

SPEECH

# Central bank digital currencies: defining the problems, designing the solutions

## Contribution by Fabio Panetta, Member of the Executive Board of the ECB, to a panel discussion on central bank digital currencies at the US Monetary Policy Forum

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It is a great pleasure to take part in this panel on central bank digital currencies (CBDCs).

Throughout history, money and payments have been constantly evolving. And this also holds true in the digital age. As we increasingly pay digitally and shop online, we rely less on cash. Our wallets are gradually moving from our pockets to smartphones and other electronic devices.

These changes have profound implications for the nature of money itself, raising the question of whether central banks should issue digital currencies for retail use.

Today I will argue that in a digital world CBDCs are necessary to preserve the role of central bank money as a stabilising force at the heart of the payments system and to safeguard monetary sovereignty.

But CBDCs will need to be carefully designed. To be successful, they will need to add value for users, support competition rather than crowd out private innovation, and avoid risks to financial intermediation.

### Why we need central bank digital money

Our monetary system is based on the complementarity of private money with public money – which is available for retail payments in the form of banknotes.<sup>[1]</sup>

Confidence in private means of payment is determined by our ability to convert private money into safe public money. This is because central bank money is a risk-free form of money that is guaranteed by the State: by its strength, its credibility, its authority.

Other types of money are liabilities of private issuers: their value is based on the soundness of the issuer and is underpinned by the promise of one-to-one convertibility with central bank money.<sup>[2]</sup> Our readiness to hold private money such as bank deposits reflects the confidence that we can always go to a branch or a cash machine and convert our deposits into cash. The fact that we can do this tells us that our deposits are safe. It reassures us that we will be able to convert them into risk-free central bank money in the future, too.

Bank runs and financial crises start when confidence in the convertibility of private money evaporates.<sup>[3]</sup> Without the anchor of sovereign money, people would constantly have to monitor the soundness of private issuers in order to assess the value of each form of private money. This would undermine confidence in the singleness of money and impair the functioning of the payments system.<sup>[4]</sup>

History provides examples for this. In times when various forms of private money coexisted in the absence of sovereign money – such as the free banking era of the 19th century – the notes issued by banks often traded at variable prices<sup>[5]</sup> and instability risks<sup>[6]</sup> required dominant banks and clearinghouses to act as quasi-central banks<sup>[7]</sup>.

The consensus among central banks on the coexistence between public and private money was summarised 20 years ago as follows: “*The composite of central and commercial bank money, convertible at par, is essential to the safety and efficiency of the financial system and should remain the basis of the singleness of the currency. In other words, central banks would accept neither an outcome in which central bank money crowds out private initiative, nor an outcome in which central bank money is phased out by a market mechanism.*”<sup>[8]</sup>

In the digital age, however, banknotes could lose their role as a reference value in payments, undermining the integrity of the monetary system.<sup>[9]</sup> Central banks must therefore consider how to ensure that their money can remain a payments anchor in a digital world.

Some have suggested that innovative private payment solutions such as stablecoins could, if properly regulated, make CBDCs superfluous.<sup>[10]</sup> However, confidence in stablecoins would also depend on the ability to convert them into central bank money,<sup>[11]</sup> unless stablecoin issuers were allowed to invest the reserve assets in risk-free deposits at the central bank. But this would be tantamount to outsourcing the provision of central bank money, which would endanger monetary sovereignty.<sup>[12]</sup> Moreover, in the absence of public money, stablecoins could exacerbate the “winner-takes-all” dynamics inherent in payment markets, with adverse consequences for the functioning of the payments system.<sup>[13]</sup> And stablecoins’ potentially large investments in safe assets could affect the availability of these assets.<sup>[14]</sup> This could in turn have an impact on market functioning and real interest rates, with undesirable implications from a monetary policy perspective.<sup>[15]</sup>

Other threats to monetary sovereignty could emerge in the absence of a domestic digital currency.

If a foreign CBDC were to be widely adopted, this could lead to digital currency substitution<sup>[16]</sup>. This risk would be higher for small countries with unstable currencies and weak fundamentals, especially if the CBDC were issued in a major economy.<sup>[17]</sup> But it could eventually also affect leading currencies.<sup>[18]</sup>

Such risks are not imminent, but they should not be underestimated. Just as the US dollar overtook the pound sterling as the leading reserve currency within only a decade of the end of the First World War,<sup>[19]</sup> digital innovation may give rise to powerful new foreign contenders, with disruptive consequences for those markets that are not prepared to face the digital challenge.

