# Impact of central bank digital currency (CBDC) activity on bank loan loss provisions

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## Abstract

This article explores the potential effect of central bank digital currency activity on bank loan loss provisions. We show that the effect of CBDC activity on bank loan loss provisions depends on the nature of CBDC activity and whether CBDC activity is regulated or non-regulated. As more people use CBDCs, it could lead to shortfall in bank deposits and increase funding and liquidity risk and generate a pass-through to credit risk which would require banks to increase loan loss provisions in anticipation of loan loss arising from CBDC activity. CBDC regulation may dampen this effect.

**Keywords**: digital innovation, loan loss provision, central bank digital currency, bank.

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## 1. Introduction

CBDC is a new digital innovation in central banking. CBDC is the digital equivalent of cash or paper money. A CBDC is issued by a central bank and may be distributed to users in partnership with banks or without involving banks (Bofinger and Haas, 2020). Customers can choose to convert their existing bank deposits to CBDC units, and the converted deposits may be held in a wallet or token; just as physical money is held in one's pocket or in a physical wallet or purse (Ozili, 2022a). A CBDC held in a wallet or token may not be available to commercial banks for financial intermediation purposes (Ozili, 2023b). Similarly, if bank deposits are migrated to CBDC deposits, the migrated deposits may not be available to commercial banks for financial intermediation. The implication is that CBDC activity could affect banks through the migration from CBDC deposits to bank deposits and from bank deposits to CBDC deposits. The migration of deposits may give rise to risks such as liquidity risk, funding risk or credit risk.

Credit risk is the single most important determinant of the size of loan loss provision (LLP) in banks (Bhat, Ryan, and Vyas, 2019). Other than credit risk, many factors also have an indirect effect on LLP such as economic policy uncertainty (Danisman, Demir and Ozili, 2021), competition (Dou, Ryan, and Zou, 2018), regulation (Nicoletti, 2018) and SDG activities (Ozili, 2023a), among others. However, one factor that has been ignored in the literature, but could have a significant effect on LLP – although indirectly – is central bank digital currency (CBDC) activity. By CBDC activity, we mean three major CBDC activities – (i) CBDC-to-CBDC transactions, (ii) bank deposit to CBDC deposit migration, and (iii) CBDC deposit to bank deposit migration. In this paper, we show how CBDC activity might affect bank LLP.

But why is LLP important? Loan loss provision, also known as provision for credit loss, is important because it is a crucial indicator of the expected loss on bank loans (Ozili, 2018). LLP affects bank profit because LLP is a direct charge on the net interest income of banks (Ozili and Outa, 2017). If LLP is too large, it will significantly deplete bank profit and make banks unstable. If LLP is too low, it will increase bank profit and expose banks to credit risk. Therefore, finding the right size of loan loss provisions is quite difficult because bank supervisors want banks to keep sufficient loan loss provisions while bank managers want

to keep few loan loss provisions. This is a major reason why there are contentions about what the size of loan loss provisions should be (Pandey, Tripathi and Guhathakurta, 2022; Ozili and Outa, 2017; Nicoletti, 2018). Bank supervisors want banks to increase LLP to make banks safe from a regulatory standpoint, but the resulting reduction in profit caused by high LLP could send a bad signal to bank shareholders and could increase the risk of bank managers losing their job (Kanagaretnam, Lobo and Mathieu, 2003; Nicoletti, 2018). On the other hand, bank managers want to keep very low LLP to increase the probability of receiving contractual rewards that depend on the size of bank profit. This conflict makes LLP an important accounting number in the banking sector and in the banking literature.

Despite the importance of LLPs, there is limited knowledge about the effect of digital financial innovations on bank loan loss provisions. Digital financial innovations are disrupting the banking sector in remarkable ways (Thakor, 2020; Ozili, 2022b). But scholars and researchers have not examined whether emerging digital financial innovations may affect bank LLP. This paper extends the existing literature on the determinants of loan loss provisions by showing how CBDC activity might affect bank loan loss provisions. Recent research has shown that banks may be affected by digital innovations such as Fintech (Thakor, 2020; Ozili, 2022c), cryptocurrency (Agarwal, 2021; Irfan et al 2023), blockchain (Ji and Tia, 2022) and central bank digital currency (Piazzesi and Schneider, 2020; Ozili, 2023d), and these digital innovations could affect bank profit, nonperforming loan, and bank risk. But the effect of digital innovations on loan loss provision are unknown. Therefore, we extend the literature by presenting a perspective on how CBDC activity might affect the loan loss provisions decisions of banks.

The rest of the paper is organized as follows. Section 2 presents the literature review. Section 3 explains how CBDC activity might affect loan loss provisions. Section 4 provides the conclusion.

