



Digital currencies: from myth to innovative projects

As of 2009, the concept of decentrally-issued digital assets which, according to their promoters, could replace legal tender, was put forward to the public. More than a decade on, this project has still not been implemented. Stablecoins, which have emerged more recently, are designed to be more like legal tender and aim to remedy the shortcomings in the first generation of crypto-assets. However, they still carry many risks. In response to these initiatives, both central banks and private operators have launched innovative projects in the field of payment infrastructure and instruments. The Banque de France in turn has begun experiments on a digital euro.

Christian Pfister
Directorate General Financial Stability and Operations
Paris 1 Panthéon-Sorbonne and Sciences Po

JEL codes
E40, E42,
E58

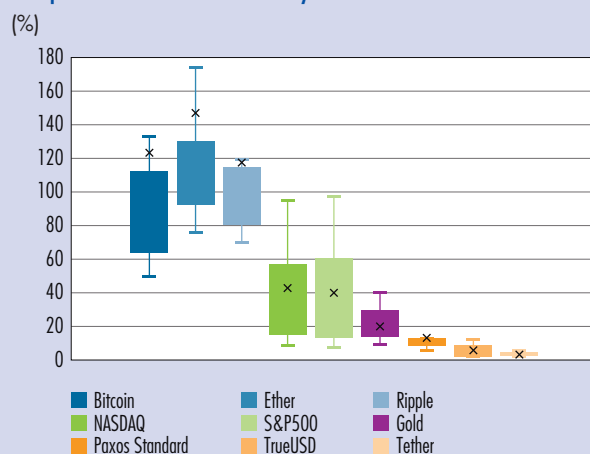
The views expressed in this bulletin are those of the author and do not necessarily reflect the position of the Banque de France. Any errors or omissions are the responsibility of the author.

Over **5,700**
number of crypto-assets identified in July 2020

240 billion euro
total stock of crypto-assets

1/5
share of the population represented by central banks willing to issue a digital currency in the near future
(source: BIS)

Comparative annualised volatility of stablecoins and other assets



Sources: Kaiko, Saint-Louis FED and Kaiko calculations.
Note: The data used cover the period from November 2019 to May 2020.

NB: This article largely reprises, updates and expands on a speech given by the author at the Rencontres du France Payments Forum (Pfister, 2020b). The author would like to thank Thomas Argente Fajari, Nathalie Aufauvre, Adeline Bachellerie, Valérie Fasquelle, Andrés Lopez-Vernaza, Anastasia Melachrinou, Ivan Odonnat, Nicolas Peligry and Nicolas de Sèze for their helpful comments.



1 The first crypto-assets, in search of a myth

Bitcoin: a pseudo-currency

By mid-July 2020, there were more than 5,700 crypto-assets in existence, with a total capitalisation of around EUR 240 billion (source: CoinMarketCap). However, Bitcoin, which was launched at the start of 2009, still accounted for close to 63% of this total, compared with some 10% for Ethereum, slightly over 3% for Ripple, around 4% for Tether and just under 2% for Bitcoin Cash. For this reason, and because from the outset it aimed to play a monetary role (Nakamoto, 2008), this analysis focuses on Bitcoin.

The three main characteristics of Bitcoin, which are also shared by many of the other crypto-assets, are as follows (the main differences are also indicated):

- It combines a public key with a private key, which defines the asset in the absence of an issuer and guarantees user anonymity. This lack of an issuer is what most distinguishes Bitcoin from legal tender, be it fiduciary money or bank deposits.
- It relies on distributed ledger technology (DLT), which enables the decentralised confirmation of transactions. In most systems, the transactions are validated in the form of “blocks” that are linked together in a chain, hence the name “blockchain”. In the case of some crypto-assets, however, such as Ripple or assets issued via ICOs¹ (initial coin offerings; see below), transaction confirmation is not decentralised.
- It uses cryptography. This is systematic in crypto-assets, hence their name. It is also used increasingly for legal tender to increase transaction security.

