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CBDC next-level: A new architecture for financial "super-stability"

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Working Paper No. 1015

CBDC Next-Level: A New Architecture for Financial “Super-Stability”

by

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ABSTRACT

Fractional reserve regimes generate fragile banking, and full reserve regimes (e.g., narrow banking) remove fragility at the cost of suppressing the role of banks as lenders. A Central Bank Digital Currency (CBDC) could provide safe money, but at the cost of potentially disrupting bank lending. Our aim is to avoid this potential disruption. Building on the recent literature on CBDCs, in this study we propose what we call the “CBDC next-level model,” whereby the central bank creates money by lending to banks, and banks on-lend the proceeds to the economy. The proposed model would allow for deposits to be taken off the balance sheet of banks and into the balance sheet of the central bank, thereby removing significant risk from the banking system without adversely impacting banks’ basic business. Once CBDC is injected in the system, irrespective of however it is used, wherever it accumulates, and whoever holds and uses it, it will always represent central bank equity, and no losses or defaults by individual banks or borrowers can ever dent it or weaken the central bank’s capital position or hurt depositors. Yet, individual borrowers and banks would still be required to honor their debt in full, lest they would be bound to exit the market or even be forced into bankruptcy. The CBDC next-level model solution would eliminate the threat of bank runs and system collapse and induce a degree of financial stability (“super-stability”) that would be unparalleled by any existing banking system.

KEYWORDS: Bank Deposits and Loans; Bankruptcy; Central vs. Commercial Bank Money; Fractional vs. Full Reserves Regime; Money Creation; Payment Service Provider; Seigniorage; Stability; Central Bank Digital Currency; Digital Currency; CBDC; Monetary Policy

JEL CLASSIFICATIONS: E42; E51; G01; G21; G23; G33

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I. INTRODUCTION

In a market economy, any two economic agents are free to agree on the means of payment to be used to settle a transaction. Yet, the acceptance of any form of money depends on the receiver's confidence that, subsequently, a third party will accept that money in trade. And since fiat money is intrinsically worthless, its acceptance must rest on the confidence that the community accepts it in the exchange process.

Maintaining trust in money and facilitating its circulation represents a major public interest. In most countries, this responsibility is entrusted to the central bank, which looks after the safety and efficiency of payment systems and seeks to preserve the stability of the (real) value of money in the economy. In discharging this responsibility, the central bank issues its own liabilities for use as money (central bank money).

However, in most market economies, other forms of money—typically issued by commercial banks, and increasingly by nonbank entities—are used in everyday transactions. Confidence in these forms of money lies in the ability of their issuers to convert them at par value into central bank money, or fiat money, upon demand of their clients, which in turn depends on the extent to which these monies are supported (“covered” or “backed up”) by enough central bank money. Should this coverage prove inadequate, parity would not be sustainable without some form of government guarantee.

Importantly, commercial banks (henceforth, “banks”)¹ are still the primary issuers of money, and their sight (demand deposit) liabilities represent most of the stock of money in circulation (henceforth, “bank money”). Banks create money by lending to borrowers (see Section II) and the economies draw significant benefits from this unique form of decentralized money creation

¹ Commercial banks are here and throughout this study defined as institutions that accept demand deposits from the public *and* lend money to borrowers by issuing demand deposit claims, that is, claims that give their owners the right to convert them in cash or to transfer them to third parties either for settling payment obligations or for transferring value.

process.

Yet, as will be explained below, banks can create money only to the extent that they can economize on the use of the central bank money required to settle their mutual obligations to repay deposits and other loans.

This implies that bank money creation essentially rests on an inherent type of instability (fragility) whereby, on one side, banks must minimize their demand for central bank money if they want to maximize their money creation power but, on the other, they must maximize their holdings of central bank money to give enough coverage to their money liabilities.

The goal of this study is to propose a system that while preserving the advantages of decentralized lending through banking, removes the inherent fragility of banking.

Building on the recent (rapidly evolving) literature on Central Bank Digital Currencies (CBDCs), this study proposes a CBDC-based system (the “CBDC next-level model”) whereby the central bank creates money by lending to banks, and banks on-lend the proceeds to the economy, thus inducing a degree of financial stability that would be unparalleled by conventional banking systems—what we, perhaps unimaginatively but effectively, call super-stability.

While the overarching aim of this study is to ensure system stability, the CBDC next-level model we propose would also protect the real value of deposits and loans through the introduction of new tools that would improve the central bank’s ability to limit inflation and unemployment, and mitigate asset booms and busts without sending the economy into recession.

The study is organized as follows. Section II illustrates the main components of the bank money creation process, analyzed in detail and at length elsewhere in the literature; considers the claims and counterclaims regarding the seigniorage that banks extract as rent from the economy thanks to their money creation power; identifies the constraints limiting bank money creation; evaluates the pros and cons of bank money creation; and recalls the radical proposals that have been submitted to reform the banking sector. Section III summarizes the basic CBDC architectures

that have emerged so far from research and central bank practice, upon which the CBDC next-level model proposed in this study develops. It also discusses the relative advantages and disadvantages of each type of architecture. Section IV describes the CBDC next-level model as the basis for a new financial architecture; explains how the new system would change current banking; and identifies the roles of its actors and its major features and impacts. Section V focuses on the implications of the CBDC next-level model for monetary policy, showing how it enriches the policy toolkit of the central bank, highlighting its advantages for effective policy. Section VI concludes with some final remarks. Annex 1 suggests “carrots and sticks” that could be employed to ensure the banks support adoption of the CBDC next-level model, and Annex 2 compares the key elements of current banking systems with the proposed CBDC next-level model.

II. MONEY IN TODAY’S BANKING SYSTEMS

In today’s banking systems, essentially comprising the central bank and a plurality of commercial banks, the two main types of money available to the public are:

1. Central bank money, namely coins and notes, which are legal tender, and
2. Commercial bank money, which is not legal tender but facilitates payments and transfers of funds via the national payments system.

For settling payments among themselves, banks use a third form of money, which is available only to them—not to the public. This third form of money consists of liabilities issued by the central bank in the form of (digital) reserve balances, which banks only (and a few other select types of financial intermediaries) are authorized by legislation to hold on the books of the central bank.

Banks receive funds from clients in the form of cash and/or transfers of central bank reserves from other banks against the issuance of sight or demand deposits to those clients releasing or

transferring the funds.² Demand deposits (henceforth, “deposits”) represent “claims” of their holders (“depositors”) on the issuing banks. While these claims are not “legal tender,” they are always, in principle, redeemable on demand by depositors at par with central bank money circulating as legal tender (banknotes) and are accepted by economic agents across the economy in place of legal tender both in the exchange process and for settling payments or other debt obligations.

At any time, therefore, deposits can be turned into legal tender on their holders’ request by simply making withdrawals in cash; alternatively, depositors may instruct their banks to transfer funds (in exchange for an equal reduction in their deposit claims) to third parties for payment or other purposes.

Banks Create Money

Even mainstream economics has eventually recognized that banks are not simple intermediaries of already existing money—a long-held tenet of post-Keynesian theories of money. They do create money by issuing claims on themselves in the form of deposits (McLeay et al. 2014a, b).³ In fact, in contemporary economies, the largest bulk of money is created by commercial banks (Ryan-Collins et al. 2012).⁴

Banks create money by lending or selling deposits against loans or securities. Money creation via lending is unique to banks, in as much as only banks are allowed by regulation to i) hold customers’ demand deposits *and* issue loans to customers in the form of demand deposits and ii) carry both operations through customer accounts held in the banks’ own books. These features are not shared by (nonbank) financial intermediaries, which may a) intermediate *only* pre-existing funds and b) perform lending functions *only* by ordering fund transfers to take place

² Banks may also sell other financial instruments in exchange for funds, but these instruments do not need detain us for the purpose of this study and we will consider them no further.

³ For a recent review (and a new perspective) on bank money creation, see Bossone (2020).

⁴ Buiter et al. (2022) persuasively argue that, in spite of the current (in some cases, successful) growth of private sector e-monies, these will prove only a temporary phenomenon, while commercial bank money with enhanced technical functionalities will remain the dominant form of money. Despite the many structural changes in finance and financial services, a similar conclusion was reached some twenty odd years earlier by focusing on the unique bank money creation process under fractional reserve regimes (Bossone, 2001a).

across accounts held with banks.

When banks create money (Box 1), they do not need to raise deposits to lend or sell deposits to third parties (Werner 2014). Yet, they must avail themselves of the cash and central bank reserves necessary to guarantee cash withdrawals for clients and to settle obligations emanating from client instructions for making payments or transfers to third parties.⁵

The relevant payments and transfers, from the standpoint of reserves use, are only those between clients of different banks, since the settlement of payments and transfers between clients of the same bank (“on us” payments) does not require the use of reserves and takes place by simply debiting and crediting the accounts held by the senders and receivers on the books of the same bank.

For both cash withdrawals and interbank payments, every bank must determine the optimal amount of cash and reserves needed to cover deposits. These reserves consist of: i) cash reserves and reserves deposited by the banks with the central bank; ii) reserves from the settlement of incoming payments from other banks; iii) borrowings from the interbank market; iv) borrowings from the central bank; v) immediate liquidation of unencumbered assets in the balance sheet, and vi) new deposits of cash from old and new clients. Also new, non-cash deposits from clients bring in reserves, but they can only consist of deposits transferred from other banks, and therefore are already comprised under item ii.

Thus, while banks may, in principle, create all the money the economy is willing to absorb at a given price (interest rate), in practice their money creation power (or, more precisely, their ability to support the payments activity associated with their money creation) is constrained by their own ability to raise the required funding (i.e., central bank reserves) and the cost of doing

⁵ Most contemporary payment settlement systems require that settlement takes place in central bank money. However, the principle of using safe assets for settlement is also adopted by those systems where central bank money is not available, and settlement can only happen in bank money. Here, participating banks must first elect the money liability issued by one of them—typically, the bank that is most highly reputed, financially solid, and large—and then hold enough balances of such money for settlement purposes. This solution was the norm in the clearinghouse arrangements adopted in the US and UK in the past centuries (Norman *et al.* 2011) and is still today the case for several payment systems especially for cross-border transactions (CPSS 2013).

so.

Box 1. The Bank Money Creation Process

The money creation process is as simple as making two simultaneous entries in the books of a bank: debit the amount of the loan in the name of the borrower, and credit the same amount as a deposit in the same name. The double entry keeps the bank's books in balance: while the loan records the amount to be repaid by the borrower to the bank (on the assets side), the deposit records the money owed by the bank to the borrower (on the liabilities side), which the borrower can spend.

As the borrower draws on the deposit, the new money gets injected into the economy, generating new activity. Borrowers must repay the loan out of future earnings. Once the loan is repaid, they will be square with society. They will have put back in (via work and/or investment) what they had first taken out by spending the proceeds of the loan. As the loans are repaid, the entries in the books of the bank are reversed and the money is destroyed, that is, written back into the "thin air" from which it came. For the economy to grow, new lending must exceed repayments to create the net new money required to fund additional transactions.

What enables banks to create credit and hence money is regulation that permits them to keep customer deposits on their own balance sheet. This means that depositors who deposit their money with a bank are no longer the legal owner of this money, whose ownership is transferred to banks. Depositors are just one of the general creditors of the bank (Werner 2014).

It is because of this creditor relationship that, while banks do not need to raise deposits or central bank reserves to lend (and create) money, they must avail themselves of the cash and reserves necessary to guarantee cash withdrawals from clients and/or to settle obligations emanating from client instructions to mobilize deposits for making payments or fund transfers.

The capacity of each bank to raise funding is constrained by two scale factors: i) the size of the bank itself, as proxied by its share of the payment market(s) where it operates and ii) the bank's level of capital (i.e., equity plus accumulated reserves). The share of the payment market(s) reflects the bank's capacity to receive funding through incoming payments from other banks, which should, on balance, be adequate for settling outgoing payments. The level of capital, on the other hand, determines (*ceteris paribus*) the bank's capacity to access (borrow) external funding to ensure settlement of its obligations under adverse contingencies, such as temporary

liquidity shortages.⁶

But Not All Banks Are Equal

Not all banks share the same money creation power. An increase in size affords a bank more than proportional efficiency gains and profits from money creation due to i) scale and network economies and ii) market power.⁷ That is, as the size of a bank grows, the bank needs less additional funding as a proportion of the new money created and can extract larger profits from money creation.

