

Christian PFISTER

PAYMENTS, MONEY AND FINANCE IN THE DIGITAL ERA (1)

State of play and
short to medium-term
prospects

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STATE OF PLAY AND SHORT TO MEDIUM-TERM PROSPECTS

Christian PFISTER

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SUMMARY

Our society is becoming increasingly digital. This trend incites the public to have expectations of unceasingly enhanced simplicity, accessibility and rapidity in the supply of services. However, up until now, the opportunities created by digitalisation do not seem to be fully exploited by the traditional financial actors, be it in the field of instant payments, of international payments or of banking inclusion in the emerging and developing economies. Indeed, with FinTech companies, the Big Tech companies, and more recently cryptoassets, it is new actors and products that have, in some cases by entering new fields of expertise, hustled financial intermediaries which were often installed in oligopoly situations. All such initiatives do not necessarily have to be supported wholeheartedly. However, one thing their latest examples have in common is recourse to a common technological substate that is provided by the blockchain and to the creation and circulation of assets in the form of “tokens” (in fact, lines of code). This study focuses on these recent initiatives.

Public authorities are progressively implementing a regulatory framework in order to facilitate the development of these new actors and products, by making their legal environment more secure while preserving public security, consumers’ and investors’ rights, financial stability and fair competition. Other public initiatives, as the possible issuance of central bank digital currencies (CBDCs) are ambiguous since they could lead to a substitution for the private sector in activities the latter currently dominates, with potentially destabilising effects.

GLOSSARY*

Altcoin. Cryptoasset which is not Bitcoin. In this study, the term also excludes stablecoins.

Batch settlement. Settlement of groups of payments, transfer instructions, or other obligations together at one or more discrete, often pre-specified times during the processing day.

Bitcoin. Refers both to a transfer system for a cryptoasset (it is then spelled “Bitcoin”, capitalized) and to a unit of account (it is then spelled “bitcoin” or “bitcoins”). Bitcoin uses a public blockchain (see also “Public blockchain”).

Blockchain. One form of Distributed Ledger Technology (DLT, see “Distributed Ledger Technology”), which allows the storage and the exchange of cryptoassets on a peer-to-peer basis, i.e. without intervention of a trusted third party.

Cash. Historically, means of payment based on the trust that the issuer will be able to exchange it for metal, hence also referred to as fiduciary money. Nowadays, notes and coins issued by public authorities (in most countries, the central banks for notes and the Treasury for coins), which benefit from legal tender (see also “Legal tender”).

Central bank digital currency (CBDC). Digital money issued by the central bank. It can take two forms. Retail or general purpose CBDC is accessible to the public, whereas wholesale CBDC can be used only in large settlements between institutions.

Central bank money. Liability of a central bank, which can take the form of cash or that of deposits at the central bank, which can be used for settlement purposes.

Central counterparty. Entity which interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer.

Central securities depository. Entity which provides securities accounts, central safekeeping services, and asset services, which may include the administration of corporate actions and redemptions.

* Sources: Committee on Payment and Settlement Systems-Technical Committee of the International Organization of Securities Commissions; “Principles for financial market infrastructures”, Bank for International Settlements/OICV-IOSCO, April 2012 (www.bis.org/cpmi/publ/d101a.pdf), and “Glossary”, *BIS Quarterly Review*, March 2020, p. vi-x (www.bis.org/publ/qtrpdf/r.qtr2003c.pdf), and France Payments Forum, 2020, “Naissance du 1er glossaire des Cryptopaiements” (www.francepaymentsforum.eu/fr/naissance-du-1er-glossaire-des-cryptopaiements/).

Clearing. Process of transmitting, reconciling, and, in some cases, confirming transactions prior to settlement, potentially including the netting of transactions and the establishment of final positions for settlement.

Collateral. Asset or third-party commitment that is used by a collateral provider to secure an obligation *vis-à-vis* a collateral taker.

Commercial bank money. Liability of a commercial bank, in the form of deposits held at the commercial bank, which can be used for settlement purposes.

Confirmation. Process whereby the terms of a trade are verified either by directly involved market participants or by a central entity.

Consensus mechanism. Mechanism through which the nodes involved in the validation of transactions in a distributed ledger ratify a new block of transactions. There are several consensus mechanisms (see also “Proof of work (PoW)” and “Proof of stake (PoS)”).

Credit risk. Risk that a counterparty, whether a participant or other entity, will be unable to fully meet its financial obligations when due, or at any time in the future.

Cryptoasset. Immaterial asset wherein the principal of the structure or the composition of which is supported by the Distributed Ledger Technology (DLT, see “Distributed Ledger Technology”).

Cryptography. Technique aiming to protect messages and fulfilling five functions: identification, authentication, integration, confidentiality and non-repudiation.

Currency. Material or immaterial asset fulfilling three functions: unit of account, means of exchange and reserve of value.

Custodian. Agent (usually, a bank) which keeps and administers securities on behalf of its customers.

Decentralized finance (DeFi). Notion referring to traditional financial services, such as the distribution of loans, using the blockchain and cryptoassets, and also including other services, such as automated market making, which do not have an exact counterpart in traditional finance.

Default. Event stipulated in an agreement as constituting a default. Generally, such events relate to a failure to complete a transfer of funds or securities in accordance with the terms and rules of the system in question.

Deferred net settlement. Net settlement mechanism which settles on a net basis at the end of a predefined settlement cycle.

Delivery versus delivery. Securities settlement mechanism which links two securities transfers in such a way as to ensure that delivery of one security occurs if and only if the corresponding delivery of the other security occurs.

Delivery versus payment. Securities settlement mechanism which links a securities transfer and a funds transfer in such a way as to ensure that delivery occurs if and only if the corresponding payment occurs.

Dematerialisation. Elimination of physical certificates or documents of title that represent ownership of securities so that securities exist only as accounting records.

Derivative. Financial contract whose value depends on the value of one or more underlying reference assets, rates or indices, on a measure of economic value or on factual events.

Distributed ledger (DL). Electronic ledger which is natively private, which can be simultaneously consulted, recorded and synchronised by entitled actors, and which evolves with the chronological addition of new information that has been validated by all actors. This information is immutable. A DL usually relies on cryptography to allow nodes (i.e. computers) to securely propose, validate and record state changes (or updates) to the synchronised ledger without the necessary intervention of a central authority.

Distributed ledger technology (DLT). Technology allowing to create and use, with recourse to smart contracts, a ledger which is distributed to a network of computers which synchronize, process and secure blocks of transactions using a validation mechanism, also referred to as a consensus mechanism, although strictly speaking consensus in the last step in the validation mechanism.

Double spending. Fraudulent act in which the same means of payment is spent more than once.

Electronic money. Monetary value which is stored in an electronic form, which represents a claim on the issuer, issued against the remittance of funds in order to make payments, and which is accepted by a physical or legal person other than the electronic issuer.

E-wallet. Scheme allowing for the storage of electronic money, using cards or a smartphone, for example.

Fiat money. Currency defined by law. For instance, according to the French Monetary and Financial Code, the currency of France is the euro. To recall, in the United Kingdom, a fiat was a decree signed by the sovereign.

Final settlement. Legally defined moment when funds (or other assets) have been irrevocably and unconditionally transferred.

Financial market infrastructure (FMI). Multilateral system among participating institutions, including the operator of the system, used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions.

Fork. Divergence of the ledger into two versions which evolve separately. A fork aims to bring substantial changes to the blockchain or to repair it in a new copy, or to launch a new blockchain offering different services on the basis of the former one. A *hardfork* does not keep the compatibility with the former version, whereas *softfork* keeps it.

Fungibility. Assets are fungible when they are interchangeable.

Governance. Set of relationships between the various stakeholders of an institution.

Haircut. Risk control measure applied to underlying assets whereby the value of those underlying assets is calculated as the market value of the assets reduced by a certain percentage (the “haircut”).

Initial coin offering (ICO). Mechanism allowing the financing of a project using the blockchain with the issuance of cryptoassets in the starting phase. Two types of cryptoassets (referred to as tokens) can be issued: security tokens and utility tokens.

Legal tender. Privilege granted by law to a means of payment. It usually applies only to fiduciary money (coins and notes).

Liquidity risk. Risk that a counterparty, whether a participant or other entity, will have insufficient funds to meet its financial obligations as and when expected, although it may be able to do so in the future.

Mark to market. The practice of revaluing securities and financial instruments using current market prices.

Mining. Step in the proof of work (PoW) type of consensus mechanism which rewards the validating node that has managed to confirm the validity of a block of transactions on a blockchain. This reward takes the form of a fee and the attribution of newly “minted” units.

Moral hazard. Risk resulting from the unobservability, by the “principal” (for instance, a regulator), of the efforts made by the “agent” (for instance, a regulated entity). One consequence of moral hazard is that the agent can use, at its own advantage, a scheme designed to protect society against a socially undesirable action.

Netting. Offsetting of obligations between or among participants in the netting arrangement, thereby reducing the number and value of payments or deliveries needed to settle a set of transactions.

Omnibus account. Account structure where securities or collateral belonging to some or all customers of a particular participant is commingled and held in a single account segregated from that of the participant.

Operational risk. Risk that deficiencies in information systems or internal processes, human error, management failures, or disruptions from external events will result in the reduction, deterioration, or breakdown of services provided by an institution. Cyber risks are one dimension of operational risk.

Payment. Extinction of a claim.

Payment instrument. Any instrument allowing to transfer funds between a debtor and a creditor.

Payment service provider (PSP). Entity that provides payment services, including remittances. Payment service providers include banks and other deposit-taking institutions, as well as specialised entities such as money transfer operators and e-money issuers.

Payment system. Set of instruments, procedures and rules for the transfer of funds between or among participants. The system encompasses both the participants and the entity operating the arrangement. A small value (or retail) payment system usually processes a large number of small value payments in such forms as cheques, transfers, direct debits and card payment transactions, while a large value payment system usually processes a comparatively much lower volume of high priority payments.

Payment versus payment. Settlement mechanism which ensures that the final transfer of a payment in one currency occurs if and only if the final transfer of a payment in another currency or currencies takes place.

Permissioned blockchain. Private blockchain with restricted access and participation.

