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CENTRAL BANK DIGITAL CURRENCY: FURTHER NAVIGATING CHALLENGES AND RISKS

IMF staff regularly produces papers proposing new IMF policies, exploring options for reform, or reviewing existing IMF policies and operations. The Report prepared by IMF staff and completed on November 10, 2025, has been released.

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CENTRAL BANK DIGITAL CURRENCY: FURTHER NAVIGATING CHALLENGES AND OPPORTUNITIES

EXECUTIVE SUMMARY

This paper informs the Executive Board of recent global developments in central bank digital currency (CBDC) in light of the upcoming publication of new chapters of the IMF's CBDC virtual Handbook (Handbook), to be released in November 2025. Exploration of retail CBDC (rCBDC) and wholesale CBDC (wCBDC) remains active, with efforts on the latter gaining prominence. This third wave of chapters, summarized below, examines the implications of CBDC for financial stability and retail payments competition, legal and financial integrity issues, payment ecosystem resilience in fragile and conflict-affected states (FCS), and tokenized reserves. The topics were mostly informed by questions expressed by member countries.

The Handbook aims to provide frameworks for policymakers to scrutinize CBDC. The Handbook is intended as a technical resource primarily for emerging market and developing economies (EMDEs) to reflect countries' experiences, lessons, and research as well as offer frameworks to help think through potential implications and tradeoffs of CBDC. Each chapter tackles a specific question and is not intended to evaluate CBDC's overall appropriateness. That is left up to policymakers given domestic circumstances. Financial support for the Handbook is provided by the Government of Japan.

What are the implications of rCBDC for financial stability?

- rCBDC could affect domestic financial stability negatively or positively through multiple interrelated channels, involving changes to bank funding and lending, fee income loss, run risks, information flow, and payment system resilience. The strength of these effects depends on adoption levels and country characteristics, but it remains empirically uncertain.
- Countries can mitigate financial stability risks through careful rCBDC design and existing policy tools. Impact assessments should begin with bank balance sheet analyses and evolve with macro-financial modeling and ongoing data collection.

How would rCBDC affect retail payments competition?

- Design features such as fee structures, interoperability, intermediary rules, and legal tender status all influence whether rCBDC would strengthen or dampen competitive dynamics. A well-calibrated design is essential for balancing benefits like inclusion and pricing discipline with risks such as crowding out private providers.
- rCBDC has the potential to improve competition, especially in markets dominated by private platforms with high fees and limited access. rCBDC may have a more moderate impact in regulated markets where there are fee caps or other controls. Other policies also exist to underpin competition in payment systems.

What are the key legal considerations for both rCBDC and wCBDC?

- rCBDC initiatives raise questions about the legal nature of rCBDC as currency, the statutory basis for its issuance and platform operation, and the regulatory authority over service providers. They also require the legal assessment of the relationships within a rCBDC ecosystem and key features such as limits, fees, interest, programmability, and offline use.
- wCBDC presents legal challenges mainly associated with tokenization, including in relation to its legal nature, the central bank's mandate to issue wCBDC and operate its platform—either directly or through outsourcing to third parties—the legal relationship between the central bank and users, and legal certainty for the settlement finality of wCBDC transactions.

How might rCBDC affect financial integrity?

- The financial integrity implications of rCBDC will depend on its design. For instance, token-based, decentralized, or direct models may pose higher or more novel money laundering and terrorism financing (ML/TF) risks, potentially requiring central banks to assume anti-money laundering and combatting the financing of terrorism (AML/CFT) responsibilities traditionally held by intermediaries. rCBDCs carry more complex financial integrity implications than wCBDCs.
- There is little precedent on the application of the Financial Action Task Force (FATF) Standards to rCBDCs, raising interpretive and practical challenges. Some aspects of AML/CFT implementation can mirror traditional approaches, but others may require new systems or further guidance. Authorities should consider the financial integrity implications and assess the ML/TF risks of a rCBDC system, ideally at the design stage and throughout successive phases of pilots or launch.

What lessons from payment ecosystems resilience in FCS could help inform rCBDC?

- Building resilient payment ecosystems in FCS requires reinforcing five layers—users, solutions, intermediaries, infrastructure, and connectivity—through strategies like redundancy and scalability, distributed infrastructure and decentralization, operational and cybersecurity, user accessibility and awareness, as well as regulatory and legal frameworks.
- rCBDC offers potential benefits, such as backup infrastructure, secure digital rails, and programmable emergency disbursements. However, these benefits must be tailored to local contexts, such as offline capabilities, low-tech access, and institutional trust.

What are tokenized reserves,[1] and how might central banks explore them?

- As issuers of the most liquid and safe assets—central bank reserves—central banks may consider issuing tokenized reserves on distributed ledger technology (DLT)-based infrastructure to preserve the role of central bank money in anchoring trust and stability in the financial system. In addition, tokenized reserves could enhance efficiency and support use cases like atomic settlement of tokenized assets or cross-currency transactions.
- Central banks might also assess alternative settlement solutions such as RTGS links, omnibus accounts, and privately-issued tokenized money. Ultimately, central banks' strategic decisions and policy options will vary across jurisdictions, reflecting differences in available resources, legal systems, and policy priorities.

[1] This paper uses the term "wCBDC" when referring to general discussion of wholesale CBDC, while the term "tokenized reserves" in this paper refers specifically to central bank reserves issued on distributed ledger technology (DLT), distinguishing it from the broader term "wCBDC."

