10. **Central Bank Digital Currencies: An Overview of Pros and Cons**

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Various central banks are actively considering forms of digital currency. This note centers on the form that comes closest a digital equivalent of cash, and summarizes the main pros and cons involved in introducing it. Key sets of considerations are: 1) the extent of anonymity of the digital currency, and the associated trade-off between limiting illicit activity and containing the growth of private cryptocurrencies; 2) monetary control and the downward extension of the Effective Lower Bound; 3) financial disintermediation risks.

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10.1. **Types of Digital Central Bank Money: Recent Developments**

Digital money comes in different forms that meet diverse needs. Bech and Garratt’s (2017) taxonomy of money summarizes the main categories of money in a Venn diagram. This diagram considers whether money is electronic, issued by the central bank, universally accessible, and usable in peer-to-peer transactions. There is a rich array of types within the “electronic” category. These include regular bank deposits and the reserve accounts that banks hold at the central bank. What distinguishes peer-to-peer types of digital money, is that these allow for direct transfer and settlement without a bank-based clearance system. Peer-to-peer digital money can be privately issued, like Bitcoin, but could also be issued as a central bank liability. The latter would constitute a Central Bank Digital Currency (CBDC).

Various central banks are studying the possibility of introducing a universally accessible “retail” CBDC that would be a digital equivalent of cash (Prasad, 2018; Yao, 2018). For instance, the Swedish Riksbank has published a report on retail CBDCs, and is expected to decide in 2019 on the possible introduction of an eKrona (Sveriges Riksbank, 2017). Uruguay has run a successful pilot on a retail CBDC (Bergara and Ponce, 2018). Other central banks, such as the Bank of Canada and the Monetary Authority of Singapore, have run pilots for

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“wholesale” CBDCs, geared at transactions among financial institutions (Bech and Garratt, 2017).

This note centers on retail CBDCs, summarizing their main pros and cons. Retail CBDCs are arguably the most macro-critical type of CBDC. Wholesale CBDCs would constitute a different settlement system among banks, but should not materially affect the broader economy (BIS, 2018). However, only retail CBDCs contain the potential to significantly affect financial stability or the conduct of monetary policy, because they effectively introduce a genuinely new form of money into the economy, one that matches some characteristics of cash and private cryptocurrencies, while potentially also offering new characteristics, discussed below. Table 1 summarizes the main pros and cons of introducing retail CBDCs that are found in the literature. The next section discusses these pros and cons in more detail.

10.2. PROS AND CONS OF RETAIL CBDCS

The disadvantages associated with the growth of private sector cryptocurrencies could be one push factor towards the development of retail CBDCs. Since the advent of Bitcoin in 2009, investment in private sector cryptocurrencies has grown rapidly. Their use as a means of payment remains modest, but even at present volumes they come with significant social costs (He et al., 2016; Pichler and Summer, 2018). First, the extreme volatility of their prices challenges their usefulness as a stable means of payment, and creates some concern about the impact of contagion, especially if investment originates from small retail investors or when leverage is involved. Second, private cryptocurrencies are subject to high operational risk, as highlighted by the collapse of the Mt. Gox Bitcoin exchange in 2014 or the recent hacking of a South Korean cryptocurrency exchange. Third, the computationally-intense processes creating cryptocurrencies impose a large environmental burden: Bitcoin mining alone is estimated to use as much power as the country of Singapore, at present (Carstens, 2018). Fourth, cryptocurrency ownership and use is effectively anonymous, as accounts can be made under fake names, raising AML/CFT concerns. Fifth, cryptocurrencies face a problem of scalability, because each transaction is recorded on the ledger that all users in the system are sent, implying a network that grows exponentially in the number of transactions (Roubini and Byrne, 2018). Sixth, if in the future private cryptocurrencies were to become a significant part of the payment system, their effect could be similar to dollarization of an economy, involving a loss of a central bank’s monetary control, emergency liquidity provision and seigniorage. While several countries have begun restricting or banning private cryptocurrencies, most countries retain a neutral or open regime towards them. Hence, one incentive that
central banks may have to develop a retail CBDC is to limit demand for private cryptocurrencies.

