. Securities Settlement Cycle to T+1", December 2021

Potential future changes to securities settlement models incorporating wCBDCs must also take into consideration the market product, operational, and capital considerations connected to the broader settlement cycle, and in particular the challenges associated with settlement cycles shorter than T+1.

DTCC has identified several important barriers which make such a change impractical at present for the broader U.S. securities markets including:[30]

- Moving to T+0 on a transaction-by transaction basis will remove the liquidity and risk-mitigating benefits of current netting features;
- Fails may increase due to lack of netting as transaction volume rises;
- Funding needs will be less predictable and transparent until end of the trading day; and
- Developing real-time reconciliation processes to comply with regulations will be difficult.

SIFMA further accentuated the T+0 challenges in its August 13, 2021 letter to SEC Chairman Gary Gensler. In the letter, SIFMA confirmed its support for and confidence in shortening the settlement cycle to T+1, but also highlighted four specific areas that would be impacted significantly if T+0 was adopted:

- Processes for global settlements, FX, margin investing, and securities lending would have to be redesigned to meet regulatory and contractual requirements in less than 12 hours;
- Retail investors would likely have to prefund accounts;
- Smaller firms and vendors may not have the resources necessary to complete a move to T+0 and, hence, could find their competitive position weakened; and
- Industry stakeholders – including the Federal Reserve's payment systems – would have to maintain services for more hours during the day than currently, which could increase the potential for operational failure.

3.2: Considerations Around the Execution of Monetary Policy

Policymakers need to consider potential impacts on a wCBDC and/or rCBDC on the mechanics of the execution of monetary policy:

In its paper, the Board raised the question of whether CBDCs could have the potential to impact the impact the goals and implementation of monetary policy. While SIFMA does not have a position on how a potential CBDC might affect the ability of the Federal Reserve to meet its monetary policy goals within the broader economic environment, we believe it is important for policymakers to consider potential impacts on a wCBDC and/or rCBDC on the mechanics of the execution of monetary policy.

Monetary policy is executed through interactions between market participants and the official sector through Treasury auctions and open market operations. As part of the wCBDC analysis process, it is important to look at the mechanics of these process and the infrastructure which supports them to see if they could potentially change if they incorporated the new functionality provided by wCBDCs.

Our initial analysis suggests that the fundamentals of primary dealers and investors' interactions with the Treasury and Federal Reserve through auctions and open market operations would not change in terms of areas like pricing, settlement risk, and demand for Treasury securities. However, there could be changes to the mechanics of post-trade post trade processes following auction take-downs to take advantage of hypothetical new settlement functionality. Similarly, there could be changes to how foreign

[30] See DTCC, "Advancing together: leading the industry to accelerated settlement", February 2021

investors access US Treasury markets in the event that institutional wholesale mCBDC arrangements develop.

While ultimately we do not expect these process changes to fundamentally affect the demand for U.S. Treasuries or their pricing, this functionality could offer potential new market efficiencies and the Federal Reserve should work with the operators of key market infrastructure supporting Treasury auction and settlement processes to understand potential impacts and opportunities.

In addition, to the extent a wCBDC is available to nonbank entities that operate a narrow bank or payments-only business model, the potential effects on monetary policy of having pass-through investment entities available to provide indirect access to central bank money should be considered.[31]

3.3: Impact of a CBDC on Funding Models

A U.S. CBDC could have a major impact on key funding markets, and policymakers should consider mitigants to reduce negative effects:

There has been extensive discussion about the potential substitution effects of rCBDC away from bank deposits, but there has been less focus on the impacts of CBDCs on capital markets-based funding models. We recommend the policy makers examine the potential impacts of CBDCs on other funding models, including both the impacts of rCBDCs and wCBDCs.

One area of impact could arise if either form of CBDC (though most likely a rCBDC) were to be viewed as a substitute for investments in other low risk, liquid assets, such as MMFs and Treasury bills that have features that make them near-cash instruments or comparable to bank customer deposits. This potential substitution effect could lead to abrupt shifts in their funding. For example, at end-2019, there were an estimated $7tn of AUM in MMFs. Depending on its design features and its relative remuneration (if accounts were interest bearing), the introduction of a CBDC could be an attractive alternative for some risk-averse holders of other cash-substitutes, even in benign conditions. This in turn could reduce the demand for assets that such funds invest in, possibly affecting yields in turn.

Mitigants for this risk could include[32]:

- *Quantity measures/limits:* these would restrict the use of CBDC by either imposing caps on the total holdings of CBDC or limiting the transfers of CBDC. Quantity limits could either be stock-based (central banks limit that amount of CBDC that can be held) or flow-based (restricting the amount of CBDC that can be transferred within a given period). However, policymakers should bear in mind that political pressure could be brought to bear to raise or otherwise alter limits during periods of significant market stress, potentially limiting the effectiveness of these measures.
- *Price measures:* these could be used to disincentivize holdings of CBDC or large payments in CBDC without necessarily restricting them. For example, CBDC accounts could be prohibited from earning interest, thereby making it more “cash like” than “deposit like.” Progressive fees for

[31] See SIFMA, “SIFMA Comment on Proposed Guidelines for Evaluating Account and Services Requests (Docket No. OP-1747), July 12, 2021. Available at: Proposed Guidelines for Evaluating Account and Services (sifma.org)
[32] BIS CBDC Financial Stability Implications Report, pp. 14-16.

transferring larger amounts of CBDC could also be another mechanism to disincentivize large holdings of CBDC.

- *In-crisis measures:* in the event of a run-event, gates or switching limits could be imposed.

More broadly, policymakers should consider the potential impacts on the capital markets of a substitution out of bank deposits which could arise from a rCBDC. If banks need to rely on wholesale funding to a greater degree, there could be a range of unforeseen impacts on wholesale funding markets and on other market participants.

Issues around the use of wCBDC as collateral in funding transactions:
Future wCBDC infrastructure could potentially be used to support new models for handling of wCBDC as collateral in funding transactions. These could potentially allow for faster, more efficient financing models, however, there remains substantial legal questions which would need to be resolved, along with challenges around the design of wCBDC infrastructure and its interactions with other financing platforms for these potential models to be realized. Open legal questions include demonstrating that legal transfer has occurred when transferring between wallets and that there is clear legal recognition of the status of wCBDC. On the operational and technical side, interactions between lenders, borrowers, and collateral platforms and DLT infrastructure would need to be defined and supported by participants and infrastructure providers.

