

Central bank digital currencies - the future backbone of the international payment system?

Iulia Monica OEHLER-ȘINCAI*

Abstract

Due to the increasing role of digital payments, demand for commercial bank money and nonbank money is expanding, while that for physical cash is sharply diminishing. The retail central bank digital currency (CBDC) is considered the only safe alternative to compensate for this decrease, as a public good complementary to cash that can be used by the general public. It is seen also as a response to the surge of private digital currencies, which could threaten national monetary sovereignty. Complementarily, in parallel to the retail public digital currency, wholesale CBDC targets large-value interbank transactions, limited to selected financial institutions, focused on efficiency, security and lowering transactions costs for cross-border transactions. Based on the extensive literature review and a qualitative synthesis, the present paper has as a key objective the interpretation of the main approaches to the retail CBDC adoption, justified by specific motivations. The research question is “in which circumstances should a retail CBDC be adopted?”. The historical perspective of failed projects, combined with current experiences, offers a clear overview of the CBDC as a potential dominant currency of the digital economy, but in the presence of a cautious approach.

Keywords: central bank money, fiat money, central bank digital currency, retail, wholesale, payment innovations

Introduction

The consequences of the Covid-19 pandemic, combined with the new crisis of the war in Ukraine are sending shock waves through the world economy. The current crisis “on top of a crisis” generates not only a painful increase in energy costs, persistent inflation, high debt and fiscal deficits, but causes also “another growing risk: fragmentation of the world economy into geopolitical blocs - with different trade and technology standards, payment systems, and reserve currencies” (Georgieva, 2022).

Beyond these challenges is another one, present in our day-to-day life: the payments revolution. The Covid-19 crisis determined an unprecedented acceleration of digital payments (Auer *et al.*, 2020). Payment innovations (such as decentralized finance DeFi platforms, cryptocurrencies, stablecoins,

* Iulia Monica OEHLER-ȘINCAI is Senior Researcher at the Institute for World Economy of the Romanian Academy, e-mail: oehler.sincai@gmail.com.



embedded payments within specific applications), and innovators (especially non-traditional players such as financial technology companies FinTechs and BigTechs¹) surpass the regulatory speed, posing inherent risks to the financial system stability. The payment innovations are considered by their creators as fast, cheap and safe instruments, while regulators have an opposite opinion, urging caution.

According to the Bank of International Settlements (BIS), the DeFi ecosystem “is geared predominantly towards speculation, arbitrage and investment in cryptoassets” (BIS, 2022). “Due to their volatile growth cycles, and as long as relevant regulatory provisions do not apply, crypto-assets entail numerous risks which may in future become relevant for financial stability” (ESMA, 2022). At the same time, “in case of rapid adoption, the emergence of a closed ecosystem around a global stablecoin would reinforce the loop between data, network externalities and activities (DNA) that underpins big techs’ growth” (BIS, 2022).

As a consequence, the *non-bank money* is increasing its role, to the detriment of the central bank money and commercial bank money. Non-bank money includes payments through large e-commerce platforms, payment applications (such as WeChat, WhatsApp, Grab, Gojek, M-Pesa) and DeFi platforms.

In other words, money has entered a new period of transformation (the era of electronic or digital money), in the direction of shaping a cashless society. This could reshape not only the financial sector, but also the economy and society as a whole, marking a new round of *competition* between official and private money, both domestically and internationally (Cerna, 2022a; 2022b).

The alternative to these challenges would be the *retail* Central Bank Digital Currency (CBDC) (open to citizens and businesses), as free of liquidity risk, credit risk and market risk, resembling cash (House of Lords of the United Kingdom, 2022). The second form of CBDC is *wholesale* digital currency. In the literature is underscored that “not surprisingly, the interest in wholesale CBDCs is driven predominantly by the potential of payment system efficiency and stability and cost efficiency gains, while interest in retail CBDCs is usually driven by the demand for digital payments” (Jahan *et al.*, 2022).

