

# Central Bank Digital Currency

**Benefits and drawbacks**

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# Abstract

Prompted by technological advances and a decline in cash usage, many Central Banks are investigating whether it would be possible to issue a digital complement to cash, a so-called Central Bank Digital Currency (CBDC). Despite ongoing research and occasional pilots, Central Banks have shied away from introducing a CBDC for public use. Even though CBDCs would have the potential to counteract some of the problems that could arise for the payment system in the future when the use of cash is rapidly declining, they also present significant risks for financial stability.

This article contributes to the discussion by setting out a CBDC framework and formulating broad design principles for CBDC in line with the central bank's function as Lender of last Resort (LOLR). The attributes and functionality of a CBDC are highly determinative of the architectural design and technical solution chosen, particularly in the context of LOLR. Therefore, we argue in favour of a solid coin for e-emergency liquidity assistance, available 24 hours a day and seven days per week, anonymous, interest-bearing and unlimited, to prevent bank runs and restore financial stability in times of financial distress.

# 1. Introduction and background

Digitalisation is reshaping economic activity, disrupting society and revolutionising all spheres of life. Ultimately, it requires a fundamental reconsideration of established approaches. Monetary policy as well as the financial services industry do not remain unaffected by these developments. The digital transformation has an appreciable impact on consumers' spending behaviour and the desire for 'convenience' when it comes to payment systems. Visibly, the role of cash is diminishing while new forms of digital payment systems are evolving rapidly. As currency guardians and guarantors of financial stability, Central Banks have been pondering whether and how to adapt. One possibility is a Central Bank Digital Currency (CBDC), a widely accessible digital form of fiat money that could be used as legal tender. A large number of Central Banks have actively studied the adoption of CBDC but most remain reluctant to put concept papers into practice.

CBDC as a potential novel approach to payment systems shows that technological changes work both ways in monetary policy. On the one hand, new technological advancements have made it possible for companies to develop payment systems that bypass central banks for settlement. On the other hand, Central Banks are granted a possibility to provide new forms of retail payment channels that can bypass the use of intermediaries (Kahn et al. (2018)).

To begin with, and to distinguish it from traditional reserves, CBDC can be defined as electronic central bank money that (i) can be accessed more broadly than reserves,

(ii) potentially has much greater functionality for retail transactions than cash, (iii) has a separate operational structure from other forms of central bank money, allowing it to potentially serve a different core purpose, and (iv) can be interest bearing, under realistic assumptions paying a rate that would be different from the rate on reserves (Kumhof and Noone (2018)). Alternatively, it can be described as Central Bank e-money and as electronic liability of the central bank, which might be held as a token or in an account that can be used for executing transactions and for maintaining value (Bank of Israel (2018)).

To set apart different forms of money, Bech and Garratt (2017) developed a new taxonomy of money. According to them, the key characters of money are: issuer (central bank or other); form (electronic or physical); accessibility (universal or limited); and transfer mechanism (centralised or decentralised, meaning peer-to-peer). This taxonomy proves useful in order to differentiate between two potential types of (electronic) CBDC, namely central bank-issued and peer-to-peer. Whereas one is accessible to the general public (retail CBDC), the other is only available to financial institutions (wholesale CBDC) (Bech and Garratt (2017)). Section 4 explains why this paper opts for a wholesale CBDC and a continuation of the existing system whereby only banks have access to Central Bank reserve accounts. Either way, commercial banks are facing a fundamental systemic change, which will have a severe impact on their business models.



Two observations are key in order to properly assess the discussion surrounding CBDC. First and foremost, CBDCs are not crypto-assets such as Bitcoin. The only trait they could – but do not have to – share with well-known crypto currencies is the technical platform used: Distributed-Ledger-Technology (DLT). Apart from this, in contrast to crypto currencies, CBDCs would be a liability of the central bank, comparable to banknotes. In essence, the distinguishing feature is nothing less than trust. Second, Central Banks have always issued digital money in the form of reserves. CBDC, however, at least according to the majority of Central Bank proposals, is token-based, whereas balances in reserve accounts and most forms of commercial bank money are account-based (Committee on Payments and Market Infrastructures (CPMI) (2018)).

