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## The Digital Future of Central Bank Money

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**Abstract** Nowadays the vast majority of money is in digital form. Except for banknotes and coins. But that's changing now and some central banks are already offering digital currencies to the public, the so-called Central Bank Digital Currency (CBDC). A number of reasons can be given for the interest of central banks in CBDC. Some of them are directly related to monetary policy, others can be explained by the willingness of central banks to keep pace with private sector innovations in the field of payment services, especially the emergence of digital assets such as stablecoins. At the same time, there are differences in the disposition of central banks on two sides of the Atlantic towards the CBDC. In any case, the future of money is digital and physical cash will have a digital counterpart, including in Europe.

**Keywords** Central Banking, Central Bank Digital Currency, Money, Monetary Policy.

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**Introduction**

Digitalization in finance is an irreversible process that has been gaining momentum in recent decades. The banking business has long been part of these processes and is already largely digitalized. On this background, central bank notes and circulating coins look obsolete and entirely outmoded. They are completely incompatible with the digital world of modern finance.

But does it mean the central banks are lagging behind the new technologies? In fact, *large part of central bank money is in digital form*. The reserve accounts of credit institutions at central banks have long been digitized. The final settlement of all payments through the banks is made with this part of digital central bank money through Real-time Gross Settlement (RTGS) system. If we look at the overall picture of money supply in developed economies, about 90% of money are deposits in credit institutions and, as is well known, they are in the form of digital records in bank books. The vast majority of payments in modern economies are also digital, with the exception of cheque payments, which are still used in some countries, and of course, with the exception of cash payments with banknotes and coins.

So, the bulk of modern money is in digital form, except for cash. In recent years, technologies have emerged that allow the introduction of a digital version of banknotes and coins.

But should central banks rush to launch digital currencies? Could they rely on technologies that only came into use two decades ago? Central banks are usually perceived as conservative institutions. It once took more than 200 years for banks to start printing banknotes after the invention of the printing press in the mid-15th century. In Europe, the pioneer in banknote issuance was the Riksbank, established in 1668 and today's central bank of Sweden. Nowadays, the central banking seems to be much rapidly advancing institutions, as some central banks have already introduced *central bank digital currency (CBDC)*. In October 2020 the Central Bank of the Bahamas was the first to issue CBDC, known as “sand dollar” and few months later in March 2021 the Eastern Caribbean Central Bank launched digital currency, DCash, for islands of Antigua and Barbuda, Grenada, Saint Christopher and Nevis and Saint Lucia (Urbinati et.al. 2021: 10). The largest economy currently using a CBDC in the form of e-CNY is China.

A number of reasons can be point out for the interest of central banks in introducing CBDC. The considerations related to monetary policy deserve particular attention. At the same time, CBDC are not the only alternative for a counterpart to banknotes and coins. Some digital assets may prove to be a direct competitor to the CBDCs. In this regard, the preferences for digital currencies in United States and other Western countries differ significantly. Particularly impressive are the projects in the European Union for the introduction of CBDC. These topics will be discussed below.

### **1. Monetary policy reasons for central banks' interest in CBDC**

In recent decades, cash payments have been steadily declining as a share of the total volume of payments in the economy. A European Central Bank study on payment habits in the euro area found that in 2022, the number of cash payments as a percentage of all payments at points of sale decreased to 59% compared to 2016, when this percentage was 79%. In terms of transaction volume measured by value, card payments are 46% of total volume in 2022, while the percentage of cash payments is 42% (ECB, 2022: 13). The habits of people in the eurozone are not uniform, with preferences for cash payments being lowest among the Nordic nations. In Finland, in 2022, the share of cash payments by value decreased to 12% of the total volume of transactions at points of sale, and in the Netherlands this percentage was 15% (ECB, 2022: 19).