## 2. Literature review

Existing studies examined the effect of CBDC on banks. For instance, Ozili (2023c) argued that the effect of CBDC on banks depend on the specific attributes of CBDC, indicating that the design features of a CBDC may enhance or worsen bank performance. Sandner, Gross, Grale and Schulden (2020) examined the impact of a Euro CBDC on European banks and showed that a Euro CBDC might affect European banks by causing largescale financial disintermediation of the financial sector and it could lead to digital bank runs. Choi and Rhee (2022) examined the impact of central bank digital currency (CBDC) on bank stability and found that banks will find it costly to hold onto its depositors because as consumer benefit from using CBDC increases, more consumers will adopt CBDC despite a high deposit rate, and this will lead to a decrease in banks' balance sheets (Choi and Rhee, 2022). Andolfatto (2021) investigated how a central bank digital currency can impact a monopolistic banking sector. The author used the Diamond (1965) model of government debt with the Klein (1971) and Monti (1972) model of a monopoly bank. The author found that the introduction of a central bank digital currency has no detrimental effect on bank lending activity and may even serve to promote it. The author also showed that competitive pressure could lead to a higher monopoly deposit rate which would reduce profit but expand deposit funding through greater financial inclusion and desired saving. This implies that a well-designed central bank digital currency will not threaten financial stability (Andolfatto, 2021). Bacchetta and Perazzi (2022) showed that a CBDC is an imperfect substitute for bank deposits and the design of CBDC is characterized by its interest rate, its substitutability with bank deposits, and its relative liquidity. They also showed that CBDC will improve welfare through three channels: seigniorage; a lower opportunity cost of money; and a redistribution away from bank owners. Jun and Yeo (2021) argued that central bank digital currencies (CBDCs) will broaden the scope of monetary policy, and reduce consumers' need for conventional demand deposits, which, in turn, will increase banks' loan provision costs because deposits require higher rates of return. They showed that CBDC will lower the cost of liquidity circulation and become a strong substitute for demand deposits. The resulting increase in loan supply and insolvency risk will be countered by subsequent increases in the rates of return on term deposits and loans, which in turn, will reduce loan supply and the risk of bank failure.

These offsetting forces will lead to no significant change in banking, as long as the rate of return on loans is below a certain threshold. However, once the rate is above the threshold, bank failure risk will increase, thereby undermining banking stability (Jun and Yeo, 2021). Ozili (2023b) investigated the role of central bank digital currency (CBDC) in bank earnings management, focusing on how CBDC activity might influence banks to engage in accrual earnings management using loan loss provisions (LLPs) and the implications for earnings quality. The author showed that banks will use loan loss provisions to manage earnings when CBDC-induced bank disintermediation leads to a reduction in bank deposits, a reduction in bank lending and a reduction in reported earnings. Bank managers will mitigate the reduction in reported earnings by lowering discretionary LLPs to increase reported earnings (Ozili, 2023b). Sarkisyan (2022) showed that CBDC will not necessarily crowd out bank deposits in economies with significant demand for currency, and non-interest-bearing CBDC will lead to an inflow of deposits caused by cash substitution. Banks would lower deposit rates and lend more. But banks will not decrease lending if CBDC is intermediated even if they experience an outflow of deposits; however, CBDC can lead to disintermediation when it is interest-bearing (Sarkisyan, 2022). While these studies examined the effect of CBDC in the banking sector, these studies did not examine the effect of CBDC on bank loan loss provisions.

# 3. Potential effect of CBDC activity on bank loan loss provision

## 3.1. Widespread CBDC usage with few CBDC-to-bank deposit migration

CBDC activity can significantly affect the size of bank loan loss provisions if these conditions are met.

i. There is widespread CBDC usage which manifests in the form of frequent and large CBDC-to-CBDC transactions.
ii. There is little or few CBDC deposit to bank deposit migration.
iii. CBDC users do not use bank channels or bank applications to transact CBDCs.
iv. There is unrestricted bank deposit to CBDC deposit migration.

If the above conditions are met, it is possible that CBDC activity will significantly affect the loan loss provisioning decisions of banks. This is because the widespread use of CBDC, combined with frequent and large CBDC-to-CBDC transactions, will reduce the amount of money (deposits) available to banks for financial intermediation purposes. This is expected because a CBDC is assumed to be cash outside the commercial banking sector but in digital form and is held in a wallet or in a token (which is similar to physical cash held in your pocket). As more people use CBDC and perform more CBDC-to-CBDC transactions, the money (deposits) in the vault of banks will decrease while the money (deposits) in the vault of the central bank will increase. The decrease in customer deposits in banks will increase the cost of funding for banks. This will increase funding risk and liquidity risk, and these two risks would translate to credit risk if the shortfall in customer deposits compel banks to call in some loans prematurely, or if it compels banks to increase interest rate on new loans as a means to generate enough liquidity to augment the shortfall in customer deposits caused by widespread CBDC usage and the few CBDC-to-bank deposit migration. This can lead to heightened credit risk because banks may incur actual loan losses if they call in some loans prematurely, and debtors may default on new loans when interest rates are raised. Either way, the resulting increase in credit risk will require banks to increase loan loss provisions in anticipation of loan loss arising from unfavourable CBDC activity.

