

DIGITAL EURO: USE CASES AND DESIGN



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A digital euro: the next step in the advancement of our currency

The world is changing towards ever more digitalisation and so are people's payment habits. As cash usage as a means of payment is declining, Central Bank Digital Currencies (CBDCs) are the next logical step in the advancement of currencies. According to the Bank of International Settlements (BIS), there are around 85 central banks in the world working on their own CBDC projects. The European Central Bank (ECB) is no exception. We have been investigating for more than a year how to develop a digital euro that would ensure access to central bank money in the digital era. This would at the same time strengthen Europe's monetary sovereignty and prevent undue dominance of private providers.

A digital euro would be a digital central bank liability for retail payments that would offer an additional payment

solution for citizens and businesses to use throughout the euro area. It would complement cash and central bank deposits. In essence, a digital euro would bring the most appreciated features of cash to the digital era. Hence, it could be used for all daily transactions in several payment segments, including e-commerce. The ECB is prioritizing three digital euro use cases that are currently served by separate solutions, mostly without pan-European reach and provided by non-European firms. For now, these include :

- (i) person-to-person payments made between individuals,
- (ii) consumer-to-business payments, including e-commerce and purchases made in a physical shop,
- (iii) payments to/by the government (e.g. to pay a tax). In the future, additional use cases could be added, such as machine-to-machine payments.

For each use case, we aim to design online and offline functionalities, which would increase the currency's resilience and privacy options. As a central bank, the ECB has no interest in users' personal data. This is why, within the limits of pending legislative developments, we are considering solutions that would preserve privacy by default and by design, giving people control of their payment data.

In essence, a digital euro would bring the most appreciated features of cash to the digital era.

A digital euro would be distributed via supervised intermediaries, including banks, that would be the direct counterparts for digital euro users. For instance, supervised intermediaries would be the actors taking care of opening digital euro accounts or wallets for end users.

To be effective as a monetary anchor, which unifies the entire euro payment ecosystem, a digital euro will need to be widely used and accepted. Consequently, a digital euro will need to be easily accessible to everyone who wants to use digital euros. A digital euro will be designed to be inclusive.

Therefore, it will be user-friendly and take on board those who cannot afford a credit card or who do not have a bank account. In line with its public good nature, a digital euro would also be basically free. This principle is at the core of the digital euro's fee model, which, at the same time, would generate incentives and network effects for distributors and merchants. Pending legislative developments, this model foresees offering comparable economic incentives for distributors while the Eurosystem would bear certain investments and operating costs, as with the production and issuance of banknotes. Overall, the wide distribution of a digital euro will make the euro area a more competitive space by adding a truly pan-EU means of payment.

To ensure a harmonised user experience, this model will be framed within a digital euro scheme for the distribution of a digital euro, which is currently under development with all market stakeholders involved. The creation of such a scheme needs to set technical rules, standards and procedures that will ensure that, same as banknotes today, citizens can pay with a digital euro independently of the providing intermediary of both the payer and the payee throughout the entire euro area.

In conclusion, the digital euro represents taking European integration a step forward by increasing Europe's strategic autonomy and monetary sovereignty. While the use of cash as a means of payment is declining in Europe, a digital euro would work as an effective option to serve as a monetary anchor in the digital era. In this regard, decisions taken by European legislators will be key in shaping the next steps in the evolution of the digital euro.

The ongoing investigation phase will conclude in autumn 2023 when the ECB Governing Council will decide whether to move to a next phase. Such a decision will be independent from issuance, which will be decided only at a later stage in the process.



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The digital euro - same but different

The future issuance of a digital euro is currently under investigation in the Eurosystem. Such a digital euro would be for use by private end users and companies, i.e. as a retail CBDC. It should be free of charge for citizens and widely accepted in payment transactions throughout the euro area.

Up to now, central banks have been offering a similar but analogue product: cash. Basic features and benefits of cash should also apply to a digital euro. With the digital euro, however, the role of the central bank will not end with the printing, issuance and withdrawal of the (digital) banknotes, as it does with cash. Nor can a digital euro change hands without a technical device such as an app or card. Due to its digital form and the infrastructures needed for processing payments, a more complex business model is required than for cash. While the Eurosystem has a more important role than before, private intermediaries will form an integral part of the overall ecosystem. The digital euro could create new space for competition in payments – and at the same time offering new business opportunities for market participants.