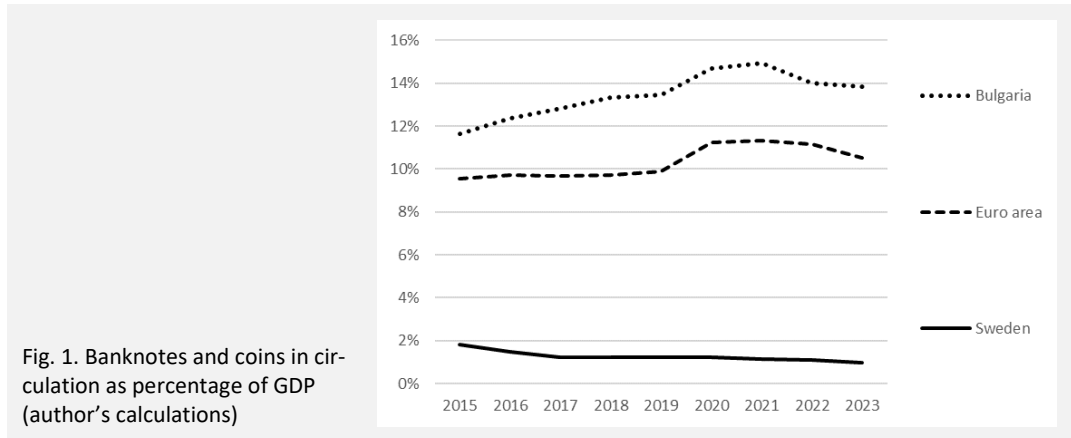
Thanks to the payment habits of people in Southern and Central Europe, the share of banknotes and coins circulating in the eurozone is not at such a critically low level, yet. Fig. 1 shows that in the eurozone the circulation of cash and its importance for the economy are well preserved and the situation is not much different from that in Bulgaria.<sup>1</sup> On the other hand, the circulation of banknotes and coins in Sweden is at a *critically low level* and

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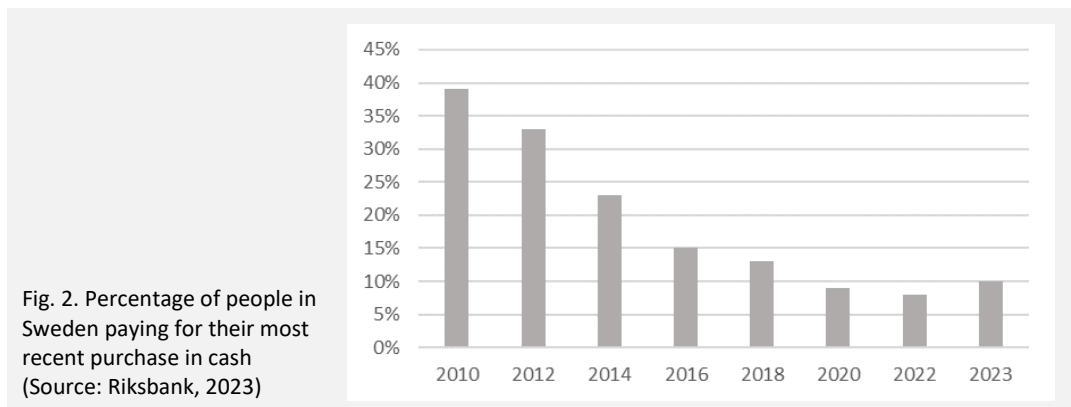
<sup>1</sup> The source of data in Fig. 1 regarding banknotes and coins in circulation is the monetary statistics of the Bulgarian National Bank, European Central Bank and Riksbank. The GDP data are from the National Statistical Institute, Eurostat and Statistics Sweden. The figure presents the ratio between the average annual amount of banknotes and coins in circulation to the value of GDP in the respective years.

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continues to decrease in recent years. Why should such low levels of cash circulation, as shown on Fig. 1, be a concern for central banks?



The physical cash is the only part of central bank money directly available to public. When the circulation of this part of the money supply falls to such a low level, the very nature of money – *to be widely accepted* – is directly affected. According to the Riksbank, one in ten merchants in Sweden does not accept cash payments (Riksbank, 2023). As shown on Fig. 2 the percentage of people paying in cash declines and it is around 10% for the most recent years. This creates a risk that banknotes and coins will cease to be used, despite their statute as legal tender.



