

Central Bank Digital Currency: Critical Analysis of the Two-Tier Model Consideration for Zambia

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Abstract

This paper investigated the determinants of a Central Bank Digital Currency (CBDC) as a payment systems platform in Zambia. The study adopted a two-tier model of a CBDC and employed the methodology of using time series monthly data to ascertain if the introduction of a CBDC payment systems platform could improve the efficiency of payments systems, make a stronger national defense against AML/CFT, ensure non-discriminatory access to domestic financial services through financial inclusion and play a role in mitigating the high cost of processing currency. The key databases used in this study included Science Direct, JSTOR and Ebscohost information services and digital libraries. This is paper focuses on a critical literature review that brought out main advantages of considering a two-tiered approach in the developing jurisdiction like Zambia.

Keywords: Central Bank Digital Currencies (CBDC), Exploring, Two-Tier Model, Zambia

DOI: 10.7176/EJBM/14-16-03

Publication date: August 31st 2022

1. Introduction

The main study on the determinants of a Central Bank Digital Currency (CBDC) as a payment systems platform, adopted a two-tier model and architecture of a CBDC where benefits of a tiered architecture for the distribution of retail CBDC through commercial banks and payment service providers (PSP) alike working together to distribute CBDC in an economy. The study uses the two-tier model as a simplified abstraction of reality which incorporates the central bank and all the financial institutions such as banks, non-bank financial institutions (NBFIs), payment systems providers (PSPs) and all other financial services providers (FSPs). These in turn service the individuals, households and organizations that could have a CBDC account with FSPs. The model assumes that the CBDC can coexist with cash and serve as legal tender and be used as the medium of exchange, a unit of account and store of value for all financial agents in the Zambian financial landscape.

2. Back Ground of the Study

The background of the study focused on the empirical analysis which looks at the main variables as the main determinates of issuing a CBDC by comparing with the efficiency of payments systems platforms, CBDC as a stronger national defense against AML/CFT, non-discriminatory access to domestic financial services and CBDC as a mitigant to the cost of processing cash. The study further uses high-frequency monthly time series data for both narrow money (M0, M1) and broad money (M2, M3), the cash in circulation (CiC), the exchange rate between cross boarder CBDC (NER), individual mobile subscribers and internet penetration rates. From the research analysis and results, the study explored the main prevailing determinants for introducing a Central Bank Digital Currency (CBDC) in Zambia addressing and the research results concluded that the CBDC should interoperate with other already existing payment system platforms. This interoperability should include both retail and large value payment systems (LVPS) on the Real-Time Gross Settlement (RTGS) and the retail payment systems on all the other payment systems platforms including cash, electronic funds transfers (EFT), Point of Sale (PoS), Automated Teller Machines (ATM), Mobile Financial Services (MFS), Digital Financial Services (DFS) and Cheque Image Clearing (CIC). The study finally ascertained that the introduction of a CBDC could bring about a stronger national defense against AML/CFT, and non-discriminatory access to domestic financial services and lead to financial inclusion. The study also reviewed that the introduction of a CBDC initially does not mitigate the high cost of processing currency in Zambia. Over time, however, the cost of processing currency decreases as CBDC payments increases in the economy.

3. The Two-Tier CBDC Model

This study adopted the two-tier model proposed by the Bank for International Settlement in which the CBDC is issued from the Central Bank using the commercial banks as the second tier and may take the form of a retail, a