3.4: Impacts of CBDCs on Cross-Border Capital

While wCBDCs do offer the potential to execute and settle FX transactions in potentially more efficient ways, these potential benefits needed to be understood in the context of legal, interoperability, and infrastructure issues which would need to be addressed to support CBDC enabled FX transactions:
The policy discussions around CBDCs have often noted the potential they offer to change the dynamics of cross-border payments, and particularly the management of wholesale foreign exchange (FX) transactions, particularly if multiple countries adopt wCBDCs. A number of proof-of-concept exercises and discussion papers have explored the mechanics of how mCBDC arrangements could be developed to support FX market innovation, and potentially allow for faster or more efficient FX transactions. While these exercises have yielded interesting findings, there are challenges in generalizing from experiments to asserting the impacts of wCBDCs on the FX markets as a whole, particularly given the differences between experimentation under controlled conditions and involving a narrow range of transactions.

While wCBDCs do offer the potential to execute and settle FX transactions in new and potentially more efficient ways, these future benefits needed to be understood in the context of legal, interoperability, and infrastructure issues which would need to be addressed to support CBDC enabled FX transactions.

One of the most potentially far-reaching impacts could be changes to settlement times and settlement dates internationally as a result of new transactions timeframes in wCBDC enabled infrastructure, which could affect not just operational process but also market pricing and liquidity.

In any exploration of these issues, we encourage the Board to review the research and analysis development by the Global Financial Markets Association (“GFMA”) Global FX Division (“GFXD”), which

has released a number of papers and comment letters exploring operational and market issues which would be impacted by wCBDCs and resulting changes to settlement infrastructure and processes, including complexities around expanding payment vs payment (PvP) settlement, interoperability of new infrastructure models, and considerations for FX market participants looking to use new settlement technologies.[33] The GFXD has also actively contributed to the CPMI Cross-Border project and we encourage the Board to review the GFXD responses on the following topics: aligning payment system operating hours (January 2022), call for ideas on solutions to expand PvP settlement (November 2021) and targets for addressing the four challenges of cross-border payments (July 2021).[34]

Analysis of the impacts of a potential U.S. wCBDC on the broader FX markets will need to be assessed across the value chain of the FX product life cycle. One particular challenge which will need to be considered and addressed will be the management of parallel infrastructure arising from wCBDC-based infrastructure operating alongside legacy infrastructure and systems, particularly if they operate on different time frames and with different settlement models. In particular, challenges could arise if wCBDC infrastructure has longer operating hours – or even continuous availability - or operates on a real time gross settlement model (RTGS).

If wCBDC payments infrastructure has different operating hours, and potentially operates on a real time settlement model, market participants and infrastructure operators would need to think through the broad implications of having parallel systems with different timeframes. The multilateral netting model underlying much of the FX market could be impacted as well. This could mean that firms would need to have parallel infrastructure to settle transactions in different timeframes and with potentially different operating models. Implementing such parallel infrastructure at this time would be expected to reduce current efficiencies. Before doing so, it would be critical to ensure that settlement risk is not re-introduced into the FX ecosystem.

There will be additional operational challenges if this parallel infrastructure exists for multiple currencies as they adopt wCBDCs, so FX market participants would need to manage the complications of interactions across a range of combinations of infrastructure types and operating timeframes. Disconnects between the settlement timeframes of legs of FX transactions could create new types of settlement risk and potentially fails. While these impacts on the institutional capital markets are most obvious in the FX market, they would also have a range of impacts in purely domestic systems as well.

These challenges would likely result in broad funding and operating model impacts in the FX markets. For example, if wCBDC enabled some FX trades to settle within shorter timeframes to the rest of the market, then different settlement times could result in those transactions having differential spreads or pricing of

[33] GFXD paper on expanding PvP opportunities (https://www.gfma.org/wp-content/uploads/2020/03/expanding-pvp-opportunities-march-2020.pdf); GFXD paper on interoperability (https://www.gfma.org/wp-content/uploads/2018/09/recommendations-for-the-promotion-of-interoperability-between-new-technologies.pdf; GFXD paper discussing some of the considerations for market participants looking to use new settlement technologies https://www.gfma.org/wp-content/uploads/2019/09/developments-in-wholesale-fx-settlements-september-2019.pdf.

[34] GFXD response on payment systems operating hours (https://www.gfma.org/wp-content/uploads/2022/01/gfxd-response-final-the-committee-on-payments-and-market-infrastructures-cpmi-consultation-on-extending-and-aligning-payment-system-operating-hours-for-cross.pdf); GFXD response on expanding PvP settlement (https://www.gfma.org/wp-content/uploads/2021/11/gfxd-response-pvp-rfi-final.pdf); GFXD paper on targets (https://www.gfma.org/wp-content/uploads/2021/07/gfxd-response-fsb-cp-payment-targets-may2021-final.pdf).

the currency itself vis-à-vis other transactions in that currency pair using only non-wCBDC infrastructure. If third currency hedging is introduced, there would be even more potential fragmentation of pricing. It could also change the pairwise hours gaps between regions, creating additional risk and business model implications. These dynamics could also vary depending on counterparty risk, including whether or not the transaction occurs though industry infrastructure such as CLS.

The above-mentioned operational challenges should also be considered for the Federal Reserve's own foreign exchange operations. Although actual Federal Reserve FX intervention is historically rare, it is used to "counter disorderly market conditions."[35] It is worth reviewing the potential impact a wCBDC could have on these open market operations, including any impact on FX market liquidity, both positive and negative, and whether a wCBDC could affect the ability to transact on behalf of foreign governments The impacts of a U.S. wCBDC on FX markets would be felt globally, given that predominant role of the USD in FX markets, accounting for roughly 80% of global FX transactions.

