# BANKING ON TOKENS

Tokenized Commercial Bank Deposits -A Primer

Digital Euro Association Private Digital Euro Working Group





## **Banking on Tokens**

#### A Primer on Tokenized Commercial Bank Deposits

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## List of abbreviations

AML	Anti-Money Laundering
B2B	Business-to-Business
CBDC	Central Bank Digital Currency
CSM	Central Clearing and Settlement
CFT	Combating the Financing of Terrorism
DEA	Digital Euro Association
DLT	Distributed Ledger Technology
ECB	European Central Bank
EDPB	European Data Protection Board
EMI	Electronic Money Institute
EMT	Electronic Money Token
EU	European Union
FATF	Financial Action Task Force
FIU	Financial Intelligence Unit
FSA	Japan's Financial Services Agency
GDPR	General Data Protection Regulation
HQLA	High-Quality Liquid Assets
КҮС	Know-Your-Customer
MAS	Monetary Authority of Singapore
MiCA	Markets in Crypto Assets Regulations
PKI	Public Key Infrastructure
PvD	Payment versus Delivery
ΡνΡ	Payment versus Payment
RLN	Regulated Liability Network
rCBDC	Retail Central Bank Digital Currency
TD	Tokenized (Commercial Bank) Deposit
UN	United Nations
wCBDC	Wholesale Central Bank Digital Currency
ZKP	Zero-Knowledge Proof

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## 1. Introduction

#### 1.1. Overview of Commercial Bank Money Tokens

Contrary to widespread belief, the majority of money in circulation is not issued by central banks. Instead, up to 96% of fiat money in circulation, depending on the country and the specific definition of money, exists electronically in the form of bank deposits created by privately-owned commercial banks in the course of their lending activity (McLeay et al., 2014). This process powers economic growth (Hook, 2022), but also largely relies on infrastructures that, due to their age, often lead to inefficient and costly value transfers (Cecchetti & Schoenholtz, 2018).

In recent years, advances in technology have led to the rise of privately-issued stablecoins: digital tokens that replicate the value of other assets using distributed ledger technology (DLT). In response, central banks around the world have begun serious exploration into issuing their own digital currencies, with the majority of the world's central banks currently studying the potential for Central Bank Digital Currency (CBDC), and Bahamas, Nigeria, Eastern Caribbean countries and Jamaica already having live CBDC implementations (CBDC Tracker, 2023).

Amidst this proliferation of new forms of digital money, there are also growing concerns around the potential disintermediation of traditional commercial banks - and what this might mean more broadly for economies - as end-users may shift away from bank deposits into holding and transacting with stablecoins and CBDCs instead. A large-scale shift away from deposits might potentially curb banks' lending capabilities, driving up businesses' financing costs, and significantly slowing economic growth in the coming years.

As we transition to digital-native money forms, it is crucial to explore potential solutions that can mitigate these risks, and maintain the ability of commercial banks to create credit and thus fuel economic growth. This paper delves into the relatively unexplored topic of Tokenized Deposits (TDs), examining the potential impacts and implications of various TD designs and shedding light on the associated opportunities, challenges, and effective implementation strategies within the broader financial system.

#### **1.2.** Scope of discussion

In this paper, the Digital Euro Association's working group endeavors to foster an enriched understanding of TDs. We conduct an in-depth exploration of TD structures, delve into regulatory considerations, and enumerate their benefits and use cases. Furthermore, we examine the challenges, risks, and potential impacts linked with the

implementation of TDs. The paper concludes by presenting a comprehensive series of recommendations on TDs, aimed at policymakers, central banks, and financial institutions.

## **2.** Definitions

#### 2.1. Content and Form

This paper examines the concept of TDs with respect to two key aspects, namely content and form, both of which are closely associated with tokenization and tokens. Tokenization is the process of digitizing traditional assets onto a programmable platform, typically a DLT, while tokens are their digital embodiments on such platforms or distributed ledgers. These tokens may represent values originating either on the platform, or distributed ledger, or outside it (FSB, 2019 and BIS, 2023). Specifically, TDs are traditional deposits reimagined using advanced technology; whilst these do not in and of themselves constitute a new form of money, their digitized form does give rise to potential capabilities - and correspondingly, pose potential challenges - not associated with deposits in their traditional form.

