

Central bank digital currencies

Evolution or revolution?

SUMMARY

Payment systems are of vital importance for today's economies and are the core activity of central banks. To adapt to recent trends – including the decline in cash usage, the surge in online commerce and contactless forms of payment, and the creation of cryptocurrencies – central banks have, in recent years, explored the possibility of issuing digital currencies themselves.

Proponents of central bank digital currencies (CBDCs) note that, among other things, they can: alleviate the problem of concentration of the payments infrastructure; facilitate instantaneous and cheaper execution of payments; discourage illicit activity and rein in the shadow economy; spur competition in the payment industry; reduce the problem of banks being 'too big to fail'; promote financial inclusion; contribute to financial stability; preserve the EU's sovereignty over transactions; help facilitate monetary policy; and support the international role of the euro.

Critics of CBDCs range from those who question the need for such currencies altogether, to those who point out the risks, including the possibility that CBDCs could: amplify the international spillover effects of shocks; curtail the autonomy of less powerful economies in their monetary policy, and even substitute their domestic currency; facilitate tax avoidance or a loss of domestic oversight capabilities; put at risk the variety of payment instruments available to households; create undesired volatility in exchange rates; and put banks' deposit bases under threat, with negative implications for credit provision and output.

The European Central Bank (ECB) is involved in the general discussion about the design and launch of CBDCs. In October 2020, it published a report on a digital euro, identifying and discussing features of and options for a euro-area CBDC. In July 2021, the ECB launched an investigation phase, which should last 2 years and aims to address key issues of design and distribution. The European Parliament, as well as other stakeholders, is expected to participate actively in this phase.



IN THIS BRIEFING

- > Introduction
- > Early attempts
- > Design choices
- > Potential benefits
- > Potential risks
- > Latest evolutions at international level
- > A CBDC for the euro area?

Introduction

[Money](#) is fundamental to the functioning of market economies inasmuch as they are based on exchange and credit. Acceptance of any form of money depends on the receiver's trust that, subsequently, a third party will accept that money in trade.

Payment systems today [build](#) upon a two-tier structure provided by the central bank together with commercial banks. The central bank plays an important role by ensuring the aforementioned trust in money, while the private sector leads on innovation in serving the public.

For a long time, the only central bank money widely [available](#) to the public was cash (coins and/or banknotes). But cash is being used less and less as a means of payment, and the surge in [online commerce](#) and contactless forms of payment during the Covid-19 pandemic has [accelerated](#) this development. At the same time, the past decade has seen the creation and explosive growth of cryptocurrencies. To adapt to these trends, central banks have explored the possibility of creating digital currencies themselves.

Early attempts

[Central banks](#) around the world have been researching the concept and design of digital currencies for several years.

In 2015, the Central Bank of the Netherlands experimented with a coin based on decentralised ledger technology (DLT) called the [Dukaton](#).¹ A year later, similar projects were launched at the Bank of Canada ([Project Jasper](#)), the Monetary Authority of Singapore ([Project Ubin](#)) and the Hong Kong Monetary Authority ([Project LionRock](#)). In 2017, the ECB and the Bank of Japan launched the first known example of cooperation between two central banks on CBDCs with [Project Stella](#).

Another central bank that has conducted extensive work on retail CBDCs (see below) was the Swedish [Riksbank](#). In Sweden, the use of banknotes and coins has been declining in recent years, and the Riksbank has initiated a societal discussion on access to a central bank payments instrument for the general public. Over time, this 'e-krona' project has been developed further, and in February 2020 the Riksbank announced it would conduct a pilot project with Accenture that aimed to propose a technical solution for an e-krona.²

In the United States, the Federal Reserve has continued its ongoing research on [retail CBDCs](#).

Finally, the [digital currency electronic payment](#) of the People's Bank of China – a 'digital Yuan' – was announced later than the aforementioned projects, but to date is perhaps the most advanced CBDC project. It is currently being tested through pilot programmes in certain economic regions of China.³

Design choices

Wholesale or retail?

