

The Macroeconomic Implications of CBDC: A Review of the Literature

Executive summary

This paper reviews the potential implications of the introduction of a central bank digital currency (CBDC), according to the academic literature, concentrating on macroeconomic topics, as opposed to the payments system, bank supervision and regulation and technology. The list of purported benefits that a CBDC could render include a reduction of some of the financial frictions in deposit or loan markets; enhanced efficiency of payments; improved financial inclusion of the unbanked; elicitation of private-sector technological innovations in banking and payments; and improved transmission of monetary policy. But CBDCs also carry risks. An oft-cited concern is the possibility of bank disintermediation and the associated ease with which a CBDC could facilitate rapid changes in financial holdings that could affect the availability of bank credit or endanger financial stability. Overall, the particular design features of a CBDC are critical for understanding the likely effects of issuance and at the top of the list of important design features is remuneration.

The paper is divided into four sections: implications for the banking sector; financial stability; implementation of monetary policy; and the transmission of monetary policy. There are also two appendices, one compares a CBDC to the Federal Reserve's overnight reverse repurchase agreement (ON RRP) facility, while the other discusses the international experience with CBDCs.

Regarding the banking sector, the paper notes four factors of importance: the remuneration of the CBDC; the competitive structure of the banking sector; access to alternative sources of funding to retail deposits; and the central bank's policy in response to shifts in holdings between CBDC and reserves and currency on its balance sheet. All else equal, the more competitive the banking sector, the more likely that the introduction of a CBDC that pays interest in the competitive range will induce *disintermediation* via competition for funds that currently flow into retail bank deposits. However, in what is arguably the more plausible case of an imperfectly competitive market for deposits (and loans), the introduction of a CBDC could enhance competition and allocative efficiency, which could even induce an expansion of bank deposits owing to higher deposit rates. The fear of adverse macroeconomic effects from disintermediation is often predicated on the assumptions that bank loans are the sole source of credit for at least some borrowers and that retail deposits are the sole source of funding for at least a class of banks. Both of these assumptions are questionable and in any event ongoing technological innovations are likely to change those conditions. The literature notes that nonbank financial institutions are an alternative and growing source of credit for households and some businesses and that *wholesale funding* does serve as an alternative source of funding for banks. It is also the case that if a large quantity of funds were to end up on a central bank's balance sheet as CBDC instead of reserves, the question of what the central bank

would do in response becomes germane. Depending on the central bank’s policy response, those CBDC could be “recycled” through the financial system either through the purchase of securities or, where the law allows, through direct lending to the economy. The central bank’s purchase of assets to back its CBDC liability could expand the supply of credit to households and businesses more than would otherwise be the case.

As a part of its discussion of the banking sector, the paper includes a brief discussion of what a CBDC could do to encourage financial inclusion of the unbanked in a country like the United States. The discussion draws on the experience with digital currencies elsewhere in the world, especially emerging economies. (Appendix B expands on the international experience with CBDC, including a discussion of its effects on financial inclusion.) In the end, the paper notes that while a CBDC has the prospect of improving financial inclusion, how much improvement to expect is unclear, partly because of the apparent lack of trust of institutions, broadly defined, among the unbanked.

Wholesale funding may represent a good substitute for retail deposits during “normal times,” but the *run risk* associated with uninsured wholesale funding raises financial stability concerns. The paper distinguishes between what a CBDC would mean for financial stability in “normal times,” meaning its effects on the structure of banking in steady state, and a CBDC’s implications for stability in times of financial stress. The effect of a CBDC in normal times mostly captures induced changes in the business model of banks and other nonbank financial institutions that operate in short-term funding markets. On the one hand, to the extent that a CBDC induces disintermediation of the banking sector such that banks shift funding from retail deposits to (uninsured) wholesale funding markets, financial stability would be undermined, absent a technological or regulatory response. On the other hand, a remunerated CBDC that is accessible to a wide set of counterparties has the potential of putting upward pressure on the gamut of short-term funding rates, mitigating financial intermediaries market power in the market for deposits and other short-term funding sources, and thus reducing intermediaries’ reliance on short-term funding. The paper also notes that, depending on design features and other factors, the advent of a CBDC could either support the development of a robust stablecoin sector by enhancing the efficiency and interoperability of the payments system, or it could supplant stablecoins altogether.