It would be hard to believe for society that central bank defends the value of money if people don't see the connection between their means of payments and central bank. This could affect public confidence in the central bank and its *monetary policy*. But there is a more direct impact of declining cash on monetary policy. In the modern monetary system,

physical cash reaches the public through banks. This engage a part of bank reserves, which might be quite significant, for expected withdrawal by clients, when the ratio of cash to deposits preferred by public is high. The high demand for cash *increases the dependence of commercial banks on central bank funding* to replenish their reserves and on monetary policy rates, respectively. Conversely, if the demand for cash is insignificant, banks' dependence on central bank and its monetary policy decreases.

This relationship can also be demonstrated through the concept of money multiplier ( $m$ ), which is most often represented by the following equation (Kamelarov, 2017: 91):

$$m = \frac{1+c_p}{c_p+e+r} \quad (1)$$

In this equation  $c_p$  represents ratio of cash to deposits in banks, preferred by public,  $e$  is the ratio of excess bank reserve to deposits, and  $r$  is percentage of required reserves. The reserve requirements that big central banks impose today are at a minimal and almost zero levels. Banks generally try to minimize their excess reserves, so a higher value of  $c_p$  will stabilize the money multiplier. The introduction of a CBDC as a complement to physical cash and corresponding rise of  $c_p$  would have a similar *stabilizing effect* and would make the relationship between the monetary base and the money supply stronger and more predictable.

As the equation (1) shows, an increase in  $c_p$  when newly introduced CBDC add on physical cash can reduce the money multiplier, as long as  $e + r$  in the denominator is less than 1. In other words, the demand for CBDC could limit financial intermediation through banks and cause an outflow of deposits from the banking sector. This will make bank lending more expensive, but monetary policy can neutralize these effects. It is unclear how the introduction of the CBDC will change payment habits of public. People who prefer to pay in cash, in countries like Bulgaria, where cash payments have a larger share, are likely to continue to do so, as they do not like electronic payments. People who are used to pay by credit and debit cards will not change their habits much, and payments with CBDC will be an additional option for them, which will only change the payment instruments they use. This could have an impact on banking intermediation and may *strengthen competition in the payment services market*, which would be beneficial for consumers.

Another question is whether the CBDC will bear interest. It depends on their technical design and their legal statute. Interest-bearing CBDC will have an impact on bank interest rates, which will affect banking intermediation. But the central bank will gain an additional monetary policy instrument. This can be very useful in times of low and negative interest rates.

A very important consideration that central banks must envisage, if they introduce a CBDC, is *the impact on financial stability*. CBDC is a direct claim against the central bank and will be perceived as a risk-free asset. In a situation of market turbulence, a flight to

assets viewed as safe haven is guaranteed. This would be an additional source of systemic risk and could even cause a bank run. Appropriate technical design of the CBDC and the introduction of limits can alleviate this problem.

## 2. Central banks' divergence on CBDC on the two sides of the Atlantic

Among the considerations guiding the European Central Bank's interest in the CBDC is the goal of *achieving strategic autonomy* of European Union and *fostering digitalization* in European economy. The retail payment services in Europe are dominated by the leading United States cards companies and the digital euro issued by ECB "could represent a building block for a European solution for point-of-sale and online payments" (ECB, 2020: 10). The introduction of a European CBDC is seen as a countermeasure to the spread of foreign digital payment platforms. The latter undermine the *monetary sovereignty* of eurozone countries and affects the ECB's ability to conduct monetary policy.

A particular challenge for central banks is the emergence of crypto-assets, which have the potential to become widely accepted as money. We are talking about the so-called *stablecoins*, which are part of the spectrum of digital assets based on *blockchain technology*. Unlike speculative assets like Bitcoin and similar "cryptocurrencies," stablecoins attempt to attach their value to a given asset, pool of assets, or fiat money. A peculiar attempt to create multi-currency stablecoins was the project „Libra“, later renamed „Diem“, but its implementation faced opposition from central banks and governments and failed.