Retail CBDCs may counter private cryptocurrencies, although to do so, CBDCs may need to inherit the challenges associated with offering a degree of anonymity. An essential feature of physical cash is its anonymity. A preference for anonymity does not necessarily stem from a desire to conduct illicit activities (Bech and Garratt, 2017). Yet, one major externality of anonymity is that it can promote illicit activities (Rogoff, 2016). A stable, trusted, and fully anonymous CBDC could be ideally suited for illicit transactions. Instead, if CBDC transactions are made fully public, the CBDC may fail to contain the demand for private cryptocurrencies, and may raise concerns about excessive state monitoring (Raskin and Yermack, 2016). However, anonymity is a spectrum, not a discrete choice. Under an intermediate option, users do register with their national IDs to create CBDC accounts, but those accounts are kept anonymous unless transactions are larger than a certain threshold, or judicial authorities have reason to suspect an account is associated with illicit activities.

CBDCs are not merely a “Bitcoin-repellent”, however, and can be a natural next step in the development of money. Although some societies, like Sweden and Denmark, have become nearly cashless, in most countries there remains an intrinsic demand for cash (Judson, 2018). CBDCs are a natural extension of cash to the digital realm (Bech and Garratt, 2017). CBDCs can be less costly than cash, which has a high printing and maintenance cost (Ponce, 2018). CBDCs may also offer efficiency gains in certain realms, like international transactions, where settlement through correspondent banking relationships can be slow.\textsuperscript{3}

If retail CBDCs are interest bearing, they can also improve monetary control. Cash is constrained to a zero nominal return. This feature is the foundation of the effective lower bound (ELB) on monetary policy, because if bank deposit rates become too negative, depositors can always switch to cash. In the aftermath of the Global Financial Crisis, the ELB has played a crucial role, arguably providing the impetus for the use of unconventional monetary policies. Moreover, the decline in neutral rates among advanced economies, raises the specter of recurring ELB problems in future recessions. Retail CBDCs can be designed to offer adjustable interest rates, which can go into negative territory, possibly creating the potential to overcome the ELB (Haldane, 2015; Goodfriend, 2016). Agarwal and Kimball (2015) have argued that a time-varying cash conversion fee can allow CBDCs to eliminate the ELB, even with continued presence of cash. Bordo and Levin (2017) make a similar argument, and contend that interest-bearing

\textsuperscript{3}The list of potential motivations for considering retail CBDCs also includes maintaining seigniorage, promoting financial inclusion, and increasing contestability in payments (Engert and Fung, 2018).
CBDCs can improve monetary policy effectiveness in normal times too, by strengthening the currency’s unit of account function.

Figure 1: Conducting monetary policy with CBDCs: constraints on the policy space

A lower bound constraint can also emerge from competition from private cryptocurrencies or political pressure. To the extent thatcountering private cryptocurrencies is an aim of retail CBDCs, the central bank may still face a type of ELB, even if the free convertibility of cash were curtailed. The demand for private cryptocurrencies depends on the alternatives that are available to such currencies (Hendry and Zhu, 2017). A CBDC that is fully anonymous and has a zero nominal return is almost certainly more attractive than a private cryptocurrency (outside of speculative motivations to purchase private cryptocurrencies). Instead, negative rates and/or reduced anonymity of the CBDC can raise the demand for private cryptocurrencies. This is represented by the lower left shaded area in Figure 1. This figure qualitatively relates the policy space of a monetary authority to the constraints that it may consider relevant. Offer too much anonymity and the CBDC may accidentally promote illicit activities. But a combination of low anonymity and low or negative interest rates could fail to counter private cryptocurrencies. If this consideration is important enough, the ELB becomes dependent on the CBDC’s extent of anonymity, as seen in the right pane of Figure 1.4 In addition, consumers may be inherently averse to a negative return on digital cash, being used to guaranteed nominal returns on physical currency. If so, politicians may face pressure to appoint central bank governors who are sensitive to such concerns, and would not easily cut CBDC rates into deeply negative territory.

