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Part B

The Future of Money and Finance: Blockchain Transformation

Chapter 3

Central Bank Digital Currencies and the Digital Euro

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The Chapter addresses central bank digital currencies (CBDCs) as a new form of public money, directly issued and backed by the central bank. After outlining the difference between public and private money, the Chapter highlights why national monetary authorities worldwide are interested in digitalizing their domestic currencies to face the increasing challenges to monetary sovereignty posed by the rise of electronic money and payment systems, cryptocurrencies and stablecoins. Building on these considerations, the Chapter explores the main characteristics of CBDCs and the underlying legal and economic issues. Finally, the Chapter discusses the ECB's project on the Digital Euro.

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1. General overview

1.1 Central Bank Digital Currencies (CBDCs) are a new form of public money. They are a purely digital form of central bank money with legal tender status, directly issued and managed by the monetary authority thanks to advanced technological infrastructures. Upon introduction, CBDCs would complement other forms of public money, such as cash and reserves, and private money, including bank money (deposit) and other private instruments of payment like e-money and stablecoins. Different kinds of CBDC can be designed, such as wholesale CBDCs for institutional transactions in a cross-border environment and retail CBDCs, which are intended for everyday use by the public as "digital cash". In this Chapter, we refer to CBDCs as retail CBDCs, as the most debated kind of CBDC.

1.2 The primary motivation for introducing retail CBDCs is the protection of monetary sovereignty. This happens in response to the growing use of foreign payment instruments as well as stablecoins and cryptocurrencies. By issuing CBDC, central banks aim to regain control over their domestic payment systems and prevent currency substitution, that is the process where a foreign currency or private digital currency substantially replaces the national one. Other key reasons include fostering financial inclusion for unbanked populations and modernizing payment systems to increase efficiency. Furthermore, the digitalization of money could be a strategic move to strengthen the international role of currencies like the Euro and the Yuan, potentially challenging the dominance of the U.S. Dollar.

1.3 To date, nearly every country has engaged in CBDC research or experimentation. For example, China is already piloting its CBDC, while the EU and UK are entering the implementation phase of their digital currencies.

2. Central Bank Digital Currencies as a new form of public money

2.1 Money exists in many different forms and can be classified as either public or private. **Public money** is a liability of the central bank and is considered the safest form of money. It includes **physical banknotes and coins** for retail use, as well as **central bank reserves** used by commercial banks for wholesale settlements. **Private money**, on the other hand, is a liability of a private institution. The most common form is **bank money** (deposits), which is created by commercial banks through lending and represents a claim on the bank's reserves held at the central bank. Other forms include **e-money** (electronic money), issued by non-bank financial institutions as a claim on commercial bank deposits, and **stablecoins**, a type of cryptocurrency designed to maintain a stable value by being pegged to a reserve asset.

2.2 **CBDCs are a new form of public money that exists in a purely digital form as a direct liability of the issuing central bank**. Like cash and reserves, a CBDC is a final claim on the central bank, backed by its balance sheets, and an official means of payment. Since this new form of public money is purely digital, a robust **technological infrastructure** is required to process transactions and manage accounts. This infrastructure can be based on various technologies, not exclusively on blockchain or distributed ledger technology. This system would be **managed by the central bank**, possibly in cooperation with commercial banks and other authorized intermediaries. In the so-called 'two-tiered' model, these private institutions would be responsible for distributing CBDCs and managing customer wallets, while the central bank maintains its core function as the sole issuer of the CBDC, operating the wholesale ledger and ensuring the overall integrity and stability of the digital currency.

2.3 The design and implementation of CBDCs vary, but they are generally divided into two main categories: wholesale CBDC and retail CBDC. A **wholesale CBDC** is a digital currency designed for **use by financial institutions for interbank payments and settlements**. It is not intended for the general public but aims to improve the efficiency, speed, and security of large-value transactions, potentially reducing settlement risks. In this sense, wholesale CBDCs are a **digital evolution of central bank reserves**, but they are more suitable for **transnational wholesale transactions**.