Vary close substitutes for money are those stablecoins that attempt to maintain a stable value against fiat currencies, mainly the US dollar. That's why they maintain coverage by dollar assets, such as US treasury securities. To a large extent, this resembles the regulated financial business of investment funds or electronic money institutions, which requires increased attention from regulators and central banks on stablecoin issuers. If these types of stablecoins become more widespread and widely accepted by the public as a means of payment, central banks will need to find a way to bring them under the control of their monetary policy.

It is likely that CBDC and stablecoins covered by fiat currency will be direct competitors in this new segment of the payment services market. As a product of the private sector, stablecoins have a *very high innovation potential* and can offer very flexible and efficient solutions in the field of payments. They can more easily implement new technologies that are not sufficiently secure in the assessments of central bankers. It is likely that CBDC will have to catch up with stablecoin innovations, but the advantage of central banks should be the *security* and *reliability* of their digital money for public.

The competition between CBDCs and stablecoins likely explains the *divergence* in positions on these issues between the US Federal Reserve and the central banks of other Western countries. The United States is prioritizing the private sector to develop a *digital dollar* built on the stablecoin model. Currently, the Federal Reserve System neither has a plan to

introduce a CBDC nor is it developing a project in this area. The only initiative the Fed took was a discussion with the public in 2022 about the possibility of launching CBDC, which was concluded within the year. The Board of Governors published a paper discussing CBDC and explicitly stated that the “Federal Reserve does not intend to proceed with issuance of a CBDC without clear support from the executive branch and from Congress, ideally in the form of a specific authorizing law” (Board of Governors of the Federal Reserve System, 2022: 3). No such support was ever given. Quite the opposite. A bill was introduced in the House of Representatives to prohibit the Fed from issuing CBDC, which was passed in 2024, but was stalled in the Senate. In 2025, this law was reintroduced in the US Congress.

Meanwhile, on January 23, 2025, President Trump signed an executive order, prohibiting US agencies „from undertaking any action to establish, issue, or promote CBDCs within the jurisdiction of the United States or abroad” (The White House, 2025). This order explicitly *prohibits circulation and use of a CBDC* within the jurisdiction of the United States on the grounds of protecting Americans „from the risks of Central Bank Digital Currencies (CBDCs), which threaten the stability of the financial system, individual privacy, and the sovereignty of the United States”. This can also be interpreted as a ban on the use of any foreign CBDCs, for example European ones, in all territories under US jurisdiction. It remains to be seen what consequences these restrictions will have on the vitality of the CBDCs.

The hostility towards the CBDCs in the United States can probably be explained by reflections on the economic governance in that country from the 19th century, when banknotes were issued by private banks. It is known that in those years opposition to central banking failed to pave the way for this institution in the United States, and the Federal Reserve was only created in the 20th century. At this stage the United States is leaving the digital dollar in the hands of the private sector and is only considering introduction of appropriate *regulations* for companies issuing stablecoins. It should be noted, however, that the introduction of the CBDC does not find support even in Board of Governors of the Federal Reserve. Such a position may be justified from the perspective of protecting the *reputation of the central bank*. The issuance, circulation and use of CBDC rely on new and insufficiently tested technologies, which can lead to the failure of the project. A private sector startup company introducing stablecoins can fail, a central bank launching CBDC cannot. Maybe it's wiser to let the private sector take a few steps forward and learn from its mistakes and possible failures.

### **3. Towards introduction of central bank digital currencies in European Union**

The European Union is on the path to becoming a leading player in the development and promulgation of CBDCs. Extremely intensive and profound work in the field of design, experimentation and implementation of the CBDC is being carried out by the Sveriges Riksbank. This is not surprising considering the previously mentioned threat that Sweden would be left without legal tender if the public stopped using banknotes and coins in

everyday payments. Since 2017, the Riksbank has been working on a project to introduce an *e-krona*.