In light of this operational and market complexity, the ultimate impact and real degree of benefits to end users in the FX markets from wCBDC programs remains uncertain. The Federal Reserve is closely involved in the Committee on Payments and Market Infrastructures ("CPMI") workstreams around payment system operating models and operating hours in the FX markets, and we encourage policy makers to draw on that experience in thinking through the impacts of an institutional USD CBDC on the FX market.[36] We also encourage the Federal Reserve to review the international research and proof of concept projects which have taken place around CBDC enabled FX transactions. These include the previously discussed Project Jura, which tested FX transactions in Euro and Swiss franc wholesale CBDCs in connection with cross border securities transactions, and well the recent Oliver Wyman – J.P. Morgan paper on CBDC innovation supporting cross border payments[37].

Policymakers should consider the impact of a wCBDC on international investment:
The policy debate around CBDCs has explored their potential to allow for faster, lower cost, and more efficient cross border payments. Much of this debate has focused on retail applications (such as remittances) or institutional payments for corporate users. However, the analysis of the value of a potential U.S. wCBDC should also examine the impacts on cross border capital markets investment flows, and more broadly how a wCBDC could impact the U.S. as a destination for international securities investment and as a hub for cross-border capital markets.

While these issues are to some degree connected with the open questions around the potential transformation of FX markets by wCBDCs discussed above, policymakers should examine operational and markets issues specific to the cross-border investment capital flows. These include the potential for wCBDC operating hours to alleviate the challenges associated with time zone mismatches for cross

[35] Federal Reserve Bank of New York, "Foreign Exchange Operations." Available at: https://www.newyorkfed.org/markets/international-market-operations/foreign-exchange-operations.
[36] The CPMI Cross-border Payments Expansion Workstream, including Federal Reserve participants, has released consultative reports on extending and aligning payment system operating hours for cross-border payments (https://www.bis.org/cpmi/publ/d199.pdf), among other research.
[37] Oliver Wyman, J.P. Morgan, "Unlocking $120 Billion Value in Cross-Border Payments: How banks can leverage central bank digital currencies for corporates. Available at: unlocking-120-billion-value-in-cross-border-payments.pdf (oliverwyman.com).

border investment. Models with shared infrastructure among mCBDC participants could also address timing issues that present challenges for cross border investments.

Additionally, the design specifics of future mCBDC arrangements can also promote easier cross border investment. For example, there are differences between models where under a mCBDC arrangement financial institutions can hold the local wCBDCs in their wallets in the local participating jurisdiction and then arrange transfers via correspondent relationships, versus ones where they can hold *both* participating wCBDCs in their local wallets in *either* jurisdiction. This would allow the holding of multicurrency accounts of central bank money, which would be a divergence from current practice; while this could allow for easier cross border investment it would have a range of other implications as well which need to be considered.[38]

Future analysis of these issues and their impact on the role of the U.S. as a destination for cross border investment would need to bear in mind the differences with some other markets which have explored mCBDC arrangements to support cross border payments and investment. Explorations of mCBDC arrangements have often focused on the degree to which they can solve challenges currently limiting cross border payments in markets that face issues such as the high cost of transaction banking, low speed, limited access, and limited demand; in contrast international investors in the U.S. are not generally constrained by these factors.

[38] These models are explored in the World Bank white paper "Central Bank Digital Currencies for Cross Border Payments" (Nov. 2021) https://openknowledge.worldbank.org/bitstream/handle/10986/36764/Central-Bank-Digital-Currencies-for-Cross-border-Payments-A-Review-of-Current-Experiments-and-Ideas.pdf.

Appendix: Responses to Discussion Paper Questions

Responses below submitted via *https://www.federalreserve.gov/apps/forms/cbdc*. We cross-reference sections in our full response that contain additional information to support the answers to each of the questions below.

1. What additional potential benefits, policy considerations, or risks of a CBDC may exist that have not been raised in this paper?

Because 73 percent of all U.S. economic activity is funded through capital markets activities, it is vital that capital markets impacts be a central consideration for policymakers considering adoption of a U.S. CBDC. There are several potential capital markets use cases for a "limited purpose" or "wholesale" CBDC (referred here to as "wCBDC") that would be used for institutional financial transactions rather than a more widely available public "retail" CBDC ("rCBDC"), many of which have already been the subject of tests and experimentation. These use cases highlight some of the potential benefits of wCBDC, particularly in the cross-border payments space; they also help us better understand important policy and design tradeoffs that would need to be considered prior to implementation.

See the cover letter, Section 1 "Scope of Response," Section 3.1 "Securities Settlement," and Section 3.4 "Impacts of CBDCs on Cross-Border Capital" on pages 2-6, 22-25, and 27-30.

2. Could some or all of the potential benefits of a CBDC be better achieved in a different way?

While we are not yet able to opine on the desirability of adopting a U.S. CBDC, we do believe that a wCBDC model would be a preferable approach to achieve the potential benefits of a CBDC for the following reasons. A wCBDC would be less disruptive to the financial system and financial stability than a rCBDC; it would provide a testing ground for experimentation of key systems amongst a small group of sophisticated and established financial actors; and has more proven and obvious use cases than a rCBDC. A wCBDC would also be less politically fraught, raising fewer concerns around issues such as consumer privacy than a rCBDC. Finally, a wCBDC may also be more effective than a rCBDC in preserving the U.S. dollar's status as a reserve currency and as the predominant currency for international financial transactions.

First, at a conceptual level, a wCBDC could serve as a bridge between an "on-chain" financial system and the traditional financial system. That is, if the financial system evolves such that more transactions move into a blockchain-based environment with new forms of payments and financial services, a wCBDC could help payments services providers more easily move funds on a wholesale basis within the blockchain environment (*e.g.*, to other payment services providers on behalf of underlying customers) and transfer funds from the blockchain environment to the legacy financial system (*e.g.*, a transfer of a wCBDC to a traditional central bank reserve balance, which can then be used in the traditional financial system).

Second, a wholesale digital payments system could be significantly less disruptive to monetary policy and financial stability than a more widely accessible rCBDC (with its potential to disintermediate the banking

industry and disrupt short-term funding markets), particularly if a wCBDC were confined initially to institutions that already have direct access to central bank money.

Third and related, a wCBDC would provide policymakers with the opportunity to study and test a new payments system amongst a relatively small group of sophisticated and experienced financial institutions. This would enable policymakers to address operational issues prior to more widespread adoption.