A **retail CBDC**, by contrast, is a **digital legal tender** designed for the general public for everyday payments. Retail CBDCs are a form of **"digital cash"** that could be used for **both online and offline payments** and are designed to be accessible to a wide range of users, including those without a bank account. They can be implemented in a variety of ways, such as a token-based system (similar to cryptocurrencies) or an account-based system (similar to commercial bank accounts). Moreover, while bank money bears a credit risk as it represents a claim against the issuing institution, **CBDCs are risk-free means of payment**, as they represent a direct liability of the central bank. Therefore, retail CBDCs could provide a risk-free digital alternative to private money, ensuring the public's continued access to secure central bank money in an increasingly digital economy. In this Chapter, we refer to CBDCs as retail CBDCs.

⇒ International Monetary Fund, CBDC Virtual Handbook
⇒ Bank of International Settlements (CPMI), Central bank digital currencies, 2018
⇒ Bank of International Settlements (Group of Central Banks), Central bank digital currencies: foundational principles and core features, 2020
⇒ Bank of International Settlements (Group of Central Banks), Central bank digital currencies: system design and interoperability, 2021

2.4 Worldwide monetary authorities are highly interested in developing CBDCs as an instrument to defend and reinforce monetary sovereignty in an ever-digitalized world. Indeed, the increasing diffusion of foreign instruments of payment, as well as decentralized cryptocurrencies and stablecoins, risk undermining the use of domestic currency in favor of foreign assets: this phenomenon of **currency substitution** may **diminish the central**

bank's ability to conduct effective monetary policy, as it would lose control over a significant portion of the money supply.

The introduction of a CBDC is seen as a strategic response to these challenges. By providing a secure, public, and risk-free digital alternative to private money, a CBDC would help central banks to reaffirm their monetary sovereignty. It would ensure that the national currency remains the primary medium of exchange in the digital sphere, preventing a shift to foreign private digital currencies and CBDC.

Moreover, a CBDC also serve as a foundation for innovation in payment systems, **allowing central banks to maintain control over the monetary and payment system** while fostering competition and efficiency. This would not only enhance financial stability but also ensure that the central bank remains the ultimate source of trust and stability in a digitalized financial world.

⇒ ATLANTIC COUNCIL, CBDC tracker

⇒ EUROPEAN CENTRAL BANK, Report on a Digital Euro, 2020

2.5 However, the implementation of a CBDC presents a number of **significant challenges**. The primary economic concern is the potential for **currency substitution between CBDC and bank money**, as savers may convert their bank money accounts into a risk-free CBDC. Such a large-scale migration of deposits could **disrupt the entire credit system**, as it is predicated on banks' ability to create credit from those deposits. To mitigate this risk, all ongoing CBDC projects are designed to be non-interest bearing and to have a limit on the amount of CBDC that an individual can hold.

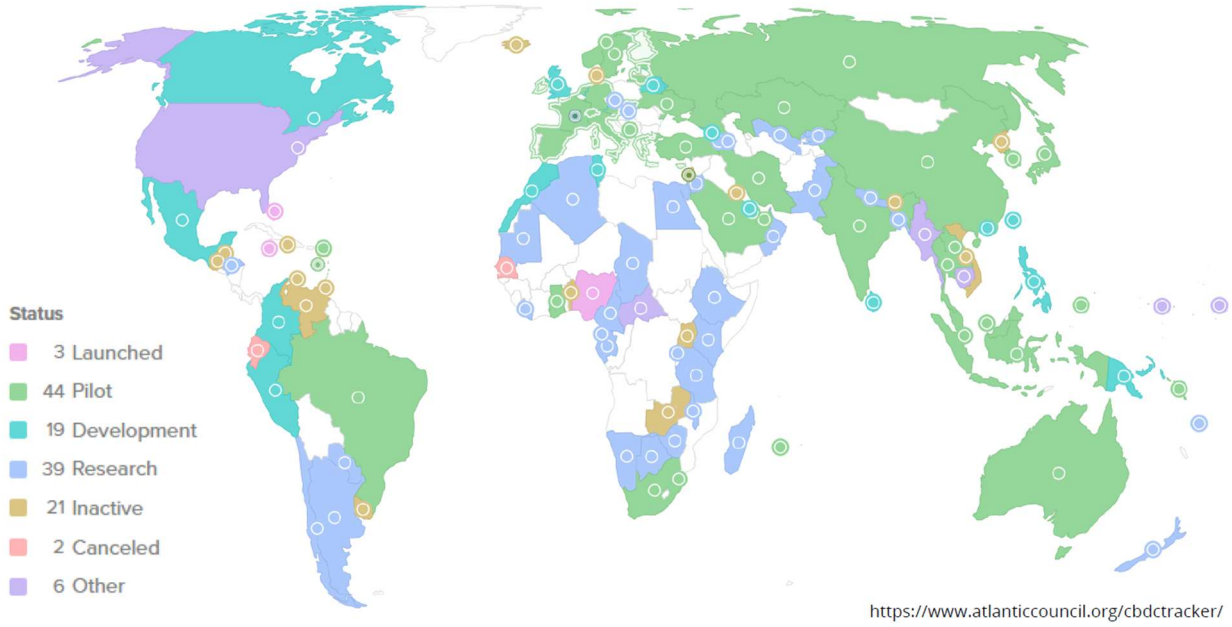
There are also significant technological and operational challenges involved in building a secure, resilient, and accessible CBDC infrastructure that can handle a high volume of transactions, protect user data, and operate seamlessly.