As a digital fiat currency, it has to accomplish a set of principles and requirements, including: “ease of use, low cost, convertibility, instant settlement, continuous availability and a high degree of security, resilience, flexibility and safety” (BIS, 2020). It also needs to be carefully designed to ensure

¹ Conglomerates with extensive customer networks and core businesses in social media, telecommunications, internet search engines and e-commerce. Relevant examples include the following: the American companies Amazon, Google-Alphabet, Apple, Meta (Facebook), Microsoft and the Chinese Alibaba and Tencent (with WeChat, one of the most popular super-apps with over 1.2 billion users).

the effective implementation of the framework related to anti-money laundering and countering the financing of terrorism AML/CFT (BIS, 2020; ECB, 2020; G7, 2021).

Starting from a benefit-risk evaluation, this paper has as a main objective the interpretation of approaches to the retail CBDC adoption. The research question is “in which circumstances should a retail CBDC be adopted?”. The methodology is based on empirical research (regarding the current context and also the historical perspective), using the tools of synthesis and analysis. Besides the critical overview of the already rich literature, the novelty effect is ensured by three axioms regarding CBDC, synthesized in the section of conclusions. This brings elements of novelty to the current theoretical framework.

Motivations for adopting a CBDC

The CBDC is a new form of fiat currency that can be issued by the central bank as a liability. It is on par with the physical currency. CBDC is new only from the perspective of retail users (individuals and companies in the non-financial sector), as central banks already offer digital money in the form of reserves or settlement account balances held by commercial banks and other financial institutions at the central bank (CPMI-MC, 2018; Bank of England, 2020; BIS, 2021).

It is a way to ensure that central bank money remains at the core of the financial system. In other words, it is a reflection of the fulfilment of the central bank’s key task, namely money creation, thus accomplishing “public interest objectives such as inflation control and the cyclical stabilisation of the economy”. It is a complement to cash, not its replacement (Panetta, 2021a; 2021b; 2021c; 2021d; 2022).

Starting with the BIS studies and analyses of the BIS, the International Monetary Fund (IMF) and the main central banks around the world, a set of *arguments* in favour of adopting the CBDC has been outlined since 2018. Among these, the most relevant are the following:

- Addressing the consequences of a pronounced decrease in demand for cash;
- Offering an alternative to private crypto-assets, in order to avoid the risks associated with them;
- Meeting future payment needs in a digital economy (efficiency, stability and safety);
- Reducing the illicit use of money;
- Facilitating cross-border payments;
- Stimulating financial inclusion;

- All the motivations mentioned before are associated with supporting central banks' objectives of maintaining monetary and financial stability, but without jeopardizing competition, efficiency and innovation.

In addition to these motivations, monetary authorities around the world realize that the international payments system is dominated by private actors, and the key currency remains the dollar. In this context, the acceleration of the internationalization of currencies such as the euro and Chinese yuan (CNY/RMB), but also recovering lost ground to non-state players are two other major motivations for the adoption of CBDCs.

To these arguments must be added the specific justifications of small island states. The experience reflected by central banks of Bahamas (with Sand Dollar) and Eastern Caribbean (with DCash) underscores that on the one side, population is skilled and adapted to the digital economy and, besides, a digital currency controlled by the state is the best and safest way to connect people living in low density regions. The Sand Dollar addresses both the geographical and infrastructural challenges of providing digital financial services, taking into account that Bahamas is an archipelago of 700 islands in the Caribbean, of which 30% are inhabited.

Wright *et al.* (2022) and CBDC WG (2020) underline that CBDC:

- Provides a safe and liquid government backed means of completing payments without the necessity of getting or maintaining a bank account;
- Advances more inclusive access to regulated payments and other financial services for underserved communities and socio-economic groups, reduces service delivery costs and increases transactional efficiency for financial services at national level.

In the Digital Age, cash use is drastically decreasing. For instance, in the United States, it fell from 40% of transactions in 2012 to 19% in 2020, while in Sweden the percentage decreased from 33% to less than 10% in the same time frame. In China, 50% of point-of-sale payments are made with a mobile wallet or app, while cash accounts for 13% of POS payments (Board of Governors of the Federal Reserve System, 2022). In China, two tech giants, namely the private actors (the Ant Group Co.'s Alipay and Tencent Holdings Ltd.'s WeChat Pay) control more than 90% of the mobile payments market. This a strong motivation for the Chinese central bank to finish the testing phase and push for a nationwide adoption of the e-CNY, the paperless version of its fiat currency (Mukherjee, 2022). China banned all transactions with cryptocurrencies in 2021, having in mind their inherent risks and is one of the leading countries in testing CBDC.

