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THE IMPACT OF CENTRAL BANK DIGITAL CURRENCIES ON BANK BALANCE SHEETS

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Abstract
This article reveals statistical and analytical data related to the impact of the issuance of CBDC on the balance sheet of the banking system and its liquidity and money circulation.

Keywords: Digital currency, CBDC, structural current surplus, structural liquidity deficit, correspondent accounts, liquidity provision and absorption operations, inflation, velocity of money, seigniorage, OMOs (open market operations).

Introduction

When focusing on the impact of central bank digital currencies on the macroeconomic environment, it is difficult to separate them from the important aspects of the banking sector, as the launch of a digital currency can affect the transmission mechanism of monetary policy, financial stability, liquidity and profitability of the banking sector, absorption operations.

It should be noted that the issuance of a digital currency does not technically mean a direct expansion of the money supply, but rather a structural change in the liabilities of the central bank (cash and reserves).

Analysis and results

The partial replacement of cash in circulation with digital currency affects only the composition of the liabilities of the central bank: the share of issued cash decreases, and the share of issued digital currencies increases. At the same time, the balance sheets of credit institutions do not change: the volume of balances on customer accounts decreases, and the volume of funds on correspondent accounts of banks decreases.

This, in turn, affects the liquidity of the banking sector, in particular, leads to a decrease in the size of the structural current surplus and even a structural liquidity deficit. However, the potential impact on bank liquidity will gradually increase as the CBDC spreads in circulation. The current system of monetary policy instruments provides the level of liquidity required by banks (through the Central Bank's liquidity provision and absorption operations), thereby creating conditions for the formation of money market rates close to the key rate. Thus, the introduction of a digital currency will not significantly affect the achievement of the operational objective of monetary policy.

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Table 1. Balance sheet impact of cash swap for CBDC

Household balance

Assets	Liabilities
Deposits	Others
CBDC +100 Digital cash	
Cash -100 Fiat Money	
Balance of operations 0 Local currency	Balance of operations 0 Local currency

Commercial Bank balance

Assets	Liabilities
Loans	Deposits
Reserve accounts at CB	CB Loans
Others	Capital
Balance of operations 0 Local currency	Balance of operations 0 Local currency

Central Bank balance

Assets	Liabilities
CB Operations	Commercial Bank Reserve Accounts
Others	CBDC +100 Digital cash
	Cash -100 Fiat Money
Balance of operations 0 Local currency	Balance of operations 0 Local currency

Cash payments require physical proximity for the payer to transfer value to the recipient, and there are delays between the time the cash is received and the time it is transferred to the banking system. In contrast, since CBDCs are digital, transactions can be made remotely and the recipient's digital wallet is credited immediately. Such rapid turnover of payments can lead to a structural increase in the velocity of money or to instability in the velocity of money.

The instability of the velocity of money affects the relationship between money, inflation and GDP and reduces the effectiveness of monetary targeting regimes. Monetary targeting regimes are based on a fixed relationship between an intermediate target (money supply) and a policy objective (inflation). The instability of the velocity of money means that the relationship between money and inflation is no longer predictable, and achieving the intermediate target (broad money) may not produce the desired result on the target variable (inflation).

Indeed, this distortion in the relationship between monetary aggregates and target variables, such as inflation and nominal income, is part of the reason why many countries have moved to IT regimes.

A structural change in the velocity of money means that the relationship between money and inflation can still be stable and predictable, but an increase in the velocity can indicate high inflation. If the quantity of money (M) or the velocity of money (V), or a combination of both, increases faster than real GDP, prices will increase in proportion to how much the MV exceeds the growth of output. Countries using IT regimes will have to carry out additional monetary operations to achieve a desired level of inflation.

CBDCs also have the potential to affect central banks' seigniorage revenues, due to their potential to change the relative cost function of issuing currency. CBDCs can reduce the operational costs associated with printing, storing, and transporting banknotes, but they may also introduce new costs and change the demand for cash. Depending on the direction of changes in seigniorage income, central banks can increase or decrease their reliance on

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the government for operational financing, and changes in seigniorage income affect the central bank's independence in formulating and implementing monetary policy.

Financing CBDC through a reduction in deposits affects monetary policy through its impact on deposit intermediation and through increased volatility in commercial bank reserves at the central bank

When customers finance their CBDC wallets by reducing their deposits, commercial bank deposit liabilities decrease and, on the asset side, commercial bank reserves decrease with the central bank's decrease, thus reducing the total size of the commercial bank's balance sheet (Table 2). For the central bank, replacing bank deposits with CBDCs simply changes the liability composition of its balance sheet, as the decrease in commercial bank reserves is offset by a corresponding increase in CBDCs. The household balance sheet only records changes in the composition of assets.

Table 2. Balance sheet impact of replacing bank deposits with CBDC

Household balance

Assets	Liabilities
Deposits -100 Local currency	Others
CBDC +100 Digital cash	
Cash	
Balance of operations 0 Local currency	Balance of operations 0 Local currency

Commercial Bank balance

Assets	Liabilities
Loans	Deposits -100 Local currency Deposits
CB Reserve Accounts -100 Local currency	CB Loans
Others	Capital
Balance of operations -100 Local currency	Balance of operations -100 Local currency

Central Bank balance

Assets	Liabilities
CB operations	Commercial Bank Reserve Accounts -100 Local currency
Others	CBDC +100 Digital cash
	Cash
Balance of operations 0 Local currency	Balance of operations 0 Local currency

CBDCs in digital wallets are held on the central bank's book and are not available for lending by commercial banks. All else being equal, a decline in bank deposits and, consequently, a decline in commercial bank reserves would reduce banks' lending to the economy. This could increase the cost of bank lending, which in turn could reduce the demand for credit. Since traditional monetary policy relies on the ability of central banks' policy rates to influence the amount of credit that banks provide to the economy (households and businesses), a decline in bank credit would reduce the importance of bank lending in the overall transmission of monetary policy.