Another key challenge is the question of **privacy vs. traceability**. While users may desire the same level of anonymity they have with cash, public authorities need to be able to trace transactions to prevent illicit activities like money laundering and terrorism financing. In any case, it is the central bank who ultimately manages the whole CBDC infrastructure and the core ledger. This inevitably creates a difficult balance between user privacy and regulatory oversight.

2.6 The introduction of a CBDC could have a profound **impact on the global financial system**, including cross-border payments **and international currency competition**. A widely adopted CBDC could potentially challenge the dominance of major international currencies, raising complex questions about global monetary stability and cooperation. Jurisdictions like China and the EU are exploring CBDCs also as a way to strengthen the international role of their currency. Moreover, CBDCs allow for the creation of multilateral infrastructures for cross-border payments in diverse currencies.

⇒ BIS – IMF - WB, Central bank digital currencies for cross-border payments. Report to the G20, 2021

3. CBDCs development around the world



3.1 **To date, three CBDCs have already been launched**. The Central Bank of **The Bahamas** launched the **Sand Dollar** in 2020, making it the first CBDC. This initiative was a response to the unique challenges of a dispersed archipelago, aiming to improve financial inclusion, reduce transaction costs, and enhance the efficiency and resilience of the nation's payment system. The following year, the Central Bank of **Nigeria** launched the **e-Naira**, a digital version of its national currency. It was aimed at modernizing the country's payment systems in view of the population doubling expected by 2030, as the domestic economy still heavily relies on cash. Lastly, the Central Bank of Jamaica issued its CBDC in 2022, named **JAM-DEX**, motivated by similar considerations of financial inclusion and modernization of payment systems.

⇒ Sand Dollar - Website
⇒ eNaira - Website
⇒ JAM-DEX - Website

3.2 The **most advanced CBDC pilot project** is **China**'s **e-CNY**. Its development began in 2014, and large-scale trials have been ongoing for several years, involving millions of users and billions of dollars in transactions. Unlike its counterparts in the Bahamas and Nigeria, the e-CNY has been rolled out incrementally across a wide range of cities and use cases rather than with a single, nationwide launch. The People's Bank of China (PBOC) has been testing the e-CNY with various pilot programs, including a crucial trial during the 2022 Winter Olympics in Beijing, which allowed both domestic and foreign visitors to use the digital currency. To date, the digital renminbi is already available in many Chinese metropolises. The introduction of the e-CNY is motivated by different objectives, ranging from the need to

protect and enhance **monetary sovereignty** in the face of the dominance of private digital payment platforms like Alipay and WeChat Pay, to the aim of strengthening the **international role of the Yuan** through cross-border payments. Still, to date the e-CNY is primary for domestic retail use. The e-CNY is built on the two-tiered system.

⇒ PEOPLE'S BANK OF CHINA, Progress of Research and Development of E-CNY in China, 2021

3.3 Also, the **United Kingdom** is experimenting the **Digital Pound**. After publishing a proof-of-concept and a consultation paper in 2022 and 2023 respectively, in 2025 the Bank of England launched the Digital Pound Lab to start the design phase. This CBDC is envisioned to perform as a **public payment infrastructure supporting private innovation and competition** and to ensure a level of privacy equal to or greater than payments in bank money and via credit cards. It is expressly stated that neither the Bank of England nor the Government can acquire personal data on user transactions.

⇒ BANK OF ENGLAND, The digital pound: A new form of money for households and businesses? Consultation paper, 2023
⇒ BANK OF ENGLAND, Progress update: The digital pound and the payments landscape, 2025

3.4 Many other jurisdictions are exploring CBDCs such as the EU, Japan, Canada, Switzerland, India, Brazil, Sweden, and more.