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CONTENTS

Glossary

AE	Advanced Economy
AML/CFT	Anti-Money Laundering/Combating the Financing of Terrorism
AMRO	ASEAN+3 Macroeconomic Research Office
BIS	Bank for International Settlements
BOC	Bank of Canada
BOE	Bank of England
BOT	Bank of Thailand
CBDC	Central Bank Digital Currency
CBOB	Central Bank of the Bahamas
CD	Capacity Development
DLT	Distributed Ledger Technology
DNFBP	Designated Non-Financial Businesses and Professions
DvP	Delivery-versus-Payment
ECB	European Central Bank
e-CNY	Digital Yuan
EMDEs	Emerging Market and Developing Economies
EU	European Union
FATF	Financial Action Task Force
FCS	Fragile and Conflict-Affected States
FPS	Fast Payment System
HKMA	Hong Kong Monetary Authority
IMF	International Monetary Fund
JAM-DEX	Jamaica Digital Exchange
MiCA	Markets in Crypto-Assets Regulation
ML/TF	Money Laundering/Terrorism Financing
PFMI	Principles for Financial Market Infrastructures
POS	Point-of-Sale
PSP	Payment Service Provider
PvP	Payment-versus-Payment
QR	Quick Response
RBA	Reserve Bank of Australia
rCBDC	Retail Central Bank Digital Currency
RTGS	Real Time Gross Settlement
SNB	Swiss National Bank
TIPS	TARGET Instant Payment Settlement
UPI	Unified Payments Interface
USSD	Unstructured Supplementary Service Data
VASP	Virtual Asset Service Provider
wCBDC	Wholesale Central Bank Digital Currency

INTRODUCTION

1. **As CBDC exploration continues, the breadth and depth of questions to be addressed increase, requiring central banks to proceed with careful and methodical analysis.** The IMF's CBDC virtual Handbook aims to offer frameworks to help policymakers identify and explore the complexities of CBDC. As a resource primarily for EMDEs, the Handbook is a document that evolves with new experiences, lessons, and research. It is a technical document—not a policy or prescriptive document—offering frameworks to help countries carefully think through the potential implications of CBDC. Each chapter addresses a specific question and is not intended to provide an overall judgment on the appropriateness of CBDC or systematically compare CBDC to alternatives, leaving such assessments to jurisdictions based on their own circumstances. Financial support for the Handbook's development is provided by the Government of Japan.

2. **The first and second waves of Handbook chapters covered key considerations for CBDC analysis and received widespread interest from IMF member countries and beyond.** The first wave covered foundational questions, including approaches to CBDC exploration and product development, potential impacts on monetary policy transmission, the role of CBDCs in supporting financial inclusion, and how capital flow management measures could be implemented in a CBDC context. The second wave covered design and policy considerations for CBDCs within the broader payments landscape, including its positioning compared to e-money and fast payment systems (FPS), cyber resilience, data use and privacy protection, and strategies to tackle adoption. It also explored implications for monetary operations and cross-border rCBDC arrangements. Since the Handbook's launch in November 2023, the Handbook's webpage has attracted over 62,090 unique visitors and the chapters have collectively garnered 49,287 downloads.

3. **The third wave of Handbook chapters explores emerging issues related to CBDC, summarized in this paper.** Scheduled for publication in November 2025, this set of six Fintech Notes covers macro-financial topics including the implications of rCBDCs for (1) financial stability and (2) payments competition. It covers legal and regulatory themes such as (3) key legal considerations and (4) financial integrity. It also provides (5) insights for using rCBDC to strengthen payment ecosystem resilience in FCS and sheds light on the emerging area of (6) tokenized reserves. The findings, summarized in this paper, are preliminary and may be updated in the future as new knowledge and experiences emerge.

4. **The Handbook chapters have contributed to the IMF's capacity development (CD).** The chapters have helped policymakers identify complexities related to CBDC and think through them more systematically. The chapters have also bolstered peer-to-peer learning in helping countries share lessons and experiences. In multiple cases, the chapters have encouraged policymakers to methodically explore CBDC rather than rush into deploying it. Discussions with authorities, also in the context of CD, have complemented the Handbook frameworks and helped identify key questions.

CURRENT CBDC AND PAYMENTS LANDSCAPE

5. **Global interest in CBDCs continues, with a growing focus on wholesale use cases and continued strong retail interest in certain regions.** The Bank for International Settlements' (BIS) most recent CBDC survey reveals that 91 percent of 93 surveyed central banks are exploring rCBDCs, wCBDCs, or both—with work on wCBDC progressing to more advanced stages than rCBDC (BIS, 2025). Yet interest in exploring rCBDCs remains notably high in certain regions of the world. An IMF survey in Sub-Saharan Africa found that 75 percent of countries surveyed are currently engaged or planning to be engaged in CBDC, with roughly two-thirds in the research phase and more than a quarter actively preparing for a rCBDC launch by 2028 (IMF, 2024).

6. **Some countries are preparing for near-term issuance, while others continue to assess use cases, market fit, and operational feasibility.** Kazakhstan is in the process of rolling out its Digital Tenge for full launch by the end of 2025, to support use cases such as programmability, settlement for digital assets, and cross-border payments (The Astana Times, 2025). Russia plans to have its largest banks enable Digital Ruble transactions to their clients from September 2026 (TASS, 2025). Brazil also plans to launch its Drex CBDC in 2026, in two phases (Valor International, 2025). Meanwhile, the Bank of England has recently set up a Digital Pound Lab to co-create and test different potential use cases with the industry to better understand potential business models for payment service providers (BOE, 2025). Similarly, the European Central Bank has continued its work on the digital euro scheme rulebook and intensified experimentation, user research, and stakeholder engagement (ECB, 2025), and EU finance ministers have agreed on a roadmap for launching a digital euro (Reuters, 2025).

7. **Expanding CBDC pilots in major economies underscores the importance of integration, interoperability, and user centricity.** China's e-CNY pilot has been extended to Hong Kong, allowing residents to open and top up e-CNY wallets via FPS—representing the world's first FPS-CBDC linkage and an advancement toward cross-border payments interoperability (HKMA, 2024). Domestically, China is also trying to encourage adoption by integrating the e-CNY into two payment platforms—WeChat Pay and Alipay. Meanwhile, India expanded its e-Rupee pilot to include offline and programmability features, as well as allowed certain nonbanks to offer e-Rupee wallets to enhance adoption and improve distribution (The Hindu, 2025). India also launched a pilot for the settlement of government securities via the wholesale e-Rupee.

8. **Some countries have paused rCBDC efforts altogether following an assessment of limited domestic needs.** Some AEs, like Canada and Australia, after conducting years of extensive research and consultation on rCBDC, found that existing payment systems already meet public needs effectively and concluded that there is limited added value from issuing a rCBDC at this time (BOC, 2025 and RBA, 2025). In EMDEs, Thailand's live pilot demonstrated that while rCBDC can effectively enhance competition, innovation, and resilience, there is no need for immediate issuance (BOT, 2024). These cases emphasize the importance of having clear use cases, on-point analysis, and a compelling policy rationale before moving forward. Meanwhile, the U.S. House passed the Anti-CBDC Surveillance State Act bill (still pending passage by the Senate), which would amend the Federal Reserve Act to prohibit the Federal Reserve Board from testing, studying, developing, creating, or implementing a CBDC.