Scale and Network Economies

Where banks are permitted to hold only a fraction of reserves against their total deposit liabilities, a growing bank size implies that the bank can expand its depositor base and increase its share of the payments flows. This allows the bank to increase the volume and value of the payments that it settles on its own books (“on us” payments), to intercept a large share of reserves, and to stabilize its funding due to higher asynchrony of deposit withdrawals (at least in normal times). Consolidation of the banking sector generates increasing returns to the consolidated banks, enabling them to create money with lower reserve margins needed for coverage (*ceteris paribus*).⁸

⁶ The capacity of a bank to satisfy its funding needs acts as a constraint on the bank’s power to create money by lending or selling deposit claims. At the margin, the cost of funding for each bank may be higher than the expected return from creating money or it may even become prohibitive. A bank’s idiosyncratic decision to, say, double at once its total lending by issuing new deposits would run against the bank’s capacity to support the new lending level with adequate funding. The bank would always be able—in principle—to create money by signing off new loans with the stroke of a pen (or, in our times, with the press of a key or click of a mouse); yet the new volume of money created would not be sustainable under the bank’s normal funding structure. As most of the payments generated by the new loans would go to payees holding accounts with other banks, the bank would be unable to settle its obligations if it were unable to raise the needed funds. The bank would not be able to expand at once its deposit base as needed or to capture a larger payments market share overnight; it would not have all the collateral needed to borrow from the central bank; also, borrowing so many extra funds from the market, with given capital, might be perceived as too risky by depositors and other lenders or investors, and in general the market. Even a deep money market and a fully accommodating central bank’s monetary policy stance would not help if the bank’s funding and capital structures were unchanged: the marginal cost of the extra funding could become infinite for the bank.

⁷ While, as discussed, the payments’ market share of individual banks affects each bank’s optimal demand for reserves at the margin, rules and technologies for settling payments determine the structural demand for reserves of the whole banking system. Since the role of these rules and technologies is not relevant for the purpose of this study, they will not be further considered here. Interested readers are referred to Bossone (2020).

⁸ For evidence on economies of scale in banking, see references in Bossone (2020).

Market Power

If free entry were allowed into commercial banking, banks' profits would be reduced accordingly, as banks would compete on the asset and liability side of their balance sheet until their extra profits would vanish. In fact, policy regulations restrict the number of bank entries into the market, with a view to ensuring their soundness and preserving their franchise. If a bank holds quasi-monopolistic power in the market for loans and/or a monopsonistic power in the market for deposits, it can create money at lower funding cost and at extra profit (all else being equal).

In conclusion, larger banks can exercise a more than proportionally stronger power to create money than smaller banks. All else being equal, smaller banks must hold relatively larger (optimal) reserve balances than larger banks as a share of their deposit liabilities, also, they face relatively higher funding costs and hold lesser power to set higher lending rates. All this constrains the power of smaller banks to create money to a much larger degree than would be the case for larger banks and may even eliminate it (forcing them out of the market).

Bank Seigniorage

Whenever money is created by fiat, at a cost that is lower than its value, and is lent out or sold in exchange for real resources (or claims thereon), as banks typically do, a special type of rent ("seigniorage") is extracted from the economy by the money creator. This is the power that money creators uniquely hold and exercise, generating exchange value through which they can exert a degree of command over real resources more than those they have contributed to produce. This degree of command consists of claims on goods, services, or assets (if the money is sold) or claims on future streams of interest income (if the money is lent), which do not reward the money creator for any abstention from present consumption or sacrifice of liquidity, or for the services they perform.

Seigniorage, therefore, is inherently associated with the power to create money, irrespective of who exercises this power. And while the concept still meets some reluctance when associated with private sector entities (as most banks are) (Box 2), it in fact relates to the *function* of money

creation rather than the *legal* nature of the entities carrying it out. Thus, as banks are allowed to operate with fractional reserves and create money,⁹ they do extract seigniorage from the economy in the form of extra-profits (or rents), or profits beyond the “normal” level that would prevail in a fully competitive market, where each bank would have to fully fund its loans with reserves.¹⁰

Box 2. More on Bank Seigniorage

While becoming increasingly accepted, the concept of seigniorage is still met with criticism when associated with private sector entities, as most banks are.

One common counterargument is that the income that banks extract is not rent but rather a share in the newly created output, corresponding to the resource allocation services that they provide to society by applying their specialized screening and monitoring technologies to lending.

In response, it should be said that while these specialized services do represent a contribution to output (and should therefore be compensated at a normal profit rate), they are not inherently associated with the banks’ money creation process. These services can be provided through pure intermediation of existing resources and do not require or necessarily involve any creation of money. As regards, specifically, the money creation function that is associated with lending, banks have the advantage in terms of the wider interest rate spread.

A second counterargument claims that rents from bank seigniorage are ultimately transferred to bank shareholders as dividends, much as central bank profits are given back to taxpayers through the government budget. Yet, there are two substantial differences between the cases. First, in the central bank case, resources are extracted from the economy and (in large part) returned to the public through the fiscal budget. In the case of commercial banks, on the other hand, resources are extracted from the economy and appropriated by the bank owners. To be sure, the owners may re-inject these resources into the economy (using them to finance their

⁹ The term “fractional” is here used to indicate those regulatory frameworks that allow banks to hold only a fraction of reserves against their deposit liabilities, including those whereby a reserve ratio of less than 100% is required by regulation or simply left to banks’ discretion as part of their liquidity management policy. It is important to notice that bank money creation, in this context and as accepted in this study, has nothing to do with the fractional reserve theory of bank money creation that became dominant in the 1950s and 1960s, influencing the description of the money process in the academic textbooks on macroeconomics and monetary economics of the time, which would still consider banks as intermediaries that can only lend the funds they receive from depositors (Bossone 2020).

¹⁰ For a full analytical treatment of bank seigniorage and its macroeconomic and distributional implications, see Bossone (2021). It should be noted that the banking market could never be fully competitive as regulations always limit market entry both to protect market integrity and to preserve banking franchise (Hellman et al. 2000). In the hypothetical limit case of only one bank in a cashless economy, no central bank reserves would be necessary for the above purposes and the bank would extract seigniorage from its money creation functions no more nor less than a central bank does. In fact, no real-world economy features a system consisting of a single bank and in the real world not all banks in an economy share an equal money creation power. Thus, the power to extract seigniorage from the economy varies considerably across banks depending on their size (cet. par.), as discussed.

own consumption and/or investment activities), but this would not compensate those who initially had to pay for the seigniorage. Different would be the case of cooperative banks where seigniorage, if extracted, is paid back to the same loan users. Second, the central bank is not in the business of “making money”: it creates and manages the money supply for the purpose of pursuing public policy objectives, and the value it adds to the economy as a result is compensated at the cost rate of the factors of production employed. Again, any extra revenue (seigniorage) is returned to the economy through the fiscal budget.

Analysis shows that, all else equal, money creation allows commercial banks to extract larger rents from the economy than is possible for pure financial intermediaries operating under (hypothetically) identical market conditions, that is, where banks and intermediaries, respectively, hold the same market power as buyers and sellers of financial resources (Bossone 2020). Thus, any extra profit extracted by banks (which go into seigniorage) are due to their money creation power, combined with deposit guarantees. The guarantees advantage banks by allowing them to offer lower rates of interest on deposits (because of lower risk), reducing the cost of funds relative to financial intermediaries that receive no such guarantee.

One way of setting apart the effects of a bank’s economies of scale vs. its market power over seigniorage is to consider that the former affect quantities (i.e., by expanding the bank’s power to create money while economizing on reserves), and the latter works through prices based on the reserves and deposit guarantees (as it enables the bank to increase the loan-deposit interest rate spread). The two effects are necessarily intertwined, however, and seigniorage is whatever extra rents are associated with the money creation function.

Quantitatively, bank seigniorage can be significant, implying that economies may suffer from large rent extraction by their banking systems. Estimates of bank seigniorage change depending on how it is defined.¹¹

Constraints to Bank Money Creation

Banks may create money by lending or selling deposits only within an overall resource envelope

¹¹ For estimates of bank seigniorage, see Bossone et al. (2018) and the references therein. For an analysis of bank seigniorage defined based on recent developments in accounting principles and practices, see Bossone and Costa (2021).

that is determined by the bank's capacity to raise funds (reserves) at costs that are consistent with the sustainability of its business. A bank's funding plan must consider the bank's in- and out-payments (as adjusted for growth and risk factors), the bank's borrowing capacity, and its cost of raising and holding funds vis-à-vis the prospective return from lending or otherwise investing the money created. As discussed, creating deposit claims, per se, does not require any funding. What matters is that i) funding is in place when the bank's new financial obligations to other banks (or other payment system participants) fall due and are to be settled, and ii) funding can be obtained when necessary and without impairing the bank's financial equilibrium and business viability.

Within the planned funding envelope and its associated costs, the bank extends its loans until the marginal returns on lending and investing (considering the risks and administrative costs involved), do not exceed the marginal cost to the bank of raising and holding funds.

On this very price mechanism rests the power of central banks to govern monetary conditions in contemporary economies, where sophisticated markets render the use of direct control instruments (e.g., required reserve ratios or credit ceilings) inefficient and ineffective. Central banks operate indirectly by changing the policy interest rates and publicly communicating their policy strategy in view of achieving their low-inflation objective. These indirect instruments are intended to affect the current and expected costs of funding to the banks, thus influencing their risk-return prospects and ultimately their money creation (lending) decisions, which will flow onto retail borrowers.

This influence is partly psychological, as the central bank uses pronouncements ("forward guidance") to signal its policy intentions in the hope that lenders and borrowers modify their behavior in line with the central bank's objectives. Actual changes are made by setting the interbank lending and borrowing rates and by buying and selling securities. These have the effect of reducing borrowing and spending (as interest rates are raised), thereby dampening demand, or encouraging borrowing and spending (as rates are dropped), thereby stimulating demand.

However, these are very blunt instruments, often leading to adverse impacts on the economy overall, especially when inflation is due to a decrease in supply, rather than an increase in

demand because of excessive borrowing. The system also leads to inefficient pricing when interest rates are below the inflation rate, punishing savers and misallocating resources.

Other prudential regulatory tools (such as capital, liquidity, and leverage ratios) may act as constraints on the banks' power to create money. These tools do not intervene directly on deposit issuances but influence the cost factors that banks must face when extending new credit.

Pros and Cons of Bank Money Creation

The power of banks to create money by lending is a key factor in efficiently allocating society's resources. Rather than leaving it entirely in the hands of a centralized bureaucracy to decide where and on what "new money" ought to be allocated and spent, current banking systems distribute the decision-making process across the community by putting it in the hands of specialized institutions (banks), which compete for identifying opportunities to lend resources and/or for providing financial services that can match the demand. A centralized process would inevitably be less efficient and effective than a decentralized process taking place in an information-intensive environment; and would render the money supply process much less elastic, and less apt to meet the variegated and changing needs of the economy.

In carrying out this function, banks should ensure that the proceeds of the loans are used for lawful purposes, in line with societal objectives. Ideally, bank loans should be restricted to the "low-risk" end of the market, as they represent new money being injected into the economy at the lowest cost, while higher risk loans ought to be financed by investors putting their own money at risk in the expectation of higher returns. Banks should also manage liquidity prudently, with the aim always to be able to match their clients' demands for cash withdrawals and deposit mobilization, and to accomplish payments settlement in due time.

History shows that this is not always the case, and the financial literature explains why banks are inherently *fragile*. In the seminal work by Diamond and Dybvig (1983), banks can profitably intermediate liquidity between savers who want to deposit in liquid accounts and borrowers who need to take out long-maturity loans, only at the cost of exposing themselves to the risk of a run. That is, by aggregating funds from many different depositors with different time preferences for

fund withdrawals, banks can commit to lending money on longer terms, counting on their ability to service depositors' immediate liquidity needs. Yet this makes banks inherently fragile, in the sense that if, for some reason, all depositors wanted to withdraw their money at the same time, banks would find themselves unable to honor their obligations. The inherent fragility is evident considering that if, hypothetically, banks wanted to guarantee themselves fully against the risk of runs, the liquidity they would have to hold as collateral would prevent them from lending to borrowers: banking, understood as deposit-taking *and* lending, would be impossible.