Key drivers of CBDC are not only new technological opportunities but also the gradual decline of cash usage and simultaneous long-term increase of card payments (Olsen (2018)). Central Bank's intent behind CBDC, however, is not to abolish cash but to develop an alternative payment method and value storage. At the same time, Central Banks intend to continue providing a legal tender, in case cash can no longer be considered a generally available 'legal tender'. Importantly, Central Banks are not contemplating CBDC in order to create a convenient payment method for consumers based on the digitalisation trend. Rather, against the background of diminishing cash use, tangible concerns such as the stability of the financial system and the economy as a whole are at stake (Olson (2018)).

The aforementioned considerations show that there certainly are significant technological, economic, systemic and – last but not least – legal repercussions linked to CBDC, which cannot be overestimated. Ethical repercussions – depending on whether the design of a CBDC allows for traceability or whether it guarantees anonymity – are entirely disregarded for the purposes of this paper.

What will matter most for users and ultimately for the success of CBDC is confidence in the means of payment, functionality and the total costs for users themselves (Olson (2018)). Clearly, courage, vision and technological expertise are key factors for introducing a CBDC. However, carefully drafted frameworks, clear concepts as well as a good strategy are at least equally important in order to exploit the full potential of CBDC. Also contributing to CBDC potential are private sector service providers neglecting certain niches and the vacuum left by the decline of cash. In addition, existing payment infrastructures are limited as regards technological add-ons and supplements. There certainly is scope for new payment models.

After briefly reflecting on ongoing CBDC initiatives as well as pros and cons, this article contributes to the CBDC discussion by setting out how a potential CBDC regime in line with and supportive of the Central Bank's function as a Lender of Last Resort (LORL) can be designed. Essentially, the novel approach of this paper demonstrates that an e-coin can contribute to solving short-term liquidity crunches and creates systemic stability.





## 2. Benchmark analysis – CBDC initiatives

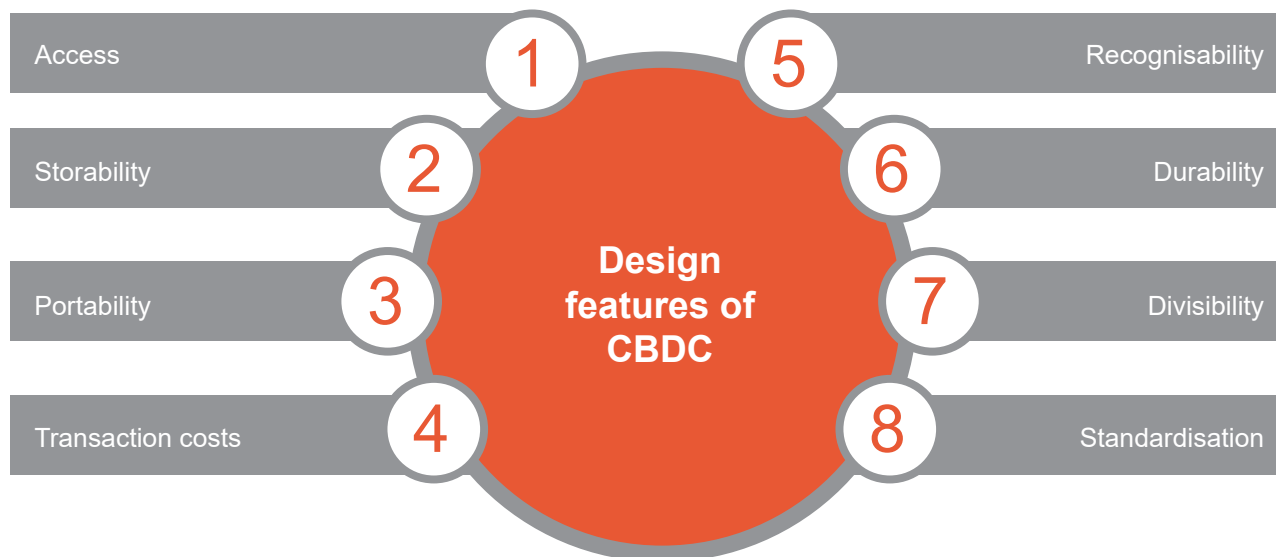
The following section describes prominent CBDC initiatives and ongoing research projects undertaken by Central Banks. In terms of e-currency design approach, method, technology, and involvement of stakeholders, Central Banks are moving at different speeds. Even though some are at advanced stages of research and experimentation, including actual trials,<sup>1</sup> no digital currency for broad use has successfully been issued.<sup>2</sup>