9. **Lessons on the importance, and limits, of incentives in driving adoption are emerging in countries that launched rCBDC.** For instance, rCBDC adoption remains very limited with less than 2

percent of population using rCBDC in Nigeria, and less than 1 percent in Jamaica and The Bahamas (Osakwe et al., 2025 and Cato Institute, 2024). In Jamaica, the uptake of its JAM-DEX has been driven by government incentives, revealing the challenge of sustaining organic user demand. However, authorities remain determined to address first-mover challenges by working to integrate the JAM-DEX into point-of-sale (POS) systems for merchants, including testing dynamic QR codes (Jamaica Observer, 2024). The Bahamas has similarly relied on incentive programs like the SandDollar Holiday Rebate program to encourage users to activate new wallets, load funds, and receive rebates for spending (Central Bank of the Bahamas, 2024). The central bank plans to require commercial banks to distribute CBDC in 2026, shifting away from incentives toward regulatory mandates (Reuters, 2024).

10. **Interest in wCBDC is rapidly rising, driven by the desire to understand how tokenization could enhance financial market infrastructures.** Project Acacia by the Reserve Bank of Australia demonstrated that placing both wCBDC and tokenized assets on a shared programmable platform can yield efficiency gains and reduce settlement risks (RBA, 2024). Project Agora, a large collaboration involving seven central banks[2] and over 40 private sector financial firms now in its design phase, underscores the value of public-private coordination in designing interoperable platforms that integrate tokenized central money and commercial bank money, reinforcing the potential for a coordinated ecosystem that supports future financial innovation (BIS, 2025). Project Helvetia by the Swiss National Bank is testing two approaches (wCBDC and RTGS links) for settling tokenized assets transactions, to evaluate flexibility and long-term integration (SNB, 2025). The Eurosystem in 2024 also tested three interoperability solutions comprising a full DLT solution, a TARGET Instant Payment Settlement (TIPS) hash-link, and a trigger solution (ECB, 2024).

11. **This heightened interest is also propelled by efforts to make cross-border payments faster, cheaper, and more efficient.** Project mBridge,[3] now in its Minimum Viable Product stage,[4] explores how multi-currency wCBDC arrangements, built on a common technical platform, could enable instant, low-cost, and universally accessible cross-border payments with final settlement. Other countries are pursuing similar efforts to improve regional payment corridors, such as Project Sunbird,[5] which explores applications among the Common Monetary Area countries in Africa. Projects in related areas are also underway, exploring how new technologies can automate regulatory compliance, enhance AML/CFT checks, and detect criminal activity in payment data (BIS, 2025).

12. **Beyond CBDCs, countries have made significant strides in advancing domestic and cross-border payments through investments in FPS, interoperability, and multilateral platforms.** India's Unified Payments Interface (UPI) has been especially successful and some countries around the world have begun adopting the technology. In Latin America, various countries have launched their own FPS

[2] The Bank of France (representing the Eurosystem), Bank of Japan, Bank of Korea, Bank of Mexico, Swiss National Bank, Bank of England, and Federal Reserve Bank of New York.

[3] Project mBridge is a collaboration between the People's Bank of China, Hong Kong Monetary Authority, Bank of Thailand, Central Bank of the United Arab Emirates, and Saudi Central Bank.

[4] mBridge's Minimum Viable Product (MVP) platform is enabled to undertake real-value transactions (subject to jurisdictional preparedness) and is also compatible with the Ethereum Virtual Machine, allowing it to be a testbed for add-on technology solutions, new use cases and interoperability with other platforms (BISIH, 2024).

[5] Project Sunbird is a collaboration between the Central Bank of Eswatini, Central Bank of Lesotho, Bank of Namibia, and South African Reserve Bank.

(with considerable adoption of Pix in Brazil). In Southeast Asia, cross-border QR code interoperability has spurred local currency settlement and provides a cost-effective model for countries to bypass legacy card infrastructure (AMRO, 2025). QR payments are especially attractive for small merchants without POS terminals, requiring only a printed QR code linked to an account. Countries with existing FPSs are also exploring cross-border linkages, with Project Nexus[6] using a "hub and spoke" model to connect multiple FPSs, offering greater efficiency and scalability beyond bilateral linkages. It recently established an operating entity to manage the platform in 2025 and aims to go live by 2026 (Nexus Global Payments, 2025).

13. **Recent development and regulatory shifts in crypto assets and stablecoins could have implications for payment system development.** The enacted GENIUS Act and Clarity Act bill (still pending passage by the Senate) in the U.S. aim to establish a regulatory framework for payment stablecoins and to clarify the regulatory jurisdiction of federal agencies overseeing other digital assets, respectively, encouraging broader adoption by reducing legal and regulatory uncertainty. Meanwhile, the EU's Markets in Crypto-Assets Regulation (MiCA) establishes harmonized rules for crypto asset and stablecoin issuance and services. These frameworks seek to foster innovation and bring greater legal and regulatory clarity. However, some EMDE authorities are concerned that foreign stablecoins could amplify capital outflow risks and undermine local financial systems. Some jurisdictions expect that both stablecoins and CBDC could be used for payments. They could compete against each other if they are seen as close substitutes or could coexist if they focus on different use cases, dictated by their different economic, legal, and technological characteristics (IMF, 2025).[7] As such, it will be critical to monitor their effects on payment system development.

14. **The IMF's CD work has encouraged jurisdictions to take a careful and systematic approach to evaluate CBDC rather than rushing to deployment.** Increasingly, this work is becoming more data driven, drawing on information provided by country authorities and tailoring analysis to their specific macroeconomic and financial conditions.

15. **In response to growing demand, recent CD has also expanded into adjacent areas, including cross-border payments.** For example, the IMF and World Bank have joined hands to provide joint technical assistance on cross-border payments to help countries improve payment systems, reduce costs, and meet G20 Roadmap targets for faster, safer, and more inclusive payments. These CD efforts have also been integrated with the IMF's analytical and surveillance work, aiming to help member countries navigate an increasingly complex digital payment landscape.