Like cash, the digital euro as means of payment could be considered a public good that will not be handed out directly to the end user by central banks,

but distributed through intermediaries. After all, the Eurosystem does not operate its own ATMs for cash either. The involvement of intermediaries in getting the digital euro into circulation ought to be in the interests of both central banks and private solution providers. The Eurosystem will focus on its core tasks and avoid extending its footprint in the ecosystem too much. For efficiency reasons, it will be the private sector – already at the interface with end users – that runs distribution. For intermediaries, there may be benefits to retaining the key point of contact with end consumers who want to make payments, serving them and generating revenue from a stable client relationship.

The latter is important, of course, because without economic incentives intermediaries will not be eager to offer attractive services. They should therefore not consider the provision of digital euro services as a sort of obligation, but should explore the economic potential by developing and competing for creative solutions. However, the Eurosystem had made clear that, like cash, the digital euro, at least with regard to the basic functionalities, should be offered free of charge. This implies that intermediaries will not be allowed to charge private users for services like providing access to digital euro, apps, or for transferring the digital euro to other holders. Nevertheless, income should also be generated from simple payments by end customers, not just via more abstract benefits in terms of the banks' overall range of services, i.e. customer loyalty, cross-selling and the like.

**For all participating
businesses, there are
good economic reasons
to bet on the digital euro.**

Thus, as it is common practice in payments today, the (commercial) receiving side would have to pay fees for incoming payments and these fees will be distributed between the involved parties. Additional value-added services around payments will of course also be possible.

Now, where is the incentive for the receiving side if it is supposed to pay fees and so partly finance the system? For merchants, this is not an altogether unusual situation; they already pay service providers for processing cash or non-cash payments. However, the

digital euro is expected an attractive alternative to other non-cash payment services. Stronger competition on merchant fees is expected to emerge, both for payments in digital euro and indirectly for other means of payment.

Similar to cash, it seems straightforward that the Eurosystem would bear its own costs, balancing the overall cost in the entire ecosystem. The Eurosystem will be responsible for the settlement of payments in digital euro and also for managing the digital euro scheme. It could be expected that fees would not be charged for either service, given the currency's status as a public good. The Eurosystem is confident that the digital euro will see uptake and that favourable conditions and new services will be created for merchants by the industry.

Thus, for all participating businesses, merchants and payment providers alike, there would be good economic reasons to look forward to a digital euro, even for plain vanilla payment services, and regardless of additional value added services the industry might develop. Of course, not everything will stay the same with the digital euro – nor should it. New players and incumbents with a purely domestic focus today are invited to compete for end customers. They could quickly gain scale through the European reach of the project. Competition could become stronger and broader.

All participants in the digital euro ecosystem should internalise this outlook and start working on convincing solutions for customers, whether for merchants or for private users. It would be wise to move early and to get ahead of the game.



TIM HERMANS

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Towards the digital euro: our European digital public money

The ECB and the other central banks of the Eurosystem are currently conducting the investigation phase for the potential issuance of a digital euro. This phase, launched in autumn 2021 for a period of two years, aims to seek consensus on technical issues and to study the implications of issuing a digital currency on payment infrastructures, financial stability, and financial inclusion.

Simultaneously, a regular dialogue on a digital euro has been established between the Eurosystem and all market participants (See “Digital euro Project governance and stakeholders (europa.eu)”, ECB, 2022), including payment service providers, consumer representatives and merchants through the Market Advisory Group or the Euro Retail Payments Board at European level and the National Retail Payments Committee at the Belgian level. The work carried out by the Eurosystem, coupled with the lessons learned from the consultations, has thus allowed progress to be made in the design of a potential digital euro.

Among the decisions taken so far, the “transfer mechanism”, i.e., the procedure by which transactions and their validation are carried out, is a key

building block. As such, the Eurosystem has approved the further exploration of an “online third-party validated solution” and an “offline peer-to-peer validated solution”. In addition, it was decided that transactions would be settled at the Eurosystem level for online transactions and at the local storage device level for offline transactions. Transaction, liquidity, and user management tasks are to be carried out by supervised intermediaries (payment service providers), who would be the direct contact entities for private individuals, merchants, and companies seeking to handle a digital euro.

When it comes to privacy, the Eurosystem will further explore (i) selective confidentiality for low-value online payments and (ii) an offline functionality which ensures that the users’ balances and transaction data remain private. Further work is still needed to explore how both options could be activated, either under the current regulatory AML/CFT framework or under a new tailored regime.

The Eurosystem is conducting the investigation phase for the potential issuance of a digital euro.

Lastly, quantitative limits on holdings and remuneration-based tools were discussed, so as to prevent the rise of a structural substitution of commercial bank deposits, which could have an adverse impact on monetary policy, financial stability and credit flow within the real economy. Moreover, in order to prevent the potential quantitative limit on assets from becoming a transaction limit, the Governing Council agreed on the possibility of using the so-called “waterfall” and “reverse waterfall” functionalities, hence ensuring that end-users have the possibility of making/receiving a payment beyond the quantitative limit, using the linked commercial bank money account as a source/recipient.