Private blockchain. Blockchain in which all nodes belong to one entity or a group of entities (consortium), which controls access, writing and consensus.

Proof of stake (PoS). Consensus mechanism based on the receivership of cryptoassets by the validating nodes of a public blockchain.

Proof of work (PoW). Consensus mechanism that has recourse to miners (see Mining) to check the data loaded into the ledger, validate the authenticity of transactions and create new blocks. The proof of work consists in asking the miners to solve a mathematical problem which necessitates an important computing power. The miner who solves this problem first creates the next block of the blockchain.

Public blockchain. Entirely distributed blockchain, with permissionless access, and in which all nodes have the same roles.

Real-time gross settlement (RTGS). Immediate settlement of payments, transfer instructions or other obligations on a transaction-by-transaction basis.

Reconciliation. Procedure to verify that two sets of records issued by two different entities match.

Run. Massive demand for conversion of intermediated assets, like bank deposits, into central bank money or other intermediated assets. Nowadays, runs take place in the interbank market, and very rarely at bank counters.

Securities registrar. Entity which provides the service of preparing and recording accurate, current and complete securities registers for securities issuers.

Securities settlement system. Entity which enables securities to be transferred and settled by book entry according to a set of predetermined multilateral rules.

Security token. Cryptoasset issued in the process of an ICO that represents value and that can give access to a pecuniary remuneration.

Settlement risk. Risk that settlement in a funds or securities transfer system will not take place as expected. This risk may comprise both credit and liquidity risk.

Sidechain. Separation of blockchains into two groups, allowing a user to transfer virtual assets into one group which supplies services that are specific and separated from those supplied by the other group but related to them.

Smart contract. DLT protocol or code that self-executes when certain conditions are met.

Stablecoin. Cryptoasset that seeks to stabilise its price by linking its value to that of an asset or pool of assets; in most cases, the U.S. dollar.

Systemic risk. Risk that the inability of one or more participants to perform as expected will cause other participants to be unable to meet their obligations when due.

Tokenisation. Process of converting assets into digital tokens.

Traceability. In the context of payments, capacity to track each step of a payment within an audit trail.

Trade repository. Entity which maintains a centralised electronic record (database) of transaction data.

Utility token. Cryptoasset issued in the process of an ICO that gives access to some services the project has financed.

Virtual asset. Asset which can be dematerialized, electronic or digital in the narrow sense. A dematerialized asset is designed to be stored and exchanged manually, then transformed into an electronic form. An electronic asset is natively designed to be stored and exchanged in that form. Narrowly defined, a digital asset is an electronic asset whose issuance and transfer is generally controlled by DLT. In this study, the terms “virtual asset” (in the narrow sense) and “Cryptoasset” are used indifferently.

Virtual asset service provider (VASP). Physical or legal person who conducts activities aiming at facilitating the exchange of virtual assets, such as the exchange between virtual assets and fiat currencies, the exchange between one or more forms of virtual assets, the transfer of virtual assets, the safekeeping and/or administration of financial assets or instruments enabling control over virtual assets....

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Our society is becoming increasingly digital. This trend incites the public to have expectations of unceasingly enhanced simplicity, accessibility and rapidity in the supply of services. However, up until now, the opportunities created by digitalisation do not seem to be fully exploited by the traditional financial actors, be it in the field of instant payments, of international payments or of banking inclusion in the emerging and developing economies. Indeed, with FinTech companies, the Big Tech companies, and more recently cryptoassets, it is new actors and products that have, in some cases by entering new fields of expertise, hustled financial intermediaries which were often installed in oligopoly situations. All such initiatives do not necessarily have to be supported wholeheartedly. However, one thing their latest examples have in common is recourse to a common technological substate that is provided by the blockchain and to the creation and circulation of assets in the form of “tokens” (in fact, lines of code). This study focuses on these recent initiatives.

Public authorities are progressively implementing a regulatory framework in order to facilitate the development of these new actors and products, by making their legal environment more secure while preserving public security, consumers’ and investors’ rights, financial stability and fair competition. Other public initiatives, as the possible issuance of central bank digital currencies (CBDCs) are ambiguous since they could lead to a substitution for the private sector in activities the latter currently dominates, with potentially destabilising effects.

* The author is expressing his own views, unrelated to his capacity at Sciences Po or the University of Paris-I-Panthéon-Sorbonne. He thanks Thomas Argente, Françoise Drumetz, Jean-Michel Godeffroy, Andès Lopez-Vernaza, Pierre-Dominique Renard and Nicolas de Sèze for their remarks and remains solely responsible for any errors.

I. A RAPIDLY EVOLVING BUT STILL UNSATISFACTORY SITUATION

Rapid developments that have taken place in recent years in the field of payments, essentially as a result of changes in the demand of consumers and of innovations in the public sector. However, the situation in this industry remains unsatisfactory, with payments which remain slow in comparison with what digitalisation would allow. Furthermore, access to the banking system can be improved and its functioning has often been questioned in the wake of the Global Financial Crisis (GFC), although the public would seem to trust it more than other parts of society to protect the confidentiality of personal data.

1. Payments remain slow in comparison with what digitalisation would allow

In an economy, domestic payments are organised in systems, as a set of instruments, procedures and rules allowing the circulation of funds between the participants in the system. A distinction is usually drawn between payment systems, according to the size of the payments they process¹. Wholesale payments take place between financial institutions, mainly banks, and are small in number and large in value, although there is usually no minimum amount prescribed. For instance, in the euro area, in 2020, the Target system has processed a daily average of 345,000 payments, with an individual average value of 5.3 million euros. Conversely, retail payments, which are either made between individuals and merchants or between individuals, are very numerous and are of a lower unit amount than wholesale payments, so that the total amount they reach over a given period is significantly below the one processed by wholesale payments.

Within these two categories of systems, another important distinction can be drawn between the front-end and the back-end of a payment infrastructure. The front-end involves the payer, who takes the initiative of the payment, drawing from a source of funds (for example, a bank account), a channel of transmission of the payment order (for example, a mobile application) or a payment instrument (for example, a transfer). It can thus be seen by the user of the payment service. By contrast, the back-end cannot be seen by the user. It includes two sorts of operations: clearing and settlement. Clearing itself includes the transmission, the reconciliation (between the information received by the holders of the payer and the payee) and, in some cases also the confirmation of the transactions. Clearing is in most cases processed multilaterally through a clearing house. Settlement corresponds

1. See Morten Bech and Jerry Hancock, "Innovations in payments", *BIS Quarterly Review*, March 2020, p. 21-36 [www.bis.org/publ/qtrpdf/r.qtr2003f.pdf].

to the transfer of funds and allows the debtors (the initiator of the payment and the intermediaries it has recourse to) to discharge their monetary obligations. Payments can be settled on an individual gross basis within real time gross settlement (RTGS) systems operated by central banks or on a net basis and not in real time within differed net settlement (DNS) systems operated by the private sector. Both organisations can be found in the euro area and in the U.S.

In the last twenty-five years or so, the main innovation in wholesale domestic payments has been the adoption of RTGS systems, which can nowadays be found in most economies. These systems bring two main benefits in comparison with DNS systems: on one hand, they are more rapid, since each transaction is settled as soon as it enters the system; on the other hand, they are safer, since the duration of the exposure to credit risk is reduced and, in case a participant defaults, there is no need to unwind transactions that have contributed to the net exposure. This reduces the risk of a domino effect, in which the default of a participant can trigger a cascade of defaults among the other participants. However, the lack of a clearing of payment orders prior to their entry into the RTGS system entails a substantial use of liquidity, in the form of collateral that has to be posted in the system. This in turn has two consequences, which displace part of the risks outside the systems they were intended to eliminate. Firstly, participants try to send their payment orders later in the day, so as to avoid pledging collateral that guarantees the intraday overdrafts granted by the central bank to facilitate the operation of the RTGS. Secondly, RTGS systems have evolved towards systems allowing to “queue” payments before they are processed by the system.

A remedy to this situation could be the adoption of real time monetary policies which, by recognizing the value of durations of time below a calendar day, would create incentives to faster payments². Beyond the spreading of RTGS systems, there have not been other significant developments in clearing and in front-end over the last twenty-five years. For instance, post-market operations still settle routinely at D + 2, although it is generally possible to make same-day operations though they remain rare, notably as a consequence of the multiplicity of actors implied in the processing chain.

The changes most visible to the public have of course taken place in domestic retail payments, with in particular the generalization of distant payments, contactless and smartphone payments, as well as the launching of applications (ApplePay, GooglePay, PayPal, SamsungPay...) which rely for settlement on existing systems. A study conducted by the European central Bank (ECB) provides an overview of the recent changes in the payments

2. For more details, see Christian Pfister, “[Real-]Time Is Money”, April 2018, Working Paper 675, Banque de France, <https://publications.banque-france.fr/sites/default/files/medias/documents/wp675.pdf>.

of consumers, both at the national and the euro area levels³. The main results of this study relating to France and the euro area are summarized in the description below. In the case of France, they are complemented by information extracted from the yearly publication of the Banque de France on non-cash payments.

Retail payments in the euro area and in France

Unlike what one can observe in countries such as China or Sweden, consumers' payments in the euro area are still in large part conducted in fiduciary money ("in cash"). In 2019, 73% of the volume of transactions at the physical point of sale (POS) or person-to-person (P2P) was carried out using cash as a payment instrument. The corresponding percentage was only 59% in France. France is, with the Netherlands, the country that uses the least amount of cash in the euro area, as a result of having experienced a protracted period of high inflation*. The share of payments in cash decreased rapidly (it still stood at 79% in the euro area in 2016) and, according to certain surveys, this descent has been accelerating since the start of the Covid-19 pandemic.

Cash is mostly used in payments of small value that account for 48% of all consumers' transactions in the euro area (only 27% in France). The decreasing use of cash is not surprising, since this means of payment is costly for the economy, especially for merchants, and it gives way to the risk of loss or theft. However, faced with growing circulation, as exhibited in the central banks' balance sheets, it has led to referring to a "paradox of cash**". This apparent paradox reflects in part the fact that a large part of banknotes, in particular large denominations, circulate abroad; an estimate is that this would be the case of more than half of denominations of 100 euros and more, which themselves account for more than half of the total banknote circulation. Furthermore, since 2008, the economic environment has supported the demand for cash. This reflected two factors. The first was the very low level of interest rates, to such an extent that certain financial intermediaries even stored banknotes to avoid paying interest on their deposits with the ECB or in the interbank market, where interest rates were negative in both cases. The second was the development of the underground economy, a feature of all economic crises. More recently, the fear of contagion via the handling of cash, even though it was exaggerated, has penalised its use. Overall, it is thus unsurprising that the cash outstanding has increased while its use in transactions has decreased.