Fourth, wCBDCs have already been shown in existing experiments to be viable and there are several important use cases where they could improve existing securities markets processes and infrastructure. Moreover, successes in these areas could help with future expansion into the retail space. For example, one of the most-discussed benefits of a wCBDC is its potential to deliver faster, cheaper and safer cross-border institutional payments. While that would have little immediate direct impact on consumers, the payment rails developed to facilitate cross-border wCBDC applications could lead to improvements in the cross-border payments infrastructure available to retail end-users, which may make it easier for the public to make direct remittances and other payments across borders in the future.

Fifth, as the Board's discussion paper notes, one of the rationales for adopting a U.S. CBDC would be maintaining the U.S. dollar's status is the most widely used currency for payments and investments, as well its status as the world's reserve currency. A U.S. wCBDC would be well positioned to maintain the currency's reserve status and its predominance in financial markets transactions. In particular, it would support U.S. participation in mCBDC arrangements in the areas where U.S. capital markets play a key role internationally, such as through foreign participation in Treasury auctions, FX markets, cross border payments – both for financial institutions and their corporate clients, as well as cross border investment. It could also be used to support swap line arrangements with other countries that may also adopt a wCBDC, thereby helping to maintain the dollar's reserve currency status. In contrast, a retail-only U.S. CBDC would not support the use of the U.S. Dollar in these institutional markets.

Finally, it would initially be politically easier to implement a wCBDC. A wCBDC would not, for example, incur the same sorts of individual privacy concerns that could arise in a rCBDC context or require the same sorts of considerations of how to allocate risk and liability between the private sector and government with respect to operational and cyber issues.

Although we believe that adopting a wCBDC *could* provide the benefits of a rCBDC without the corresponding risks, we also believe that further study is needed to fully assess the costs and benefits before moving forward with adoption.

See the cover letter, Section 1 "Scope of Response", and Section 2.1 "Access" on pages 2-8.

3. Could a CBDC affect financial inclusion? Would the net effect be positive or negative for inclusion?

We do not address this question in our response given that we focus on the impact of CBDC (and specifically a wCBDC) on the institutional capital markets rather than the broader public.

4. How might a U.S. CBDC affect the Federal Reserve's ability to effectively implement monetary policy in the pursuit of its maximum-employment and price-stability goals?

In its paper, the Board raised the question of whether CBDCs could have the potential to impact the goals and implementation of monetary policy. While SIFMA does not have a position on how a potential CBDC might affect the ability of the Federal Reserve to meet its monetary policy goals within the broader economic environment, we agree that it is important for policymakers to consider potential impacts on a wCBDC and/or rCBDC on the Federal Reserve's execution of monetary policy. As part of the analysis, we believe it is important to look at both the mechanics and the infrastructure supporting the Federal Reserve's monetary policy and how these processes are impacted by the new functionality of wCBDCs and/or rCBDCs.

Our initial analysis suggests that the fundamentals of primary dealers and investors' interactions with the Treasury and Federal Reserve through auctions and open market operations would not be changed, in terms of pricing, settlement risk, and demand for Treasury securities, by a wCBDC. However, there could be changes to the mechanics of post-trade processes following auction take-downs as participants take advantage of the hypothetical new settlement functionality. Similarly, there could be changes to how foreign investors access US Treasury markets in the event that institutional wholesale mCBDC arrangements develop.

While ultimately we do not expect these process changes to fundamentally affect the demand for U.S. Treasuries or their pricing, this functionality could offer potential new market efficiencies and the Federal Reserve should work with the operators of key market infrastructure supporting Treasury auction and settlement processes to understand potential impacts and opportunities of a wCBDC.

In addition, to the extent a wCBDC is available to nonbank entities that operate a narrow bank or payments-only business model, the potential effects on monetary policy of having pass-through investment entities available to provide indirect access to central bank money should be considered.

See Section 3.2 "Considerations Around the Execution of Monetary Policy" on pages 25-26.

5. How could a CBDC affect financial stability? Would the net effect be positive or negative for stability?

There has been extensive discussion about the potential substitution effects of rCBDC away from bank deposits, but there has been less focus on the impacts of CBDCs on capital markets-based funding models. We recommend the policy makers examine the potential impacts of CBDCs on other funding models, including both the impacts of rCBDCs and wCBDCs.

One area of impact could arise if either form of CBDC (though most likely a rCBDC) were to be viewed as a substitute for investments in other low risk, liquid assets, such as MMFs and Treasury bills that have features that make them near-cash instruments or comparable to bank customer deposits. This potential substitution effect could lead to abrupt shifts in their funding. For example, at end-2019, there were an estimated $7tn of AUM in MMFs. Depending on its design features and its relative remuneration (if accounts were interest bearing), the introduction of a CBDC could be an attractive alternative for some risk-averse holders of other cash-substitutes, even in benign conditions. This in turn could reduce the demand for assets that such funds invest in, possibly affecting yields in turn.

Mitigants for this substitution effect could include:

- *Quantity measures/limits:* these would restrict the use of CBDC by either imposing caps on the total holdings of CBDC or limiting the transfers of CBDC. Quantity limits could either be stock-based (central banks limit that amount of CBDC that can be held) or flow-based (restricting the amount of CBDC that can be transferred within a given period). However, policymakers should bear in mind that political pressure could be brought to bear to raise or otherwise alter limits during periods of significant market stress, potentially limiting the effectiveness of these measures.
- *Price measures:* these could be used to disincentivize holdings of CBDC or large payments in CBDC without necessarily restricting them. For example, CBDC accounts could be prohibited from earning interest, thereby making it more "cash like" than "deposit like." Progressive fees for transferring larger amounts of CBDC could also be another mechanism to disincentivize large holdings of CBDC.
- *In-crisis measures:* in the event of a run-event, gates or switching limits could be imposed.

More broadly, policymakers should consider the potential impacts on the capital markets of a substitution out of bank deposits which could arise if a rCBDC becomes more desirable. Because banks need to rely on such deposit funding to a greater degree than nonbanks, there could be a range of unforeseen impacts on traditional wholesale funding markets and on other market participants as a result of such substitution effects.

See Section 3.3 "Impact of a CBDC on Funding Models" on pages 26-27.

wCBDCs could also have significant impacts on the FX markets that merit further study. While wCBDCs do offer the potential to execute and settle FX transactions in new and more efficient ways, these potential benefits need to be understood in the context of the various legal, interoperability, and infrastructure issues that a wCBDC would raise. These issues would need to be addressed to support CBDC enabled FX transactions.

