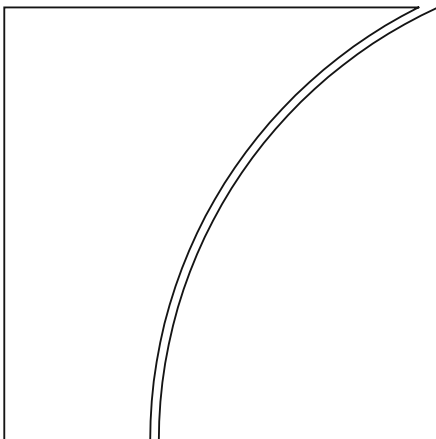




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Central bank digital currencies and fast payment systems: rivals or partners?

José Aurazo, Holti Banka, Jon Frost, Anneke Kosse and Thomas Piveteau¹

Abstract

Retail central bank digital currencies (CBDCs) and fast payment systems (FPS) share a number of similarities. Both allow for instant transactions for end users, can rely on underlying infrastructures operated by the central bank and can allow for an important role for private payment service providers (PSPs) to offer their services to end users. The key difference is that retail CBDCs are a new form of central bank money for the general public, while FPS to date allow end users to transfer private money (eg commercial bank money or electronic money). The paper analyses how retail CBDCs and FPS compare with each other and why some jurisdictions have opted for a retail CBDC, while others have chosen to introduce an FPS or both. Interviews with central banks in 14 jurisdictions around the world (at different stages of implementation of a retail CBDC and/or an FPS) show that some see a case for both to fulfil different policy goals and complement one another. The paper also compares emerging challenges and risks related to retail CBDCs and FPS. Our key conclusion is that the choice between a retail CBDC or an FPS, or both, is very contextual and will depend on the market features, ecosystem and degree of maturity and innovation of existing payment infrastructures in a country. Decisions regarding a retail CBDC, FPS or both involve important considerations regarding success factors, design choices and the role of central banks and the private sector.

Keywords: central bank digital currencies, fast payments, fast payment systems, digital payments, financial inclusion, fintech, interoperability, innovation.

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1. Introduction

To advance digital payments, promote innovation and enhance safety and efficiency in the financial sector, central banks have multiple tools at their disposal. One prominent option is to issue a retail central bank digital currency (CBDC), which is a digital liability of the central bank denominated in the national currency that households and firms can use for everyday transactions. Another is to build a retail fast payment system (FPS), which allows for the processing of retail payments and the availability of final funds of private money (eg commercial bank money or e-money) to the beneficiary in real time or near real time and as near as possible to 24 hours a day and seven days a week (24/7).

This paper explores two key questions: How do retail CBDCs and FPS compare with each other? Why have some jurisdictions opted for one of them while others are considering both? To answer these questions, we describe key similarities and differences between retail CBDCs and FPS, including functionalities, the role of central banks and other stakeholders, and risks and challenges. We take the characteristics and features of current FPS as a starting point for our comparison, while acknowledging that the functionalities and designs of FPS may also evolve over time. We also examine central banks' policy rationales for exploring and implementing either or both. To inform our analysis and discussion, we interviewed central bank staff in 14 jurisdictions.² These institutions are at different stages in terms of design, implementation and adoption of retail CBDCs and FPS. The interviews took place between December 2022 and February 2023. The sample of 14 central banks was selected in a way that covers a wide range of perspectives, from central banks that already have both a retail CBDC and an FPS, to those that have one of the two, to those that have neither (yet) (see Annex 1).

Currently, consumers and businesses in about 120 jurisdictions can make and/or receive fast payments through a domestic or regional FPS. These are operated by either central banks or private parties or as a public-private collaboration.³ While some of these systems are still at an early stage of development, others have demonstrated impressive uptake after their launch. For instance, Pix onboarded more than 150 million individual and business users in Brazil in its first year of operation and is now used by over 90% of adults in the country. PromptPay registered around 63 million end users in Thailand in early 2022, representing more than 85% of the population.⁴ As of March 2024, nearly 600 banks were live on UPI in India, with more than 13 billion transactions carried out using that infrastructure in a peak month.

Meanwhile, as of September 2024, three central banks have launched a live retail CBDC (in the Bahamas, Jamaica and Nigeria) for general use by households and

² The sample of interviewed central banks is diverse. It involves four jurisdictions in the Americas (The Bahamas, Brazil, Canada and Jamaica), four African jurisdictions (Ghana, Morocco, Nigeria and the Western African States), three jurisdictions in Europe (Denmark, the euro area and Switzerland), two jurisdictions in Asia (India and South Korea) and one jurisdiction in Oceania (New Zealand). A list of the acronyms used in this paper when referring to the individual central banks of these jurisdictions can be found in Annex 1.

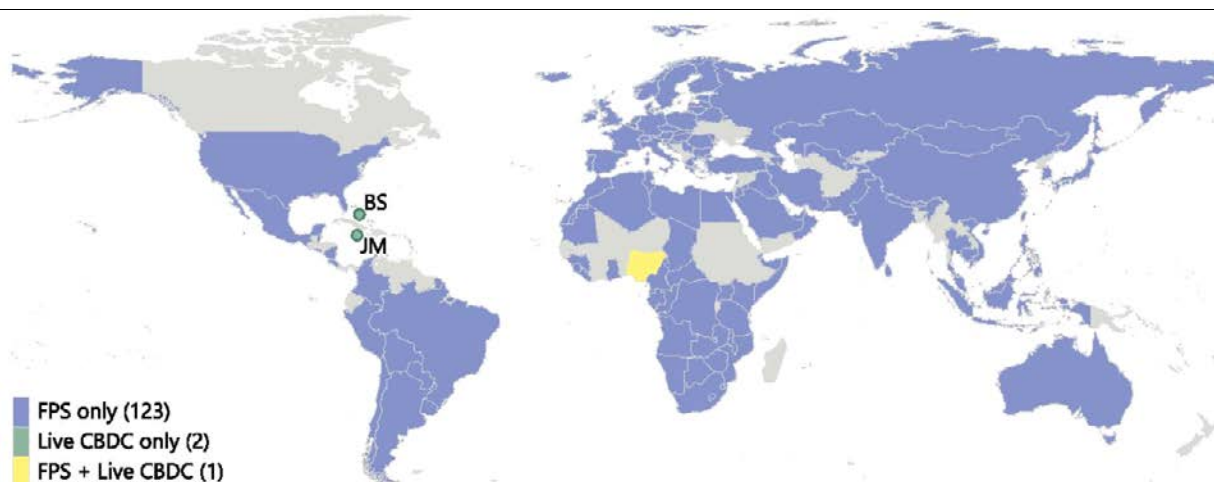
³ Note that many of the FPS still support relatively few use cases and only basic features. They may therefore require further development for wider uptake and use. See World Bank Fast Payments Global Tracker, fastpayments.worldbank.org.

⁴ World Bank (2021).

businesses. Of these, Nigeria has implemented an FPS as well.⁵ Adoption of these three retail CBDCs in terms of users as well as transactions has been relatively slow compared with the global uptake of FPS. In The Bahamas, roughly three years after the introduction, there were about 100,000 wallets in March 2023 (about 25% of the adult population), with about 200,000 transactions per month.⁶ In Nigeria, there were about 900,000 wallets (0.5% of the population) one year after the launch.⁷ Nevertheless, a BIS survey of central banks found that about a quarter of central banks were piloting a retail CBDC in 2023.⁸ Graph 1 shows the status of retail CBDC projects and FPS around the world.

Retail CBDCs and FPS around the world^{1, 2}

Graph 1



The use of this map does not constitute, and should not be construed as constituting, an expression of a position by the BIS regarding the legal status of or sovereignty of any territory or its authorities to the delimitation of international frontiers and boundaries and/or to the name and designation of any territory, city or area.

BS = The Bahamas; JM = Jamaica.

¹ As of the beginning of September 2024. Numbers in parentheses indicate the number of jurisdictions in each category. ² FPS refers to access to at least one domestic or regional FPS.

Sources: Auer et al (2023); World Bank; central banks' websites; BIS.

There are key similarities between retail CBDCs and FPS. Both allow for instant (and usually low-cost) transfers for end users and can facilitate payment efficiency and interoperability.⁹ Both can be built on infrastructures operated by the central bank with an important role for private payment service providers (PSPs), for example in the interaction with end users. Both can be designed to enhance access by

⁵ Based on the updated data set on CBDC projects, speeches and search interest, as of March 2024, from Auer et al (2023). For further overviews of CBDC projects, see the CBDC tracker of Mikhalev et al at cbdctracker.org and the CBDC Tracker from the Atlantic Council at www.atlanticcouncil.org/cbdctracker.

⁶ See Branch et al (2023).

⁷ Ree (2023).

⁸ See Di Iorio et al (2024).

⁹ See Boar et al (2021) for a discussion of the benefits and trade-offs of interoperability between payment systems.

individuals, households and businesses to a range of competing and affordable financial services, thereby promoting financial inclusion.

The chief difference between retail CBDCs and FPS is that CBDCs allow users to pay each other using a direct claim on the central bank and are thus a form of central bank money – like cash. By contrast, FPS allow end users to transfer private money (eg commercial bank money or electronic money). Because CBDCs are central bank money, retail CBDC balances are not subject to bankruptcy risks. Depending on the specific design and the availability of safeguards to underpin private money (such as deposit guarantee schemes), retail CBDCs may have different implications than FPS in terms of disintermediation of private banks, eg in times of financial market stress or uncertainty.

We show that, in the view of about half of the interviewees, there can be reasons for both issuing a retail CBDC and establishing an FPS in the same jurisdiction. Counterparts mentioned programmable and offline payments and preserving a form of publicly issued money for the general public (avoiding currency substitution) as advantages of retail CBDCs. However, some noted that those features might also be seen in FPS in the future. Others noted that there could be advantages from having both systems in terms of consumer choice and redundancy. Some also mentioned that there may be benefits from accountability and transparency in welfare and social disbursements by the government. Yet this view was not universal. Some questioned the value of retail CBDCs if an FPS is already in place. In terms of timing, many saw a case for building an FPS first, with research and experiments in retail CBDCs occurring in parallel. Some discussed the potential to integrate the two in various ways in the future. There are important debates about the role of the central bank in each system, as well as the operational, financial and reputational risks of each and the technological and institutional safeguards needed to address these.