The widespread adoption of a foreign CBDC would increase the risk of financial transactions being based on technologies managed and supervised elsewhere, with limited oversight by domestic authorities. A system of this kind may not have sufficient safeguards against external threats, including cyber threats. It could put the confidential data of people, businesses, and states at greater risk of being misused. And it could make the information needed to counter criminal activities harder to trace.

The scenario I am describing is not one of science fiction. It is already the case in the market for crypto-assets, which are widely used for criminal activities.<sup>[20]</sup> A similar situation might affect other digital asset markets in the future. So the regulatory framework needs to be adjusted, and this will make a big difference.<sup>[21]</sup> But it may not be sufficient.

## **The main benefits of CBDCs**

A CBDC would preserve the coexistence of sovereign and private money in a digital world. This is not an abstract benefit – it is the basis for financial and monetary stability, ensuring competition and efficiency in payment markets.

But a CBDC could generate even more benefits for users.

It could improve the confidentiality of digital payments. The information contained in electronic transactions can be monetised by private companies<sup>[22]</sup>, posing a threat to privacy. This risk is further compounded by big techs starting to offer financial services and by the rapid development of artificial intelligence. Data

protection regulation aims to prevent misuse, but cannot always keep pace with technological innovation, as we have seen in past cases of data breaches and misuse by tech companies.<sup>[23]</sup>

If a digital currency were offered by an independent public institution such as the central bank – which has no interest in exploiting individual payment data for any purpose – it could enhance, not reduce, the confidentiality of electronic payments. Potential users clearly want this: when we consulted the public on the topic, privacy was identified as the most important aspect of a digital euro.<sup>[24]</sup> Sound governance arrangements that comply with data protection regulations would ensure that payment information is only accessed for permitted purposes, such as countering illegal activities. We are cooperating with the relevant European authorities on this issue.

A digital euro would also increase choice and reduce costs, contributing to a level playing field in payments.<sup>[25]</sup> Key segments of the euro area payments market, such as cards and e-payments, are dominated by a handful of players, which strengthens their pricing power. Some estimates suggest that Europeans pay about 1.4% of GDP for payments services. In the United States, the costs are higher.<sup>[26]</sup>

One might argue that private service providers are already well equipped to offer low-cost digital payment solutions. However, the limited evidence available suggests that low-income households use digital payments less than high-income households. This is consistent with the hypothesis that digital payments remain expensive for many users.<sup>[27]</sup> And even in advanced financial systems, many citizens are “unbanked” or “underbanked”.<sup>[28]</sup> Although financial inclusion depends on several factors, such as financial and digital literacy, the cost of financial services is likely to play a role.

Our digital euro project comes with a commitment that all – including vulnerable population groups – will have access to safe public money in the digital era.

## Designing a successful digital euro

The fact that CBDCs are necessary to guarantee the smooth functioning of the payments market does not mean that their success should be taken for granted. Users may lack incentives to fully appreciate such benefit and – given the vast supply of private digital monies – could show limited interest in CBDCs.

Indeed, we face two opposite risks: being “too successful” and crowding out private payment solutions and financial intermediation, or being “not successful enough” and generating insufficient demand. We take both risks seriously.

To avoid interfering with the functioning of the financial system, we are considering how to make the digital euro a convenient medium of exchange but not an attractive form of investment. We are examining the pros and cons of introducing a quantitative cap on digital euro holdings<sup>[29]</sup> or a tiered remuneration that would disincentivise excessive holdings.<sup>[30]</sup> We are analysing the potential impact on monetary policy.

To ensure that our digital currency would be a convenient means of payment, we are working to make it available within private payment solutions, so that people would be able to use it easily wherever they can pay digitally. We aim to level the playing field by allowing intermediaries – including small ones – to offer innovative solutions to their customers. And we are considering how a digital euro could improve financial inclusion.

We are interviewing focus groups to identify the characteristics of a digital euro that would add value for users. And we are working on the technical options to reconcile different objectives such as the right of individuals to confidentiality versus the public interest in guaranteeing the transparency required to counter illegal activities; or the benefits of allowing the digital euro to be widely used versus the need to safeguard financial intermediation.