On top of the above-described potential building-blocks of the digital euro project, in-depth work is also taking place in relation to the collaboration with selected market players for the construction and design of several user interface prototypes (front end infrastructure) according to the wide range of use cases, e.g., peer-to-peer online transactions (CaixaBank), peer-

to-peer offline transactions (Worldline), e-commerce transactions (Amazon), point-of-sale payments in physical shops (EPI & Nexi). The user interface prototype development exercise serves as a learning exercise. There are no plans to re-use the prototypes in later phases of the digital euro project.

In parallel to this, the Eurosystem has launched a market research exercise to gather feedback from relevant stakeholders and to obtain non-binding information on potential technical solutions, their possible costs and related planning considerations. This information will help the Eurosystem to gain a better understanding of the market’s knowledge and experience of solutions and technologies suitable for the potential implementation of a digital euro. The Eurosystem aims to entrust the development of the various components of a digital euro either to the market, to the ECB or to the Eurosystem national central banks for in-house development, considering, inter alia, the responses to the market survey.

Finally, the Eurosystem will decide in autumn 2023 whether to proceed to the experimentation and preparation phase. Should it decide to do so, this subsequent phase is expected to last approximately three years and aims to develop and implement the technical solutions and commercial arrangements needed to deliver the digital euro. In the meantime, the European Commission is working on creating the legislative basis for a digital euro.



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Retail CBDC as a safeguard against bank runs

Introduction

When retail CBDC was first proposed, many warned against it because it makes bank runs 'just a click away'. Then the Silicon Valley Bank and UBS collapse happened, which made it clear that bank runs are already a reality even without a CBDC. With electronic payments people do not need to line outside a bank for a bank run to occur anymore. All they have to do is connect to a bank account and they will wire money elsewhere in seconds.

Against this backdrop, I would argue that CBDC, if a bank run does occur, can make things better. Indeed, a CBDC would actually help to mitigate the potential trade-off that a Central Bank might face between financial stability, which could be jeopardized if no liquidity is provided to the failing bank, and control of monetary aggregates, which might be endangered by the additional influx of Central Bank money.

A toy economy

To make my point, I use a toy model to compare the consequences of a bank run with and without CBDC.

Here is my toy model. There is a Central Bank (CB), two commercial banks, Bank A (CBA) and Bank B (CBB), and a private

sector (PS) that includes all households and firms. There is no government, and commercial bank money is the only means of retail payment available. Banks hold reserves for their deposits to the tune of 10%. The CB has a bond worth 20 issued by the PS as assets and CBA and CBB reserves (10 each) as liabilities.

CBA and CBB are identical. Each has loans to the private sector worth 90 as assets and reserves held at the CB worth 10; they have deposits worth 100 as liabilities.

The PS has assets worth 200 (aggregated deposits) and liabilities worth 20 in bonds (bought by the CB) and 180 in loans from commercial banks.

CBDC does not cause bank runs; it mitigates the trade-off faced by a CB when a bank run occurs.

The monetary base (Mo) is 20; deposits are 200; M1 is 220. Banks do not hold spare reserves at the CB; thus the maximum amount of M1 is equal to the actual one.

A bank run when no CBDC is available

Assume a bank run occurs at CBA. Because there is no CBDC, the PS has no place to hide but in CBB. Thus the PS shifts its deposits from CBA to CBB, which in turn parks them at the CB. At this stage, Bank A is solvent but illiquid; obeying the Bagehot rule, the CB steps in with Emergency Liquidity Assistance (ELA), thereby preventing CBA from failing. The new state of the economy is:

Figure 1: Status of the economy after ELA (no CBDC is available)

CB		CBA	
A	L	A	L
20 A	20 R	90 L	100 D
90 ELA	110 R	10 R	90 ELA

CBB		PS	
A	L	A	L
90 L	100 D	200 D	20 A
10 R			180 L
100 R	100 D		

In this equilibrium Mo is 110. Total deposits are 200; M1 is therefore 310, larger than before the bank run. It is important to notice that CBB has excess reserves worth 90; thus the maximum amount of M1 is 1210 (110+110/0.1), much larger than the actual amount and than the pre-run amount. In order to preserve financial stability, the CB has to expand its balance sheet, thereby increasing the

actual and potential amount of money in the economy.

A bank run when CBDC is available.