The following Table synthesizes the main characteristics and goals of CBDCs, as seen by various monetary authorities. It includes central banks that have already adopted a CBDC (Bahamas

nationwide, China, Sweden and the eight members of the Eastern Caribbean Currency Union as pilot projects); European Central Bank as an active explorer; the United States and Canada as cautious observers/sceptics.

Table 1. CBDC: Characteristics and goals

Monetary authority of	CBDC
United States	<i>A digital liability of a central bank that is widely available to the general public. It is analogous to a digital form of paper money and maintains the centrality of safe and trusted central bank money in the digital economy. It should be: free from credit risk and liquidity risk; privacy-protected; intermediated (through commercial banks and regulated nonbank financial service providers); widely transferable and identity-verified (in order to combat money laundering and the financing of terrorism) (Board of Governors of the Federal Reserve System, 2022).</i>
Canada	<i>“CBDC - as a digital version of cash – can serve the public policy objective of maintaining competition in payments in digital markets” (Usher et al. 2021).</i>
European Central Bank	<i>A digital euro could be issued:</i> <i>(i) to support the digitalisation and strategic independence of the EU;</i> <i>(ii) in response to a significant decline in the role of cash as a means of payment,</i> <i>(iii) if there is a significant potential for foreign CBDCs or private digital payments to become widely used in the euro area,</i> <i>(iv) as a new instrument of monetary policy,</i> <i>(v) to mitigate current risks to the normal provision of payment services,</i> <i>(vi) to stimulate the internationalisation of euro, and</i> <i>(vii) to reduce the costs and to green the monetary/payment systems (ECB, 2020).</i>
Sweden	<i>Physical cash and digital cash - "e-kronor" - shall coexist and complement each other. The Swedish central bank (Riksbank) shall have the exclusive right to issue e-kronor and regulate its circulation. It is mainly intermediaries that will connect end users, distribute e-kronor to end users and enable transactions between end users (Sveriges Riksbank, 2022).</i>
China	<i>e-CNY would be “traceable and programmable” and would allow financial authorities “to track and monitor how CBDC circulates after issuance,” something not plausible with cash. It will be cheaper for the government to manage and will remove the cryptocurrencies’ volatility and anonymity of use. It will stimulate financial inclusion by enabling digital transactions in remote rural areas (Fanusie and Jin, 2021).</i>
Bahamas	<i>The Sand Dollar has four key functions: Increase the efficiency of the Bahamian payments systems through more secure transactions and faster settlement speed; Provide non-discriminatory access to payment systems without regard for age, immigration or residency status; Achieve greater financial inclusion, cost-effectiveness, and provide greater access to financial services across all of The Bahamas; Strengthen protection against money laundering, counterfeiting, and other illicit ends by reducing the ill effects of cash usage (Central Bank of the Bahamas, n.d.).</i>
Eastern Caribbean Central Bank	<i>DCash is considered as a safer, faster and cheaper way to transfer funds and process payments (ECCB, 2022).</i>

Source: Based on literature review

The characteristics mentioned above reflect some arguments in favour of adopting a CBDC. But all these potential advantages can only be translated into practice by a high rate of CBDC adoption by consumers and the business environment. Besides, there have been already individualised numerous risks associated to retail CBDC, as reflected in the following section.

Risks associated with the CBDC

Some scholars, especially in the United States and the United Kingdom underline that CBDC adoption, apparently demanded by market failures and inefficiency is rather “a solution in search of a problem”. Other initiatives can better address the existing problems than the CBDC (Waller, 2021). CBDC can cause banking sector disintermediation, with negative consequences for credit allocation and financial stability. It can lead to the undesirable situation of state surveillance of people’s spending choices (risks to individual privacy). Financial instability can be exacerbated as people convert bank deposits to CBDC during periods of economic stress, but also when is recorded an increase in central bank power without sufficient scrutiny (also through unconventional monetary policy). It is possible to generate centralised point of failure (namely the centralised CBDC ledger) that would be a target for hostile state and non-state actors (House of Lords of the United Kingdom, 2022).