[6] Project Nexus is a collaboration between Bank Indonesia, Bank Negara Malaysia, Bangko Sentral ng Pilipinas, the Monetary Authority of Singapore, and the Bank of Thailand.

[7] Both CBDC and stablecoins could be used for payments and could compete against each other if they are seen as close substitutes. The more stablecoins are safe and integrated with the payment system, the more stablecoins can be seen as a substitute for CBDC. This could happen for instance, if stablecoin issuers have access to the central bank payment system, and even more so if they are allowed to be fully-backed by central bank reserves. Stablecoins and CBDC could also co-exist if they focus on different use cases, dictated by their different economic, legal and technological characteristics. Indeed stablecoins and CBDC differ in issuer, risk, legal status, transferability, technology, and potential use for illicit activities.

MAIN MESSAGES FROM THE NEW HANDBOOK CHAPTERS

A. Macro-Financial Implications

16. **This section summarizes two chapters that relate to the macro-financial implications of rCBDC. In** most countries, central banks are mandated to ensure price stability and trust in money, which requires close supervision of payment systems. As such, central banks must carefully assess how rCBDCs might affect the financial system, and through this monetary stability, as well as competitive dynamics within the payments landscape.

Evaluating the Implications of rCBDC for Financial Stability

17. **Financial stability concerns are a primary question that central banks consider when evaluating rCBDC.** There are concerns that wide acceptance of rCBDC could increase financial stability risks, primarily through the impact on banks. The financial stability implications of rCBDC have been widely researched, but primarily from a theoretical perspective and with country-specific applications.

18. **This chapter contributes to literature in two main ways.** First, it provides a framework of the transmission channels in a domestic context, taking a broad perspective on financial systems in different types of economies, and drawing insight from studies that have quantified some of these effects. Second, it offers practical guidance on tools and models to evaluate financial stability risks and discusses options to mitigate them. Key findings are summarized below.

19. **As a new liquid, safe, and widely accessible payment instrument and a store of value, rCBDC substitute for existing forms of money.** A foundational principle of rCBDC is that it should be designed to coexist with existing forms of money. Still, agents may choose to decrease their holdings of bank deposits, as well as safe and money-like assets, in favor of the rCBDC.

20. **rCBDC could impact financial stability negatively or positively through six interrelated channels.** These channels operate through (1) changes in the composition of financial institutions' liabilities and, relatedly, an increase in the cost of funding (referred to as the liability channel); (2) a reduction in the size of financial institutions' assets, changes in their composition, and relatedly an increase in the cost of lending (asset channel); (3) a reduction in banks' income from collected fees (fee income channel); (4) an increase in the risks and intensity of runs on banks and issuers of issuers of safe and money-like assets in stress times (run-risk channel); (5) changes in the flow of information on borrowers and CBDC users (information channel); and (6) an increase in competition in retail payment markets and operational resilience (payment system resilience channel).

21. **The relative strength of these channels and their economic significance are uncertain**. They will depend on factors such as the level of rCBDC adoption, country characteristics, and design features. The application of models to real-world data can help determine how these factors affect the magnitude of each channel and the overall impact in practice.

22. **To date, quantitative studies have found that rCBDC would not pose significant financial stability risks under scenarios of mild adoption, though it will depend on country-specific factors.** Existing studies have focused primarily on the effects on bank balance sheets and are calibrated to specific countries, usually advanced economies. The findings suggest that while banking system profitability may decrease, the impact on financial stability is likely to be limited overall, especially in countries whose financial systems are characterized by low competition, low reliance on deposit funding, sufficient alternative sources of funding, and continuous innovations that enable banks to respond to competition from CBDC. Moreover, a key factor is how banks will react to the competitive pressure: banks that offer new products or services able to compete with rCBDC will most likely see a lower impact on financial stability. However, the complexity of interactions within the financial system and the need for nuanced modeling underscore the uncertainty surrounding rCBDC's real-world effects.

23. **Countries can evaluate the possible impact of rCBDC on their own financial systems by using a number of tools and models.** A useful starting point is to explore how the balance sheet of financial institutions could respond, along with those of the central bank, government, and private sector. Models that capture richer dynamics in the financial sector, as well as consumer/borrower and government behavior, require more modeling capacity and have a more simplified treatment of banks. Analysis should be rooted in data such as the balance sheet composition of banks and the central bank, their profitability, metrics of competition in the banking system, and other financial indicators related to the broader financial system.

24. **Finally, countries can mitigate financial stability risks with well-calibrated rCBDC design features and traditional financial stability safeguards.** A menu of options can be used to curtail or slow the substitution of bank deposits with rCBDC. These include quantity limits on rCBDC holdings or fees applied to holdings above a certain limit. Restricting rCBDC adoption, however, can also undermine specific rCBDC objectives and even be counter-productive if downside stability risks are small or if the financial system has the capacity to adapt. Appropriate rCBDC designs would need to be complemented by traditional safeguards for financial stability, such as macroprudential and crisis management policies.

The Impact of rCBDC on Competition in Retail Payments

25. **Central banks are seeking guidance on how to assess the potential competitive effects of rCBDC within their domestic retail payments market.** While enhanced competition is not typically the primary motivation for exploring rCBDC, it has emerged as a relevant consideration, particularly in jurisdictions where retail payment systems are dominated by a few large payment platforms. In this context, a key question arises: can the introduction of rCBDC improve competition in payment markets, and how might its design features shape that outcome? The question is posed independently of other policy options to underpin competition, as well as other potential objectives and risks of rCBDC.

26. **This chapter draws on the existing payments literature to answer this question.** It provides practical guidance on how specific design choices, such as fee structures, interoperability, intermediary participation and holding limits, may either enhance or constrain competitive dynamics. Importantly, the framework also considers the associated risks and tradeoffs, recognizing that the impact of rCBDCs on competition is highly context dependent and must be evaluated alongside broader policy objectives and market conditions. Key findings are summarized below.

27. **Payment markets are shaped by powerful network effects and platform dynamics that can naturally lead to concentration.** As two-sided markets connecting payers and payees, payment platforms tend to grow in value as more users join, often resulting in dominance by a few large providers. For instance, a few card networks, BigTechs, and mobile wallets dominate many national and global payment markets.

