Central bank digital currencies and financial stability

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Most Central Banks in the world are currently considering - or at least studying - the launch of a Central Bank Digital Currency (CBDC). For instance, on 14 July 2021 the European Central Bank decided to launch a two-year investigation phase of a possible Digital Euro [European Central Bank (2021)]. Those announcements have raised many expectations and also some concerns. There is a fear that once the general public has easy access to the Central Bank balance sheet through electronic means (in addition to physical banknotes), competition will increase on the deposit taking activities of banks. This would compromise their funding, reduce their profitability and destabilise their business models. The perspective of frequent and ample bank runs would be very bad for financial stability.

These are legitimate concerns, especially in the euro area, where banks and bank credit take a major role in financial intermediation. However, there is another side to the issue. Central Bank money - and easy access to it - are crucial to financial stability. Contemporary monetary systems are based on a close complementarity between private and public money. CBDCs are necessary to preserve that equilibrium in a rapidly transforming digital economy.

1 Public money and financial stability

Private money is inherently unstable. In modern times, that instability was especially apparent during the period of free banking in the United States. It was marked by a succession of bank runs and panics. Modern Central Banks - first of all the Federal Reserve - were created with the primary purpose to remedy to that instability.

Private money is unstable because its value is uncertain. It is not anchored. For the same nominal face value, private banknotes may trade at different discounts across regions and periods of times. Their price is contingent on news and event, dependent on the perceived solvability and liquidity of the issuer. They are vulnerable to self-fulfilling expectations and multiple equilibria which trigger bank runs. In modern parlance, we would say that private money is information sensitive [Dang et al. (2015)]. That sensitivity is the potential source of permanent instability.

Central Banks issue a different kind of money. It is backed by their “unimpeachable solvency” [Woodford (2001)], the power of Governments to tax and, in most countries, is supported by legal tender. Public money is of superior quality. It provides the ultimate settlement asset between banks. It also defines the unit of account: a Euro is a liability of the Eurosystem with a nominal value of 1€.

With those attributes, public money is well equipped to serve as an anchor to the monetary and financial system. It provides a reference value. Analytically, there are two components to that anchor function: the currency must be uniform; and it must be attached to the unit of account.

Ensuring that the currency is "uniform" is a major mission for Central Banks. Uniformity means that, without any possible doubt, a euro is a euro whatever its form, its location and the entity which has issued it. If the currency is uniform, all monetary instruments with the same nominal value trade at par in all circumstances, which eliminates a major source of uncertainty in their valuation, as well as any information asymmetry that could impede trade.

After a century of successful central banking, we tend to take the uniformity of currency for granted. It is not. Europeans had a vivid reminder of this reality when, in Spring 2012, a "denomination risk" materialised between different parts of the euro area, temporarily introducing frictions in liquidity transfers and potentially compromising the equivalence between bank deposits in different countries. More broadly, uniformity can be compromised by physical distances (as in the Free Banking area in the US), differences in intrinsic values of monetary objects and, more recently, technological barriers.

The requirements for a uniform currency are very demanding. There needs to a process, an enforcement mechanism that ensures that all forms of money are considered as strictly equivalent at any moment in time. In practice, uniformity can be achieved if and when the different forms of money are always and everywhere convertible into each other, unconditionally and at par. In that case, the same money is truly circulating under a multiplicity of representations.

In principle, mutual and unconditional exchangeability is sufficient for uniformity. However, it raises, two questions. First, it necessitates an infinite supply of each forms of money, to accommodate potential shifts in their relative demands. Private issuers might not be able or willing to achieve that result. Second, while convertibility stabilises the relative prices of different monies, it would not by itself determine their value in terms of the unit of account. It does not exclude a dissociation between the medium of exchange and the unit of account, for instance through a partial or total dollarisation of the economy. There would still be the possibility of a general depreciation or appreciation of the whole set of private currencies (something that could be triggered for instance by a flight to safety).