There are also technical issues, most of them unanticipated, as indicated by DCash. The IMF presents briefly the problem as follows: “Between January and March 2022 DCash experienced an extended outage on account of a problem with the system’s operational management processes of digital certificates. While leaving the Distributed Ledger Technology and existing data and transactions intact, the outage disrupted new transactions and on-boarding of new users” (IMF, 2022). Besides, DCash represents less than 1% of cash in circulation, which makes this initiative still a pilot project (IMF, 2022).

Soderberg *et al.* (2022) point to the following risks:

- Reputational risk may occur in the situation where there is not a wide acceptance and circulation of CBDC.
- If the central bank charges intermediaries for using the CBDC system, there is a risk that intermediaries will in turn pass the cost downstream and raise the price of payments, which may counter initial policy goals.
- “CBDC projects are resource-intensive and become even more so as their scale increases”.
- As technology is still developing, with multiple alternatives possible, it is evident that “choosing the best technology is deemed a challenge”.

Table 2. Potential benefits and risks associated to a CBDC

Benefits	Risks
Levelling the playing field in payment innovation for private-sector firms of all sizes	Banking sector disintermediation, with negative consequences for credit allocation and financial stability
Improvement to cross-border payments	Potential state surveillance of people's spending choices
Support the internationalisation of currencies	CBDC, a possible target for hostile state and non-state actors
Preserve the dominant international role of the USD (from the US perspective)	Technical issues
Promote financial inclusion (particularly for economically vulnerable households and communities)	Reputational risks
Extend public access to safe central bank money	Potential higher costs for consumers
Increase the prevention of financial crimes	High costs for monetary authorities

Source: Based on literature review

A look into the past, at the Finnish and Ecuadorian experiences, reveals two important lessons. First, the Bank of Finland launched the Avant project in the 1990s, a digital prepaid card intended to be used in a single national electronic payment system. However, the customers were charged for loading/using their cards, in contrast to the automated teller machines, where withdrawals were free. Debit and credit cards had become more and more efficient, therefore the Avant card was not at all attractive for customers. Consequently, it was discontinued in 2003 (Grym, 2020).

In its turn, the Ecuadorian experience underscores another relevant lesson. Ecuador implemented its digital currency, Dinero Electrónico in 2014. The digital fiat currency was active until 2018. In the absence of a critical mass of users and amid the position of private banks that considered Dinero Electrónico a threat to their intermediation activities, the Ecuadorian central bank abandoned its digital currency. If there are fears that there is not enough trust or support for a CBDC, the initiative of launching a CBDC should be cancelled.

Status of adopting retail CBDCs worldwide

More than 100 countries, representing over 95% of global GDP, are exploring a retail CBDC (The Atlantic Council, 2022). A handful have already launched a CBDC, either nationwide or as pilot projects (Table 3). Most of them are active explorers, starting from the European Central Bank and continuing with Brazil, India, Russia, Turkey and so on. Some are cautious observers, including the United States, the United Kingdom and Singapore. There are also sceptics (Denmark) and countries who abandoned tests for the time being (Japan). It is worth mentioning that all the cautious observers and sceptics in the field of retail CBDC support testing the wholesale CBDC, as reflected by various

projects such as: Ubin (Singapore), Jasper (Canada), Inthanon (Thailand), LionRock (Hong Kong-China), Helvetia (Switzerland), Stella (European Central Bank-Japan), the mBridge multi-CBDC arrangement project (monetary authorities of China, Hong Kong-China, Thailand, and the UAE).

