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Stablecoins – no coins, but are they stable?

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Introduction

In science fiction, there are societies that, having eliminated hunger, poverty and the need for possessions, can do without money. In *Star Trek Voyager*, one of the main characters states that “Money went the way of the dinosaurs”. In those societies where money has not become extinct, it is now common to imagine some sort of digital representation of value as an advanced form of money, accepted by everyone.

Over the past few years, there has been a lot of hype surrounding Bitcoin and other digital assets and their potential to substitute money. The fact that they have been called “cryptocurrencies”, “digital currencies” or “virtual currencies” might have given rise to some false expectations as to their features and functionalities. As there is currently no international agreement on how these assets should be defined, this note will follow the terminology and definitions as put forward in a recent ECB Occasional Paper on crypto-assets.¹ In broad terms, crypto-assets are assets recorded in digital form that are considered valuable by their users as an investment and/or means of exchange but that are neither a financial claim on, nor a financial liability of any natural or legal person. Cryptographic tools are applied to both issue crypto-assets and to validate transactions they are used in.

The price of crypto-assets is very volatile. In 2017 and 2018, the volatility of crypto-assets dwarfed not only the volatility of the diversified European stock and bond markets, but also that of the oil and gold prices, which typically are more volatile. This shows the market risk that crypto-asset investors are subject to.² This high volatility means that crypto-assets cannot perform the three functions of money: a store of value, a means of payment and a unit of account.

In an attempt to protect crypto-asset investment revenues from high volatility, financial service providers and technology companies have been working on a new

¹ “Crypto-Assets: Implications for financial stability, monetary policy, and payments and market infrastructures” by ECB Crypto-Assets Task Force, *Occasional Paper Series*, No 223, ECB, May 2019: “In this paper, the term “crypto-asset” denotes any asset recorded in digital form that is not and does not represent either a financial claim on, or a financial liability of, any natural or legal person, and which does not embody a proprietary right against an entity. Yet, a crypto-asset is considered valuable by its users (an asset) as an investment and/or means of exchange, whereby controls to supply and the agreement over validity of transfers in crypto-assets are not enforced by an accountable party but are induced by the use of cryptographic tools.”
The EU regulator’s definition of virtual currencies in the Fifth Anti-Money Laundering Directive (AMLD5) represents a broader set of assets compared with crypto-assets as defined in the ECB paper.

² Ibid., p. 14. For details on statistical coverage of crypto-asset markets and related challenges see also “Understanding the crypto-asset phenomenon, its risks and measurement issues” by Chimienti, M.T., Kochanska, U. and Pinna, A., *Economic Bulletin*, Issue 5/2019, ECB, August 2019.

type of digital assets that uses stabilisation mechanisms which can minimise price fluctuations. These stabilisation mechanisms ensure that the value of the digital assets is backed by either: (i) holdings of money (in one currency or a basket of different currencies), (ii) securities and commodities such as gold, (iii) crypto-assets or even (iv) users' expectations about future purchasing power.

This new type of digital assets has been termed "stablecoins". Stablecoins are meant to allow the exchange of an inherently volatile crypto-asset into a less volatile asset without leaving the crypto-ecosystem. For example, if you wanted to secure your gains from crypto-assets in less volatile assets, you could purchase stablecoins that you trust will maintain a stable price in the currency you use in your everyday life.

More recently, the idea has emerged to develop stablecoins for payment transactions on a global scale. Facebook's announcement about its Libra project has attracted unprecedented media coverage as well as fierce criticism from regulators and politicians worldwide.

It has been argued that global stablecoin initiatives could make international payments cheaper and faster while supporting financial inclusion. But they also raise challenges across a broad range of policy domains: operational robustness, safety and soundness as payment systems, customer protection, risks to financial stability and monetary sovereignty, and, last but not least, data protection and compliance with rules on anti-money laundering and terrorism financing. This paper offers a brief overview of the different types of stablecoins, the current status of stablecoin initiatives, as well as potential use cases and future prospects. It is based on the ECB Occasional Paper by Dirk Bullmann, Jonas Klemm and Andrea Pinna entitled "In search for stability in crypto-assets: are stablecoins the solution?"

What are stablecoins and what different types are there?

Generally, the term stablecoin identifies a phenomenon that is still under development and lacks a single agreed definition. To try and bring some clarity, it may therefore be useful to describe the different types of stablecoins that have emerged.