### 3.2. Few CBDC-to-CBDC transactions with significant CBDC-to-bank deposit migration

CBDC activity will have no effect on the size of bank loan loss provisions if these conditions are met.

i. There is small or limited CBDC-to-CBDC transactions both in frequency and size.
ii. There is frequent and large CBDC deposit to bank deposit migration.
iii. There is free and unrestricted CBDC deposit to bank deposit migration.
iv. CBDC users use both bank and non-bank channels or applications to transact CBDC.

If the above conditions are met, CBDC activity will not affect the size of bank loan loss provisions in a significant way. This is because the significant CBDC-to-bank deposit migration by users (i.e., re-intermediation) will offset any loss of bank deposits caused by bank disintermediation. As some customers move some deposits from commercial banks to the central bank in the form of CBDC, other customers will also move some CBDC deposit back to commercial banks at any time. This means that any loss of customer deposits in the commercial banking sector will be regained when customers move their CBDC deposit back to the commercial banking system. The effect of this on loan loss provisions is neutral because such CBDC activity would only make bank deposits become volatile in the short term, but banks can mitigate this effect by increasing the interest paid on bank deposits[1] to discourage disintermediation and to make customer deposits become more stable. The short-term deposit volatility will not significantly increase the cost of funding for banks; therefore, there will be no significant increase in funding risk and liquidity risk, and there will be no pass-through to credit risk. Therefore, the size of loan loss provisions will remain unchanged when there is significant CBDC-to-bank deposit migration with few CBDC-to-CBDC transactions.

[1] The interest rate paid on customer deposits in banks should exceed the interest rate paid on CBDC deposits to motivate bank customers to keep their deposits with banks.

### 3.3. Low CBDC usage and few CBDC-to-CBDC transactions

CBDC activity will have no effect on the size of bank loan loss provisions if these conditions are met.

i. There is low CBDC usage in society.
ii. There are few CBDC-to-CBDC transactions both in frequency and size.
iii. There is insignificant CBDC-to-bank deposit migration.
iv. There is insignificant bank-to-CBDC deposit migration.
v. CBDC users use bank channels or applications to transact CBDC.

If the above conditions are met, CBDC activity will not have a significant effect on bank loan loss provisions. This is because the low use of CBDC and the few CBDC-to-CBDC transactions will not significantly decrease the amount of money (deposits) available to banks for financial intermediation purposes. As fewer people use CBDC and perform few CBDC-to-CBDC transactions, the money (deposits) available in the vault of banks will not be affected in a significant way. As a result, there will be no significant increase in funding risk and liquidity risk, and there will be no pass-through to credit risk. Therefore, the size of loan loss provisions will remain unchanged when there is limited CBDC usage in society.

### 3.4. Widespread CBDC usage with regulatory price and quantity CBDC controls

CBDC activity will have no effect on the size of bank loan loss provisions if these conditions are met.

i. There is widespread use of CBDC in a country.
ii. There are regulatory quantity controls on the frequency and size of CBDC-to-CBDC transactions.
iii. There is regulatory price control on CBDC, meaning that there is a relatively high cost for migrating bank deposit to CBDC deposit and a relatively low cost for migrating CBDC deposit to bank deposit.
iv. CBDC users use both bank and non-bank channels or applications to transact CBDCs.

If the above conditions are met, CBDC activity will not affect the size of bank loan loss provisions in a significant way. This is because the widespread use of CBDC in a regulated environment will prevent a significant loss of bank deposits caused by bank disintermediation. As more people use CBDCs, regulators will impose daily limits on CBDC activity. For instance, regulators can introduce regulation that stipulates (i) the number or frequency of CBDC transactions that can be performed in a day, (ii) the quantity or highest amount/value of CBDC that can be transacted in a day, (iii) the number of times in which users can migrate bank deposits to CBDC deposits in a week or in a day, and (iv) the cost of migrating bank deposit to CBDC deposit (such cost should be higher than the cost of migrating CBDC deposit to bank deposit in order to discourage bank disintermediation). This type of regulation would prevent disorderly bank disintermediation and reduce the volatility of customer deposits, thereby making bank deposits become relatively stable. Consequently, there will be no significant increase in funding risk and liquidity risk, and there will be no pass-through to credit risk. Therefore, the size of loan loss provisions will remain unaffected. When such regulations are in place, commercial banks may bolster regulatory efforts by introducing competitive deposit rates to attract customer deposits. This will further make bank deposits become more stable and reduce funding risk and liquidity risk, and there will be no pass-through to credit risk. Therefore, the size of loan loss provisions will remain unchanged.

## 4. Conclusion

This paper explored how CBDC activity might affect bank loan loss provisions. It showed that the effect of CBDC activity on bank loan loss provisions depend on the nature of the CBDC activity and whether CBDC activity is regulated or non-regulated. It is important for regulators to consider how the nature of CBDC activity might affect bank loan loss provisions and introduce regulatory safeguards that would ensure that CBDC activity does not affect bank provisions in a significant way.

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