⇒ ATLANTIC COUNCIL, CBDC tracker

3.5 Against this backdrop, **the U.S. position is in complete opposition**. In 2025, the newly elected U.S. President Donald Trump issued an executive order expressly **prohibiting the development and promotion of a CBDC**. Moreover, with another executive order, he created a Working Group to provide new regulations for digital assets and stablecoins. These initiatives signal the clear intention of the U.S. Government not to digitize the Dollar, but rather to **foster private innovation** in the field of money and payments by expressly supporting the development of stablecoins. This foreshadows a **scenario of global competition over money**, where challengers to the dominant and hegemonic power of the U.S. Dollar appear intent on digitizing their currencies, while the world's largest economy seems to be betting everything on private innovation to maintain global demand for the U.S. Dollar and preserve its role within the international economic system.

⇒ Executive Order 23 January 2025
⇒ Executive Order 6 March 2025

4. The ECB's project on Digital Euro

4.1 The European Central Bank published the first report on Digital Euro in 2020, outlining the motivations and challenges underlying the digitalization of the common currency. Since then, significant progress has been made. After concluding the investigation phase in 2023, the project has entered the **preparation phase**, which is expected to end in 2025. The final decision on the issuance of the CBDC would follow the conclusion of this phase.

⇒ Digital Euro - Website
⇒ ECB, Report on a digital euro, 2020
⇒ ECB, A stocktake on the digital euro Summary report on the investigation phase and outlook on the next phase, 2023

4.2 The ECB's motivations for developing a digital euro are multifaceted. One primary driver is to ensure the public's continued access to **safe and risk-free central bank money**, especially as cash usage declines. It also aims to foster **strategic autonomy** within Europe's payments landscape, reducing reliance on foreign payment providers and private digital currencies. By providing a public, centralized alternative, the digital euro would help maintain the central bank's control over the monetary system. Furthermore, it could act as a catalyst for **innovation and competition** in the private payment sector, ultimately benefiting European consumers. Last, but not least, the digital euro is also envisioned as a way to **strengthen the international role of the currency**.

⇒ EUROGROUP, Eurogroup statement on the digital euro project, 2023

4.3 The European Commission proposed a legal framework for the digital euro in June 2023, known as the **Digital Euro Regulation**. This proposal is a cornerstone of the project, as it would grant the digital euro legal tender status and ensure its acceptance across the euro area. The regulation also addresses key design principles, including privacy protections and the role of intermediaries in its distribution. The ECB maintains that a strong legal basis is essential for public trust and for ensuring that the digital euro is fully interoperable and widely accepted.

⇒ EUROPEAN COMMISSION, Digital euro package COM/2023/369 final, 2023

4.4 The European Central Bank's proposed design for the digital euro incorporates several critical features to address potential concerns, particularly regarding privacy, distribution, and resilience. One of the primary design principles is ensuring a **high degree of privacy**, especially for low-value transactions. While the digital euro won't be completely anonymous like physical cash, its system is designed to prevent the ECB from accessing users' personal data. This approach aims to protect user privacy while still allowing for the traceability needed to combat illicit activities like money laundering.
The digital euro is designed to operate on a **two-tiered system**. The ECB would act as the sole issuer of the digital currency, providing the ultimate guarantee of its value and security.

However, commercial banks and other supervised payment service providers would be responsible for its distribution to citizens and for managing customer wallets. This model is strategically chosen to leverage the existing financial infrastructure, ensuring a smooth transition and maintaining the vital link between the public and private sectors. It prevents the ECB from becoming a direct retail bank, preserving the roles of commercial banks in providing customer-facing services.

To ensure its practicality and resilience, the ECB is also exploring **offline functionality** for the digital euro. This feature would allow users to make payments in situations where there is no internet connection, mimicking the reliability and accessibility of physical cash. This is a crucial design element, as it would ensure that the digital euro remains a dependable means of payment even during a power outage or in remote areas with poor connectivity.

⇒ ECB, Progress on the preparation phase of a digital euro - First progress report, 2024
⇒ ECB, Progress on the preparation phase of a digital euro - Second progress report, 2024
⇒ ECB, Progress on the preparation phase of a digital euro - Third progress report, 2025