Regarding the potential [design](#) of CBDCs, there are [three ways](#) of issuing them. In the first case – indirect or 'wholesale' CBDC – central banks could change the interbank payment system from a central clearing system to a peer-to-peer system, under which central banks would manage their reserves using DLT. These digital tokens would only be used for interbank payments, could only be held by eligible financial institutions, and could not be used as a general means of payment. The ECB's digital euro has explored such a design.

In the second case (direct or 'retail' CBDC), central banks could issue a new digital means of payment to the general public, which would coexist with bank money and cash, and could be used as a general means of payment. Unlike bank deposits, it would not be a claim on a legal tender⁴ but would become legal tender itself, like cash. Here, the central bank would handle all payments in real time and thus keep a record of all retail holdings. Sweden's e-krona has explored such a design.

A last possibility would be to construct a 'hybrid' CBDC. Under this intermediate solution, the CBDC would be a claim on the central bank (as with the direct system), but the real-time payments would be handled by intermediaries. In this architecture, the central bank would retain a copy of all retail CBDC holdings, so as to be able to transfer holdings from one payment service provider to another in the event of a technical failure.

Another [compromise](#) solution would be for public-private partnerships, through which designated banks would offer CBDC accounts to the public, as conduits for central banks. Banks would be divided into a 'narrow bank', holding CBDCs and backed 100% by reserves, and an investment bank, which would engage in financial intermediation. The narrow bank segment, similar to a regulated utility, could charge a fee for providing this service.

Account or token-based?

Another design choice is between accounts and tokens. The first option follows the conventional account model and ties ownership to an identity. Claims are represented in a database that records the value along with a reference to the identity, just as in a bank account. Projects that have explored or are exploring this option include Iceland's Rafkrona and Ecuador's Dinero Electronico.

The second option is for the central bank to honour claims only when the CBDC user demonstrates knowledge of an encrypted value – an option sometimes referred to as 'digital tokens'. The argument for tokens is that they are more like cash and would be anonymous. Possible downsides are that: (i) they can be stolen or lost; (ii) there is a verification cost to token-based digital systems because of the need to verify the distributed ledger systems behind them; and (iii) they can be used for money laundering and other illicit activities, just like cash. Projects that have explored or are exploring this option include South Africa's Electronic Legal Tender and Brazil's Digital Fiat Currency.

At the moment, account-based systems are generally viewed as more secure. Moreover, CBDC accounts payments could be practically instantaneous and costless. On the other hand, they would result in the loss of some privacy – as exists today with the identification requirements for opening a bank account. Michael D. Bordo [thinks](#) that accounts systems can be used in general and token systems can be used for small transactions.

Potential benefits

CBDCs in general could [alleviate](#) the problem of concentration of the payments infrastructure, as well as its potential vulnerability to loss of confidence.⁵ The issuance of CBDCs may also facilitate instantaneous and cheaper execution of payments. With appropriate interoperability arrangements between central banks, cross-border payments can also be made instant.

Another potential advantage is that their use would discourage illicit activity and rein in the shadow economy by reducing the anonymity of transactions now provided by the use of currency banknotes, especially in the context of high-denomination banknotes. This would also affect tax revenues, both by bringing more activities out of the shadows and into the tax net and by enhancing the government's ability to collect tax revenues more efficiently.

CBDCs would [spur competition](#) in the payment industry. This would also lower transaction costs for international payments where lack of competition (often due to regulation), not technology, is the bottleneck.

CBDCs, if adopted, would reduce the '[too big to fail](#)' problem. One motivation to support struggling banks derives from the fact that bank failure puts strain on the payment system – a key pillar of the economy; since payment system failure is not an option, neither is bank failure. If many households and firms used CBDCs rather than deposits for their transactions, the social cost of bank failure would be lower, and so would be the motivation to provide state support. With less need for state support, regulatory constraints on banks could be relaxed.