Diamond and Rajan (2001) further develop the essential role of *fragility* for banking. They argue that banks purposefully adopt a fragile structure as a commitment device, whereby a bank's refusal to deliver a depositor the amount requested would prompt all other depositors to try to withdraw as well and effectively cut off all lending to the bank. Thus, they voluntarily expose themselves to the risk of a run and commit to managing such risk to enable depositors to withdraw funds when needed while buffering borrowers from depositors' liquidity needs. If credible, this commitment induces depositors to trust banks with their money. A credible commitment also allows banks to deliver on their promises while economizing on costly central bank reserves.

As these studies show, and several other contributions corroborate,¹² the whole banking system is inherently fragile when the reserves base of the banks is fractional, which explains the institutional arrangements (e.g., access to central bank refinancing facilities, deposit insurance, public guarantee mechanisms, etc.) that most jurisdictions worldwide adopt to prevent risk of default and to mitigate its consequences.

Throughout modern history, governments worldwide have had to support banks to avoid system collapse. The problem occurs usually in rising markets. To stay competitive, banks (especially, but not exclusively, the large ones) are tempted, in competition with each other, to take on more risk than is prudent in the expectation that they would be protected by government guarantees if the risk materializes (engendering “moral hazard”). The result is booms and busts in asset

¹² For a recent review of the literature on banking fragility, see Amador and Bianchi (2021).

markets and the broader economy, leading to recessions and, in the worst cases, depressions.

III. OLD AND CURRENT PROPOSALS TO REFORM BANKING

Especially in the aftermath of banking crises, proposals for radical changes to banking are flagged by scholars and practitioners. Proposals typically include such ideas as reducing the size of banks to eliminate the “too big to fail” systemic risk, separating commercial banks from investment banks, prohibiting credit relations between commercial banks and investment banks, eradicating speculation (e.g., derivatives, high-frequency trading) and separating consulting activities from market activities, and even socializing the banking sector.¹³ None of these have been implemented in any jurisdiction so far, and actual remedies have generally included tightened regulations and supervisory practices.

A radical proposal to remove the endemic fragility of banks, that has cyclically resurfaced after major banking crisis episodes, consists of changing banking legislation from fractional reserves to so-called “narrow banking.” This would require banks to fully back their deposit liabilities with high-quality and liquid assets. The most extreme version of this proposal is the “100% reserve banking” regime, invoked by early economists, whereby banks would be required to keep 100% of the funds deposited with them by customers as reserves balances held at the central bank, which carry zero liquidity and credit risks. All other bank lending functions would be transferred to mutual-fund-like institutions that would not be insured by the government. This arrangement would prevent bank money creation (via lending) and allow the government or the industry to scale back costly deposit insurance programs without jeopardizing the safety of the banks and their depositors. In addition, as the proponents argue, the institutions that inherited the banks’ role in commercial lending would be loath to take excessive risks because their own capital and that of their investors would be at stake.

On the other hand, while bearing less than certain benefits in terms of greater financial stability,

¹³ See “What is to be Done with the Banks? Radical Proposals for Radical Changes,” CADTM, available at www.cadtm.org/What-is-to-be-Done-with-the-Banks,13315.

narrowing the scope of banking might exact some heavy costs in terms of efficiency and credit availability. Narrow banking would dissipate the significant benefits associated with conventional banking systems, which stem from the decentralized issue of demandable deposits to finance other than government liabilities.¹⁴

Better alternatives to narrow banking would be Bryan's (1991) “core banking” model,¹⁵ or those regulatory regimes that separate commercial (short-term) banking from investment (longer-term) banking activities, even within the same financial holding companies.

Another radical proposal is by Bossone and Sarr (2002, 2003). Instead of outright suppressing banks' power to create money, as narrow banking would aim to do, their proposal retains inside money creation by specialized payment service institutions but separates it from lending, as money is allocated on a nonlending basis. Their solution would preserve the advantages of decentralized money creation, which only conventional banking can deliver, while, at the same time, removing the rents that conventional banks extract from the economy through seigniorage.

In recent years, a new proposition has been made possible by technological progress: the issuance of retail CBDC, which would make available to the public the highest quality asset that a jurisdiction could possibly produce in digital form. CBDC has already become a reality in some countries and is being actively researched and experimented in many others.¹⁶

¹⁴ For a historical and technical analysis of narrow banking that reaches this conclusion, see Bossone (2001b).

¹⁵ According to this model, the scope of banking is narrowed down to a core of activities where banks have a demonstrated comparative advantage: issuance of checking, savings, and money market deposit accounts; provision of payment, trust, and custody services; and loans to individuals, small businesses, and medium-sized companies. A core bank, on the other hand, would not lend to large corporations and developing countries; it would not engage in high-leveraged transactions and in large commercial real estate projects; it would not undertake the global money market activities of large banks; and it would not underwrite securities. According to Bryan (1991), a core bank is a “safe place to keep your money” and the core banking functions he refers to are those where banks reportedly make the overwhelming bulk of their profits.

¹⁶ For tracking CBDC progress around the world, see Central Bank Digital Currency Tracker (by the Atlantic Council), available at <https://www.atlanticcouncil.org/cbdctracker/>; CBDC Tracker, available at <https://cbdctracker.org>; Central Bank Digital Currency Tracker (by SME Finance Forum), available at <https://www.smefinanceforum.org/post/central-bank-digital-currency-tracker>; or Kiffmeister's Global Central Bank Digital Currency Monthly Monitor—The CBDC Think Tank, available at <https://cbdctt.com>.

A CBDC system that replaced conventional banking would provide the ultimate solution to the quest for deposit safety, since CBDC would be a direct claim on the state (like physical cash is) and, like physical cash, it would be a perfectly safe and liquid asset since its issuer—the central bank—could not default on its own obligations and could always issue additional CBDC, when necessary.¹⁷

However, whereas narrow banking and the other proposals have been thought of precisely for the purpose of changing the existing banking regime altogether, no central bank today considers CBDC as a game-changer aimed to replace conventional banking. On the contrary, one of the main concerns commonly shared by central banks is the fear that CBDC issuance would disrupt the deposit-taking and lending functions of banks. This fear has so far kept them from considering how CBDC could be introduced at the retail level in ways that do not destabilize the existing financial market structures.

Our proposed CBDC next-level model does point to a CBDC system as a game-changer that replaces conventional banking while not losing its benefits. The model combines centralized money creation by the central bank with decentralized credit provision by banks. Such a CBDC system, we argue, would provide money to society at lower costs and significantly lower risks than current banking systems.

Since our proposed CBDC next-level model builds on one of the basic CBDC architectures that have emerged so far from research and central bank practice, let us briefly examine these architectures first.

Basic CBDC Architectures

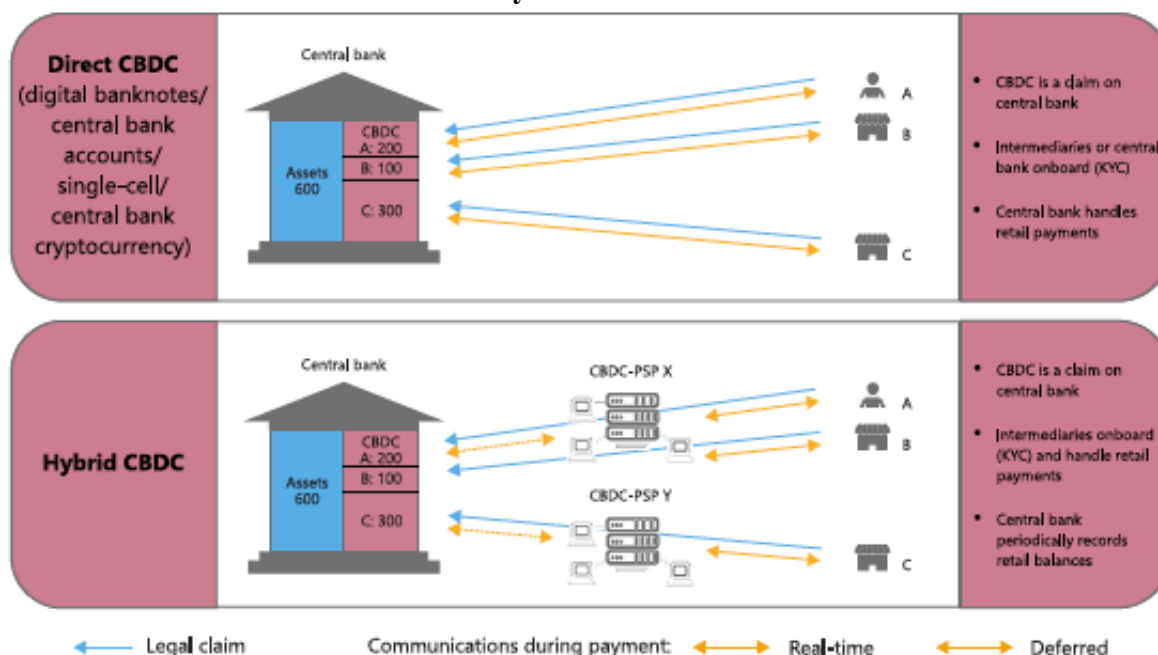
Two models have been identified in the recent literature as the technical benchmarks for CBDC architectures:¹⁸ the “direct” (or single-tier) model and the “hybrid” (or two-tier) model (Chart

¹⁷ Of course, while this holds true in principle, in practice there is a limit beyond which additional CBDC issuance would affect the credibility of the central bank and compromise its macro-financial policy objectives.

¹⁸ In only a few years, the literature on CBDC has become simply too vast for being reflected in a list of references that would do justice to the huge effort made by the international community on the topic. Many central banks, academics and macro-financial policy experts have produced reports, studies, simulations, and experimental results,

1). In both models, the central bank is the only issuer and redeemer of CBDC. Both models also allow for either account- or token-based access to CBDC. In the direct model, the central bank offers direct access to CBDC from retail users, handles all payments in real time, keeps a record of all balances, and updates the record with every transaction. In the hybrid model, retail users can access CBDC only indirectly via (bank or nonbank) payment service providers (PSPs).¹⁹

Chart 1. CBDC Today's Basic Identified Architectures



Source: Adaptations of Graph 2 in Auer and Böhme (2020).

which have enormously contributed to global knowledge on CBDC. Here, we only refer to select work by international organizations like the Bank for International Settlements (BIS), the International Monetary Fund, and the World Bank. BIS (2020, 2021a, b, c) are the reports issued by seven central banks and the BIS, which investigate users' needs, technological design options, and the financial stability implications of retail or general purpose CBDCs. The World Bank (2021) report considers CBDC from the perspective of payment systems and services and aims to provide central banks and other relevant public authorities with a decision-making framework to be used as they investigate the potential use of CBDC as an instrument to strengthen or modernize their national payments system. Finally, IMF (2022) studies six advanced CBDC projects, drawing on collaboration and exchanges with the respective central banks, to get insights beyond what has previously been published for the purpose of sharing lessons and open questions with countries that will embark on CBDC initiatives.

¹⁹ A third type of architecture has been proposed by Kumhof and Noone (2018) under the name of "indirect" CBDC, and by Adrian and Mancini-Griffoli (2019) under the name of "synthetic CBDC", and appears on the original printing of Chart 1 taken from Auer and Böhme (2020). Accordingly, CBDC would originate from a public-private partnership whereby PSPs would issue a digital currency and be required by regulation to ensure that the value of the digital currency is always fully matched by funds held at the central bank. PSPs issuing this fully backed digital currency would act like narrow banks, and because the currency would be a claim on the issuing PSPs (not on the central bank), it would not qualify as CBDC. A discussion of what would be required for this currency to be a close replica of CBDC is provided in Bossone (2021b).

The direct model looks attractive for its simplicity, as it eliminates system dependence on intermediaries by doing away with them. Yet, for the very same reason, no central bank seems to show preference for it, since its adoption might seriously upset existing market structures and disrupt current businesses by disintermediating banks and payment institutions. Also, the model would require the central bank to fulfill some significant, new responsibilities such as, *inter alia*, handling customer relationships, engaging in dispute resolution, executing know-your-customer (KYC) requirements, and providing all related retail services. These new responsibilities would raise central bank costs and risks and involve the central bank in functions and tasks that transcend its perimeter and capacity.

