



► Central bank digital currencies: ongoing policy perspectives

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Bank of Canada
European Central Bank
Bank of Japan
Sveriges Riskbank

Swiss National Bank
Bank of England
Board of Governors Federal Reserve System
Bank for International Settlements

A group of central banks, together with the Bank for International Settlements, are working together to explore central bank digital currencies (CBDCs) for the public (“general purpose” or “retail” CBDC).¹ Since publishing (i) a report in October 2020 setting out the common foundational principles and core features of a CBDC;² and (ii) an executive summary³ and three detailed reports on system design and interoperability⁴, user needs and adoption⁵ and financial stability implications⁶ in September 2021, the group has continued to share ideas and perspectives on similar themes, which are summarised in this note.

Background/motivation

Most central banks are now exploring CBDCs, and more than a quarter of them are developing or running concrete pilots ([Kosse and Mattei \(2022\)](#)). Many of our jurisdictions are examining whether there is a need to ensure ongoing retail access to central bank money at a time of profound, ongoing changes across finance, technology and society. The motivation for introducing a retail CBDC may rest primarily on the role of central bank money as a public good. At the same time, the introduction of a CBDC could be an innovative opportunity for the monetary system. It is in this context that the central banks contributing to this group have continued their collaboration to deepen the practical policy and technical analysis of CBDC. Annex 1 draws out some elements of the discussion in 2022.

Some of the members of this group are approaching a point where they may decide on whether or not to move to the next stage of their CBDC work. This may include deeper investment in design decisions relating to technology, end user preferences and business models, while leaving open the decision on whether to issue CBDC. To date, none of our jurisdictions have yet decided to proceed with the issuance of a retail CBDC. CBDC issuance and design are sovereign decisions for relevant authorities based on their assessments and a jurisdiction’s circumstances. However, there has been value in working collectively on common issues.

¹ Participating central banks are: the Bank of Canada, the Bank of England, the Bank of Japan, the European Central Bank, the Board of Governors of the Federal Reserve System, Sveriges Riksbank and the Swiss National Bank.

² Group of central banks, *Central bank digital currencies: foundational principles and core features*, October 2020.

³ Group of central banks, *Central bank digital currencies: executive summary*, September 2021.

⁴ Group of central banks, *Central bank digital currencies: system design and interoperability*, September 2021

⁵ Group of central banks, *Central bank digital currencies: user needs and adoption*, September 2021

⁶ Group of central banks, *Central bank digital currencies: financial stability implications*, September 2021

Key messages

Development of CBDC work requires careful consideration and engagement with a wide range of stakeholders, including the private sector and legislators.

The experiences of this group indicate that no single form of outreach or engagement fits all purposes or all stakeholders. Two-way public outreach on CBDCs may take different forms (eg bilateral engagement, forums, open consultations) and will need to engage a variety of stakeholder groups. Bilateral exchanges can be used both to create awareness and understanding, and to gather input from stakeholders. Established forums can also serve to update stakeholders and develop practical insights. Open consultations may also be useful for seeking views from a broader range of industry professionals and the wider public (see Box 1).

Private innovation is seen as an important factor for the long-term success of any CBDC. Depending on jurisdictional circumstances, central banks may choose to take different approaches in shaping and guiding private sector propositions for possible CBDC services and use cases. Some may favour a model where the central bank clearly defines a scope and practical use case, whereas other central banks might favour allowing the private sector to innovate within a set of principles and objectives.

Legislators and authorities will need to remain engaged as work on CBDC progresses. The development of solutions to some of the outstanding legal issues related to CBDC will largely be a matter of national law and will tend to be highly dependent on policy choices and the design of a CBDC (see Box 2). The central banks in this group recognise that no meaningful retail CBDC could be issued without the support of respective governments.

To successfully meet its public policy objectives, a CBDC ecosystem should allow a wide range of private and public stakeholders to participate and, in doing so, deliver services which benefit end users.

The central banks contributing to this report anticipate that any CBDC ecosystem would involve both the public and private sector. There are a variety of potential CBDC business models, and central banks may need to understand potential benefits to stakeholders and the public in each model, including incentives to participants and value added to end users. They may also need to consider the optimum level of adoption needed to meet their public policy objectives; for example, certain policy objectives may only be achieved if CBDC adoption reaches, or exceeds, a certain level. This may, in turn, influence the functionality, solution design and use cases for CBDC.

