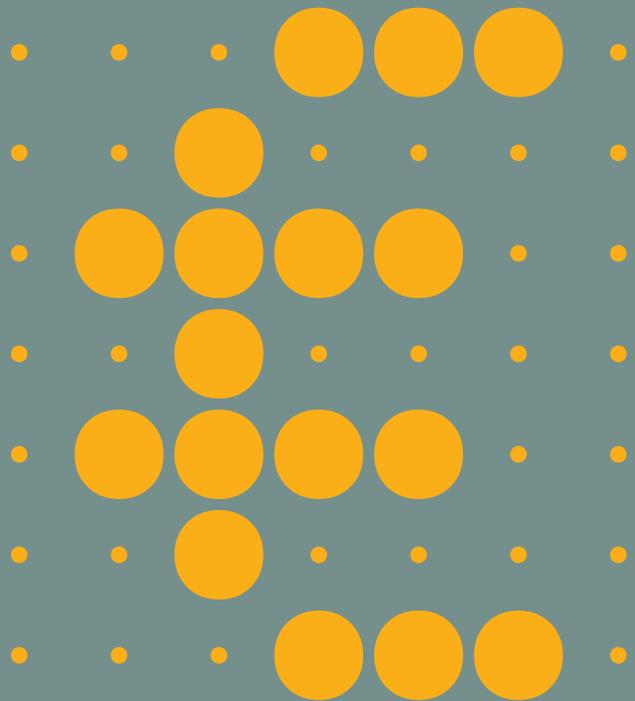


# Establishing a Digital Euro

How to Ensure  
Financial Sovereignty  
in the Digital Realm

September 2021





# Foreword

**THE ESTABLISHMENT** of an economic and monetary union has been at the heart of the European Project since its very inception. The introduction of a common currency, the Euro, marked a historic step towards an ever-closer common market, stable monetary policies and continental Europe's capacity to compete in the global financial and economic system. Since then, Europe's monetary system has been confronted with two decades of increased economic turbulence, uncertainty and crisis, but the European Central Bank (ECB) and the Eurosystem<sup>1</sup> have proven that the Euro is a resilient currency, providing price stability and facilitating inner-European and international trade. The Euro now stands as a central pillar of Europe's political strength in the international arena.

However, there is no guarantee that the Euro's strength can last, and a key cause is the digital transformation of global finance. The nature of money is rapidly changing. Therefore, time is of the essence and the ECB must move fast with the Digital Euro while working in a risk-taking and explorative, yet consensus-based, approach. New actors, services, technologies and consumer needs are supercharging the digitalization of our financial system with little regulatory supervision nor public inclusion. Private, decentralized and mostly foreign players dominate this digitization of finance, and Europe's digital sovereignty and strategic financial autonomy is threatened more than ever. The European Union (EU) is growing concerned that its citizens, businesses and EU member states are gradually losing control over: their data, their capacity to innovate and their ability to shape and enforce legislation in the digital realm closely linked to the Euro. Coupled with Europe's already diminishing power in key areas such as capital markets or payment systems, this growing threat will accelerate in the near future unless bold moves are taken.

---

<sup>1</sup> The Eurosystem comprises the ECB and the National Central Banks (NCBs) of the countries that have adopted the euro. The Eurosystem and the ESCB will co-exist as long as there are EU Member States outside the euro area.

<https://www.ecb.europa.eu/ecb/orga/escb/html/index.en.html>



**Prof. Dr.  
Friedbert Pflüger**  
Chairman  
Internet Economy  
Foundation



**Dr. Klaus Hommels**  
Founder and  
Chairman of  
Lakestar

Across the globe, new businesses are focused on the tokenization of commodities to lower the cost of trade and guarantee faster settlement. To ensure that European consumers and market actors continue to have unfettered access to central bank money in a way that meets their needs in the digital age, European governments are intensively exploring central bank digital currencies. Europe needs its own Central Bank Digital Currency (CBDC) as soon as possible to seize the unprecedented opportunity to strengthen its digital infrastructure, its (digital) economy and technological competitiveness.

The Internet Economy Foundation is dedicated to helping ensure Europe's place in a global digital economy – one marked by free and fair competition and European values. Our focus is on key issues central to developing a vibrant digital ecosystem in Europe and its member states, like digital infrastructure and data policy. Until now, we have not weighed in on matters of monetary policy nor currency design. But just as “software eats the world,” developments in the digital economy have now made clear that money itself is simply another piece of data. And if money can now be programmed, how should Europe program the Euro?

We have therefore prepared this policy paper to help decision makers and financial experts across Europe understand the key concepts and crucial choices ahead on the path to a Digital Euro, especially from the point of view of Europe's flourishing digital ecosystem. If Europe moves wisely and boldly to establish the Euro's place in this new digital realm, it could help unleash a wave of growth and innovation, spurring new products, services and its own global players. We hope that this policy paper will inspire debate and discussion and ultimately contribute to this decisive moment in European history.

# Contents

<b>1</b>	<b>INTRODUCTION</b>	<b>Page 7</b>
<b>2</b>	<b>DIGITAL (CENTRAL BANK) CURRENCIES AND THEIR ROLE IN THE INNOVATION ECONOMY</b>	<b>Page 18</b>
<b>3</b>	<b>THE (GEO-)POLITICS OF DIGITAL CURRENCIES</b>	<b>Page 27</b>
<b>4</b>	<b>WHERE DOES THE ECB GO FROM HERE?</b>	<b>Page 35</b>
<b>5</b>	<b>POLICY RECOMMENDATIONS &amp; CONCLUSION</b>	<b>Page 45</b>
	List of Abbreviations	<b>Page 49</b>



# 1 INTRODUCTION

A new type of money is being explored by monetary authorities and institutions around the world<sup>2</sup>: Central Bank Digital Currencies (CBDCs). More than a new buzzword, CBDC is a good case study for understanding the multiple challenges and opportunities that a digital innovation brings to an economy and society.

Digital money has been around for decades. It has either been within customer balances sheets in commercial banks, or within the reserves that Central Banks issue to commercial banks. But the digitalization of the financial sector is about to open an entirely new chapter: with CBDCs, everyday citizens and the business world will gain direct access to Central Bank money for the very first time in history. Though this concept was first proposed by James Tobin<sup>3</sup> in the 1980s, it has taken decades of technological advancement to finally implement his idea.

Over previous decades, technology companies have already developed a more convenient use of money, facilitating transactions and providing efficient alternatives for secure digital payments. Companies like Mastercard and Visa positioned themselves as the operators of payment systems via financial innovation that changed the game for finance. They made online banking possible, as well as many of the innovations consumers use today. Shortly after they introduced digital credit cards, the fintech pioneer Paypal became the next technology company to disrupt finance. Paypal worked towards facilitating payment services on top of MasterCard and Visa at first, but quickly moved directly to consumers' bank accounts providing a secure digital interface.

There are now new players in the money market, cryptocurrencies (also referred to as 'crypto'). These are privately-issued digital assets that use cryptography to secure transaction records in peer-to-peer payments.

---

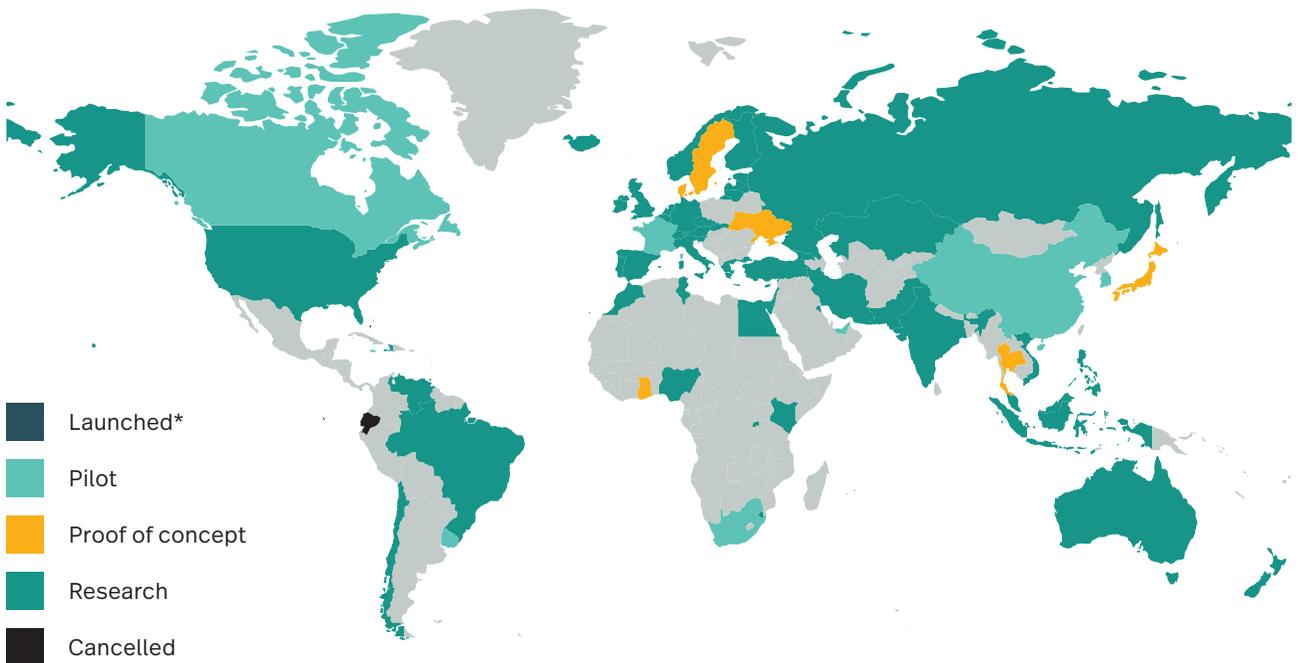
<sup>2</sup> See Fig. 1 for status check on CBDCs projects around the World.

