

## »» The value of a bitcoin: more competition in payments

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Bitcoin and other cryptocurrencies are increasingly making a splash because of their sharp price jumps and other features. Their supporters celebrate them as a private alternative to public money in the digital age. But because of their high volatility and design, Bitcoin and other cryptocurrencies hardly perform the functions of money. They are neither a reliable store of value nor a meaningful unit of account.

Nevertheless, even central banks are increasingly considering whether to issue virtual currencies of their own to reflect the changing needs of the general public. At the moment, however, it appears that issuing electronic central bank money is unlikely to provide additional net benefits.

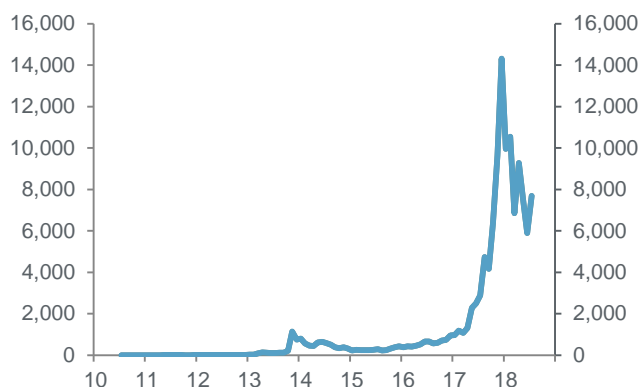
Bitcoin & Co. still perform at least one important function, however. They stimulate competition in international payments and contribute to speeding them up and lowering their costs. Moreover, the blockchain technology behind Bitcoins is likely to become much more important in various ways in the future.

### What is a cryptocurrency?

In the year 2008, Satoshi Nakamoto, whose identity remains unknown to this day, published a white paper in which he described the creation of a currency that can operate without a central authority. Transactions are processed exclusively through a network of computers using the architecture developed by Nakamoto, in other words, in a peer-to-peer exchange.<sup>1</sup>

**Figure 1: Bitcoin exchange rate in USD**

On a monthly basis.



Sources: Bloomberg, own rendition.

The mysterious figure Nakamoto is regarded as the creator of Bitcoin, a virtual currency that uses a technology which can do exactly that: perform transactions without involving a central counterparty. Transactions are stored in a computer network using a cryptographic process – a kind of encryption – in the form of a block containing all relevant information. Because blocks containing the information of subsequent transactions refer to the existing blocks, over time a chain of blocks of information is generated which is known as a blockchain. It gave its name to the technology behind Bitcoin. Tech-savvy supporters may celebrate this innovation but because of the way it is designed Bitcoin cannot function as money – nor can any other cryptocurrency designed in a similar way.

### Bitcoin: not money but an object of speculation

Economists distinguish between three functions of money: medium of exchange, store of value and unit of account. Which of these do Bitcoin and similarly designed cryptocurrencies fulfil?

Payments are made with Bitcoin and other cryptocurrencies even if they are somewhat complicated and time-consuming. De facto, cryptocurrencies can generally function as a medium of exchange, although it is questionable how efficient the technologies used actually are and whether they would also be able to cope with much higher numbers of transactions than is currently the case.<sup>2</sup>

More problematic are the store of value and unit of account functions. Owing to the extreme volatility of Bitcoin (Figure 1), it neither fulfils the store of value function nor the unit of account function. Bitcoin supporters would argue that the value of the cryptocurrency should rise in the long term – also because of its design, which we examine below. But even if the high volatility were to level out over time and the price of the cryptocurrency (calculated in other currencies) were to trend upward, Bitcoin would in all likelihood hardly be able to function as a unit of account.

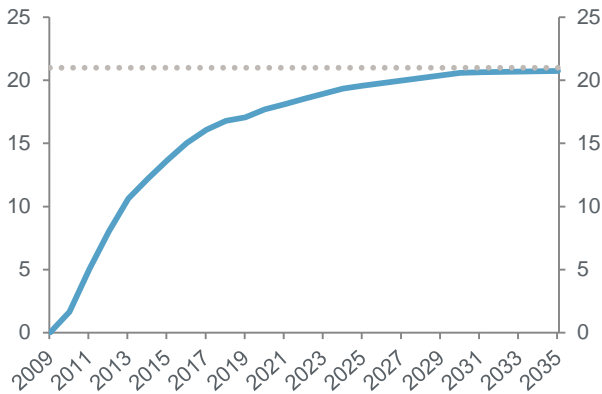
A fundamental problem lies in the design of the cryptocurrency – explicitly intended by its creator: The quantity of Bitcoins is capped at around 21 million units, of which roughly 17 million units have already been issued (Figure 2). The idea behind this Bitcoin upper limit is to set a currency with a more stable value against state-issued currencies whose quantity is constantly growing.