Our key conclusion is that the choice between issuing a retail CBDC or building an FPS, or doing both, is very contextual and will depend on the market features, ecosystem and implementation choices made in the past. While work on retail CBDCs is still in early stages and FPS are further evolving, we also conclude that there are useful lessons from experiences to date on design choices, the factors that contribute to the success of a retail CBDC and fast payments, and the role of the central bank and other stakeholders.

Our main contribution to the literature is to collect views on the question of how retail CBDCs and FPS compare and interact with each other, primarily from a policy perspective, based on in-depth interviews with central bank staff. Existing literature in this area is scarce and mainly based on hypothetical considerations. Using data from a BIS survey, Kosse and Mattei (2023) show that most central banks believe that, in principle (ie regardless of the design and availability of their existing or planned CBDC or FPS), there may be value in having both an FPS and a retail CBDC. This is not only because they believe that a retail CBDC has specific properties and may offer additional features, but also because having both could benefit the efficiency and resilience of the payments market. Wong and Maniff (2020) compare a retail CBDC system with existing types of payment systems and conclude that, depending on its actual design and features, a retail CBDC could provide value in certain areas. These include being a digital form of a bearer instrument, offering more cost-effective payment services, ensuring greater anonymity than current digital transactions and acting as a catalyst for greater innovation. Khiaonarong and Humphrey (2022) study the adoption of fast payments and the degree to which they have replaced other types of payments in 12 jurisdictions. They argue that if FPS allow for free person-to-

person (P2P) transactions between end users and a low-cost alternative for merchants, the adoption of a retail CBDC, if issued, may be importantly compromised, as the similarities with fast payments are too strong. They also note that fast payments have a first-mover advantage, which may hamper the demand for retail CBDCs. Recently, Patel et al (2024) discuss how CBDCs, FPS and e-money systems interact and can achieve central banks' objectives. They also explore what can drive the exploration of a CBDC and argue that this is strongly driven by jurisdiction-specific circumstances. We go beyond these studies by assessing in-depth specific features of retail CBDCs and FPS, including technical design and risk management implications. In many cases, we show that it is technically possible to build similar functionalities in both a retail CBDC system and an FPS. Yet in practice, there may be differences in the feasibility of providing these functionalities. Experience from different jurisdictions can be very helpful to inform the design of either initiative.

The remainder of this paper is organised as follows. Sections 2 and 3 give important definitions and a comparative analysis, respectively, of retail CBDC and fast payments (and retail CBDC systems and FPS). Section 4 draws on interviews with the staff of 14 central banks to analyse the rationale for exploring and implementing retail CBDC and FPS initiatives. Section 5 discusses technical functionalities and differences between the two, while section 6 addresses the role of the central bank and other stakeholders in each. Section 7 describes the risks and challenges of retail CBDCs and FPS. Section 8 puts forward key takeaways from the experience to date, and section 9 concludes.

2. Definitions

A clear definition of terms is of paramount importance to establish an accurate comparative analysis and avoid ambiguity between the two concepts. The following terminology is used consistently throughout this paper.

A CBDC has commonly been defined as a liability of (or a claim on) the central bank, denominated in the national unit of account that is different from balances in traditional reserve or settlement accounts.¹⁰ Like today's forms of central bank money, a CBDC can co-exist with commercial bank money.¹¹ In this paper, we look at the features of a CBDC not only as a new type of central bank liability but also as a new system, which includes the infrastructure and rules (eg clearing, settlement and governance) underlying the transfer of the CBDC among system participants and end users. Two broad categories of CBDCs are generally distinguished: wholesale and retail. Wholesale CBDCs are specifically tailored for use by financial institutions and other eligible participants for the settlement of interbank transfers and other related large-value wholesale transactions and post-trade financial processes.¹² Retail CBDCs are designed for access and use by individuals and businesses and can be used for a diversity of use cases. Retail CBDCs have often been described as a digital alternative to cash issued by a central bank. Although references to wholesale CBDCs are made

¹⁰ CPMI-MC (2018).

¹¹ See CPSS (2003) for a discussion on the role of central bank money and how it can coexist with commercial bank money.

¹² See BIS (2021).

when relevant, this paper focuses on retail CBDCs and retail CBDC systems for the comparative analysis with fast payments and FPS.

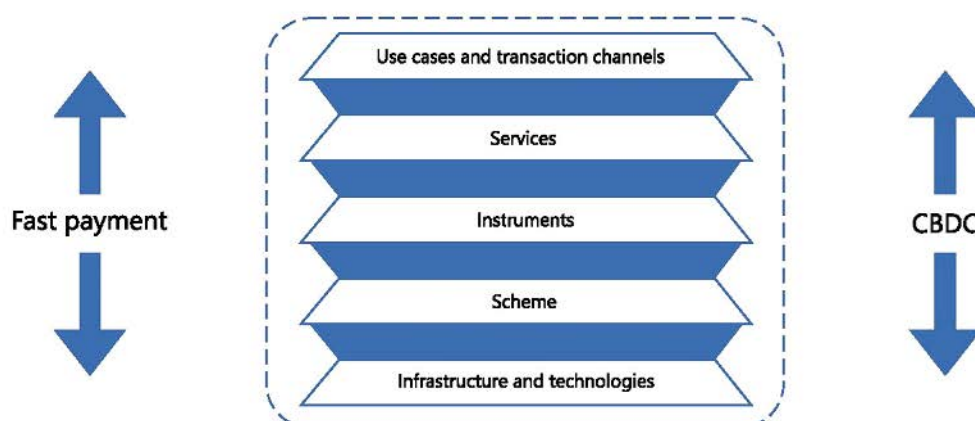
In this paper, we define an FPS as a system that encompasses the infrastructure, participating PSPs, end-user-facing services and underlying rules that govern the processing and delivery of fast payments.¹³ Fast payments, also referred to as instant, real-time, immediate or rapid payments, are understood to be retail payments in commercial bank money or e-money that allow for the transmission of the transaction message and the availability of final funds to the beneficiary to occur in real time or near real time and as near as possible to 24 hours a day and seven days a week (24/7).¹⁴ FPS can be owned and operated by central banks (eg Pix in Brazil), private entities (eg RTP in the United States) or both (eg Nigeria Inter-Bank Settlement System Instant Payments). While the final settlement of funds between the PSPs of the payer and payee could be done in both central bank and commercial bank money, the vast majority of systems settle in central bank money or in commercial bank money backed by central bank money.¹⁵ Further, settlement can be done on a real-time and gross basis or be deferred and done on a net basis.

In this paper, we focus on differences and similarities across some of the main components/layers of retail CBDC systems and FPS (Graph 2). From a technical perspective, both retail CBDC systems and FPS consist of different modules that constitute the core underlying **infrastructure**, including the clearing and settlement component. Settlement could take place directly within the system or by connecting it to the jurisdictions' real-time gross settlement (RTGS) system. Both retail CBDC systems and FPS also comprise functional **technologies** and communication channels. The **scheme**, or rulebook, sets out the rules and standards governing the relationship between the participants of the system, the operator and other relevant parties, in compliance with the applicable regulatory framework. Payments are made with different payment **instruments**. Finally, they offer directly or facilitate the provision of basic and value added **services** such as aliases and proxy registries. They can cover a diversity of **use cases** (eg the types of needs covered such as person-to-person, person-to-business, person-to-government, business-to-business) and **transaction channels** (eg internet, unstructured supplementary service data (USSD), mobile apps, branches, agents, quick response (QR) codes). Different parties are involved in the good functioning of payments, including the operator, participating institutions, end users and the overseer. For the purpose of this paper, the above layers make up a **payment system** – regardless of whether it is an FPS or a retail CBDC system. Despite the many components and layers, the main comparison between retail CBDCs and FPS in this paper is made at the level of the instruments, services, scheme, infrastructure and system as a whole. When left uncharacterised (ie simply retail CBDC or fast payment), the context implies that we are referring to the instrument or service layer. Annex 2 gives an overview of the definitions used in this paper.

¹³ The meaning of the term “fast payment systems” can vary based on the context in which it is used. It sometimes refers to only the infrastructure underlying the delivery of fast payments, its governing rules and participants (see CPMI (2016a, 2021)). Following Frost et al (2024), our interpretation is wider and includes the end user-facing services offered by multiple participants.

¹⁴ CPMI (2016a).

¹⁵ See CPMI (2021).



¹ The components/layers presented here are not intended to be exhaustive and represent only a subset of what a payment system consists of.

Source: Authors' elaboration.

3. Key similarities and differences between retail CBDC and fast payments

Before delving into the drivers and motivations for central banks to launch a retail CBDC system, FPS or both, we provide a breakdown of similarities and differences between the two. We focus on the features where clear distinctions can be made. The degree to which individual retail CBDC systems and FPS truly compare eventually depends on their specific designs. There is a spectrum of retail CBDC system designs and a spectrum of FPS designs. This means that some retail CBDC payments may be more similar to fast payments than others and vice versa. Further, one has to acknowledge the dynamic and evolving nature of both, which means that similarities and differences across the two solutions can also change over time.

In general, there are three categories of transfer assets under which particular subcategories can be included: public/central bank money (eg cash, central bank reserves, wholesale CBDCs, retail CBDCs), private money (eg commercial bank deposits, e-money, wholesale digital tokens, potentially some stablecoins) and instruments that are not a liability of anyone (eg cryptoassets). As shown in Annex 3, the main difference between retail CBDC (systems) and fast payments (FPS) resides in the nature of the claim held by the end users on the issuer (ie the liability held by the end users being borne by either the central bank or a financial institution). Undoubtedly, depending on the availability and design of supporting infrastructures that ensure the redemption of commercial bank money at par,¹⁶ this feature may have profound implications from a technical, financial, monetary and regulatory point of

¹⁶ For instance, the distinction between central bank money (ie CBDCs) and commercial bank money (for FPS) in terms of the protection of end user balances may not be so stark in practice, if and when there is robust banking supervision and deposit insurance with a high limit.

view.¹⁷ Another smaller difference resides in the underlying messaging standards, as an increasing number of FPS are adopting ISO 20022, while the three live retail CBDC systems to date mostly rely on proprietary standards.