<sup>3</sup> "The case for preserving regulatory distinctions", Tobin, J (1987)

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.555.3159&rep=rep1&type=pdf>

Even if not legal tender in most jurisdictions, they constitute another medium of exchange, and due to their programmability and privacy features, end-consumers find them increasingly attractive. While some claim that cryptocurrencies simply represent a speculative asset class without actual relevance for economic, financial and technological activity, others see their underlying potential. Crypto is opening up a new world for securely trading value. Most cryptocurrencies use Decentralised Ledger Technology (DLT) and blockchain as their operating system. This allows simultaneous access across a network of multiple entities for the

**Fig. 1: Today's Central Bank Digital Currencies Status**



\* Currently only the Bahamas are listed as having launched a CBDC.

Source: <https://cbdctracker.org>

validation of transactions and immutable record updating. It is a new type of infrastructure that has become highly relevant for startups and scaleups, and increasingly for the traditional economy as a whole<sup>4</sup>.

### Info Box 1

**Distributed ledger technology (DLT)** uses independent computers (referred to as nodes) to record, share and synchronize transactions in their respective electronic ledgers (instead of keeping data centralized as in a traditional ledger).

**Blockchain** is one type of a distributed ledger that organizes data into blocks, which are chained together in an immutable mode.

Blockchain and DLT are the building blocks of the “Internet of value” (See Info Box 2), and enable the recording of interactions and transferring of “value” from peer-to-peer, with no need for a centrally coordinating entity. “Value” refers to any record of ownership of assets – for example, money, securities, land titles – and also ownership of specific information like identity, health information, and other personal data.

DLT has the potential to fundamentally change the financial sector, making it more efficient, resilient and reliable. This could address persistent challenges in the financial sector and change the roles of financial sector stakeholders. Opportunities for deployment of DLT within various other sectors like manufacturing, government financial management systems and clean energy are tremendous as well.

Source: World Bank<sup>5</sup>

---

<sup>4</sup> “European Commission Blockchain Strategy”

<https://digital-strategy.ec.europa.eu/en/policies/blockchain-strategy>

<sup>5</sup> See: “Blockchain & Distributed Ledger Technology (DLT)”

<https://www.worldbank.org/en/topic/financialsector/brief/blockchain-dlt>

The primary goal of a Central Bank remains: to maintain monetary stability and the functioning of the overall payment systems. In response to the challenges from new technologies and the rise of private monies, electronic commerce and digital services with their related data privacy concerns<sup>6</sup>, Central Banks have now started exploring the creation of their own digital currency. For some countries, the continued decrease of cash use has contributed to accelerating the need for a CBDC. One example is Sweden, where the cash in circulation has been reduced by more than half over the last decade.<sup>7</sup>

### 1.1 The Two Most Relevant CBDC Projects to Date

Two major CBDC projects are currently being developed by the U.S. and China. In the U.S., the “Digital Dollar Project” explores the establishment of a tokenized US dollar (USD). Its whitepaper<sup>8</sup> outlines the benefits of a CBDC within the context of the USD, and proposes potential use cases and pilots. The paper ultimately explores how a so-called “champion-model” of a tokenized USD could provide societal and economic benefits while operating alongside existing monies and supporting the USD as the world’s reserve currency.

The People’s Bank of China (PBoC) project is at a particularly advanced stage. To date, pilots of the Chinese project, Digital Yuan (e-CNY) have been launched on an experimental basis in 5 major cities (although this number is changing as they add more regions)<sup>9</sup>. Here, the introduction of a CBDC can be observed in a highly digitised economy and in a society

---

<sup>6</sup> “Digital sovereignty for Europe” [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS\\_BRI\(2020\)651992\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS_BRI(2020)651992_EN.pdf)

<sup>7</sup> “Withering cash: Sweden seems special rather than ahead of the curve” <https://voxeu.org/article/withering-cash-sweden-seems-special-rather-ahead-curve>

<sup>8</sup> “Digital Dollar Project” <https://digitaldollarproject.org/exploring-a-us-cbdc>

<sup>9</sup> These cities are Beijing, Changsha, Shanghai, Shenzhen, Suzhou.

See: “Shanghai digital yuan trial extends pilots to more than 2 million people” <https://www.ledgerinsights.com/shanghai-digital-yuan-2-million-people-cbdc-china-currency>

with widespread use of private digital payment services.<sup>10</sup> Up to this point, it is not intended to fully replace physical cash but to be treated as a legal tender. The digital currency is currently being operated and exchanged by authorized operators including commercial banks, payment service providers (PSPs) and other private sector actors.

On a global level, other Central Banks and international institutions are also exploring the introduction of digital versions of legal tenders. They are doing this so that CBDCs would be liabilities of the Central Banks and thus fully backed and risk-free assets. The detailed designs of these currencies remain unclear to date, since they are highly dependent on the specific requirements and characteristics of each currency area. Each government follows different motivations and objectives with regard to the issuing of these CBDCs. However, a survey<sup>11</sup> by the Bank of International Settlements (BIS) highlights *payment efficiency and safety/robustness* as the main reasons behind the possible introduction of CBDCs in Advanced Economies and Emerging Markets and Developing Economies<sup>12</sup> (See Fig. 2).

---

**10** “Rise of the central bank digital currencies: drivers, approaches and technologies”

<https://www.bis.org/publ/work880.pdf>

**11** “Ready, steady, go? – Results of the third BIS survey on central bank digital currency”

<https://www.bis.org/publ/bppdf/bispap114.pdf>

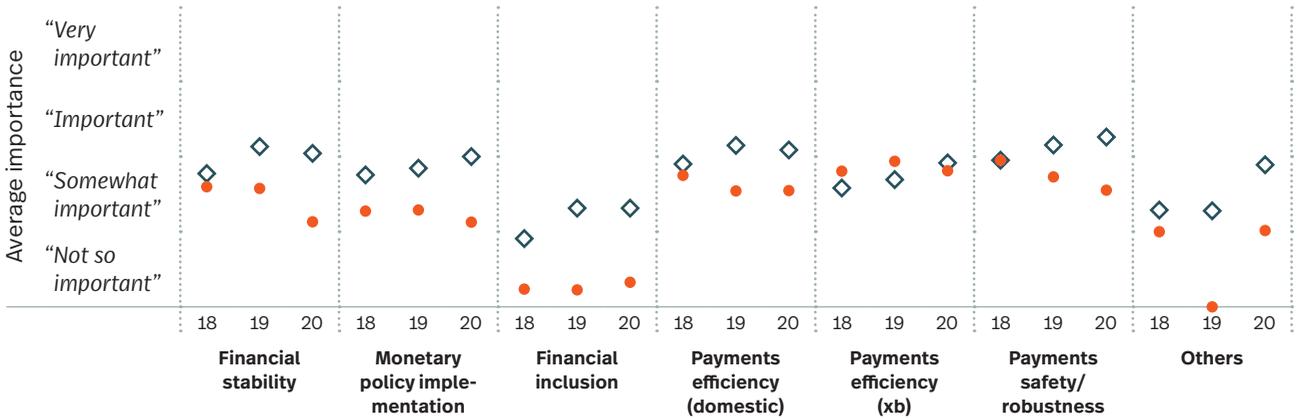
**12** It should be noted that EMDEs have unique reasons to issue a CBDC due to their low-rates of financial inclusion. However, since the scope of this paper is limited to the digital Euro, this level of analysis is not included in this study.

**13** See: “Ready, steady, go? – Results of the third BIS survey on central bank digital currency”

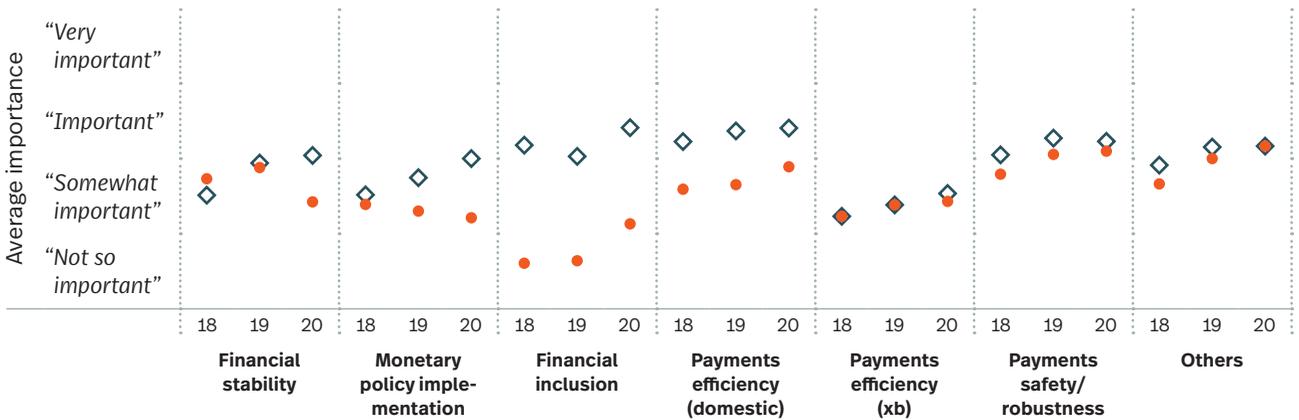
<https://www.bis.org/publ/bppdf/bispap114.pdf>

**Fig. 2: Motivations for issuing a wholesale or retail CBDC**

**Motivations for issuing a wholesale CBDC**



**Motivations for issuing a retail CBDC**



- Advanced Economies
- ◇ Emerging Markets and Developing Economies

Source: BIS (2021)<sup>13</sup>

## 1.2 The Digital Euro Project

For the eurozone, the European Central Bank's Governing Council<sup>14</sup> started to explore the introduction of a Digital Euro in the Eurosystem and created a High-Level Task Force on the topic in 2019<sup>15</sup>. The release of the Eurosystem's October 2020 report<sup>16</sup> on a Digital Euro can be considered the first formal step towards the potential issue of a Digital Euro. This report made clear that the Digital Euro would be central bank money made available in digital form "complementing cash (and deposits)" for use in retail payments while supporting the digitalisation of the European Economy and preempting the uptake of foreign currencies.