The hybrid model is, by far, preferred by central banks. Here, all banks and nonbank PSPs (not the central bank) handle all communications with retail users, clear payments, and send/receive payment messages to/from other PSPs and wholesale payment instructions to/from the central bank. The latter settles wholesale CBDC transactions with finality and retains a copy of all CBDC holdings, allowing it to transfer holdings from one PSP to another in the event of a PSP's technical failure. As the central bank does not directly interact with retail users, it can concentrate on a limited number of core processes, while banks and nonbank PSPs deliver services for which they are specialized and over which they have a comparative advantage *vis-à-vis* the central bank.

While a full comparison of the two architecture solutions can be found in Auer and Böhme (2020), some important remarks, which justify the CBDC next-level model proposed in this study, are in order on the implications of the hybrid model for the money supply process.

The potentially disruptive effects of CBDC on the money supply process arise from the substitution away from bank money that CBDC could trigger if it were to be preferred by the public as a settlement asset and means of payment *vis-à-vis* currently existing instruments (typically bank deposits). While a central bank would accommodate the demand for CBDC, flows into CBDC would drain reserves from the banking system in the same way as flows into banknotes and central bank deposits held by non-monetary counterparties (e.g., the treasury, foreign central banks, or financial market infrastructures) currently do. If banks found their

reserve balance position to be below their preferred level, they would compete for funding to restore their original reserve position to their desired level, which would raise the level of short-term interest rates.

The central bank could intervene with compensatory measures, for instance, by expanding the availability of reserves to the banks. Yet, with massive portfolio shifts toward CBDC, banks would need to have large stocks of eligible assets to use as collateral in refinancing operations or as securities to trade in open market operations, adding to bank costs.

Assuming strong public preferences for CBDC, and hence significant deposit substitutions, bank money creation via lending would decline and/or become more costly, also negatively affecting the demand for bank loans. The more attractive the CBDC, the greater the disintermediation of banks and the greater the impact on the money-supply process: CBDC issuance would shift the bank money supply schedule backward. As a result, the money supply process would become centralized, with the central bank and the national treasury (through fiscal budget) having to take on a more direct role in money provision to the economy, with the inefficiencies noted earlier.

The fear of disintermediating banks and disrupting their business is such that the central banks engaged in CBDC initiatives are very cautious about their CBDC becoming “too successful” and consider adopting safeguards (such as caps or price mechanisms) that would limit CBDC holdings and use for transactions, creating a seeming paradox: the more successful CBDC, the more unstable the whole banking system could become, and the more the central bank would have to restrict access to CBDC.

The remainder of the study focuses on how to replace bank money with CBDC without destroying the banks’ basic business model, and, in fact, even improving the role of banks as lenders and their terms of lending provision to the economy.

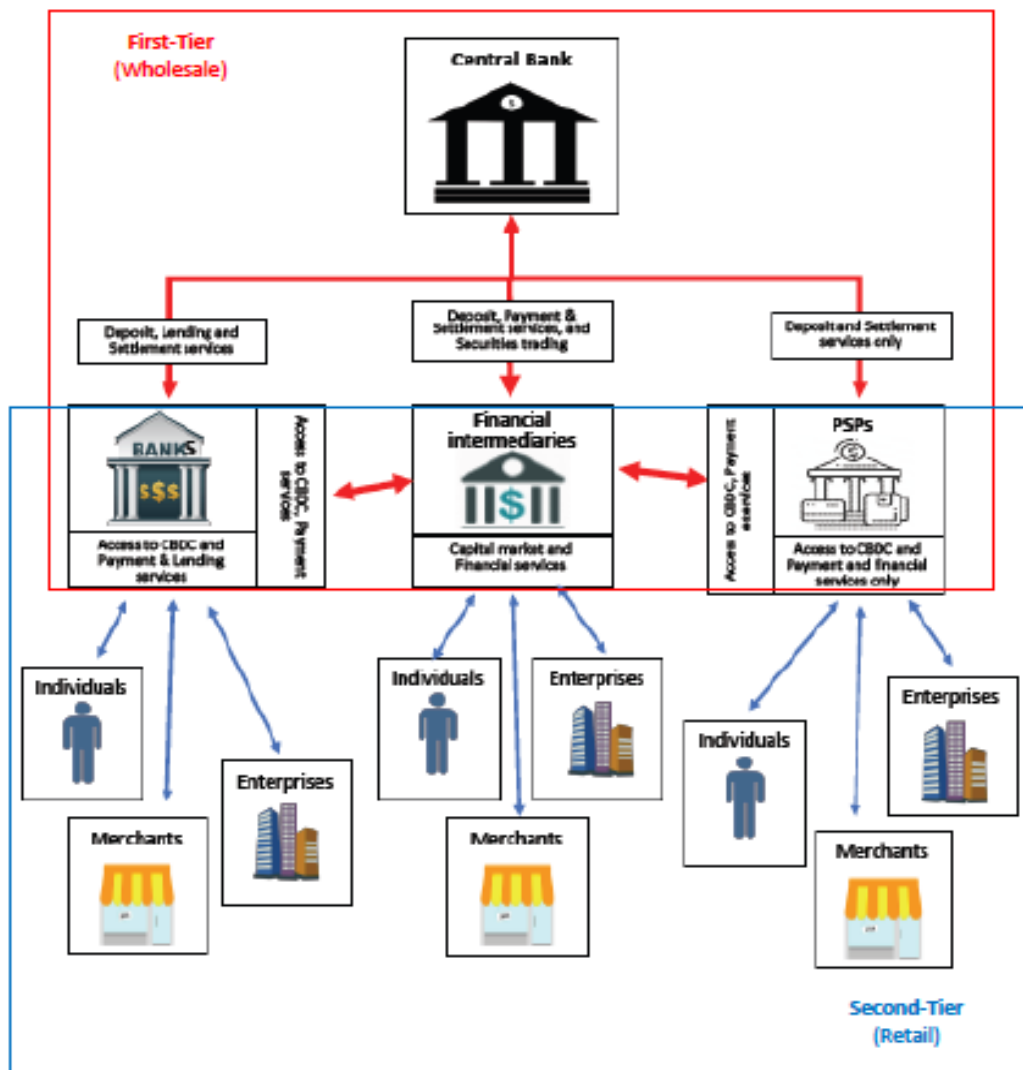
If, as discussed, fractional reserve regimes generate fragile banking, and if full reserve regimes remove fragility but at the cost of suppressing the role of banks as lenders, CBDC could provide safe money but at the cost of potentially disrupting bank lending.

Only allowing banks to on-lend CBDC borrowed from the central bank, as proposed next, would remove fragility, and preserve bank lending at the same time.

IV. CBDC FOR A NEW FINANCIAL ARCHITECTURE

The proposed CBDC next-level model is essentially a two-tier model where, in the first tier, the central bank creates money and distributes it (wholesale) to banks which, in the second tier, on-lend it (retail) to borrowing enterprises and households (Chart 1).

Chart 2. The “CBDC Next-Level Model” Architecture



All resident individuals, nonfinancial enterprises, and nonbank financial intermediaries (as well as select non-resident agents) would have access to CBDC through banks or nonbank PSPs, which would be responsible for mobilizing their CBDC holdings on demand. Unlike banks, nonbank PSPs would not be permitted under legislation to engage in lending operations.

To Start

With appropriate legislation, at an appointed time the central bank would, in a round robin, issue and loan to each bank CBDC sufficient to pay out its depositors (including term deposits), as well as all loans from other banks and bond holders who request their bonds to be paid out (see also below).

Prior to the round robin, nonbank investors (bondholders) could choose to leave their money at-risk with the banks. In this case, the corresponding bank liabilities would not be paid out. Instead, they would count toward the banks' "at-risk" capital. Alternatively, investors could choose to be paid out and have their money switched into CBDC.

Each bank would then pay out each depositor, bank, and bondholder by transferring CBDC received from the central bank to a new deposit account opened with the central bank in the name of the depositor/bank/bondholder. In this way, all deposits, and all loans from another bank, as well as any nonbank loans elected to be paid out, would shift from the books of the bank to the books of the central bank where they would all appear as deposits.

At any time, customers would be free to transfer funds to any bank of their choice or to any nonbank PSP. Overseas banks that had their loan transferred from a bank to the central bank could elect to have the money paid out in a different currency at the current exchange rate. All local banks that had an interbank loan paid out would retain the payout in their own central bank account. This would leave each bank with its own loan book balanced on the liability side by the loan received from the central bank (rather than by deposits and third-party loans).

Deposits would never have to be repaid, other than in cash. They would get transferred from one central bank account to another via messages between banks (as now). Or they could be paid out

in physical cash or transferred as eCash to a device/wallet on demand by the customer (within specified limits to reduce illicit transactions). This would simply change the form of the claim on the central bank (from electronic to paper) but would not alter the money supply or its legal nature. In this case, CBDC could be established and used as legal tender under the law, as physical cash is.

The deposit accounts would sit on a ledger managed by the bank as “fiduciary” (i.e., agent of the central bank). The bank would have no liability to repay the deposits. While these would be off the books of the banks, and on the books of the central banks, the banks would continue to manage the deposits of their customers and the whole payments system in such fiduciary capacity for whatever fees they chose (in competition with other banks). To protect privacy, the central bank would have no direct access to the individual accounts; it would simply have a “real time” running total of deposits held by each bank and nonbank PSP.

Such deposits would be claims of their holders on the central bank and would thus constitute retail CBDC, equivalent to physical cash. Following the changeover, any CBDC holder would have the ability to access their CBDC account and withdraw funds to either get physical cash, or eCash, or to make payments and/or transfers into other accounts at any time, without any risk of loss or delay, instantaneously and with immediate settlement. As will be explained, this would significantly reduce system risk and cost of money.

Existing loans made by banks to nonbank borrowers would remain standing, on the terms that are current at the time of the changeover.

Banks should find it convenient to join the new system, due to the advantages discussed below. Key to the transition will be giving all impacted parties time to make the change without major disruptions. Yet, if reluctance remains, incentives and penalties can be used to get all banks on board (Annex 1).

Loans

Whenever a bank plans to make a loan to a borrower, it would call on the central bank to create

the required volume of CBDC, which would then be deposited into the bank's account with the central bank and recorded as a loan from the central bank to the bank. The central bank would provide CBDC to the bank on the same terms as the prospective loan to the borrower, without any need for oversight by the central bank. The central bank would record both the deposit and loan to the bank in its own ledger, keeping its books in balance.

Importantly, the loan from the central bank to the bank would be repayable at the same time the borrower is expected to repay the bank. This would provide a key element for the stability of the whole system.

No longer would the system record a mismatch between lending and borrowing schedules, and no longer would resources need to be devoted by the bank to funding its loan book. This alone would simplify the business of banking, reducing cost.

The interest applied by the central bank on loan advances would be sufficient to meet its operating costs, plus a margin based on monetary policy considerations, which would act as a policy rate. This is discussed in the section on Monetary Policy.

The bank would then lend the CBDC to the borrower by transferring CBDC out of its central bank account and into the central bank account of the customer (which it would still manage, but now as fiduciary). In effect, the bank would replace the "cash on hand" in its own account with the central bank, with a "loan to a borrower," as the matching asset against the new loan from the central bank, thereby remaining in balance.

The loan interest rate applied by each bank would reflect the risk profile of the borrower, as appraised by the bank, the interest applied by the central bank on loan advances, as well as its own operating costs and profit margin, and the competition in the banking market for loans.

At any time, the borrower would instruct the bank to pay specific third-party accounts as the loan was spent. In each case, the money would go from the borrower's central bank account to the payee's central bank account (managed by the payee's bank), or to an eCash device held by the

payee, or it could be taken in cash.

As a borrower's loan is repaid, the money would be transferred from the borrower's central bank account (managed by the bank) to the bank's central bank account.

To ensure the matching flow of funds, the bank would keep only the interest component of the loan repayment as compensation for its services, while it would pass on the principal component to the central bank, thus repaying its loan to the latter.

The reversal of the entries in the books of the central bank would have the effect of destroying the money initially created when the loan was made.

Until it is destroyed through the repayment process, the money would never leave the central bank's accounts—unless taken in physical cash or eCash. Cash controls would continue to be required to limit the black market.

While from the borrower's perspective the interest is the “cost of money,” from the bank's perspective, it is the revenue to cover the cost of its services, to provide for risks, and to generate profit.

Payment Services

Banks and nonbank PSPs would manage their customers' central bank accounts as fiduciaries, using central bank subsidiary ledgers under their control, including payments between their own customers and the customers of other banks and nonbank PSPs via messaging (as now). All payments would go from one central bank account to another, in real time. Banks and nonbank PSPs would be entitled to charge fees for their services.

