Are digital currencies disruptive for central banks?

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Abstract:
Digital currencies represent a small proportion of transactions and are currently not a danger for monetary policy or financial stability. Nevertheless, they are experiencing a spectacular rise. Combining a new form of currency and a new payment system, these digital currencies could, in the near future, be "disruptive" for the banking system and for central banks. Faced with such changes, central banks could even be forced to issue digital currencies under various scenarios that we lay out in this article. Most of these scenarios would entail an end to the fractional reserve system and, potentially, the disappearance of cash and bank deposits, with major consequences for the money creation mechanism.

James Tobin, who won the Nobel Prize for Economics in 1981, regarded the entwined functions of deposit taking and credit creation within commercial banking as an "accident of history" (Tobin 1985). Yet this is the foundation for the operational framework of many central banks. This is a vulnerable foundation, as shown by the 2008 financial crisis, as the risks related to credit distribution or those that affect the value or liquidity of currency-backed assets could have a negative impact on the functioning of the payment system. To combine all the advantages of a payment instrument without the aforementioned disadvantages, James Tobin put forward a suggestion that was deemed unworkable due to the technological limitations of the 1980s: namely, to allow individuals to deposit money directly in the central bank.

Today, this proposal is no longer science fiction: The central bank of Ecuador has begun to issue digital currency in order to promote financial inclusiveness, as a large proportion of the Ecuadorian population is non-bancarised. Other central banks are considering launching similar schemes soon, such as the central bank of Sweden, which is faced with a sharp erosion in demand for cash (Skingsley 2016). Still other central banks have begun discussing this topic, notably the Bank of England (see Broadbend 2016 and Barrdear & Kumhof 2016), the Bank of Canada (see Fung & Halaburda 2016) and the People's Bank of China.

(1) The views expressed in this article are solely the opinions of its author. They do not necessarily reflect the official views of the Banque de France or the Eurosystem.

The spectacular rise of digital currencies since the bitcoin's inception in 2009 is striking. These currencies combine a new form of currency and a new payment system. On one hand, they correspond to assets with monetary characteristics that are neither linked to a specific legal currency or a state, nor backed by debt. Their intrinsic value is nil, and depends only on the fact that it is anticipated that these currencies will be used by numerous individuals (i.e. a network effect) and that they will have the power to discharge debt (i.e. an ability to buy goods or services, or to be traded for real currency). On the other hand, they rely on a distributed ledger and on a network of third parties that are (generally) not banks. The emergence of virtual currencies therefore allows the two functions previously fulfilled by banks to be dissociated, and will perhaps eventually allow banks to be circumvented. Combined with crowdfunding platforms, these currencies give individuals the possibility to obtain funding for clearly-identified projects. By contrast, bank depositors have little visibility on how banks allocate their deposits. Therefore, they are potentially disruptive for the banking system.

"Crisis currencies"?

Some digital currencies, such as bitcoin (see Nakamoto 2008), can be regarded as "crisis currencies" to a certain extent. Apart from the technological factor, related to the development of the Internet, their appearance can be interpreted as the consequence of certain economic agents losing confidence in the value of legal currency.

The 2008 crisis revealed that the banking system is fragile, or even inherently unstable. For the proponents of the free-banking school (Rothbard 1992, Dowd 1992), this inherent instability explains why banking system regulation, central banks and a lender of last resort are all necessary. However, such a system is the source of friction and constraints that prevent market forces from working freely. This leads to suboptimal allocation of resources, which gives rise to recurring banking crises. Conversely, the emergence of private currencies, created and managed directly by individuals, would ensure financial stability (i.e. the agents would be more capable of managing their own interests) and monetary stability. The founders of the bitcoin network referred directly to this school of thought and to the Austrian School (more specifically Hayek 1976) in creating this currency which bypasses the central bank.

The Austrian School (see Von Mises 1953) regards central bank action as the source of undesirable economic fluctuations: through money creation, central banks fuel excess credit growth and hold interest rates at artificially low levels. In this context, financial imbalances appear and grow until they trigger an abrupt downturn in the business cycle. Central banks fail to preserve the value of money. The theorists of the Austrian School recommend adopting the gold standard, wherein the value of money cannot be easily manipulated by monetary authorities.

From this standpoint, the quantitative easing policies implemented since the 2008 crisis are proof that central banks do not want or are unable (because they are still overdependent on political authorities) to ensure monetary stability. These policies therefore led to surplus money supply.