In a world whose output is currently growing, however, a currency issued in a limited quantity would generate deflation because a fixed quantity of currency units would be distributed over a steadily growing quantity of goods, so that increasingly fewer Bitcoins would be payable for each good. In the case of Bitcoin, such a deflationary effect would even increase significantly if more and more people wanted to pay with the cryptocurrency. That, too, would increase the quantity of goods and services that would potentially change hands through Bitcoins – amid a limited quantity of currency units. In a (strongly) deflationary environment, however, a currency loses its function as a unit of account – as it also does in a strongly inflationary environment.

Besides, deflation hampers economic activity, if it does not prevent it altogether. Businesses would regularly face falling prices for their products but would largely have fixed nominal costs, especially wages and salaries, as well as debts to be paid. This would weigh on profits.

**Figure 2: Bitcoins in circulation since 2009**

In millions, value at the start of the year.



Sources: blockchain.com, Antonopoulos (2014), p. 180<sup>3</sup>; own rendition.

When the economic agents eventually perceived the deflation they would stop spending their Bitcoins and start hoarding them because their value would then grow steadily. It would then make little sense to part with the currency. It would also mean the absence of expenditure, that is, demand and transactions, which would slow down the economic process and accelerate the drop in prices. The classic deflationary spiral which may end in a deep economic crisis would be set in motion.

So even if Bitcoin – as proxy for other cryptocurrencies – should enjoy the trust of economic agents (even though it offers no security), it cannot constitute money because of the way it is designed and will therefore not be used as money on a broader scale in the future either. Rather, it is an object of speculation.<sup>4</sup>

**Would it make sense with a different design?**

Cryptocurrencies generally do not have to be limited in quantity, however, although it can be assumed that it is precisely this artificial scarcity that makes them so attractive for their users – as it flags them as an object of speculation. Rather,

their quantitative expansion could basically follow nominal economic growth or the development of general money demand. Would a private cryptocurrency then make sense? The answer would ultimately depend on the preferences of the general public. The following would have to be considered, however:

First, it would be unclear at what rates the supply of cryptocurrency or the several cryptocurrencies should grow if they were used internationally as a payment instrument, since the economic area for which they were to function as money would be difficult to define. In other words, the problem of relatively high levels of volatility (measured in other currencies such as the US dollar or euro, or in goods) would probably remain.

Second, cryptocurrencies such as Bitcoin provide no security. There is no authority that can redeem it. Central banks, on the other hand, which issue our traditionally used currencies, are backed by the economic strength of the entire relevant currency area.

Third, the blockchain technology usually being used is not yet effective enough. Transactions processed through it take too long. In the specific case of Bitcoin, registering transactions in the computer network involves a complicated process at the end of which the participants are rewarded with the cryptocurrency. Experts estimate that this process now consumes at least as much energy in one day as all of Ireland. This makes Bitcoin look like an unnecessary ecological disaster.<sup>5</sup>

Another question is what consequences would arise for commercial banks if cryptocurrencies became increasingly more popular. To the extent that they replaced traditional currencies, banks would lose deposits (compared with a world without cryptocurrencies). That would reduce their ability to lend. Some are therefore debating and even demanding that banks should introduce cryptocurrency accounts.<sup>6</sup>

**Central banks are also embracing the topic**

Despite the above arguments against cryptocurrencies, central banks around the world have been discussing for some time whether they should issue these themselves or offer alternative variants of digital money. The motivation behind this is that demand for cryptocurrencies points to a need for digital currencies, particularly as some countries such as Sweden are using less and less cash and substituting it with electronic money. The Bank of Sweden, for example, also sees the risk of concentration in the payments market as a result of the declining use of cash. Issuing an own digital currency would be a way to counteract the emergence of oligopolies or even monopolies in the payments market. Another option would be to rein in any concentration trends through regulation.<sup>7</sup>