Retail CBDCs and FPS present many similarities at the overall system level. For example, both innovations can support various overlay services. Retail CBDCs may open new prospects in terms of programmable payments and composability, but it is theoretically possible for these to also exist in FPS, for example if they are enhanced to process tokenised deposits.¹⁸ Similarly, both generally rely on central bank money for the settlement of the resulting payment obligations between system participants.¹⁹ Moreover, even though retail CBDC systems have often been associated with distributed ledger technology (DLT), both the live retail CBDCs and CBDC experiments to date show that this is not a necessary feature. At the same time, while most FPS to date rely on centralised technology, they can also be built on or incorporate DLT components.^{20, 21}

A retail CBDC ecosystem involves a number of players, including the central bank (as catalyst, overseer, operator, issuer and settlement agent); private banks and potentially non-banks (as payment service providers); individuals and businesses (as users of payment services); and the government (both as a user of services and as a key player enacting relevant legislation to allow for retail CBDC issuance). An FPS ecosystem can look much the same, except for the type of money transferred between end users and some differences in the roles of the central bank and government (see Graph 3). (Section 5 goes into more depth on the role of the central bank in each initiative).

¹⁷ World Bank (2021b), Soderberg et al (2023).

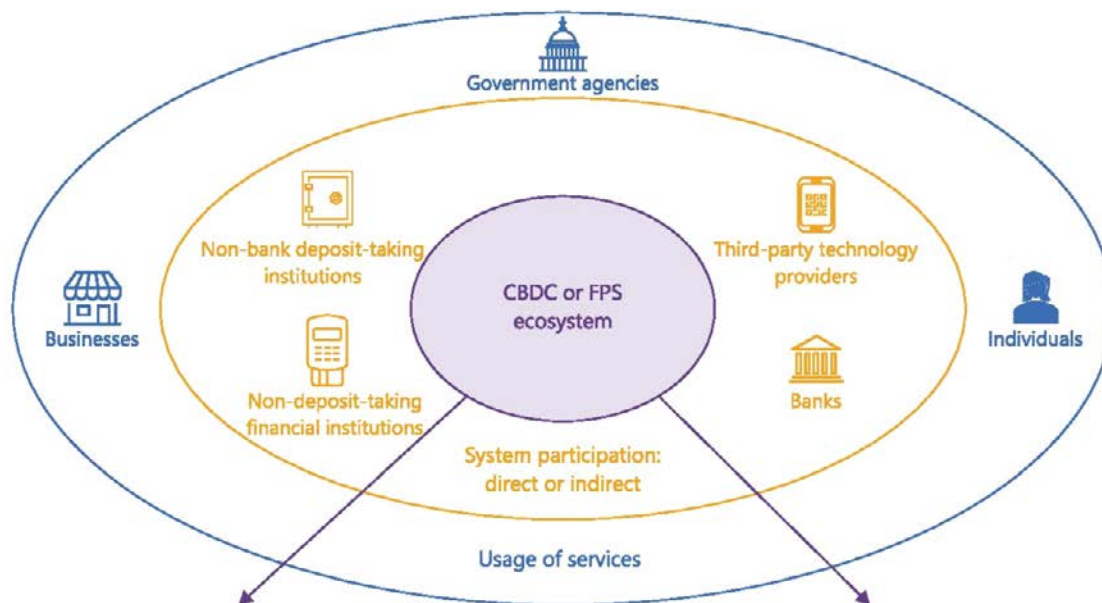
¹⁸ Programmability allows for specific actions to be automatically executed when a set of predetermined and preprogrammed conditions are met. Composability means that many smart contracts covering multiple transactions and situations can be bundled together, like “money legos”. See BIS (2022a).

¹⁹ Although to date, many FPS have adopted deferred net settlement (DNS) in central bank money, this may change, as there is a trend towards the use of RTGS systems for interbank settlement of FPS and as central banks are increasingly considering extending the operating hours of their RTGS systems.

²⁰ For instance, the Bakong system, a peer-to-peer fund transfer service in Cambodia, uses DLT (Hyperledger Iroha).

²¹ Both retail CBDC systems and FPS can be considered digital public infrastructures (DPIs). DPIs are interoperable, open and inclusive digital systems, supported by technology to enable the use and provision of essential, society-wide, public and private services (GPFI (2023)). DPIs can take different forms and generally cover three main areas: (i) digital identity, (ii) data exchange and (iii) digital payments. DPIs differ from other traditional digital and financial infrastructures by being more foundational and cross-cutting. FPS are generally cited as the typical example of a digital payment DPI – regardless of whether it is owned or operated by private entities. The reason for this is that FPS often leverage state-of-the-art technologies, support innovative use cases such as aliases, proxy registries or request-to-pay (RTP), and can enable individuals and businesses to access transaction accounts and services offered by both banks and non-banks. FPS can also foster enhanced workflows to provide public and private services (eg when combined with digital identities to facilitate government-to-person transactions). And they can make the opening and use of transaction accounts more attractive. Retail CBDC systems can also meet these criteria and therefore be qualified as a DPI as well.

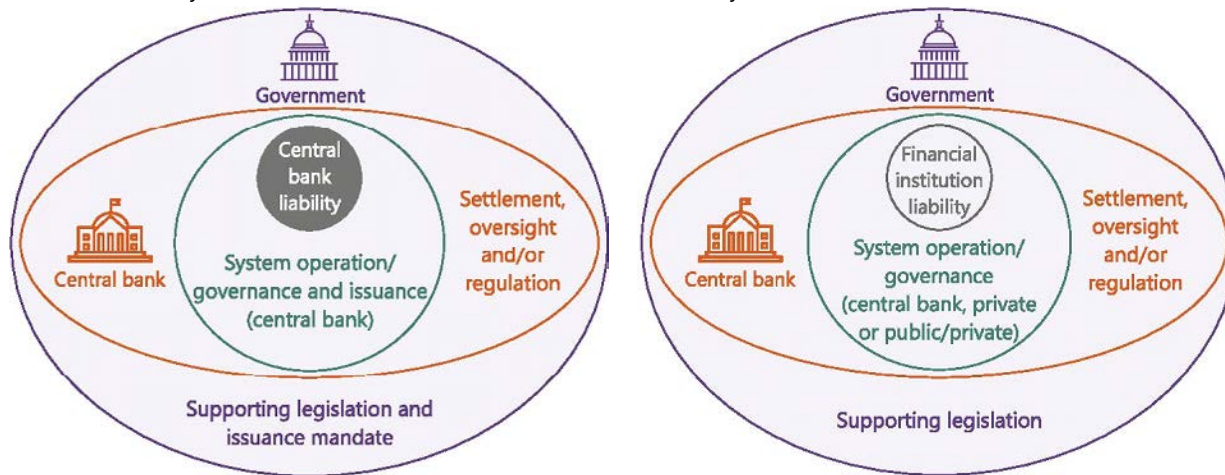
A. Many similarities...



B. ...with a different type of liability being transferred between end users

Retail CBDC ecosystem

FPS ecosystem



Source: Authors' elaboration.

Ultimately, on several dimensions, such as the applicable regulatory environment, the instantaneity and availability of the service and the potential use cases and transaction channels, retail CBDC systems and FPS are almost identical. For instance, both are able to support alias registries, and they could both support offline transactions (though there may be challenges as described in Section 5). As illustrated in the graph, both can allow non-banks to participate. Of course, both need to be smoothly integrated with existing financial market infrastructures (FMIs), such as other existing retail payment systems and RTGS systems.

4. Rationale for exploration and implementation

Common motivations and considerations

Despite their similarities, central banks may consider issuing a retail CBDC and implementing an FPS to support different policy goals. In this section, we discuss the insights gained from interviewing 14 central banks, in particular on the motivation for one or both initiatives.

The motivations for retail CBDCs and FPS are as varied as the policy mandates of central banks and local conditions of jurisdictions around the world. Yet there are commonalities. Overall, the most common motivations cited by central banks interviewed for issuing retail CBDCs are (i) increasing financial inclusion, (ii) improving cost efficiency and speed in current domestic payment systems, (iii) safeguarding financial stability, (iv) preserving the monetary anchor role of central bank money and (v) contributing to the safety and robustness of payments.²² The key motivations mentioned by interviewees for building an FPS are (i) enhancing the speed of transactions, (ii) fostering the safety and efficiency of domestic and cross-border payment systems, (iii) increasing financial inclusion and (iv) promoting competition.²³

Clearly, some goals overlap. Yet in the view of some interviewees, retail CBDCs could bring some features which are not feasible (at least, at this stage) or relatively difficult to implement with FPS, such as programmable payments, composability and enforcement of greater privacy for users. In addition, retail CBDCs may help to pursue other goals of central banks, such as safeguarding the use of the local currency over stablecoins or other cryptoassets. This is seen as one major goal by some of the interviewed central banks. The possibility of arranging interoperability between payment systems to enhance cross-border payments is also being considered by central banks but not as an immediate priority. Finally, some central banks underscored risks that are unique to retail CBDCs, such as concerns of disintermediating private banks.

Several central banks that have issued live retail CBDCs or launched an FPS (or are exploring them) see the two as complements rather than substitutes. In the interviews with the BCEAO, BoC, BoG, Bank of Jamaica (BoJ), Central Bank of Nigeria (CBN), ECB and RBI, it was noted that the two are expected to coexist rather than compete, because they can or would each serve different purposes or offer different benefits. Both are also seen as different in terms of the role they can play in the transaction chain. For instance, it was noted that in the euro area, the TARGET Instant Payment Settlement (TIPS) system is viewed more as an interbank infrastructure, whereas the digital euro would be an electronic means for retail payments. In any case, both would help to promote settlement in central bank money, though TIPS does it mostly in the interbank sphere.

The degree of complementarity between retail CBDC systems and FPS might change over time, depending on the technology used by both. Interviewees at the BoG noted that, as traditional payment systems have also started experimenting with new technologies, in the longer run there might be competition between a retail CBDC and fast payments. This would be particularly relevant if both were to use the same underlying technology.