In terms of form, traditional deposits manifest as account balances on traditional bank ledgers, while tokens (TDs included), rely on a unique data structure with programmable functionality. As the Bank for International Settlements (BIS) recently clarified (BIS, 2023), tokenization can define assets as well as defining what can be done with them. For example, smart contracts and programmability can enable tracking of token ownership, monitoring of associated valuations / balances, and govern how they are transferred. The value representation of a TD, in particular, may remain linked to a traditional ledger in a commercial bank, while the tokenized form has additional functionality in a programmable platform.

#### 2.2. Technology

Throughout this paper, we have assumed that TDs are represented using a programmable platform such as a DLT or a similar technology (GBIC, 2023, SBA 2023, BIS 2023). It is this programmability that gives TDs their unique form; nevertheless, this does not negate the fact that the underlying deposit (i.e., the issuing bank's liability) must be created prior to tokenization, typically through the bank's credit creation activities.

It is our view that, as long they support programmability, TD implementations may be broadly technology-agnostic. TDs can be issued on a variety of programmable platforms, including but not limited to private, consortium, or public DLTs. In a private DLT scenario, the TD issuance is centralized within one entity. This means that a single TD issuer serves multiple roles as the developer, administrator, validator, and DLT provider. Essentially, the issuer has complete control over the private ledger distribution. In the case of a consortium DLT, an association of commercial banks or similar entities collectively handle the issuance of the TD. Finally, a public DLT represents a decentralized method of distributing the ledger operation. In this approach, the ledger is openly accessible and managed by a distributed network of participants rather than a single entity or a consortium.

TDs also have the potential to be composed with other tokenized assets and in more complex transactions such as multi-asset atomic settlement; in these scenarios, it is likely that the underlying programmable platform would distribute roles and responsibilities across multiple stakeholder participants in the system.

The expense of maintaining the technology infrastructure that supports TD issuance and TD-based transactions may be minimized by opting for a unified network in which commercial banks serve as nodes. Conversely, if a set of participating commercial banks are utilising disparate programmable networks, these networks may be interconnected using bridges, APIs or unified ledger technologies (BIS, 2023). Given that commercial banks, by nature, are likely to utilize a range of different technologies, it is crucial for both the issuing banks and regulators to ensure that a framework for interoperability is developed across the industry at the earliest opportunity. This will mitigant potential technological deadlock and the corresponding risk of "walled gardens" arising between different banks and their TD issuances, enabling end-users to transfer their TDs smoothly and efficiently across different commercial banks and platforms, and to fully leverage the opportunities created by composable, conditional and complex TD functionality.

#### 2.3. Structure

In the contemporary financial system, deposits maintained at commercial banks hold significant importance. They represent a form of agreement where the bank promises to return the account holder's funds upon request. This traditional system is seamlessly interwoven with the unique capability of commercial banks, thanks to their regulated status, to generate money through the process of credit creation. Commercial banks create new deposits in the borrower's account when they issue a loan, effectively minting new money. This function is rooted in the public's trust in the banking system and regulatory compliance.

Tokenized deposits are structured as *claims* against the issuing bank, convertible on demand and at par into traditional bank deposits held on account, and to central bank money (in both cash and future CBDC formats), thus ensuring full fungibility and preservation of the "singleness" of a given fiat currency across its multiple public and

privately-issued forms (GBIC, 2023). Since a TD is still a classic bank deposit (albeit in a new technical guise), this claim is *backed* in the same way as traditional bank deposits, i.e. by the entire asset side of the bank's balance sheet, which need only be partially composed of high-quality liquid assets (HQLA), including but not limited to central bank reserves. If designed properly and subject to the appropriate regulatory frameworks being in place, TDs do not necessarily impede fractional reserve banking and the role of commercial banks in credit creation - unlike non-bank stablecoins and synthetic CBDCs, both of which would require full backing with HQLA or central bank money, minimizing or eliminating the issuer's credit creation capabilities.