In a second formal step, the ECB revealed after a public consultation<sup>17</sup> that a well-designed Digital Euro can and must provide privacy, security and the ability to pay across the euro area in a cash-like manner. In parallel, the Digital Euro must also remain integrated with existing payment solutions.

In mid-July 2021, the ECB formally announced<sup>18</sup> how it wants to introduce the Digital Euro. The Governing Council of the ECB has launched a 24-month investigation phase of the Digital Euro Project where "key issues regarding design and distribution" will be addressed. The design will be based on previous input from citizens during the consultation period

---

**14** The Governing Council is the main decision-making body of the ECB. It consists of the six members of the Executive Board, plus the governors of the national central banks of the 19 euro area countries.

**15** Interview with Christine Lagarde. See: <https://www.ecb.europa.eu/press/inter/date/2020/html/ecb.in200108~f3ba434000.en.html>

**16** "Report on a Digital Euro"

[https://www.ecb.europa.eu/pub/pdf/other/Report\\_on\\_a\\_digital\\_euro~4d7268b458.en.pdf](https://www.ecb.europa.eu/pub/pdf/other/Report_on_a_digital_euro~4d7268b458.en.pdf)

**17** "Report on the public consultation on a Digital Euro"

[https://www.ecb.europa.eu/paym/digital\\_euro/html/pubcon.en.html](https://www.ecb.europa.eu/paym/digital_euro/html/pubcon.en.html)

**18** "Eurosystem launches digital euro project"

<https://www.ecb.europa.eu/press/pr/date/2021/html/ecb.pr210714~d99198ea23.en.html>

and technical advice from the Market Advisory Group (MAG)<sup>19</sup> supported by the Euro Retail Payments Board (ERPB).

While there are numerous motivations for issuing CBDCs, the key potentials of the Digital Euro include:

- Secure a place for the Euro as a global reserve currency and its relevance in international trade
- Enable global access to Central Bank money and provide resilience in the payment system by reducing the “too-big-to-fail” problem
- Strengthen monetary policy effectiveness: access to more detailed real-time data, better monitoring of the performance of the monetary instruments, i.e. by having a remunerated CBDC, and targeted policies thanks to programmability
- Address competition from the new forms of money not denominated in Euros that threaten monetary and digital sovereignty in the Euro area
- Improve cross-border and domestic payment efficiency
- Secure compatibility between financial infrastructures and the data and machine economy, e.g. for Internet of Things (IoT)
- Distribute stimulus payments
- Support digitalisation yet remain easily accessible to increase financial inclusion
- Provide a digital alternative payment method in the event of a significant decline of cash usage

---

<sup>19</sup> MAG attempts to tap market intelligence and professional expertise with a view to determining the value that a Digital Euro could add for stakeholders. See: Mandate of the Digital Euro Market Advisory Group (MAG). [https://www.ecb.europa.eu/paym/digital\\_euro/mag/shared/files/digital\\_euro\\_mandate\\_mag.pdf](https://www.ecb.europa.eu/paym/digital_euro/mag/shared/files/digital_euro_mandate_mag.pdf)



Ultimately, the Digital Euro has the potential to **reaffirm the Euro as an influential global currency, strengthen its digital infrastructure and secure its position within the booming digitalization of global finance.**

The U.S. and China appear to have secured a place at the very top of the race for Central Bank digital money. The U.S. has recognised the implicit geopolitical threats and is increasing the pace and resources of its own projects in the field. Europe is in danger of severely falling behind – not only in the international payment arena, but also in the bigger context of its goal for digital sovereignty. If Europe is not prepared for the future of money, the Eurosystem will have to accept foreign values and decisions as its societies and businesses adopt new types of monetary systems and infrastructures – all developed and operated outside its circle of influence.

If Europe and the ECB want to foster the Euro as a future-oriented stable currency, the window of opportunity is now to secure the Euro's position as an internationally relevant currency and embrace its technological importance for Europe's digital economy as a whole.

# 2

## **DIGITAL (CENTRAL BANK) CURRENCIES AND THEIR ROLE IN THE INNOVATION ECONOMY**

## 2.1 Digital Currencies over Time

Since the 1960s, the financial system has become evermore complex. However, it has not undergone any profound structural changes that would make it fully compatible with or fit for the Internet of Value era that we are now entering. Over the last 30 years, different private initiatives have arisen to tackle this, and proposals from the public sector, more concretely Central Banks, are gaining momentum today.

### Info Box 2

**The Internet of Value (IoV)** refers to an online space in which individuals can instantly transfer value between each other, negating the need for a middleman and eliminating all third-party costs. In theory, anything that holds monetary or social value can be transferred between parties.

Source: Financial Monthly<sup>20</sup>

The first cryptographic algorithms that support cryptocurrencies were developed in the 1980s. Currencies for the Internet age started emerging in the early 1990s with *electronic cash*<sup>21</sup> payment systems for electronic commerce, modelled after cash<sup>22</sup>. By the turn of the millennium, *Bit Gold*<sup>23</sup> was designed: a decentralised mechanism for digital currencies where participants would dedicate computer power to solving cryptographic puzzles. These private initiatives were the first exploratory steps towards

---

<sup>20</sup> See: “What Is The Internet Of Value And How Will It Impact Finance?”  
<https://www.finance-monthly.com/2018/03/what-is-the-internet-of-value-and-how-will-it-impact-finance>

<sup>21</sup> “How to make a mint: The cryptography of anonymous electronic cash”  
<https://groups.csail.mit.edu/mac/classes/6.805/articles/money/nsamint/nsamint.htm>

<sup>22</sup> One of the most concrete examples is Mondex, later acquired by Mastercard.

<sup>23</sup> “Bit Gold and Bitcoin”  
<https://medium.com/@insearchofsatoshi/bit-gold-and-bitcoin-9357176cd420>

what would become the first cryptocurrency to gain widespread traction in 2008: the Bitcoin.

Bitcoin, a *Peer-to-Peer Electronic Cash System*, was born first as an anonymous white paper that was published in the context of the Global Financial Crisis, the biggest recession since the Great Depression. Constant bailouts of banks laid bare the shortcomings of the global financial system and its fractional reserve structure. As a result, Bitcoin was perceived by many as a private democratic solution to a public problem. The aim of its open source software was to democratise the use of secure money, provide a certain level of anonymity in the transaction and offer tamper-proof global access to the value network.

## 2.2 The Rise of Decentralised Finance as an Innovation Driver

Many other variations of privately issued cryptocurrencies were subsequently created, but one of the most important advancements happened in 2015 with the launch of the Ethereum blockchain, which was optimised for programmability. Ethereum's use of DLT allows it to create applications that adjust to different needs of the platform economy and thus opened up new possibilities for programmable money and Decentralised Finance (DeFi) – see Info Box 3. In other words, Ethereum essentially created a network for decentralized applications to run on, expanding the size, influence and possibility for DeFi as a whole. With the COVID-19 crisis, a large disruption of the global economy, access to the digital economy has become even more relevant; in fact, the crisis has accelerated the trend towards convenient, fast and contactless digital payment. This has contributed to more mainstream adoption of DeFi<sup>24</sup>. Today, many users actively operate in the decentralised economy, and one of the first nations in the world, El Salvador declared Bitcoin to be legal tender<sup>25</sup>.

---

<sup>24</sup> “COVID-19 Incentivizing Crypto and Leading Mainstream Adoption”  
<https://cointelegraph.com/news/covid-19-incentivizing-crypto-and-leading-mainstream-adoption>

<sup>25</sup> “El Salvador Becomes First Nation to Make Bitcoin Legal Tender”  
<https://www.nytimes.com/2021/06/09/world/americas/salvador-bitcoin.html>

### Info Box 3

**Decentralized Finance (DeFi)** is an umbrella term for financial services offered on public blockchains. Like traditional banks, DeFi applications allow users to (among other things) borrow, lend, earn interest, and trade assets and derivatives. The collection of services is often used by people seeking to borrow against their crypto holdings to place even larger bets.

There are two key differences from mainstream banks: All services are for digital currencies instead of government-issued ones such as the dollar and the euro, and there is no intermediary or centralized system through which transactions are processed. Users typically access DeFi platforms through software known as dapps, or decentralized apps, most of which run on the Ethereum network. They connect their digital wallet to the app and select a service from a drop-down menu. Functions handled at a traditional bank by a loan officer or teller are automated.