Regarding dematerialised payments, most of them were conducted in 2019 using debit and credit cards, accounting for 24% of the volume of consumers' POS and P2P payments (35% in France) and 41% of their value (57% in France). As a share of card payments, 38% of the volume was conducted contactless in the euro area as well as in France. Dematerialized payments conducted using other means of payment than cards were made via transfers, direct debits and cheques, accounting for 3% of POS and P2P

3. European Central Bank, Study on the payment attitudes of consumers in the euro area (SPACE), December 2020 [www.google.com/search?client=firefox-b-d&q=ECB+2020+spacereport202012_bb2038bbb6.en.pdf].

of consumers' payments, but for 11% of their value, since large value payments are mostly conducted using these instruments. With a share of 85% of all cheques issued in the euro area in 2020, France held the sad privilege of remaining nearly the sole user of this expensive payment instrument in the euro area. This situation resulted from a regulation that forced banks to deliver cheques freely, as a counterpart to making the payment of wages on bank accounts mandatory, and to the non-remuneration of demand deposits.

Finally, the consumers who were surveyed in the framework of the ECB study generally expressed satisfaction regarding their access to the various means of payment, in particular cash and cards. They also expressed their desire to be able to pay in cash, while declaring that dematerialized payments were more convenient. 34% of them also indicated they saved in cash (25% in France), mainly using large denominations.

* See Sanvi Avouyi-Dovi, Christian Pfister and Franck Sédillot, "French Households' Portfolio: The Financial Almost Ideal Demand System Appraisal", Working Paper n° 728, Banque de France, September 2019 (<https://publications.banque-france.fr/sites/default/files/medias/documents/wp728.pdf>).

** See inter alia Marc Schwartz and Yannick Messaoui, *Le Grand Paradoxe – ou pourquoi le règne du cash est loin de s'achever*, Terra Nova, 8 January 2021 (https://tnova.fr/site/assets/files/10502/terra-nova_le-grand-paradoxe-ou-pourquoi-le-regne-du-cash-est-loin-de-s-achever_ms_080121.pdf), and Alejandro Zamora- Pérez, "The paradox of banknotes: understanding the demand for cash beyond transactional use", ECB Economic Bulletin, vol. 2, 2021, p. 121-137 (www.ecb.europa.eu/pub/pdf/ecbu/eb202102.en.pdf).

Overall, beyond certain anachronisms such as the lasting use of cheques in France, domestic retail payments in the euro area do not exhibit blatant anomalies or evidently disappointed consumer expectations. However, if one broadens the perspective to the global level, the euro area is clearly lagging in the adoption of instant payments, which allow the payer's account to be debited and the payee's account to be credited in a few seconds and on a 24 hours a day x 365 days a year basis. Such payments are nearly non-existent at the retail level, due mainly to their elevated cost, close to 1 euro per transaction in France. This situation is all the more astonishing given that the back-end infrastructure has been operating since November 2018, with the creation by the Eurosystem of Target Instant Payment Settlement (TIPS), which charges €0,2 cent per transaction. In comparison, in Brazil, the central bank launched in November 2020 the Pix real-time payment system and, fifteen months later, two thirds of the adult population had made or received a transaction via the system. In fact, instant payment systems, which appeared at the beginning of the 2000s, where first adopted mainly in the emerging economies, in particular in Asia (South Korea in 2001, Iceland and Taiwan in 2003, Malaysia and South Africa in 2006, Chile and the United Kingdom in 2008, China and India in 2010). In China and also in the Scandinavian countries (Denmark and Sweden) that adopted instant payments later, the spread of this mode of

payment has been particularly rapid, to such an extent that instant payment with Alipay or WeChatPay in China, or with Swish in Sweden has become the dominant POS payment instrument. In these countries, merchants even refuse payments in cash, since instant payment provides them with the same real-time settlement benefit, with a lesser risk of loss or theft and allows them to spend less time managing their treasury.

Regarding cross-border payments, those initiated in France in 2020 accounted for only 7% of the volume (11% of the value) of non-cash payments and were predominantly made by transfer. Linking systems is a long, complex and costly process, which is potentially profitable for only a limited number of “corridors” linking two currencies together. One alternative to such links is to create payment systems which are both cross-border and multi-currency⁴. However, there are less than ten of them in the world. Furthermore, they do not process large volumes, with Continuous Linked Settlement (CLS), used by the world’s largest financial companies (the 72 direct participants, that are members and shareholders of the group), as a notable exception. However, CLS processes payments in only 18 eligible currencies since, in order to be efficient, secure and rapid, its functioning must rely on deep and liquid money and foreign exchange markets. As was already the case in Medieval times, the bulk of the volume of cross-border payments, both wholesale or retail, are still carried out through the “correspondent banking” model. In this model, a so-called “correspondent bank” manages accounts which are opened by other banks (“responder banks”) and supplies them with back-end and foreign exchange services, thus avoiding them to have to be present in the country of the payee. However, for reasons related mainly to compliance with know-your-customer (KYC) and anti-money laundering and combatting the financing of terrorism (AML/FT) procedures, this model has sharply receded in the recent years. For instance, the number of correspondent banks has fallen by 20% from 2011 to 2018, whereas the value of payments the correspondent banks processed has increased. This is cause for concern, since it could lead users to shift their operations toward parallel, less secured, systems and aggravate the already well-known inefficiencies of correspondent banking. These inefficiencies are particularly evident in the processing of small value payments, such as remittances. They are essentially of four sorts:

- Slowness: cross-border payments are significantly slower than domestic ones;
- Opacity: it is difficult for the payer to observe step by step the processing of its payment order and the remuneration of each intermediary;

4. A cross-border payment does not have to be a cross-currency payment, since it can take place within a monetary union. This is the case for payments in the Single Euro Payments Area (Sepa). This scheme has allowed to make transfers of euros between European banks of different countries as cheap and rapid as domestic transfers within each of the participating countries.

- High costs: in June 2021, according to the measure made by the World Bank on the basis of data collected from 48 countries sending remittances to 105 receiving countries, and for four categories of service providers (banks, money transfer operators such as Western Union or Wise, mobile operators and postal services), the average cost of a remittance was 6.30%. This cost was still a 1.3 percentage point higher than the objective the G20 had set in 2014. However, it had been falling steadily since 2013, when it stood around 8%. The most expensive remittances took place via banks, from South Africa and toward Sub-Saharan Africa, the least expensive ones via entirely digital operators (3.41%) and between G8 countries, with the exception of Japan as a sending country;
- Limited accessibility: notably in receiving countries, for reasons related both to a less widespread digital education and a less developed degree of financial inclusion (see below).

In order to take into account the requirements of the international community, notably the G20, that these handicaps should be remedied, the international messaging service Swift launched its Global Payment Innovation (gpi) initiative, which in the beginning of 2022 had received support from more than 4,200 banks from 141 countries. This initiative was targeted toward firms' payments in the first instance. Its objectives were to settle a payment within a day, to allow the supervision of the statute of payments in real time, and to price each step in the payment chain in a transparent manner, while supplying all the information necessary to implement LCB/FT regulations. It appears that payment using gpi are generally rapid, with a median duration of less than two hours. However, there is considerable heterogeneity, with some routings taking as long as two days, notably toward Africa, due in part to heavy capital controls and the time it takes the receiving bank to make the funds available to the beneficiary⁵.

Overall, the picture that emerges in the field of payments is that of an insufficient use of the possibilities opened by digitalisation, particularly in regards to instant payments:

- In spite of the generalisation of RTGS systems, wholesale payments remain rather slow, in particular in the processing of past-market operations;
- As far as retail payments are concerned, with a few exceptions such as Nordic countries, instant payments remain marginally used in developed economies (the assessment made for the euro area is also valid for the North American continent).

5. See Committee on Payments and Market Infrastructures (CPMI), "SWIFT gpi data indicate drivers of fast cross-border payments", Bank for International Settlements (BIS), 8 February 2022 (www.bis.org/cpmi/publ/swift_gpi.pdf).

This analysis emphasises a double contrast between payments and the rest of society on one hand, developed and emerging economies on the other hand. Indeed, as indicated in the introduction to this study, digitalisation is gaining ground in our societies, whereas it is treading water in the field of payments. This situation is all the more astonishing given that, as could be expected developed economies have long been leaders in the process of digitalisation of payments, be it with the adoption of RTGS systems or, in retail payments, with the computerisation of mass processing of cheques, transfers and direct debits, and with the spreading of cards.

2. Trust in the banking and financial system is uneven in time and across countries

The banking sector enjoys is not always and everywhere trusted, but is generally considered more capable of protecting privacy than other sectors. However, access to it remains difficult in many countries.

Thanks to polls made by Gallup since 1973, the U.S. is one of few countries for which we have access to data on the trust placed in the domestic institutions, inter alia the banking sector, over a rather long period. These polls show a level of confidence that largely fluctuates according to financial crises, with lows reached in the wake of the savings and loans banks crisis at the end of the 1980s and of the GFC in 2008-2009. However, trust has not been restored since then and the percentage of Americans who declare they have “quite a lot confidence” in banks has fluctuated between 32% and 36% from 2007 to 2021, admittedly against a backdrop of a very general erosion of trust in the nation's institutions.. More closely related to digitalisation, and over which the public declares they are very sensitive, trust in the banking sector regarding privacy remains high. According to a survey conducted in September 2020 by the Federal Reserve Bank of New York, American households declared they were more trusting of the traditional financial institutions than in the government or in Fintechs, the latter being ranked last, in order to preserve the confidentiality of their personal data, in particular in relation to the risk of identity theft⁶.