Now let us assume that CBDC is available. When a bank run occurs, the PS could park its deposits in CBDC rather than at CBB (I assume it does so since CBDC is a risk-free asset). As in the previous case, the CB steps in to provide ELA to CBA, which is illiquid but not insolvent, thereby preventing it from going bankrupt. The status of the economy is now:

Figure 2: Status of the economy after ELA (CBDC is available)

CB		CBA	
A	L	A	L
20 A	20 R	90 L	100 D
90 ELA	10 R	10 R	90 ELA
	100 CBDC		

CBB		PS	
A	L	A	L
90 L	100 D	200 D	20 A
10 R		100 D	180 L
		100 CBDC	

The fact that the PS uses CBDC to park its funds implies that the amount of deposits in the banking sector declines and that there are no reserves in excess to be used to expand deposits and lending.

In this new equilibrium, Mo is still 110 (assuming CBDC is the monetary basis). Total deposits are 100 and M1 is therefore 210. The provision of liquidity to the illiquid bank does not imply an expansion of the money in the economy. Thus the existence of CBDC allows the CB to achieve both financial stability (CBA) and price stability (M1 does not increase, in fact it actually declines). This mitigation effect is even more evident when one looks at the maximum amount of M1 that can be created. In our example, the Mo would still be at 110 and the maximum amount of deposits would stay at 100, so that the maximum amount of M1 is still 210, much less than in the case without CBDC (1210).

Conclusions

This paper suggests that CBDC does not cause bank runs; it actually helps when a bank run occurs. Its existence mitigates the potential trade-off faced by the CB when dealing with a bank run: provide liquidity and thereby risking to lose control of money supply, or let the bank fail and put financial stability at risk

In more practical terms, this exercise suggests that limits on CBDC holdings, while protecting financial stability in normal times, might jeopardize it when a bank run occurs. Thus one could even consider removing them in specific situations such as a bank run.



CHARLOTTE HOGG

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Protecting consumers is key to digital euro project

The digital euro project holds great opportunity for Europe, and it can spur payment innovation and meet its intended public policy objectives—preserving the role of public money while addressing declining use of cash payments. Implementing a retail central bank digital currency (CBDC) is an immensely complex task and requires cooperation and partnership across the entire payment ecosystem.

A key part of this task is understanding the anticipated role of existing payment service providers. We see the role of payment networks, such as Visa, very clearly: we support the broader policy objectives of the digital euro and will extend the same protections and benefits that consumers currently enjoy to the digital euro.

Designing a system that significantly alters the payment landscape while mitigating financial system risk is a delicate dance, but achievable if certain principles are followed. We find the G7 Principles for Retail CBDCs provide a good guide for policymakers, particularly their focus on competition, resilience, cybersecurity, and privacy.

Fostering competition is the most fundamental principle for the project and for consumers: robust competition pushes service providers to bring their best capabilities and drive innovation. The best way to encourage competition for the Digital Euro is to leverage the existing and widely used acceptance infrastructure for digital payments. Further, by creating an open platform built on existing acceptance infrastructure, policymakers can tap into the already very competitive, innovative, and secure payment system.

Policymakers must also create a regulatory framework that ensures a level playing field for the payment ecosystem, both between providers (banks/fintechs) and currencies (commercial bank money/digital currencies). Regulations for the digital euro ecosystem should not sit separate from current rules governing the payment ecosystem: current rules and expectations should be extended to the digital euro. This includes considerations for licensing, oversight, pricing, and consumer choice. Ultimately, when the rules are fair and competition is healthy, consumers benefit the most.

Operational resilience and cybersecurity are also fundamental to the project and should be top of mind for every design consideration. A diverse payment system is a resilient payment system: having many providers with competing services creates natural redundancies and fail-safes and at the same time benefits consumers. This includes important value-added services such as enhanced risk analytics, which already serve a critical role in safeguarding consumers today.

CBDC design should protect consumers and through competition, resilience, cybersecurity and privacy.

Further, payment security requires significant, ongoing investment in public and private infrastructure. Initiatives to provide payment services for free or on a cost-recovery basis may put future innovation and security at risk. We believe that no service should be expected to be given at or below cost, including those provided by the Eurosystem. Integrating the digital euro into the existing payments regulatory framework will not only contribute to the overall success of the project but will also ensure the coexistence of central bank

money and commercial bank money. As ECB Executive Board member Mr. Fabio Panetta stated, the digital euro by design should not “crowd out existing private financial instruments.”^[1]

Privacy is also critical for both protecting consumers and maintaining trust in the payment system. Because the digital euro is intended to compliment and not replace cash, consumers will expect some of the same anonymity that cash holds. Of course, anonymity must be balanced with financial integrity considerations, but by default consumer data should be anonymized whenever possible.