Table 3. Categories of central banks according to their attitude towards *retail CBDC adoption* – several examples for each category

Early adopters, either universally or as pilot projects	Active explorers	Cautious observers/sceptics/countries which abandoned tests
<i>Nationwide CBDCs</i> - Bahamas, 20 October 2020; - * Cambodia (Bakong), 29 October 2020; - Nigeria (eNaira), 25 October 2021; - Jamaica (JAM-DEX), 11 July 2022;	- European Central Bank; - Turkey; - Russia; - India;	- United States; - United Kingdom; - Singapore; - Denmark; - Japan.
<i>Ongoing pilot projects</i> - China, since 2019-2020; - Sweden, since February 2020; - Eastern Caribbean Central Bank: Antigua and Barbuda, Grenada, St Kitts and Nevis and St Lucia 31 March 2021; St Vincent and Grenadines August 2021; Dominica and Montserrat December 2021; Anguilla 29 June 2022;	- South Korea; - Indonesia; - Vietnam; - Malaysia; - Thailand; - Bangladesh; - Ghana; - Uruguay; - Brazil;	

* Bakong is different from other CBDCs, as it is not issued by the central bank, but by partner financial institutions, under its supervision.

Source: Based on literature review

Singapore is more focused on projects on wholesale CBDC, involving only financial institutions, not the business sector and citizens as a whole. It is a case worthy consideration. According to the Monetary Authority of Singapore (MAS), which has not yet decided on issuing a retail CBDC: “Further in-depth analyses on the implications of a retail CBDC for MAS’ regulatory frameworks, operational and legal considerations and its impact on the financial sector among others, still need to be undertaken in parallel. MAS’ decision to proceed with further technological and policy explorations of a retail CBDC should not be taken as a commitment to its issuance. There are broader considerations for CBDC issuance, such as whether the public expects direct access to central bank money as part of the social contract in Singapore. At the same time, while there is general consensus that money and payments are public goods whose provision should not be left entirely to the private sector, the appropriate “division of labour” between the public and private sector ultimately also involves some normative judgement” (MAS, 2021).

One alternative taken into account is the support for Singapore dollar-denominated stablecoins, including by allowing issuers to back their tokens fully using central bank reserves. In this situation,

MAS “would play a more indirect back-end role in the provision of money and payments to households and firms in Singapore” (MAS, 2021).

A retail CBDC in Singapore “is not compelling” for the time being, due to the broad financial inclusion and well-functioning payment systems (fast, efficient and at zero cost retail electronic payments), while “a residual amount of cash remains in circulation and is unlikely to disappear” (Menon, 2022).

Another similar case is **Denmark**, among the most digitalised countries in the world. In 2021, just under 90% of payments made in physical trade were digital, and the average number of card transactions per citizen was about twice as high as the EU average. However, Denmark rejects the necessity of CBDC: “At present, and with the associated costs and possible risks, it is not clear how retail CBDCs will create significant added value relative to the existing solutions in Denmark” (Danmarks Nationalbank, 2022).

The **Federal Reserve and Bank of England** are latecomers in the group of monetary authorities launching consultations and debates with the general public and key stakeholders regarding the potential risks and benefits of a CBDC. The **US** have a cautious approach, taking into account that the USD is the key currency of the international financial system. It considers that broad consultation with the general public and key stakeholders is necessary. It has decided it would proceed with the issuance of a CBDC only with a clear support from the national executive and legislative powers (Board of Governors of the Federal Reserve System, 2022).

After carrying out experiments in 2021 and the first part of 2022, the Bank of **Japan** (BoJ) abandoned its tests on CBDC. There are three main determinants: (1) a reported lack of public interest; (2) universal access to the banking system, the prevalence of internet banking services, credit card usage and e-money payment tools, accompanied by tangible benefits (points that can be gained which can be accumulated and used for shopping or payment for other services) and (3) a still high demand for cash, in spite of its declining use (Shirai, 2022).

In antithesis, Bahamas was the first country worldwide to launch a CBDC. It is prepared for adopting a CBDC nationwide and besides, it needs such a digital currency, given its geographical conditions.

The Bahamas has a population of nearly 400,000 inhabitants, a GDP of approximately \$12 billion, and a GDP per capita of nearly \$30,000. The Bahamas is therefore a high-income country. It has a digitized economy and a mobile phone penetration rate of 90%, so the population is ready to adopt MDBC (Bharathan, 2022). However approximately 20 percent of the adult population does not have access to a bank account and also cash and cheques still dominate the payments market (IMF, 2019).