See Section 3.4 "Impacts of CBDCs on Cross-Border Capital: Wholesale FX" on pages 27-29.

Finally, the analysis of the benefits of a potential U.S. wCBDC should also examine the impacts on cross border capital markets investment flows, and more broadly how a wCBDC could impact the U.S. as a destination for international securities investment and as a hub for cross-border capital markets.

See Section 3.4 "Impacts of CBDCs on Cross-Border Capital: International investment" on pages 29-30.

6. Could a CBDC adversely affect the financial sector? How might a CBDC affect the financial sector differently from stablecoins or other nonbank money?

The impact of a CBDC on the financial sector may vary depending on whether financial institutions are required to act as CBDC "intermediaries" (which would be more common in the wCBDC context) or a narrower "distributor" role (which would occur more often in a rCBDC context). This distinction is certainly

important when considering potential disintermediation effects of different CBDC operating models (an issue we do not discuss in length here). It is also crucial in evaluating who bears financial responsibility for key risks associated with CBDC, and therefore, how likely financial institutions would be to participate in any CBDC system.

Banks (and other financial institutions with direct access to a wCBDC) would be acting as intermediaries when they receive wCBDC from another institution with direct access to the wCBDC system. They would also be acting as intermediaries if they were to issue CBDC-like instruments that have sometimes been referred to as "synthetic CBDC" backed on a one-to-one basis by central bank reserves – essentially a form of stablecoin. In either scenario, the responsibility for various operational, cyber, and compliance risks associated with the wCBDC or CBDC-like instruments would clearly lie with the financial institution acting in an intermediated capacity.

When acting as "distributors" of rCBDC, financial institutions would provide rCBDC accounts or digital wallets and charge fees for ancillary services, but the rCBDC itself would be a liability of the central bank rather than the financial institution. Since the rCBDC would not be a liability of the intermediary, it could not be used to support revenue generating trading or lending activity. At the same time, there would be numerous potential operational and cyber risks attached to providing these accounts, plus a variety of compliance costs.

Would banks be responsible for all of these costs when acting as a distributor of rCBDC? And if so, would the limited revenue and high costs lead banks and other financial institutions to opt out of participating in a rCBDC system, thereby undermining its effectiveness? Are there mitigants to this potential problem and how would they work (*e.g.,* perhaps through some form of cost sharing between the central bank and financial institutions)? Those are all crucial questions for policymakers to consider before moving forward with adoption of CBDC, particularly if they were to ultimately adopt a rCBDC.

See Section 2.4 "Implications for Banks Acting as 'Distributors' versus 'Intermediaries'" on pages 10-11).

Furthermore, a CBDC could adversely affect the financial sector through its impact on monetary policy and financial stability, and as a result of any overly punitive regulatory requirements that may be imposed (*e.g.*, prudential treatment or risk management requirements).

See Section 2.3 "Prudential Treatment" on page 10 and Section 2.5 "Risk Management" on pages 11-14.

7. What tools could be considered to mitigate any adverse impact of CBDC on the financial sector? Would some of these tools diminish the potential benefits of a CBDC?

Mitigants for the substitution effect created by CBDCs are discussed in the response to Question 5. Furthermore, many of the potential risks associated with a CBDC may be mitigated by requiring CBDCs to be intermediated by regulated financial institutions as discussed in the response to Question 11.

8. If cash usage declines, is it important to preserve the general public's access to a form of central bank money that can be used widely for payments?

We do not address this question in our response given that we focus on the impact of CBDC (and specifically a wCBDC) on the institutional capital markets rather than the broader public.

9. How might domestic and cross-border digital payments evolve in the absence of a U.S. CBDC?

While wCBDCs offer the potential for settlement innovation, they are neither necessary nor sufficient for the evolution of existing settlement models and settlement times. In particular, the acceleration of settlement cycles **must** be understood in a broader context of securities products and operations that are adopted by market participants in practice. While wCBDCs could potentially enable new settlement models and new settlement infrastructure that would drive gains in efficiency, capital reductions and risk reduction, the unique features of wCBDCs are best understood as an *enabler* of these changes and one element of a broader process of innovation and change.

See Section 3.1 "Securities Settlement: Securities settlement – limits to the benefits of CBDCs" on page 22.

The creation of a CBDC is not in and of itself sufficient to enable changes in settlement processes. The functionality provided by CBDCs would need to be supported by a range of other changes in settlement infrastructure itself, the participation and responsibilities of the counterparties to the transaction, as well as potential changes to ancillary products and services dependent on current settlement models.

Furthermore, many of the benefits of faster settlement or different settlement models often associated with CBDCs could be developed using other payment infrastructure such as stablecoins or settlement tokens using DLT infrastructure. If providing new infrastructure for the payment leg of securities settlement is a key objective for policymakers, they should also consider the degree to which these other solutions could achieve the same goals with less complexity to implement and fewer consequences to the broader financial system.

For example, stablecoins have been explored as providing a ledger-based payment function to support faster settlement. Similarly, tokenization of existing fiat currency within a ledger-based settlement environment could offer focused benefits for the speed and efficiency of settlement.

Within this context, a narrower scope institutional CBDC could be more easily inserted within the existing infrastructure system, providing new functionality at key points within post-trade processes to while minimizing disruption to the broader financial system.

See Section 3.1 "Securities Settlement: wCBDCs are not necessary for settlement innovation" on pages 22-23.

Potential future changes to securities settlement models incorporating wCBDCs must also take into consideration the market product, operational, and capital considerations connected to the broader settlement cycle, and in particular the challenges associated with settlement cycles shorter than T+1.

DTCC has identified several important barriers, which make such a change impractical at present for the broader U.S. securities markets including:

- Moving to T+0 on a transaction-by transaction basis will remove the liquidity and risk-mitigating benefits of current netting features;
- Fails may increase due to lack of netting as transaction volume rises;
- Funding needs will be less predictable and transparent until end of the trading day; and
- Developing real-time reconciliation processes to comply with regulations will be difficult.