We have launched several work streams: on the design choices that can guarantee confidentiality, on the prioritisation of different use cases,<sup>[31]</sup> and on the business options for intermediaries<sup>[32]</sup>. We will cover

areas such as cyber security and operational resilience.

We are interacting with all relevant stakeholders, from intermediaries to consumers, merchants and authorities. We are cooperating with the European Parliament, the European Commission and the finance ministers of the euro area countries. To get technical advice and collect a broad range of views on possible solutions, we have set up a Market Advisory Group<sup>[33]</sup> and are regularly discussing the project with the Euro Retail Payments Board<sup>[34]</sup>, academics and think tanks. Bearing in mind the international implications of CBDCs,<sup>[35]</sup> we are cooperating with other major central banks.

In October 2021 we launched a two-year investigation phase to define the design features of the digital currency. At the end of 2023 we could decide to start a realisation phase to develop and test the appropriate technical solutions and business arrangements necessary to provide a digital euro, which could take three years. Only thereafter will we decide whether to actually issue a digital euro.

## Conclusion

Let me conclude.

For decades, the complementarity of public money and private money has guaranteed stability, competition and innovation.

The digitalisation of payments cannot be ignored by central banks, which have so far provided their money only in physical form. Central banks cannot escape these transformations, nor should they underestimate the potential for far-reaching shifts that may occur.

To ensure that public money maintains its fundamental role in the digital age, the ECB has launched an investigation into the possible issuance of a digital euro alongside cash.

The digital euro is an ambitious and complex project that can improve the efficiency of the economic and financial system. We want to make it a driver of stability and inclusive progress, capable of strengthening ties between economies and financial systems around the world.

Our experience may provide useful insights for other central banks. And likewise, we are keen to learn from them. I am therefore pleased to exchange views with US experts, and I am now looking forward to our discussion.

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1. Although central bank money can also take the form of reserves (deposits that commercial banks hold at the central bank), the focus of this speech will be on cash.
  2. One-to-one convertibility with central bank money is what makes the regulated forms of money convertible with each other and is why they are perceived as interchangeable when making payments.
  3. This does not mean that the safeguards put in place to protect savings – legislation and banking supervision, deposit insurance schemes, capital markets supervision – are not important. On the contrary. They must, however, be flanked by convertibility to ensure the smooth functioning of payments and the stability of the financial system.
  4. On the singleness of money see Bank for International Settlements (2003), [The role of central bank money in payment systems](#), Committee on Payment and Settlement Systems, August.
  5. For instance, the notes of new banks were more heavily discounted. See Gorton, G. (1996), “Reputation Formation in Early Bank Note Markets”, *Journal of Political Economy*, Vol. 104, No 2, pp. 346-

397. Price variability was inconvenient, as users had to consult a note reporter to monitor the value of the notes in circulation. See Eichengreen, B. (2019), "[From Commodity to Fiat and Now to Crypto: What Does History Tell Us?](#)", *NBER Working Paper Series*, No 25426, January.

6. The experience of the free banking era in the United States varied considerably among states and each had a significant number of problem banks. See Rolnick, A.J. and Weber, W.E. (1983), "New Evidence on the Free Banking Era", *American Economic Review*, Vol. 73, No 5, pp. 1080-1091.

7. In the United States, dominant banks disciplined note issuing banks by threatening them with bulk redemption of their notes, while clearinghouses regulated member bank levels of equity, reserves, and interest rates, audited members, produced money during crises and issued a form of insurance; See Gorton, G. (1985), "Banking theory and free banking history: A Review Essay", *Journal of Monetary Economics*, 16(2), 267-276.

8. See Bank for International Settlements (2003), op. cit. For an overview of the role of central bank money over the past 20 years, see Bindseil, U., and Terol, I (2020), "[The evolving role of central bank money in payments](#)", *Central Banking*, 15 July.