Globally, readiness to share one's data appears stronger vis-à-vis firms of the financial sector than vis-à-vis Fintechs or the non-financial sector, with the latter one including Big techs. This readiness can also be found in the euro area where, according to a recent study, almost all respondents, when asked about their choice regarding the adoption of a new digital means of payment, would prefer this instrument to be issued by a bank, a central bank or a European institution, rather than a Big Tech⁷.

6. See Olivier Armantier, Sebastian Doerr, Jon Frost, Andreas Fuster and Kelly Shue, “Whom do consumers trust with their data? US survey evidence”, *BIS Bulletin*, n° 42, 27 May 2021 (www.bis.org/publ/bisbull42.pdf).

7. See Kantar Public, *Study on New Digital Payment Methods*, March 2022.

The distrust vis-à-vis the Big Techs, which is thus highlighted, is also one factor that casts doubt over the capacity of a global stablecoin or any other unit issued by a Big Tech or with its support, to substitute for the legal currency and in this way to jeopardize monetary sovereignty, especially in developed economies (see *volume 2*). Moreover, in the case of France, the lack of trust in the banking sector does not play a significant role in the decision of individuals to hold cryptoassets (see “*Cryptoasset holdings in France and around the world*”).

According to the definition given by the World Bank, financial inclusion means that individuals and businesses have access to products and services which are useful, accessible and which meet their needs in the field of transactions, saving, credit and insurance. Access to these services is important because it facilitates daily life and allows families to plan their long-term projects as well as to face unforeseen emergencies. The first step toward financial inclusion is generally the holding of a transaction account, which can be opened with a bank or other intermediaries such as postal operators, mobile operators – the latter are very present in Africa – or microfinance institutions. According to data published by the World Bank, 69% of the adults in the world had an account in 2018, but nearly one adult out of three – or 1.7 billion people – were “unbanked”, with some of them thus holding a transaction account, but not with a bank, and therefore unable to use their account for saving purposes nor access a wider range of financial products and services.

It is of course in developing economies that the situation is most critical. Substantial progress has admittedly been made in those countries that have actively pursued policies in the area of digitalisation, such as those aiming at universal digital identity (the Aadhaar program in India is one example), or that have facilitated the establishment of mobile financial services, as Kenya has done with M-Pesa. However, it would seem that a little less than half the adult population living in developing economies does not have a bank account⁸. Conversely, banking inclusion is not an issue in most of developed economies: in France, 99% of the adult population is banked, and one can thus consider that all the French adults who wish to have a bank account have one. This results in part from a regulation that has prescribed the provision of basic banking services and a right to access an account.

Bearing in mind the inefficiencies underlined above regarding remittances, developing economies thus appear penalised in a double way, since financial inclusion lags in these countries and they are heavily dependent on remittances. In this case also, the benefits of digitalisation are not fully reaped.

8. See “Inclusion financière”, lafinancepourtous.com, 14 December 2021 [www.lafinancepourtous.com/decryptages/finance-perso/banque-et-credit/inclusion-financiere/?gclid=EAlaIObChMldrLqpvj9gIVCZBoCR3mjwdIEAAYASAAEGlszvD_BwE].

II. VARIOUS YET NOT ALWAYS CONVINCING MARKET INITIATIVES, BUILT ON A COMMON TECHNOLOGICAL SUBSTRATE

Certain market initiatives have underlined the insufficient use by traditional actors of the banking and financial system of the possibilities opened by digitalisation. These initiatives are developed on a common technological substrate, the Distributed Ledger Technology (DLT) and the blockchain⁹. They have taken various forms.

Cryptoassets intended for a monetary purpose, essentially Bitcoin at the start of year 2009, appeared first. However, they did not fulfil their promises, insofar as they are not used as a currency unless the government prescribes their use, and even then only to a limited extent. Stablecoins, as attempts to combine DLT and the supply of assets of stable value, unlike the first cryptoassets, came after. Initial coin offerings (ICOs) seem to have been no more than a flash in the pan, during the years 2016 to 2018. Decentralized finance (DeFi) has since then proposed a set of peer-to-peer financial services around cryptoassets. Finally, non-fungible tokens (NFTs) have been developing at an extremely rapid pace since 2020. However, it is too early to say whether they will be a new El dorado or whether they will give rise, after ICOs, to another bout of speculative fever.

1. A common technological substrate¹⁰

A distributed ledger (DL) is an electronic ledger which is natively private, which can be simultaneously consulted, recorded and synchronised by authorised actors, and which evolves with the chronological addition of new information that has been validated by all actors. This information is immutable and therefore never to be modified or deleted. A DL usually relies on cryptography to allow nodes (i.e. computers) to securely propose, validate and record state changes (or updates) to the synchronised ledger without the necessary intervention of a central authority. Distributed ledger technology (DLT) allows to create and use, with recourse to smart contracts (i.e. a protocol or code that self-executes when certain conditions are met),

9. By focusing on the blockchain, the author is leaving out another development affecting finance, the increasing use of artificial intelligence (AI). Indeed, AI has consequences for society that go far beyond the sectors of payments, money and finance. Furthermore, by exploiting payment data for the purpose of evaluating potential investors or borrowers, AI creates an inter-relation between these sectors, rather than a unity, to such an extent that it has been said that, nowadays, data replaces collateral. From an industrial point of view, a potentially very important consequence is that the Big Techs, experts in AI, are bound to try to sue their comparative advantage by investing the area of payments, which is less protected by regulation, and then possibly in those of money and finance.

10. The definitions used in this section are essentially those proposed by France Payments Forum (see the glossary at the beginning of this volume).

a ledger which is distributed to a network of computers which synchronize, process and secure blocks of transactions using a validation mechanism, commonly referred to as a “consensus mechanism”. This mechanism allows the nodes involved in the validation process to ratify a new block of transactions. There are several consensus mechanisms, the most well-known of which today are the proof of work (PoW) and the proof of stake (PoS). PoW has recourse to “miners” to check the data loaded into the ledger, validate the authenticity of transactions and create new blocks. It consists in asking the miners to solve a mathematical problem which necessitates an important computing power. The miner who solves this problem first is rewarded through the payment of a fee and the attribution of newly created (“minted”) units, and creates the next block of the blockchain. PoW is the first consensus mechanism that was used by the blockchain with Bitcoin. PoS is based on the receivership of cryptoassets by the validating nodes of a public blockchain. It thus introduces an element of centralization in an organisation which is *a priori* decentralised.

A blockchain is one form of DLT which allows the storage and exchange of cryptoassets on a peer-to-peer basis, i.e. without intervention of a trusted third party. A blockchain instead has recourse to cryptography and to a consensus mechanism, which both make it very difficult to falsify it and thus solves the problem of “double spending” (a fraudulent act in which the same means of payment is spent more than once). The exception is the 51% attack, in which an attacker or a group of attackers manages to take control of a majority of the nodes participating in the validation mechanism, which is very costly.

A cryptoasset is an intangible asset whose principal is supported by DLT. There are two main forms of blockchains: public and private. A public blockchain is an entirely distributed blockchain, with permissionless access, and in which all nodes have the same roles, the same rights in terms of reading (consultation) and writing (entry of new transactions, thus participation in the validating mechanism), without any dominating node. In a private blockchain, all nodes belong to one entity or a group of entities (consortium), which controls access, writing and consensus. A permissioned blockchain is a private blockchain with restricted access and participation.

A cryptoasset with intended monetary purpose, as Bitcoin, which is based on its own blockchain technology, is called a coin. One also refers to altcoins to designate coins other than Bitcoin. If the cryptoasset is associated with an existing blockchain, such as Ethereum, it is called a token. This does not prevent a token on a blockchain, contrary to the usual use of the term, from representing only itself (this is always the case for coins). The exceptions to this lack of an extrinsic value of coins and tokens are, in principle, tokens issued during ICOs and, by nature, the cryptographic representation of assets in existing categories, such as securities and money (see below) and which are then “tokenized”.

The advantages of the blockchain are that it allows information to be shared instantly, permanently and at the global level, that has the following properties:

- It is safe, thanks to recourse cryptography, to the consensus mechanism and the resilience implied by its distribution, which shelters it from the failure of any participating node (the so-called “single point of failure” problem), as this can occur in the centralised organisations that prevail nowadays;
- It is transparent, as all the nodes have access to the same information, although, in private and even public blockchains, access to certain information can be restricted so as to preserve confidentiality;
- It is unalterable.

One consequence is that the blockchain makes it possible to dispense with certain operations, such as reconciliation, and trusted third parties. In a blockchain, the distinctions between the notions of front-end and back-end, of clearing and settlement, are blurred, since the infrastructure offers the possibility of carrying out these operations in a very rapid manner, with, however, several trade-offs (*see volume 2*). Furthermore, the introduction of this new technology allows the entry of new products and actors, and thus supports competition and innovation.

2. Bitcoin and first-generation altcoins: the myth of private decentralised currencies

The word bitcoin refers both to a transfer system for a cryptoasset (it is then spelled “Bitcoin”, capitalized) and to a unit of account (it is then spelled “bitcoin” or “bitcoins”). Bitcoin uses a public blockchain (see also “Public blockchain”). At 28 June 2022, there were more than 20,000 cryptoassets for a total market capitalisation of around \$950 billion¹¹. Although its share has significantly decreased in the last ten years, before which it stood at 100%, Bitcoin still accounted for 42% of the total market capitalisation of cryptoassets, compared to 16% for Ethereum, 7% for Tether, 6% for USD Coin, 4% for Binance Coin and 2% for Binance USD, Ripple, Cardano and Solana (Tether, USD Coin and Binance USD are stablecoins, see below). For this reason, because it is in a way the ancestor of cryptoassets, and also because Bitcoin claimed to play a monetary role from the moment it was launched¹², the analysis here focuses on this cryptoasset rather than on altcoins.

11. Source: CoinMarketCap.

12. See Satoshi Nakamoto, “Bitcoin: an electronic peer-to-peer payment system”, bitcoin.org, 2008 (https://bitcoin.org/files/bitcoin-paper/bitcoin_fr.pdf). Satoshi Nakamoto is a pseudonym.