SIFMA further accentuated the T+0 challenges in its August 13, 2021 letter to SEC Chairman Gary Gensler. In the letter, SIFMA confirmed its support for and confidence in shortening the settlement cycle to T+1, but also highlighted four specific areas that would be impacted significantly if T+0 was adopted:

- Processes for global settlements, FX, margin investing, and securities lending would have to be redesigned to meet regulatory and contractual requirements in less than 12 hours;
- Retail investors would likely have to prefund accounts;
- Smaller firms and vendors may not have the resources necessary to complete a move to T+0 and, hence, could find their competitive position weakened; and
  Industry stakeholders – including the Federal Reserve's payment systems – would have to maintain services for more hours during the day than currently, which could increase the potential for operational failure.

See Section 3.1 "Securities Settlement: Securities settlement – challenges of T+0 and industry initiatives to shorten the settlement cycle" on pages 23-24.

10. How should decisions by other large economy nations to issue CBDCs influence the decision whether the United States should do so?

Policymakers need to consider the impacts on U.S. capital markets if other major jurisdictions move to adopt their own CBDC and the U.S. does not. This is particularly the case for wCBDC, as it is unclear whether the adoption of rCBDC by other jurisdictions would have major implications on the U.S. capital markets or their competitiveness. At the same time, it is important *not to overemphasize* the importance of foreign CBDC adoption on the decision-making process for any future U.S. CBDC. While there are a number of areas where connections with foreign CBDCs could potentially drive market efficiencies or where the absence of a U.S. wCBDC could impact investment flows, ultimately these are far less significant considerations than the effects of a wCBDC on U.S. financial markets and infrastructure.

There has been speculation that the U.S. dollar's status as a reserve currency could be threatened if it also does not move forward with a wCBDC. There are also questions around whether early adopters could enjoy significant first-mover advantages, which some have suggested should speed up adoption in the U.S. (though it is questionable whether rCBDC focused initiatives – for example, like that being implemented in China – would confer any significant advantages in this regard). While the U.S. dollar's

preeminent role in the international system is undoubtedly driven by a range of factors, this will be an important consideration for policymakers considering adoption of a U.S. CBDC.

It is possible that new forms of digital currency may have competitive advantages relative to older forms of currencies and may be appealing as holding for foreigners whose home country does not have a native wCBDC. However, these potential benefits should also be weighed against the degree to which mature and sophisticated capital markets infrastructure in the U.S. currently delivers these services to investors even without a wCBDC, in contrast to other jurisdictions which have explored a wCBDC as a solution to long standing challenges for their payments and investment infrastructure.

An analysis of the impact of the presence or absence of a U.S. wCBDC on U.S. capital markets (*e.g.,* on FX, cross-border payments and investment flows, international demand for U.S. Treasuries, *etc.*) needs to be grounded in the specifics of other major capital markets and their supporting infrastructure.

Coordination with jurisdictions that have not yet launched wCBDC projects will be important as well, both to help share experiences that will help the design process for any future wCBDCs so they are more likely to develop in a compatible way, and also potentially to ensure that points of interaction between clients and institutions in their markets and platforms and institutions using any future U.S. wCBDC are incorporated in their regulatory frameworks with a minimum of disruption.

See Section 2.10 "Implications of international CBDCs: Considerations if other jurisdictions adopt CBDC while the U.S. does not" on pages 18-19.

11. Are there additional ways to manage potential risks associated with CBDC that were not raised in this paper?

Many of the potential risks associated with CBDC may be mitigated by requiring CBDCs to be intermediated by regulated financial institutions. Specifically, such financial institutions should be able to incorporate wCBDCs into their existing risk management processes and solutions for clients without the need to create new risk frameworks to accommodate wCBDC infrastructure.

Likewise, policymakers should avoid imposing additional risk charges on financial institutions handling wCBDCs. There is no reason why wCBDCs should incur an additional operational risk charge or any other technology risk factor. While the technology that a future wCBDC uses is still an open question, this technological uncertainty is not a reason to impose new capital charges on banks. Instead, policymakers would be better advised to be adopt an approach to these issues that is technology neutral and based on underlying risk. Doing so would not only reflect the emerging international principle of "same risk, same treatment" in this space, it would also avoid discouraging bank participation in the system.

While any future wCBDC should generally be incorporated into existing risk management processes, there are several areas where its impact on particular risk factors ought to be studied, with an eye to minimizing risk impacts through the design and implementation of the wCBDC itself. These include credit and liquidity risks and operational and cyber risks. We discuss these risks in our full response.

See Section "Risk Management" on pages 11-14.

12. How could a CBDC provide privacy to consumers without providing complete anonymity and facilitating illicit financial activity?

The Board's discussion paper rightly raises privacy as a key consideration in the design of any CBDC and the decision-making process on its viability and desirability. While privacy concerns are particularly important in a retail CBDC, a wholesale environment does not raise the same sorts of privacy concerns that a rCBDC would. Compared with rCBDC, wCBDC applications would likely hold substantially less personally identifiable information and have less information related to individual transactions.

We expect that under most wCBDC design models, individual clients and their transactions would be aggregated under the accounts of the financial institutions they work with, provided that direct access to central bank money by individual clients is not allowed. This would reduce the scope of personal and transactional information which is captured by the wCBDC platform.

However, privacy concerns are not completely absent from the design of a wCBDC. Depending on the architecture of the CBDC infrastructure and the role that intermediaries play in it, if it is possible to follow the transactions through the chain of the wCBDC infrastructure and if there is considerable transparency into what is visible and explorable, it could potentially trace transactions back to their originators as can be done on some public chains. This potential auditability of transactions by outside users ought to be avoided.

Additionally, there are likely to be some institutional transactions and client types where privacy considerations need to be addressed. For example, many wholesale customers would be very sensitive to information on their transaction history being accessible *e.g.,* if it led to investment strategies being revealed. More broadly, wCBDC design must not allow any transparency into individual transactions carried out by institutions, whether purchases by retail or wholesale securities clients, or purchases of goods or services by participating financial institutions themselves. Existing confidentiality regulations govern the protection of information on client transactions held at firms – any new CBDC infrastructure needs to be consistent with these confidentiality protections. The personally identifiable information ("PII") of employees at financial institutions who are authorized to work with the wCBDC infrastructure on behalf of their firms also needs to be protected, given the contractual requirements for the protection of this PII.