²² See Di Iorio et al (2024).

²³ World Bank (2021).

Still, some interviewees questioned the added value of retail CBDCs or were concerned that the potential added benefits of a retail CBDC system may be outweighed by the risks and costs of having multiple separate payment infrastructures. Out of the 14 central banks interviewed, six are still studying or do not see clear advantages to issuing a retail CBDC, at least for now. For instance, the BCB is assessing the issuance of a wholesale CBDC (Drex) rather than a retail CBDC, due to the success of its FPS (Pix) in terms of increasing financial inclusion.²⁴ The SNB is also investigating a wholesale CBDC and has piloted its use for settling market transactions on SDX.

Indeed, for central banks of some jurisdictions where access to transaction accounts is nearly universal, and where a well-developed FPS, an innovative and interoperable payments market and a deposit guarantee scheme are already in place, there are doubts about the value of a retail CBDC. Some respondents also noted that it is challenging to identify the tangible benefits of using retail CBDCs instead of fast payments from an end user's perspective. Interviewees at the BAM acknowledged a risk of retail CBDC payments cannibalising other initiatives that the banking sector has invested in and saw this as a reason to be cautious with retail CBDC. Still, several interviewees highlighted the promise of a wholesale CBDC, eg regarding programmable payments and composability. Depending on the technology used, a wholesale CBDC platform could be a way to bridge the traditional financial sector and the decentralised finance (DeFi) environment and offer an opportunity for innovation that goes beyond payments.

Timing and sequencing

Most central banks with whom we spoke have started with an FPS and are looking to see how a retail CBDC system could add value for end users and society, either by offering something new or by achieving the same objectives better. Some central banks decided to also issue or explore the issuance of a retail CBDC to increase financial inclusion, enhance end user access to central bank money (in digital form) and foster innovation. For others, launching a retail CBDC system in addition to an FPS would depend on the further evolution of cash and the need to provide alternative ways to guarantee access to central bank money. The increasing demand for crypto, the need for efficient cross-border payments and the need for instant funds availability for end users are also factors that central banks are taking into account in their exploration of a potential retail CBDC.

Interoperability between a retail CBDC system and FPS is possible but generally not of the highest priority for central banks, at least so far. Those central banks that are still in the initial exploratory stages of a retail CBDC generally consider interoperability with the FPS as something to consider once they have more clarity about the design and architecture of a retail CBDC system. Domestic interoperability between a retail CBDC system and FPS could take different forms. For instance, a retail CBDC could be issued using the FPS as the underlying infrastructure or vice versa. Interoperability could also mean that the FPS is used by financial institutions or end users to transfer money into (or out of) their retail CBDC wallets from their bank

²⁴ The Drex platform would also support private intermediaries (banks and non-banks) in offering their clients a privately issued retail version of Drex that would be backed with bank loans or a wholesale CBDC.

accounts. In Nigeria, such interoperability is achieved using an application programming interface (API) by the national central switch that functions as a hub.

Cross-border payment interoperability is a secondary priority for several of the interviewed central banks. The BoC interview, for instance, noted wanting to make sure that their work on a domestic retail CBDC at a minimum does not cause any barriers to cross-border payments. The RBI interview underlined the importance of cross-border interoperability not only with other retail CBDC systems but also with other more traditional payment systems, especially since not all jurisdictions may decide to issue a retail CBDC. Some central banks, while seeing opportunities for retail CBDC for cross-border payments, are taking more of a wait-and-see approach. Interviewees from The Bahamas noted that due to the existence of common international messaging standards such as ISO 20022, and the increasing number of prevailing FPS, interlinking FPS may be easier and more effective in enhancing the speed, efficiency, cost-effectiveness and accessibility of cross-border payments in the short run compared with achieving cross-border interoperability of different CBDC systems.

The potential to serve different purposes

Some central banks explicitly discussed the potential for retail CBDCs and fast payments to serve different purposes. One recurring argument was that it is important to ensure end user access to central bank money via a retail CBDC, as the payments landscape is becoming ever more digitalised. As the use and provision of cash services is declining, access to central bank money may be compromised. Moreover, there is an increasing demand for online payments (eg for online shopping) which cannot always be met with cash. Although the public may not be fully aware of the differences between commercial bank and central bank money, the fact that central bank money is a claim on the central bank and therefore always free from default risk may matter to them in periods of stress for some central banks. Also, central banks' work on a retail CBDC is in some cases partly motivated by the increasing popularity and risks of cryptoassets, as indicated in the interviews. A retail CBDC could help maintain trust in and access to central bank money, solidify the central bank's role as a monetary anchor and contribute to safeguarding monetary sovereignty and stability.

There were different views regarding the relationship of retail CBDCs with cash. In some jurisdictions, a retail CBDC is expected to reduce cash use. These counterparts noted that each year, the production and logistics of cash implies a considerable cost for central banks, commercial banks, security and transport companies and individuals and businesses. In these cases, a retail CBDC is seen as a potential tool to (partially) substitute for cash with the aim of reducing these costs. Moreover, to them, the current use of cash in the informal economy is seen as something that a retail CBDC could address when issued as a substitute for cash. For other jurisdictions, a retail CBDC is expected to coexist with cash. Several central banks see a retail CBDC as an additional option and do not intend to replace access to cash. This is because cash is still playing an important role for a large part of their population or for certain vulnerable groups, according to some of the central banks. It is also acknowledged that it is uncertain at this point whether a retail CBDC will be used as a substitute for cash or as a replacement of commercial bank money or both.

Greater consumer choice and financial inclusion

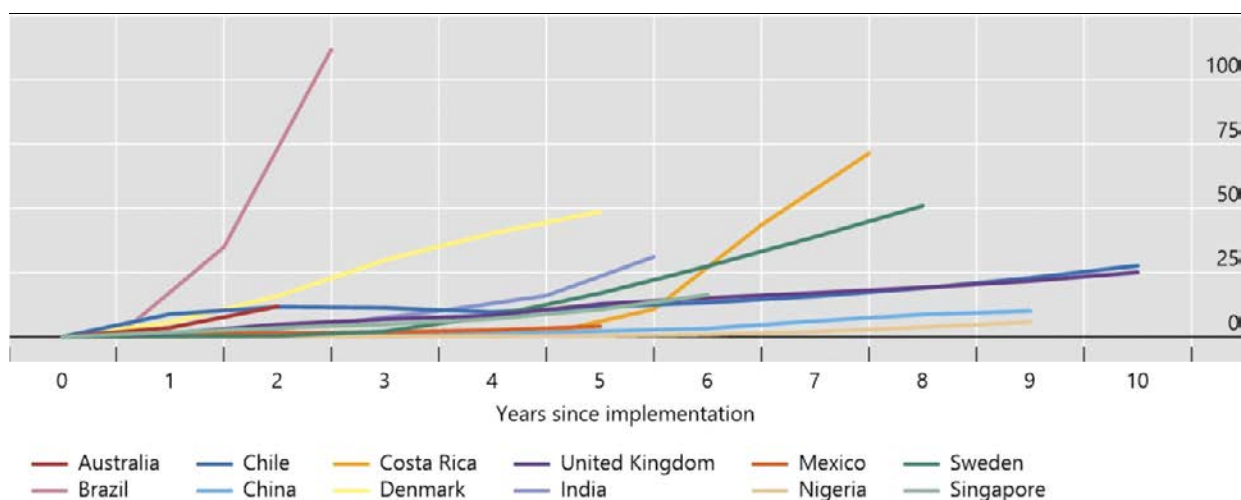
Some central banks considered that having both a retail CBDC and an FPS could increase consumer choice and offer (purposeful) redundancies. A retail CBDC is generally seen as a complement to other digital means of payment, such as credit and debit cards by some central banks. Allowing for greater user choice and enhancing the efficiency and resilience of the payment system were among the key motivations of the CBN to issue the eNaira, for instance. From a competition perspective, some central banks believe that increased user choice may promote efficiency and foster innovation. Moreover, by targeting use cases beyond those of current card payments, and by opening up the market to new actors, central banks feel that they may be able to reach people who do not have access to the financial system, promote financial inclusion and accelerate innovation.

Of course, the strength of this argument may depend on how widely adopted both fast payments and a retail CBDC will be. In practice, in some jurisdictions, fast payments have achieved mass adoption. It is estimated that over 90% of Brazilian adults use Pix, over 70% of Costa Rican adults use SINPE Móvil and at least 25% of Indian adults use UPI annually. This is reflected in a high number of transactions per capita in these systems (Graph 4). To date, the live retail CBDCs have not achieved this level of adoption.

Fast payments have become widely adopted in some jurisdictions

Number of transactions per capita per year

Graph 4



Sources: National sources; authors' calculations.

Finally, the relationship between retail CBDCs and FPS may be influenced by the level of financial inclusion in a jurisdiction. Financial inclusion has been cited by some central banks as one of the main reasons to issue a retail CBDC or to explore issuance. While both retail CBDCs and fast payments allow for low-cost and inclusive payment services for end users, some central banks see potential for retail CBDCs as a greenfield initiative to play a particularly important role. Indeed, recent research underscores how a retail CBDC system could be designed to address specific barriers to financial inclusion (Boakye-Adjei et al (2023)). In jurisdictions with a low level of financial inclusion, several central bank counterparts saw both retail CBDCs and fast

payments as having the potential to draw individuals and businesses into the financial system. Many noted that this would also need to be accompanied by complementary measures (eg public policies to reduce tax evasion and informality, efforts to promote financial literacy and legal and regulatory reforms). Functionalities like offline payments may be particularly important in settings with low levels of financial inclusion, a large, informal and cash-based economy, a diverse geography or limited connectivity to the internet and telecom services.

5. Functionalities

Both retail CBDC systems and FPS can allow for and support a wide range of technical functionalities, overlay services, use cases and transaction channels. Further, both can be built on common messaging standards such as ISO 20022, though there have been some FPS (eg SPEI in Mexico, UPI in India) and several retail CBDC systems (eg Sand Dollar, eNaira) that use proprietary standards. In addition, both could support APIs, which allow for the secure exchange of data between different entities and for new and customised overlay services to be integrated, such as request to pay or buy now, pay later.²⁵ APIs can aid interoperability and the open nature of the system. In addition, in both cases, it is technically possible to integrate banks and non-bank PSPs into the payment system, thus promoting objectives such as competition, innovation and potentially positive financial inclusion outcomes.