To be clear, our reference to *backing* is not to be confused with possible additional *collateralisation*, which entitles the holder to preferential satisfaction with assets outside the bankruptcy estate in the event of the issuer's insolvency beyond deposit insurance or deposit guarantee schemes (e.g. collateralisation by central bank reserves in the "third model" in Maechler & Moser, 2023). Such security interest, however, is not required in the case of TDs.

Туре	lssuer	Definition
CBDC	Central Bank	Represents a direct liability of the central bank and can be either issued for wholesale (wCBDC) or retail (rCBDC) purposes.
Synthetic or Indirect CBDC	Regulated institution	A digital representation of a private liability that is backed 1:1 with wCBDC or with traditional reserves held at a central bank.
Tokenized Deposit	Regulated deposit- taking institutions	A digital representation of a private liability against a commercial bank issuer, on a programmable platform, that is backed by the issuer's entire balance sheet, in most jurisdictions secured (to a maximum limit) by a deposit guarantee scheme.

Fiat-pegged Stablecoin	Regulated or non-regulated institution	A liability against a private issuer (bank or non-bank), pegged to a fiat currency (or a basket thereof) and backed by assets (primarily but not exclusively cash and its equivalents) held directly or indirectly and denominated in the currency of the peg.
Tokenized e-Money	Regulated e-money issuer (EMI)	A qualified type of fiat-denominated stablecoin, insofar as it is a liability of a regulated EMI (in applicable jurisdictions), that is referenced to a single fiat currency and backed 1:1 by a statutorily defined set of liquid, low risk assets (such as bank deposits) denominated in the currency of the peg.

 Table 1. Novel digital money forms - definitions and comparisons

 Source: Authors' elaboration

To provide a more nuanced understanding of TDs and how they would operate alongside other forms of digital currencies such as Central Bank Digital Currencies (CBDC), Synthetic or Indirect CBDC, we have composed a detailed table to capture the key attributes of each money type and their definitions. In particular, the characteristics and specifics of TDs are further elaborated within this comparative framework (see Table 1).

## 3. Legal and Regulatory considerations

Any legal and regulatory framework for TDs should be based on existing prudential and conduct rules and regulations applicable to regulated deposit-taking institutions. TDs should be subject to operational Know-Your-Customer (KYC), anti-money laundering (AML) and combating of the financing of terrorism (CFT), consumer protection, and lending requirements, in the same way as traditional deposits. Additional regulatory requirements should be introduced only to the extent that TDs introduce new risks or challenges, or give rise to new usages that introduce additional regulatory considerations.

The Monetary Authority of Singapore (MAS) and other authorities have suggested a "same risk, same regulatory outcome" approach to TDs. Regulators aligned with this principle would not seek to impose additional reserve backing and prudential

requirements on regulated deposit-taking institutions that tokenize their liabilities, as such institutions are already subject to stringent risk-based capital, liquidity, operational and technology resilience and risk management requirements.

The regulation of TDs may require some review of monetary policy measures and regulatory requirements, to ensure that there is no unwanted impact on the provision of credit or on financial stability. Where TDs are to some extent backed by dedicated reserves at the central bank, regulatory relief from Basel IV or similar requirements may be possible (although the distinction between these and synthetic CBDCs may be superficial at best).

Tokenized deposits should be insured similarly to traditional deposits, and deposit insurance schemes should be extended, or new schemes created specifically for TDs, potentially requiring the establishment of funds and development of regulations. The explicit extension of local deposit protection schemes to cover TDs may also bolster end-user confidence; Japan's Financial Services Agency (FSA), for example, already states that TD holders would be protected by existing deposit insurance. In the EU, however, changes to the definition of 'deposit' in the European Deposit Guarantee Schemes Directive 2014 would be necessary. TD accounts/wallets should be compatible with open banking and open finance initiatives, potentially necessitating revisions to relevant law and technical frameworks / standards.