9. While banks could continue to hold central bank money in the form of reserves, this may not prove sufficient to fully preserve the monetary anchor role of central bank money. People would be unable to use central bank money as means of exchange and would thus have little incentive to hold it. This would weaken the unit of account role of sovereign money. If the currency is not demanded by the public, the mere announcement that the central bank would make it available would not be enough to preserve its role in the economy. In history, sovereign money was at times used as unit of account but not as a medium of exchange. This was for example the case of the *livre*, the "imaginary money" introduced by Charlemagne in the monetary reform of the eighth century, named after the *libra* (pound), the sovereign money introduced by the ancient King of Rome Servius Tullius in the sixth century BC. The *livre* was never coined and never circulated. However, it had a fixed conversion rate with another form of sovereign money, the *denier* (1 *livre* was equal to 240 *deniers*), which was actually coined and actively used as means of exchange. See Einaudi, L. (1936), "Teoria della moneta immaginaria da Carlo Magno alla rivoluzione francese", *Rivista di storia economica*, Vol. 1, pp. 1-35; Cipolla, C.M. (2001), *Le avventure della lira*, Il Mulino, Bologna.

10. Quarles, R.K. (2021), "[Parachute Pants and Central Bank Money](#)", speech at the 113th Annual Utah Bankers Association Convention, Sun Valley, Idaho, June.

11. The value of a stablecoin is linked to a portfolio of one or more other assets (the *reserve assets*), including currency in the form of commercial bank deposits. Stablecoins can therefore be low-risk but not risk-free. Risks increase if stablecoin arrangements are backed by risky or opaque assets, especially in

times of market turmoil. See Adachi, M., Cominetta, M., Kaufmann, C. and van der Kraaij, A. (2020), "[A regulatory and financial stability perspective on global stablecoins](#)", *Macprudential Bulletin*, Issue 10, ECB, Frankfurt am Main, May.

12. Panetta, F. (2020), "[From the payments revolution to the reinvention of money](#)", speech at the Deutsche Bundesbank conference on the "Future of Payments in Europe", 27 November.

13. New players, including operating platforms with huge customer bases, can exploit network effects and economies of scale to build dominant positions, creating their own closed-loop ecosystems. They may exploit customer data for private scoring and other uses. They may erect barriers to impede interoperability and use their "coins" to displace other forms of money. See Brunnermeier, M.K., James, H. and Landau, J.-P. (2019), "[The Digitalization of Money](#)", *NBER Working Paper Series*, No 26300, September; Sandbu, M. (2022), "The main objection to digital currencies is misguided", *Financial Times*, 28 January.

14. Garratt, R., Lee, M., Martin, A. and Torregrossa, J. (2022), "[The Future of Payments Is Not Stablecoins](#)", *Liberty Street Economics*, Federal Reserve Bank of New York, 7 February.

15. Panetta, F. (2021), "[Stay safe at the intersection: the confluence of big techs and global stablecoins](#)", speech at the UK G7 Presidency Conference on "Safe Openness in Global Trade and Finance" hosted by the Bank of England, 8 October.

16. Brunnermeier, M.K., James, H. and Landau, J.-P. (2021), "[The digitalization of money](#)", *BIS Working Papers*, No 941, Bank for International Settlements, May.

17. Panetta, F. (2021), op. cit.

18. While the international role of a currency will continue to depend to a large extent on the fundamentals of the underlying economy, availability in CBDC form would facilitate use in cross-border payments by reducing frictions and costs. Model simulations suggest that the share of a country's currency in global export payments increases when it is available as a CBDC, but continues to depend to a large extent on forces such as the size and the stability of the economy and the development and efficiency of the financial sector. See ECB (2021), "[Central bank digital currency and global currencies](#)", *The international role of the euro*, Frankfurt am Main, June, and Panetta, F. (2021), "[Hic sunt leones](#)" – [open research questions on the international dimension of central bank digital currencies](#), speech at the ECB-CEBRA conference on international aspects of digital currencies and fintech, Frankfurt am Main, 19 October.

19. Chitu, L., Eichengreen, B. and Mehl, A. (2014), "[When did the dollar overtake sterling as the leading international currency? Evidence from the bond markets](#)", *Journal of Development Economics*, Vol. 111, November, pp. 225-245.