Further benefits are more specific to the CBDC's design. Introducing a wholesale CBDC is thought to increase efficiency in the interbank market.

In the current environment, characterised by declining cash usage and the emergence of private digital solutions, a retail CBDC would [offer](#) a public, risk-free alternative, which would have virtually all of the attributes of physical cash and would be less subject to theft and loss. In addition, it would increase access to financial services for the poor, rural households, and other segments of the population that may be under-served by the banking system – provided that access to the currency is easy. Also, it would lower costs associated with cash payments, half of which are borne by merchants.⁶ Moreover, such a currency would satisfy demand for anonymous transactions.⁷

In addition to the above, a CBDC would preserve a country's sovereignty over transactions, in the face of global [stablecoins](#) such as the Libra project. Their introduction could also contribute to financial stability, given that the general public's direct access to a risk-free asset could [remove](#) the incentive for depositors to flee in times of crises.

A wholesale CBDC would provide the market with an asset whose value is equivalent to that of other forms of central bank currency, that is exempt from any liquidity or credit risk (unlike private sector stablecoins), and that can be moved through blockchain-type protocols. In addition, it could possibly reduce the frictions that block some transactions, particularly online, [help](#) facilitate the smooth implementation of the ever-increasing techniques linked to unconventional monetary policies, and support the euro's international role.

Todd Keister and Cyrille Monnet [note](#) that an important function of banks relates to information. In times of stress, for example, unusual withdrawals of deposits from banks and reallocation to CBDCs would provide the central bank with important information regarding banks' financial conditions. This information might be crucial in designing an appropriate policy response (such as choosing the interest rate on CBDCs), the more so where a faster response is needed to be effective.

Potential risks

Are CBDCs necessary?

Andrew Clark and Alexander Mihailov [summarise](#) four criticisms in this respect: firstly, cryptocurrencies have slower transaction times and are energy-inefficient (compared to [fiat money](#)). In this context, the authors note that central banks should only use technology when the social benefits outweigh the social costs in implementing them, and not to compete with the private sector.

Another criticism is that an important part of cryptocurrency transactions is used for illicit activities, as they exploit the anonymity embedded in the design of cryptocurrencies. Central banks creating CBDCs would have to tread a fine line between allowing their currencies to be used for illicit activities and monitoring transactions for law enforcement purposes.

Another issue comes from replacing the current 'hub-and-spoke' banking system (with a central bank, and commercial banks as intermediaries) with a single source for all monetary matters. This would impact negatively the retail and commercial banking industry, raising significant competition issues. For the above reasons, the authors are of the view that central banks should focus their efforts relative to CBDCs on facilitating transactions in international reserves.

Further risks

International use of CBDCs could have important [implications](#) for monetary policy, macroeconomic policy and other public policies, for both the issuing country and the country in which the foreign CBDC is used. In particular, CBDCs could [amplify](#) the international spillover effects of shocks, thereby increasing international linkages. However, the magnitude of these effects depends on the design of the CBDC and can be significantly dampened if the CBDC possesses specific technical features.⁸

In a similar vein, the issuance of a CBDC in one country could curtail monetary policy autonomy in another country, possibly to an economically significant extent. It could force the foreign central bank to alter its monetary policy stance to mitigate the stronger international spillover effects created by the CBDC.

Another [concern](#), particularly in developing countries, is the risk that use of a foreign currency CBDC (e.g. euro or US dollar) may become widespread in a recipient economy, [displacing](#) the domestic currency in payments and financial transactions. This trend may have destabilising effects on the economy as a whole.

Regarding financial stability (see above), deposit insurance schemes were relatively effective in preventing runs by depositors during the 2007-2009 crisis; instead, major runs happened in the wholesale funding markets (e.g. repo markets).