"Tokenised funds" are a type of stablecoins backed by funds (i.e. commercial money, e-money or central bank money) which an issuer or custodian holds for safekeeping; this implies that there is a commitment to ensuring that tokenised funds can be redeemed in full.

One example of tokenised funds is Tether³. Tether was among the first stablecoin initiatives to surface and thus has a significant first-mover advantage. While the market has become increasingly competitive, Tether remains the most commonly used stablecoin with a trading volume hovering around 95% of the overall stablecoin market.

³ For more information see "In search for stability in crypto-assets: are stablecoins the solution?" by Bullmann, D., Klemm, J. and Pinna, A., *Occasional Paper*, No 230, ECB, August 2019, p. 15.

“Off-chain collateralised stablecoins” are backed by other traditional asset classes (such as securities and commodities) that require a custodian for their safekeeping and are in the possession of the issuer of the stablecoins as long as the user does not redeem the stablecoins – or what is left of them in the case of default.

“On-chain collateralised stablecoins” are backed by assets, typically crypto-assets, which are recorded in a decentralised manner and do not need either an issuer or a custodian to satisfy any claim.

One example of on-chain collateralised stablecoins is Dai, which is backed by units of Ether, a crypto-asset on the Ethereum blockchain⁴.

“Algorithmic stablecoins” are backed by users’ expectations about the future purchasing power of their holdings, which does not need the custody of any underlying asset, and whose operation is totally decentralised.

One example of an algorithmic stablecoin is NuBits⁵. NuBits is one of the oldest algorithmic stablecoins and has been operational since 2014. While NuBits was able to withstand temporary price fluctuations and recovered from a major loss of confidence in June 2016, its value has not recovered after a drop in March 2018.

Figure 1 introduces the ‘crypto-cube’, which categorises the four types of stablecoins according to three criteria:

- i) the existence/absence of an issuer that is responsible for satisfying any attached claim (right horizontal axis);
- ii) the decentralisation/centralisation of decision-making responsibilities over the stablecoin initiative (left horizontal axis);
- iii) what underpins the value of a stablecoin and its stability in the currency of reference (vertical axis).

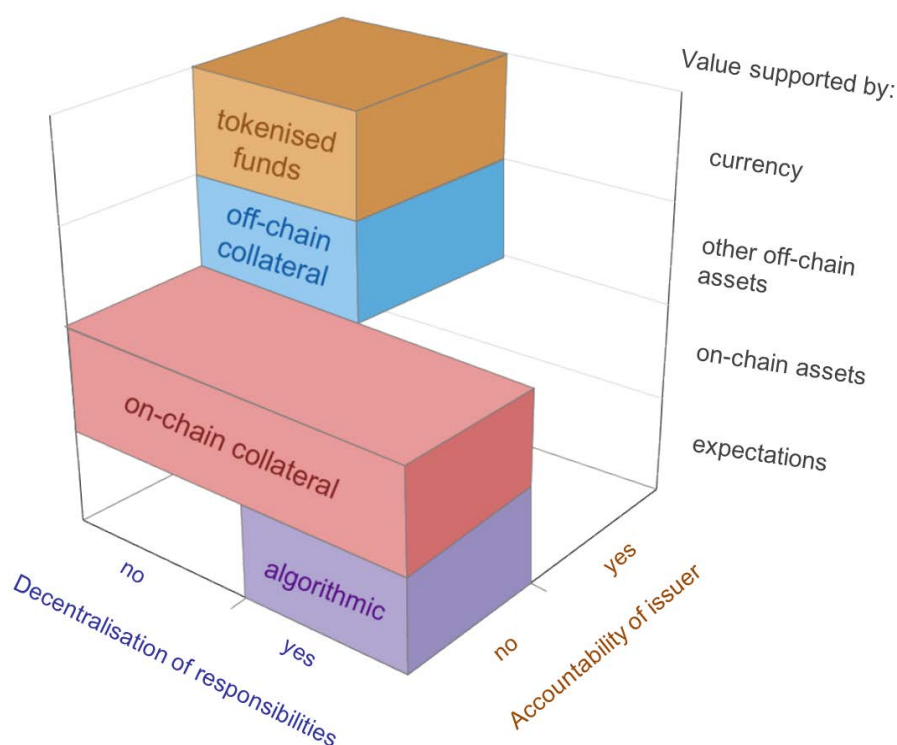
Classifying stablecoins on the basis of what backs their value allows us to highlight that some stabilisation mechanisms require the intervention of accountable institutions (i.e. issuers and/or third parties in charge of bookkeeping and managing the initiative), while other stablecoins cannot be associated with any liable party.