A recent Bank for International Settlement (BIS) study shows that 70% (in a sample of 63 questioned) of the Central Banks are engaged in some type of CBDC work (Barontini and Holden (2019)). The study also shows that all Central Banks collaboratively commenced with theoretical and conceptual research, half having progressed into practicality-focused and proof-of-concept phases. Five Central Banks are conducting pilot e-coin projects. Similarities and certain design features of e-currencies appear across the board (please see Figure 1). Similarly, scalability, interoperability, accessibility, security and flexibility play an important role in the design of all proposed CBDCs (Olson (2018)).

Probably the most advanced and well-known project is the E-krona in Sweden. In Sweden, the decline of cash is well advanced and there is a general affinity for technology among Swedes. Sweden is therefore much further ahead than other countries in the development of a Central Bank-issued crypto currency. Thus far, it seems like a possible E-krona would not be based on distributed ledger technology (DLT) as the Swedish Central Bank does not consider the technology sufficiently mature (Sveriges Riksbank (2018)). According to the Central Bank, the E-krona would be broadly available to the general public 24/7 and is initially non-interest-bearing. It is unclear whether an E-krona would be in an account with the Riksbank or value-based units stored locally on a card or in an app (Sveriges Riksbank (2018)).

Other instances of CBDC research include the Bank of Canada and the Monetary Authority of Singapore (MAS), which have launched projects to obtain insights on the use of digital currencies. The Bank of Canada is working on

Figure 1: Similarities in CBDC Design



Source: (Kahn et al. (2018)).

<sup>1</sup> In Uruguay, the E-Peso pilot lasted for 6 months between 2017 to 2018. 10,000 mobile phone users participated. According to the Central Bank of Uruguay, the project ran successfully (Gnan and Masciandaro (2018)).

<sup>2</sup> In 2017, Ecuador abolished the central bank electronic money it had introduced in 2014.

'Project Jasper', a collaborative research initiative between the public and private sectors to understand how DLT could transform the wholesale payments system. In phases 1 and 2 the project focused on exploring the clearing and settlement of high-value interbank payments using DLT. Phase 3 explored the potential benefits from integrating this "cash on ledger" with other assets such as foreign exchange and securities.

In Singapore, 'Project Ubin' is a collaborative project with the industry to explore the use of DLT for clearing and settlement of payments and securities. The project aims to help MAS and the industry better understand the technology and the potential benefits it may bring through practical experimentation (Monetary Authority of Singapore (2018)). The next phases of Project Ubin focus on new methods of conducting cross-border payments using central bank digital currency.

Regarding the Situation in Switzerland, the Federal Council of the Government of Switzerland requested a report on the risks and opportunities of introducing its own state-backed digital currency, or so called 'e-franc.' The proposal also intends to examine and clarify legal, economic, and financial aspects of the e-franc. Nevertheless, the Swiss National Bank (SNB) raises financial stability issues and does not seem determined as regards the introduction of a CBDC (Jordan (2018)).