Offline payments, programmability, composability and tokenisation could be facilitated by retail CBDC systems

Certain functionalities such as offline payments are considered by some central banks to be easier to achieve with a retail CBDC system than with an FPS. Offline payments are transactions whereby the payer and/or payee do not need a connection to any ledger system (BIS (2023)). Hence, these payments can for example be made in the absence of internet or telecom connectivity. In such cases, it may be difficult to communicate with an FPS and update the ledger of the bank or PSP of both the payer and payee, though attempts have been made (eg UPI Lite X in India). Some counterparts noted that having a tokenised claim (similar to a stored value card) may be easier in a retail CBDC system than in an FPS, as the a CBDC could enable smoother solutions (eg where tokens are signed out by debiting a locally held offline balance). For instance, the BCB has explored offline payments for both a retail CBDC and fast payments but consider it easier from a technological perspective in a retail CBDC system.²⁶ In Ghana, the BoG is considering offline payments using wearable devices. In Nigeria, a few local and foreign solution providers are involved in the exploration of offline functionalities with the CBN regarding e-Naira. The exploration has now

²⁵ APIs enable a software application (eg a mobile phone app) to request a specific piece of data from one or more other software applications (eg a banking platform installed on a server in a bank's data centre), and for data transfer from the data providing application(s) back to the requester, provided the original request was valid (see BIS (2020, 2022b)). See CPMI (2022) for an overview of important trends in interlinking arrangements and API adoption by payment systems. For a discussion of buy now, pay later, see Cornelli et al (2023).

²⁶ The BCB counterparts also noted that this was not a key demand of the public in their case. This was again a reason to start with the wholesale CBDC pilot, rather than retail CBDC issuance in the near term.

advanced into the pilot stage.²⁷ Overall, for any offline capability to work, it needs to be based on principles such as privacy, security, interoperability and scalability.

Counterparts noted that retail CBDC systems can also bring new use cases based on programmability, composability and tokenisation. The interviewed central banks mentioned programmability as a unique feature for CBDCs, even for jurisdictions where the level of financial inclusion is high and the space for a retail CBDC appears to be small.²⁸ Whereas FPS could support programmability using two separate databases (one that records balances and one that contains the program logic), CBDC systems could be more efficient, as they can encompass and bring together both databases, thus unifying ledgers.

Some central banks, such as BoG, view a retail CBDC system as a means to ensure instant settlement among system participants, thus avoiding credit risk between them and challenges associated with prefunding.²⁹ While instant settlement can also be achieved in an FPS context, many FPS today are processing their payments on a deferred net basis.³⁰ With several countries moving toward RTGS systems that are open 24/7, the settlement model of their FPS could also switch toward real-time gross. Countries might even use the RTGS infrastructure itself to process retail fast payments in addition to traditional large-value payments.

FPS appear more promising to improve cross-border payments in the short term

There are also areas where an FPS may offer advantages over a retail CBDC system. First, given the nascent nature of retail CBDC systems to date, retail CBDCs may not be able to contribute to the short-term targets of the G20 cross-border payments programme.³¹ By contrast, the proliferation of FPS globally provides opportunities to foster interlinkages between them to enhance cross-border payments. Interlinking FPS is one of the priorities for meeting the G20 targets of cheaper, faster, more accessible and more transparent cross-border retail payments and remittances, while maintaining their safety.³² Various initiatives are currently under way to interlink FPS, such as the bilateral link between the FPS of Singapore (PayNow), Thailand (Promptpay), Singapore (PayNow) and India (UPI). Similarly, a pilot initiative spearheaded by the BIS Innovation Hub (Project Nexus) has shown promising signs on a larger scale. Nexus acts as a hub to which domestic FPS can connect to link with each other and facilitate cross-border fast payments.³³

²⁷ Lipis Advisors (2023).

²⁸ Several central banks are considering approaches to support the digital representation of assets using a DLT system, which would support programmability and composability in CBDC systems (Aldasoro et al (2023)). Current experiments focus mainly on a wholesale rather than retail CBDC as a settlement asset for tokenised deposits and assets, allowing for real-time settlement of transactions.

²⁹ Credit risk could also become relevant for end users of fast payment services to the extent it could lead to their financial institution or service provider becoming insolvent.

³⁰ The deferred net basis refers to the settlement between PSPs. Regardless of the nature of this inter-PSP settlement, from an end user perspective, the funds are (usually) available in real time to the end user receiving the funds. For further details, see CPMI (2021) and World Bank (2021a).

³¹ See CPMI et al (2023).

³² See CPMI (2024).

³³ BISIH (2024).

That said, retail CBDCs have the potential to improve cross-border payments in the long run.³⁴ Multiple central banks mentioned during the interviews that they are aware that retail CBDC systems can enhance cross-border payments, but that at this stage, their priority is to test and/or develop a domestic retail CBDC system first.

Options for domestic interoperability between FPS and retail CBDC systems seem feasible (but remain little explored so far)

How to achieve domestic interoperability between an FPS and a retail CBDC system is an open question. There may be efficiency gains or cost savings from building a retail CBDC system on top of an existing FPS (or vice versa). Central bank thinking around how to achieve such interoperability between a CBDC, FPS and other existing payment systems is still at a research stage. One alternative is to enable this through APIs, which would allow end users to transfer funds between retail CBDC accounts and bank or e-money accounts. Integration may also reduce the development costs of a new system for participants. For instance, a few central banks argued that ongoing developments for an FPS might reduce incentives for banks and non-banks to invest in a new retail CBDC infrastructure in the near future. Yet, central banks may want the two to have explicitly different rails. This could help to ensure redundancy (eg from a business continuity or cyber security perspective) and to serve different purposes and use cases.

When considering launching a retail CBDC system while already having an FPS, central banks have different options for interoperability and to avoid creating silos.³⁵ For instance, in the euro area, as indicated during the interview, the idea is to reuse as much as possible existing fast payments technical standards (including the QR code standards) for the digital euro. In this way, interoperability between an FPS and a retail CBDC system can be achieved at different layers of the system (as depicted earlier, in Graph 2). In the same vein, the BCB is exploring how to add new features to its existing Pix infrastructure and allow it to interoperate with existing or new payment solutions and systems.

It was noted that, if carefully designed and regulated, retail CBDC systems and FPS can indeed co-exist. They can help promote full digitalisation of payments by, on the one hand, reducing cash use and, on the other hand, maintaining the role of central bank money in the digital economy. They could be designed with different and complementary technical functionalities to reach universal access. For instance, the e-Naira supports transactions using the USSD technology used for text messages in Nigeria. e-Naira is therefore expected to be adopted by low-income people who use feature phones and thus far mainly pay with cash.

³⁴ CPMI et al (2022).

³⁵ In 2024, the World Bank published a paper which laid out options for the interoperability of FPS and retail CBDC systems, based on technology design experiments (World Bank (2024)).

6. Role of central banks and the broader ecosystem

Both CBDCs and fast payments involve an important role for central banks

Central banks play an important role in maintaining the safety, integrity and efficiency of payment systems. In most jurisdictions, this role is formalised in the central banks' legal mandates. In many cases, both formal central bank laws and additional legislation or regulations govern the central banks' public policy objectives and instruments.

While the exact responsibilities in retail payments differ across jurisdictions, central banks are generally involved in payments in three ways: as system operators, as payment system overseers and/or regulators, and as catalysts of action in the payments sector. These three roles can also be identified when looking at the involvement of central banks in FPS and CBDC systems. As outlined in CPMI (2016a) and CPMI (2021), central banks' **operational role** in an FPS can range from providing final interbank settlement in the RTGS system to directly operating an FPS. In terms of the **oversight role** and/or **regulation**, there is considerable variation in central banks' mandates and powers, as well as in the scope and manner in which they are applied. In some jurisdictions, the central bank has formal regulatory oversight authority over retail payment systems, whereas in others, it depends on the prominence and designation of the payment system. As **catalysts**, central banks facilitate and support the achievement of market outcomes, for example through close cooperation with the private sector, research and analysis, cooperative relationships with regulators and other relevant public authorities, and their role in the public policy debate (eg on pricing for individuals and businesses). According to CPMI (2021), central banks have generally taken an active role providing the initial impetus for the launch of their FPS, eg by bringing together the relevant stakeholders or leading the project.

While many of the potential roles of central banks in CBDC systems can be similar to those for FPS, their involvement is generally more pivotal in the context of retail CBDCs. Not only is the central bank responsible for the issuance of the retail CBDC; in all jurisdictions having launched a retail CBDC so far, the central bank took on the operating role.

The distribution of roles between the central bank and other stakeholders varies depending on the implementation

Although central banks are generally driving the launch and operation of both retail CBDC systems and FPS, to date, central banks have been taking on very different responsibilities for each. Regarding FPS, both public and private sector ownership and operations are common. This often reflects the traditional role of central banks in other legacy retail payment infrastructures, eg automated clearing houses for cheques or credit transfers.³⁶ Some central banks have been very active and launched their own FPS. For instance, Pix is entirely owned and operated by the BCB, which has taken a prescriptive stance by defining a single brand, establishing precise scheme

³⁶ World Bank (2021a).

rules, mandating participation of large financial institutions and enforcing a transparent pricing strategy. In other cases, FPS are co-owned by the central bank and commercial banks or other private sector entities. For example, in Nigeria, NIBSS Instant Payment is owned and operated by the Nigeria Interbank Settlement System (NIBSS), which is a key financial institution providing clearing and settlement services and is jointly owned by CBN and all licensed banks. Governance and operational structures can evolve over time. Some central banks (BCB) have played an instrumental role in the definition of service requirements and front-end solutions for FPS. Besides financial service providers, other stakeholders play a key role in the functioning and adoption of fast payments, such as technical service providers responsible for processing high volumes of transactions or merchants and sub-acquirers on the acceptance side.³⁷

While there are no known examples of CBDC systems owned by the private sector, central banks are engaging with third-party vendors and information technology (IT) companies for the development of the CBDC infrastructures. Nonetheless, the rest of the ecosystem also has a part to play – from merchants to banks and non-banks (see also Graph 3 above). In particular, the introduction of a two-tier system, where PSPs are responsible for onboarding, know your customer (KYC), custody of a retail CBDC and potentially other front-end services can help to mitigate disintermediation risks (see Section 7).