Apart from using the blockchain, Bitcoin, as the altcoins, associates a public and a private key, which defines the asset in the absence of an issuer and allows the user to remain anonymous, or more accurately, to protect their privacy by using a pseudonym. The absence of an issuer is certainly the characteristic that most differentiates Bitcoin and altcoins from legal currencies, be they fiduciary money or bank deposits. First generation cryptoassets (Bitcoin and altcoins) are unbacked, whereas fiduciary money and bank deposits are backed by the assets held by their respective issuers (the central bank and commercial banks). This lack of a backing allows Bitcoin to be essentially decentralised, although some elements of centralisation can be found in its ownership, which is difficult to gauge because pseudonymity, which allows a same user to have different private keys or, conversely allows multiple holders to be grouped by an exchange under a single key. Elements of centralisation are more visible in the mining activity, which is concentrated in “farms” that have a very large computation power, in order to increase their chances of being rewarded. Above all, the absence of a backing makes Bitcoin prices extremely volatile, which is one of the obstacles, probably the most important one, to the monetary use intended by its promoter(s). Two other handicaps penalise Bitcoin in the use it was intended for:

- Bitcoin’s supply is inelastic: the pace of creation of bitcoins is programmed to reduce by half every four years (this procedure is called “halving”), resulting in a progressive convergence of the number of units toward 21 million in 2140, compared to around 19 million units in March 2022. Furthermore, new units are “minted” only to reward miners who manage to solve first the cryptographic problem allowing them to chain a new block of transactions (in case of conflict for the attribution of the reward, the length of the chain serves as a proof), instead of being created in relation to the value of transactions, as for legal currencies, although the link is rather indirect in the latter case. Changing the algorithm for the creation of new units would be both difficult and risky. Indeed, it could create expectations for other increases in the future, since the ceiling of 21 million units has thus far been presented as intangible. As a result, Bitcoin’s prices, which are essentially grounded on its scarcity, could collapse;
- Bitcoin is slow. It processes only seven transactions per second and the standard reckoning is that it takes one hour, or the mining of three blocks, for a transaction to be statistically irreversible (the energy expenditure required to produce a false blockchain that would be longer than the exiting one would then be staggering).

These two handicaps create a scalability issue, together with congestion episodes and erratic fluctuations in transactions costs, since miners ask for higher fees when there is congestion, in order to process certain transactions

before others. They can be overcome by accelerating the pace of transactions through the addition of sidechains, like the Lightning network, which allows settlements to be made in the blockchain of issue only for the balance of transactions carried out between two users who have created a “channel” in the sidechain for that purpose. However, in line with the so-called triangle of Buterin (*see volume 2*), the addition of sidechains in turn creates difficulties, notably by introducing centralization and a loss of security, insofar as they resort to the clearing of bilateral positions, which introduces a credit risk, aggravated by the specialization of certain nodes in the redistribution of liquidity, similar to the clearing houses grafted onto the gross settlement system formed by Bitcoin.

Indeed, in spite of the development of settlement services in cryptoassets by major actors of the payment industry (for instance PayPal, Visa, Mastercard, or Worldline), Bitcoin and the altcoins are very seldom used in daily transactions. Furthermore, their prices are too volatile to use them as reserves of value. Overall, they are unfit for a monetary use¹³. In fact, they serve essentially four purposes:

- Principally, as instruments for speculative investing (see “Cryptoasset holdings in France and around the world”);
- Settling transactions under pseudonyms, so as to protect privacy, but also in some cases may finance illicit transactions. One estimate is that a quarter of the volume of transactions in bitcoins and close to half of the value of all these transactions are associated with illegal activities¹⁴. However, this estimate is already a bit old and police services have since then made progress in tracing transactions in the blockchain, as the example of the Colonial Pipeline “ransomware” demonstrated. Transactions implying illicit addresses would have accounted in 2021 for only 0.15% of transactions in cryptoassets, with the amounts received by these addresses totalling \$14 billion¹⁵. Regarding the ratio, one should however be mindful that the bulk of transactions in cryptoassets takes place between them. Consequently, taking into account only those transactions in cryptoassets against goods, services and assets other than cryptoassets, would make more sense and would yield a much higher figure. Furthermore, licit addresses may also be involved in illicit activities, which suggests that the \$14 billion figure is probably a minimal evaluation;

13. To remind, the three functions of money are to provide a unit of account, a means of transaction and a reserve of value.

14. Sean Foley, Jonathan R. Karlsen and Tālis J. Putniņš, “Sex, Drugs, and Bitcoin: How Much Illegal Activity Is Financed through Cryptocurrencies?”, *The Review of Financial Studies*, vol. 32, n° 5, May 2019, p. 1798-1853 [restricted access: <https://academic.oup.com/rfs/article-abstract/32/5/1798/5427781?redirectedFrom=fulltext>].

15. *The 2022 Crypto Crime Report*, chainanalysis.com, February 2022 [<https://go.chainalysis.com/2022-Crypto-Crime-Report.html>].

- Circumventing capital controls, which is an illicit activity. However, such circumvention is efficient only if the purchase and the resale of cryptoassets go unnoticed by the controllers. Furthermore, it is ambiguous since they can serve to discipline economic policies, which can contribute to social welfare (*see volume 2*);
- In cross-border payments, preferably of large value so that the transactions are not too heavily penalised, in percentage of their value, by high fees, in particular during contagion episodes.

3. Stablecoins: a brave new world?¹⁶

A stablecoin is a cryptoasset that seeks to stabilise its price by linking its value to that of an asset or pool of assets, in almost all cases, the U.S. dollar. Consequently, from a conceptual point of view, stablecoins differ significantly from the first generation of cryptoassets, especially those that, as Bitcoin, aimed at displacing legal currencies. Thanks to the stability they offer, they allow users to remain in the “cryptosphere” and avoid paying high transactions costs when buying and selling legal currencies, if they wish for instance to rebalance their portfolio of cryptoassets (there are markets between cryptoassets other than stablecoins but they often lack liquidity). Furthermore, some cryptoasset exchanges refuse payments in legal currencies, thus avoiding compliance with certain regulatory constraints, whereas the main stablecoins generally allow easy switching between exchanges.

The first stablecoin, launched in 2014, was Tether (USDT). As of 28 June 2022, the total market capitalisation of stablecoins reached approximately \$150 billion, or 16% of the total market capitalisation of all cryptoassets. USDT, which aims at parity with the U.S. dollar and which remained the only stablecoin until 2018, accounted for more than 40% of the amounts issued, followed by USD Coin (one third), Binance Coin (one tenth) and DAI (around 5%). Four stablecoins thus accounted for close to the total market capitalisation of this category of cryptoassets.

After the collapse of Terra, the capitalisation of which was still around \$30 billion, in May 2022, almost all stablecoins are backed by an off-chain reserve, meaning that the assets that enter the reserve are not cryptoassets, and thus cannot be kept on the blockchain. DAI is the only significant on-chain stablecoin, and is backed by cryptoassets. By nature, off-chain stablecoins are more centralised (the users have no visibility over the

16. This section draws on the article by Anastasia Melachrinou and Christian Pfister, “Stablecoins: A Brave new world?”, 2021, *Stanford Journal of Blockchain Law and Policy*, 4(2), 113-138, <https://stanford-jblp.pubpub.org/pub/stablecoins-brave-new-world/release/1>.

reserve), whereas on-chain stablecoins are more transparent (the users can on the blockchain that the collateral is there). However, as a result of the volatility in cryptoasset prices, on-chain stablecoins have the drawback, from the users' point of view, of relying on collateral rates higher than unity (150% in the case of DAI). Furthermore, since the positions are liquidated in case the collateral rate is not respected, this can destabilise the market for the collateral (i.e. the cryptoasset) that had been posted. Off-chain stablecoin essentially rely on market arbitrage to stabilize the value of the units they issue, thus expecting market participants to buy a stablecoin when its price falls below parity and to sell it when its price rises above parity, in both cases without the issuer being forced to intervene. Such an arrangement can of course only work if the parity commitment is credible, hence the reserve is managed in a prudent and transparent manner, which is not always the case.

Stablecoins are presented as offering four potential advantages¹⁷:

- Making instant payments at a low cost, an advantage which can certainly be attained more realistically than in the case of cryptoassets of the first generation, whose prices and transaction costs are highly volatile;
- Making money programmable, although it would be more correct to say “making means of payment programmable”, since stablecoins are not money in its own right, for two reasons. The first reason is that stablecoins are not autonomous, as legal currencies are, since they are referenced to legal currencies and hence have to be backed by these currencies. The second reason is that they are imperfectly stable. However, if the latter limit could be remedied, and if the use of stablecoins in transactions spread, their holding by residents could be included into the corresponding monetary aggregates;
- Supporting financial inclusion, in particular in emerging and developing economies, which could be the case if they were distributed at a wide scale and at low costs, although this has not been the case so far;
- Serving as a privileged instrument within DeFi (see below). This is the most widespread use of stablecoins today. Within DeFi, stablecoins play a role that compares with that of “safe assets”, such as Treasury bills or central bank reserves in traditional finance (or centralised finance, CeFi). They are used as collateral, reserves of liquidity, and safe havens. On-chain stablecoins are in fact themselves a DeFi business case.

Stablecoins can thus be viewed at this stage as an appendage of other cryptoassets. However, this situation could change if, in spite of the withdrawal of the Diem (formerly Libra) project by Meta (formerly

17. Christian Catalini, Alonso de Gortari and Nihar Shah, “Some Simple Economics of Stablecoins”, *MIT Sloan Research Papers* n° 6610-21, 15 December 2021 [https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3985699].

Facebook) because of the hostility of regulators, other global stablecoin projects emerge. This could notably be the case in the field of wholesale payments, in which two projects are known: Utility Settlement Coin (USC), supported by a group of banks and institutional investors (Finality), and JPMCoin, supported by JPMorgan. The main contribution of the Finality project would be to provide their customers with quasi-instant settlement at the global level on a 24 hours a day x 365 days a year basis, allowing them to save liquidity by holding one pool of cash at the global level in each of the currencies that would be covered by the project, instead of several pools as the result of the time zone constraints. Furthermore, USC would be almost entirely protected against credit risk, since in principle the tokens would be fully backed by reserves held with each central bank of the reference currency; the stablecoins used would thus be of a 100% reserve type¹⁸. Following the Bank of England's decision in April 2021 to open omnibus accounts allowing the participants in the Finality project to pool their assets, the pound sterling version of USC is expected to launch in October 2022.