wholesale and interoperable cross border multiple Central Bank Digital Currency (mCBDC). This model was ideal for this study because the study looks at the CBDC determinants that apply a two-tier CBDC model (BIS, 2021), which cements the benefits of tiered architectures for the distribution of retail CBDC through commercial banks, financial services providers and payment service providers alike. The two-tier model is a simplified abstraction of reality which incorporates the Central Bank and all the financial institutions, banks, non-bank financial institutions (NBFIs), payment systems providers (PSPs) and all other financial services providers (FSPs). These in turn service the individuals, households and organizations that could have a CBDC account with FSPs. The model assumes that the CBDC can coexist with cash and serve as legal tender and be used as the medium of exchange, a unit of account and store of value for all agents in the Zambian financial landscape. The study adopted the framework of (Lagos & Wright, 2005) which has the same structure of a centralized market (CM) and a decentralized market (DM) and considered other theoretical investigations on the impact of CBDC in order to firm up on the two-tier model. The study also assumes that Zambia already has a competitive banking industry comprised of 18 commercial Banks (BOZ, 2021) and a growing number of NBFIs, payment systems providers (PSP) and financial technologies (Fintech) organizations that are providing various payment systems platforms in the country. The access to a CBDC does not imply that the Central Bank provides retail services to all holders of CBDC, and for simplicity, the study assumes that only banks and NBFIs can trade CBDC directly with the Central Bank, while households and firms use a new type of electronic money issuance from NBFIs, which can be assumed as a CBDC exchange that can be used to buy and sell CBDC in exchange for deposits. This is an alternative where individuals, households and firms can directly trade CBDC with the Central Bank but this is not the main responsibility of the Central Bank and the heavy lifting should be left to the commercial players for the Central Bank to concentrate on its main mandate (BIS, 2021). Figure 2.4 below shows the two-tier CBDC model and how the variables interact with each other. The main variables in this model include cash in circulation (CiC), internet penetration (IP), mobile subscription rates (MS), narrow money (M0, M1), broad money (M2, M3) and the nominal exchange rate (NER) for cross border transactions.

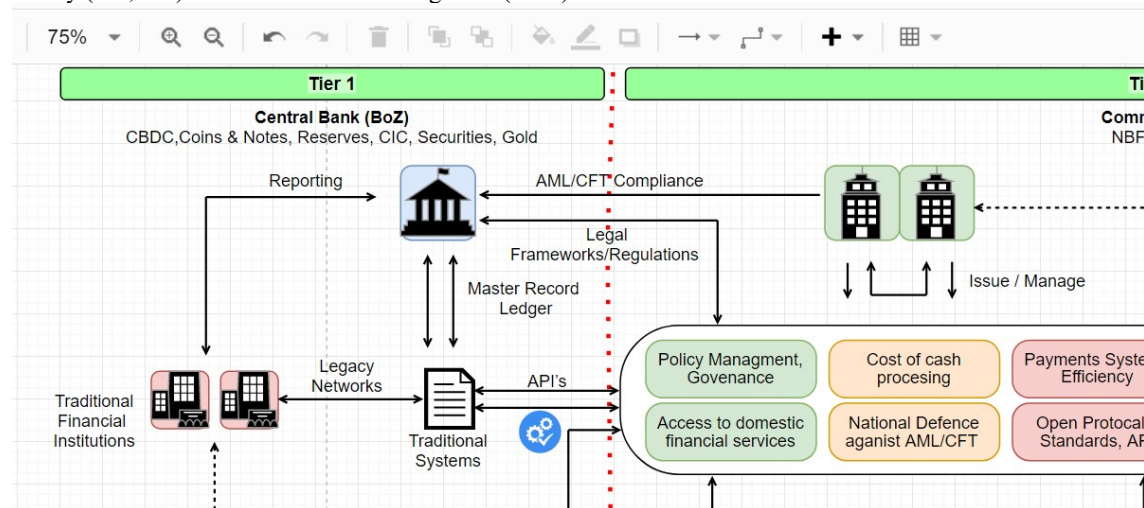


Figure 3.1: Two-tier CBDC Model (Source: Authors Construct)

To simplify the exposition, the study assumes that banks and NBFIs do not themselves use the services of CBDC exchanges, given their direct access to the Central Bank and their ability to transact in wholesale debt markets to acquire eligible collateral. CBDC account holders can trade CBDC among themselves, in exchange for assets which might include bank deposits, goods and services. Banks, in addition to having CBDC accounts, are also likely to minimize CBDC holdings, have access to reserve accounts at the Central Bank, and no other economic agents have access to reserve accounts.

4. Two-Tier Considerations in the Zambia Jurisdiction

The literature in the study reviewed that CBDC should be viewed in the context of other types of fiat currency and the figure below is a representation of the taxonomy of money in the form of a Venn diagram referred to as the money flower (Bech & Garratt, 2017). The taxonomy version focuses on the combinations of four key properties which include the issuer that might be the Central Bank, some form of digital or physical assets, the accessibility which might be widely or restricted and the technology in form of the token- or account-based. Money is typically based on one of two basic technologies which are the tokens of stored value or accounts. Cash and many digital currencies are token-based, whereas balances in reserve accounts and most forms of commercial bank money are account-based. Figure 4.1 shows the money flower Venn diagram and how it can be

applied.