In accordance with e-money regulations in some jurisdictions such as the EU and the UK, EMIs are usually subject to client fund safeguarding regulatory requirements, meaning that e-money can only be issued 1:1 against segregated funds. In compliance with such requirements, these issuers are obliged to ensure that the whole customer funds are maintained in commercial bank accounts and/or invested in liquid and low-risk assets, such as government bonds (Kerse and Staschen, 2018). It is important to emphasize that such fund safeguarding regulations would not extend to TDs, which, as deposits, are backed by commercial bank balance sheets as opposed to segregated funds.

Regulatory regimes applicable to non-banking financial institutions and financial service providers typically take a proportionate approach to mitigating risks, whilst allowing for the flexibility to promote competition and innovation across the sector, and not introducing unduly high barriers to entry for new service providers. Consequently, non-banking regulatory regimes are typically less stringent than those for banking institutions, particularly in terms of prudential requirements, which are necessarily much higher for institutions engaged in the deposit-taking and lending activities associated with fractional reserve banking.

The starting point for any regulatory regime applicable to TDs should be that they are a form of commercial bank money and that therefore all regulatory requirements and protections applicable to commercial bank money in its current form should be applicable to TDs as well. There is then a potential question regarding the extent to which additional regulatory requirements apply as a consequence of tokenizing deposits. It is our view that TDs are unlikely to be categorised as asset-referenced tokens as defined in the EU's MiCA regulation, and hence they should not be captured as such. On the other hand, a stablecoin issued by a regulated deposit-taking institution would clearly be captured within the scope of MiCA.

## 4. Benefits and Use Cases

#### 4.1. Preservation of Credit Creation / Financial Stability

Fractional reserve banking forms the foundation of modern finance and economies. It is a system in which commercial banks play a crucial role in allocating resources efficiently to promote economic growth. These regulated banking institutions create credit, which form the major source of deposits in the fractional reserve banking system, and therefore the vast majority of money (Hook, 2022). However, the introduction of new forms of digital money, in particular where these are issued by currently unregulated private firms, raises concerns about their impact on commercial bank business models and, more broadly, overall financial and economic stability (BIS, 2021).

Recognising the crucial role in credit - and hence money - creation played by commercial banks in the economy, and the long-standing two-tier model of most modern money (in which public central bank money and private commercial bank money coexist), some central banks have considered introducing mitigants to address the risks posed by potential deposit outflows - and the subsequent impact on banks' ability to create credit - in their retail CBDC designs. Such measures include capping user holdings, introducing transaction limits, and not offering remuneration in the form of interest.

Tokenized deposits present an opportunity to leverage the advantages of programmable, conditional and composable digital money and traditional 'two-tiered' money systems without putting undue strain on credit creation, monetary policy, or financial stability. They also present an opportunity for central banks to consider an ecosystem in which TDs, retail, and wholesale CBDCs can coexist and fulfil different functions and needs across the financial system.

#### 4.2. Relationship with CBDCs

CBDCs can be viewed as a central bank response to the challenges and potential risks to financial stability that potentially arise from the introduction of global, systemically important stablecoins and other new forms of privately-issued digital money. Tokenized deposits represent a response to the same developments on the part of commercial banks, and a means of delivering similar functional benefits to CBDCs, stablecoins and other new forms of digital money, whilst preserving the innate features and role played by bank deposits in the financial system.

As has been seen from both long-running pilots and live examples, retail CBDCs (rCBDC) have not yet been adopted at a scale that would pose a significant threat to traditional commercial bank deposits. Some Chinese users, engaged in the digital yuan's multi-year pilot, have expressed views that they did not see significant benefits of this retail CBDC when compared to the already sophisticated offerings from their banks and other providers. Commercial banks offer more than deposit facilities, including loans, investments and other financial tools, and there may be potential to create more sophisticated product and service offerings using TDs as a basis for payment and settlement.