What are Bitcoin and the other first-generation crypto-assets used for? They are essentially used for three purposes (Pfister, 2019a):

- Speculative investments.
- Carrying out payment transactions under a pseudonym, which helps to protect privacy but also facilitates the financing of illicit activities. An estimated quarter of the total number of Bitcoin transactions, and nearly half in terms of value, are thought to be linked to illegal activities (Foley et al., 2019).
- Transfers of funds abroad. The downside for users, however, is that the associated fees are difficult to evaluate ex ante due to price volatility in both legs of the transaction. The infrastructure may also become congested as it is ill-equipped to process mass payments.

Overall, Bitcoin does not fulfil, or only partially fulfils the three functions of money (Banque de France, 2018). It is not a unit of account (it is rarely if ever used to price goods and services, in particular labour and capital), nor is it a payment instrument (very few purchases of goods and services are settled in bitcoins), or a store of value (its exchange rate against other currencies, and hence its value in terms of goods and services, is too volatile).

A promising outlook: blockchains and stablecoins

While the idea that Bitcoin or other crypto-assets might become a decentralised fiduciary currency is thus a myth, the use of the underlying technology (DLT or blockchain) to issue financial assets in the form of tokens appears more promising. To date, two possible extensions of the use of DLT have emerged (Pfister, 2019a):

¹ An ICO is a project financing mechanism consisting in the issuance of tokens subscribed in exchange for crypto-assets.



- The first is ICOs. These operations are used for project financing, and consist in the issuance of tokens on a blockchain in exchange for crypto-assets. Holders of the tokens are given access to services on the issuing blockchain (utility tokens), or may instead be remunerated, making the tokens similar to marketable securities (security tokens). The presence of an issuer is what distinguishes tokens from other first-generation crypto-assets. In 2018, more than 1,000 ICOs were carried out, raising in excess of EUR 21 billion (Fatás and Weder di Mauro, 2019). However, the number of ICOs has declined since the second quarter of 2018, following the sharp drop in the price of Bitcoin.

- The second possible use is the issuance of stablecoins.

2 Stablecoins, a desire to reconcile crypto-assets with legal tender

Stablecoins: crypto-assets pegged to legal tender

Stablecoins first emerged in 2014 and are designed to maintain a stable price vis-à-vis a benchmark, which is most often provided by a legal currency (usually the US dollar). On a conceptual level, therefore, stablecoins differ markedly from first-generation crypto-assets.

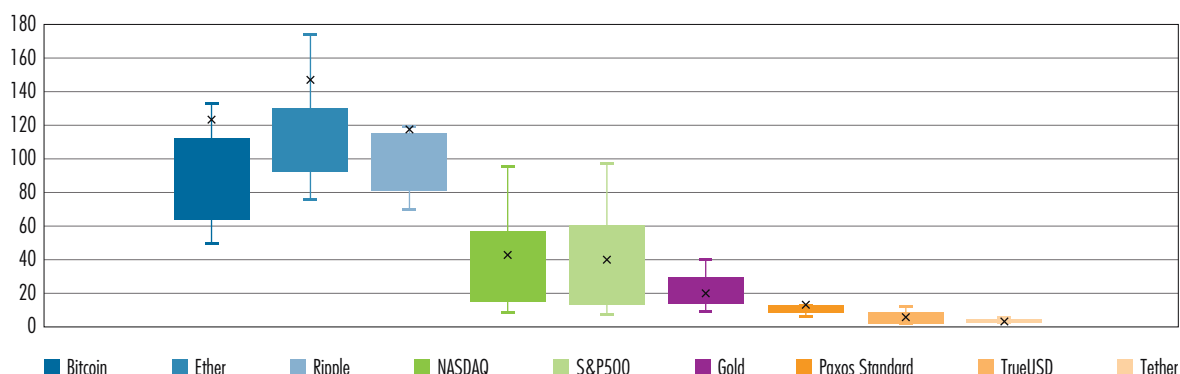
They offer users the benefit of a stable environment while at the same time enabling them to remain in the

“crypto universe”. In this sense, stablecoins seem to offer “a brave new world” (Melachrinou and Pfister, 2020). Nonetheless, fewer than 100 stablecoin projects have actually been implemented, with a total capitalisation of around EUR 10 billion (figures as at mid-July) or just 4% of the capitalisation of all crypto-assets. Moreover, four-fifths of this amount are accounted for by just one stablecoin, Tether (USDT), which was created in 2014 and is referenced on the dollar.