Figure 4.1: The Money Flower Venn-diagram (Source: Authors Construct).

From the diagram, here are many questions about who is supposed to issue the CBDC, how it is distributed and in what form the CBDC is held. The end-user for the CBDC can either hold an account or a token according to research by the R3 consortium. For a token-based CBDC, the digital currency is represented as a token with a specific denomination, mostly 1:1 with cash and the account based CBDC, each user of digital currency holds an account with the Central Bank or subsequently with commercial banks in a two-tier distribution model. An account-based model may ease AML and KYC compliance but can be a large overhead for Central Banks in a single tier model. The CBDC can also take the form of being token based or an account based CBDC. In a token-based system, the token contains all information necessary for the recipient to verify the legitimacy of the transaction, and the recipient can verify the object transferred in terms of the token. The table below shows the token-based and account based-type of a CBDC. The simplest way of launching a CBDC would be to allow the public to hold deposit accounts with the Central Bank. The study by (BIS, 2020), observes that this implies that the Central Bank would be responsible for conducting know-your-customer (KYC) checks and ensuring AML/CFT compliance. This would include not only handling the initial KYC process but also authenticating customers for bank transactions, managing fraud, and dealing with false-positive and false-negative authentications. Given the limited physical presence of central banks in society and the fact that citizen authentication is currently not something Central Banks are likely prepared to do on a large scale, any account-based CBDC would require the central bank to outsource these checks. According to (Andolfatto, 2020), tokenization is the process of protecting sensitive data by replacing it with an algorithmically generated number called a token. Often times tokenization is used to prevent credit card fraud. The actual bank account number is held safe in a secure token vault. Table 4.1 below summarizes the main differences between token based and account based CBDC.

Table 4.1: Token Based vs Account Based CBDC (Source: Authors Construct)

Token-Based CBDC	Account-Based CBDC (Interest Bearing)
Verifying the validity of the object used to pay.	Verifying the identity of the payer (KYC).
Cash and many digital currencies are token-based,	Balances in reserve accounts and most forms of commercial bank money.
Held by Owners in Digital Wallets.	Citizens holding accounts at the Central Bank.
Risk of Disintermediation.	Risk of Disintermediation.
Token authenticates the sender.	Operator authenticates the sender.
Decentralized privacy, safety using DLT to avoid double spending.	Centralized with the ledger in one place.
Rely on tokenization.	Rely on trusted third-party operators.

According to a study by the World Bank global Findex of 2016, digital financial services lead to a great increase in financial inclusion (World Bank, 2016). Financial inclusion is defined as a global effort which seeks to ensure that all individuals, households and businesses, regardless of their income levels, have access and can effectively use the appropriate financial services they need to improve their lives. Virtual currencies including CBDC are a major type of digital finance which, if properly regulated and guided, would receive mass adoption,

usage and also add to financial inclusion. Financial inclusion is important in reducing poverty and achieving inclusive economic growth. The World Bank study further states that when people participate in financial systems, they are better able to plan for the future by saving and investing in good health to avoid diseases, plan for their children’s future and plan for any other natural disasters.

Our final CBDC analysis involves an evaluation of the CBDC against the four main motivations including the efficiency of payments systems platforms, stronger national defense against AML/CFT, ensuring non-discriminatory access to domestic access to financial services and mitigating the high cost of processing cash in Zambia. We compare the baseline model without CBDC with an interest-bearing CBDC model under the impact of a quality of capital shock. While the previous analysis suggests that full allotment is necessary to prevent destabilizing effects, the Central Bank can also use another tool. (Bindseil, Ulrich, 2020) proposes that Central Banks can actively use the interest rate on CBDC to disincentivize its accumulation in a crisis and, thus, to counteract disintermediation. The literature also reviews different types of CBDC including the retail rCBDC, wholesale wCBDC and cross boarder mCBDC.