20. The share of illicit payments in total transactions of crypto assets is often underestimated. See Europol (2022), "[Cryptocurrencies: tracing the evolution of criminal finances](#)", Europol Spotlight Report series, Publications Office of the European Union, Luxembourg. For a review of other available studies on the use of bitcoin for criminal activities, see Bindseil, U., Papsdorf, P. and Schaaf, J. (2022), "[The encrypted threat: Bitcoin's social cost and regulatory responses](#)", *SUERF policy Note*, No 262 January.
21. The European Union is revising the regulation, supervision and oversight of digital finance with the proposed Regulation of Markets in Crypto-Assets (MiCA) and the ECB's new payment oversight framework (PISA). The discussion on regulatory steps is also ongoing in other advanced economies, e.g. in the United States. See President's Working Group on Financial Markets, Federal Deposit Insurance Corporation and Office of the Comptroller of the Currency (2021), [Report on Stablecoins](#), November; and Gensler, G. (2021), "[Remarks Before the Aspen Security Forum](#)", 3 August.
22. Botta, A., Digiacoimo, N. and Mole, K. (2017), [Monetizing data: A new source of value in payments](#), McKinsey & Company, 5 September.
23. Beyond the well-known case of Oxford Analytica, big tech firms are facing increased criticism over revelations that staff and contractors listened to audio recordings of people speaking to virtual assistants, and voice chats recorded on messenger apps. Even children were affected: one major video-sharing app popular among young people was heavily fined in 2019 by the US Federal Trade Commission for collecting personal data from children under 13. See New Scientist (2019), [Big tech data abuse capped off Silicon Valley's decade-long fall](#), 18 December.
24. In the public consultation conducted by the ECB in 2020, 43% of respondents ranked privacy as the most important aspect of a digital euro, well ahead of other features. The other characteristics highlighted in the consultation were the security of payments and usability throughout the euro area, which were ranked first by 18% and 11% of those surveyed, respectively. See Panetta, F. (2021), "[A digital euro to meet the expectations of Europeans](#)", introductory remarks at the ECON Committee of the European Parliament, 14 April.
25. See Panetta, F. (2021), "[Evolution or revolution? The impact of a digital euro on the financial system](#)", speech at a Bruegel online seminar, 10 February.
26. See McKinsey (2020), [The 2020 McKinsey Global Payments Report](#).
27. Based on the Study on the payment attitudes of consumers in the euro area (SPACE), the preference for cash in the euro area is significantly higher among low-income respondents. While only 36% of those with an income of €1,000 per month or less have a preference for cards or other cashless means of payment, that preference was expressed by 61% in the income bracket of €2,500 and more. See Panetta, F. (2021), "[Cash still king in times of COVID-19](#)", speech at the Deutsche Bundesbank's 5th International

Cash Conference on “Cash in times of turmoil”, 15 June.

Although they are often invisible to the customer, the various layers of merchant fees can add up to some 3% of the transaction value. According to Glory Global Solutions, “Some banks tell merchants to budget for between 2.5% and 3% of the transaction value, but with so many variables, this is only ever a rough guide.” See Glory Global Solutions (2018), [Electronic Payments – Not As Cheap As You Think](#).

28. In the United States, 6% of adults do not have a checking, savings, or money market account. See Federal Reserve (2019), [Report on the Economic Well-Being of U.S. Households in 2018 - May 2019](#). In the euro area there are still more than 5% of adults without a payment account. See World Bank (2017), [Global Financial Inclusion \(Global Findex\) Database](#).

29. In the case of quantitative holding limits, we are considering waterfall solutions linking digital euro accounts to private money accounts, to allow payments in excess of the limit.

30. Bindseil, U. (2020), [“Tiered CBDC and the financial system”](#), *Working Paper Series*, No 2351, ECB, January; Panetta, F. (2021), [“Evolution or revolution? The impact of a digital euro on the financial system”](#), speech at a Bruegel online seminar, 10 February.

31. Use cases refer to the various interactions between people, businesses, Government and machines (e.g. payments at the point of sale, online, peer-to-peer, machine-to-machine, etc.).

32. Business options are naturally related to costs (fees, devices), but can also include the front end, taking into account consumers’ preference to use the current payment methods, be it their smartphone, card or cash. A digital euro should provide a similar payment experience, while also considering future innovations like QR codes, which are becoming more and more popular.

33. The Market Advisory Group includes 30 professionals from the retail payments industry and provides advice on the design and potential role of a digital euro in the payments ecosystem. See ECB (2021), [ECB announces members of Digital Euro Market Advisory Group](#), 25 October.

34. The Euro Retail Payments Board is the Eurosystem’s established forum for institutional dialogue on retail payments.

35. Panetta, F. (2021), [“Hic sunt leones” – open research questions on the international dimension of central bank digital currencies](#), speech at the ECB-CEBRA conference on international aspects of digital currencies and fintech, Frankfurt am Main, 19 October.