4 The extent to which consumers value anonymity is an active research question (Athey, Catalini and Tucker, 2017; Borgonovo et al., 2018; Mascianardo, 2018).
Interest rates on retail CBDCs will also have to be carefully geared to avoid financial disintermediation effects. If cash earned a positive interest rate, bank deposits could be at serious risk of depletion. A similar concern applies to interest-bearing CBDCs. Banks could try and compete by raising deposit rates and, to the extent they possess market power, lending rates too, but only to a point, as profitability concerns would begin to surface. This implies an effective upper bound on CBDC interest rates, represented by the shaded area on the right end of Figure 1. This upper bound would be dynamic, moreover, and depend on bank profitability. During the introduction phase, when demand for CBDCs relative to bank deposits may not yet be well understood, the central bank would need to pay extra attention to disintermediation effects. For example, in a country that has become almost cashless, the introduction of a CBDC could entail a “recashification shock”. In addition to financial stability concerns, this may induce volatility in the money multiplier and monetary aggregates.

Irrespective of interest rates, the introduction of retail CBDCs may imply a permanently higher risk of bank runs. The sheer ease of digital conversion from bank accounts to a retail CBDC could have implications for financial stability. Any concern about a bank’s health could prompt depositors to convert their money into CBDCs (Broadbent, 2016; BIS, 2018). To some extent, however, bank runs can already happen at the click of a button, if depositors have accounts with other banks to transfer to. Nevertheless, CBDCs may suit concerned depositors particularly well, because CBDCs are created outside of the banking system and are backed up by sovereign credibility.

When CBDCs experience inflows, due to permanent or temporary disintermediation effects, the central bank faces a difficult decision on the allocation of those flows. The central bank could attempt to prevent some of the disintermediation effects by recycling funds back to the banking system. But, in doing so, the central bank would explicitly take on credit risk, and would need to determine the allocation of funds among financial institutions. Central bankers would likely be averse to such a role, let alone the direct intermediation of credit to the private sector. However, passively investing CBDC inflows in government securities might not be the neutral choice that it seems either. Such a policy would effectively reallocate credit provision away from the private sector (which would face the full brunt of financial disintermediation effects) and towards the public sector.

10.3. OPEN QUESTIONS

When considering the introduction of a retail CBDC, policy makers will need a granular view on many of the considerations outlined above. Open questions for further research include:
Financial disintermediation risk: How will the introduction of a retail CBDC impact upon existing bank deposits (both their level and their resilience to shocks)? If bank deposits are affected, what would be the impact on bank credit provision, and would this depend on the structure of the financial sector (i.e., large banks may tap alternative funding sources more easily than small banks)? To what extent does the impact on bank deposits and credit provision depend on the design features of the CBDC, including anonymity and interest rates? What differences between countries’ financial sectors are central in determining whether they are “ready” for a retail CBDC? Is there a sequence of preparatory steps towards such “readiness”? Are there effective ways in which the introduction of a CBDC can “test the water”, initially limiting the impact on the financial sector, such as by introducing the CBDC at sufficiently negative interest rates?

Monetary effects: How would the existing transmission channels of monetary policy be impacted by the introduction of CBDCs? To what extent does this depend upon a co-existence of CBDCs and physical cash? Can the ELB indeed be broken while cash is retained, as Agarwal and Kimball (2015) suggest? More generally, is there truly a potential to “end” the ELB with CBDCs, or merely to extend the ELB downwards, and if so, how far? Does CBDCs’ impact on monetary transmission channels and on the downward extension of the ELB depend upon their design features? Is there a trade-off between the optimal CBDC design for monetary purposes and for financial stability purposes, or do both sets of considerations point in similar directions? How much of a concern is the potential for volatile monetary aggregates during the introduction of a retail CBDC? How would central banks invest their new CBDC liabilities, and would the answer depend on the state of the economy and the health of the banking sector?

Operational risk: What are the operational challenges involved in the introduction of a CBDC? To what extent are central banks technologically ready to ensure the cybersecurity of a retail CBDC? Is there a risk that operational CBDC issues could cloud the communication and thereby the effectiveness of monetary policy? Can we draw tentative inferences about some of the operational issues associated with the introduction of a retail CBDC from the pilot cases, such as Uruguay?