The Bahamas is located in a region in the path of hurricanes, and the low population density means that all the costs of connecting the population, physically and virtually, are high. Therefore, the digital system of the Bahamian dollar is considered to be the optimal solution, adapted to the specific geographical and meteorological conditions. The digital Bahamian dollar can be used in a hybrid wireless network (WIFI), online and offline, with e-wallets synchronizing when the connection is reactivated (Bharathan, 2022). The digital Bahamian dollar is also intended to improve financial inclusion, reduce all transaction costs and increase transaction efficiency (Central Bank of the Bahamas, 2019).

Conclusions and future research directions

The retail CBDC, issued and guaranteed by state, complementary to cash, is seen by many experts and central banks as a safe instrument able to accomplish the functions of fiat money: a means of payment, a store of value and a unit of account. In contrast to cryptocurrencies, the digital state-issued money is considered free of any risk, either market risk, credit risk, or liquidity risk.

There are various approaches towards CBDC adoption, underlining different key motivations for implementing a CBDC, as well as inherent risks and opportunities.

The acceleration of efforts towards the CBDC exploring and testing is evident worldwide. For most developing/emerging countries, increasing financial inclusion is among the major objectives. The adoption of digital currencies by tiny states such as Bahamas and the eight members of the Eastern Caribbean Currency Union is considered the best solution to connect the population to the payment system, given the geographical position in the path of hurricanes, with devastating effects on the transport, communication and electricity supply networks. “Faster, cheaper and safer” is their motto, similar to the Decentralized Finance ecosystem. Therefore, for island countries, such as those in the Caribbean, CBDC is considered a mean to counter their vulnerability to natural disasters.

On the contrary, the United States, whose USD remains the key currency of the international financial system, is among the most cautious countries worldwide as regards a CBDC. In the category of “cautious observers and sceptics” are also: the United Kingdom, Singapore, Denmark and so on. Bank of Japan abandoned its tests on a retail CBDC, as demand for cash is still at a high level.

Referring to Ecuador's experience and the discard of Dinero Electrónico in 2018, the key lesson learned is that no matter how attractive they may seem, retail CBDC initiatives can only be successful if they meet two conditions: (1) they are intensely publicized, explained and understood, (2) they are supported and trusted by all economic actors, including consumers, bank and nonbank actors.

The main limitation of this paper is the lack of statistics, which is due to the low number of countries that have already adopted a CBDC, while the other current projects are in various testing phases. In order to compensate for this weakness, the research presents a set of novelty elements.

In this paper there have been identified several categories of countries according to their current attitudes towards CBDC: (1) early adopters, (2) active explorers, (3) cautious observers; (4) sceptics and (5) countries which abandoned tests (Japan). Monetary authorities already know that the attitude of the general public and the business sector, as well as the balance between benefits and threats are crucial for any CBDC project. Whether CBDCs are “a solution in search of a problem”, as suggested by American and British experts, or a real solution to the current challenges faced by the international payments system, remains to be seen in the years to come. As a first action to be taken by regulatory authorities, it is recommendable to impose strict rules regarding private digital currencies in particular and non-bank money in general.

This investigation underscored that there are various reasons for the CBDC receiving more and more attention, not only addressing the consequences of a decline in cash payments. Another axiom is that there are countries with a very low share of cash in offline payment transactions which reject the necessity of CBDC, while others with still a high share consider it a means of financial inclusion and discouraging illicit activities. Not all the countries with a low share of cash in offline payment transactions at points-of-sale are willing to adopt a retail CBDC. Evident examples are the United States, the United Kingdom, Singapore, Denmark. Third, it is not enough that the central bank decides the retail CBDC adoption. Only payment instruments which are attractive for consumers (competitive as compared to the others) will survive in the competitive market. Participation and support of the private sector and citizens in the development process, as well as cooperation between different jurisdictions are crucial.

This paper focused on retail projects, as it involves the general public and the business sector, which generates more risks as compared to the wholesale CBDC. This topic has a high relevance in various fields of world economy, the initiatives regarding CBDC should be further analysed and interpreted from a benefit-risk perspective, both as regards retail and wholesale projects.

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