5. Retail rCBDC and Two-Tier Considerations

The literature also reviews forms of rCBDC and how the two-tier model is applied. The retail variants of CBDC includes the indirect retail CBDC, the direct retail CBDC and the hybrid retail CBDC. The indirect retail CBDC is one of the common CBDC types with considerable similarities to existing retail payment processes. There is a need for an intermediary layer of financial institutions for setting up an indirect retail CBDC and such intermediaries take care of onboarding and communications with businesses and individuals, as well as sending payment messages to financial institutions. The other type is the direct retail CBDC solutions which focus on businesses and individuals holding ownership of CBDCs by leveraging Central Bank private accounts. Therefore, intermediaries are not necessary for the direct retail CBDC types. The Central Bank is responsible for the heavy lifting of onboarding and management of financial services. However, new developments in the direct retail CBDC model would encourage the involvement of intermediaries among users and central banks. The other form is the hybrid retail CBDC which offers a blend of indirect and direct retail CBDC variants. They make use of an intermediary layer of financial institutions in hybrid retail CBDC. However, individuals and enterprises could enjoy a direct claim of a CBDC at the concerned Central Bank. One of the significant implications of this scenario is that intermediaries can maintain the separation of CBDC from the balance sheets resulting in the enterprises and individuals having more profitability for holding rCBDC.

Subsequently, research by (Auer, Raphael; Böhme, Rainer, 2021) discusses the concept of liability or legal claim to better understand the quantitative differences between CBDC, cash and commercial bank digital money. This is best illustrated using the balance sheet T-accounts. The T-accounts diagram below shows a retail CBDC, one of the major types of central bank digital currencies as outlined in the BIS, CBDC the quest for minimally invasive technology working paper.

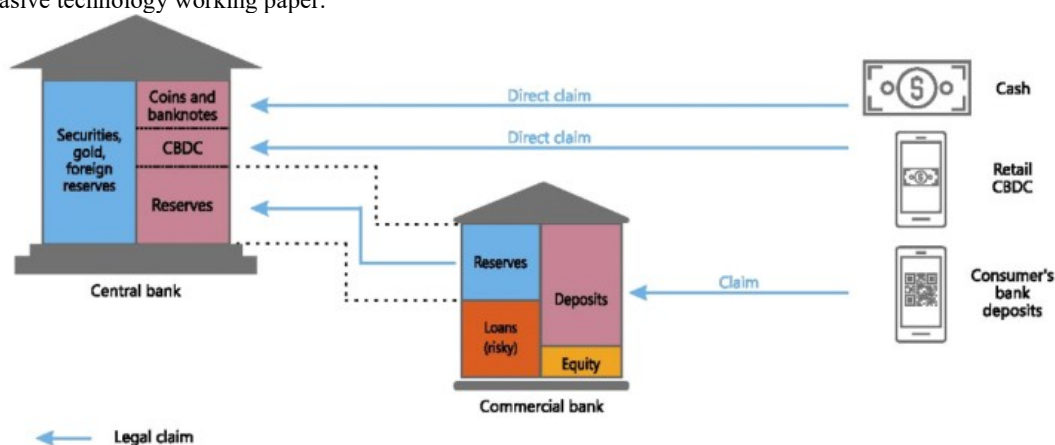


Figure 5.1: rCBDC T-Accounts (Source: (Auer, Raphael; Böhme, Rainer, 2021))

Figure 5.1 above uses T-accounts to illustrate a comparison of CBDC to cash and bank deposits. Cash is a direct and legal claim on the central bank, as indicated by the blue arrows. Like cash, a CBDC is a claim on the central bank. Deposit accounts, on the other hand, are claims on the commercial bank. Commercial banks back some of these claims by holding reserves at the Central Bank.

6.0 Conclusion

To summarise, the literature reviewed the exploration of the two-tier model and the consideration for a CBDC in Zambia. It was concluded that as many other Central Banks around the world are considering the feasibility of a

CBDCs, there has been increasing attention in both developed and emerging and developing economies looking at different models from the single-tier, two-tier and hybrid tiers and how best these support a jurisdiction. These studies are accelerating CBDC research, pilot and launch efforts and central Banks are now moving from theoretical research to proof of concept and pilot projects. The two-tier model is a good fit for Zambia because the architecture supports the distribution of retail CBDC through commercial banks and payment service providers (PSP) similar to the way fiat currency is distributed in the Zambian economy.

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