Prominently, the Republic of Marshall Islands issued the Sovereign Currency Act of 2018 in February 2018 introducing a new Blockchain based currency called the Sovereign ('SOV'). The currency will be pegged to the dollar. In September 2018, the International Monetary Fund (IMF) released a report warning the Republic of Marshall Islands not to launch its own cryptocurrency (International Monetary Fund (2018)). The primary concerns were that cryptocurrency would be a second form of legal tender as the revenue from the ICO would be smaller than expected, that it would cause financial instability and that proper governance of the cryptocurrency was not adequate. Further initiatives include:

- Bank of Thailand: Project Inthanon
- South African Reserve Bank: Project Khokha
- Saudi Arabian Monetary Authority and the United Arab Central Bank: Project Aber
- Bank of Japan and the European Central Bank (ECB): Project Stella



# 3. Benefits and drawbacks of CBDC

Although the implications of a digital fiat currency can only be assessed vaguely at this point in time, the implications for monetary policy and financial stability will be significant, both positively and negatively. Highlighting the complexity in evaluating such a currency, a recent Reserve Bank of New Zealand study finds that pros and cons of a CBDC are mixed across each of the central bank functions (Wadsworth (2018)). The subsequent two sections provide an overview of pros and cons.

## 3.1 Pros

The potential benefits of a CBDC can be summarised as follows:

- Lower transaction costs: it could lead to a reduction of transaction costs for retail and institutional payments.
- Economic growth and digital innovation: becoming a favourable digital currency jurisdiction and creating an attractive crypto ecosystem does not only lead to enhanced economic activity but could also create spill-over effects into other technology sectors.
- Financial inclusion: it could improve access to digital payments for unbanked households. Given that some consumers do not have a bank account – a precondition for using existing digital payment tools – a CBDC could offer them access to these tools at minimal or zero cost (Gnan and Masciandaro (2018)).
- Trailblazer position: acting swiftly on a CBDC could position a country as a pioneer in defining monetary policy on CBDCs and setting applicable standards for the years to come
- Cheap, safe value storage: a CBDC is potentially cheaper than cash as it avoids production and storage costs, transportation, disposal, etc. Equally, it is safer to distribute and could minimise fraud in the payment ecosystem (Gnan and Masciandaro (2018)).
- Technology efficiency: not having to rely on intermediaries such as banks and a CBDC could improve settlement speed and allow for payments in real time (Wadsworth (2018)).
- Promoting competition: it could boost competition in payment systems and require private actors to innovate; at the same time, it could lead to increased competition between banks to attract bank deposits regarding assets that might otherwise migrate to CBDC.
- Monetary policy transmission: CBDC could be used as a direct monetary policy tool if it was interest bearing, which would allow for more direct control of the money supply (Wadsworth (2018)).
- Liquidity: it allows Central Banks to provide short-term liquidity assistance, even on bank holidays; this effectively lowers the risk of individual institutions systemically triggering chain reactions.

- Increased privacy: a conventional digital currency could offer more anonymity than existing commercial bank card payments.

## 3.2 Cons

The potential drawbacks of introducing a CBDC are the following:

- Cryptocurrencies that have no link to a conventional currency display a high level of price volatility and are thus subject to speculations (Maechler (2018)).
- Increased risk of system-wide bank runs: as a risk to financial stability, such bank runs in financial crises are potentially much faster and will be independent of geographical proximity and time (Olsen (2018)).
- Competition for commercial banks: the introduction of a near substitute for bank deposits may motivate banks to raise deposit rates and lead to a shift from deposit funding to wholesale funding (Olsen (2018)).
- Geographic limitations: CBDCs are only accepted in the country that issued them (Wadsworth 2018).
- Additional compliance costs: CBDCs could require additional monitoring and compliance as regards AML/ CFT laws (Wadsworth (2018)).
- Lack of reliability: CBDCs are vulnerable to electricity outages and insufficient internet connections (Wadsworth (2018)).
- Lower economic growth: as Central Banks become direct competitors to payment service providers, banks might lose income. Likewise, a new form of investment opportunity may reduce consumer deposit demand. In return, this could reduce bank lending to overall economy and hence, economic growth (Olson (2018)).