Central banks already have expertise in creating and managing a sophisticated value chain for a mass market retail product – banknotes. While the value chain for CBDC would be different, some of the expertise in banknotes may be applicable. The range of digital products and solutions available today provide the central bank with various options in building the ecosystem: when designing a CBDC system, central banks could consider which services to procure from the private sector and which services will require internal development; these decisions would be tailored to

respective policy goals, stakeholder constraints and institutional priorities. Central banks should identify their respective institutional preferences and constraints, and where necessary adjust these as needed to fulfil the desired public policy objectives for CBDC.

The complex design questions and the potential risks arising from the implementation of any CBDC require careful consideration.

In 2021, this group noted there was a balance between facilitating adoption of any CBDC to realise policy objectives and managing any potential excess demand for CBDC. CBDC design will need to account for potentially wide ranges of demand or CBDC adoption in the early/introductory stages, and preparedness for market stresses or other extraordinary scenarios must be there from the outset. To the extent that any central bank wishes to actively shape demand for CBDC, as part of its larger policy toolkit, there is likely no one-size-fits-all solution for whether pricing or quantity control approaches are most suitable, either in the introductory phase or over time (see Box 3). In designing and implementing any measures, central banks would need to be mindful of central bank balance sheets, interaction with bank regulation and how CBDC compares with other forms of money.

CBDCs, if issued, must be interoperable with other forms of money and existing payment systems. Two key issues are how CBDC would connect with instant payment infrastructure,⁷ and how CBDC transactions could be processed at point of sale (PoS) terminals. Similar to its role in existing infrastructure and a diverse set of industries, international standardisation could be highly beneficial in supporting the development of the CBDC ecosystem.

Decisions to deepen technology investments will also carry meaningful cost. Testing and development of solutions has not yet led any member of this group to make firm choices around one technology or system design, although such choices are likely to occur in the coming years. For example, the use of blockchain within CBDC systems remains a possibility, although it is currently not deemed essential to the functioning of a potential CBDC system (see Box 4).

The evolving payments landscape requires central banks to give some consideration to how CBDCs may be used for wholesale and cross-border use cases.

Jurisdictions issuing CBDC will likely want to enable cross-border payments between them. Enabling, let alone enhancing, cross-border payments via a retail or wholesale CBDC will require central banks to collaborate and make substantial decisions about

⁷ The motivations for issuing a CBDC will need to be considered from a holistic perspective, taking into account existing and potential future payment rails in a jurisdiction, such as instant payment systems. Such alternatives might make it possible to achieve some of the benefits that are also attributed to CBDCs.

how CBDCs connect across respective jurisdictions, as well as approaches to non-resident access.⁸

There have been several experiments looking into whether wholesale CBDCs can help to improve cross-border payments⁹ and the settlement of tokenised assets both domestically and across borders.¹⁰ As financial institutions usually already have access to central bank money in digital form, discussion of wholesale CBDC tends to focus on central bank money which utilises new technologies such as distributed ledger technology (DLT).¹¹ Compared with today's central bank reserves, wholesale CBDC might enable programmability, composability and tokenisation within the future financial system.¹² For example, wholesale CBDC could facilitate delivery versus payment settlement in central bank money for tokenised assets and allow for efficiency gains in "atomic settlement".

Many experiments with wholesale CBDC for cross-border payments have enabled a wider set of participants to have direct access to central bank systems. Broadening access arrangements to a wider set of participants (domestically and/or internationally) would be a significant policy choice that could also be undertaken without CBDC. Therefore, further work is needed to understand how value could be drawn through issuing a wholesale CBDC – particularly what it may provide over and above upgrades and improvements to existing systems. Making improvements with CBDCs may also require central banks to consider the role of further governance and standardisation or alignment in areas beyond messaging standards.

⁸ Joint report to the G20 by the BIS Committee on Payments and Market Infrastructures, the BIS Innovation Hub, the International Monetary Fund and the World Bank, *Options for access to and interoperability of CBDCs for cross-border payments*, July 2022.

⁹ BIS Innovation Hub, *Using CBDCs across borders: lessons from practical experiments*, June 2022.