Another concern is that CBDCs could facilitate tax avoidance or a loss of domestic oversight capabilities. This could occur if domestic authorities had only a limited overview of holdings or transactions by residents in a foreign CBDC. Similarly, anonymity could allow unlawful activities to be funded up to such limits as may be set.

A cash-like CBDC risks [reducing](#) cash demand below the critical mass where ATMs become sparser and fewer shops accept cash, thus potentially putting at risk the variety of payment instruments available to households with diverse needs.

If, by their design, CBDCs were to become similar to [deposits](#), this could crowd out retail banks from parts of the deposit market, with possible negative implications for credit provision and output.

A further potential concern is undesired volatility in exchange rates, for instance if flows between a domestic currency and a foreign CBDC were to be disorderly.

Finally, there could be complications in macroeconomic management, and in foreign economic cooperation, from the perspective of the issuing central bank.

Latest evolutions at international level

On 9 October 2020, a group of seven central banks,⁹ together with the [Bank for International Settlements](#), published a [joint report](#) on foundational principles and core features of CBDCs. They noted that the common motivation for exploring a general-purpose CBDC is its use as a means of payment. Such a use could, among other things, encourage financial inclusion, improve cross-border payments and increase the resilience of the payments system. The principles emphasise that: (i) a central bank should not compromise monetary or financial stability by issuing a CBDC; (ii) a CBDC would need to coexist with and complement existing forms of money; and (iii) a CBDC should promote innovation and efficiency. Furthermore, any decision to launch a CBDC would depend on an informed judgement that the possible financial stability risks of a CBDC would be manageable and monetary sovereignty would be preserved.

On 30 September 2021, the above central banks published three more reports on the subject,¹⁰ as well as an updated [executive summary](#) highlighting the progress since the October 2020 report. The central banks noted that, to be effective, a CBDC system would need to involve both public and private actors to ensure interoperability and coexistence with the broader payment system. Such involvement would also help a CBDC to anticipate the needs of future users and incorporate related innovations. Lastly, to help maintain safety and stability, a CBDC would need careful design and implementation, allowing time for the existing financial system to adjust and flexibility to use safeguards.

The group pledged to continue its analysis, contribute to other international work on CBDCs and strengthen dialogue domestically and internationally.

A CBDC for the euro area?

The digital euro project

In the context of the general discussion on CBDC, the ECB published a [report](#) in October 2020 on a digital euro. The report examined the possible issuance of a CBDC, the 'digital euro', from the perspective of the Eurosystem, which would complement cash and wholesale central bank deposits.

The first step by the ECB in the report was to set overarching guiding principles: (i) first and foremost, the digital euro must be convertible at par with other forms of the euro; (ii) the amount of central bank money issued in the form of digital euros should always be under the full control of the Eurosystem; (iii) supervised private intermediaries should be able to participate in the provision of digital euro payment services; (iv) a digital euro should neither discourage nor crowd out private solutions for efficient digital retail payments in the euro area; (v) measures should be taken to ensure that the digital euro is trusted from its inception and over time.

The report also outlined other reasons for which the ECB could issue a digital euro: (i) to support the digitalisation of the European economy and the strategic independence of the European Union; (ii) in response to a significant decline in the role of cash as a means of payment; (iii) if there is significant potential for foreign CBDCs or private digital payments to become widely used in the euro area; (iv) as a new monetary policy transmission channel; (v) to mitigate risks to the normal provision of payment services; (vi) to foster the international role of the euro; and (vii) to support improvements in the overall costs and ecological footprint of the monetary and payment systems.

Section 3 of the report examined the consequences of issuing a digital euro for the balance sheet and the core tasks and functions of the Eurosystem. The aim was to identify requirements that it should meet irrespective of which specific future scenario materialises, to protect the European economy and financial system from unwarranted implications arising from issuing a digital euro. These requirements are, in turn, used to identify a digital euro's necessary features. In this context, the report identifies two broad types that could satisfy the desired characteristics: offline and online. These types are compatible with each other and could be offered simultaneously to the extent that they both satisfy the core principles and meet the general requirements identified.