28. **rCBDC's potential impact on competition in retail payment markets can be assessed across a range of market structures and regulatory environments.** This framework identifies three typical market structures: (1) private platform-dominated markets, which may operate with or without regulation, and include systems based on credit and debit card networks, e-money platforms, or private FPS. Examples include Canada, where there is no direct regulation of payment fees, and the EU, where regulatory oversight (such as interchange fee caps) is more active; (2) markets with established and widely adopted public FPS, such as Brazil's Pix and India's UPI; and (3) cash-reliant markets with limited digital payment infrastructure, such as the Pacific Island countries, where digital payment adoption remains low due to infrastructure gaps.

29. **rCBDC's impact on competition depends on market structure.** rCBDCs are most transformative in markets dominated by unregulated private platforms, where they can reduce fees, boost access, and enhance service standards. In regulated payment markets with fee caps, rCBDCs have a more moderate effect, reinforcing existing controls and addressing gaps in inclusion or price transparency. Where public FPS are strong, rCBDCs play a complementary role, supporting wider access for underserved groups. In cash-heavy markets with limited digital infrastructure, rCBDCs can encourage digital payments and financial inclusion while curbing potential future market concentration.

30. **Benefits of rCBDC must be carefully balanced against risks, such as crowding out private providers, reducing market resilience, or increasing operational costs for central banks.** Appropriate design can help mitigate risks while still advancing policy goals. For example, tiered access models and intermediary-based distribution can preserve private sector roles, while flexible fee structures can discipline pricing without mandating zero fees that may undermine existing business models. Interoperability with existing systems can prevent duplication and support smoother integration, especially in jurisdictions with functioning public infrastructure.

31. **Evaluating rCBDC's impact on retail payment competition requires a broad set of indicators, such as prices, market concentration, contestability, and financial inclusion.** Several categories of indicators can be tracked: (1) price-based outcomes, such as changes in merchant discount rates or interchange fees, can signal pricing pressure on incumbents; (2) market concentration measures, including the Herfindahl-Hirschman Index and shifts in provider market shares, can capture changes in market power; (3) contestability indicators, such as new market entry, user switching, or multihoming may reveal whether barriers to entry are falling; and (4) financial inclusion metrics, such as increased digital payment use among underserved populations can show whether rCBDC is expanding access and fostering competition in segments underserved by private providers. In addition, these indicators may also help inform the decision-making on rCBDC issuance.

B. Legal and Financial Integrity Aspects

32. **This section summarizes the two chapters covering selected legal and financial integrity considerations for CBDCs.** As central banks and other relevant authorities explore CBDCs, they must ensure these initiatives are built on robust legal and regulatory frameworks, support financial integrity objectives, and uphold public trust in the monetary and financial systems. Proactively addressing these considerations will help mitigate associated risks and enhance the credibility, safety, and legitimacy of CBDCs.

Selected Legal Considerations for CBDC

33. **As jurisdictions weigh the adoption of CBDC, they must assess the readiness of their legal frameworks to minimize potential risks.** The primary legal concern for authorities is whether existing laws (and regulations) provide an adequate basis to ensure a secure and effective deployment of CBDC. Without this foundation, central banks and associated parties (such as intermediaries and users) may face significant legal, financial, operational, and reputational risks. These risks could potentially undermine public confidence in and successful adoption of CBDC. The evolving nature of CBDC technology further underscores the importance of ongoing legal review and legislative adaptation in anticipating and responding to emerging risks and opportunities.

34. **This chapter aims to guide policymakers in assessing their legal frameworks to ensure the existence of a sound basis for the issuance and management of CBDC.** It primarily addresses rCBDC, with one dedicated section on wCBDC. It first discusses the mechanisms by which rCBDC may be sanctioned as currency, the legal basis for its issuance and deployment of rCBDC payment platforms, as well as the central bank's regulatory authority over rCBDC service providers. It subsequently examines wCBDC-specific considerations mainly associated with tokenization. These include the legal nature of wCBDC, the central bank's mandate to issue wCBDC and operate its platforms—either directly or through outsourcing to third parties—the legal relationship between central banks and users, and the legal certainty for the settlement finality of wCBDC transactions.

35. **A robust legal foundation is essential to support the legal nature of rCBDC, particularly if it is to be granted currency status.** In many jurisdictions, granting rCBDC currency status may necessitate amendments to central bank and monetary laws. In this context, typically, rCBDC would be designed to constitute a liability of the central bank, entailing its exclusive issuance authority and legal tender status. These features support convertibility with other forms of central and commercial bank money, reinforce monetary sovereignty, and preserve the singleness of money.

36. **The legal frameworks for the issuance of rCBDC and the ownership and operation of rCBDC payment platforms require particular attention.** Explicit legislative authorization and a clear mandate for the central bank would mitigate relevant risks associated with rCBDC initiatives. Where rCBDC platforms attain systemic importance, adherence to the Principles for Financial Market Infrastructures (PFMI) is essential. The outsourcing arrangements of the platform operation must be governed by legally binding agreements that ensure effective central bank control and accountability. Jurisdictions may authorize central banks to offer front-end rCBDC services (such as digital wallets or hardware devices), mandate the participation of designated intermediaries in the public interest, and enable wallet portability under defined conditions with appropriate safeguards. Governance frameworks

must also address potential conflicts of interest arising from the central bank's dual role as both operator and regulator of the rCBDC payment platform.

37. **The multiple legal relationships within a rCBDC ecosystem necessitate clear delineation of legal responsibilities.** This includes defining the legal roles and responsibilities among the central bank, intermediaries, and users—both in terms of the use of a monetary instrument (rCBDC) and the technological services to access this instrument. Existing legal and regulatory payment regimes may require amendments to adequately rein in intermediaries offering rCBDC services. Also, those intermediaries, when participating in the rCBDC payment platform, should abide by standardized contractual arrangements of a rulebook. While the intermediary-user relationship may generally fall under existing payment service regulations, rCBDC-specific provisions may be necessary to ensure that rCBDC holdings are protected and legally segregated from intermediary assets, even in insolvency cases.