Therefore, privacy oriented mitigants need to be embedded from the outset even in a wCBDC system. Additionally, if a wCBDC eventually existing alongside a rCBDC, there will arise a new class of wholesale/retail interactions where policymakers need to be aware of privacy concerns, such as the aggregation of wholesale flows. As these issues are evaluated, policymakers should also consider whether new privacy standards need to be codified into law.

See Section 2.8 "Privacy" on page 17.

13. How could a CBDC be designed to foster operational and cyber resiliency? What operational or cyber risks might be unavoidable?

Although further study needs to be conducted, there is no reason to believe that wCBDCs ought to have greater operational risk than current central bank money operating models. In fact, it is possible that the unique features of distributed ledger technology ("DLT") could result in *lower* operational risk in some

areas, though again that proposition would need to be subject to extensive testing. Close collaboration among the Federal Reserve, other participating infrastructure providers, and market participants would be critical to have a 360° view of operational risk and to help ensure that the appropriate controls and risk management features are embedded from the outset. Any novel approaches to the operational risk for users of wCBDCs should not, in and of itself, be treated as grounds for the imposition of any supplemental risk changes.

See Section 2.5 "Risk Management: Operational risks" on page 12.

We believe that cybersecurity considerations need to be front and center in the design of any future wCBDC platform. Given the digital nature of a wCBDC and its reliance on a range of new technology platforms to support the wCBDC, securing the technology infrastructure that supports the wCBDC would be critical.

Cyber-attacks on wCBDC infrastructure could be driven by a range of motivations and carried out by many different types of threat actors. Cyber-attacks could be aimed at stealing non-public information on market participants, introducing inefficiencies in market infrastructure that they could profit from, potentially illicitly moving funds, or simply degrading the performance or availability of wCBDC infrastructure, such as by a hostile geopolitical actor or a "hacktivist" group.

Regardless of motivation, scale, or type, a successful cyber-attack on wCBDC infrastructure would not only impact specific users but reduce confidence in the wCBDC itself and potentially the security of the central bank more broadly. While embedding cybersecurity in the design of the wCBDC from the outset is critically important, the specific features of cyber defense programs will depend on a range of other design considerations which shape the access points to the infrastructure and data it stores. These include access models, interoperability features, and any degree of programmability.

See Section 2.5 "Risk Management: Cyber risks - general cybersecurity concerns" on page 12-13.

Cyber risk associated with CBDCs should be differentiated into two levels – risk which exists at the level of the central bank and risk at the level of an institution which serves as the wallet provider (in distribution models). The degree of cyber risk at the level of the financial institution serving as the wallet provider will vary substantially depending on different distribution models for the CBDC. This level of risk will be critically important in understanding who bears the cyber risk, and as a result, the risks and incentives for financial institutions to take part in a CBDC program.

See Section 2.5 "Risk Management: Cyber risks for banks serving as CBDC distributors" on pages 13-14.

14. Should a CBDC be legal tender?

We recognize that there is an ongoing process underway to address the question of the existing legal permissibility of a U.S. CBDC, as mandated by President Biden's "Executive Order on Ensuring Responsible Development of Digital Assets." Regardless of the outcome of that process, it is crucial that the legal status and treatment of any CBDC (whether under statute and/or through regulation) be made

equivalent to the legal status of legacy fiat currency, and that both be fungible with one another. Clearly defining CBDCs as equivalent to legacy fiat currency is necessary for the effective implementation of a wCBDC, and to prevent a range of unintended consequences which could increase costs and risks in the system. These costs and risks would include negative liquidity impacts owing to a bifurcation between activities in CBDC and traditional fiat money markets and infrastructure; it would also reduce the interoperability of infrastructure and create the risk of funding mismatches.

There should also be clarity and consistency regarding key terminology. One area for clarity is the distinction between an "account-based" and "token-based" CBDC system. Many central bank speeches and papers, informed by the existing distinction between bank accounts and cash, have argued that these are distinct types of CBDC systems. An account-based system would operate in much the same way that central bank settlement accounts do today and is rooted in the concept of identity verification; that is, the payment from the account could be verified by knowing the identity of the account holder. By contrast, a token-based CBDC would be based on the ability of the users of the system to verify that the digital store of value (i.e., token) is genuine (others have defined CBDC tokens as "digital representations of value that are not recorded in accounts" – essentially digital banknotes).

For example, to the extent any CBDC regime is indeed based on a token-based model, it would raise legal questions that an account-based approach (one that is essentially is identical to the current system) would not.[39] As noted, the digital token cannot be stored locally, but the private key that allows for the transfer of the tokens on the blockchain is stored locally. Should the legal framework then be updated so that the private key is considered the bearer instrument rather than the digital object/token? That is, should the key be rated as equivalent to physically holding the token or asset? Related to this is the question of who ought to be responsible for the loss of the private keys: should it be the owner or would it be a third-party service provider if one was used? These and likely other questions would need to be resolved in any legal framework, ideally in a manner that was consistent with other major jurisdictions across the globe.

See Section 2.2 "Legal Status" on pages 9-10.

15. Should a CBDC pay interest? If so, why and how? If not, why not?

Price measures could be used to mitigate substitution risks. For example, CBDC accounts could be prohibited from earning interest to make them more "cash like" than "deposit like" and disincentivize holdings of CBDC or large payments in CBDC.

See Section 3.3 "Impact of a CBDC on Funding Models" on pages 26-27.

[39] See discussion in Alexander Lee, Brendan Malone, and Paul Wong, "Tokens and accounts in the context of digital currencies," *FEDS Notes*, December 23, 2020. Available at: The Fed - Tokens and accounts in the context of digital currencies (federalreserve.gov).

16. Should the amount of CBDC held by a single end-user be subject to quantity limits?

Quantity limits could be used to mitigate substitution risks. However, policymakers should bear in mind that political pressure could be brought to bear to raise or otherwise alter limits during periods of significant market stress, potentially limiting the effectiveness of these measures.

See Section 3.3 "Impact of a CBDC on Funding Models" on pages 25-26.

17. What types of firms should serve as intermediaries for CBDC? What should be the role and regulatory structure for these intermediaries?