As is the case with any central-bank-operated payment system, central banks operating a retail CBDC or FPS system may face potential conflicts of interest when performing multiple functions, notably the roles of operator and overseer. The same applies today for central banks operating and overseeing their jurisdiction's RTGS system. In these instances, central banks generally have a clear functional and organisational separation between the two roles and separate lines of reporting.

The extent of a central bank's involvement and its roles will ultimately depend on public policy objectives and will be shaped by domestic market dynamics. In several jurisdictions, central banks decided to launch a retail CBDC or an FPS (or both) to compensate for the absence or slowness of private initiatives and to address market inefficiencies, such as lack of competition. In the European Union, the Eurosystem launched TIPS to foster fast payments interoperability within Europe despite the existence of other privately operated FPS which failed to provide pan-European reach. In Ghana, a retail CBDC is seen as a tool that would tackle limited access and high fees which are not addressed by GhIPSS Instant Pay (GIP), launched in 2015. In New Zealand, the private sector is responsible for the fast payments implementation, while CBDC falls into the parameter of the RBNZ. Although work on a retail CBDC is only exploratory at this stage, the RBNZ sees it as an additional incentive to move the industry forward on fast payments.

From this perspective, central banks also need to be aware of potential risks. For instance, a proactive approach by central banks to launching new payments infrastructures can spur a wait-and-see reaction from market participants and deter the private sector from innovating. It could also hinder the credibility of the central bank if an initially intended new central bank payments infrastructure is not eventually launched, or if its adoption remains limited. Both retail CBDCs and fast payments are widely considered digital public goods, which can justify central bank intervention on

³⁷ FPS toolkit, World Bank (2021).

aspects that are traditionally performed or determined by the market, such as the direct provision of services to end users and determining end user fees.

For both fast payments and retail CBDC, it is necessary to have a solid regulatory framework that grants clear mandates to the central bank. For instance, Article 172 (2) of the Treaty on the Functioning of the European Union entrusts the Eurosystem to promote the smooth operation of payment systems. In India, the Payment and Settlement Systems Act (2007) provides regulatory and oversight powers to the RBI regarding retail and wholesale payment systems. In Brazil, Law 12,865 of 2013 represented a landmark in the modernisation of retail payments and provided a basis for subsequent innovation. In line with this law, the BCB introduced a set of rules governing payment schemes and payment institutions, including the entry of non-banks into the market and the prohibition of exclusive bilateral agreements. Regulatory intervention may be generally more important for the introduction of a retail CBDC as it may require a modification of the status of legal tender.

Consultation with market players and end users as well as peer learning is beneficial before implementation

For both retail CBDC systems and FPS, interviews with central banks highlighted the need for an extensive consultation and preparation phase, regardless of the ownership structure. Most interviewed central banks have engaged in discussions with market participants. Such market consultations have entailed the creation of dedicated committees and working groups, as well as bilateral exchanges with market participants. For example, in 2018, the BCB created a working group on fast payments to foster the implementation process, which eventually became the “Pix Forum”, with participation from around 200 institutions.

Consultations with end users have also been organised for retail CBDCs. The ECB has launched an extensive consultative process as part of the digital euro investigation phase, including the creation of dedicated structures for market discussions (eg Market Advisory Group) and focus groups targeting different profiles of potential end users. Ghana followed a similar route, which allowed authorities to pinpoint the demand for offline capabilities and the concerns regarding tax collection and informality. Besides this preparatory role in leading early market discussions, several central banks have set up and rolled out a communication strategy aiming to prompt rapid adoption after launch. This has been observed for both FPS and retail CBDCs. Interviews showed that external communication efforts by central banks often reflect their engagement in the operations of the system. For instance, BCB followed an innovative path by supporting uptake on various media, including social networks through partnerships with influencers.

Overall, central banks interviewed indicated being more cautious regarding the issuance of retail CBDCs, given their novelty, indicating they have promising features but introduce uncertainty (BCEAO, SNB). By contrast, FPS are more well established from a technological and policy point of view and have passed the test of time. Most central banks interviewed have largely relied on peer learning and previous experiences for the design and implementation of their FPS. A similar phenomenon is progressively taking shape for retail CBDCs. For instance, BAM and BCEAO are monitoring developments in other jurisdictions and benefit from World Bank and International Monetary Fund technical assistance. As the number of live retail CBDCs

is still low, several central banks are following a second-mover strategy and waiting for other jurisdictions to pioneer the new way of paying and collect feedback.

7. Risks and challenges

Retail CBDCs and FPS represent two distinct approaches to modernising the traditional payments landscape. Each introduces specific risks and challenges. The Principles for Financial Market Infrastructures (PFMIs) issued by the Committee on Payments and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO) highlight several categories of risks characterising systemically important FMIs. These risks may also arise in retail payment systems such as retail CBDC systems and FPS. These categories include systemic risk (when systemically important), legal risk, liquidity risk, general business risk and operational risk.³⁸ Box 1 gives an overview.

Although each of the risks listed in Box 1 is to some extent relevant to both FPS and retail CBDC systems, each type of system may have a different risk profile depending on its specific design and risk management framework. Generally speaking, while FPS may resemble other legacy payment systems through the integration of existing use cases and value added services, retail CBDC systems could constitute a more disruptive innovation and may introduce novel challenges. For fast payments, the extent of credit and liquidity risks will depend on the settlement model, with DNS currently the settlement model for many FPS.³⁹ Similarly, the cross-border functionality of some systems (such as India's UPI and Singapore's PayNow) can raise additional issues from a legal and operational perspective.

Retail CBDCs introduce several new challenges compared with FPS

As a direct claim on the central bank, retail CBDC balances are default-remote. Moreover, the CPMI-IOSCO guidance on the application of the PFMIs to central bank-operated FMIs would also be relevant to retail CBDC systems.⁴⁰ But in the view of the interviewees, new challenges – or at least more disruptive ones – could emerge with the introduction of retail CBDCs. Retail CBDCs are viewed by central banks as potentially riskier in certain respects, such as in terms of financial stability, transmission of monetary policy, resilience and cyber security, privacy and data protection, and disintermediation of the existing financial ecosystem. Interviewed central banks have differing views on these specific challenges and how to address them.

The main risk of retail CBDCs highlighted by interviewed central banks relates to the impact on the existing ecosystem and the potential disintermediation of market participants. The issuance of a retail CBDC inherently gives a prominent role to the central bank in the retail payments space. While the global consensus converges towards a two-tier distribution model to preserve the role of market participants, at least from an onboarding and custody perspective, the introduction of a retail CBDC

³⁸ CPSS-IOSCO (2012).

³⁹ See CPMI (2021).

⁴⁰ See CPMI-IOSCO (2015).

Box 1: The risk categories covered in the PFMI are also relevant for retail CBDC systems and FPS

Systemic risk

Systemic risk may arise when a system becomes systemically important. In such a scenario, the inability of one or more participants to perform as expected could cause other participants to fail to meet their obligations. Subsequently, the system operator may be unable to complete full settlement or may take actions that would raise unexpected credit and liquidity exposures. Such knock-on effects could cause further disruptions and erode public confidence in the infrastructure, resulting in systemic risk for the market. In addition, payment systems, like other types of FMIs, may have complex interconnections and common participants, which can also transmit disruptions across the ecosystem and pose a source of systemic risk.

Credit risk

Credit risk is the risk that a counterparty, whether a participant or other entity, will be unable to fully meet its financial obligations when due or at any time in the future. In payment systems, credit risk arises for participating PSPs when the crediting of a payee account and the debiting of a payer account is instant, while the final settlement of the inter-PSP obligations takes place on a deferred basis.

Legal risk

Legal risk can arise from the unexpected application of a law or regulation, usually resulting in a loss. It can also refer to uncertainty in the application of a regulatory framework, rendering contracts illegal or unenforceable, or to the delay in the recovery of financial assets or freezing of positions due to legal procedures. These challenges are often more acute in a cross-border context, as different bodies and regulations can apply to a single transaction, activity or participant.

Liquidity risk

Liquidity risk refers to the risk of a counterparty not having enough funds to meet its financial obligations as expected, even if it can do so in the future. It includes situations where a seller does not receive payment on time and may need to borrow or liquidate assets to make other payments. Liquidity risk may also arise when a buyer does not receive timely delivery and may need to borrow the asset to fulfil its obligation. Liquidity problems can lead to systemic issues, especially during market closures or illiquid conditions.

General business risk

General business risk refers to the administration and operation of a system as a business enterprise, involving potential financial impairments due to declining revenues, increasing expenses and losses charged against capital. Such issues can stem from reputational consequences, poor business strategy, ineffective response to competition, losses in other business lines or other business factors. It can result in a disruption of business operations.

Operational risk

Operational risk refers to the risk of service reduction, deterioration or breakdown due to deficiencies in information systems, internal processes, human errors, management failures or external disruptions. Operational failures can cause delays, losses, liquidity issues and even systemic challenges, as well as hinder risk management measures. They can stem from internal and external sources and include processing errors, system outages, capacity issues, fraud and data loss.

could prompt changes in the demand for bank deposits and services. A quick and significant uptake could have consequences for lending, profitability and resilience. In addition, it could have longer-term implications in terms of crowding out private stakeholders, leading to weaker competition, lower quality of service and less innovation. From this perspective, central banks interviewed often mentioned that more research is needed.