¹⁰ BIS Innovation Hub, SNB and SIX, *Project Helvetia Phase II: Settling tokenised assets in wholesale CBDC*, January 2022.

¹¹ This differs from retail CBDC exploration, which is not necessarily based on DLT and is more focused on providing the public with access to central bank money in digital form.

¹² BIS, *Annual Economic Report 2022, "The future monetary system"*, Chapter III, June 2022.

Annex 1

Box 1: How can central banks best engage industry and the public?

Central banks have a variety of approaches to public engagement and consultation about a possible CBDC.

- **Stakeholder forums:** Some approaches, such as reports and speeches, are traditional one-way modes for sharing information. Others involve the two-way exchange of information and could include meetings with stakeholders and topical forums that invite feedback on a range of issues. All central banks in this group have some level of bilateral engagement, while some have also set up forums to meet with multiple stakeholders in one setting.
- **Public consultations:** Several of the central banks have consulted the public on a CBDC. Although consultations can be useful in casting light on issues that are important to stakeholders, in some cases results may not provide an accurate reflection of public opinion if the responses are not part of a balanced sample.
- **Surveys of payment behaviour** may be useful to document a decline in the use of cash and understand consumers' payment habits more broadly. They may also provide information on individuals' access to accounts and various payment instruments, which can be relevant for assessing whether a CBDC may expand financial inclusion.
- **CBDC-dedicated user studies** may be warranted. Yet how to conduct such studies is far from trivial. As they concern a product that does not yet exist, an "indirect" approach may be needed. In practice, central banks that have started dedicated user studies have used online communities, together with focus group research, to leverage participant interactions.
- **Case studies** could be used to draw inferences about users' needs and preferences for a CBDC. The advantage of such studies is that they go beyond the hypothetical by revealing users' choices "in real life". The downside is that those choices, and ultimately the success or failure of a payment solution, are affected by many factors, which makes it hard to draw strong conclusions. Case studies may also be useful in studying go-to-market strategies.

Box 2: What are the key legal issues related to retail CBDC?

The legal issues related to a retail CBDC span many different branches of a country's national law. Some of these issues also arise with traditional forms of money, although the solutions may differ. Legal issues include: (i) the legal classification of a retail CBDC; (ii) the authority of the central bank to issue one; (iii) the concepts of settlement and payment finality in a retail CBDC system; (iv) data governance, privacy and

anonymity in a retail CBDC system; (v) the potential imposition of restrictions on holdings; (vi) non-resident access to a retail CBDC; and (vii) the potential liabilities of participants in a retail CBDC system. Regulatory issues such as competition and AML/CFT also need to be addressed.

A foundational legal question concerns the legal classification of a retail CBDC and, for example, whether it should reflect an existing classification such as cash or deposits, or a new type of classification. The CBDC's legal classification will have implications for the resolution of a broad range of questions including the rules on payments and settlement finality, which may differ from those applicable to payments and settlements under the current system. Legislation may need to be enacted or adjusted to specifically authorise the issuance and distribution of a retail CBDC (eg changes to central bank charters/statutes, legislation in other areas related to payments or to the constitution itself). The data protection regime that would apply to a CBDC system would be determined, to some degree, by system design and the choice of the types of participants who are allowed to hold customer data in the system, as well as by other policy choices. As CBDC work progresses, authorities will need to factor in competition law implications surrounding elements of the CBDC system. Further attention may also need to be devoted to the use and design of any limits on holdings of CBDC, and rules governing CBDC's convertibility into other means of payment. International cooperation will be an important consideration in the establishment of rules governing non-resident access to a CBDC.

The legal design of a CBDC may also have an impact on its adoption. For example, attribution of legal tender status to CBDC could result in greater public trust and uptake but would likely require legislative change in most jurisdictions.

Box 3: What tools may be needed to manage stressed conditions?

When considering potential tools and policies to manage stressed conditions (eg limiting or managing fund outflows from bank deposits), there are price and quantity control approaches, with a mix of the two also being possible.

Quantity holding limits have the advantage of directly limiting the extent of potentially harmful levels of disintermediation (eg structural changes resulting from CBDC adoption that increase the cost or availability of credit across the economy), and being relatively simple to implement. However, they also have disadvantages, such as potentially impacting adoption; this may happen if holding limits increase the risk of failed transactions occurring, or make CBDC transactions less convenient, especially if alternative forms of digital money (eg stablecoins) do not present similar limits.