Source: Wall Street Journal 2021<sup>26</sup>

An example of a widely used DeFi product includes decentralized money markets, which enable users to lend and borrow cryptoassets through over-collateralized loans. These markets aim to provide lenders with a source of high yield and give borrowers access to working capital in a permissionless, censorship-resistant<sup>27</sup>, and transparent manner. On-chain programmatic code provides the core business logic while Chainlink's

---

<sup>26</sup> See: "DeFi Is Helping to Fuel the Crypto Market Boom—and Its Recent Volatility" <https://www.wsj.com/articles/defi-is-helping-to-fuel-the-crypto-market-boom-and-its-recent-volatility-11622712602>

<sup>27</sup> Censorship-resistance concept: Censorship-resistance is the degree to which a system ensures continual open access to its services. Censorship-resistant systems are resilient against unwanted tampering that could adversely affect the user experience by limiting accessibility.

price oracle networks<sup>28</sup> are used to secure the loan issuance and liquidation processes for markets<sup>29</sup>, helping to ensure solvency even during market volatility. With the added security, these decentralized money markets have been able to reliably support tens of billions of dollars in user deposits.

### 2.3 Businesses Create Their Own Currency

The increasing adoption of cryptocurrencies as a medium of exchange and the market share of related businesses in the tech industry bring new regulatory challenges and opportunities. After years of institutional backlash and rejection from commercial banks facing a possible disruption of their business model in private money creation, many non-crypto-native companies have also experimented with creating their own coins (See Info Box 4).

The most prominent and politically contested example is Diem.<sup>30</sup> In 2019, the Facebook conglomerate announced the global launch of its own DLT based cryptoasset (previously known as Libra). Facebook designed Diem in part to harness its position as the world's biggest social media network, with roughly 3.45 billion monthly active users.<sup>31</sup> It is worth noting that Facebook's core products span beyond its eponymous social network and include Instagram, WhatsApp, Messenger and the Oculus platform. Facebook's plan to back its crypto asset with government bonds and several fiat currencies alarmed financial authorities and governments worldwide. Politicians feared that if the conglomerate introduced Diem, Facebook's 3.45 billion monthly active users would operate in an unregulated parallel economy using a type of money not considered legal tender. Diem and

---

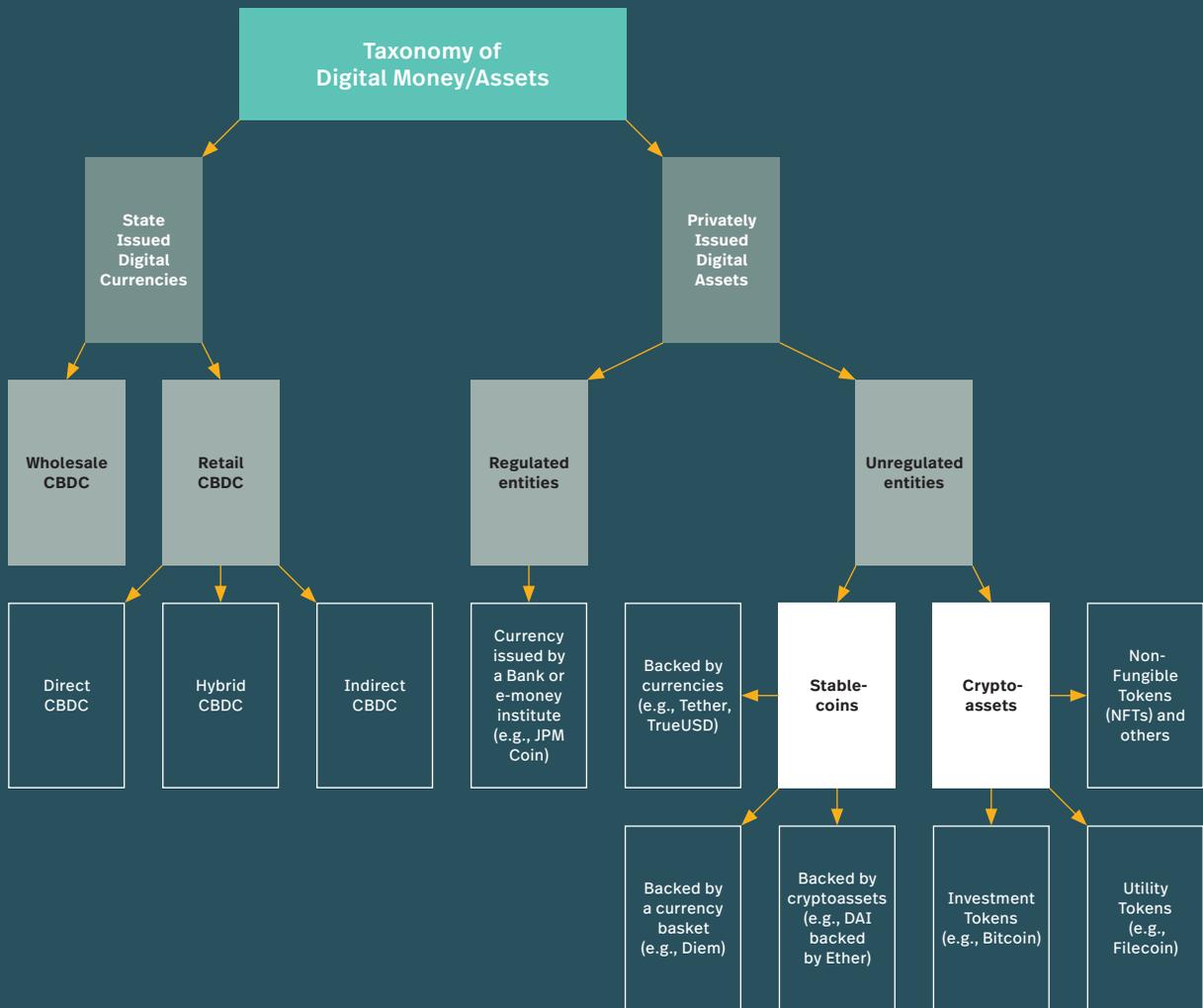
**28** Oracle networks are secure middleware that facilitates communication between blockchains and any off-chain system, including data providers, web APIs, enterprise backends, and more. See: <https://blog.chain.link/what-is-the-blockchain-oracle-problem>

**29** Examples are Aave and Compound Lending, Borrowing DeFi platforms.

**30** Diem Association <https://www.diem.com/en-us>

**31** "Number of monthly active Facebook users worldwide as of 1st quarter 2021" <https://www.statista.com/statistics/264810/number-of-monthly-active-facebook-users-worldwide>

Info Box 4



Source: adaptation from Gross et. al 2020<sup>32</sup>

other stablecoins are increasingly perceived as threats to financial and monetary stability, but with a proper regulatory framework for innovation and standards for interoperability, the competition they represent can open the door to fruitful private-public collaboration<sup>33</sup>.

#### Info Box 5

**Crypto Asset** denotes any asset recorded in digital form that is not and does not represent either a financial claim on, or a financial liability of, any natural or legal person, and which does not embody a proprietary right against an entity. Cryptographic techniques are used to replace the trusted bookkeeper in the recording of crypto-assets, with a view to: i) ruling out any unexpected increase in crypto-assets issued on a distributed ledger, and ii) getting the network of users to agree on who owns what (further eliminating the need for a trusted bookkeeper). A distributed ledger is essentially a record of information – or database – that is shared across a network of users, eliminating the need for a central party to deal with the validation process.

Source: ECB 2019<sup>34</sup>

---

<sup>32</sup> See: "The Digital Euro and the Role of DLT for Central Bank Digital Currencies"  
[http://explore-ip.com/2020\\_The-Digital-Euro-and-the-Role-of-DLT-for-Central-Bank-Digital-Currencies.pdf](http://explore-ip.com/2020_The-Digital-Euro-and-the-Role-of-DLT-for-Central-Bank-Digital-Currencies.pdf)

<sup>33</sup> Shaping Europe's digital future: Blockchain Strategy  
<https://digital-strategy.ec.europa.eu/en/policies/blockchain-strategy>

<sup>34</sup> "Understanding the crypto-asset phenomenon, its risks and measurement issues"  
[https://www.ecb.europa.eu/pub/economic-bulletin/articles/2019/html/ecb.ebart201905\\_03~c83aeaa44c.en.html](https://www.ecb.europa.eu/pub/economic-bulletin/articles/2019/html/ecb.ebart201905_03~c83aeaa44c.en.html)

Recently, private companies have developed DLT-based platforms that support smart payment solutions and industrial digital products. This is noteworthy for the EU considering its goal of digital sovereignty: if the ECB creates its own natively-digital money, a Digital Euro that matches the needs of this growing tech industry, it can assure the presence of the Euro as legal tender in newly created payment solutions. This will allow European developers and those using IoT and machine-to-machine (M2M) payments in their products – or more importantly, the startups and companies who want to interact with them – to integrate legal tender into their infrastructure and products. In other words, the availability of an official and stable Digital Euro will significantly ease processes in terms of costs and regulation, and underlines the entire value-add a European CBDC could generate for the digital economy as a whole.

A successful example of a DLT-based platform that supports smart payment solutions is Daimler Trucks and Commerzbank's 2019 pilot project. The project allowed Daimler Trucks to carry out fully automated payments to electronic charging points without any human intervention. It tested a blockchain-based payment solution for automated machine-to-machine payments.<sup>35</sup> In this case, Commerzbank, who has developed additional blockchain-based products and services with Continental and Siemens,<sup>36</sup> issued a digitised form of the Euro in a blockchain that enabled payment between machines.