Stablecoins in fact have a number of disadvantages (Melachrinou and Pfister, 2020):

- First, they are not completely stable vis-à-vis their benchmark. Between November 2019 and May 2020, Tether had a median volatility of 2%, while TrueUSD and Paxos Standard, which are also pegged to the dollar, had respective volatilities of 5% and 10%, admittedly compared with over 80% for Bitcoin, Ether and Ripple (see chart). In the case of stablecoins, however, the volatility comes with no prospect of a return, as they are not remunerated and their price is supposed to remain fixed.
- The fees on stablecoins are high (entry, exit, custody and transaction fees).
- The current low level of interest rates means there are limited returns on projects backed by most major

Comparative annualised volatility of stablecoins and other assets (%)



Sources: Kaiko, Saint-Louis FED and Kaiko calculations.

Note: The data used cover the period from November 2019 to May 2020.



currencies. For example, policy rates on the euro and yen are negative. Conversely, if interest rates were to come back up to near pre-crisis levels, it would be difficult to get investors to purchase stablecoins without paying them a remuneration. Consequently, the market seems destined to remain marginal in its current form.

- There is a lack of transparency in the management of stablecoins, notably because the reserves backing them are often held outside the blockchain (off-chain).

At present, therefore, despite its differences vis-à-vis first-generation crypto-assets, the market for stablecoins is merely an appendix to that of other crypto-assets, starting with Bitcoin. Tether issues, for example, have increased sharply as the price of Bitcoin has fallen.

Libra-type global stablecoins: a scaling up that poses new risks

The status of stablecoins as a mere complement to other crypto-assets or as artefacts of legal currencies could change with the arrival of global stablecoins (GSCs) issued by very large players. These GSCs have the potential to reach a wide audience, thereby generating significant network effects, while the financial strength of the issuers could provide an additional level of confidence. The problem is that this would also potentially give the projects a systemic footprint (G7, 2019). To better evaluate the risks, it is useful to draw a distinction between two main categories of GSCs: wholesale and retail (Melachrinou and Pfister, 2020).

- **Wholesale stablecoins** are used for large-value transactions and aimed at financial institutions and large corporations. Two main projects stand out in this category: the USC project and JPM Coin. USC (Utility Settlement Coin) is an initiative led by

major banks that aims to create a market infrastructure for cross-border payments. This stablecoin would be issued in different references, each entirely backed by reserves held with the central banks issuing these references (the US Federal Reserve, the Eurosystem, the Bank of England, the Bank of Canada and the Bank of Japan). The project would offer users the possibility of making almost instantaneous payments at the global level every day, at any time of the day. They would thus be able to make liquidity savings by holding only one pool of liquidity at the global level in each of the currencies represented, instead of several pools with different correspondent banks depending on time zone constraints. The JPM Coin project, led by JPMorgan, differs in two main ways from USC: the only reference currency would be the US dollar, and the guarantees would be constituted by deposits with JPMorgan bank, and not by central bank reserves. The JPM Coin aims to reduce frictions in the dollar money market by facilitating the settlement of transactions between different customers, especially intraday transactions.

- **Retail stablecoins** are designed for mass transactions between individuals or between individuals and merchants or payment service providers. Among retail stablecoin projects, the most famous is Libra, which was made public in June 2019 with the publication of the White Paper on Libra (Libra, 2019).² In it, Libra is presented as a global currency which, as such, “must be conceived and governed as a public good”. Its different denominations would be backed by a legal currency or by a basket including only stable currencies. Investor confidence and stability would thus be maintained by investing the assets raised via issues of Libra units in “a set of low-volatility assets, including bank deposits and government securities in the currencies of stable and reputable central banks” (Libra, 2019). Libra would be accessible to Facebook account holders.

² An updated version of the Libra White Paper was published on 16 April 2020.



More than the historical crypto-assets, GSCs could encourage the greater use of blockchain technology to reduce frictions in cross-border payments. Similarly, retail GSCs could lower the costs of remittances by migrant workers to their country of origin and contribute to financial inclusion in emerging countries. These projects nonetheless pose significant risks to financial stability and monetary policy (Melachrinou and Pfister, 2020).