The system set up by the bitcoin network is a direct response to this concern. The money creation process is completely automated, such that the pace of money creation is predetermined and the quantity of money created by the system is set in the long term (21 million bitcoins in 2050). The process of creating bitcoins is complex and costly, as its name “mining” implies. This mining is a process that uses the computers of certain users (known as “miners”) to perform increasingly complex mathematical calculations intended to confirm transactions and therefore to ensure the network's security. These calculations are constantly gaining in complexity in order to maintain a constant frequency for validating transactions (a new “block” is created every ten minutes). The “miners” who successfully resolve these complex equations collect transaction fees along with the newly-created bitcoins, at a pace that decreases geometrically by 50% every four years. However, the analogy with the Austrian School's gold standard stops there, because there is no mechanism that would link the value of one bitcoin unit to any outside benchmark.

The inherent risks of e-money for central banks' operational framework

Central banks' operational framework relies on two pillars: a partitioned payment system and a fractional reserve system.

The partitioned payment system

In the current payment system, bank reserves deposited with the central bank play a crucial role: they are the assets used to settle interbank transactions. Only banks have direct access to these reserves. A transaction between Client A1 (see Figure 1), who holds an account in Bank A, with Client B2, who has an account in Bank B, can only be carried out through these two banks' accounts with the central bank. This settlement is carried out using reserves. Through the mandatory reserves mechanism, banks must deposit their reserves with the central bank. This mechanism enlarges the system's liquidity shortage, which can only be reduced by the central bank through its refinancing operations. The central bank thus acts as the marginal lender. This allows it to set the interest rate at which reserves are borrowed. This interest rate is the benchmark for setting other interest rates, notably for banks.

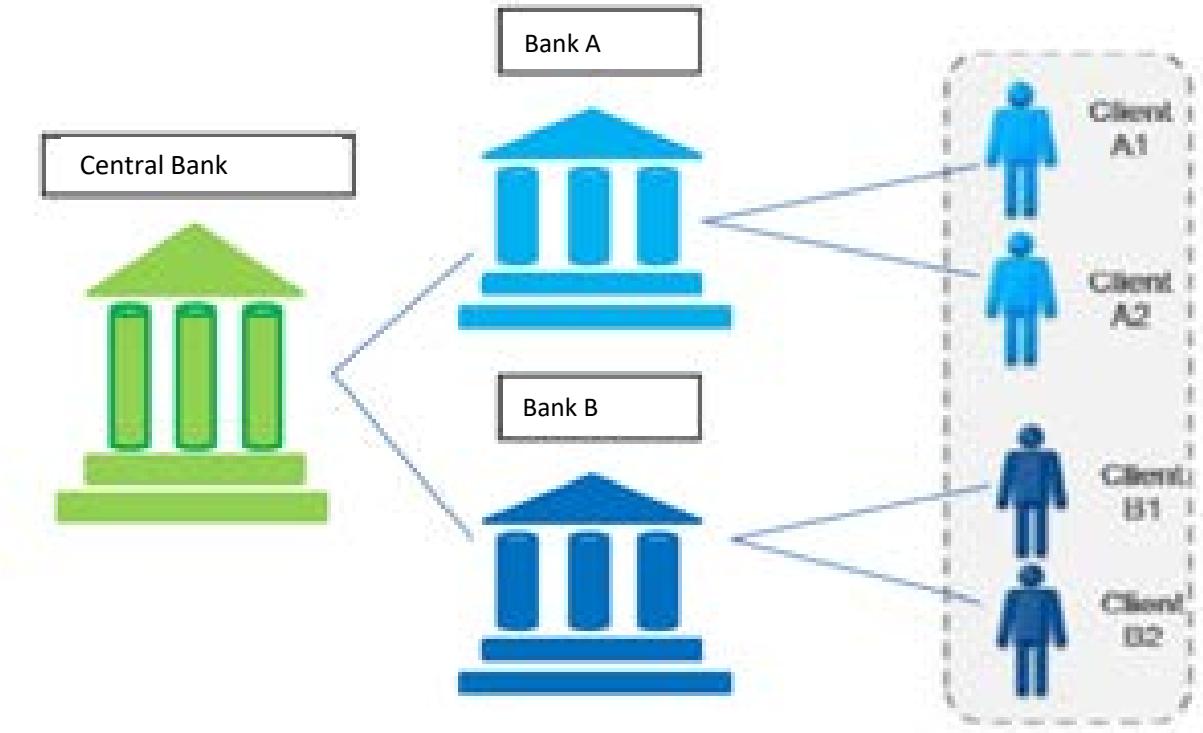

Figure 1. Partitioned payment system
Sources: HE *et al.* (2016), IMF.