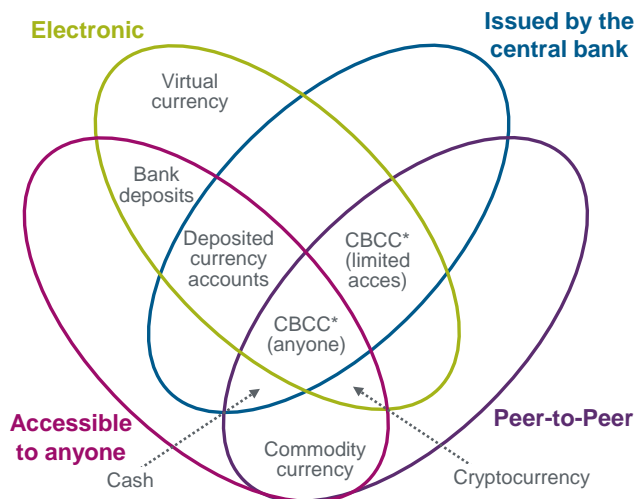
### What type of digital currency could be issued?

When people talk about cryptocurrencies or digital currencies, it is often not clear how these are defined. Precise definitions can be made with the aid of the Money Flower designed by two researchers of the Bank for International Settlements (BIS).<sup>8</sup> The Money Flower categorises types of money with four characteristics:

1. Generally accessible: yes / no
2. Electronic: yes / no
3. Issued by the central bank: yes / no
4. Peer-to-peer principle: yes / no

Bitcoin, for example, is generally accessible, electronic, not issued by a central bank and functions in a peer-to-peer exchange. Cash, on the other hand, is also generally accessible and a peer-to-peer medium but not electronic and, additionally, issued by a central bank (Figure 3).

**Figure 3: The Money Flower of the BIS**



\*CBCC=Central Bank Crypto Currency.

Source: Bech, Garrat (2017), cf. endnote 4, own rendition.

If central banks wanted to issue a cryptocurrency of their own (a CBCC, Figure 3), this would have to be done in line with the peer-to-peer principle. In the case of Bitcoin, transactions in the peer-to-peer system are pseudo-anonymous – that is, generally visible to all but without the requirement to disclose the true identity of the user. But in order to avoid encouraging criminal activities, such as money laundering or tax evasion, central banks would likely have an interest in preventing their currencies as far as possible from enabling such anonymous transactions – even if that is precisely what cash does.<sup>9</sup>

If the problem of anonymity could be solved, the question would remain whether central banks would use blockchain technology to issue a possible virtual currency of their own. But this, too, is highly questionable since the technology has relatively limited capabilities – at least for now.

What central banks could then also offer would be to issue an electronic currency which, in an extreme case scenario, would be accessible to anyone and whose accounts would be held directly by the central bank (Figure 3: ‘Deposited currency accounts’). That way, however, the central bank would compete for deposits with commercial banks. These would have lower deposits than in the current system while they would have to offer higher interest rates on deposits than the central bank. This would limit their lending because the traditional money creation process would be disturbed. In order to offset the absence of money creation by commercial banks, the central bank would have to take on more securities and, thus, add more risks to its balance sheet.

Moreover, the commercial banks’ deposit-taking business would probably be significantly more volatile. The reason is that as soon as signs of a (banking) crisis appeared, customers could quickly shift deposits from the relatively unsafe commercial banks to the safe central bank.

A decline in deposit business would probably mean less business overall for commercial banks. Such a change would be radical and disruptive. The introduction of digital central bank money is therefore highly unlikely in the foreseeable future.<sup>10</sup>

### Competitive pressure on international payment systems

At the end of these scenarios, not much remains of Bitcoin and the cryptocurrency idea – besides its character as an object of speculation. But the fact that cryptocurrencies are being used to process payments across currency areas shows that a need exists here (cf also endnote 2). After all, international payment transactions between banks are exceptionally costly and also relatively slow. Bitcoin helps unmask this weakness, although payment systems such as PayPal also play a key role here. This competitive pressure should (continue to) bring about (long overdue) improvements to the existing systems, enabling international payments to be processed more cost-effectively and/or more quickly.<sup>11</sup>

### Conclusions and outlook

Ever since their sharp price increases in 2017, cryptocurrencies such as Bitcoin have been growing in popularity and attracting a great deal of attention. Central banks have been observing them for years. The Bank of Sweden is even examining whether it would be useful to introduce an ‘e-krona’ as a digital cash substitute. It would differ from Bitcoin in several ways, however. Its quantity would not be limited and it would not have the peer-to-peer characteristic either. Instead, ‘e-krona’ users would be able to keep the new digital currency units in accounts with the Bank of Sweden itself.