For example, as an enterprise received a bank loan and started spending the proceeds, for each payment it would direct its bank to pay a certain amount to another specific person or business account. If this other account were managed by another bank or nonbank PSP (as fiduciary), a message would be sent to the other bank or nonbank PSP that would credit the specific central

bank account with CBDC, and the enterprise's CBDC holdings would be reduced equivalently. That is, immediately after the switch to the new system, CBDC would always go from one central bank account to another, regardless of which bank or nonbank PSP acted as fiduciary for which people or businesses. At no point, in any transaction, could the CBDC be lost or stolen (unless taken as cash or eCash).

The central bank would play no part in any retail operations. It would have no access to individual accounts and would only see the running total of each subsidiary ledger, making overall reconciliation instantaneous.

Each account should continue to be subject to Know Your Customer (KYC) requirements to combat money laundering, tax evasion and terrorist financing, without breaching the privacy of CBDC holders who obey the law.

While all licensed banks and nonbank PSPs would be permitted to act as fiduciaries, only the entities licensed as banks could issue loans of new CBDC.

Inflation Adjustment

In an important change, CBDC holdings would be adjusted by the daily inflation rate²⁰ (tax-free) to keep their real value stable (unless taken as eCash²¹). No other interest would be payable. If

²⁰ In principle, where feasible, no adjustment should be made where a decrease in supply (e.g., due to a drought, supply chain disruption, etc.) caused a spike in prices, as the prices themselves are the mechanism for re-balancing the market. Yet, it might be difficult to apply this principle in practice. A practical way to handle this issue would be for the adjustment to take place automatically, based on an inflation index selected to match the cost base of most people (irrespective of the “true” nature of inflation), and for the central bank then to act on inflation through its various instruments (depending on the nature of inflation and the tools chosen to deal with it), based on the central bank's target envelope. Looking forward, however, one of the upsides of moving to CBDC is that the new and evolving technology supporting it would make it possible at some point to incorporate de-identified 'meta data' along with every transaction, which would extract and aggregate real-time information that would better assist the central bank investigating and understanding the true nature of price dynamics.

²¹ We are using the term “eCash” to refer to CBDC held on a separate device/wallet. The CBDC would be downloaded from the customers central bank account (reducing the account by the amount of the download). The CBDC on the device could then be used to pay for goods and services anonymously, just like paper money. Specific limits would need to be imposed on the amount of cash that could be held on a device and the number of devices a person could have to limit the illicit use of cash. Once CBDC was downloaded to a device, it would no longer attract the inflation adjustment.

anyone wanted more, they would have to invest their money at risk.

It would work as follows.

The total outstanding amount advanced to each bank by the central bank would be increased by the daily rate of inflation²² to keep the real value of the advances stable.

The money collected from the banks in the form of the inflation adjustment would be returned to the community via a similar inflation adjustment on all deposits held with the central bank.

The inflation adjustment would flow through to the bank's borrowers, increasing the amount of the outstanding principal, thus bearing no impact on the bank's costs, profit, or net worth.

Each bank, however, would be entitled to earn interest on the adjusted balance of the loans it makes. In this way, interest *income* would also keep pace with inflation, without any change in the interest *rate*.

Passing the inflation adjustment from borrowers to depositors would avoid any impact on the total amount of money in circulation, while ensuring that depositors retain the real value of their deposits, and borrowers repay the real value of their loans. This is key to attaining economic efficiency.

It would not put banks at a competitive disadvantage with other lenders. With all deposits adjusted by the inflation rate, all lenders would have to recover the real value of their loan as a minimum. Otherwise, the money would be better left on deposit. This alone will greatly improve economic efficiency, eliminating negative interest rates.

With these arrangements in place, funding and inflation would no longer be an issue for banks. Their focus would be on cost control, borrower risk mitigation, and provision for defaults, as well as service provision to maximize profits in competition with other banks and nonbanks.

²² Excluding inflation due to supply shortages, where it can be identified, see previous footnote.

How interest on central bank deposits and bank loans would be managed is discussed below.

Actors, Features, and Impacts

Depositors

All money issued and distributed by the banking system (including the central bank and the banks) would become legal tender (CBDC, cash, and eCash).

As CBDC would only move across central bank accounts, no deposit could ever be at risk due to a bank failure. Nor could depositors lose access to their account (unless in breach of the law). And even in the case of theft from a central bank account, if the depositor has followed the required procedures, any loss could be reinstated.²³

Since CBDC would be held without risk, holding it would be no different than holding cash in a safe, so it would earn no interest, just like cash. Better than cash, however, CBDC need not be invested at their holders' risk to maintain the real value of their deposit. This is important not only for economic efficiency, but also for equity. If a person has added value through work or investment and received money in recognition of that value, the holder of the money ought to be able to take out from society the same amount of value when they come to spend it—no matter how long they wait to spend.

To give effect to this principle, depositors would receive a daily tax-free credit equal to the inflation rate applied to their deposit, to keep the real value of their deposit stable.

Borrowers

Borrowers would be required to repay the real value of their loans, with the outstanding balance

²³ For a loss to be irretrievable, the thief would have to take the money in cash (with limits imposed to reduce the risk of crime) or transfer it overseas (subject to monitoring and control processes prior to the transfer).

adjusted by the daily inflation rate.²⁴ This adjustment would not be tax-deductible, and interest would be payable on the adjusted balance.

Once the adjusted loans are repaid, the borrowers and society will be square. They will have put back in what they have taken out—in *real terms*. This will have a major positive impact on economic efficiency.

Borrowers who are not in default would no longer be at risk of having their loans called in to pay out depositors due to a bank failure, or of having their interest rate raised to cover bank losses on other loans. Why this would be so is discussed in the section below, titled Regulatory Oversight and Bank Failure.

The Central Bank

Unlike a bank's liability to depositors, CBDC would never have to be repaid by the central bank or redeemed in any form of value other than another claim on the central bank (i.e., physical cash or eCash).²⁵ Any withdrawal of cash would simply replace one form of central bank liability with another, which the central bank can similarly issue at will, and any CBDC transfer would simply go from one central bank account to another central bank account. Additionally, the central bank would never run out of CBDC.

As such, it is more accurate to categorize the CBDC on issue as equity of the central bank, as it represents the collective citizen claim on society's resources, like the collective claim that shareholders have on the resources of a company (Bossone et al 2018; Bossone and Costa 2021; Kumhof et al. 2020). This bears crucial implications for the stability of the CBDC next-level model.

Any bank loan that a borrower failed to repay would simply stay on the books of the central bank. The central bank would suffer no real loss as the money would not have disappeared. As

²⁴ Again, where possible, no adjustment should be made for price rises due to supply shocks. See the previous footnote.

²⁵ Unless the central bank was operating under a currency board or was tied to a fixed exchange rate arrangement.

the borrower spent their loan proceeds, the money would always end up in another deposit account with the central bank. The central bank could simply change the entry in its books from “loan to bank A,” to “money in permanent circulation.” Excluding loss of cash, money disappears (or better, it gets destroyed) only as and when a loan is repaid, since the entries in the books of the bank and central bank (that created the money) are both reversed.

To sustain economic activity in difficult times, the central bank could agree to defer repayment of part of its loans, allowing the banks to defer repayment of part of the principal by their borrowers. The interest would be repayable, so the bank had the income to go on trading). This could be done, for example, if there is a big downturn in the property market (perhaps at the same time as higher inflation), so large sections of people are struggling to meet their higher payments and house prices are falling. As a result, the bank may be struggling to meet its obligations to the central bank. Yet, calling in the loans (both the banks and the borrowers) will only make the situation worse.

In exchange for deferring loan repayments, banks should not be permitted to increase the interest rate on struggling borrowers. With the support of the central bank, both banks and their borrowers will weather the storm. However, if a bank has made loans to many borrowers who cannot repay them, and there is little hope of recovery in any upturn, it could be allowed to fail.

In that event, as explained in the section on Regulatory Oversight and Bank Failure, the viable parts of the failed bank would be sold by the administrator in a tender to other banks for their future income stream. The viable parts would include the central bank deposit register managed by the failed bank, all loans that are not in default, as well as the loans with good prospects of recovering any shortfalls.

The in-default borrowers with no prospects of full recovery would be pursued by the bank's administrator.

Any assets held by the failed bank as security in respect of the loans in default would be sold by the administrator. All recoveries, together with the proceeds of sale of the viable business would

go first to the central bank. If the money from the recoveries and sale were insufficient to repay the central bank's loan to the failed bank (after administrator costs), the loss would be put against the bank's at-risk capital (equity and debt).

The central bank would only suffer a shortfall, if the failed bank's capital was insufficient to repay the central bank's outstanding loan in full. Any such shortfall would represent a "paper loss" for the central bank. The money would still be in circulation and on the books of the central bank. The asset in the central bank's books would simply change from "loan to bank A," to "money in permanent circulation."

Once injected into the system, irrespective of its use, wherever it accumulates, and whoever holds and uses it, CBDC will always represent central bank equity, and no losses or defaults by individual banks or borrowers can ever dent it, weaken the central bank's capital position, or hurt depositors.

Individual borrowers and banks would still be required to honor their debt in full, lest they would be bound to exit the market or even be forced into bankruptcy.

No current banking system could possibly replicate this super-stability property.

The new system would also offer the opportunity to provide additional tools to help the central bank minimize inflation and unemployment, thereby mitigating booms and busts. How this can be done is discussed in the section on Monetary Policy Implications.

The central bank would have its operating costs met via a percentage interest rate on the total of its inflation adjusted loans to each bank.

Banks

In fractional reserve regimes, a banking license is literally a license to create money. This would change in the CBDC next-level model, where the purpose of banks is to manage CBDC deposits and payments as fiduciaries of the central bank and to lend newly issued CBDC as principal to

third parties at low risk, with fees and interest charges to cover its operating costs, provisions for defaults, and profits.

Banks would be required to pay fees to the central bank (and other relevant regulators) to cover the authorities' operating costs. The fees would be a percentage of the total amount of CBDC on loan to each bank.

In the CBDC next-level model, banks would no longer extract seigniorage from the economy as they would no longer be permitted to create money out of fractional reserves. The bank's costs would also be lower as they would no longer need to borrow in the open market to fund their own loans. All else equal, this would lower the cost of money to borrowers, while the proposed inflation adjustment would ensure that they repaid the real value of their loan, enhancing economic efficiency.

After adopting the new system, the central bank would become the sole creditor in the books of each bank, other than trade creditors (or bank shareholders and bondholders putting their money at risk as part of the bank's at-risk capital—see *Regulatory Oversight and Bank Failure*).

The main constraints on bank lending would be:

1. The demand for loans, which would be influenced by interest rates, economic conditions, and any levies imposed by the central bank to mitigate inflation (see section on *Monetary Policy Implications*);
2. The capital ratio that would limit a bank's total loan book to a multiple of the bank's at-risk capital (equity and debt);
3. Regulatory restrictions on the type/purpose of loans.

Reserves (and their cost) would no longer affect the resource envelope of banks, as it happens in fractional reserve regimes.

Regulatory Oversight and Bank Failure

Banks would continue to be subject to regulatory oversight. However, regulatory frameworks

could be simplified, since no deposits would be at risk, and the failure of any one bank would not impact other banks (because there would be no cross-investment among banks).

To ensure the banks have “skin in the game,” each bank would only be permitted to lend a set multiple of its at-risk capital (equity and bonds).²⁶ Once a bank reached the limit of its capital ratio, it would have to raise more capital to lend more or increase its capital by retaining earnings.

In keeping the bank responsible for its lending decisions, the bank would not be freed from its obligation to repay the central bank together with any interest due on the predetermined schedule when a borrower defaults.

This means the bank must enforce its default provisions against any borrower unless the central bank agreed to defer repayment of its loan to the bank to support the economy during a downturn (see section Monetary Policy Implications).

Bank Directors and Officers

With all loans funded through the central bank, the directors and officers of each bank would retain primary responsibility under corporate law to determine if, and when, their bank could no longer pay their debts as they fell due, and/or losses on their bank’s loan book were likely to exceed their capital, forcing them to stop trading. Without depositors and other bank lenders on its books, this decision would not impact the banking system.

Bank directors and officers would thus be in the same situation as those of any other business. However, they would have one major advantage. They could seek dispensation from the central bank to go on supporting their bank to get them out of insolvency—if it appeared that the bank could ultimately recover its losses.