Regarding financial stability, wholesale GSCs carry a residual credit risk, as there is always a possibility that the issuer might default. They could also lead to a fragmentation of liquidity or, conversely, to a concentration of risks in the event the market were dominated by a single player, notably risks relating to a single point of failure or to resolution ("too big to fail"). With regard to retail GSCs, banks in user countries could see a structural decline in their resources if customers substituted GSCs for legal tender. Moreover, banking systems in issuing countries could be exposed to the risk of erratic flows in resources, especially in the event of a run on GSCs.

In the case of monetary policy, the main risk would be if stablecoins were to crowd out legal tender – if they were backed by a currency other than the national legal tender of the user country, then any changes in the legal tender interest rate would have less of an impact on domestic demand. This risk would be particularly acute in countries with at least one of the following characteristics: legal tender lacks credibility, insufficient trust in the banking system, inefficient payment system. An extreme case would be if a stablecoin became very widely used and then was depegged from its reference currency and instead pegged to itself, meaning it could set its own issuance terms. This would create a form of "digital monetary area", as referred to by Brunnermeier et al. (2019).

3 Launch of innovative projects by central banks and the private sector

In response to the risks posed by GSCs, central banks and the private sector are adapting regulations to mitigate the threats while at the same time taking advantage of GSCs' innovative potential. Public and private sector agents are also looking for ways to move into the field and improve the performance of existing payment systems.

Adapting regulations at the global level

Public sector actors have launched efforts to establish appropriate international regulations that will mitigate the risks associated with stablecoins while at the same time exploiting their innovative potential. This will be the "first line of defence" and its application will be compulsory. Work on this regulatory response is currently being carried out by the Financial Stability Board (FSB), with the backing of the Committee on Payments and Market Infrastructures (CPMI), the Bank for International Settlements (BIS), and the International Organization of Securities Commissions (IOSCO). One of the biggest challenges could be establishing a **legal classification of stablecoins**. Three non-exclusive options may be considered (Melachrinou and Pfister, 2020):

- The first would be to consider them as funds, and more specifically as money markets funds. However, a money market fund aims to maximise returns for holders within a prudent management framework, whereas a stablecoin does not commit to offering a return.
- The second option would be to consider stablecoins as electronic money, on the grounds that stablecoin units are intended to be used as a payment instrument and that their issuer undertakes to redeem them at par.
- The third option would be to treat stablecoins as payment systems since they circulate units on a blockchain for the purpose of making payments.



The direction of **prudential and monetary policies** could also be changed in user countries, as in those economies affected by dollarisation (Melachrinou and Pfister, 2020):

- with regard to prudential policies, by strengthening banks' liquidity requirements and monitoring the supply of loans in stablecoins, or even by adopting exchange rate controls;
- by placing greater emphasis on exchange rate stability, in the case of monetary policy, which would thus lose part of its autonomy.

Making payment systems more efficient

The adaptation of international regulations is a requirement, but is not in itself sufficient. There is also a need to make existing payment systems more efficient, and to consider the possibility of implementing new payment instruments.

At the European level, improving the existing landscape means first implementing a pan-European retail payment system that will prevent the fragmentation of the mass payment market and the dominance of non-European solutions (Villeroy de Galhau, 2019). As regards the international level, there are multiple and persistent inefficiencies in cross-border payments that affect costs and payment times, to the extent that the G20 has made resolving them one of its priorities for 2020. There are a number of possible solutions: enhancing the interoperability of payment solutions across different jurisdictions; interconnecting central banks' gross real time settlement systems or extending their opening times to mitigate the effects of different time zones; increasing the transparency of fees; standardising the format and type of information collected throughout payment chains.

Should central banks also offer their own digital payment instruments, in addition, of course, to the reserves banks hold on account with them, which have long been digitalised?

Should central banks create their own digital currency?

A central bank digital currency (CBDC), issued and exchanged at par with other forms of central bank money (banknotes and reserves), would be created and destroyed only by the central bank. Like banknotes and electronic money, and currently unlike reserves,³ holders would be able to use it 24/7 on a peer-to-peer basis. It could also be issued in two forms, independently of each other: a wholesale CBDC, designed for large-value payments and which could only be held by financial institutions authorised by the central bank, and a retail CBDC, for use by the general public.