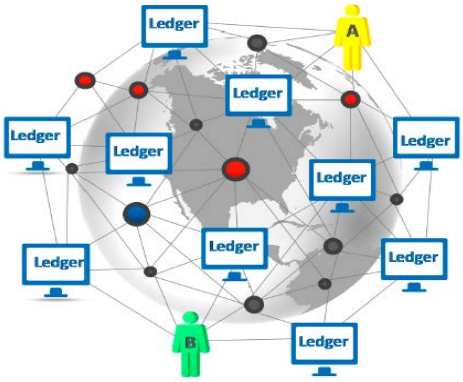

Figure 2. Decentralised payment system
Sources: HE *et al.* (2016), IMF.

The fractional reserve system

Banks have the power to create money: by distributing loans to the economy, banks generate new deposits within the banking system. A fraction of these deposits are held by the banks as mandatory reserves deposited with the central bank. However, the amount of these reserves is very low in comparison with banks' money creation, which is why we use the term “fractional reserve system”. By changing the reserve requirements or the bank refinancing rate, the central bank affects the economy's financing conditions.

The disruptive nature of decentralised systems

Digital currencies are potentially disruptive for the payment system as it functions today. They enable direct transactions between Individuals A and B without going through the banking system and the central bank (see Figure 2 above). The central bank loses a large portion of its influence over financing conditions, all the more because the partitioned payment system relies only on the banking system, excluding other financial intermediaries such as asset managers or fintech firms. There is therefore a genuine risk of a disconnect between the partitioned payment system and transactions carried out in a completely decentralised fashion.

Could central banks issue digital currency?

Expected benefits

Assuming that digital currencies experience strong growth, issuance by a central bank would notably:

- favour the transition to a digital economy by eliminating illegal cash-based activities and generating efficiency gains thanks to a reduction in the informal economy, a larger tax base and a lower cost of cash (see Rogoff 2014)
- foster payment systems innovation, more specifically by welcoming new competitors to banks
- provide new tools for managing systemic risk by reducing concentration and credit risks, and also decreasing moral hazard by lowering the amount of deposits requiring insurance
- allow the said central bank to use new instruments (e.g. negative interest rates, Friedman's “helicopter money”) and to regain control of the money creation process
- lastly, allow the central bank to recover a portion of its seigniorage which has been lost due to the decline of cash and the marginalisation of reserves

Different possible ways of issuing digital currency

The status quo: a step towards making unconventional measures permanent?

An immediate solution would be to keep the current operational framework and authorise the use of digital currencies. What matters to a central bank is that its actions have a direct impact on economic agents' decisions. Since the 2008 crisis, monetary policy has maintained a degree of effectiveness despite almost total gridlock in the banking sector. Thanks to their unconventional measures, central banks have financed the economy directly, bypassing the weakened banking sector. However, continuing unconventional measures has some drawbacks: firstly, it requires constant adaptation to changing circumstances; secondly, it acts in a targeted fashion, to the detriment of the cross-cutting effects of conventional monetary policy ("Monetary policy gets in all of the cracks", Stein 2012).

Issuing digital currency in addition to paper currency

A second possibility would entail maintaining the use of legal currency while issuing a new digital variant. The central bank would open its accounts to banks and to fintech firms. The former would supply this digital currency in exchange for collateral (e.g. Treasury bonds). These institutions could then use this digital currency to make loans, while the central bank would ensure the convertibility of the legal digital currency and cash. For the central bank, the advantage of this scenario is its blockchain-based system, which would give an almost real-time view of the transactions within the entire financial system, allowing the economy's debt level to be measured while controlling the digital money supply (Dyson & Hodgson 2016). Nevertheless, this system would mean abandoning the fractional reserve system: the reserve ratio would increase to 100% and banks would lose their entire money creation capacity. This scenario corresponds to a "narrow banking" system.