The JPMorgan project is similar to the Finality one in the technology it uses (a permissioned blockchain) and in its purpose (the transfer of wholesale money in real time at a global level and on a 24 hours a day x 365 days a year basis). However, there are two differences: in the current state of the project, the only currency of reference would be the U.S. dollar and, above all, the collateral would be provided by deposits with the JPMorgan Bank, instead of central bank reserves, which would leave residual liquidity and credit risks. JPM Coin aims to reduce friction on the dollar money market by facilitating the settlement of transactions between users.

Stablecoins can offer advantages. However, they can also present risks. This is particularly the case for global stablecoins. Indeed, as underlined in report of the G7 working group on stablecoins¹⁹, global stablecoins combine two sorts of risks:

- The risks inherent in any stablecoin scheme, often common to other cryptoassets issuance schemes: temptation to increase profitability by investing in risky assets and practising "maturity transformation", where assets have a longer maturity than resources whose holders can request liquidation at any time; lack of legal certainty, especially with regard to the rights available to users; governance failures, including risk review and control; risk to financial integrity in the frequent absence of AML/CFT controls; protection of user transaction data,...;

18. On the 100% reserve models, their topicality and in particular their similarities with USC and CBDCs, see Christian Pfister, "100% Reserve: Calamity or Opportunity?", *Working Paper 786*, Banque de France, November 2020, <https://publications.banque-france.fr/sites/default/files/medias/documents/wp-786.pdf>.

19. G7 Working Group on Stablecoins, *Investigating the impact of global stablecoins*, G7-FMI-BIS, October 2019 (www.bis.org/cpmi/publ/d187.pdf).

– The risks that global stablecoins are likely to create due to their size: not only can the risks inherent in any stablecoin scheme be magnified in the case of global stablecoins, but they create three specific categories of risk, the last two of which are discussed in volume 2. The first category relates to the conditions of competition. The absence of competition would prevent consumers from fully benefiting from the innovation that stablecoins represent; obviating this risk would require global stablecoins to be fully interoperable. The second category of risks relates to financial stability implications, the third to monetary policy implications.

4. Initial Coin Offerings (ICOs): the 2016-2018 fever

In an ICO, tokens issued on blockchains in exchange for cryptoassets are used to finance a project, which is itself often related to cryptoassets. These tokens give their holders access either to services offered on the issuing blockchain (utility tokens), or to participation in the governance of the project and a remuneration that makes them assets similar to shares (security tokens). ICOs aim to reduce intermediation costs by using the capabilities of the blockchain (see above). Utility tokens also aim to escape more easily than security tokens from the regulation of securities issuance and, in a logic reminiscent of that of crowdfunding, to support a demand from investors allowing them to reach a critical mass more quickly thanks to network effects (*see volume 2*).

From a very limited number until the end of 2016, ICOs have multiplied and, in 2018, more than 1,000 have taken place, raising over €21 billion²⁰. However, Fatás and Weder di Mauro have pointed out that the strong correlation between the price of ICOs and that of the two main cryptoassets, Bitcoin and Ethereum, suggested that ICOs were "riding the wave" of the speculative bubble surrounding cryptoassets more than they were responding to specific funding needs²¹. Indeed, the number of ICOs has fallen sharply since the second quarter of 2018. That more than one ICO-funded project failed in the few months following its launch and that a non-negligible proportion, around one fifth according to some sources, were scams, also most likely played a role in the downturn and prompted the public authorities to introduce regulations (see below for France in the context of the PACTE law).

20. Antonio Fatás and Beatrice Weder di Mauro, "Initial coin offerings: Fundamentally different but highly correlated", in Antonio Fatás (dir.), *The Economics of Fintech and Digital Currencies*, CEPR Press, 2019, p. 75-82 (<https://voxeu.org/content/economics-fintech-and-digital-currencies>).

21. *Ibid.*

5. Decentralised finance (DeFi): a set of financial services around cryptoassets

DeFi aims to provide some of the functions of the traditional financial system, in a decentralised (transactions are peer-to-peer, without recourse to trusted third parties) and non-permitted way (governance is potentially owned by the users), based on the blockchain - specifically Ethereum - and smart contracts. This has two important consequences:

- Contrary to a common presentation, DeFi does not strictly speaking "replicate" traditional finance, since the assets traded in it are not the same. In the case of DeFi, it is exclusively cryptoassets, which still represent only a tiny share of all assets available in the world. Like the stablecoin market, with which it has a close relationship, DeFi is an appendage of the cryptoassets markets;
- In addition to the risks created by DeFi, explained below, those specific to cryptoassets, such as the absence of AML/CFT controls, or more generally of regulation or supervision, are found in most DeFi applications.

DeFi projects appeared as early as 2017 but the industry only really started to develop from the summer of 2020. The amount of assets tied up (total *value locked*) in DeFi applications rose from \$2 billion at the beginning of July 2020 to more than \$100 billion at the beginning of 2022, only to fall, with the decline in the prices of the two main cryptoassets (Bitcoin and Ether), to less than \$80 billion in March 2022²². The industry is highly concentrated, with a dozen or so applications accounting for the bulk of the locked assets.

The architecture of DeFi is based on a stack of "layers" which give the system three of its fundamental characteristics: "composability" (different "bricks" belonging to different layers can be put together to form a product or service, making the DeFi a sort of financial Lego for cryptoassets), interoperability, facilitated by the dominance of the Ethereum protocol; but also opacity for the neophyte investors, in spite of the use of the blockchain²³.

The markets covered by DeFi are essentially of two kinds, which accounted for more than 85% of locked assets in mid-2021 according to the OECD²⁴:

- Decentralised exchanges: compared to centralised exchanges, which are still the markets most used for cryptoassets transactions but which assume

22. Source: www.defipulse.com. These figures, reported by the industry, include some double counting.

23. For more details, the reader may refer to Fabian Schär, "Decentralized Finance: On Blockchain- and Smart Contract-Based Financial Markets", *Federal Reserve Bank of Saint-Louis Review*, vol. 103, n° 2, Second quarter 2021, p. 153-174 (<https://research.stlouisfed.org/publications/review/2021/02/05/decentralized-finance-on-blockchain-and-smart-contract-based-financial-markets>).

24. OECD, *Why Decentralised Finance (DeFi) Matters and the Policy Implications*, 19 January 2022 (www.oecd.org/finance/why-decentralised-finance-defi-matters-and-the-policy-implications.htm).

trust and involve custody fees, decentralised exchanges have the advantage for users of not having to deposit their assets before trading them. In addition, transactions are carried out in an atomic manner (the two "legs" of the trade take place indivisibly and form one transaction, which is the blockchain equivalent of Payment-versus-Payment or PVP in traditional finance);

- Decentralised lending platforms: these allow transactions to be carried out anonymously and income to be earned from holding stablecoins and "staking" them in these platforms. There are two ways for the lender to secure the loan. In the first, as in transactions through decentralised exchanges, the lender contracts atomically. This is an instantaneous loan, referred to as a "flash loan". Such loans are still not very developed and are mainly used for arbitrage purposes between platforms. In this respect, the amazing rates of these loans, from the lender's point of view, should not be misleading; these are transactions that are almost all "unwound" in a few seconds; they also reflect risks, as the difficulties faced by the Celsius platform in the summer of 2022 have shown. The second solution is to lend against collateral (often stablecoins but also cryptoassets, notably Ether) which is locked in a *smart contract* and released only when the loan is repaid.

Other markets, which are still underdeveloped, are:

- Decentralised derivatives markets where tokens are traded whose value depends either on the performance of an underlying asset, which makes it possible to take speculative positions, or on the occurrence of an event (prediction markets). These markets are usually dependent on "oracles", i.e. a source of information that allows smart contracts to integrate information from the outside world, which introduces an element of centralisation but also of fragility, as the source of information can be manipulated;
- On-chain asset management, which allows for automated diversification.

DeFi has been the subject of two types of warnings:

- It is not always decentralised: designed on the model of Decentralised Autonomous Organisation (DAO), Defi's applications have governance bodies, where the holders of governance tokens, who are the initiators of the project but also large loyal users, play a role comparable to company administrators, which implies a certain degree of centralisation. Validation mechanisms also introduce elements of centralisation, with proof-of-work participants being rewarded with governance tokens, while proof-of-stake mechanically leads to clustering. As mentioned above, the use of "oracles" is also a factor of centralisation;

– It creates new risks. Some of these risks are reminiscent of those found in centralised markets, such as the reuse of collateral (funds borrowed on one platform can be deposited on another platform and so on), the use of leverage through derivatives markets, or the pro-cyclicality of liquidating positions when loan collateral thresholds are no longer observed due to price drops. However, DeFi also creates interdependencies between cryptoassets markets, such as stablecoins markets (this is particularly the case when stablecoins are on-chain, see above), as well as with some of the traditional financial actors that invest in them, such as *hedge funds* and *family offices*. In addition, the construction of most DeFi applications on non-permissioned blockchains where access and transactions are conducted under pseudonyms opens up opportunities for tax evasion and other illicit practices²⁵. This last point is all the more worrying as DeFi could give rise to a double form of regulatory arbitrage. In the first form, if DeFi is not regulated, traditional financial activities could be transferred to Defi, through the "tokenisation" of the assets concerned. However, as these activities would then lose the credibility and protection associated with regulation, this scenario is unlikely. In the second form of regulatory arbitrage, as with other cryptoasset activities, the global nature of DeFi would allow its promoters to relocate their activities to the jurisdictions that would impose the fewest constraints on them, potentially resulting in less protection for users or shifting the costs of malfunctioning to the global financial system. This risk highlights the need for international coordination (see volume 2).

If the "tokenisation" of assets were to progress, making them routinely available on the blockchain, and extend to bank deposits in particular (leading to the creation of a new sort of cryptoassets, sometimes referred to as "bankcoins"), with stablecoins being regulated and final settlement of transactions taking place in wholesale CBDC (see below), DeFi could nevertheless play an important role in financing the economy.