Initially, the Riksbank published two reports, in 2017 and 2018, which analyzed the need for CBDCs, outlined the conceptual framework for their design, discussed the consequences of this new form of central bank money on financial intermediation, monetary policy and financial stability, as well as a number of legal aspects of their issuance and use. From 2020 to 2023, the Riksbank worked on an *e-krona pilot project*, which went through four phases with very *intensive experimental work* that clarified many of the technical details related to the CBDC platform, their issuance and use in payments.

The European Central Bank launched work on the CBDC in 2020 with the creation of the High-Level Task Force on Central Bank Digital Currency. The High-Level Task Force has published a report on the digital euro (ECB, 2020), which outlines its prospects and potential advantages, and formulates core principles and general requirements for the new digital central bank money. The launch of the digital euro project was linked to practical experimental work to explore functional design options and their technical feasibility.

In 2020-2021, several national central banks of the Eurosystem conducted comprehensive *experimental work*, which demonstrated that the currently available technologies allow the creation of a digital euro that meets the requirements set for it. This allowed the launch of the *investigation phase* of the digital euro project, which lasted two years and ended in October 2023 with the publication of a report (ECB, 2023) summarizing the results of the work carried out and the outlook on the next steps. During investigation phase, the product design of the euro-denominated CBDC and the key features characterizing its use by end users and businesses were developed, as well as the role of payment service providers in delivering a digital euro was detailed.

The next step of the digital euro project, so-called *preparation phase* was launched in November 2023. It is expected to be completed in October 2025. This will likely be the last phase before a decision is made on the possible introduction of a CBDC in the eurozone. Before that, however, the digital euro rulebook must be finalized and the development of the digital euro platform and infrastructure must be ensured. An important condition for deciding to introduce the euro is that the legal framework for its functioning has come into force. The legal package has already been prepared by the European Commission, but its adoption by the European Parliament and the Council has not yet advanced.

The intensive activity on the digital euro and e-krona projects facilitates their future introduction. To a very large extent, there is now clarity about what these two digital currencies will look like and how they will function. Both of them will be *retail* CBDC with *limits* set for the amount held by the end users. The e-krona will be built as *value-based* CBDC in form of *tokens*. The digital euro will most likely implement an *integrated* model that combines an *account-based* module, representing an enhanced version of existing instant

payment system TIPS (Target Instant Payment Settlement), and a *DLT-based* module<sup>2</sup>, allowing *token-based* CBDC and off-ledger payments directly between end users.

Neither the digital euro nor the e-krona can be a substitute for physical banknotes and coins. The Riksbank's experimental work shows that offline payments without an internet connection of payment instruments and the CBDC platform are possible, but only temporary, with many limitations, without sufficient security and without guarantees against technical breaches. In the current state of technology, introducing an offline functionality for direct peer-to-peer payments between end users would be a rather risky move. For now, these advantages of physical cash are difficult to replicate with a CBDCs. Therefore, banknotes and coins will remain for a very long time, as long as people prefer to pay with them and CBDCs will only be *complemental* to physical cash.

Initially, the use of retail CBDC will most likely be *domestic* and will not be able to replace the advantages of card payments when making payments abroad. The digital euro is intended primarily for citizens of the eurozone, but it is planned to be available to foreigners as well, following the logic of prepaid payment instruments. The possibility of full use of the digital euro by citizens of member states outside the euro area will be subject to an agreement between the ECB and the national central bank of the country outside the euro area. Therefore, in this respect, the digital euro cannot replace the advantages of the physical euro as a widely accepted currency in the world.