Because we believe that a wCBDC has distinct advantages over a rCBDC, we answer the question of who exactly would have access to central bank money for settlement purposes in a wholesale environment? Direct access to central bank money today is generally restricted to banking organizations and, in certain jurisdictions outside of the United States, a limited number of non-bank, regulated payment systems providers. Limiting access to prudentially regulated institutions has been seen as important for a number of reasons: it allows the central bank to better fulfil its monetary policy objectives, promote financial stability, and ensure the safety and soundness of the banking system.

In a wCBDC context, however, demand for direct access to wCBDC from other, non-bank market participants could grow as those institutions seek to settle transactions directly in wCBDC using their own accounts or wallets (as opposed to the current indirect model, with settlement occurring via a limited number of financial institutions with accounts held at the central bank). Policymakers would then need to decide whether to expand access to these institutions, and if so, what type of rules and oversight ought to apply to those entities – including whether to impose activities restrictions on nonbank institutions that have direct wCBDC access. And if access is granted, they would also need to settle a variety of important design questions, such as whether CBDCs can be created without pre-funding (i.e., can current central bank money be exchanged for wCBDC rather than increasing the money supply by issuing new wCBDC); whether intraday and end-of-day credit should be available to all participants or selected participants; and whether wCBDC would be recorded as on or off intermediaries' balance sheets.

Given these potential challenges, and for a range of practical reasons, we recommend that direct access to wCBDC be restricted to institutions that are subject to a framework of regulation and supervision that is comparable to that currently in place for institutions with access to Federal Reserve master accounts and services. The Board could also consider whether the imposition of activities restrictions on non-bank institutions participating in this system would be warranted.

See Section 2.1 "Access: Determining access to a wCBDC" on pages 7-8.

18. Should a CBDC have "offline" capabilities? If so, how might that be achieved?

This topic is not addressed in our response.

19. Should a CBDC be designed to maximize ease of use and acceptance at the point of sale? If so, how?

We do not address this question in our response given that we focus on the impact of CBDC (and specifically a wCBDC) on the institutional capital markets rather than the broader public.

20. How could a CBDC be designed to achieve transferability across multiple payment platforms? Would new technology or technical standards be needed?

SIFMA supports the Board's view that any CBDC ought to be able to operate alongside legacy instruments and systems rather than replace them in order to minimize disruptions to the financial system and given that legacy systems have become significantly more efficient in recent years.

The potential gains in efficiency and risk reduction from development of wCBDCs would be easier to realize if there is smooth interoperability with existing infrastructure, such as the ability to transfer balances between a wCBDC and traditional central bank reserve balances. This of course recognizes that new processes and infrastructure which build on the functionality offered by wCBDCs will likely gradually expand from smaller pilots in specific market segments. These pilots will often occur in partnership with existing infrastructure providers, who may handle multiple parts of the process using existing infrastructure even as new features are added.

Interoperability will need to be built across multiple dimensions, including in the design of the wCBDC framework, its operating standards and protocols, and its technology architecture. wCBDC design needs to consider interoperability with a broad range of existing systems and infrastructure platforms. These must include, but are not limited to, existing and new wholesale payment instruments and systems; the broader capital market ecosystem and financial market utilities; cross-border foreign exchange systems; local rCBDC systems and local wCBDC systems; and ideally, cross-border and mCBDC arrangements.

As we note later in our response, this will require both coordination with domestic regulators who oversee these infrastructure venues and markets as well as internationally, with foreign central banks and monetary authorities as they implement their own CBDC projects and with infrastructure venues in those jurisdictions as CBDC functionality is embedded in them.

We recommend the Board and other policymakers look to the lessons provided by a variety of international wCBDC pilot programs, which have explored how wCBDC can be connected to existing payment and settlement infrastructure. For example, Project Helvetia is a joint experiment by the BIS, SNB, SIX and five commercial banks (i.e., Citi, Credit Suisse, Goldman Sachs, Hypothekarbank Lenzburg, and UBS). Although additional study is needed, this project suggests that a wCBDC could offer safe and efficient settlement on a tokenized asset platform and identified issues regarding the operational, legal and policy questions necessary for wCBDC issuance. Additionally, the Board should explore how existing infrastructure platforms have been able to create interoperability with an expanding range of adjacent payment and settlement services, such as the experiences of the Depository Trust and Clearing Corp (DTCC).

See Section 2.6 "Domestic Interoperability" on pages 14-15 and Section 3.10 "Implications of international CBDCs: Cross-border interoperability – mCBDC" on pages 19-20.

21. How might future technological innovations affect design and policy choices related to CBDC?

The potential for wCBDCs to be embedded with logic, or programmability, offers the potential for innovation and new functionality. However, programmability features need to be developed so they do not impair the fungibility of central bank money or introduce operational risk.

See Section 2.7 "Programmability" on pages 15-16.

22. Are there additional design principles that should be considered? Are there tradeoffs around any of the identified design principles, especially in trying to achieve the potential benefits of a CBDC?

CBDCs offer the potential for including some degree of programmability within the CBDC itself or associated with it. Programmability would allow users to embed logic for a predefined purpose within the money itself. The restrictions created by the programming could be either open ended or limited – in dimensions such as time (permanent vs time limited), venue (programmability within a specific infrastructure platform vs across all uses), and others.

While some elements of traditional fiat money have limited programmability (such as the restrictions around checks or letters of credit), CBDCs would in theory allow for much greater programmability, both in terms of range of applications and the flexibility of the logic associated with the programming. It is possible that future DLT platforms could be designed to offer a broad range of new features building on programmable wCBDCs.

In the institutional capital markets, researchers and pilot programs have identified a range of applications where programmability could increase the efficiency of capital markets products and infrastructure. For example, certain transactions could be programmed to be self-settling, or to embed features allowing payment on confirmation of transactions.

However, despite the potential benefits offered by programmability, policymakers need to consider the potential consequences of programmability more broadly, particularly for the fungibility of CBDCs with conventional fiat currency. These fungibility concerns could potentially be offset through appropriate design of the wCBDC programmability features.

Programmability features also raise a number of operational and cyber risk concerns which must be accounted for before it can be realized for any large-scale capital markets applications. If multiple platforms or infrastructure providers support transactions using programmable wCBDCs, there also would need to be a baseline of interoperability and harmonized standards to create an effective system.

See Section 2.7 "Programmability" on pages 15-16.