Despite the relatively low uptake of retail variants so far, many central banks perceive CBDCs, as a digital-native form of publicly-issued money, performing a vital role in maintaining local legal tender as the primary monetary anchor and in ensuring the 'singleness of money' (Garratt, 2023). European authorities, in particular, are increasingly mindful of the monetary sovereignty risks that can arise if cash use declines rapidly and if large foreign bank networks and unregulated technology companies continue to play growing and outsized roles in the emergent digital payments sector.

Many central banks have also expressed interest in and piloted projects to test the potential role of wholesale CBDCs (wCBDCs) in support of the settlements infrastructure underpinning TDs, and in achieving multi-asset settlements on programmable platforms. This is the concept of the Regulated Liabilities Network (RLN) (McLaughlin, 2021) which places wCBDC and TD on a shared ledger network, with wCBDC used to instantly and atomically settle each inter-bank TD transaction, thereby reducing counterparty risk. The BIS also recently dedicated a section of its June 2023 Annual Report to exploring the concept of a unified ledger that could combine central bank money, tokenized deposits and tokenized assets on a programmable platform (BIS, 2023).

#### 4.3. Relationship with Programmable Payments

When included alongside other assets on a programmable platform, TDs can enable atomic transactions — instantaneous transactions executed in an all-or-nothing fashion and appearing indivisible with respect to other concurrent transactions (Lampson, 1981). This significantly reduces counterparty and settlement risks, and accelerates and supports settlement finality. Additionally, smart contracts (self-executing code functions) may be utilised to add automation, traceability, and irrevocability to TD transactions (Janssen, 2021).

Beyond classic applications of programmability features, like payment versus payment (PvP) or delivery vs payment (DvP), a more novel use case of programmability in TD could be implemented by integrating TDs within the decentralised finance (DeFi) industry. Such an integration could bring stability and regulatory compliance to the entire DeFi ecosystem (SBA, 2023).

#### 4.4. Relationship with Open Banking

Open banking is a regulatory and technical framework whereby banks share opt-in access to customers' financial data with authorised third parties. This data can be used to create innovative applications, such as budget tracking tools, automated investment services and many more.

As transparency and accessibility are core tenets of programmable platforms such as DLTs as well as Open Banking, there is a clear synergy between the two. Combining TDs with Open Banking could introduce exciting opportunities, such as the creation of data- or event-driven Al/ML programmable money services, whereby users can set automated rules for their finances based on their specific needs and habits.

#### 4.5. Use in Fast Payments

Fast payment systems, offering real-time funds availability, near-24/7 operations, and central clearing facilitated by central banks, are experiencing global adoption (BIS, 2021; The World Bank, 2023). Despite the benefits documented in successful examples, such as PIX in Brazil, implementing integration with these systems poses significant challenges for the traditional financial system, often involving costly migrations and upgrades from legacy systems, and the redesign of sanctions and AML processes.

TDs, with their potential programmability, composability, and conditionality, could theoretically provide an alternative avenue for addressing these integration challenges. TDs could enable banks to facilitate bilateral or multilateral clearing on programmable platforms, potentially easing the transition from legacy systems and promoting interoperability between different national fast payment schemes.

However, it's important to note the complexities and significant costs involved in implementing such an approach. Central Bank Digital Currencies (CBDCs) could offer similar benefits while potentially avoiding some of the complexities associated with TDs. While both TDs and CBDCs hold potential in addressing the challenges of integrating fast payment systems, their practical implementation would require thoughtful planning, considerable investment, and possibly, a combination of both solutions.

#### 4.6. Cross-Border Payments

Improvements to cross-border payments have been slower to materialise than in domestic payments due to their inherently more complicated market structure. Cross-border payments may involve multiple intermediaries and correspondent banks, cover various time zones and market hours, and must comply with multiple different jurisdictions' laws and regulations (Bank of England, 2023). Key friction points include: inconsistent and incomplete data formats, intricate and lengthy compliance check procedures, restricted operating hours for the underlying wholesale payment systems, outdated technological infrastructure, high funding costs, long transaction chains via, in many cases, a series of correspondent banks, and a lack of effective competition. With USD250 Tn in cross-border transactions expected to be processed annually by 2027, the commercial case for reducing obstacles and delays is obvious (Bank of England, 2023). The benefits of greater innovation and competition in cross-border payments have already been seen with stablecoin-based payment systems, in terms of increased speeds and efficiencies and substantially reduced costs as a result (BIS, 2021).