Will CBDCs be introduced in the European Union? The answer is almost certainly „yes“, but it is not known „when“. It is also unclear which of the two central banks that are working hard in this direction will introduce a CBDC first. Despite the Riksbank's efforts on the e-krona project, an inquiry into the role of the state in the Swedish payment market from 2023 found that the social need for the introduction of a CBDC is currently insufficient, but the launch of the digital euro may accelerate the introduction of the e-krona. (Börestam et al., 2024: 18). Although cash payments are still popular in the eurozone, it is very likely that the ECB will be the first to introduce CBDC in Europe. After the Fed abandoned the development of the CBDC, the Eurosystem became the most significant central bank in the world, which would set the standards and rules in this area for all other central banks that would follow it. This is a very strong argument for the ECB to be first.

## Conclusion

The future of central bank money is digital, but physical cash will not disappear. CBDCs can have a beneficial effect on monetary policy in an environment of declining use of banknotes and coins. The appropriate design of this new form of base money can prevent potential adverse effects on banking intermediation and financial stability from the introduction of CBDCs. Central banks cannot afford to be indifferent when private market players create innovative digital assets, so-called stablecoins, with the potential to become widely

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<sup>2</sup> DLT stands for Distributed ledger technology.

accepted as means of payment. The Federal Reserve System's hostile stance towards CBDCs and the US government's ban on their issuance and circulation could be a chance for the Eurosystem to become a global standard-setter in the design and functionality of digital central bank money. This may induce the ECB to accelerate the decision to launch the digital euro, along with other reasons it is guided by: achieving strategic autonomy of European Union, fostering digitalization in European economy, limiting dependence on US card companies and foreign digital technologies in payments. However, the introduction of CBDCs requires caution from central banks. This new form of central bank money relies on relatively new technologies that cause risks. Central banks must ensure they offer the public sound and reliable money.

### References

1. Board of Governors of the Federal Reserve System (2022). *Money and Payments: The U.S. Dollar in the Age of Digital Transformation*. Available at: [www.federalreserve.gov/publications/files/money-and-payments-20220120.pdf](http://www.federalreserve.gov/publications/files/money-and-payments-20220120.pdf) (Accessed: 5 May 2025).
2. Börestam, A., Pedersen, A. (2024). *The digital euro and its potential consequences for Sweden*. Sveriges Riksbank. Available at: [www.riksbank.se](http://www.riksbank.se) (Accessed: 5 May 2025).
3. ECB (2020). *Report on a digital euro*. Available at: <https://www.ecb.europa.eu> (Accessed: 5 May 2025).
4. ECB (2022). *Study on the payment attitudes of consumers in the euro area (SPACE) – 2022*. Available at: <https://www.ecb.europa.eu> (Accessed: 5 May 2025).
5. ECB (2023). *A stocktake on the digital euro. Summary report on the investigation phase and outlook on the next phase*. Available at: <https://www.ecb.europa.eu> (Accessed: 5 May 2025).
6. Kamelarov, A. (2017). *Theory of Money (A Lecture Course)*. Varna, E-Litera Soft.
7. Riskbank (2023). *Payment habits of Swedish people*. Available at: <https://www.riksbank.se/en-gb/statistics/statistics-on-payments-banknotes-and-coins/payment-patterns/> (Accessed: 5 May 2025).
8. The White House (2025). *Strengthening American leadership in digital financial technology*. Available at: <https://www.whitehouse.gov/presidential-actions/2025/01/strengthening-american-leadership-in-digital-financial-technology/> (Accessed: 5 May 2025).
9. Urbianti, E., Belsito, A., Cani, D., Caporrini, A., Capotosto, M., Folino, S., Galano, G., Goretti, G., Marcelli, G., Tiberi, P., and Vita, A. (2021). *A digital euro: a contribution to the discussion on technical design choices*. Markets, Infrastructures, Payment Systems series No. 10, Banca d'Italia. Available at: [https://www.bancaditalia.it/pubblicazioni/mercati-infrastrutture-e-sistemi-di-pagamento/questioni-istituzionali/2021-010/N.10-MISP.pdf?language\\_id=1](https://www.bancaditalia.it/pubblicazioni/mercati-infrastrutture-e-sistemi-di-pagamento/questioni-istituzionali/2021-010/N.10-MISP.pdf?language_id=1) (Accessed: 5 May 2025).