Lastly, the report considered technical and organisational approaches to digital euro services. These include organising the back-end infrastructure and solutions that enable end-users to access it.

In the future, the ECB noted that, before any decision is taken on issuance, the technical implementation of a digital euro needs to be thoroughly tested and legal considerations¹¹ carefully examined. A high-level task force on CBDC is coordinating the experiment, while other elements will be decided following a broader consultation with EU institutions and other stakeholders.

A few months later, in July 2021, the ECB Governing Council [decided](#) to launch the investigation phase of the digital euro project. The investigation phase will last 24 months and aims to address key issues regarding design and distribution. During this phase, the Eurosystem will focus on a possible functional design that is based on users' needs, involving focus groups, prototyping and conceptual work. The investigation phase will examine the use cases that a digital euro should provide as a matter of priority to meet its objectives: it should be a riskless, accessible and efficient form of digital central bank money.

The project will also shed light on the changes to the EU legislative framework which might be needed and that will be discussed with, and decided by, the European co-legislators. The ECB will continue to engage with the other EU institutions throughout the project's investigation phase. Finally, the investigation phase will assess the possible impact of a digital euro on the market, identifying the design options to ensure privacy and avoid risks for euro-area citizens, intermediaries and the overall economy. It will also define a business model for supervised intermediaries within the digital euro ecosystem.

Legal considerations

Christian Pfister [notes](#) that the EU Treaties do not provide expressly for the ECB to issue a CBDC. There are two options: one is to use the derogation in Article 129(3) TFEU to amend the statute of the European System of Central Banks (ESCB) and ECB through the legislative procedure. However, this is restricted to a limited number of statute articles and authorises only marginal amendments. The other is to amend the Treaties, with the inherent difficulties linked to amending an EU Treaty.

Another option, extending further than mere technical amendments but without a Treaty amendment would involve equating the CBDC with 'digital banknotes', so Article 128 TFEU could be applied.¹² This option would correspond to a non-remunerated retail CBDC, which would benefit from legal tender status.

Another, potentially complementary, option would be to include CBDC issuance under one of the ESCB's basic tasks, as set down by Article 127(2) TFEU, to maintain the ability to implement monetary policy, or to promote the smooth operation of payment systems. Here, the CBDC would not have legal tender status in the strict sense of the word. However, if the ESCB undertook to exchange its CBDC promptly with any holder of the currency, against other forms of currency, the security provided by this commitment would be regarded as equivalent to that offered by legal tender status.

MAIN REFERENCES

Allen, S., Capkun, S., Eyal, I., Fanti, G., Ford, B., Grimmelmann, J., Juels, A., Kostianen, K., Meiklejohn, S., Miller, A., Prasad, E., Wüst, K. and Zhang, F., '[Design choices for central bank digital currency: Policy and technical considerations](#)', Brookings, July 2020.

Andolfatto, D., '[Assessing the Impact of Central Bank Digital Currency on Private Banks](#)', Federal Reserve Bank of St Louis, April 2020.

Barrdear, J. and Kumhof, M., '[The macroeconomics of central bank issued digital currencies](#)', Bank of England Staff Working Paper, July 2016.

Bech, M., Hancock, J., Rice, T. and Wadsworth, A., '[On the future of securities settlement](#)', BIS quarterly review, March 2020.

Brunnermeier, M. K. and Niepelt, D., '[On the Equivalence of Private and Public Money](#)', NBER working paper, May 2019.

Chiu, J., Davoodalhosseini, M., Jiang, J. and Zhu, Y., '[Bank Market Power and Central Bank Digital Currency: Theory and Quantitative Assessment](#)', Bank of Canada Staff Working Paper, 2019.

Clark, A. and Mihailov, A., '[Why private cryptocurrencies cannot serve as international reserves but central bank digital currencies can](#)', University of Reading discussion papers, September 2019.