Public money can solve the two problems at once. It defines the unit of account, it can be supplied elastically. It can be made exchangeable against all private currencies. It guarantees a uniform currency anchored on the unit of account. It serves as a bridge for converting one private money into another. It anchors their value. As noted more than 15 years ago by major central bankers, confidence in

commercial bank money lies in their ability to convert their sight liabilities into the money of another commercial bank and into Central Bank money, upon demand of their clients [Committee on Payment and Settlement Systems (2003)].

To fulfill those functions, public money must be present and freely available in all sectors and parts of the economy. It is no coincidence that in nearly all countries, the circulation of banknotes is under the close control of the Central Bank to ensure universal access (even if printing is often contracted to the private sector). More broadly, the two-tier banking system that prevails in contemporary economies guarantees the complementarity between Central Bank and private bank money. That equilibrium is now challenged and possibly destabilised by technological evolutions.

2 New challenges in a digital economy

Digitalisation brings multiple forces of destabilisation of public money and its role: the disappearance of cash; a new diversification in the forms of money; a fragmentation of payment systems; and, finally, a possible fragilisation of the unit of account.

2.1 The possible disappearance of cash

Cash is the only public money accessible to the general public. Its role in transactions has been constantly decreasing and displaced, in particular, by mobile contactless payments - a trend accentuated by COVID-19 pandemic. If cash were to disappear fully or be marginalised, it would eliminate universal access to public money. It would effectively suppress the convertibility of bank deposits, as there would be nothing left to convert them into.

2.2 Diversification in the forms of money

With the digital revolution, money becomes easy to create by (almost) anyone. A digital file can be transformed into a means of payment by attaching a value, a cryptographic protection that allows to securely confer ownership and a protocol to move safely on the internet. The era of "e-cash" foreshadowed in by Milton Friedman in 1999 has effectively arrived.[1] This "tokenisation" of money brings

1 "The internet is going to be one of the major forces for reducing the role of government. The one thing that's missing but that will soon be developed is a reliable e-cash, a method whereby on the Internet you can transfer funds from A to B without A knowing B or B knowing A, the way in which I can take a $20 bill and hand it over to you and there's no record of where it came from and you may get that without knowing who I am. That kind of thing will develop on the Internet and that will make it even easier for people to use the internet" (remarks from a video-recorded interview accessible under this link: https://youtu.be/6MnQJFEVY7s).

enormous benefits for the efficiency of payments (especially cross borders) and financial inclusion. It also brings a proliferation of new amenities as money is bundled with a diversity of services attached to payments [Brunnermeier et al. (2019)].

The consequences for the uniformity of money, however, may be problematic. At the same Digitalisation has revived private money creation. At the same time, it has boosted creativity by enabling the creation of a multiplicity of special purpose tokens. In the current, fashionable, parlance, money can be made "programmable", with two possible meanings attached to this formulation. First, programming can be inserted into the use of money Payments can be managed by smart contracts, i.e. algorithmically triggered by events or conditions. A second acceptation is that programming directly affects the nature - and value - of the monetary unit itself. It might be tempting, for instance to make some welfare payments in a money with an expiration date, so as to ensure that they are spent, not hoarded, thus maximising their stimulus impact. Governments with autocratic or moralistic tendencies can limit the use of those welfare payments, prohibiting the purchase of alcohol or leisure goods, making them closer to food stamps. The technical possibilities are almost infinite. But what is the value of a money with an expiration date, or limited use? Will be traded as a discount? How can it be transferred? It is clear that one central characteristic of money has been lost: its liquidity, its unconditional exchangeability. Programmable money is, by design, information sensitive. Two obvious conclusions can be drawn. First, left to its own dynamics, digital private money will be increasingly diverse and non-uniform; and, second, digital public money should not be designed as programmable.

2.3 Fragmentation of the monetary system

Launched in 2019 by Facebook, the Libra project has acted as a wakeup call. Think of the potentialities of a new money, denominated in its own unit of account and instantly available across the world to more than 2bn users, irrespective of borders. Though rebutted by regulators, Libra illustrated the synergies that large platforms can develop between payments and other data-based activities such as social media and e-commerce. The economic logic of platforms pushes them to develop as closed ecosystems where consumers are "locked in" a specific environment though economic incentives and technical standards. Many existing or projected models of so called "stable coins" are built on this model. Like Facebook, they aim to issue digital money backed by a portfolio of financial or digital assets. Obviously, they raise financial stability concerns of their own as they de facto engage into large scale maturity transformation.