38. **Key functional aspects of rCBDC must be anchored in the law.** Jurisdictions may impose limits on rCBDC holdings, transaction amounts, or service fees, provided there is a clear legal basis for each. Programmable payments also introduce novel legal questions about enforceability and associated risks, warranting careful legal analysis. Similarly, ensuring offline functionality for financial inclusion and payment resilience must be supported by explicit legal provisions to ensure settlement finality, convertibility, compensation mechanisms, and the validity of ownership transfers.

39. **A range of legal considerations arise in relation to wCBDC due to its distinct users (authorized institutions), purposes, and challenges mainly associated with tokenization.** Jurisdictions must assess whether existing central bank laws allow wCBDC issuance or if legislative reform is necessary—particularly where wCBDC departs from traditional balance-based reserves and is utilized as a tokenized instrument. Statutory authority must extend to not only issuing tokenized wholesale instruments but also operating or outsourcing the wCBDC platform, while maintaining central bank's ultimate control. Legal clarity is essential regarding settlement finality and the treatment of wCBDC tokens in cases of loss, unauthorized transfer, or good-faith acquisition. Furthermore, wCBDC tokens are designed to represent claims on central bank reserves, often linked to financial institutions' accounts in the RTGS system. This creates legal complexity in ensuring synchronization between token records and central bank ledger balances to prevent risks such as double spending or issuance of unbacked tokens.

40. **Given the diversity of national legal frameworks, legal responses to CBDC must be carefully tailored to align with domestic legal traditions and institutional structures.** A uniform approach to legislation is not feasible. The legislative landscape for CBDC remains nascent worldwide, resulting in limited comparative legal analysis and judicial interpretation. As CBDC designs and technologies evolve, novel features may generate additional legal uncertainties and unique challenges. Nonetheless, emerging legislative initiatives, pilot implementations, and judicial decisions in certain jurisdictions offer useful reference points for the formulation of robust legal and regulatory frameworks.

Financial Integrity Considerations for rCBDC

41. **The design of rCBDC has important financial integrity implications.** Some design features may present greater risk or have more significant consequences for effective implementation of AML/CFT measures than others. For example, pure token-based models inherently present higher ML/TF risks than pure account-based models due to the lack of account management; however, proper

mitigation measures can effectively manage such risks. Highly decentralized and permissionless systems could present higher risks due to reduced oversight. While highly centralized systems may be beneficial from a regulatory or law enforcement standpoint, they may need to be balanced with appropriate safeguards. A direct, unintermediated rCBDC model[8] may disrupt the current financial system by placing the central bank at the forefront of AML/CFT preventive measures, while an indirect, intermediated model[9] leverages existing infrastructure and more closely aligns with current policy and standards.

42. **This chapter analyzes the application of FATF standards in a rCBDC context and provides guidance on practical implementation as well as highlights areas for further discussion.** The chapter aims to guide policymakers and competent authorities on the implementation of the FATF Standards in a rCBDC setting and highlight specific aspects of the AML/CFT standards that may require further thought.

43. **There are currently limited information and guidance on the implementation of AML/CFT measures for rCBDC.** AML/CFT assessor bodies have not assessed the AML/CFT regime of countries that have issued or piloted a CBDC, and it appears that no issuing jurisdiction has yet comprehensively applied the FATF standards in a rCBDC context. Similarly, limited information is available on the assessment and mitigation of ML/TF risks.

44. **Implementation of AML/CFT measures pursuant to the FATF standards may present novel challenges for issuing jurisdictions.** While some aspects of the FATF standards will be implemented in a similar or identical manner as in traditional financial systems, others may be harder to implement due to the novelty of rCBDCs or may raise new questions about the application of the FATF standards (such as the notion of "account" in a rCBDC setting). As rCBDCs offer an opportunity to recalibrate some aspects of traditional financial systems, these challenges may provide the international community an opportunity to revisit the global approach to AML/CFT in some areas.

45. **Jurisdictions should develop a solid understanding of the overall ML/TF risks at the national level, as well as how various rCBDC design choices may affect the AML/CFT regime.** A clear understanding of ML/TF risks should inform both the design decisions for rCBDCs and the development of mitigating measures. Threats and vulnerabilities should be identified at the design stage, and a phased plan to enable data collection and analysis to advance risk understanding should be developed as the rCBDC is rolled out. These efforts should be ongoing, grounded in real-world data and on-the-ground experiences, with continual refinement of the assessment criteria to reflect an evolving financial landscape.

46. **Issuing jurisdictions should ensure adequate implementation of AML/CFT obligations.** Actors in a CBDC ecosystem who meet the FATF's definition of a financial institution, designated nonfinancial businesses and professions (DNFBPs), or virtual asset service provider (VASP) must be subject to AML/CFT obligations and supervision. Jurisdictions should aim to understand the regulatory implications of their rCBDC models, including what kinds of intermediaries will be playing a role in CBDC distribution and activities. In some rCBDC models (such as direct, unintermediated), central banks may

[8] The central bank directly distributes rCBDCs to all end users and/or opens and manages accounts of end users.

[9] The central bank distributes rCBDCs via identified intermediaries (such as commercial banks), and end users open accounts with, or obtain wallets from, an intermediary through which they can transact in CBDC.

need to implement AML/CFT preventive measures—given the more prominent role that central banks may play in executing transactions and legally holding accounts or wallets on behalf of customers. In such cases, countries will need to consider arrangements for AML/CFT oversight and align these with central bank independence.

47. **Even where a central bank does not assume AML/CFT obligations, the nature of its relationship with intermediaries in a rCBDC system impacts the nature of intermediation.** Where central banks legally hold the accounts or wallets of users and are in control of executing transactions, intermediaries may develop a different type of relationship with end users. In some intermediated rCBDC models, intermediaries might act purely as gatekeepers (simply providing a vetting service whereby instructions from cleared customers are sent through to the ledger for processing). But even if a fundamental shift in the international approach to AML/CFT does not occur, challenges in effective implementation of AML/CFT preventive measures may arise.

48. **Customer due diligence challenges may arise with certain design choices, such as those relating to "cash-like" features.** Whether rCBDC models that allow certain types of accounts or wallets to be opened without identification by name violate the FATF's prohibition on anonymous accounts is not entirely clear and will likely depend on the specifics of the rCBDC model. This includes the type of information collected and whether that information could lead to identification of the customer, even if not done by the financial institution upon account or wallet opening. Other factors, such as the demonstrated level of ML/TF risk, will also be relevant.