Hess, S., '[Regulating Central Bank Digital Currencies: Towards a Conceptual Framework](#)', April 2020.

Fernandez-Villaverde, J., Sanches, D., Schilling, L. and Uhlig, H., '[Central Bank Digital Currency: Central Banking For All?](#)', November 2020.

Keister, T. and Sanches, D., '[Should Central Banks Issue Digital Currency?](#)', Federal Reserve Bank of Philadelphia, November 2019.

Kumhof, M. and Noone, C., '[Central Bank Digital Currencies – Design Principles](#)', Bank of England Staff Working Paper, 2018.

Meaning, J., Dyson, B., Barker, J. and Clayton, E., '[Broadening Narrow Money: Monetary Policy with a Central Bank Digital Currency](#)', Bank of England Staff Working Paper, May 2018.

Nabilou, H., '[Central Bank Digital Currencies: Preliminary Legal Observations](#)', Journal of Banking Regulation, March 2020.

Pfister, C., '[Central Bank Digital Currency: A Primer](#)', SUERF policy note, March 2020.

ENDNOTES

- ¹ This was named after the dukaat, a golden coin used at the time of Dutch independence from Spain in the 16th century.
- ² Within the e-krona project, the Riksbank has produced three reports, one in [2017](#), one in [2018](#) and one accompanying [pilot phase 1](#) of the project.
- ³ The regions are Beijing-Tianjin-Hebei, the Yangtze River Delta, and the Guangdong, Hong Kong and Macau area.
- ⁴ [Legal tender](#) has the following narrow technical meaning: if one offers to fully pay off a debt to someone in legal tender, the counterparty cannot sue the party paying in that legal tender for failing to repay. Within the euro area, [only the euro](#) has the status of legal tender.
- ⁵ In the context of the e-krona, the digital currency would be based on a separate infrastructure that would also be open to private agents willing to offer payment services linked to the e-krona. The general public would have access to the e-krona, with both payment suppliers and fintech companies having access to the network. Thus, an e-krona system would promote competition, innovation and financial stability.
- ⁶ A 2012 [ECB study](#) found that merchants bear half of the total cost of cash payments, or approximately 1 % of GDP.
- ⁷ A token-based retail CBDC would be a payment instrument that ensured privacy, subject to the risk of personal data capture in the event of hacking.
- ⁸ The authors find that tight restrictions on transactions in CBDCs by foreigners or – even more importantly – adjusting the remuneration rate on the CBDC flexibly, reduce international spillover effects.
- ⁹ Bank of Canada, Bank of England, Bank of Japan, European Central Bank, Federal Reserve, Sveriges Riksbank and Swiss National Bank.
- ¹⁰ Namely, on [system design and interoperability](#), on [user needs and adoption](#), and on [financial stability implications](#).
- ¹¹ In this context, it is noted that 'The Eurosystem must address a number of important legal considerations related to a digital euro, including the legal basis for issuance, the legal implications of different design features and the applicability of EU legislation to the Eurosystem as the issuer.'
- ¹² Article 128 gives the ECB the right to authorise the issuance by the ECB and national central banks (NCBs) of banknotes within the Union and specifies that banknotes issued by the ECB and central banks shall be the only such notes to have legal tender status within the Union.

DISCLAIMER AND COPYRIGHT

This document is prepared for, and addressed to, the Members and staff of the European Parliament as background material to assist them in their parliamentary work. The content of the document is the sole responsibility of its author(s) and any opinions expressed herein should not be taken to represent an official position of the Parliament.

Reproduction and translation for non-commercial purposes are authorised, provided the source is acknowledged and the European Parliament is given prior notice and sent a copy.

© European Union, 2021.

Photo credits: © thodonal / Adobe Stock.

eprs@ep.europa.eu (contact)

www.eprs.ep.parl.union.eu (intranet)

www.europarl.europa.eu/thinktank (internet)

<http://epthinktank.eu> (blog)