⁴ Ibid., p. 23.

⁵ Ibid., p. 28.

Figure 1

Classification of stablecoins within the “crypto-cube”



Source: ECB.

What is the current status of private sector initiatives?

Currently, at least fifty-four stablecoin initiatives are in existence⁶, twenty-four of which are operational. The overall market capitalisation of operational initiatives almost tripled from €1.5 billion in January 2018 to a new all-time peak of more than €4.3 billion in July 2019. Between January 2019 and July 2019, the average volume of stablecoin transactions was €13.5 billion per month. In comparison, market capitalisation of crypto-assets peaked in January 2018 at €650 billion and declined to €96 billion in January 2019.⁷

Chart 1 shows the allocation of stablecoin initiatives among the four types described above. **Tokenised funds** initiatives are the most common stablecoin type and account for 99.8% of the monthly volume of the six major stablecoin initiatives⁸. Only

⁶ “In existence” means that a stablecoin initiative is either operational and traded (source: coinmarketcap.com) or has been active by committing code and operational details (source: GitHub.com and reddit.com platforms).

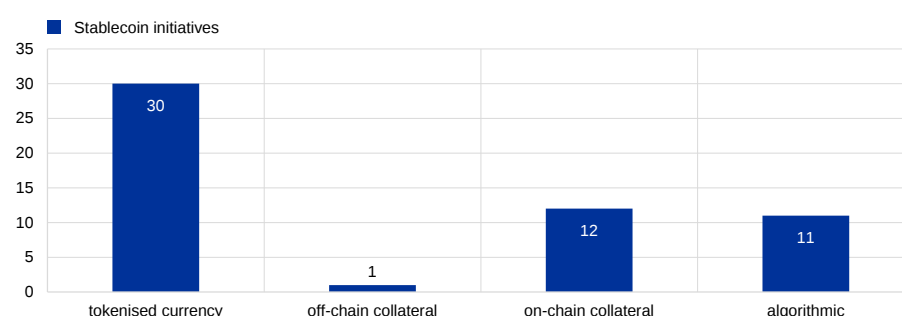
⁷ Occasional Paper No 223, op.cit, p. 11.

⁸ According to data from Coinmarketcap, the stablecoin initiatives with the highest trading volume are USDT, USDC, TUSD, PAX, GUSD, DAI.

one **off-chain collateralised stablecoin** is included in the chart⁹, since initiatives using this kind of stabilisation mechanism are rarely denominated in currency units. Among the analysed stablecoin initiatives, there is an almost equal amount of **on-chain collateralised** and **algorithmic stablecoins**, the former generally showing a higher maturity than the latter. Out of twelve active on-chain collateralised stablecoin initiatives, seven (i.e. 54%) are operational, whereas the same is true only for two out of eleven active algorithmic stablecoins (i.e. 18%), which may suggest that the latter is designed in a way that fails to ensure stabilisation.

Chart 1

Classification of 54 active stablecoin initiatives



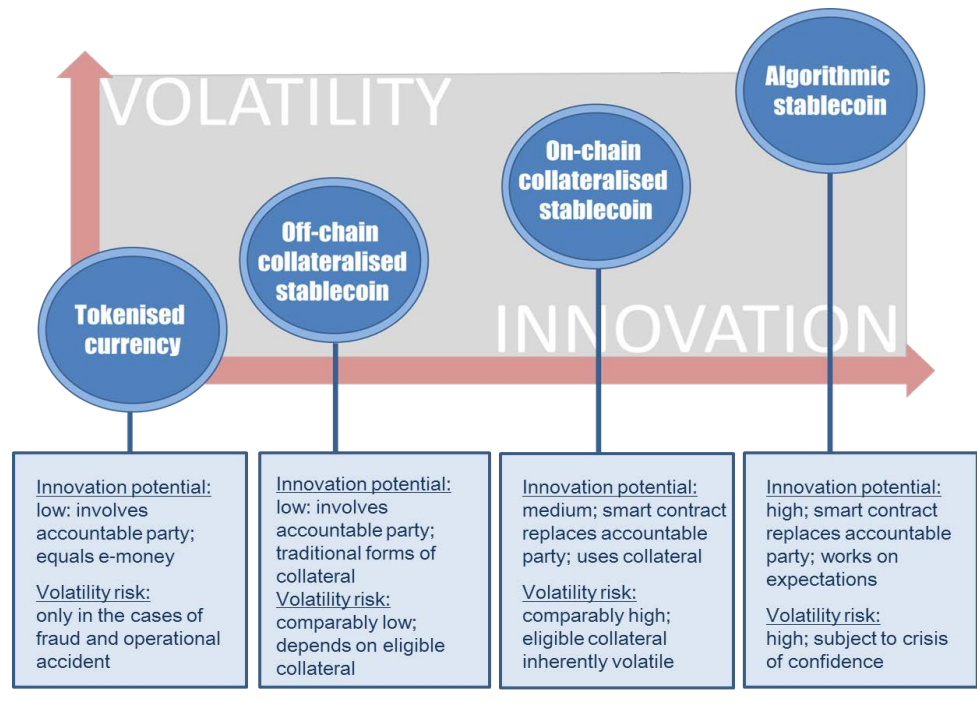
Source: ECB.