Implementing limits may also have knock-on effects on the potential functionality of CBDC. Technical solutions such as "waterfall" or "cascade" functionality, whereby CBDC holdings or payments that would breach a limit would automatically be transferred into other deposits, could be considered to ease the effects of being close to any holding limit/threshold. These would require careful design and implementation because obligatory (ie automatic system-induced) transfers are not currently used widely, and they could bring some additional

operational complexity and legal challenges, to ensure payments succeed across both payer and receiver linked accounts and wallets.

Price-based measures like fees and tiered remuneration have the advantage of being more flexible by allowing for any size of transaction or holdings, albeit at increasing costs. In principle, the decision about the amount of CBDC transferred or held above a certain level is influenced via incentives but still relies primarily on each user's preference. However, price-based measures may permit larger inflows into CBDC in stress situations compared with holding limits as the fee or scale of negative remuneration required to dissuade runs may be very large. Subject to jurisdictions' motivations and priorities, providing the possibility for these extra inflows into CBDC, (at a pre-specified cost to users), could be considered consistent with a goal for CBDC to provide the public with access to central bank money. While fee-based measures and negative interest rates have been applied by some central banks to non-monetary policy deposits from (non-monetary) policy counterparties such as international organisations and central banks, central counterparties or RTGS members, they have been not fully transmitted to households' accounts in some jurisdictions where households' accounts have not yet been subject to fees / negative remuneration.

Box 4: What could be the implications of using blockchain technology and associated concepts in CBDC?

The use of blockchain technology within CBDC systems remains a possibility, although it is not deemed essential to the functioning of a potential CBDC system. Any CBDC architecture choices¹³ are likely to be made in the context of policy, business model, market, political and organisational constraints.

The core organising principle of blockchain technology is that there are no trusted parties within a system, but the central bank, as the issuer of CBDC, is implicitly trusted by holders of the CBDC. The need to proxy trust in blockchain-based systems creates inefficiencies resulting in challenges with performance and scalability. However, there may be ancillary uses for blockchain technology, and associated concepts from within the cryptoasset ecosystem, that could potentially extend the functionality of a CBDC (eg enabling certain types of programmability, micropayments).

- Programmable payments involve allowing for some automation or conditions to be set around a transaction. Assessing their potential raises questions of: (i) whether supporting programmability requires a blockchain design, or whether it would be feasible to extract the required constructs and provide them in a non-blockchain design; and (ii) what type of CBDC designs could be launched without programmability but would leave open the capability to introduce it at a future date, if needed, without requiring a major redesign.
- Micropayments refer to very small-value payments which are largely considered unfeasible within the existing infrastructure. Enabling

¹³ [Archetypes for a retail CBDC - Bank of Canada](#) shows how asking three questions regarding organisation of the system state leads to the five archetypes of the Centralized, the Leaderless, the Macro-Partitioned, the Micro-Partitioned and the Direct.

micropayments may also require the capability to process a large number of very small payments in a short time. Supporting CBDC micropayments may therefore require infrastructure that would enable ultra-low cost of settlement (ie fractions of a cent) and very high throughput (eg hundreds of thousands or millions of transactions per second). It remains to be seen whether blockchain technology will be able to support these specifications.

Quantum computing is developing quickly in addition to the evolving threat of security vulnerabilities. These developments could break current “classical” cryptography that is used by most systems. A new generation of “post-quantum” cryptography (PQC), which is resistant to attacks by quantum computers, is in the process of being developed and standardised. PQC may need to be considered in potential CBDC designs.

Annex 2: Steering group members in 2022

Co-chairs

Bank for International Settlements	Cecilia Skingsley
Bank of England	Sir Jon Cunliffe

Members

Bank of Canada	Carolyn Rogers (since Sept 2022) Timothy Lane (until Sept 2022)
European Central Bank	Fabio Panetta
Bank of Japan	Shinichi Uchida
Sveriges Riksbank	Per Jansson (since Dec 2022) Cecilia Skingsley (until July 2022)
Swiss National Bank	Andréa Maechler (since Aug 2022) Fritz Zurbrugg (until July 2022)
Board of Governors of the Federal Reserve System	Lael Brainard
Bank for International Settlements	Hyun Song Shin

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