A partitioned payment system backed by a blockchain

In this kind of system, the central bank selects the participating banks. It issues the digital currency, and institutions' reserves are transformed into central bank digital currency. These institutions would make loans in central bank digital currency. The banks can issue their own digital currency (a portion of which is guaranteed by their deposits of central bank digital currency held by the central bank). Thus, the fractional reserve system is preserved. Consumers can still convert the digital currency issued by banks into legal currency (i.e. cash). This system's advantage lies in the gains arising from using the blockchain (execution speeds, lower costs, etc.). As for its drawbacks, the banks that issue their own digital currencies would have the ability to carry out manipulation and fraud, and these currencies could suffer significant fluctuations in value compared to the legal currency.

One variant of this scenario would be to authorise indirect access through digital currency accounts. The central bank would create the digital money and would hold it in its aggregate accounts. The banks and fintech firms would manage these accounts and offer them to their clients. These digital account providers would also supply all the related services (statements, codes, account numbers, online banking, etc.). They would be mere intermediaries acting as account administrators. In this system, the reserve ratio would be 100% (narrow banking).

Central bank access for all

One last way to organise the issuance of digital money would be for the central bank to open direct accounts for all entities (namely banks, fintech firms, companies and individuals). The central bank would issue the digital money, which would completely replace cash. Such a system would require a free market for loans and deposits, and would be based on a distributed ledger. The distributed ledger ensures virtual anonymity for transactions and holds a record of credit events. With a distributed ledger, payments are very fluid, and consumers can transfer their deposits from one bank to another very easily at a low cost. In such a system, the central bank provides all the management services for digital accounts. However, it is in competition with commercial banks. As in the previous scenario, the reserve ratio would be 100%.

A few stakes of central banks issuing digital currency

One of the goals of a central bank issuing digital currency is the possibility of setting negative interest rates. However, negative interest rates could encourage economic agents to hold all their money in cash (which has a zero interest rate), making this measure ineffective. Some researchers therefore recommend that cash be eliminated in a digital currency system. In addition, when this digital money coexists with other forms of money, the question arises as to the remuneration of digital money deposited with the central bank.

The issuance of digital money by the central bank corresponds to a liability that must be offset, on its balance sheet, with an asset. If deposits are not remunerated, this asset can be a perpetual zero-coupon bond specially issued by the Treasury. Conversely, if deposits are remunerated, then the security issued must be of a different nature – this is not without consequences for public debt.[2] If digital accounts are not remunerated (or if the remuneration is lower than for bank reserves), then the banks would have a comparative advantage. Therefore, the interest rate paid to depositors must be at least equal to the interest rate on reserves. This would make digital money deposits a substitute for reserves, opening the way for negative interest rates. However, digital accounts opened with the central bank are presumably without risk, unlike bank deposits. Remunerating central bank deposits would implicitly amount to setting a floor on bank deposit remuneration. This would create an incentive for banks to offer depositors higher interest rates in order to

(2) In the previous scenario, this security is not actually a debt because it does not give rise to interest payments nor does it have a maturity.

attract clients, with a potentially negative impact on bank margins. There would thus be a risk of bank deposits drying up in favour of accounts held with the central bank. In this case, the end result is a narrow banking system (as mentioned above), as a group of economists in the 1930s recommended in their "Chicago Plan" (see Simons *et al.* 1933).

In all, several of the options presented above would entail an end to the fractional reserve system and, potentially, the disappearance of cash and bank deposits (which could have major consequences for the money creation mechanism).

Conclusion

Digital currencies, which represent a very low amount of transactions for the time being, are not an immediate risk for the implementation of monetary policy or for financial stability. Nevertheless, they are experiencing a spectacular rise and may be disruptive.

Their development reopens one of the basic questions of the theory of money. Up to now, the origin of money was attributed to the problem of the double coincidence of wants: in a barter system, trading of goods can only occur if the goods in my possession are of interest to the person with whom I want to trade. The introduction of money – which acts simultaneously as a unit of account, a medium of exchange and a reserve of value – resolves this difficulty. Kocherlakota (1996) puts forward another hypothesis whereby money is a substitute for memory. A barter system can work perfectly in a small community. Individuals must simply remember the history of the exchanges and what is owed and to whom. As time goes on and the community becomes larger, this memory of exchanges gets increasingly difficult to preserve. Here again, money resolves this difficulty. The distributed ledger, more so than digital currencies, offers an alternative solution because this ledger is "memory". It allows for the potential emergence of a widespread barter system – or more precisely, a "credit" system because it introduces an intertemporal dimension – without necessarily requiring money.

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