---

<sup>35</sup> “Commerzbank is testing blockchain-based machine-to-machine payment for the first time”  
<https://www.lifepr.de/inaktiv/commerzbank-aktiengesellschaft-frankfurtmain/Commerzbank-testet-erstmal-Blockchain-basierte-Maschine-zu-Maschine-Zahlung/boxid/762580>

<sup>36</sup> “Commerzbank, Evonik and BASF conduct first blockchain technology and programmable money test to manage supply chain processes between companies”  
[https://www.commerzbank.de/en/hauptnavigation/presse/pressemitteilungen/archiv1/2021/2\\_quartal/presse\\_archiv\\_detail\\_21\\_02\\_97290.html](https://www.commerzbank.de/en/hauptnavigation/presse/pressemitteilungen/archiv1/2021/2_quartal/presse_archiv_detail_21_02_97290.html)

## In a Nutshell: Comparing the Traditional Euro, the Digital Euro and Private Crypto Currencies

	<b>The traditional Euro</b>	<b>What the Digital Euro (as a retail CBDC) can become</b>	<b>Non-government issued/ Decentralised Crypto-currencies (Bitcoin, ETH)</b>
<b>Backed by</b>	Central Bank-backed or liability of supervised private entities	Central Bank-backed	Not a liability of any entity
<b>Access</b>	Central Bank money access only through commercial banks	Direct access to risk-free Central Bank money	No access to Central Bank money
<b>Form</b>	Provided in digital and physical form	Provided in digital form and potential to design for functional offline use	Only accessible in digital form
<b>Infrastructure</b>	Central and commercial bank databases	Based on traditional central bank database or based on a permissioned DLT	Most relevant cases use DLT
<b>Availability</b>	Deposits subject to payment system operating hours and cash availability 24/7	Available 24/7	Available 24/7
<b>Anonymity</b>	With deposits: all participants in the transaction are known. With cash: all participants are anonymous in the network.	Designed with a certain level of anonymity: Users are either known to the central bank or intermediaries, or could be anonymous to counterparties.	Usually pseudo-anonymity: transactions can be traced but not be linked to users.
<b>Programmability</b>	Not programmable	Programmable and not programmable	Programmable
<b>Interoperability</b>	Not interoperable with IOT & M2M ecosystems	Can be programmed to operate with IOT & M2M ecosystems	Operate with IoT & M2M ecosystems

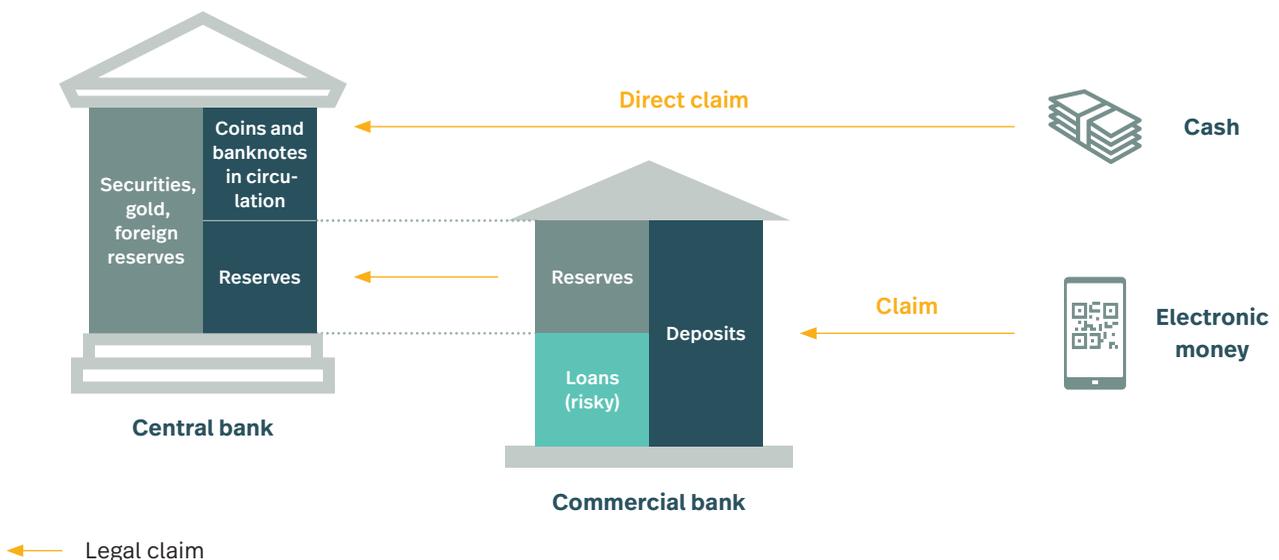
# 3

# THE (GEO-)POLITICS OF DIGITAL CURRENCIES

In order to understand the impact of a Central Bank digital Euro, it is important to first understand how money is created today, and that our current financial system is based on debt creation in the economy. Since the abolition of the gold standard in the early 1970s, cash is no longer backed by gold but generated by Central Banks through lending activities or by purchasing assets such as government bonds.<sup>37</sup> Commercial Banks support their operations by using Central bank money to settle interbank

<sup>37</sup> “The Digital Euro and the Role of DLT for Central Bank Digital Currencies”  
[http://explore-ip.com/2020\\_The-Digital-Euro-and-the-Role-of-DLT-for-Central-Bank-Digital-Currencies.pdf](http://explore-ip.com/2020_The-Digital-Euro-and-the-Role-of-DLT-for-Central-Bank-Digital-Currencies.pdf)

**Fig. 3: Cash vs electronic money in today’s two-tier monetary system**



**Source:** economy adaptation from Auer and Böhme (2020)<sup>38</sup>

payments. Central Banks provide banknotes, enable money convertibility and offer liquidity through the lender of last resort when in contingencies. This allows loans to be backed by risky deposits, see Fig. 3, and creates an excessive debt in the private sector that has historically been transferred to the public sector via bank bailouts during financial and economic crises. This cycle results in a very fragile type of money, where small shocks in the financial system can have disproportionately large effects on the economy.

### 3.1 Central Banking and the Birth of the Chicago Plan

To avoid shocks like this, money could be created in a different way, and the idea for a new form of money creation without debt creation dates back to the US Great Depression. It began with a market crash in 1929 and brought to light the fragilities of the banking system that, at that time, was not even close to the complexity and regulations we know today. One of the reforms proposed back in the 1930s to help avert a future cyclical crisis was The Chicago Plan, a collection of banking reforms suggested by University of Chicago economists to the US government. This proposal did not result in a new legislation;<sup>39</sup> however, it did introduce the concept of *full-reserve banking*<sup>40</sup>, a different way of creating money in the economy. Full-reserve banking called for the separation of monetary and credit functions in the banking system by requiring 100% of deposits in commercial banks to be backed by reserves. Essentially, when money is created in such a system, there is no debt creation while issuing money, and the Central Bank is therefore the sole issuer of money in the economy – unlike our current system where commercial banks issue money for people and businesses. The Chicago Plan was never developed further, but the idea was kept alive in research for decades to follow.

---

38 See: “CBDC architectures, the financial system, and the central bank of the future”  
<https://voxeu.org/article/cbdc-architectures-financial-system-and-central-bank-future>

39 “The ‘Chicago Plan’ and New Deal Banking Reform”  
<http://www.levyinstitute.org/pubs/wp/76.pdf>

40 also known as 100% reserve banking, narrow banking, or sovereign money system

In a more recent study<sup>41</sup> of The Chicago Plan, the authors agree on the benefits of a transition to a full reserve banking system in order to avoid cyclical financial crises deriving from bank runs. This would represent a disruption for commercial banks' traditional business model, since it would separate the monetary and credit functions of the banking system. In such a case, the state would need to provide the framework for a smooth transition. The former Governor of the Central Bank of Spain, Miguel Ángel Fernández Ordóñez, argues that transitioning to such a system would drop rigid banking regulations and thus set commercial banks free to compete in the payment market<sup>42</sup>.

Even if moving to full reserve banking is not the aim, and a potential CBDC is designed with an indirect architecture, there is still a small risk that end-users would decide to switch their deposits from their commercial bank account to the Central Bank, causing a “bank run”. However, regulation can mitigate this risk. For instance, regulators could apply a penalty rate on holdings above a certain amount or simply set a limit on how many digital euros individuals can own – say 3,000 Euros<sup>43</sup>.

The direct issuance of money from the Central Bank to citizens offers a channel for “helicopter money” to boost the economy in times of crisis. For example, the United States' direct \$1200 payments to citizens during the Covid-19 crisis provided direct liquidity in the market, liquidity that was crucial for monetary stability. The ability to shorten the process of delivering money is a promising opportunity, especially when it is difficult to manage cash transactions. Moreover, in certain jurisdictions where cash has been in decline in the last years, digital payment service providers are private entities; as a result the transactions in the economy, and their generated data, are under the control of a fourth party. In

---

41 “The Chicago Plan Revisited” <https://www.imf.org/external/pubs/ft/wp/2012/wp12202.pdf>

42 See: Ordóñez, M.F. (2020). *Adiós a los bancos*. Taurus.

43 Amount cap suggested by Fabio Panetta (ECB Board member) in an interview with Germany's *Der Spiegel*. See: <https://www.bloomberg.com/news/articles/2021-02-09/ecb-s-panetta-floats-3-000-euro-limit-on-digital-cash-spiegel>

fact, the European market of payment systems providers is dominated by non-European companies.

### 3.2 What is at Stake for Europe?

In recent years, Europe's policy priorities in the digital realm have shifted towards the preservation of its digital sovereignty:

**“Strong concerns have been raised over the economic and social influence of non-EU technology companies, which threatens EU citizens’ control over their personal data, and constrains both the growth of EU high-technology companies and the ability of national and EU rule-makers to enforce their laws ... digital sovereignty’ refers to Europe’s ability to act independently in the digital world.”<sup>44</sup>**

---

<sup>44</sup> “Digital sovereignty for Europe” [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS\\_BRI\(2020\)651992\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS_BRI(2020)651992_EN.pdf)

Digital currencies and payment services are at the very heart of this debate; the main payment services providers that operate in the eurozone are foreign organizations and infrastructures. While it is important that the EU remains open to global competition for innovation, excessive dependency on foreign private or public digital means for payment and technologies could lead to adverse effects.<sup>45</sup> Until today, no strong European substitute services are positioned to efficiently replace them.