Unlike normal creditors, the central bank can afford to take a long-term view of what is in the

²⁶ An optimal multiple would have to be identified, but a factor of 12 would seem prudent.

best interest of the economy overall.

In exchange for such support, the payment of bonuses should be restricted until the bank has recovered viability. This would also provide a unique benefit to bank shareholders and bondholders enjoyed by no other entity.

Unlike the current system, if a decision were eventually made to wind up a failed bank, the only ones impacted would be the shareholders and bondholders, perhaps some trade creditors, as well as the directors and senior staff, and possibly some other employees, who would lose their jobs. A bank failure would have zero impact on depositors and all borrowers whose repayments were up to date, any other bank, or any other financial institution.

The central bank could continue to support the bank while an administrator (appointed by the central bank or any other authority under the law) would sell the loans not in default and the management rights to the central bank deposit register (together with any necessary operating assets and staff) as a going concern to a viable bank. The administrator would pursue the borrowers who were in default. The proceeds of sale and any recoveries from delinquent borrowers would go first to the central bank, then to other creditors, bondholders and finally shareholders, as per the normal bankruptcy provisions.

Bank Shareholders and Bondholders

Monies invested in a bank could only go toward providing its operating assets (including working capital) or held on deposit with the central bank as security. As with all deposits, these “security deposits” would be increased by the daily inflation rate to maintain their real value, tax-free.

A bank’s income would be restricted to the net return on the loans that it makes and any fees it charges for managing deposits and payments.

As the whole system should be far more stable, banks should have no trouble attracting investment (both equity and debt) to grow their at-risk capital to meet market demand for new

loans.

The investment of a bank's shareholders and bondholders would be lost entirely if the total losses due to loan defaults exceeded the total of the bank's at-risk capital (equity plus debt), after the bank had been liquidated—as with any other business.

On the positive side, if the bank remains solvent, it is assured of funding from the central bank, without any need to attract depositors or other lenders. Also, because the central bank (unlike depositors) can afford to carry banks and their borrowers through a downturn, only in the worst cases would the foreclosure of loans (and potentially bankruptcy of the bank) be required.

Payment Service Providers

These may only facilitate customer access to CBDC and offer customers payment services as well as any additional value-added services that could be associated with CBDC account or wallet. PSPs would not be permitted under legislation to enter the lending business.

Nonbank Financial Intermediaries

These would operate under their own regulator and use savings to invest in higher-risk projects and/or second-level financing (on top of bank lending), and to buy existing securities and financial assets. People would have to put their own money at risk for these markets to operate efficiently.

Banks would not be allowed to make loans to nonbank financial intermediaries.

Nonbank financial intermediaries would hold their own central bank accounts, which would be managed by banks or nonbank PSPs. Alternatively, the central bank could grant them direct access to CBDC accounts. They would not be allowed to create money but could extend loans out of their own funds or by intermediating their clients' savings.

The Payments System

In the CBDC next-level model, as in all retail CBDC systems, CBDC would be the economy's

digital cash. Payments made by any entity, either on its own behalf or on behalf of its customers (if the entity is an intermediary), would go from its central bank account (or device/wallet) to the payee's central bank account (or device/wallet). CBDC would be the settlement asset for all (wholesale and retail) transactions. The money would never leave the central bank's ledger unless taken in physical cash or eCash.

Other forms of money, issued by private-sector agents under regulation, would be possible and interoperability would allow agents to convert CBDC into any other currency instrument accepted in the economy, and vice versa. However, where feasible, settlement in all systems should take place in CBDC. CBDC ought to be the only legal tender (along with traditional cash and eCash).²⁷

The Banking and Monetary Systems

With banks getting all their loan funds from the central bank, they would no longer have to attract money from depositors or other lenders. While loans should always be expected to be

²⁷ Scam crypto-currencies would be outlawed outright (as China and other countries have already done). These include currencies that are deflationary by design (which simply advantage the holder of the "money" over the holders of assets, the reverse of inflation - in both cases the antithesis of "sound money"), and which deliver nothing but a key to the code that holds a record of who owns the currency. Bitcoin would fall into this category: if I hold the key to a Bitcoin and you are a 'retail' buyer, as an example, you must pay me \$30,000 fiat (which I can then spend). All you get is a key to the code. You can only realize a profit if someone else is prepared to pay you more than \$30,000. This is the essence of a Ponzi scheme.

Looked at from the viewpoint of a crypto "miner," such currencies are like counterfeit money. The counterfeiter must incur cost, using society's resources, either in the form of energy, plates, paper, and ink in the case of fake notes, or energy and hardware in the case of crypto. The counterfeit money gives the counterfeiter/crypto-miner access to society's resources without contributing anything of value in return. In the case of crypto it is worse, as the deflationary design enables the miner (and any subsequent holder) to accrue a rising benefit for doing nothing but holding the coin! Worse still, simulations run by Phillip Rosedale, founder of Second Life, show that most of this benefit accrues to the original promoters who retain most of the initial coins (Parton 2022). He claims crypto wealth is more concentrated than wealth in the real world... so much for helping the unbanked!

Bitcoin and its ilk are the ultimate counterfeiter's dream. They are run in the open without fear of goal. Large holders can use anonymous accounts to bid up the price without losing control of the tokens, and then sell out, watch the price fall, and buy back in again... rinse and repeat, turning their scam money into real money. While, in theory, the price of the coin could fall to zero (as it has zero backing), the world is a big place, so there will always be another "mark" (unless it is outlawed). Even then, it will be impossible to stop it completely, although it can be greatly constrained if people know that it can never be used in lawful exchanges. Last but by no means least, crypto is also used for illicit trade, to avoid taxes, to commit money laundering, to finance terrorism, for extortion, and as scams. Of course, fiat money is too! However, regulating well-identified entities is much easier than trying to regulate thousands of decentralised networks that cannot be held accountable due to the distributed global nature of crypto-currencies. There are in fact valid uses for blockchain and crypto tokens that act more like securities, where the value is based on some underlying good or service, and they should be regulated as such.

repaid, repayments would not be necessary to meet depositor demands for liquidity, since all deposit claims outstanding would—by construction—be with the central bank.

Most importantly, the CBDC next-level model would eliminate the risk of bank runs and system failure due to bank insolvencies. By adjusting both outstanding loan balances and deposits to reflect inflation, it would also be a fairer and more efficient system overall.

Banks would not need to access wholesale funds from other banks (or other intermediaries), since all loans would be funded using CBDC. However, the money market might still operate, but on a more limited basis. Banks would no longer need to access it, but other private entities may need cash that they cannot get from a bank, due to the risks involved, while those with cash surpluses may look for higher returns by offering them in the money market. Trading in money market shares would be prohibited since it would be equivalent to creating new money (which, under the new system, may only be done by the central bank).

The competitive edge between banks would have nothing to do with their cost of funds (as that would be the same for every bank). It would be based solely on their operating costs, risk profile, provisions for defaults, and profit margin, together with the quality and variety of their service offering. This could put small banks on more equal footing with large banks, strengthening competition.

Banks would still vie for depositors as a future source of borrowers, to provide a source of fees for managing their deposits and payments, and as clients of their financial subsidiaries for investment services provision.

The market would ensure that all borrowers (not just bank borrowers) would have to repay the real value of their loans, plus a margin for putting the money at risk. Otherwise, there would be no incentive for anyone to lend, as opposed to leaving their money on deposit (where it would be adjusted at the daily inflation rate).

Under the CBDC next-level model, as the principal would be adjusted for inflation, interest rates

would only need to reflect the operating costs of the banks, the banks' margin for default, and the banks' profit margin. This would make interest rates far more stable, though inflation would impact the principal.

Overall, permitting banks to continue their characteristic lending activity would maintain the benefits of decentralized money supply process much better than other radical alternatives.²⁸ The benefits include adapting local supply to a highly variegated and rapidly evolving demand, therefore making the whole system more efficient and effective.

Finally, no CDBC could be lost, stolen, or inadvertently destroyed (unless taken in cash or eCash); nor could it be counterfeited.

Other Options to Mitigate System Risk and Enhance Efficiency and Effectiveness

We understand that the following provisions are contentious. They are offered as options that the new system would permit. However, they are not critical to its implementation.

Banks are given a license to lend newly created money. This is a social license, so that it is proper for society to impose restrictions aimed at protecting the common good.

To further mitigate systemic risk, banks should be prohibited from lending to, or investing in, other banks, or associated parties. They should also be prohibited from creating money to invest in any form of securities or property, as principal.

Ideally, to ensure each bank retained the risk of its lending decisions, no bank should be permitted to on-sell any of its loans. This ensures that the banks making decisions to lend bear the loss if any loan cannot be repaid, further improving economic efficiency.

If an individual bank has mispriced risk, this has nothing to do with existing borrowers who are

²⁸ As discussed, these alternatives include centralization of money supply or the use of term-financing instead of demand deposits to fund loans: the former alternative would be highly inefficient, the latter would be largely inadequate to match demand and significantly more costly.

making good on their loans. With funding and inflation out of the equation, once an interest rate is agreed, and borrowers are keeping up their payments, a bank should be prohibited from raising their rate to offset losses deriving from other borrowers who are not repaying their loans. Raising rates on “good” loans to compensate for losses on “bad” loans is like a car manufacturer seeking a top up from buyers of previous models to pay for losses on a current model! If that is seen as a step too far, at the very least, borrowers ought to have the option to refinance with other banks at no cost. That is, the bank seeking to up the rate of interest should absorb any discharge and application costs for a borrower to shift to another bank.²⁹

The biggest unknown would be the extent of widespread defaults driven by changes in economic conditions. Even in this case, the new system would offer several tools that help mitigate the impacts of a downturn on both the banks and borrowers. These tools are discussed in the next section.

V. MONETARY POLICY IMPLICATIONS

Monetary Policy Toolkit

Adjusting central bank deposits and bank loans to reflect inflation would, all else being equal, prevent any alteration to the outstanding stock of money in circulation. While depositors would earn more, borrowers would have to repay more, with the two flows offsetting each other.

Even so, the objective of the monetary policy authorities remains to minimize inflation and unemployment, with the aim being to mitigate booms and busts. This is done conventionally by adjusting the policy rate or through quantitative (easing or tightening) measures.

With the new CBDC system, quantitative measures would no longer be required to “save the banks” in extreme situations (see also below), thus removing a major distortion from the markets, since all money would be issued as CBDC by the central bank to the banks on demand

²⁹ In all cases, the Ombudsman could be called upon to adjudicate if borrowers felt they have been treated unfairly.

to fund loans (and the payments activity deriving from them).³⁰

The demand for bank loans could be managed via the interest rate charged by the central bank on CBDC balances advanced to each bank (for subsequent on-lending), which would act as a policy rate. Yet, this would remain a blunt instrument, since it would impact all bank lending equally, and it would take time for it to work its way through highly diversified asset markets. Aside from forward guidance—the effects of which are transitory, if they exist at all— a general increase in interest rates (via the rate charged by the central bank on its loan advances to banks) would indeed suppress inflation at some point, but likely at the cost of throwing the economy into recession (Storm 2022).

With CBDC, the interest rate strategy could be refined to improve targeting. Instead of applying the interest to the whole outstanding balance of its advance to the bank, the central bank could limit the interest to only new loans, and further limit it to loans for specific purposes, in specific regions and/or specific sectors of the economy.

An alternative approach is to give the central bank a new power to levy an extra charge on select loans by type, sector, and region. This levy would be payable by all borrowers whose loans fell under the designated category, and it would be collected by *any lender* (not just the banks) and remitted by them to the central bank. This mechanism would work much like the value-added tax (VAT), which is collected from customers by vendors and remitted to the tax department. It could be much better targeted than the policy rate, limiting undesired impacts.

For example, if the housing market is overheating in one region of an economy, while the rest of the economy is relatively calm, the objective should be to mitigate excessive house price rises in the specific market, without impacting the rest of the economy. In this case, the central bank could levy an extra charge on all *new* loans made for *existing* homes in the region. There would be no need to apply the same levy to *existing* loans and for *new* loans for *new* homes. As the levy

³⁰ A central bank with large security holdings (for instance, because of past Quantitative Easing (QE) operations, could unwind its current position over time to let the markets down slowly, at a rate that did not adversely impact the market. This would imply that, in the future, equity markets would have to stand on their own feet: no more would they have the central bank put to support them.

was raised, this would dampen demand (and hence prices) for existing homes in the region, while lending for new homes would be untouched, encouraging supply (which would also tend to reduce prices).