From a monetary perspective, such ecosystems have been dubbed "Digital Currency Areas" (DCAs) [Brunnermeier et al. (2019)] where economic agents are

held together not by a macroeconomic commonality but by digital interconnectedness. Such DCAs can develop cross border or inside a monetary authority jurisdiction. In China, the payment systems developed by Ant Financial and Tencent are very close to meet that definition, with each of them counting several hundred million consumers and no interconnection between the two networks.

In a fragmented monetary system, different types of currency would become imperfect substitutes, despite being denominated in the same unit of account. Because frictionless arbitrage would not be possible between different forms of money, each would carry a specific and idiosyncratic risk that would necessarily be reflected in the price at which they trade. As a result, "exchange rates" would arise between different types of domestic money. In effect, the monetary system would be transformed and behave more like the broader financial system where the creditworthiness of every single instrument is constantly re-assessed and priced. The likely result would be greater fragility, with the possibility of liquidity crises and periodic runs on some forms of currencies if doubts about their issuers emerge [Landau and Genais (2019)].

2.4 Monetary sovereignty

Monetary sovereignty is usually defined in international economics as the ability to conduct an independent monetary policy with associated trade-offs between capital account and exchange rate policies. However, there is a more fundamental component to monetary sovereignty: the prevalence of the domestic unit of account on a monetary territory, and the associated uniformity of currency. Only if it controls the unit of account used by economic agents in trade and financial contracts, can the Central Bank conceive and implement an independent monetary policy. It can then fix the overnight interest rate on its own liabilities and, by arbitrage, influence the whole set of monetary and financial conditions. The weakening of the Central Bank's liabilities as a unit of account would reduce the monetary authority's ability to conduct monetary policy. Central Banks have become aware of the possibility that new forms of "digital dollarisation" could threaten their autonomy and sovereignty. It is no coincidence that the most advanced projects of CBDCs are in emerging economies historically more exposed to the risk of dollarisation.

A CBDC would help monetary systems to face the numerous challenges posed by the digitalisation of money. It would grant the general public direct access to public money. It would enable full substitutability between payment instruments and keep their relative prices fixed. It would maintain maintaining the uniformity of money in a digital economy.

3 Policy choices regarding CBDCs

The design of CBDCs will involve many difficult choices and tradeoffs, including their functional scope, privacy regime and access to nonresidents. Only those features that have a direct impact on domestic financial stability, and more specifically the banking sector, will be discussed here. It will be assumed that the CBDC is issued as a "cash like" instrument, exchangeable on a peer to peer basis, with a zero interest rate guaranteed for at least for some amount of transaction balances.

In the current monetary arrangements, deposits by the general public are convertible into Central Bank money (the banknotes). But that convertibility does not occur permanently on a large scale. The reason is that it meets with physical obstacles: collecting, transporting and storing cash is costly and risky. In a paradoxical way, the equilibrium of the whole contemporary monetary system rests upon a purely physical friction. What digitalisation and CBDC bring is an easier way to shift money from one intermediary to another or from one issuer to another. Physical frictions would disappear. If the objective is to preserve the current equilibrium between private and public money, it is a legitimate question whether they should be replaced by different, policy made, economic and financial frictions.

3.1 Disintermediation risk

There are two dimensions to the disintermediation risk: (i) a "structural shift" could occur from private deposits to CBDC, fragilising the funding of banks; and (ii) runs may become easier and more frequent.

With immediate and easy access to Central Bank money, it is possible that the general public will permanently shift part of its transaction balances away from bank deposits and into CBDC. The potential amplitude of such a shift is unknown. It would have two cumulative effects: banks would lose funding; and they would have to compete more for deposits, increasing the cost of their resources. Depending on the magnitudes, there could be a significant reduction of banks profitability, and of their ability to distribute credit. Theatrically however, it is possible to conceive of a mix of policies that would exactly compensate for the structural shock [Brunnermeier and Niepelt (2019)].