The reasons for issuing a CBDC may differ depending on the country (Villeroy de Galhau, 2019):

- In developing and even emerging economies the main concern is often to promote financial inclusion.
- In developed economies, there are generally two main motives. For wholesale CBDCs, the objective may be to foster financial innovation by enabling blockchain technology to be used in end-to-end transactions. Meanwhile, for countries such as Sweden, where banknote usage is declining, a retail CBDC for use in mass payments would offer a way of maintaining a direct link with the public. For both retail and wholesale CBDCs, the desire to internationalise the currency may also play a role.

How could the distribution of a CBDC be organised? (Villeroy de Galhau, 2019):

- In the case of a wholesale CBDC, DLT could be used. A number of major issues would need to be resolved, however, such as the interoperability of blockchains accepting the CBDC, be they the central bank blockchain or those of financial institutions.
- In the case of a retail CBDC, a straightforward central bank electronic currency that did not require the use

³ Reserves are sight deposits held by banks with the central bank, and can only be accessed during central bank opening hours.



of a blockchain would probably suffice. However, a blockchain would be useful in order to integrate smart contracts (i.e. contracts that self-execute automatically when certain predefined events occur, such as interest payments), for micropayments, for example. Indeed, this is the approach that the Chinese and Swedish central banks are currently taking with their own CBDC projects. In this case, the central bank could, in principle, issue its CBDC directly to the public. However, payment service providers have direct experience in know-your-customer and anti-money laundering and combating the financing of terrorism (AML/CFT) obligations, and it would be a pity not to take advantage of this.

Whatever the case, the issuance of a CBDC would raise a number of questions (Pfister, 2019b, 2020a; Melachrinou and Pfister, 2020):

- In the euro area, would the Treaty on the European Union, in its current form, authorise the European Central Bank, the sole body equipped to do so (Villeroy de Galhau, 2019), to issue a CBDC? And should a distinction be made between a wholesale and retail CBDC?
- Should a digital euro have legal tender status, which in principle would make it compulsory to accept payments in this form of money?
- How can we respond to the public's desire for anonymity? One possibility would be to allow anonymity vis-à-vis the counterparty but not vis-à-vis the financial intermediary managing the CBDC account or the central bank.
- Should euro area non-residents be authorised to hold the CBDC and, if not, what means would the Eurosystem have to prevent them from doing so when it currently has no way of restricting the holding of euro banknotes outside the single currency area?
- Should the CBDC model be token-based (also known as value-based) or account-based? In the case of a retail CBDC, a token-based model would be similar to that currently used for banknotes, prepaid cards and meal vouchers. With an account-based model, financial intermediaries would open CBDC accounts for their customers.

These questions cannot be answered without first analysing closely how a CBDC would affect the core missions of a central bank (monetary policy and financial stability). The effects would most likely differ depending on whether the CBDC were wholesale or retail (Pfister, 2019b, 2020a):

- With regard to the impact on monetary policy, all other things being equal, the issuance of a CBDC would constitute a supply shock which would support economic growth in the medium to long run. Moreover, as a wholesale CBDC would be accessible universally and 24/7, its users would carry out transactions when financial markets and central banks were closed. This could lead to the development of an intraday market for the CBDC. In the case of a non-interest-bearing retail CBDC, unless restrictions were placed on holding it, it could put a "hard" zero floor on short-term interest rates as it would be the most liquid and safest asset in this maturity category, but also in the long-term category as expectations for short-term interest rates would not be able to go below zero. Conversely, if the retail CBDC were remunerated, it could reinforce the transmission of monetary policy, although at the risk of raising bank deposit rates.
- In terms of the consequences for financial stability, aside from the possible impact on the cost of bank intermediation as mentioned above, a retail CBDC could foster disintermediation by substituting the holding of central bank money for the holding of bank deposits. This nonetheless appears to be a distant prospect given the size of banks' structural liquidity surplus (as a result of central bank asset purchases, bank reserves are currently much higher than the required levels, and the excess could be converted into another form of central bank money without having to borrow from the central bank). In addition, the issuance of a CBDC could facilitate flights to central bank money in the event of a financial crisis.