But the possibility for everyone to maintain accounts with the central bank would have real consequences for commercial banks. Their deposits and, consequently, their overall business would probably shrink substantially. Furthermore, the fiat money generated by the commercial banks would also decrease as a result. Central banks would have to throw them-

selves into the breach and possibly have to take even more risky securities into their balance sheets than before, which could lead to loss of faith in the central bank etc. All of this makes it unlikely that central banks will issue virtual currencies of their own in the foreseeable future. The consequences for the commercial banks and the central banks themselves would be too far-reaching.

At the same time, it is hardly conceivable that private cryptocurrencies such as Bitcoin could establish themselves as a general payment instrument, since their design prevents them from fulfilling the money functions. And if they were structured differently (namely, not as an object of speculation), they would probably be less sought-after, especially since they do not represent a claim against anyone.

So what remains of the cryptocurrency as an invention? First, it exerts very timely and healthy additional pressure on all those who are doing business in international payments, which are still expensive. Cryptocurrencies can be an alternative and they are already being used in this area. Second, the block chain technology on which Bitcoin is built will probably play an increasingly important role in the future – as a decentralised, transparent ledger for transactions and for contracts that can be entered into automatically (so-called smart contracts, which we have not addressed here). But neither the transactions nor the contracts would then have to be denominated in Bitcoins. They can then continue to be denominated in traditional currency units. ■

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<sup>1</sup> Cf. Nakamoto, S. (2008): Bitcoin: A Peer-to-Peer Electronic Cash System, 1 November 2008, <https://bitcoin.org/bitcoin.pdf>

<sup>2</sup> At present, some 200,000 Bitcoin transactions are being performed every day (cf. <https://www.blockchain.com/de/charts/n-transactions>). According to Internet data published by the relevant providers, PayPal processes around 25 million transactions per day, SWIFT about 30 million and Visa 150 million, but some of the processes taking place in these transactions are very dissimilar to those of Bitcoin. The number of possible Bitcoin transactions per second is often described as relatively limited, with the network being able to process a maximum of seven, and normally rather three or four. The second largest cryptocurrency, Ethereum, can handle twenty transactions per second, while PayPal can process around 200 and Visa as many as 56,000 per second, although the performance of the systems is not entirely comparable here either. Cf. e.g. <https://altcointoday.com/bitcoin-ethereum-vs-visa-paypal-transactions-per-second/>

<sup>3</sup> Cf. Antonopoulos, A. M. (2014): Mastering Bitcoin, Early Release Version 6, Beijing and other locations (O'Reilly).

<sup>4</sup> In addition, it is rumoured time and time again that a very large portion of Bitcoins is concentrated in the hands of a few (presumably its inventors among them).

<sup>5</sup> Cf. De Vries, Alex (2018): Bitcoin's Growing Energy Problem, in: Joule 2, 16 May 2018, p. 801–809.

<sup>6</sup> Cf. e.g. McCormack, P. (2018): An Open Letter to Banks about Bitcoin and Cryptocurrencies (05.03.2018), <https://hackernoon.com/an-open-letter-to-banks-about-bitcoin-and-cryptocurrencies-b0c7ef9b7c62>

<sup>7</sup> Cf. Sveriges Riksbank (2017): The Riksbank's e-krona project, Report 1, September 2017, p. 39 f.

<sup>8</sup> Cf. Bech, M., and Garrat, R. (2017): Central bank cryptocurrencies, in: BIS Quarterly Review, September 2017, p. 55–70, especially p. 60 f.

<sup>9</sup> Cf. Berentsen, A., and Schär, F. (2018): The Case for Central Bank Electronic Money and the Non-case for Central Bank Cryptocurrencies, in: Federal Reserve Bank of St. Louis Review, Second Quarter 2018, p. 97–106, especially p. 103 f.

<sup>10</sup> Cf. Fatás, A., and Weder di Mauro, B. (2018): Cryptocurrencies' challenge to central banks, 14 May 2018, <https://voxeu.org/article/cryptocurrencies-challenge-central-banks>

<sup>11</sup> Cf. Fatás, Weder di Mauro (2018).