Anonymity and AML/CFT considerations: In what ways could an “intermediate” degree of CBDC anonymity be offered (i.e., anonymity up to a transaction value threshold, or until judicial authorities have reason to suspect illicit activity, etc.)? Are there significant operational issues associated with tailoring the anonymity of retail CBDCs? What other steps should authorities take to ensure that retail CBDCs are an asset and not a liability to AML/
CFT policy? Would AML/CFT concerns significantly limit the use of CBDCs for cross-border transactions, or would central banks be able to work out bilateral agreements to monitor appropriate usage?

- **Further research on private cryptocurrencies**: In the absence of retail CBDCs, are private cryptocurrencies likely to thrive and become a larger part of the payment system? If so, would that make the negative externalities associated with their use macro-critical?
Table 1: Summary of key pros and cons of introducing CBDCs

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<th><strong>PRO</strong></th>
<th><strong>References include:</strong></th>
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<td>Eliminate the Effective Lower Bound (ELB) on monetary policy. Central banks can charge negative rates on CBDCs, potentially eliminating the substitution out of bank accounts that creates the ELB. It may be possible to sustain such negative rates without phasing out cash, through conversion fees.</td>
<td>Haldane (2015), Agarwal and Kimball (2015), Barrdear and Kumhof (2016), Rogoff (2016), Goodfriend (2016), Bordo and Levin (2017)</td>
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<td>Improve monetary control. Beyond the ELB argument: also in normal times, interest-bearing CBDCs give CBs a new precision tool, which can strengthen monetary transmission; in addition, this could help operationalize price-level targeting.</td>
<td>Barrdear and Kumhof (2016), Bordo and Levin (2017), Davoodalhosseini (2018), Meaning et al. (2018)</td>
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<td>Counter cryptocurrencies. Private cryptocurrencies have large disadvantages: volatile pricing; scalability problems; operational risk; transaction costs; environmental impact; and dollarization risks (loss of seigniorage &amp; LOLR function). If CBDCs offer similar use, but with less volatility and risks, they could supplant private cryptocurrencies.</td>
<td>Fung and Halaburda (2016), Barrdear and Kumhof (2016), Raskin and Yermack (2016), He et al. (2017)</td>
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<td>Fulfilling a societal need. Digital currency is the natural next step in the development of money. Token-based money has intrinsic value, as does free access to a liability of the central bank: these characteristics are currently constrained to physical cash only. Related: lower cost from maintaining cash.</td>
<td>Raskin and Yermack (2016), Bech and Garratt (2017), He et al. (2017), Bergara and Ponce (2018)</td>
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Table 1: Summary of key pros and cons of introducing CBDCs (continued)

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<td>Financial disintermediation and the central bank balance sheet. Banks may lose part of their retail funding base, if interest rates on CBDCs are not carefully calibrated. Moreover, CBDCs permanently raise the risk of runs, because they make it easier to convert cash out of the domestic banking system and into an asset that is backed by sovereign credibility. Furthermore, to the extent that disintermediation occurs, the central bank is faced with an unpalatable choice on the allocation of CBDC resources, which would either tilt credit provision towards the public sector or be reinjected into the financial sector. The latter implies explicit credit risk for the central bank and a choice of how to allocate funding among banks.</td>
<td>Broadbent (2016), Raskin and Yermack (2016), Cerqueira Gouveia et al. (2017), Bjerg (2017), BIS (2018), Fernandez de Lis (2018), Kumhof and Noone (2018), Panetta (2018), Keister and Sanches (2018)</td>
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<td>Illicit activities. Token-based intermediation is currently anonymous and favored for illicit activities. CBDCs, if anonymous, could make it easier to conduct illicit transactions in digital and global form. But if not anonymous, this raises concern about a “super-state”, capable of full monitoring of all individual transactions (which also means CBDC could boost the demand for private cryptocurrencies, rather than supplant it).</td>
<td>Fung and Halaburda (2016), Bech and Garratt (2017), Raskin and Yermack (2016), BIS (2018)</td>
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<td>Operational risk. Among private cryptocurrencies operational risk has been high. Are central banks ready for the operational challenges of CBDC? Any CBDC cybersecurity breach would come with large negative externalities on other central bank activities, due to reputational effects.</td>
<td>Mersch (2017), He et al. (2017), BIS (2018), Panetta (2018)</td>
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Do We Need Central Bank Digital Currencies? Economics, Technology and Institutions, SUERF/BAFFI CAREFIN Conference volume


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