C. Strengthening Payment Systems

49. **This section explores two areas that could help strengthen future payment systems as financial landscapes continue to evolve.** First, it considers how lessons from FCS can inform rCBDC exploration to enhance payment system resilience. Second, it examines how central banks are exploring tokenized reserves to support innovation while preserving the role of central bank money.

Payment Ecosystem Resilience in Fragile and Conflict-Affected States

50. **Payment ecosystem resilience refers to the robustness of all interconnected layers that enable payments and their ability to sustain or restore operations during disruption.** A payment ecosystem comprises five core layers: (1) users; (2) payment solutions, including emerging tools like stablecoins and rCBDCs; (3) intermediaries; (4) payment infrastructures for clearing and settlement; and (5) power and communications. Disruptions and risks often hit multiple layers simultaneously or cascade quickly through the system, making comprehensive resilience measures essential.

51. **Payment ecosystem resilience is a central concern in FCS, where disruption can halt daily life, erode trust, and intensify fragility.** More than 1 billion people live in FCS today, and by 2030, these regions are expected to account for two-thirds of the world's extreme poor. Ensuring that payment ecosystems can function or be rapidly restored is therefore a critical policy priority. Authorities are exploring different options to maintain payment ecosystem resilience, including emerging instruments such as stablecoins and rCBDCs.

52. **This chapter reviews how payment ecosystem resilience can be sustained in vulnerable environments and assesses whether lessons also apply to CBDCs.** It notes that rCBDCs could bolster

resilience if designed appropriately, though other options may be equally or more effective. The chapter assumes the introduction of rCBDC and presents a framework for authorities to weigh potential impacts. Key findings are summarized below.

53. **Selected FCS experiences suggest strategies and lessons that could strengthen payment ecosystem resilience.** Experiences from Ukraine, West Bank and Gaza, Sudan, Yemen, Haiti, Tuvalu, and the Central African Economic and Monetary Community region show there is no single model to improve resilience.

54. **Country experiences highlight that building resilience relies on a structural approach based on core practices that strengthen every layer of the payment ecosystem.** These practices include (1) redundancy and scalability to avoid single points of failure; (2) distributed infrastructure and decentralization to provide backups and absorb demand surges; (3) user-centric accessibility and awareness to keep services usable during disruptions; (4) operational and cybersecurity measures aligned with global standards; and (5) regulatory and legal frameworks that combine strong foundations with agility in crisis. Together, these practices create the structural approach needed to keep payment ecosystems functioning under severe stress.

55. **Resilience practices have shown themselves to be effective even under the significant stress encountered in FCS.** Redundancy and scalability measures include multisite operational architecture and reducing dependency on single-connectivity providers. Distributed infrastructure and decentralization—through the dispersion of critical operations and connectivity across multiple actors and geographies—can be strengthened through satellite networks, decentralized connectivity, cloud-based systems, and foreign infrastructure backups. To enhance user access and awareness, countries have prioritized continuity-focused payment design, secure digital ID, digital literacy, the continued role of cash, and digital money as fallback tools. Operational resilience has relied on contingency planning and coordinated incident response frameworks, such as pre-established crisis protocols, alternative operational arrangements, and close cooperation between regulatory bodies and payment intermediaries. Regulatory and legal strategies have focused on building pre-crisis financial stability, enabling regulatory flexibility to maintain continuity across all the layers of the payment ecosystem strengthening oversight, and resorting to using foreign currencies to support short-term continuity where needed.

56. **A well-designed rCBDC could add a layer of resilience to fragile payment ecosystems.** Building on the lessons drawn from FCS examples, similar principles can guide CBDC design. While most rCBDC projects remain at the research or pilot stage, they hold potential to provide backup digital infrastructure and support emergency disbursements. Yet the challenges are significant: fragile institutions, low trust, cybersecurity risks, and evolving technology all complicate implementation. rCBDC will only strengthen resilience if developed through deliberate planning, secure design, and close coordination across national and international partners.

57. **rCBDC can strengthen trust and diversify payment options in FCS as a complementary third form of central bank money.** As a direct liability of the central bank, rCBDC can serve as a secure anchor for transactions, reinforcing continuity. Where confidence in the central bank is strong, rCBDC can offer a credible alternative to private or informal channels. Where trust is weak, adoption will require clear communication, transparency, and partnerships. rCBDC should complement, not displace, cash and private digital money.

58. **rCBDC can offer a backup payment option and fill critical infrastructure gaps.** It provides an additional digital rail that can keep transactions flowing when private platforms fail, and in extreme cases could rebuild wholesale settlement or even deliver retail payments directly when banks and payment service providers are offline. A direct, unintermediated rCBDC model should remain a last resort, but could offer a contingency for maintaining basic monetary functions when conventional payment infrastructure collapses.

59. **If used, rCBDC should consider resilience by design and clear yet flexible regulation. rCBDC could** maintain payment continuity in FCS by incorporating features that work even when core infrastructure does not, such as offline functionality and low-tech payment options like Unstructured Supplementary Service Data (USSD). Moreover, programmability could enable targeted aid transfer payments in emergencies, while DLT and cloud solutions could provide extra redundancy and fault tolerance, allowing the system to continue operating even when some nodes are offline. These design and technical choices must be paired with legal and regulatory frameworks that ensure stability and trust while allowing timely adjustments in response to changing conditions.

Central Bank Exploration of Tokenized Reserves

60. **The rise of DLT and tokenization in financial markets raises important questions about the future role of central bank money.** Central banks supply commercial banks with the most liquid and secure assets—central bank reserves—for settlement and policy purposes. As DLT becomes more prevalent, central banks may consider making their reserves available on DLT-based platforms to settle payments for tokenized assets.

61. **This chapter explores emerging opportunities, potential risks, and broader macro-financial implications associated with tokenized reserves.** It aims to provide insights by comparing various implementation models and alternative solutions to tokenized reserves.

62. **Like traditional reserves, tokenized reserves would be a direct liability of the issuing central bank and be accessible to predefined institutions.** However, unlike current reserves, which operate on a centralized infrastructure, tokenized reserves would be issued on a DLT-based infrastructure. While traditional reserves are typically operated by central banks, tokenized reserves may involve different implementation models with varying degrees of central bank control.