*“Technologies that shape all modern life are being run without European values, ideas or input. Being digitally-dependent has serious financial, political and cultural implications for Europe”.*<sup>46</sup> The digital retail payments market is dominated by US-based payment system providers like *Visa, Mastercard* or *Paypal*, and digital platforms operated by big tech companies such as Google, Apple, Facebook and Amazon represent a threat to financial and data sovereignty.

If the Euro area wants to preserve its sovereignty, it needs to address the supremacy of foreign players in the financial market by providing not only regulation but also a chance for EU-based companies to compete. A critical wake up call was the announcement of the Diem (ex Libra) that was seen as a threat to monetary stability.<sup>47</sup> There was no competitive European solution that could have competed in the market with Libra. Now with a CBDC, more competition and opportunities for growth are possible.

---

<sup>45</sup> On the edge of a new frontier: European payments in the digital age.

Keynote speech by Fabio Panetta <https://www.ecb.europa.eu/press/key/date/2020/html/ecb.sp201022~d66111be97.en.html>

<sup>46</sup> Dr. Klaus Hommels. Lakestar Briefing <https://www.lakestar.com/uploads/LS-Briefing-10.pdf>

<sup>47</sup> “France, Germany reject Facebook’s libra cryptocurrency” <https://www.dw.com/en/france-germany-reject-facebooks-libra-cryptocurrency/a-50424810>

### 3.3 What This Means for the Eurozone

The Euro is the second most important currency in the international monetary system after the US Dollar as a **global reserve currency**, and in terms of trade China has positioned itself as second behind the U.S.<sup>48</sup> These two countries are engaged in a years-long currency (and debt) competition, and both are already far ahead in the CBDC race. China is already in the pilot phase and preparing to launch by 2022, and the US has projects from the private sector in development. The opportunity for the EU to join, profit from “first-mover advantage”<sup>49</sup> and the positioning itself is clear.

In the Eurozone, existing asymmetries related to the monetary union could also find practical solutions with a Digital Euro. If a CBDC is designed that provides risk-free money for all, it means that all the deposits in the Euro area would be secured in the same way, independently from any country’s financial situation. When facing a crisis in the current system, the ECB gives aid to the different national banks in the Euro area, and the amount of aid varies depending on the bank and country’s financial reputation, all of which are based on past performance. This always carries further political implications. In an attempt to solve this issue and achieve a monetary union closer to the optimum, the Eurozone is focusing on discussions about a single bank resolution fund<sup>50</sup> and a common bank deposit insurance scheme. The existence of risk-free Digital Euro would cut the high cost of ensuring uniform and efficient application of resolution tools for resolving bank failure.

---

<sup>48</sup> The international role of the euro:

<https://www.ecb.europa.eu/pub/pdf/ire/ecb.ire202006-81495c263a.en.pdf>

<sup>49</sup> “Central bank digital currency in an open economy”

<https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2488-fede33ca65.en.pdf>

<sup>50</sup> “EU to Introduce Common Backstop to Single Resolution Fund by 2022”

<https://www.moodysanalytics.com/regulatory-news/Nov-30-20-EU-to-Introduce-Common-Backstop-to-Single-Resolution-Fund-by-2022>

When designing a Digital Euro, it is vital to develop a strategy for an efficient crossborder payment infrastructure less dependent on US-dominated payment channels. Looking at the traditional banking sector, the US dominance of SWIFT<sup>51</sup> payments is clear. Users of this payment system need to accommodate their transactions according to US sanctions of other countries, which can hamper their ability to trade with partners that are restricted by the US government. The necessity of independence for the international payments operation had been cited by Germany's Foreign Minister Heiko Maas: *"We must increase Europe's autonomy and sovereignty in trade, economic and financial policies. [...] It will not be easy, but we have already begun to do it."*<sup>52</sup>

---

**51** Society for Worldwide Interbank Financial Telecommunication (SWIFT)

**52** "Germany urges SWIFT end to US payments dominance"

<https://www.dw.com/en/germany-urges-swift-end-to-us-payments-dominance/a-45242528>

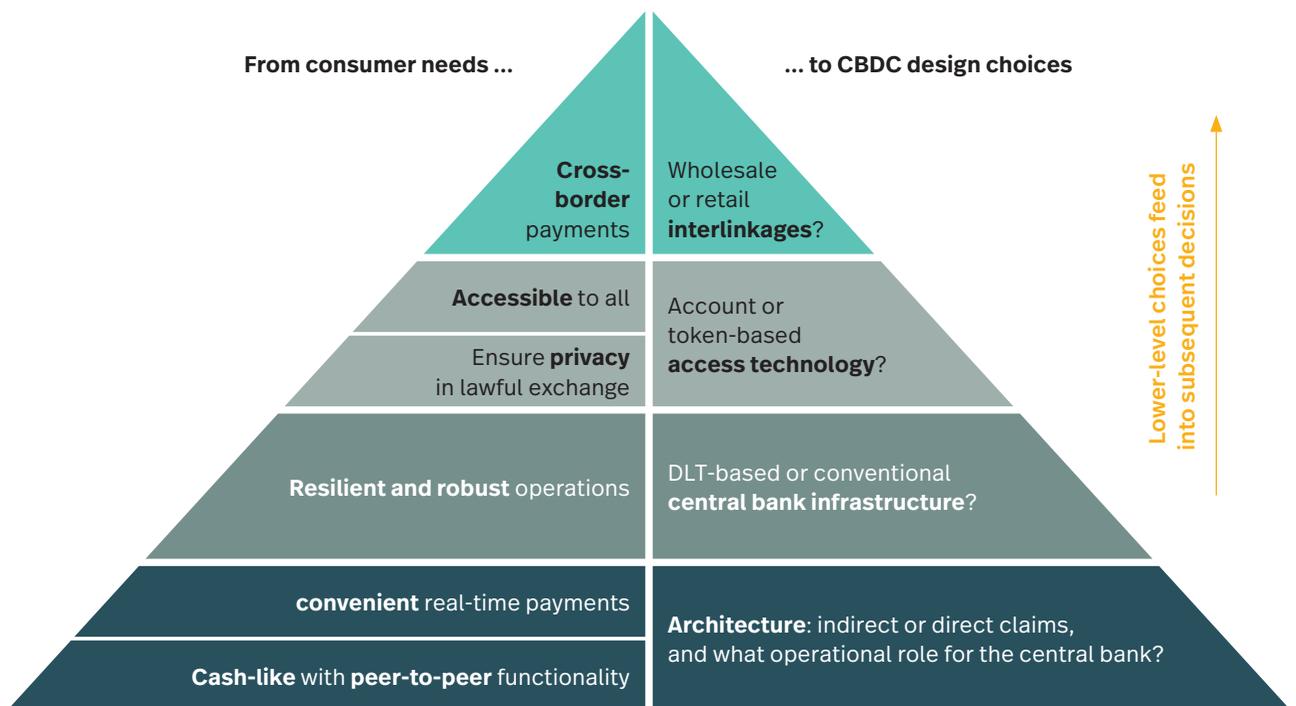
# 4

## **WHERE DOES THE ECB GO FROM HERE? FOUR AREAS OF FUNDAMENTAL DESIGN CHOICES**

A CBDC gives Central Banks back the power to create money, and, depending on the architecture supporting it, CBDCs can provide risk-free money to the entire economy. In order to design an efficient CBDC, a consortium of several Central Banks<sup>53</sup>, led by the BIS, engaged in a series of research

<sup>53</sup> “Central bank group to assess potential cases for central bank digital currencies”  
[https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200121\\_1-e99d7946d6.en.html](https://www.ecb.europa.eu/press/pr/date/2020/html/ecb.pr200121_1-e99d7946d6.en.html)

**Fig. 4: CBDC Design choices Pyramid**



Source: BIS<sup>55</sup>

collaborations. Through a consensus, they established the common principles and core features necessary to consolidate the base for future international cooperation. The pillars for this design of retail CBDC are described in the “CBDC pyramid”<sup>54</sup> (see Fig. 4), which links “consumer needs” with “design choices” in the agreed terminology.

In their CBDC exploratory work, Central Banks examine the area of wholesale banking but mostly focus on financial mechanisms that also allow citizens and firms to access Central Bank money. The novelty of CBDCs and the digital euro rely on two primary factors: the extent to which this digital liability of the central bank is made available to the private sector and the types of technologies and systems to facilitate its implementation and additional innovations.<sup>56</sup>

#### 4.1 The Architecture

The first and fundamental area derived from the Design Choice pyramid is the Architecture of the CBDC system. It is essential to define the relationship between Central Banks, commercial banks, intermediary PSPs and end users in the envisioned CBDC system. This relationship forms the basis of the three main proposals of technical architecture of CBDC, identified for analysis and illustrated on page 38.

The **direct** approach (Fig. 5a) proposes a radical change in the financial structure: **not only moving to full reserve banking (one-tier system) but also having the Central Bank take over all the complementary banking services that commercial banks currently offer citizens today**. When bank disintermediation<sup>57</sup> happens, it means that the Central

---

<sup>54</sup> “The technology of retail central bank digital currency”

[https://www.bis.org/publ/qtrpdf/r\\_qt2003j.pdf](https://www.bis.org/publ/qtrpdf/r_qt2003j.pdf)

<sup>55</sup> See: “The technology of retail central bank digital currency”

[https://www.bis.org/publ/qtrpdf/r\\_qt2003j.pdf](https://www.bis.org/publ/qtrpdf/r_qt2003j.pdf)

<sup>56</sup> “EUBOF: Central Bank Digital Currencies and a Euro for the Future”

<https://www.eublockchainforum.eu/sites/default/files/reports/CBDC%20Report%20Final.pdf>

<sup>57</sup> In this case referring to: removing banks as intermediaries in the process of money creation in the economy.