6. NFTs: Eldorado or new speculative fever?

While tokens are in principle interchangeable, non-fungible tokens (NFTs) exist in unique copies. Thus, according to the Association pour le Développement des Actifs Numériques (ADAN), "an NFT can be defined as a unique token, certifying the ownership of an asset - material (artwork, real estate and others) or digital (collectibles, digital avatars, digital artworks and others) - to its holder and registered on the public blockchain registry. To date, most NFTs are issued via the Ethereum network. The NFT is usually

25. See Igor Makarov and Antoinette Schoar, "Cryptocurrencies and Decentralized Finance (DeFi)", *NBER Working Papers*, n° 30006, April 2022 [www.nber.org/system/files/working_papers/w30006/w30006.pdf].

accompanied by information about the author of the work, the previous owner and other more technical terms inherent to the underlying asset"²⁶. NFTs thus make use of the immutability and non-falsifiability properties of the blockchain.

NFTs first appeared in 2017, notably with the CryptoPunks series, a collection of algorithmically generated pixelated images limited to 10,000 in number, and CryptoKitties, a virtual game that allows virtual cats to be bought, raised and sold. Although these tokens have since traded at very high prices, expressed in Ether, the NFT market only really took off in 2020, as Bitcoin and altcoins prices rose sharply and lockdown measures prompted artists and collectors to find new forms of distribution. According to NonFungible.com, the total capitalisation of the NFT market thus grew from \$124 million in 2019 to \$372 million in 2020 and \$16.9 billion in 2021.

By the end of 2021, three-quarters of NFT's supply was collectibles, similar in design to Pokémon cards. The other use cases were mainly cultural (art, music) and gaming. Two potentially important points for the future of the market highlighted by ADAN are that virtual avatars representing users within the metaverse are provided by NFTs and that the legal status of NFTs is uncertain²⁷. Also potentially important is that the disappearance or mitigation of two factors that have contributed to the development of the market in 2020-2021 (rising prices of first generation cryptoassets and the Covid-19 pandemic) could negatively affect the future development of the market.

III. PUBLIC SECTOR RESPONSES, COMPLEMENTARY BUT ALSO POSSIBLY COMPETING WITH PRIVATE SECTOR INITIATIVES

The public authorities have put in place or are preparing to put in place a legal framework which, by securing the environment in which businesses operate, should facilitate their development, at least for those that already exist or have sufficient resources, possibly from the moment of their creation. Indeed, all regulation carries a cost that creates barriers to entry, protecting established players, which makes it ambiguous from the point of view of competition. Another form of public intervention, which is much stronger than regulation, aims to provide an alternative to private supply,

26. "Les non-fungible tokens (NFT) : la rareté numérique", adan.eu, 15 November 2021 [<https://adan.eu/article/nft-la-rarete-numerique>].

27. *Ibid.*

as is the case with MNBC projects. The ambiguities of public intervention imply that, before intervening, the public authority should in principle ensure that two conditions are met. The first condition is that private initiative is unable to meet a clearly expressed need (in other words, there must be a "market failure"). The second condition is that the benefits of public intervention outweigh any disadvantages. The two forms of public intervention, regulatory and production-based, are examined here in turn.

1. The legal environment of cryptoasset activities is made more secure, facilitating their creation and development

The regulation of cryptoassets activities, whether already existing or in preparation, is rightly based on the rejection of two extreme approaches:

- The first approach is to do nothing, or even worse to promote cryptoassets as El Salvador has done by giving Bitcoin legal tender status (see *Bitcoin as legal tender: the case of El Salvador*). This approach is incompatible with the risks that cryptoassets present at this stage (see above) and those that they may present in the future, particularly for financial stability;
- The second approach is instead to prohibit cryptoassets activities. Banning cryptoassets altogether cannot reasonably be envisaged given their global accessibility and the lack of an issuer that characterises them. The prohibition can then be implicit (exchanges, banks and other financial institutions are prohibited from offering services to natural and legal persons trading in cryptoassets) or explicit (trading in or holding cryptoassets is subject to criminal penalties). According to the US Library of Congress, the number of countries imposing some form of a ban increased between 2018 and 2021 from eight to nine (Algeria, Bangladesh, China, Egypt, Iraq, Morocco, Oman, Qatar, Tunisia) for the explicit ban, and from fifteen to forty-two for the implicit one. This highly administrative approach is unfavourable to competition and innovation.

Bitcoin as legal tender: the case of El Salvador

On 7 September 2021, El Salvador adopted Bitcoin as legal tender, with the US dollar continuing to play the role of unit of account that it has had in the country since 2001. The objectives were to promote financial inclusion, one of the lowest in the world, and to facilitate remittances, on which the Salvadoran economy is highly dependent. Overall poorly perceived in the country and abroad, by institutions such as the International Monetary Fund (IMF) and the World Bank, as well as by the rating agencies, which have lowered their ratings as a result, the measure has, on the contrary, sparked enthusiasm in the "crypto community". However, the latter reaction is seemingly paradoxical in view of both the libertarian doctrine that the community often claims and of the constraints imposed on the population.

In order to support the use of Bitcoin and to ensure its convertibility, a public fund of \$150 million has been created, without clearly establishing its responsibilities towards Salvadoran Bitcoin holders in the event of a sharp drop in prices. Technical standards require institutions authorised to make Bitcoin to US dollar conversions to safeguard consumer interests and the integrity of the financial system*. An official e-wallet, Chivo ("nice" in Salvadoran slang), can be downloaded free of charge and allows users to make transactions and receive remittances, free of charge and in real time through the Lightning network (see above). Salvadorans who open a Chivo receive US\$30 from the public fund mentioned above. Wallets provided by private operators, charging for their services, offer the same functions and also link to a bank account or card.

The IMF has expressed concern about the potentially redistributive consequences of the measure in an economy where 26% of the population lives below the poverty line, with no obvious benefit since Bitcoin has only poor monetary capabilities (see above). The adoption of Bitcoin as legal tender has also led to banks holding Bitcoin, introducing a strong element of risk into the financial system, while public finances have been burdened with a contingent asset, due to both the ambiguous role of the public fund created to support the use of Bitcoin and its acceptance in tax payments. Furthermore, a survey conducted on the basis of individual interviews shows that 60% of the population concerned did not download Chivo and, of those who did, 60% stopped using the application after spending the thirty-dollar subsidy, indicated as the main reason for adoption**. Conversely, the main reason for not downloading was a preference for fiat currency, followed by distrust of the system or Bitcoin. Users were few in number, mostly banked, young, male and educated. Despite the legal tender, only 20% of businesses, the largest ones, reported accepting Bitcoin as payment, and by February 2022, only 1.6% of remittances had used Chivo. All in all, the operation so far can hardly be presented as a success with the public.

* For more details, the reader may refer to Sergio Gorjón, "The role of cryptoassets as legal tender: The example of El Salvador", Banco de España, Analytical Articles, Economic Bulletin, 4/2021 (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3944765).

** See Fernando E. Alvarez, David Argente and Diana Van Patten, "Are Cryptocurrencies Currencies? Bitcoin as Legal Tender in El Salvador", National Bureau of Economic Research Working Papers, No. 29968, April 2022 (<https://www.nber.org/papers/w29968>).

These two extreme approaches aside, three other approaches are conceivable, in increasing degrees of constraint and cost:

- An "à la carte" regime, leaving the possibility for project initiators to apply for regulatory status, with all the obligations that this entails, but also with the gain in public reputation. This regime is probably best suited to a "nascent industry" but cannot be a "cruising" regime if the activities involved grow, creating risks for the whole financial sector;
- A regime based on risk alone, relying on assimilation with corresponding activities already regulated, fairly easy to implement but that may not always be suitable for Cryptoasset activities, as it would leave pockets of risk and could lead to international heterogeneity, favouring regulatory arbitrage;

– An *ad hoc* regime covering all cryptoassets, which may take a long time to implement, due to both the evolving nature of the sector and the need for international coordination (*see volume 2*).

The PACTE Law, inspired by the first approach, and the main elements of the European Commission's "regulatory package" on digital finance, inspired by the second and third approaches, are presented here in turn.

With the law of 22 May 2019 on the growth and transformation of businesses, known as the PACTE law, France has provided an early legal framework for the provision of services in digital assets and ICOs. The law provides for virtual asset service providers (VASPs) that wish to do so to be authorised and placed under the supervision of the *Autorité des marchés financiers* (AMF), the French financial markets watchdog. Those that are authorised are subject to a set of rules common to all the services covered (insurance or equity capital, internal control procedures, resilient IT systems, transparent pricing policy, etc.) as well as to a number of rules specific to the services offered. In addition, whether or not they choose to obtain the optional authorisation, VASPs wishing to carry out two activities, that of holding digital assets on behalf of third parties or that of buying/selling digital assets for legal tender, are required to register with the AMF. With regard to ICOs, the law provides for the possibility for project holders to submit their disclosure document to the AMF for optional approval, provided that they meet certain requirements. Finally, the law includes provisions authorising two types of funds to invest in cryptoassets (*fonds professionnels spécialisés* - FPS - or specialised professional funds, and *fonds professionnels de capital-investissement* - FPCI -, or professional private equity funds, the latter within the limit of 20% of their assets) and measures to protect investors. The law has undoubtedly favoured the better knowledge and development of cryptoassets in France (*see Cryptoassets holdings in France and around the world*).