63. **Central banks are exploring tokenized reserves to potentially enhance the wholesale payment system and preserve a role for central bank money if asset tokenization becomes more widespread.** Tokenized reserves could enhance resiliency by reducing single points of failure. In addition, programmability enabled by smart contracts could help automate conditional payments and complex workflows.[10] Use cases that central banks have been experimenting include delivery-versus-payment (DvP) transactions, where the exchange between tokenized assets and money happens at the same time, payment-versus-payment (PvP) transactions for exchanges among different currencies, and more complex, multistep transactions such as DvPvP. While traditional wholesale interbank systems can

[10] Smart contracts are self-executing agreements of the contract terms directly written into computer codes on DLT-based platforms and automatically enforce, verify, and execute when predefined conditions are met.

support DvP and PvP settlement mechanisms, tokenized reserves allow for atomic settlement when money and assets are on the same ledger.[11]

64. **There are various implementation models for tokenized reserves, each with distinct tradeoffs**. These models involve decisions about the type of ledger on which tokenized reserves are issued and the operating frameworks that govern and manage the ledger. Central banks can consider two main ledger models: (1) a single ledger, where tokenized reserves and tokenized assets exist on the same ledger; and (2) a compatible ledger, where tokenized reserves exist on their own ledger that is interoperable with other ledgers containing tokenized assets. Compared with a compatible ledger model, a single ledger may offer advanced programmability and fully atomic settlement without relying on third-party intermediaries, but it can lead to contagion effects that could pose risks to financial stability due to the tighter dependencies between transactions. In either a single or compatible ledger model, the central bank may operate the ledger on which its reserves are made available, or could share responsibility with other participants.

65. **Tokenization could benefit monetary operations, to the extent that central banks adopt coherent policies and operational safeguards.** Core operations, such as liquidity provision and interest rate steering would not change dramatically, though could become more efficient through automation and programmability. For instance, smart contracts could help automate open market operations and standing facilities or support 24/7 liquidity management. However, these benefits could entail risks, including cybersecurity vulnerabilities, smart contract errors, and operational challenges. Risk management frameworks will need to evolve to address these issues. Even if tokenized reserves are not used directly in monetary operations, their coexistence with traditional reserves could lead to liquidity fragmentation. These last risks can be mitigated with coordinated liquidity monitoring, improved liquidity forecasting, and interoperability between types of reserves.

66. **Central banks should consider alternative solutions for settling tokenized financial assets before adopting tokenized reserves.** Simpler RTGS links, or "trigger solutions," act as a technical bridge to coordinate tokenized asset delivery on a DLT platform with payments in traditional central bank reserves on RTGS. Alternatively, intermediaries with access to central bank reserves through omnibus accounts can provide settle services with their own liabilities fully backed by central bank reserves. Privately-issued tokenized money is also available for settlement and may well be used (just as commercial bank money is used today in multiple instances), though carries higher credit risk. Overall, RTGS links, omnibus accounts, privately-issued tokenized money, and tokenized reserves all support DvP settlement of tokenized asset transactions but vary in credit and liquidity risks. However, not all the solutions support advanced programmability or atomic settlement. Chosen solutions will depend on the priorities, resources, legal and regulatory frameworks, and policy goals of central banks and could co-exist. Overall, central banks should assess tokenized reserves with a balanced view of benefits and risks. Thus, their strategic approaches and policy solutions will likely vary across jurisdictions.

[11] Atomicity is when a multistep transaction (such as DvP settlement) either completes in full or not at all, preventing partial execution. This is usually possible through the use of smart contracts.

CONCLUSION AND NEXT STEPS

67. **This paper informs the Executive Board about emerging issues related to CBDC.** The six Handbook chapter topics covered in this paper—financial stability, payments competition, legal considerations, financial integrity, payment resilience in FCS, and tokenized central bank reserves—are based on extensive deliberations by IMF staff and their interactions with central banks of the IMF membership.

68. **A fourth wave of Handbook chapters will be published in 2026.** Given evolving interests among member countries and the extensive breadth already covered by past chapters, forthcoming topics are expected to focus on tokenized reserves and financial assets, the interaction with privately-issued money, and cross-border payments.

Annex I. Table of Contents of the CBDC Virtual Handbook

	Year Published		
	2023	2024	2025[1]
Objectives and Framework			
Chapter 1. Digital Money: Positioning CBDC		✓	
Chapter 2. Identifying Pain Points and Objectives			
Chapter 3. Elements of Thinking Through CBDC	✓		
Chapter 4. A Central Bank Strategy for Tokenized Reserves Evaluation			✓
Foundational Requirements and Readiness			
Chapter 5. Selected Legal Considerations for CBDCs			✓
Chapter 6. Cyber Resilience of the CBDC Ecosystem		✓	
Chapter 7. Required Capacity within Central Banks			
Chapter 8. Regulation and Supervision			
Design Process, Considerations, and Choices			
Chapter 9. Design Choices			
Chapter 10. CBDC Adoption Strategies for Intermediaries and Users		✓	
Chapter 11. Financial Integrity Considerations			✓
Chapter 12. Data Use and Privacy Protection		✓	
Chapter 13. Capital Flow Management Measures	✓		
Chapter 14. Payment Resilience in Fragile and Conflict-Affected States: Lessons for CBDC			✓
Technology and Project Approaches			
Chapter 15. Project Management: 5P Framework	✓		
Chapter 16. Technology Landscape and Innovation			
Potential Macro-Financial Impacts			
Chapter 17. CBDC's Role in Promoting Financial Inclusion	✓		
Chapter 18. Evaluating the Impact on Monetary Policy Transmission	✓		
Chapter 19. Evaluating the Implications of CBDC for Financial Stability			✓
Chapter 20. Retail CBDC for Cross-Border Payments		✓	
Chapter 21. The Impact of CBDC on Payments Competition			✓
Chapter 22. Implications of Central Bank Digital Currencies for Monetary Operations		✓	
Chapter 23. Wholesale CBDC and Cross-Border Platforms for Payments and the Transfer of Assets			

[1] Scheduled for publication in November 2025. Future topics will be chosen on the basis of country needs.

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