What level of innovation and stability could stablecoins bring to the crypto-asset market and beyond?

There is an apparent trade-off between the level of innovation brought about by the stabilisation mechanism underpinning each of the identified stablecoin types and its ability to provide a stable store of value, especially within the crypto-asset markets, but also in the broader economy. **Figure 2** illustrates the main results of this assessment.

⁹ It is called "Sweetbridge".

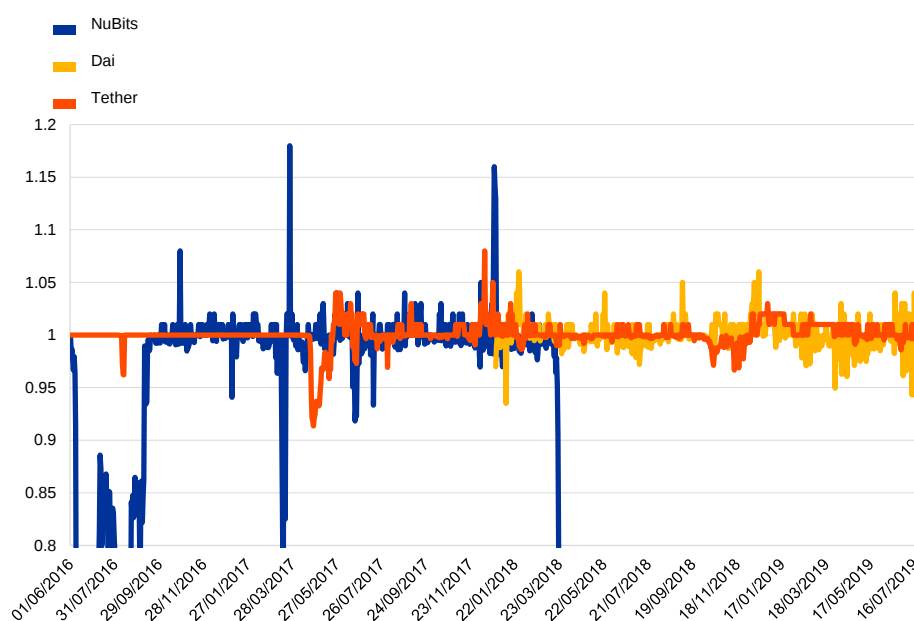
Figure 2
Assessment of stablecoin types



While this assessment is mostly qualitative, its findings in terms of volatility are confirmed by a quantitative assessment of three representative stablecoin initiatives (Tether, Dai and NuBits) as shown in [Chart 2](#). It should be noted that, while Tether has been active since the early stages of stablecoin developments and is still traded, Dai was only introduced at the end of 2017 and NuBits can be considered to have lost its peg already in March 2018.

Chart 2

Daily closing prices of representative stablecoin initiatives



ECB staff elaboration based on data from coinmarketcap.com until 28 July 2019.