With regard to financial stability in times of financial stress, the paper notes an irony in the putative success of a CBDC. Payment systems and the currencies behind them seek to harness *network externalities*—the fact that the value of a payment technology rises with the number of parties who use the same technology—such that wide take-up of a CBDC implies economic rents. Increased take-up of a CBDC comes about by making it safe, flexible, rapid and low cost. But those same features facilitate run risk because they make a CBDC a near-perfect substitute for bank deposits: the introduction of widely accessible, fully safe asset, offered at a fixed administered rate, could incentivize agents to run from the financial sector in times of market stress. Thus, it should not be surprising that many of the proposed

solutions involve either reducing the substitutability of these assets for some or all financial agents or limiting the range over which substitution can occur. The paper argues that restrictions such as ceilings on the quantity of CBDC that can be held in an account, or on the amount users can transact, or on remuneration, could significantly ameliorate run risks, albeit at the expense of some reduction in take-up.¹

Section 4 of the paper introduces a pedagogical digression, of sorts, in the form of an examination of the implications for the balance sheet positions of households, banks, the central bank and the government of the different means by which a hypothetical household might purchase CBDC, depending on how other parties respond. The outcome depends on a variety of factors but the importance of central bank balance sheet policy is stressed. All else being equal, the introduction of a CBDC seems likely to be a factor nudging a central bank toward a floor system with ample reserves, as opposed to a corridor system. The central bank might offset, partially or fully, any decline in reserves held by the banking sector associated with the exchange of deposits for CBDC. Doing so would expand the size of the central bank's balance sheet and increase its net interest income, depending on the types of assets it would purchase and their pricing, as well as the remuneration rate for CBDC. Ultimately, the paper concludes that the introduction of a CBDC need not fundamentally change the way a central bank conducts monetary policy, especially if the central bank operates a floor system with ample reserves.

The paper observes that the likely effects of the introduction of a CBDC for the transmission of monetary policy, defined as the effects of a change in the policy interest rate on market rates over time and ultimately on expenditures and inflation, is an understudied topic in the literature. An unremunerated CBDC would be akin to electronic cash, of which there are already several in many or most western economies. It follows that the effects of the introduction of such a CBDC would be determined by the convenience of the CBDC, relative to its competitors, which would presumably be limited. For a remunerated CBDC, however, the induced changes in the competitive structure of banking, where applicable, seem likely to produce stronger and faster pass-through of changes in policy rates into deposit rates, because depositors would have a flexible, low-cost alternative to bank deposits. How much of this increased responsiveness would carry forward into lending rates is less clear.² The evidence suggests that the bank lending channel of monetary policy transmission would be strengthened, but countervailing factors could also be in play that might damp and in some instances overturn this conclusion. The most obvious of these factors is if any disintermediation of the banking sector did not induce an adequate response either from the central bank or from the financial sector to free up, or restore, alternative sources of lending.

¹ Restrictions on remuneration, referred to as tiered remuneration in the paper, mean paying a rate of interest on a CBDC that at some level declines with the size of the holding. Doing so would make less attractive the rapid shifting of large sums into a CBDC account based on what might otherwise be small and possibly transient deviations in expected returns.

² For broadly similar reasons, there are prospects for the introduction of CBDCs to enhance the international arbitrage of interest rates which could amplify and/or hasten the international transmission of shocks.

Much of the literature on CBDC and the transmission of monetary policy is built on stylized general equilibrium models and in many cases the paradigm from which authors approach the question is a driver of results. For example, some authors adopt a New Keynesian framework that leads them to specifying policy rules for the setting of the CBDC rate. Others work with models that are cousins of real business cycle models, leading to neo-classical conclusions that essentially treat CBDC policy as a means to offset a wedge in the financial system. In some instances, the assumed policy instruments are sufficiently numerous—and powerful—that a CBDC is redundant. Finally, some models emphasize the venerable proposition of Milton Friedman that if liquidity provision for the financial system can be provided at minimal marginal cost, the central bank should flood the economy with liquidity, of which could be provided via CBDC, which would offset at least some of those wedges. That, in turn, would result in a reduction of the convenience yield associated with safe, liquid short-term assets, which in turn would raise the equilibrium real interest rate in the economy, tempering, at the margin, the effective lower bound (ELB) problem on nominal interest rates. More broadly, the introduction of a remunerated CBDC could render feasible negative interest rates, obviating the ELB. In contrast, an unremunerated, elastically-supplied CBDC could exacerbate the problem by raising the rate at which the ELB binds.

Finally, Appendix A of the paper summarizes the similarities and differences between a hypothetical CBDC and the Federal Reserve’s ON RRP facility. On the one hand, the ON RRP facility offers a highly liquid, risk-free investment to institutions that are ineligible to earn interest on reserve balances (IORB), which establishes a floor on money market rates in an environment of ample reserves. A remunerated CBDC could play the same role by allowing a wider counterparty base direct access to the Fed balance sheet. From this perspective, concerns over whether CBDC would disintermediate the banking sector and its potential to be a safe haven in times of market stress are reminiscent of the concerns surrounding the implementation of the ON RRP. On the other hand, the ON RRP facility was not intended for counterparties to make payments, unlike a hypothetical CBDC. In addition, depending on the design features and the regulatory framework, CBDC intermediaries might be limited in their ability to arbitrage rate spreads as effectively as do ON RRP counterparties do, making it harder to establish a firm floor on market rates.