Stemming from the risk of disintermediation, retail CBDCs' financial stability and monetary policy transmission risks have also been identified by interviewees as potential challenges. The issuance of a retail CBDC could have substantial market structure effects, foster sudden outflows from bank deposits to central bank money and undermine the ability of banks to provide credit and cope with financial stress. Similarly, retail CBDCs can entail wide-ranging monetary policy effects, both positive

and negative, depending on user uptake and interest-bearing features. Tools and policies can be implemented to mitigate these risks. Through pricing, eg decisions on fees and tiered remuneration, central banks can create incentives to use a retail CBDC as a means of payment but not as much as a store of value. Through quantity measures, central banks can limit the amount accessible to each economic agent, typically through a hard cap on wallet sizes or transactions in a certain period. For instance, for the euro area, discussion has focused on a potential maximum holding of digital euros. Multiple approaches can be combined: among central banks researching, piloting or having implemented a retail CBDC, a few envisage tiered interest rates, and several consider maximum amounts. Jurisdictions that have already issued a retail CBDC reported limited concern, due to the gradual uptake and the retail CBDC mainly substituting for cash instead of other digital payment methods. Overall, the impact of retail CBDCs on monetary policy remains little explored at present, but multiple central banks foresee minimal impact.

According to some central banks interviewed, the issuance of retail CBDCs has the potential to transform the way they operate and, from this perspective, can raise unprecedented operational and information security risks. These can include technological, cyber security and business continuity challenges, as well as third-party risks.⁴¹ The introduction of new roles mechanically creates further points of failure and increases the technical and operational responsibility of the central bank. This may expose central banks to resource management constraints and potential reputational exposure in case of incidents. This challenge can be mitigated by proper risk management frameworks and taxonomies as well as appropriate technological choices, which makes the case for the early involvement of IT and risk management units in the experimentation process.

Another challenge highlighted by central banks relates to the articulation of privacy and consumer protection with anti-money laundering/countering the financing of terrorism (AML/CFT) and fraud rules. For some central banks, an initial ambition of retail CBDCs was to provide citizens with a digital form of central bank money, offering cash-like features and use cases (RBI). Recent experiments and projects have shown that retail CBDCs could perform this role from a technical perspective, enabling full anonymity and offline transactions. Yet some central banks have progressively discarded this option due to the need to comply with AML/CFT rules and to apply minimum safeguards in instances of fraud or error.⁴² Full anonymity for a large share of transactions could make retail CBDCs attractive for illicit activities such as money laundering and terrorist financing. This would create a reputational risk for central banks, as they would not be entirely able to track and monitor these flows. Finding a balance between the objectives of privacy and countering illicit activities can be difficult, especially given populations' increasing awareness regarding privacy. Most central banks interviewed indicated that these topics are a top priority in the roll-out of a potential retail CBDC. Several of them are considering different levels of anonymity with respect to different parties and categories of transactions (for instance full anonymity for small-value transactions, eg The Bahamas). Similarly, the amount of data related to online retail CBDC payments available to the respective PSPs could be limited to what is necessary to perform services and consistent with what is required by regulation. Data available to the central bank could also be limited to what is necessary to perform critical tasks and

⁴¹ BIS (2023).

⁴² For further details, see BIS (2021) and ECB (2023).

could be pseudonymised, striking a balance between conflicting objectives and features.

The simultaneous or subsequent implementation of both initiatives raises additional challenges

From an operational perspective, additional risks can stem from the simultaneous or subsequent development and integration of a CBDC system and FPS. While retail CBDC systems and FPS have many common characteristics, differences in messaging standards and underlying technology can result in isolated and siloed technological developments. Among central banks that have launched or are assessing both options, several raised the point of ensuring the smooth technical interoperability of both systems within the existing payments landscape (CBN). Other central banks point out the necessity of having fully independent infrastructures, ensuring that if one system fails, the other serves as a backup (BoK). Moreover, projects relating to both systems are sometimes explored or developed by different teams (RBNZ). This can further accentuate the risk of coordination failure. This challenge is even more acute when both systems are launched at different times, which may result in legacy design features and implementation choices becoming a hurdle for achieving interoperability. In a number of jurisdictions, central banks have already implemented an FPS and are exploring different options for the smooth back-end integration with CBDCs.

In addition, multiple central banks acknowledged that resource and capacity constraints can arise from building and running two initiatives. BCB respondents mentioned staffing and allocating people to operations and product development as one of the main challenges for Pix. Similarly, the launch of JAM-DEX in Jamaica has been a resource-consuming project for the BoJ, involving a diversity of contributors with legal, financial and technological expertise. Thus, the interviewed central banks highlighted the need for a clear governance framework, both externally, to coordinate with market participants, and internally, to allocate tasks smoothly within the institution.

8. Key takeaways

While work on retail CBDCs and FPS is ongoing, it is possible to distil 12 takeaways in four main areas: complementarity or the relationship between retail CBDCs and FPS, success factors, design choices and the role of the central bank. Each are further elaborated on below. Note that these takeaways are the interpretations of the authors and not necessarily shared by all of the counterparts who were interviewed.

Complementarity/relationship between retail CBDCs and FPS

1. The choice between a retail CBDC or FPS, or both, is very contextual and will depend on the market features, ecosystem and implementation choices made in the past. In principle, both FPS and retail CBDC systems can support many of the same objectives. Yet, from a practical perspective, there are disproportionately more live FPS in the world. Many of these have achieved wide adoption and success. For a

jurisdiction that does not have a comprehensive and well-functioning payment ecosystem, and where resources are limited, it could make sense to focus on building an FPS first, given that it has been a proven solution in many jurisdictions and sometimes involves “just” upgrading the retail payment systems. For a jurisdiction that has an FPS but still faces gaps in inclusion and adoption, there are open questions about whether to upgrade the FPS with additional functionalities or to issue a retail CBDC with these features. Ultimately, depending on the objective, a jurisdiction would need to decide which path will lead to their intended objective in the most efficient and comprehensive way, without overburdening resources.

2. At least some of the central banks interviewed do see a role for both retail CBDCs and FPS. About half of the respondents noted a potential role for both. Yet here, too, rationales depend on context. For a jurisdiction that has an FPS but still has substantial gaps in financial inclusion, a retail CBDC system designed with inclusive features could offer further support in the pursuit of policy objectives for financial inclusion and payment efficiency. For a jurisdiction that already has an FPS and where financial inclusion is not a key issue, the purpose of a retail CBDC might go beyond payments and be associated more with monetary sovereignty or new functionalities. Notably, the degree of complementarity between a retail CBDC system and FPS might change over time, depending on the technology used by both. As payment systems are increasingly experimenting with new technologies, the differences between a retail CBDC system and FPS might eventually change and either facilitate their integration or make it harder.

Success factors

3. Success is more likely if the central bank is clear about the objective before embarking on the implementation journey. It is critical that central banks and other authorities fully understand the gaps that the particular system (retail CBDC or fast payment) is intended to fill and also learn from other implementations around the world to assess the potential for success. One recurring point in the interviews was that jurisdictions should avoid implementing a particular system just because of hype or “fear of missing out”. Rather, they should base decisions on real needs, resource constraints and availability of payment systems in the jurisdiction. For all central banks interviewed, it was clear that communicating the policy objectives of that jurisdiction to stakeholders was a key area of ongoing work.

4. Involving all relevant stakeholders early in the process can help to get their buy-in. Both retail CBDCs and FPS can be framed in the context of a broader payment modernisation strategy. The catalysts of the process (central banks and other authorities) should clearly define the roles and responsibilities of different stakeholders. These may include consumer groups, merchant associations, government agencies, banks and non-bank payment service and infrastructure providers. If a national payments council already exists in a jurisdiction, it could be used as a conducive platform to bring together the relevant stakeholders in the context of the respective system implementation as well. For retail CBDC issuance, which may be a more resource intensive endeavour, it is important to have a large interdisciplinary project team to cover all different aspects, including risk management. Further, in the context of a retail CBDC, there may be a need for legal amendments to recognise the retail CBDC as a legal tender. Therefore, the political buy-in from the government and the legislative body might be as important as the technical buy-in for the project to move forward.

5. An effective communication strategy with end users is especially crucial. One could argue that end users (consumers and merchants) constitute the most critical set of stakeholders in a retail CBDC and fast payment ecosystem due to, in part, network externalities. Ultimately, they are the ones that will need to adopt and use the services offered by the respective systems, and adoption by one group reinforces that of the other. It is therefore important to understand their needs from the very beginning. This can be done with surveys and focus groups, cutting across a variety of individuals (eg by age, gender, ethnicity, rural vs urban) and businesses (eg by size, industry, physical vs online, informal vs formal). Many central banks that are currently working on a retail CBDC started involving end users only when moving from the research to the proof-of-concept stage.⁴³ It is important that they start doing so earlier in the design process to ensure a good understanding of needs and opportunities. Furthermore, in communicating with end users, gaining trust will be important, particularly for retail CBDCs, given their novelty. Retail CBDC features, such as privacy rules and programmability, may raise concerns with end users in terms of what it means for their funds and data. It is up to the system operator and system participants to explain the design choices in layman terms. They may need to clarify from the beginning any potential controversial areas as well as debunk any myths in order to alleviate concerns. Without full trust and transparency, the uptake and usage will be severely hit and put the success of the project at risk.

6. While both FPS and retail CBDCs can play a role in financial inclusion, complementary policies are still needed. No matter how well designed a retail CBDC system or FPS is, they are not a silver bullet and will not guarantee universal access to transaction accounts and usage of digital payments by themselves. Further enablers and catalysts will be needed, such as a robust and level playing field, a sound legal and regulatory framework, a robust and widespread financial and information and communication technology infrastructure, strong commitment by the public and private sector, financial education, design of transaction accounts tailored to the needs of different sociodemographic groups, a wide network of merchants that accept digital payments, and large payers and billers acting as an example (eg governments and utility companies). All of these are elements of the Payment Aspects of Financial Inclusion framework and remain relevant for the success of the systems.⁴⁴ In addition, some complementary public policies geared toward reducing tax evasion and labour informality may be necessary to foster adoption of fast payments and retail CBDCs as well as digital payments in general.

Design choices

7. For central banks considering both a retail CBDC system and an FPS, compatibility and interoperability are key. This is especially important if one of the systems is coming after the other. Interoperability would ensure that end users can easily add or withdraw funds to or from their retail CBDC wallets and seamlessly use CBDC balances to transfer funds to others, regardless of whether the recipients have a CBDC wallet or a traditional bank or e-money account. The ability to smoothly move money between both systems, as well as with existing payment instruments such as payment cards, will be important for the adoption and use, and hence the success, of each system. This could be aided by standardisation, for instance of aliases, proxy

⁴³ See Kosse and Mattei (2023).