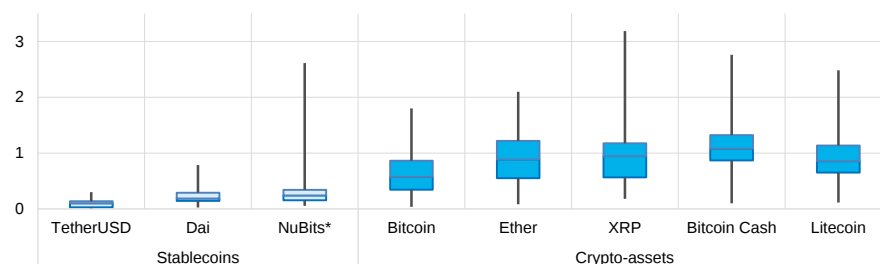
Chart 3 shows a comparison of the respective historical volatilities, including also those of major crypto-assets. The average volatility, expressed as the annualised average seven-day standard deviation of daily returns between 27 December 2017 (earliest date when all three stablecoins considered were traded) and 28 July 2019¹⁰, are 10% for Tether, 27% for Dai, and 37% for NuBits¹¹. These figures support the qualitative analysis, which suggests that tokenised funds perform better in terms of volatility than collateralised stablecoins. Net of any misbehaviour and operational mistake, tokenised funds would actually be expected to have a standard deviation close to zero. The algorithmic stablecoin examined had the highest volatility, even before users lost confidence in it. The same measure of volatility applied to the five crypto-assets with highest market capitalisation gives values of 69% for Bitcoin, 91% for Ether, 100% for XRP, 117% for Bitcoin Cash, and 96% for Litecoin.

¹⁰ For NuBits, the time series stops on the day when the stablecoin seems to have permanently lost its parity with USD (21 March 2018). Considering the same time window as the other initiatives, the volatility of NuBits soars to 127%.

¹¹ It should be noted that the volatility of NuBits underestimates the actual volatility risk to its holders, since its average value is brought down by its consistently low price since it lost its peg.

Chart 3

Historical volatility of selected stablecoin initiatives and crypto-assets



Based on ECB staff elaboration with data from Coinmarketcap.com. The assessed timeframe is the longest comparable period, (i.e. 27 December 2017 to 28 July 2019) with the exception of NuBits (*time period shifted to start in 28 September 2016 and end on 21 March 2018 due to failure to recover the peg value). Data for the boxplot annualise standardised seven-day rolling averages of the historical volatility.

What could stablecoins be used for?

So far, the main value proposition of stablecoins has been to provide a store of value for revenues related to crypto-asset investments without leaving the distributed ledger technology environment. As long as the financial system does not provide an interface between the financial market and the crypto-asset market¹² – something that entails difficulties given the price volatility and legal risk currently related to this activity – it is expected that stablecoins will continue to play their original role.¹³

Some initiatives (such as Libra) focus on international remittances and are meant to transfer stablecoins referencing a given currency to anybody connected to the internet, without using the channels of financial institutions and avoiding the inconvenience of carrying cash. Depending on their design and set-up, these initiatives will be subject to existing or new regulations based on the principle of “same business, same risk, same regulation”, regardless of the underlying technology. Adoption of stablecoins for remittances is likely to depend on the ability of the financial sector to provide similar services conveniently at the location and in the currency relevant to the prospective users.

Looking ahead

It is rather unlikely that money will go the way of the dinosaurs any time soon in our society. Nevertheless, the drive towards digitalisation has taken hold of the financial market and created, among other things, innovative types of assets and mechanisms designed to control the volatility of these assets. We have seen that the innovation

¹² Current examples include the launch of exchange-traded funds covering crypto-assets.

¹³ While some investors in crypto-assets use stablecoins because the conversion between crypto-assets and major currencies is rarely provided by financial institutions and can be a costly process, anecdotal evidence shows that some of them do so for the possibility of avoiding traditional financial rails and the identity checks associated with them.

potential of a particular stablecoin type and its ability to limit price volatility are inversely related. While less innovative stablecoins could provide a solution to users seeking a stable store of value, the jury is still out on the role that more innovative, but also more volatile, stablecoin types may play in the future. Some on-chain collateralised stablecoins have proven to withstand large fluctuations of underlying collateral, but it is unclear whether this is due to effective stabilisation mechanisms or to strong user interest in protecting their privacy and/or remaining outside the financial system. Algorithmic stablecoins are still a theoretical alternative rather than a practical solution. Their development warrants close observation as they may give rise to renewed debates in the academic and central bank communities.

Uncertainties exist around governance and regulatory treatment of stablecoin initiatives. An uptake in the usage of stablecoins may require improvements to the governance of such initiatives, including their cybersecurity framework.