Banks have always been subject to deposit flights and runs, including in modern times. Runs are the counterpart of the convertibility of deposits into public money. They can be described as a pathological form of convertibility. Digitalisation will make runs easier. Digital runs from a bank to another have already occurred. Whether runs by the public from banks to the Central Bank may become more frequent or more intense is unknown. The possibility should be taken into account when designing a CBDC.

3.2 CBDC design and financial stability

Design choices may be based on an apparently simple idea: limiting CBDC to its role as medium of exchange and preventing it to become a prominent and privileged store of value for the general public. Taking into account its attractiveness as a safe asset, it means introducing some limits to access. Limits can be set either through quantitative (ceiling) or price (tiering) mechanisms. In both cases, Central Banks would have to "legislate" an acceptable level of transaction balances. Both solutions are differently attractive.

A cap or ceiling on individual holdings of CBDC could be instituted. The mechanism is fully transparent, clear, and easily understood. Its quantitative impact can be directly assessed ex ante. It gives certainty and permissibility to banks and authorities alike. Obviously, it does not guarantee a fully elastic supply of CBDC and may have complex effects on the perceived safety of bank deposits in times of crisis. It also carries implicit choices on privacy as CBDC holdings of each individual (or corporates) would need to be clearly identified.

Tiering would be based on a different scheme, with different level of remunerations attached to different levels of holdings. For instance, transaction balances below a defined threshold would be at zero interest rate. Above and beyond that threshold, a negative interest rate could be instituted or would be applied. Conceptually, it would correspond to the safety premium that holders would be asked to pay for storing value in the Central bank's balance sheet. Operationally, it would create a disincentive to excess holdings. There would be a clear and visible separation between CBDC's roles as a medium of exchange and store of value. The negative interest rate could be flexibly adjusted in times of stress to price in the increased demand for safety. Any flight to safety could be accommodated, at least in part, by changes in prices rather than by significant quantitative shift in the holdings of different forms of money. Financial instability created by large asset reallocation would be avoided. Tiering, however, would bring its own challenges. First, the mere prospects of negative interest rates could reduce the acceptability of CBDC and compromise its primary objective of universal and ubiquitous presence in the economy. Second, the Central Bank would be seen as deciding upon two interest rates: the policy rate applied to its deposit and refinancing facilities, and the (negative) interest rates on excess holdings of CBDC. While perfectly consistent and rational, this scheme may create confusion and blur the communication on monetary policy.

Weighting the costs and benefits of different options will be the main tasks of Central Banks in the period ahead. They will have to navigate the tradeoffs between universal access and attractiveness, on the one hand, and limits to substitution with bank deposits, on the other. They may not want to make those choices in isolation.

4 The organisation and regulation of payments

As attested by the recent proliferation of speeches by prominent Central Bankers on the "future of money", digitalisation has triggered a fundamental rethink of our approaches to money. However, it raises other essential aspects of public policy and will impact financial intermediation more broadly. While the issuance of CBDC will bring a necessary response to the challenges of digitalisation, it will not be sufficient.

First, the technological features of digital private money will matter. Interoperability between digital networks, in particular, is a key condition for the uniformity of currency. As it goes against the natural economic incentives and business models of platforms, it may have to be regulated in some form.

Second, both monetary and regulatory authorities will have to take a long term and consistent view on the architecture and design of financial intermediation, in particular the place of banks and their role in the financing of the economy. The main source of future disruptions for banks is not CBDC, but the competition in payments emanating from platforms and Big Techs.

The key issue, therefore, is the relationship and future interaction between two essential financial functions: payments and credit. From a theoretical perspective, two "corner" solutions may be envisaged. The two functions can be fully dissociated, with payment competition fully open, and financial intermediation less dependent on the deposit taking activity of banks. Or they can be bundled and linked by regulation, which would consolidate the current bank - based model. The implications for financial stability and the distribution of credit in the euro area are likely to be very different and much more important than the CBDC. In the European Union, many strands of regulation are directly concerned, on data, digital platforms, privacy, payments, and crypto assets. Consistency of approaches will be very important in the current period, when innovation is intense and continuous.

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