Deposit intermediation can also affect monetary policy through the financial stability risk channel.

While deposits can be withdrawn at any time, loans are contractual and cannot be repaid early. A sudden large withdrawal of deposits could therefore create liquidity risk that could lead to bank insolvency. **Stress in the banking system** could lead to **market segmentation** as healthy banks avoid providing liquidity to weak banks, **weakening the**

transmission of monetary policy through the interest rate channel, which is important for countries with IT regimes.

The exchange of bank deposits for CBDCs could also lead to volatility in commercial bank reserves, which would complicate the liquidity management capabilities of both commercial banks and the central bank. If deposit transfers to CBDCs are large, frequent, and unpredictable, commercial bank reserves at the central bank (autonomous factors) could become highly volatile and affect monetary policy through multiple mutually reinforcing channels.

Central banks need to accurately forecast the inflows and outflows of funds into the commercial banking system in relation to the functioning of the payment system, enabling them to achieve monetary policy targets, in particular short-term interest rates. The significant volatility of commercial bank reserves makes it difficult to forecast the components of the balance sheet for the purpose of **accurately determining the size and frequency of central bank OMOs.**

• The volatility of commercial bank reserves may lead commercial banks to hold significantly larger reserves to meet not only daily payment flows but also potential flows from additional deposit withdrawals to finance CBDCs, especially in stressed market conditions. The need to hold high liquidity buffers reduces the funds available for long-term lending and weakens the credit channel.

• Liquidity accumulation may also affect the transmission of policy rate changes to interbank markets, which is central to the effectiveness of IT regimes. For any given policy rate, banks may have to offer higher deposit rates than others or raise more funds from higher-cost or more volatile sources, which can lead to higher lending rates and lower credit to the private sector.

If commercial banks decide not to reduce their asset base in response to falling deposits, and the interbank market does not quickly redistribute liquidity through the banking system in response to the shock, banks with a cash shortage will be forced to resort to central bank financing. The central bank's balance sheet, in this case, increases by the same amount. The composition of the central bank's assets and liabilities changes as follows: on the asset side, claims on commercial banks increase, and on the liability side, currency in circulation increases by a corresponding amount. The commercial bank's balance sheet returns to its previous level (Table 3).

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Table 3. Impact of Central Bank operations on the balance sheet to offset the decline in deposits

Household balance		Commercial Bank balance		Central Bank balance	
Assets	**Liabilities**	**Assets**	**Liabilities**	**Assets**	**Liabilities**
Deposits -100 Local currency Deposits	Others	Loans	Deposits -100 Local currency Deposits	CB Operations +100 Local currency	Commercial Bank Reserve Accounts -100 Local currency +100 Digital cash
CBDC +100 Digital cash		Reserve Accounts at CB -100 Local currency +100 Digital cash	CB Loans +100 Digital cash	Others	CBDC +100 Digital cash
Cash		Others	Capital		Cash
Balance of operations 0 Local currency	Balance of operations 0 Local currency	Balance of operations 0 Local currency	Balance of operations 0 Local currency	Balance of operations +100 Local currency	Balance of operations +100 Local currency

W-CBDCs are like reserves and do not affect the implementation of monetary policy or the transmission of balance sheet effects. Rather, w-CBDCs affect monetary policy by improving the efficiency of the payment system and causing changes in the market structure.

When a central bank issues w-CBDCs, financial intermediaries can "pay" them by transferring their u-MBRs in the RTGS system from reserve balances. Thus, the composition of the liabilities of the central bank's balance sheet changes with the increase in w-CBDCs, which is offset by the reduction in commercial banks' reserves. The equivalent changes in the composition of assets are recorded on the balance sheets of financial intermediaries (Table 4). Once issued, w-CBDCs can be transferred between financial intermediaries on the DLT platform without affecting the balance sheets of central banks. Intraday w-CBDCs (issued on a business day and redeemed every night) do not affect the size of the central bank's balance sheet. Since the W-CBDC is aimed at facilitating interbank settlements and other financial transactions between financial institutions, it will not lead to the disintermediation of deposits or the digitalization of operations.

Table 4. Balance sheet adjusted with W-CBDC participation

Without a CBDC

Public			Financial Intermediaries			Central Bank		
Liabilities	Assets		Liabilities	Assets		Liabilities	Assets	
	Cash (100)			Reserve balances(200)		Reserve balances (200)		
				Vault cash (100)		Cash (100)		
Total		100			300			300

With a CBDC

Public			Financial Intermediaries			Central Bank		
Liabilities	Assets		Liabilities	Assets		Liabilities	Assets	
	Cash (100)			Reserve balances (100)		Reserve balances (100)		
				W-CBDC (100)		W-CBDC (100)		
				Vault cash (100)		Cash (100)		
					300			300

Conclusion

To limit liquidity risks, the central bank will also consider the possibility of using “bank restrictions” mechanisms when conducting operations with digital currencies. In particular, the regulator will be able to prevent and regulate large-scale “digital flight” by setting the maximum possible amount of CBDC ownership per account or negative rates on CBDC balances. In this regard, the most optimal option is to develop CBDC in an interest-free form in order to minimize the significant impact of digital currency issuance on financial stability and the mechanisms for implementing and conducting monetary policy.

In general, the creation of an additional payment infrastructure for digital currencies plays an important role in maintaining financial stability, contributing to the stability, reliability and uninterrupted operation of the payment system in the country, as well as the implementation of monetary settlements in the country.

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