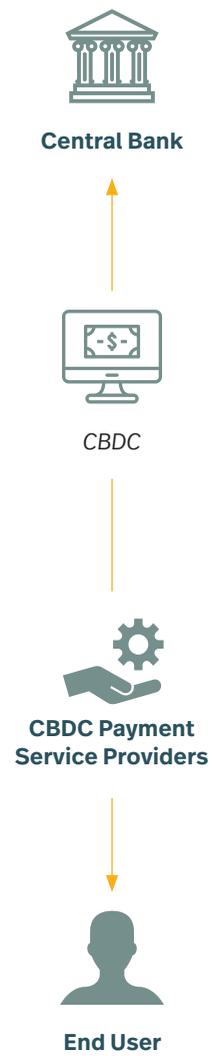
**Fig. 5a: Direct Architecture**



**Fig. 5b: Indirect Architecture**



**Fig. 5c: Hybrid Architecture**



Source: Adaptation from BIS<sup>58</sup>

Bank is involved in all payment activities by operating the entire retail ledger, including monetary and non-monetary related services such as customer digital onboarding and tech support, Know Your Customer (KYC) and Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT) compliance, etc. These are responsibilities traditionally carried by commercial banks and private financial institutions. The Central Bank would completely monopolise all financial services, and all the innovation that is created from competition between private institutions would be then non-existent. Therefore this approach would put the long-term wellbeing of the system at risk.

The **indirect** approach (Fig. 5b) would be based on the introduction of a CBDC that fits the current two-tiered financial structure. In this case, **end-users would have a claim on intermediaries** (i.e. commercial banks), **and the intermediaries would need to back their liabilities from retail clients with claims on the Central Bank. Commercial banks, as intermediaries, would handle all consumer-facing interaction and retail payments, while the Central Bank would handle wholesale payments.** This approach is the most favored at the moment and is the closest to being implemented by many Central Banks, because there would be no substantial structural changes that would lead to banking disintermediation. At the same time, this architecture would restrict the use of the CBDC to represent a claim to the Central Bank, and it would not reach the end-user when distributed through commercial banks. If commercial banks go under financial stress, there would still be the need to “bail them out.” Because a digital Euro would be by default more secure, if a crisis occurs, it could accelerate “digital runs” away from commercial banks towards the central bank.<sup>59</sup> Users might immediately convert all their money into CBDCs for greater security. Yet this problem can be tack-

---

<sup>58</sup> See: “The technology of retail central bank digital currency”

[https://www.bis.org/publ/qtrpdf/r\\_qt2003j.pdf](https://www.bis.org/publ/qtrpdf/r_qt2003j.pdf)

<sup>59</sup> “Evolution or revolution? The impact of a digital euro on the financial system”

<https://www.ecb.europa.eu/press/key/date/2021/html/ecb.sp210210-a1665d3188.en.html>

led by limiting the CBDC's deposits or applying a penalty for holdings over a certain amount of digital euros.

The **hybrid** approach (Fig. 5c) is considered to offer the perfect balance for public and private sector cooperation. In this case, **the Central Bank would create the money in the economy and take care of monetary policy, whereas Payment Service Providers from the private sector would interact with the end-user and offer their innovative approaches for customer service and regulatory compliance while delivering the CBDCs.** In the event of insolvency of the PSP, consumers' CBDCs would not be exposed. Their money would be fully backed by the Central Bank, and therefore secured.

#### 4.2 The Infrastructure

The second level of design choice is the CBDC's underlying **infrastructure**. The infrastructure could either be based on a conventional, centralised Central Bank database or more innovative technology, like a DLT. The ECB is cooperating and experimenting<sup>60</sup> with National Central Banks<sup>61</sup> on an ongoing basis in the Euro Area to identify the feasibility of the Digital Euro, and the ECB has promising conclusions. They found that “existing infrastructure, such as that used by the Eurosystem for instant payments – TARGET Instant Payment Settlement (TIPS) –, as well as DLT, could be scaled up to process the roughly 300 billion retail transactions carried out in the euro area each year”. Additionally within their discussions, the ECB is accounting for possible privacy protection, and options “ranging from segregating data to using cryptographic techniques” were explored<sup>62</sup>. This is a promising sign for European startups and scaleups; it shows that the ECB is open to a more future-proof CBDC.

---

<sup>60</sup> In September 2020, the Eurosystem's High-Level Task Force on CBDC launched experimental work on a Digital Euro and their first output is considered the Digital Euro Report.

<sup>61</sup> “Digital euro experimentation scope and key learnings” <https://www.ecb.europa.eu/pub/pdf/other/ecb.digitaleuroscopekeylearnings202107-564d89045e.en.pdf>

<sup>62</sup> “Preparing for the euro's digital future” <https://www.ecb.europa.eu/press/blog/date/2021/html/ecb.blog210714-6bfc156386.en.html>

The decision on whether to choose one or the other depends on the efficiency, security and privacy provided. In the case of DLT, experience from the industrial use of a permissioned DLT has proven to move trust from the intermediaries to the ledger, simplifying the payment system and facilitating automation and programmability of money via smart contracts. Also, cryptocurrencies have proven that, with the use of DLTs, it is possible to do instant domestic or cross-border transactions at a lower cost with access for all.

Furthermore in 2019, a Proof of Concept run by the European System of Central Banks (ESCB) research network, EUROchain, concluded that by using DLT, “it is possible to build a simplified CBDC payment system that safeguards users’ privacy for lower-value transactions, while still ensuring that higher-value transactions are subject to mandatory AML/CFT checks”.<sup>63</sup> Another benefit of using this technology is that there is a higher resistance to manipulation. Since there is no longer a single point of failure, security improves.

Ultimately, Central Banks will have to further develop their technological expertise to decide. They could either operate more complex but cost-efficient technical infrastructures that are compatible with the future of payments, or they could rely on complex supervisory policies that are not scalable considering the accelerating complexity of the financial system. Yet their openness to a public-private partnership is key. Multiple tech companies have already proven their expertise and are invited to be part of the development of PoCs and Pilots through the Market Advisory Group (MAG)<sup>64</sup>. It is essential that they are included in the development, so that the Digital Euro is tailored to fit the needs and realities of the European startup, scaleup and DeFi ecosystems.

---

<sup>63</sup> “Exploring anonymity in central bank digital currencies”

<https://www.ecb.europa.eu/paym/intro/publications/pdf/ecb.mipinfocus191217.en.pdf>

<sup>64</sup> “Mandate of the Digital Euro Market Advisory Group (MAG)” [https://www.ecb.europa.eu/paym/digital\\_euro/mag/shared/files/digital\\_euro\\_mandate\\_mag.pdf](https://www.ecb.europa.eu/paym/digital_euro/mag/shared/files/digital_euro_mandate_mag.pdf)

## An Innovative Tech Solution to Expand Access to a Digital Euro: Introducing a Secure Cross-Chain Middleware<sup>65</sup>

A key consideration for increasing access to a Euro CBDC is how to create a standardized interface for Central Banks and commercial banks to deploy and manage CBDCs across any public/private blockchain and non-blockchain systems. While Central Banks will likely generate a Euro CBDC on a purpose-built DLT, the proliferation of financial products across various blockchain and non-blockchain environments will likely result in heavy demand for a Euro CBDC that is compatible with any system.

Through Chainlink's secure cross-chain middleware, which already secures tens of billions of dollars within the blockchain economy, a Euro CBDC can seamlessly be bridged from one DLT onto any other public/private blockchain environment, enabling a "cross-CBDC" ecosystem. This will benefit the Euro, as well as the larger DeFi ecosystem, which will become accessible to all Euro CBDC systems. A growing global standard for cross-chain communication and token movement in the form of CCIP (Cross-Chain Interoperability Protocol) can be used to greatly expand the utility of a Euro CBDC by making it accessible to a global set of institutions and end-users on their blockchain or DLT of choice. Interoperability of the Euro CBDC across a wide range of environments ultimately strengthens the Digital Euro's position as a reliable and highly accessible global reserve currency.

As numerous blockchain and DLT environments emerge to support the Euro CBDC, institutions will need a standardized interface to efficiently and seamlessly interact with these disparate systems. Chainlink middleware can also be used as an abstraction layer to provide universal access to any DLT or blockchain, as well as a secure private key management solution required to initiate transactions of the Digital Euro across environments. Moreover, no modifications to an existing Central Bank system or to a commercial bank backend system are required, significantly reducing friction for integration.

Chainlink enterprise middleware also provides plug-and-play tooling that enables regulators to review CBDC movements across and within various DLT environments in support of intergovernmental Financial Action Task Force (FATF)<sup>66</sup> principles. Firms like CipherTrace and technologies like DECO offer compliance solutions enabling blockchain and DLT-based applications leveraging the Digital Euro to better comply with relevant regulations without rearchitecting their current designs or infringing on user-privacy laws. Importantly, these solutions are compatible with existing compliance solutions, simplifying the implementation and rollout for institutions that need an easy-to-integrate cross-chain CBDC solution with granular privacy controls.

---

<sup>65</sup> Cross-chain middleware is software that acts as a bridge between different blockchains (on-chain data) and also non-blockchain (off-chain data) networks in this case. Chainlink's widely adopted blockchain oracle solution serves as middleware that helps on-chain applications securely access off-chain data and computation to achieve a wider range of functionalities.