Given that a retail CBDC has such significant implications for monetary policy and financial stability, and that nearly all existing payment instruments are already highly efficient, central banks are justified in adopting a prudent approach. In contrast, the issuance of a wholesale CBDC could meet the needs of private sector agents. As a result, on 27 March 2020 the Banque de France launched a call for applications to conduct experiments on the use of a digital euro in interbank settlements (Banque de France, 2020).

Banque de France experiments in the use of a digital euro

The experiments proposed by the Banque de France will cover the following use cases:

- payment in central bank money against delivery of listed or unlisted financial instruments ("delivery-versus-payment");
- payment in central bank money against the digital currency of another central bank ("payment-versus-payment");
- payment in central bank money against digital assets (as defined in the French Monetary and Financial Code, Article L. 54-10-1, para. 2).

The aim is to exploit the possibilities offered by this technology and identify, using open selection criteria and within a secure experimental environment, concrete cases where a CBDC can be integrated into innovative procedures for the exchange and settlement of tokenised financial assets.

To mark the start of the project, on 14 May, the Banque de France successfully tested a blockchain platform developed by its staff for the settlement in CBDC of digital financial assets issued by Société Générale Forge.

It will launch further experiments in the second half of 2020, with other players selected via its call for applications. The results of these experiments will be an important element in the Banque de France's contribution to the Eurosystem's more widespread reflection on the benefits of a CBDC.



References

Banque de France (2018)

"The emergence of bitcoin and other crypto-assets: challenges, risks and outlook", *Focus* No. 16, March.

[Download the document](#)

Banque de France (2020)

Call for applications - Central bank digital currency experiment, March.

[Download the document](#)

Brunnermeier (M. K.), James (H.) and Landau (J.-P.) (2019)

"The digitalization of money", *NBER Working Papers*, No. 26300, September.

[Download the document](#)

Fatás (A.) and Weder di Mauro (B.) (2019)

"The benefits of a global digital currency", *VoxEU.org*, 30 August.

[Download the document](#)

Foley (S.), Karlsen (J. R.) and Putniņš (T. J.) (2019)

"Sex, drugs, and bitcoin: How much illegal activity is financed through cryptocurrencies?", *The Review of Financial Studies*, Vol. 32, No. 5, Oxford University Press, pp. 1798-1853.

[Download the document](#)

G7 Working Group on Stablecoins (2019)

Investigating the impact of global stablecoins, Committee on Payments and Market Infrastructures, Bank for International Settlements, October.

[Download the document](#)

Libra Association Members (2019)

"An introduction to Libra", White Paper, Libra, June.

[Download the document](#)

Melachrinou and Pfister (C.) (2020)

"Stablecoins: A brave new world?", *Working papers*, No. 757, Banque de France, June.

[Download the document](#)

Nakamoto (S.) (2008)

"Bitcoin: A peer-to-peer electronic cash system", *bitcoin.org*.

[Download the document](#)

Pfister (C.) (2019a)

"Les monnaies digitales, un nouvel univers?", *Regards croisés sur l'économie*, No. 24, Éd. La Découverte, pp. 40-52.

Pfister (C.) (2019b)

"Central bank digital currency: One, two or none?", *Revue d'économie financière*, No. 135, Association d'économie financière, pp. 115-130.

Pfister (C.) (2020a)

"Central bank digital currency", Banque de France, January.

[Download the document](#)

Pfister (C.) (2020b)

"Panorama des crypto-monnaies digitales privées et centrales", speech at the *Rencontres du France Payment Forum*, 3 March.

[Download the document](#)

Villeroy de Galhau (F.) (2019)

"Central bank digital currency and innovative payments", speech before the *Autorité de contrôle prudentiel et de résolution* (ACPR - Prudential Supervision and Resolution Authority), December.

[Download the document](#)

Published by
Banque de France

Managing Editor
Gilles Vaysset

Editor-in-Chief
Claude Cornélis

Editor
Jean-Luc Bontems

Translator/English Editor
Vicky Buffery

Technical production
Studio Creation
Press and Communication
ISSN 1952-4382

To subscribe to the Banque de France's publications

<https://publications.banque-france.fr/en>
"Subscription"