⁴⁴ CPMI and World Bank (2016).

identifiers and QR codes. Similarly, standardisation and the use of messaging formats (such as ISO 20022) and open APIs would allow participants (ie PSPs) in the retail CBDC systems and FPS to develop additional end user services and facilitate compatibility between them.

8. Setting the price of payment services involves trade-offs. Interviewees noted that for both retail CBDCs and fast payments, it is critical to get the pricing for end users (individuals and businesses, including merchants) and PSPs “right”. This means striking a balance to achieve fees that are affordable enough for end users of different socioeconomic and sociodemographic backgrounds, but also allowing PSPs some form of remuneration that gives them an incentive to innovate and build overlay services on top of the underlying infrastructure. There may be a need to set or cap prices (similar to the interchange caps on payment cards) to reach that balance. There are examples where regulators or central banks have determined that some use cases of fast payments or retail CBDC payments (such as P2P) should be free of charge, while other use cases (such as P2B) are subject to a fee cap. In other cases, P2B payments processed through an FPS have been mandated to also be free of charge, but this has impeded PSP uptake and their business model.

9. For either a retail CBDC or fast payments, operational resilience and cyber security are key. If either a retail CBDC or FPS is widely adopted, the underlying system will become systemically relevant and potentially a critical national infrastructure. Especially for retail CBDC systems building on newer and less tested technologies, it will be crucial that the system is resilient to both operational failures and cyber attacks. Outages and data breaches could harm end users and the economy and could have serious reputational risks for central banks and financial institutions. Interviewees were acutely aware of these risks and made clear that operational resilience and cyber security are a sine qua non for their work in this area.

10. Systems need to be designed to be future-proof and to accommodate further demands that may arise. Several central bank contacts flagged the need to ensure that a new retail CBDC system or FPS is designed to allow new use cases and overlay services in the future. These services include online and offline payments, remote and in-person payments, push and pull transactions, recurring and conditional payments and comprehensive fraud prevention safeguards, allowing for both banks and non-bank PSPs to offer services, and allowing for simplified KYC for vulnerable population segments. Some referred to the potential to design systems to better support cross-border payments – an aspect that was not always considered in the past design of domestic payment systems.

Role of the central bank

11. Central banks’ work on fast payments and CBDCs is proceeding in line with their mandates and public policy objectives. In the context of an FPS, the central bank is often a catalyst of private initiatives, an overseer and regulator and potentially an operator of the infrastructure. In the context of a retail CBDC, the central bank is usually both the overseer and regulator of private PSPs offering retail CBDC services and the operator of the infrastructure. In either case, the central bank can rally the different stakeholders to promote public policy objectives such as financial inclusion, efficiency, financial stability and safety and robustness, among others.

12. Regardless of the operating model, it is important that there is an efficient and inclusive governance framework, for either system, to achieve buy-in by different market actors. The central bank can play an important role in this context, particularly

for FPS that are privately operated, eg by having an independent member on the board and being a system participant itself. As more central banks experiment with different governance arrangements for FPS and retail CBDC systems, there will be a larger menu of arrangements to choose from. In any case, and for either system, central banks play an important role by facilitating the final settlement between PSPs in central bank money.

9. Conclusion

The key questions we aimed to answer in this paper are: how are retail CBDC systems and FPS similar and different from one another, and why have some jurisdictions opted for one of them while others are considering both? Our key conclusion is that the choice between issuing a retail CBDC or building an FPS, or doing both, is very contextual and will depend on the market features, ecosystem and the degree of maturity and innovation of existing payment infrastructures in a jurisdiction. Interviews carried out with 14 central banks have highlighted a variety of different approaches. While some counterparts expressed reservations about retail CBDCs and the risk of disintermediation, others see a case for retail CBDCs and FPS to coexist and address different public policy objectives.

In principle, both retail CBDC and FPS initiatives can be designed to support key policy goals such as supporting payment speed, safety and efficiency, fostering competition and promoting financial inclusion. Functions like programmable and offline payments were discussed in the context of retail CBDCs, but they may be achievable with FPS as well. Regardless of the approach adopted, the central bank has a major role to play in either initiative. Before developing and launching a retail CBDC system, FPS or both, the central bank needs to define clear objectives and to rally all stakeholders early in the process. Once the systems are in place, the central bank can fulfil a variety of tasks depending on its operating model. The central bank generally also has a regulatory and oversight mandate to mitigate the risks posed by an FPS or retail CBDC. Even though these risks present several similarities, the novelty of retail CBDCs may introduce new challenges.

As jurisdictions continue to explore and implement FPS and retail CBDC systems, the compatibility and interoperability between both, domestically and across borders, is likely to receive further attention. Several experiments are currently assessing the technical feasibility of integrating retail CBDCs into the existing payment landscape, eg with RTGS and FPS, but this field of research remains relatively new. Interoperability between retail CBDC systems and FPS as well as other payment systems could be a paramount driver for future developments and potential coexistence between them.

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Annexes

Annex 1

List of central banks, their acronyms and the availability of a live retail CBDC and/or FPS				Table A.1
Jurisdiction	Central bank	Acronym	Live retail CBDC	Live FPS
Bahamas (The)	Central Bank of The Bahamas	CBB	X	
Brazil	Central Bank of Brazil	BCB		X
Canada	Bank of Canada	BoC		
Denmark	Danmarks Nationalbank	DNB		X
European Union	European Central Bank	ECB		X
Ghana	Bank of Ghana	BoG		X
India	Reserve Bank of India	RBI		X
Jamaica	Bank of Jamaica	BoJ	X	
Morocco	Bank Al-Maghrib	BAM		X
New Zealand	Reserve Bank of New Zealand	RBNZ		
Nigeria	Central Bank of Nigeria	CBN	X	X
South Korea	Bank of Korea	BoK		X
Switzerland	Swiss National Bank	SNB		X
West African Economic and Monetary Union	Central Bank of West African States	BCEAO		

Annex 2 Glossary

This annex provides the definitions of key terms used in the paper.

Central bank digital currency (CBDC): a form of digital money, denominated in the national unit of account, which is a direct liability of the central bank. CBDCs can be either retail (general purpose, for use by households and businesses) or wholesale (for use by financial institutions) (BIS (2021)). In this paper, we look at the features of CBDC not only as a new type of central bank liability but also as a new system, which includes the infrastructure and rules (eg clearing, settlement and governance) underlying the transfer of a CBDC among system participants and end users.

Deferred net settlement (DNS): a net settlement mechanism which settles on a net basis at the end of a predefined settlement cycle (CPMI (2016b)).

Fast payments: also referred to as instant, real-time, immediate or rapid payments, fast payments are retail payments in commercial bank money or e-money that allow for the transmission of the transaction message and the availability of final funds to the beneficiary to occur in real time or near real time and as near as possible to 24 hours a day and seven days a week (24/7) (CPMI (2021)).

Fast payment system (FPS): a payment system (see below) that processes fast payments (see above).

Interoperability: technical, semantic and business compatibility that enables a system to be used in conjunction with other systems. Interoperability allows PSPs from different (domestic or international) systems to make payments across systems without participating in multiple systems (Boar et al (2021)).

Offline payments: a transfer of funds whereby the payer and/or payee do not require a connection to any ledger system (BISIH (2023)).

Payment system: a system that encompasses the infrastructure, participating payment service providers (PSPs), end-user-facing services and underlying rules that govern the processing and delivery of payments (Frost et al (2024)).

Programmable payments: payments that are automatically executed, conditional upon preset criteria (Di Iorio et al (2024)).

Real-time gross settlement (RTGS): the settlement of payments, transfer instructions or other obligations in real time, individually and on a transaction-by-transaction basis (CPMI (2016b)).

Annex 3 Retail CBDC (systems) and fast payments (FPS): similarities and differences

How parameters compare between retail CBDC (and CBDC systems) and fast payments (and FPS)	Identical
	Similarities
	Major differences
	Radical differences

Parameters	Retail CBDC (systems)	Fast payments / FPS
General		
<i>Objectives</i>	Financial inclusion, domestic and cross-border payment efficiency, monetary and fiscal policy tool, strengthening role of central bank money, lower cost for end users, digital alternative to cash transactions	Financial inclusion, domestic and cross-border payment efficiency, lower cost for end users, digital alternative to cash transactions
<i>Operation</i>	Public, public-private	Public, private, public-private
<i>Overseer/regulator</i>	Central bank	Central bank
Properties		
<i>Liability</i>	Central bank	Financial institution
<i>Crediting of payee account</i>	Instant	Instant
<i>Availability</i>	Always on	Always on
Usage and functionalities		
<i>Offline capabilities</i>	Yes	Yes
<i>Use cases</i>	P2P, P2B, B2B, P2G, G2P, B2G, G2B	P2P, P2B, B2B, P2G, G2P, B2G, G2B
<i>Payment mechanism supported</i>	Push and pull	Push and pull
<i>Transaction channels supported</i>	Internet, mobile, QR codes, physical branches/agents, NFC, agents	Internet, mobile, QR codes, physical branches/agents, NFC, agents
<i>Alias capability</i>	Yes	Yes
<i>Overlay services</i>	Programmability, self-custody, APIs	APIs; request to pay; buy now, pay later
Settlement		
<i>Settlement model</i>	Real-time gross	Deferred net settlement, real-time gross
<i>Settlement asset</i>	Central bank money	Central bank money, commercial bank money
Rules and regulatory		
<i>Access for non-banks</i>	No access, direct access, indirect access	No access, direct access, indirect access
<i>Pricing model for end users</i>	Free pricing, limits by regulator, free of charge for certain use cases	Free pricing, limits by regulator, free of charge for certain use cases
<i>Pricing for PSPs</i>	Fixed, variable, interchange	Fixed, variable, interchange
Architecture		
<i>Underlying technology</i>	Centralised or decentralised	Usually centralised
<i>Messaging standards</i>	Proprietary	ISO 8583, ISO 20022, proprietary
<i>Underlying infrastructure</i>	New stand alone, using existing infrastructure	New stand alone, using existing infrastructures/systems