<sup>66</sup> The FATF focuses on the international anti-money laundering and combating the financing of terrorism and proliferation (AML/CFT) standards. See: <https://www.fatf-gafi.org>

### 4.3 The Access Technology

The third design choice area focuses on how the user will have access to the CBDC. Consumers are currently used to operating in a world with both types of access technology: cash and digital currency (e.g. a credit card). One is traceable and secure. The other is anonymous and universally accessible. The decision comes down to whether the CBDC should act as a deposit, meaning that it would be **account/balance-based**, or mimic cash by being **token/value-based**. When using an account-based system, the identity of the account holders makes regulation enforcement easy. Also, deposits could be remunerated or restricted depending on the goal of using the interest rate as a policy instrument. Token-based CBDCs would ease interactions with interfaces of different protocols as the base for the IoT micropayment infrastructure. A token-based system would ensure universal access – as anybody can obtain a digital signature – and it would offer good privacy by default.<sup>67</sup>

### 4.4 The Interlinkages

A fourth choice refers to the accessibility of cross border payments and whether it would have **wholesale or retail interlinkages**. Cross-border payments are highly inefficient: they have high costs, low payment processing speed and insufficient transparency with limited access. However, these challenges can be reduced with new technologies. As mentioned before, there have been advances in the last years in terms of efficiency of Eurozone transactions, and improvements in cross-border payment efficiency are recognised as a priority. As well, the G20 roadmap explicitly includes coordination in its roadmap.<sup>68</sup>

International cooperation will contribute specific arrangements of cross-border interoperability for the ease of international use of different

---

<sup>67</sup> “The technology of retail central bank digital currency”

[https://www.bis.org/publ/qtrpdf/r\\_qt2003j.pdf](https://www.bis.org/publ/qtrpdf/r_qt2003j.pdf)

<sup>68</sup> “Enhancing cross-border payments: building blocks of a global roadmap”

<https://www.bis.org/cpmi/publ/d193.pdf>

CBDCs. A recent paper by the BIS recognises three conceptual approaches as models for possible implementation:

1. compatible CBDCs, meaning compatible exchange standards.
2. interlinked CBDCs, referring to common clearing mechanisms and technical interfaces; and
3. a single system CBDC that establishes a single multi-currency payment system.<sup>69</sup>

In summary, each one of these pillars represents the policy decisions ahead that need to be aligned with the specific priorities and unique needs of particular jurisdictions.

---

<sup>69</sup> “Multi-CBDC arrangements and the future of cross-border payments”  
<https://www.bis.org/publ/bppdf/bispap115.pdf>

# 5 POLICY RECOMMENDATIONS & CONCLUSION

### **1. Create the Digital Euro with a focus on European Financial Sovereignty**

Europe should not miss the opportunity to become a leader in financial innovation by providing its citizens with a resilient type of money for the future. Digital payment is about access, standards, and market power. In other words, it is about digital sovereignty. European decision makers must embrace Europe's Financial Sovereignty as a core pillar of its Digital Sovereignty, and when they create the digital Euro, we advise that they create it in alignment with their additional goal for EU digital sovereignty. In other words, create the digital Euro so that European companies have a headstart to use and develop from it ahead of US tech giants. Creating the capabilities to free Europe from US-dominated payment mechanisms and cross-border payment channels is key for European (Financial) Sovereignty. To reiterate: if Europe is not prepared for the future of money, the Eurosystem will have to accept foreign values and decisions while its societies and businesses adopt new types of monetary systems and infrastructures – all developed and operated outside its circle of influence.

### **2. Use the Digital Euro to reinforce the position of the Euro as an international reserve currency**

Securing the Euro's position as an international reserve currency is key. In the digital era, this is also a matter of survival of the fittest. To maintain its reserve status, the Euro needs to also be natively digital money for the digital economy. In the foreign exchange reserve business, the ECB can profit from a potential "first-mover advantage" and offer a digital currency as a strategic asset and key geopolitical instrument.

If Europe and the ECB want to foster the Euro as a future-oriented stable currency, *the window of opportunity is now for the European Union to secure the Euro's position as an internationally relevant currency* and embrace its technological importance for Europe's digital economy

as a whole. Europe must rely on the strength of its own economy, its stable financial system, its academic sector as well as its international role as a value-based regulator.

### **3. Design the Digital Euro with a wider vision for a more secure future financial system**

When designing the Digital Euro, policymakers must have a problem-solving strategy that considers macroeconomic perspectives in addition to geopolitical concerns. From a macroeconomic perspective, if a CBDC were introduced just alongside cash and bank deposits in the present financial system structure, it would limit the overall benefits of issuing a CBDC. Introducing a CBDC in this way should be only a first step to a future hybrid financial system – where Central Banks issue fully backed money and private payment service providers offer to the public complementary services like customer-facing services and regulations compliance (e.g. KYC, AML/CFT, etc.). This will ensure that Central Banks keep their focus on monetary and financial stability while providing a secure and resilient form of money and that the private sector will lead on innovation.

### **4. Form should follow function and keep innovation at heart**

The opportunities and risks of implementing a Digital Euro analysed in this paper can be balanced through an effective introduction into the economy. Echoing Europe's beloved Bauhaus movement, with a Digital Euro, form should follow function. The technology adopted by the ECB to issue a Digital Euro should follow the principles of providing a secure and efficient payment system while offering a certain level of privacy. At the same time, it needs to be designed to allow compatibility with the future of the digital economy in the context of the machine-to-machine and data economy. That way, the European Central Bank and sovereign European authorities can lead private-public cooperation needed for an innovative and globally competitive tech ecosystem in Europe and its individual member states.

## 5. Tailor the Digital Euro to fit the needs and realities of the European startup, scaleup and DeFi ecosystems.

The Digital Euro Market Advisory Group (MAG)<sup>70</sup> will advise the Euro-system on design-specific choices. Therefore it must include the most relevant actors of the European tech ecosystem, proactively engage with the DeFi space and make sure special emphasis is given to the needs of innovative and young challenger companies.

Although the motivation for issuing a Digital Euro may vary depending on the areas the decision makers want to improve, the key decision point is its potential place and influence in the global monetary system. The first economic power that establishes its own digital currency will set the tone of how other CBDCs will develop around the world. It could also potentially position itself as a leader for the global reserve currency, challenging the US Dollar's long time role as the de-facto global reserve.

---

<sup>70</sup> See: Stakeholder engagement in the investigation phase of the digital euro project. [https://www.ecb.europa.eu/paym/digital\\_euro/mag/shared/files/digital\\_euro\\_stakeholder\\_engagement.pdf](https://www.ecb.europa.eu/paym/digital_euro/mag/shared/files/digital_euro_stakeholder_engagement.pdf)

## List of Abbreviations

<b>AEs</b>	Advanced Economies <i>More information on p. 13, Fig. 2</i>
<b>AML/CFT</b>	Anti-Money Laundering/Combating the Financing of Terrorism
<b>BIS</b>	Bank of International Settlements
<b>CBDC</b>	Central Bank Digital Currencies
<b>DeFi</b>	Decentralised Finance <i>More information on p. 21, Info Box 3</i>
<b>DLT</b>	Decentralised Ledger Technology <i>More information on p. 10, Info Box 1</i>
<b>e-CNY</b>	Digital Yuan
<b>ECB</b>	European Central Bank
<b>EMDEs</b>	Emerging Markets and Developing Economies <i>More information on p. 13, Fig. 2</i>
<b>ERPB</b>	Euro Retail Payments Board
<b>ESCB</b>	European System of Central Banks
<b>EU</b>	European Union
<b>FATF</b>	Financial Action Task Force
<b>IoT</b>	Internet of Things
<b>IoV</b>	Internet of Value <i>More information on p. 19, Info Box 2</i>
<b>KYC</b>	Know Your Customer
<b>M2M</b>	Machine to machine
<b>MAG</b>	Market Advisory Group

<b>PBoC</b>	People's Bank of China
<b>PSPs</b>	payment service providers
<b>SWIFT</b>	Society for Worldwide Interbank Financial Telecommunication
<b>TIPS</b>	TARGET Instant Payment Settlement
<b>US</b>	United States of America
<b>USD</b>	US Dollar



## Publishers

**Internet Economy  
Foundation (IE.F)**  
Uhlandstraße 175  
10719 Berlin  
Germany  
www.ie.foundation

**Lakestar Advisors GmbH**  
Bahnhofstrasse 18  
Zurich 8001  
Switzerland  
www.lakestar.com

**Chainlink**  
chain.link

**iconomy GmbH**  
Uhlandstraße 175  
10719 Berlin  
Germany  
www.iconomy.partners

## Authors

**IE.F**  
Clark Parsons

**Lakestar**  
Nicolas Brand

**Chainlink**  
Sergey Nazarov

**iconomy**  
Valeria Aragónés

## Editors

**IE.F**  
Jennifer Bode

**Lakestar**  
Ben Cousens

**iconomy**  
Alexandra Maggaard  
Simon Schwerin  
Felix Styma

## Contact

**IE.F**  
**Clark Parsons**  
Managing Director  
c.parsons@ie.foundation  
+49 30 8877 429 400

**Chainlink**  
**Chris Barrett**  
chris.barrett@chainlinklabs.com

**iconomy GmbH**  
**Felix Styma**  
Managing Partner  
styma@iconomy.partners

**Publication date**  
September 2021

## Disclaimer

This study is intended to provide general guidance only. Readers should not act exclusively according to any content of this study, particularly without obtaining prior professional advice tailored to their individual circumstances. The IE.F does not accept any liability for losses arising from actions taken on the basis of this study.

© 2021 Internet Economy Foundation.  
All rights reserved.