Looking at additional ways to protect consumers, the digital euro should provide a clear framework for dispute resolution. Dispute resolution is integral to the current payment system and a key reason the success of digital payments. Consumers fundamentally expect that digital payments come with certain protections, and they will have these expectations for the digital euro.

Of course, dispute resolution is complex and like payment infrastructure requires ongoing investment. Policymakers have an important role to play in defining scheme rules but should ultimately leave the task of dispute resolution to the private sector, as providers will have clear market incentives to handle disputes efficiently and in the best interest of their customers.

Policymakers have a unique opportunity to meet policy objectives and foster innovation. Ultimately, we see the changing role of payment networks in the digital euro project as another important step forward in the ever-evolving payment system. We intend to work closely with the entire ecosystem to ensure consumers are as protected making purchases using the digital euro as they are making payments today.

[1] Fabio Panetta, “Bringing European payments to the next stage: a public-private endeavour,” 16 June 2022..



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A digital euro: leveraging synergies with instant payments

Central banks around the world are exploring the possible issuance of retail CBDCs, arguing a number of different reasons, such as a response to the threat from global stablecoins, preserving access to central bank money and the monetary anchor in a future cashless society, promoting financial inclusion and innovation in payments, with the background of the competition between central banks in CBDC issuance.

It makes sense for Europe to be prepared for the possible issuance of a digital euro: a decision that would be taken in due course and taking into account all the relevant factors. Nonetheless, one reason seems to be gaining particular weight in Europe as a driver for a retail CBDC: the current role of foreign players in the EU retail payments market and the lack of an independent pan-european payment solution. This would explain the focus of the digital euro project on more conventional use cases — peer-to-peer, in-store, e-commerce and government

payments — rather than on more innovative use cases, such as DLT-based programmable payments for the digital economy, which are the target of some global stablecoin initiatives.

It is certainly true that a digital euro could be the foundation of a pan-european payment solution that is independent from foreign providers and contributes to the strategic autonomy of Europe, a policy objective that has gained importance in the current geopolitical context. However, a digital euro is not the only way to achieve that goal: solutions based on instant payments can also cover the same use cases as a digital euro and do so across the EU.

Indeed, some Member States already have very successful instant payment solutions, like Bizum in Spain, which has more than 23 million active users and is now expanding into in-store payments. Moreover, the future regulation on instant payments, which is now being negotiated in the Parliament and the Council, aims to accelerate the rollout of instant payments and contribute to Europe's strategic autonomy.

**Instant payments would
make the deployment
of the digital euro faster
and more cost-efficient.**

Therefore, synergies between the digital euro and instant payments should be taken into account. The digital euro could leverage on the infrastructures and solutions already in place or being developed for instant payments — rather than building new ones from scratch —, and focus its efforts on where there is currently a gap: enabling the interconnection and interoperability between domestic instant payment solutions. This would facilitate the deployment of the digital euro in a more cost-efficient way and allow it to gain traction more quickly. Furthermore, it would enable pan-european payments in either digital euros or commercial bank money, increasing consumer choice and overcoming the existing fragmentation in instant payment solutions.

Banks would play a key role in such an ecosystem, as distributors of the digital euro — in charge of customer onboarding, KYC, management of accounts/wallets, etc. — and providers of all the associated payment services and tasks. This involves significant costs for which intermediaries will

need to be compensated to make the whole environment sustainable.

The compensation model should be aligned with that of existing payment services, where there is intense competition in the provision of acquiring services to merchants, as well as incentives for the issuing side of the market, subject to appropriate competition safeguards such as in the Interchange Fee Regulation. Incentives for issuers are essential in any payments market to build network efforts, but will be even more important in the distribution of the digital euro if it is aimed to be free for basic use by citizens.

Costs are of course a key feature for consumers, but not the only one: privacy stood out in an ECB public consultation as the most important feature of a digital euro for citizens, and will likely be a subject of intense debate looking forward. Therefore, it is worth noting that existing payment solutions already provide very high privacy standards, ensured by GDPR, while complying at the same time with AML/CFT rules. This should also be the basis for the design of the digital euro: with privacy at the core but without compromising AML and fraud prevention efforts.

In addition, access to payments data allows banks to offer greater personalization and new value-added services, such as financial advice or sustainability-related recommendations.

Therefore, consumers should always be able to decide whether their data from digital euro transactions can be used for additional purposes, as it is currently the case with other other payment solutions. This is consistent with data privacy principles, by providing individuals with control over their data, as well as with the EU objective of promoting data-driven innovation in Europe.