All existing loans, and new lending across the rest of the economy would also be unaffected, which is consistent with the overall policy objectives.³¹ This strategy could be adapted to target specific types of loans in specific regions or nation-wide, depending on the market stressors. As an example, a levy could be applied on all consumer credit to dampen consumer demand without negatively impacting business loans that may be necessary to boost supply.

While the central bank should refrain from engaging in Quantitative Easing (QE) operations as a way to support aggregate demand (with the severe distortions that QE causes), the central bank should retain the power to purchase and/or sell securities from/to nonbank financial intermediaries, both as an emergency measure to support markets under extreme stress conditions and as a policy tool to ensure asset price consistency across the full range of markets, from short-term bank loans to financial securities of different risk and maturity profiles.

As another tool, the central bank could agree to defer repayment part of its loans, allowing the banks to defer repayment of part of the principal by its borrowers. The interest would be repayable, so the bank had the income to go on trading. This could be done, for example, if there is a big downturn in the property market (perhaps at the same time as higher inflation) leading to large segments of the population struggling to meet their higher payments as house prices are falling. As a result, the bank may be struggling to meet its obligations to the central bank. Yet, calling in the loans (those belonging to both the banks and the borrowers) would only make the situation worse.

Banks should not be permitted to increase the interest rate on borrowers who are struggling, as

³¹ The levy could be even better targeted. Evidence shows that housing is fundamental to improving health, happiness, and motivation, adding to social cohesion. If there is an acute shortage of low-cost housing while labor and materials are directed to providing high-end homes, it would be in the public's best interest to switch resources to the low end of the market. This could be done by adding a levy based on the value of the contract, dampening demand so that the resources would be freed to deliver houses for those in need.

that would worsen the situation and only increase their profits. Nor should there be any need to do so, as under the proposed regime, interest would be levied on the outstanding inflation adjusted principal, ensuring the bank's real profit margin is retained. Once the emergency has passed and the economy has recovered and wages have caught up to inflation, normal repayments may resume. It would be up to each bank to manage this process. Borrowers should be able to appeal to an Ombudsman if they felt they were being treated unfairly

Consider a situation where there has been a major fall in property prices taking years to recover, so in some cases, the home no longer covers the loan. While the borrower maintains their repayments, they are the only ones out of pocket, but they still have a home. The alternative is what happened in the Global Financial Crisis—thousands made homeless, and the homes left to rot, or picked up by predatory investors at bargain prices, and later leased back to the people who once were the owners. By taking a longer-term view, people can stay in their homes, neighborhoods can be sustained and there will be less distress in the community. As house prices recover, the owner's equity will rebuild over the decades during which the loan is repaid. At no point would the banks or central bank be out of pocket while the interest is paid.

Borrowers and the banks would still have to repay their inflation-adjusted loans in full, with interest, but they would be given more time. The central bank could afford to do this at zero cost (unlike depositors and lenders under the current system).

The aim should be to limit harm to the population.

With the support of the central bank, both the banks and their borrowers will weather the storm.

However, if one bank has been making loans to people who simply cannot afford them, and there is little hope of recovery, it can be allowed to fail. As we've said, the deposit register and good borrowers and perhaps those with a good prospect of recovering any shortfalls are sold to a viable bank for the future income stream. The remainder are pursued by the bank's administrator, with the security sold up with all recoveries and proceeds of sale of the viable business going first to the central bank, with all losses put against the bank's at-risk capital (equity and debt).

Finally, to support aggregate demand more effectively, besides its intervention through the bank lending channel, under the CBDC next-level model discussed in this study, the central bank should consider using CBDC for carrying out “helicopter money” operations as a tool to affect spending decisions more directly than through the interest rate and its related portfolio effects (Buetzer 2022).³²

Another radical idea is to use tax as a monetary tool, and not simply as a fiscal tool. In this case, the central bank could be given the power to levy a flat-percent tax on all spending.³³ The money raised by the tax would be written back into the air from which it came. Using CBDC, the tax would go from the purchaser’s central bank account direct to the central bank’s own account, taking the money out of circulation. Its sole purpose would be to dampen demand. To counter its regressive effect, the central bank could use some of the proceeds of the tax to pay a flat amount to all citizens via their CBDC account. This payment would make the net tax progressive. The tax, plus the flat payment, would have the effect of dampening demand, while shifting more activity to meeting basic needs and less on other spending.

Advantages for the Conduct of Monetary Policy

The CBDC next-level model would bear significant advantages for the effectiveness of monetary policy. First, with competitive banking, changing the interest rate(s) on central bank loan advances to banks would shorten the transmission channel of monetary policy impulses and thus exert a direct and immediate impact on the cost of money to the real economy.

This would be especially evident in the case of an effective lower bound on nominal interest rates because the application of negative rates on central bank loan advances to banks would

³² We consider the judicious use of “helicopter money” in a forthcoming paper that examines how it can be used to not only eliminate systemic poverty, but as a tool to mitigate wage-push inflation, and to keep the labour market in dynamic balance as automation, virtualization, and demographics radically change it.

³³ To avoid double taxation, the tax paid on all inputs would be rebated out of the tax paid by the customers of the business providing the good or service (like VAT/GST). As well, all tax paid on the purchase of assets would be rebated upon resale. The rebate would be the lesser of the tax paid on the original purchase and the tax rate times the resale proceeds. In this way, tax would be paid only on consumption, and not on production. Reducing demand, but not supply.

swiftly be passed on by the banks to their borrowers and act as incentives on the latter to borrow and spend more.

Second, negative interest rates on bank loans need not impact interest rates on CBDC holdings; in fact, the former could be *decoupled* from the latter, thus giving more latitude to monetary policy. This is because, unlike in conventional banking systems (where, as experience shows, the transmission of negative rates from central bank reserves to bank deposits and, hence, to bank loans is neither automatic nor assured under banks' portfolio decisions, often weakening bank profits), in the CBDC next-level model negative interest rates would apply directly to the loans and would not affect bank profits.

Third, if needed, the central bank could exercise outright monetary control on demand by rationing the supply of loan advances to banks. This would act as a quantitative monetary policy tool and could be applied across the board (that is, on all new loans) or selectively (that is, only on certain types of loans or categories of borrowers, or by region).

Fourth, the ability to levy an additional charge on any loan by type, region and sector could provide a greatly enhanced capacity to target specific problems without causing adverse reactions in the wider economy.

Furthermore, given the central bank's power, under the CBDC next-level model, to intervene directly and with sufficient precision on the loan market either by setting the policy rate on loan advances to banks or (in extreme cases) by rationing loan advances, the central bank can use its interventions in the securities market to influence the price of assets with different maturities and risk profiles.

As well, the central bank could agree to defer payment on its loans to each bank on condition the same privilege was extended to the banks' borrowers, to prevent the dislocation usually caused by a temporary downturn.

Finally, CBDC could facilitate the use of "helicopter money" operations by the central bank as a

tool to support aggregate demand.³⁴ Combined with a flat % tax on spending, these two measures would have an immediate impact, reducing overall demand without pushing people into poverty.

VI. CONCLUDING REMARKS

The ambition of this study is to propose a system that, while preserving the advantages of decentralized lending through commercial banks, removes the inherent fragility of banking by suppressing their money creation power, without suppressing their basic business model.

Building on the recent (rapidly-evolving) literature on central bank digital currencies (CBDCs), this study has proposed a retail CBDC-based system (which we have called “CBDC next-level model”) whereby i) the central bank creates money by lending to banks and ii) banks on-lend the proceeds to the economy, thus inducing a degree of financial stability that would be unparalleled by conventional banking systems (which we have called “super-stability”).

The study has also proposed a method to transition the banking system from its current fractional reserves regime to the CBDC next-level model.

The proposed CBDC next-level model is essentially a two-tier model where, in the first tier, the central bank creates money and distributes it (wholesale) to banks (on-demand) which, in the second tier, on-lend it (retail) to borrowing enterprises and households. The loan from the central bank would be repayable at the same time as the loan made by the bank. The bank would act as principal in this case. The outstanding balance of the central bank loan and the bank’s loan to the ultimate borrower would both be adjusted by the inflation rate, with the principal being repayable at the same rate and time. The central bank would charge a percentage to cover its

³⁴ We recognize that all these new tools would need to be used with a great deal of care, and that, in general, the market should be allowed to function without interference. Yet, there will be times where action is required. In such cases, we urge a gradual approach that allows time to understand the impact of any initiative. Over time, it would be hoped that data on their use could improve operation of the new tools. While modeling may provide some guidance, the expectation is that the complexities of the real world militate against accurate forecasting. Use of the new tools should mirror the way interest rates are changed: by “sucking and seeing” in small steps.

operating costs.

All resident individuals, corporates enterprises, and nonfinancial intermediaries (as well as select non-resident agents) would have access to CBDC through banks or nonbank PSPs. In this case, the banks (and nonbank PSPs) would act as fiduciaries, managing the deposits on behalf of the central bank and their customers. Unlike banks, nonbank PSPs would not be permitted under legislation to engage in lending operations. CBDC would be adjusted tax-free to keep their real value stable, greatly improving economic efficiency.

Significant risk would be removed from the banking system by taking deposits off the balance sheet of banks and into the balance sheet of the central bank, without adversely impacting their basic business model. This would eliminate the threat of bank runs and system collapse, as well as mitigate the risk of “moral hazard.”

Essentially, the CBDC next-level model turns the liabilities of the banks (demand and term deposits and bond obligations) into equity of the central bank (money on issue). This equity represents the community’s collective claim on its resources (natural, built, human, technological, knowledge, organizational, legal, and cultural). The key is to ensure the amount of money on issue remains in balance with these resources as they constantly change (to avoid deflation or excessive inflation).

The central bank would no longer need to engage in QE, eliminating the distortion caused by the central bank put. Instead, it could use direct interest charges made on its advances to the banks and/or levies on all loans for specific purposes related to specific sectors or regions. Both these tools would have a much more immediate (and potentially targeted) impact on activity than simply moving the policy rate, which is the central bank’s primary tool at present.

System risk would be further reduced due to the lack of any need for interbank lending, or indeed any lending from banks to nonbank financial institutions.

All nonbank financial institutions would have to raise money from people and organizations

putting their own money at risk.

As a result of these measures, the regulatory regime could be lightened, with the focus being on a simple multiple of the bank's at-risk capital (equity and debt).

Importantly, central bank's capital would never be at risk and the central bank could afford to weather any downturn by simply not calling in its loans if there are temporary breaches of the banks' capital ratios. This would give both the banks and their borrowers time to recover with the upturn in the economy, without calling in loans that would only worsen the downturn.

Of course, if a bank were too reckless in its lending and found itself beyond recovery, the central bank could let it fail, but this would have no impact on anyone but the bank's employees, officers, directors and shareholders, and the defaulting borrowers. Everyone else would be untouched, including all borrowers who were maintaining their payments. None would have their loans called in. These would simply be transferred to a viable bank on their existing terms. It would be up to the bank's directors to determine at what point the bank could no longer pay its debts (as with any bankrupt business).

Importantly, the change can be undertaken bank-by-bank overnight. As each bank moves to the new model, the system becomes more stable. Depositors would shift quickly to those banks offering 100% security, plus tax-free adjustment equal to the inflation rate.

At the same time, to encourage the shift, the government could, after a certain time, remove the deposit guarantee. It may also be in our interest to offer a "carrot" to limit opposition (see Annex 1).

Overall, the system would become much more stable, resilient, and efficient, and much simpler. Competition between banks and nonbank PSPs would foster the development of new payment and financial services built on top of the banking network.

ANNEX 1: “INDUCEMENTS” FOR BANKS TO JOIN THE NEW SYSTEM

People are naturally resistant to change for fear of unintended consequences. For this reason alone, banks may be reluctant to switch to the new system, although it would provide them with significant benefits, including being able to offer low-cost loans, being relieved from liquidity pressures, being given more time to recover losses, and being subject to much lighter regulation, since no depositors would be at risk and no bank failure could impact other banks.