## 4. e-Emergency Liquidity Assistance a potential use case

In the light of the pros and cons and the 2007–2009 financial crisis, the question arises as to how a potential CBDC could be designed and used from a financial stability perspective, as a prerequisite of a proper monetary policy. In this context, a potential use case for CBDC could be e-emergency liquidity assistance (eELA) in restoring financial stability through the important role of the lender of last resort (LOLR). This is because, in normal times, the Central Bank acts as market maker of last resort (MMLR).<sup>3</sup> Although the LOLR suffers from various problems (such as uneven playing field and moral hazard)<sup>4</sup> the digital transformation provides helpful properties that can be used to design eELA. From this perspective, we use the properties defined by the Bank for International Settlement (BIS (2018)) to design eELA:

- Accessibility (widely vs. restricted) — to the entire public or only to financial institutions
- Availability (ranging from current opening hours to 24 hours a day and seven days a week)
- Anonymity (ranging from complete to none)
- Transfer mechanism (balance-based or token-based)
- Interest-bearing (yes or no)
- Limits or caps (different forms of quantitative limits or caps)

In terms of accessibility, a potential eELA should have restricted access because – in time of financial distress – the LOLR would be acting as intermediary for the entire public and would be subject to a bank run (Maechler (2018)).

of financial institutions would recognise that a financial institution is in a distress situation. Therefore, other related institutions have less incentive to take corrective actions through synchronised selling of risk; in extreme a fire sale (Koumbarakis (2018)). According to the transfer mechanism, eELA should be conducted on a peer-to-peer basis linked to conventional currency (e.g. Swiss franc, dollar or Swedish krona) to avoid a high level of price volatility. As regards whether or not it should be interest-bearing, eELA should be used at an interest rate in normal times because lending could be very profitable (Hellwig 2014). In this context, we also take into consideration that lending at a very high interest rate could be self-defeating, if “the cost of assistance would exceed the cost of liquidating illiquid assets” (Guttentag and Herring (1987: 166-167)). As for the limits or caps, we recommend that eELA should be unlimited because (i) a limited eELA would limit the effect of the role of the LOLR; (ii) the LOLR as a supplier of unlimited ELA in domestic currency stands alone; and (iii) although opponents would argue that the Central Bank is limited in its provision of foreign high-powered money, they failed to consider that, when a systemic crisis occurs, central banks work together and coordinate their operations through unlimited currency-swap agreements to restore financial stability (Koumbarakis 2018). Therefore, eELA should be unlimited. In the light of all these deliberations, Figure 2 summarises the above-mentioned considerations as to how a potential CBDC can contribute to the discussion in terms of financial stability and monetary policy.

Figure 2: Design of eELA



Source: Koumbarakis and Dobrauz / PwC (2019).

As regards availability, we recommend that eELA shall be available 24 hours a day and seven days a week. This eliminates the problem that financial institutions face demands for ELA during the weekend. With respect to anonymity, eELA should be anonymous, to mitigate the risk of contagious effects. In other words, eELA on an anonymous basis reduces the possibility that a number

<sup>3</sup> The MMLR includes all operations provided through the market, particularly open market operations (OMOs) (repo transactions, issuing of bills, and quantitative easing (QE)) to solvent but illiquid deposit institutions. In addition to OMOs, the MMLR includes the discount window (DW) (for example, liquidity-shortage financing facilities and intraday facilities and other operations (for instance, FX transactions, FX swaps, and derivatives) (Koumbarakis (2018)).

<sup>4</sup> See Koumbarakis, A. (2018) *The Economic Theory of Bank Regulation and the Redesign of Switzerland’s Lender of Last Resort Regime for the Twenty-First Century*, Schulthess Verlag.

# Conclusion

This article sets out the pros and cons of CBDC and contributes to the discussion by designing an eELA with the central bank's function as Lender of last Resort.

The attributes and functionality of an eELA are highly determinative of the architectural design and technical solution chosen. In this context, we argue in favour a solid coin for e-emergency liquidity assistance, available 24 hours a day and seven days per week, anonymous, interest-bearing and unlimited to prevent bank runs and restore financial stability in times of financial distress.

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