The European Commission's "regulatory package" on digital finance includes, in particular, the draft regulation on Markets in Cryptoassets (MiCA), for a pilot scheme for blockchain-based market infrastructures on one hand, and the draft regulation for a regulatory framework on Digital Operational Resilience Act (DORA) on the other hand. The use of the EU regulation instrument rather than the directive instrument is indicative of the European will to provide a harmonised framework for the exercise of cryptoasset-related activities. MiCA does not cover financial tokens, which are subject to the regime for the issuance and exchange of financial securities, notably MiFID2. It covers three types of cryptoassets: payment tokens (e-money tokens), which are stablecoins referring to a legal tender, investment tokens, which are stablecoins referring to one or several assets (asset reference tokens - ART), and utility tokens. ICOs would be subject

to the publication of a white paper after notification to the competent authority, allowing tokens to be offered throughout the EU without a passport procedure. A statute of Virtual Asset Service Provider (VASP) would be created, with a mandatory authorisation, thus with a much wider scope of obligation than the one provided for in France by the PACTE law. With regard to electronic money tokens, the issuer would have to be authorised as a credit institution or an electronic money issuer, would be subject to the obligation to redeem users at par value at any time, could refer to a legal tender other than the euro and would have to invest the funds received in the reference currency. In addition, a specific regime, with additional obligations and the intervention of a European level of supervision, would apply to electronic money tokens considered "significant". Although on the whole these provisions are a step in the right direction towards a more secure legal environment, they raise a number of questions, some of which will be addressed in the secondary legislation. Among these, why not let issuers of single-reference stablecoins also choose a mutual fund status? What does "repayment at par value" mean? Can the latter be different from par? Could stablecoin issuers remunerate holders since banks can remunerate deposits and mutual funds can remunerate unit holders? What will be the thresholds for determining whether an issue of e-money tokens is "significant"? For its part, the pilot scheme provides, for a period of three years following its implementation, which may be extended for another three years, for a "sandbox" statute for financial activities using DLT. Below certain thresholds, which vary according to the activity and the financial instrument (provision of market infrastructure, shares, bonds and funds), players would be exempt from certain obligations, in particular that of depositing listed securities with a registrar. Finally, recognising the financial sector's increasing dependence on information and communication technologies (ICT) and the interdependence within the financial sector, DORA applies to all financial agents and requires them to put in place a robust and comprehensive digital operational resilience testing programme, including testing tools, systems and methodology.

Cryptoassets holdings in France and around the world

According to crypto.com, by the end of 2021 there were 295 million cryptoasset users worldwide, three times as many as at the beginning of the year. The cryptoasset exchange and services platform Coinbase, which went public in April 2021, soon surpassed all European banks in capitalisation, and in September 2021 El Salvador made Bitcoin legal tender (see “Bitcoin as legal tender: the case of El Salvador”).

According a survey conducted in December 2021*, 77% of the French had already heard of cryptoassets or NFTs and 14% had heard of both. In parallel, respondents answered that they had heard of MNBCs, decentralised finance and stablecoins with respective response rates of 24%, 21% and 19%. 8% of the French population had already invested in cryptoassets, of which nearly half in bitcoins and 29% in Ether, with an over-representation of men (60%) and the younger generations (46% aged under 35), as well as a high concentration of their savings in cryptoassets (16% said they had between a quarter and half and 7% more than half of their savings invested in cryptoassets).

The two main motivations for those who decided to invest in cryptoassets were to seek a high return (cited by 60% of respondents) and to make a long-term investment (38%). Lack of trust in banks was mentioned by only 12% of respondents, reflecting the fairly good public image of banks, in fourth place, and ideological choice by only 7% in sixth place. Finally, a very small proportion (2%) of respondents indicated that they held cryptoassets for the purpose of transferring money abroad, which tends to confirm their low use for this purpose (see above).

These results, in particular the holding of cryptoassets for savings rather than trading purposes, are confirmed by other surveys conducted abroad. For example, the surveys conducted annually since 2016 by the Bank of Canada show a high awareness of cryptoassets among the Canadian population (90%) and a low holding rate (5%). Two interesting results are also provided by the most recent exploitation of this survey**: awareness and holdings rates are stable between 2016 and 2020 and the holding population, whose composition is similar to that in France (young and male), has a lower level of financial education than the non-holding population.

According to the December 2021, 43% of French respondents believed that cryptoassets and legal tender would coexist in the future and that the former would also be used as a means of payment; 19% even believed that the former would replace the latter. Conversely, 25% thought that cryptoassets would disappear, as their adoption was still too marginal. Finally, 47% of respondents thought that banks would eventually offer services associated with cryptoassets***.

* See Adan-KPMG, La Crypto en France : structuration du secteur et adoption par le grand public, February 2022 (<https://adan.eu/rapport/crypto-france-structuration-adoption>).

** See Daniela Balutel, Marie-Hélène Felt, Graddon Nicholls and Marcel C. Voia, “Bitcoin Awareness, Ownership and Use: 2016–20”, Staff Discussion Paper 2022-10, Bank of Canada, April 2022 (www.bankofcanada.ca/2022/04/staff-discussion-paper-2022-10/).

*** Adan-KPMG, op. cit., p. 34.

2. Central bank digital currencies (CBDCs) as alternatives to private supply

In the euro area, TIPS already provides an example of a precedent where, in the area of payments, a public supply offer has tried to support an insufficiently dynamic private supply, albeit without much success so far (see above). However, TIPS operates in dematerialised central bank money and banks currently have sole access to it (the infrastructure provided by the Eurosystem does not prevent the payer and payee from carrying out their transaction in bank money).

CBDC can be defined as a component of the monetary base (or base money) that thus trades at par with fiat money and reserves, that the central bank alone can create or destroy, that is accessible in real time on a 24 hours a day x 365 days a year basis and that circulates on a different digital infrastructure from that currently used by the monetary base for a given category of holders²⁸. As with stablecoins, it is useful to distinguish between a wholesale MNBC, accessible only to financial institutions or certain types of duly accredited operators, and a retail MNBC, intended for the public, but which financial institutions could also hold. As the two types of issuance are separable (*see volume 2*), there may be one or two forms of MNBC, or none at all if the possibility of MNBC issuance is ruled out. This is because the motives, terms and potential consequences of issuing an MNBC vary from one form to another.

The motives are discussed below, the modalities and consequences, which are more of a medium-term nature since there are still very few CBDCs, none of which are wholesale or issued in a developed economy, mainly in the second volume of this study. At this stage, however, it should be noted that a retail CBDC provides a substitute for banknotes and coins, but also for deposits, since it can be used in transactions or as a savings medium, just as the latter two. However, while the substitution for cash takes place within the central bank's balance sheet, leaving the banks' balance sheet unchanged, the same cannot be said for the substitution for deposits. The latter leads to the loss of a resource for the banks (a "disintermediation") to the benefit of the central bank (this does not necessarily result in an increase in the central bank's balance sheet or a decrease in that of the banks, *see volume 2*).

Among the reasons for issuing MNBCs, regardless of their type, there is always the desire to provide a payment instrument that carries neither credit risk (the central bank cannot default) nor liquidity risk (it can always provide more of its money if there is a demand for it). The use of a CBDC thus enhances financial stability.

28. See Christian Pfister, "Central bank digital currency", Banque de France, 2020 (<https://publications.banque-france.fr/sites/default/files/media/2020/02/04/central-bank-digital-currency.cbdc.2020.02.03.pdf>) and "Central Bank Digital Currency: One, Two or None?", *Working Paper 732*, Banque de France, October 2019, <https://publications.banque-france.fr/sites/default/files/medias/documents/wp-732.pdf>.

As regards wholesale CBDC, its issuance is sometimes considered unnecessary since, with reserves, the central bank already provides a digitalised instrument for the settlement of transactions between banks²⁹. However, CBDC is precisely an instrument that circulates on a different digital infrastructure from that currently used by the monetary base and reserves cannot be put on the blockchain: currently, there is no "cash on the ledger". In contrast, a wholesale CBDC would allow financial institutions to conduct end-to-end transactions in assets represented as tokens on the blockchain, including settlement, without the use of stablecoins which carry residual risks. As a result, the use of blockchain would become more attractive to financial institutions and safer for the system as a whole. One reason for issuing a wholesale MNBC could therefore be the promotion of financial stability and innovation and the lowering of transaction costs through the use of blockchain. The issuance of a wholesale MNBC could also improve the "contestability" of the financial services market by promoting competition through the entry of new providers into the payment services industry, allowing users of financial services to benefit more quickly from the efficiencies brought about by DLT.

Retail MNBC would adapt the provision of cash to the technological context of digitalisation, allowing central banks to maintain a link with the public where, as in Sweden, demand for cash is falling sharply. Indeed, the Swedish central bank has been considering plans to issue retail CBDC under the name of e-krona since 2016. However, it is not clear that there is a public demand for this, as the main wish for the public is to have access to technological progress in a safe and convenient manner. It is true that this access is not always assured, but, where payment service users in particular are frustrated with the benefits of real-time, there is scope to learn from successful experiences elsewhere. Issuing a retail CBDC could also help to reduce the social costs of retail payment services. These costs have been estimated at around 1% of GDP in the euro area, half of which is accounted for by cash payments, whether at the level of the central bank, banks, merchants or the public. However, the decline in the share of cash in transactions shows that this cost reduction is already happening spontaneously. In emerging and developing economies, retail CBDC can also serve a financial inclusion purpose, although examples as different as M-Pesa in Kenya or Pix in Brazil show that other means are available for this purpose. It is in the sector identified above as the most lagging, cross-border payments, particularly for remittances, that MNBCs could make the largest contribution, although this would not necessarily involve the issuance of a retail CBDC. Finally, there may be fiscal reasons for issuing a retail CBDC, especially where the use of cash is still widespread, i.e. again in emerging and developing economies.

29. This view is notably held by Fabio Panetta, see "The ECB's case for central bank digital currencies", www.ecb.europa.eu/press/blog/date/2021/html/ecb_blog211119~fda94a3f84.en.html, 19 November 2021.

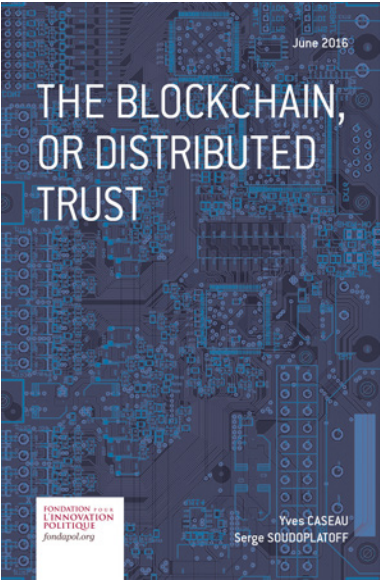
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Public authorities are progressively implementing a regulatory framework in order to facilitate the development of these new actors and products, by making their legal environment more secure while preserving public security, consumers’ and investors’ rights, financial stability and fair competition. Other public initiatives, as the possible issuance of central bank digital currencies (CBDCs) are ambiguous since they could lead to a substitution for the private sector in activities the latter currently dominates, with potentially destabilising effects.

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