Carrot

If reluctance remains, one way to get all banks on board would be to pay them a “carrot.”³⁵ The cost of the carrot would be a one-time *investment*, amortized over the life of the change (effectively indefinite!), and would represent a permanent injection of new money that the central bank could legitimately recognize as “equity” in the new system. The carrot could take one of two forms:

1. It could be set in a tender process where the aim would be to get most banks on board. Each bank would submit a bid to receive an extra payment over ten years. The central bank would then create a cut-off (say 80% of the sector by loan volume). Those banks asking more than the cut-off would then have to switch over without a carrot. This would not need to be compulsory. The central bank would simply withdraw its guarantee on the deposit liabilities of those banks that failed to meet the cut-off. No bank could afford to stay out of the new system, since they would then find themselves uncompetitive on deposits and would soon suffer a run. The alternative would be for them to sell their business to a successful bank.
2. Once the legislation is passed, no new banks would be permitted to register under the new scheme for (say) five years. The moratorium in granting new licenses would be an incentive for existing banks to switch over. After that, any company that meets the regulatory guidelines could be given a bank license.

³⁵ The idea of a “carrot” was suggested to us by Geoff Crocker based on the UK’s experience when introducing the National Health Scheme (NHS). In that case, substantial inducements were offered to key participants to agree to the establishment of the NHS.

Stick

As the change can be made overnight bank-by-bank, it would be possible to simply use “market forces” to effect the change. The government could advise that, on a certain date in the future (say five years), all bank guarantees and deposit insurance would be void. Banks that made the switch early would soon attract most depositors who would be eager for the 100% safety of CBDC and the payment of a tax-free inflation adjustment. To avoid system instability, the industry would be encouraged to work together so all banks make the change at the same time.

ANNEX 2: COMPARATIVE ANALYSIS

This annex compares the key elements of current banking systems with the proposed CBDC next-level model.

Chart A1. Banking Regimes: A Synoptic Comparison

Features	Conventional	CBDC Next Level
Role of Central Bank	<ul style="list-style-type: none"> • Issuer of reserves • Governing the banking system to ensure it remains viable • Governing the monetary system to keep inflation and unemployment low • Not involved in retail customers 	<ul style="list-style-type: none"> • Issuer of CBDC • Governing the banking system to ensure it remains viable • Governing the monetary system to keep inflation and unemployment low • Not involved in retail customers
Money on Issue	<ul style="list-style-type: none"> • Liability of central bank 	<ul style="list-style-type: none"> • Equity of central bank
Reserves regime	<ul style="list-style-type: none"> • Fractional coverage • Interest charged on reserves used as policy rate 	<ul style="list-style-type: none"> • Full coverage • Interest charged to cover the central bank's operating costs, plus additional margin as required (see table entry "Monetary Policy Implications")
Role of Banks	<ul style="list-style-type: none"> • Deposit takers, loan makers, money creators, and payment service providers • Sourcers and managers of funds • Managers of associated risks • Providers of ancillary financial and investment services 	<ul style="list-style-type: none"> • Distributors of CBDC via lending • Managers of associated risks, • Fiduciary for depositors • Payment service providers
Organization Structure	<ul style="list-style-type: none"> • International branch offices permitted 	<ul style="list-style-type: none"> • Every bank must set up as a separate company (which can be owned by another entity, which may be offshore), with its own local board and capital funding to ensure compliance
Funding	<ul style="list-style-type: none"> • Borrowings from retail and 	<ul style="list-style-type: none"> • CBDC from the central bank,

Features	Conventional	CBDC Next Level
	<ul style="list-style-type: none"> wholesale markets, as well as trading in Money Market Shares Mismatch between deposit and loan maturities exposing the bank to risk 	<ul style="list-style-type: none"> with repayments timed to coincide with repayments by borrowers, removing liquidity risk - eliminating the need to manage funding
Wind up of Banks	<ul style="list-style-type: none"> Extremely complicated and disorderly Sometimes taking decades to resolve. All bank borrowers and depositors severely impacted 	<ul style="list-style-type: none"> Very simple and orderly Viable loans and the deposit register sold to a viable bank Proceeds of sale and any recoveries from delinquent borrowers going first to the central bank, and then according to bankruptcy law No impact on depositors or borrowers that are not in default
Seigniorage	<ul style="list-style-type: none"> Banks extract seigniorage derived from their power to create money 	<ul style="list-style-type: none"> With all banks having equal access to CBDC, competition would be enhanced, reducing (if not eliminating) extraction of seigniorage
Inflation Adjustment	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> All outstanding CBDC (other than eCash) balances adjusted daily
Interest on Loans to the Bank	<ul style="list-style-type: none"> Set in the market 	<ul style="list-style-type: none"> Set to cover the central bank's costs, unless a higher rate is set by the central bank to damp demand
Interest Rates on Loans from the Bank	<ul style="list-style-type: none"> Set in the market Highly variable rates 	<ul style="list-style-type: none"> Set in competition with other banks, based on the bank's operating cost, risk profile and profit margin. Paid on the inflation adjusted balance to maintain the real value of the interest without changing the rate. Highly stable rates.
Share and Bond Subscriptions, and Retained Earnings	<ul style="list-style-type: none"> No specific restrictions on use 	<ul style="list-style-type: none"> Can only be used to finance bank operations, or held in the banks' inflation adjusted CBDC accounts as collateral, underpinning the banks'

Features	Conventional	CBDC Next Level
		capital ratio
Know Your Customer	<ul style="list-style-type: none"> Required 	<ul style="list-style-type: none"> Required
Regulatory Lending Constraints	<ul style="list-style-type: none"> Closely regulated based on capital, liquidity, and leverage ratios x class of asset 	<ul style="list-style-type: none"> Lightly regulated based on single “capital” (equity and “at-risk” debt) ratio
Restrictions on Bank Operations	<ul style="list-style-type: none"> Wide latitude to extend and manage loans, including to associated parties and to other banks and financial intermediaries, as well as for packaging and on-sale of loans into derivative securities 	<ul style="list-style-type: none"> Banks focus on low-risk loans Loans to associates, other banks and financial intermediaries are prohibited and Banks are prohibited from using central bank loan advances to spend on their own account and from on-selling loans (they must carry the risk of their own lending)
Types of Public Money	<ul style="list-style-type: none"> Cash (coins and notes): legal tender Demand Deposits (claims on bank: not legal tender) 	<ul style="list-style-type: none"> Cash (coins and notes: legal tender) CBDC (claim on central bank: legal tender)
Account Privacy	<ul style="list-style-type: none"> Private, subject to due process 	<ul style="list-style-type: none"> Private, subject to due process
Payments	<ul style="list-style-type: none"> Made by messaging between banks to effect changes to accounts and with the central bank to effect changes to reserves Payments often delayed due to intermediate steps, though less so with new fast/instant payments systems 	<ul style="list-style-type: none"> Made by messaging between banks to effect changes to accounts and with the central bank to effect changes to total CBDC balance Payments are “instant” Given deposits are adjusted by inflation, it would be open to banks to charge the real costs of managing deposits, and of making payments
Account Rectification	<ul style="list-style-type: none"> May be frozen and/or reversed, and/or restored subject to due process 	<ul style="list-style-type: none"> May be frozen and/or reversed, and/or restored, subject to due process
Risk for Central Bank	<ul style="list-style-type: none"> In worst cases (as over the last decade or more) central bank needs to increase its 	<ul style="list-style-type: none"> As all CBDC would be on the central bank’s balance sheet as equity, no bank

Features	Conventional	CBDC Next Level
	balance sheet massively to support the system	failure could impact central bank capital. Any unrepaid loans remain as “money on issue”
Risks for Banks	<ul style="list-style-type: none"> • Liquidity (<i>Including risk of run</i>) • Credit 	<ul style="list-style-type: none"> • Credit
Risks for Shareholders and Bondholders	<ul style="list-style-type: none"> • At risk in the event of insolvency or a run • Banks can increase interest rates on existing loans to recover losses • Shareholders and even bondholders could take a “haircut” even if rescued by the government 	<ul style="list-style-type: none"> • Risk of run eliminated • No ability to increase interest rates on existing loans to recover losses. • However, central bank able to take long term view in the interests of the wider economy reducing insolvency risk
Risk for Directors and Officers	<ul style="list-style-type: none"> • Risks of insolvency mitigated by government guarantees and central bank liquidity support, which is seen as necessary to avoid system collapse, especially for bank’s regarded as “too big to fail” • This induces banks to take on higher risk to keep pace with competitors knowing the government will pick up the tab 	<ul style="list-style-type: none"> • Directors in same position as all other enterprise directors: it is their call when to stop trading. As this would have zero impact on depositors or other banks, there would be no pressure on the central bank to come to the rescue. This reduces the incentive for banks to take on undue risk • However, the bank could seek dispensation from the central bank to defer its loan repayments in line with any deferral granted to its borrowers where it was likely the borrowers and banks could recover their position in due course • Unlike other creditors, the central bank can afford to take a longer-term view and support a bank if it was likely the bank could recover.
Risk for Borrowers	<ul style="list-style-type: none"> • Interest Rates highly variable and liable to be increased and/or principal called in to 	<ul style="list-style-type: none"> • Stable interest rates (though principal subject to inflation adjustment). Rates cannot be

Features	Conventional	CBDC Next Level
	cover losses on non-performing loans	<p>increased on existing loans (unless part of a general increase due to the bank's costs exceeding inflation and approved by the regulator, and the borrower can opt out)</p> <ul style="list-style-type: none"> • Nor can the principal be called-in early to cover losses on non-performing loans
Risk for Depositors	<ul style="list-style-type: none"> • Liquidity • (<i>Except for share of insured deposits</i>) • Credit • Inflation 	<ul style="list-style-type: none"> • None
Risk for System	<ul style="list-style-type: none"> • Inherently fragile: • Systemic risk 	<ul style="list-style-type: none"> • Inherently stable: No systemic risk ("Super-stability")
Systemic Risk Mitigation	<ul style="list-style-type: none"> • Government guarantees of retail deposits (to specified limits) plus QE to provide liquidity 	<ul style="list-style-type: none"> • Not required • Removal of deposit guarantee
Monetary Policy Toolkit	<ul style="list-style-type: none"> • Policy rate and QE/QT • "Helicopter money" is possible 	<p><u>To damp demand:</u></p> <ul style="list-style-type: none"> • Interest could be levied on central bank advances to banks. This would be passed through to borrowers (to discourage borrowings). • Interest could be applied to the whole outstanding central bank balances, or only on new loans (potentially targeted by type, sector, and region). • Or, (targeted) levies could instead be applied to all commercial loans (not just bank loans) • Or, there is the potential for direct control over, and rationing of, loan advances to banks in extreme circumstances. <p><u>To stimulate the economy:</u></p>

Features	Conventional	CBDC Next Level
		<ul style="list-style-type: none"> • While there would be potential for negative rates on loans (to encourage borrowings), decoupled from the inflation adjustment on deposits, we don't recommend this as it distorts resource allocation. We prefer the use of helicopter money as it provides equal benefit to all citizens. • Also, it would be possible for the central bank to agree to delay principal repayments on condition the same forbearance was extended to the banks' borrowers if a downturn threatens stability of the system, where foreclosure would only make the problem worse • QE possible • Helicopter money is possible
Competition between Banks	<ul style="list-style-type: none"> • Larger Banks have greater pricing power through less need for reserves 	<ul style="list-style-type: none"> • Increased competition as all banks have access to CBDC on the same terms • Competitive advantage is based solely on the bank's operating costs, risk profile and provisions for defaults, and profit margin, together with the quality and variety of service offering
Competition with Crypto-currencies	<ul style="list-style-type: none"> • While the landscape is still evolving, the potential for crypto-currencies to disrupt the existing system is considerable 	<ul style="list-style-type: none"> • Bank managed CBDC offers virtually all the advantages of a stable crypto-currency without the drawbacks of having multiple currencies that require policing to protect against fraud or use in illicit dealings
Money Market and Interbank Lending	<ul style="list-style-type: none"> • Essential to operation of system 	<ul style="list-style-type: none"> • Not required. Trading in money market shares would

Features	Conventional	CBDC Next Level
		be prohibited
Economic Efficiency	<ul style="list-style-type: none"> Negative real interest rates, inflation impact on savings and borrowings, & QE all distort markets and detract from economic efficiency and fairness Decentralized allocation of newly created money ensures economic efficiency 	<ul style="list-style-type: none"> Both deposits and borrowings reflect real value (with inflation adjusted principals flowing across all forms of lending, not just bank lending) Decentralized allocation of newly created money ensures economic efficiency and fairness

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