TD-based systems could complement existing infrastructures and innovations in the cross-border space. By integrating payment instructions and value transfer in the same function, TDs might offer another dimension to the ongoing efforts of reducing settlement and legal risks, such as those related to finality. In conjunction with solutions like CBDCs or stablecoins, TDs could provide an additional layer of service optimization for commercial banks to offer their extensive customer network.

## **5.** Additional Considerations for Tokenized Deposits

#### 5.1. Impact on Financial Stability or Monetary Policy Implementation

Given their expected financial and regulatory equivalence, and the ability to convert TDs into conventional deposits and vice versa, the impact of central bank monetary policy and instruments on TDs should mirror current impacts on deposits, particularly if TDs yield interest, unlike cash. As previously discussed, TDs have a major advantage over stablecoins in terms of their ability to preserve the role of commercial banks in credit and money creation in the economy, and their clear fit within the existing regulatory perimeter for commercial banks. Arguably, these characteristics also mitigate many of the risks to money creation associated with the introduction of retail CBDCs.

Nevertheless, given their implementation on potentially emerging and frontier technologies, TDs may potentially be subject to an additional degree of cybersecurity risk, such as hacking and fraud, which are not associated to the same extent or manifesting in the same ways with respect to traditional deposits. If TDs become widely used, then such risks, should they crystallise, may impact financial stability. It should be noted however, that most jurisdictions impose extremely stringent requirements on commercial banks with respect to operational resilience, security, and cyberattacks.

#### 5.2. Effects on AML/KYC

In line with the requirements associated with current bank account opening processes, holders of TD wallets will be subject to AML / KYC checks at on-boarding, ongoing transaction monitoring, and regular sanctions screening. Nevertheless, the technology platforms leveraged for issuing and transacting with TDs may give rise to novel means of complying with such requirements in more effective ways.

DLTs allow for the creation of tamper-proof digital identities implementing emerging concepts such as Decentralized Identifiers (DIDs) and Verifiable Credentials (VCs). These can enable a secure and efficient means of verifying the identities and relevant attributes of parties involved in a transaction, streamlining the KYC process while protecting user data through the selective disclosure of only relevant and necessary information.

DLT-based infrastructures inherently create a transparent and verifiable record of all transactions, useful in transaction monitoring to identify patterns of money laundering and terrorist financing activities. Nodes on the network can also be configured for the continuous screening of addresses, which can improve the ability to identify and prevent illicit transactions before they occur.

#### 5.3. Privacy Implications

Privacy concerns and data protection are among the most critical factors in digital payments and have gained significant attention in the case of CBDCs (Tronnier et al., 2022; ECB, 2021). Proponents of CBDCs and DLT-based cryptocurrencies have

argued there are approaches for mitigating such concerns through technical solutions such as Zero-Knowledge Proofs (ZKP) for account-based CBDCs (Gross et al., 2021) and others described in a privacy overview authored by the Digital Euro Association (DEA, 2023).

Given that TDs could be envisaged as being used in business-to-business (B2B) scenarios (Bundesverband Deutscher Banken e. V., 2022, p.5), user privacy concerns may differ from those regarding CBDCs or cryptocurrencies. In the case of consumer end-users in the EU, data protection would in any case be ensured through the General Data Protection Regulation (GDPR). Privacy and personal data protection concerns on the part of end-users may potentially be perceived as being less critical than those associated with CBDCs or stablecoins, given their familiarity with commercial banks and the expectation that they comply with regulatory requirements and have well-established policies and procedures related to handling customers' personal data. Depending on how they are implemented and exchanged between consumers and businesses, TDs may give rise to additional privacy considerations from the perspectives of both customers and regulators.

#### 5.4. Central Bank Money Settlement for Tokenized Deposit Transfers

Throughout this paper, we have envisaged a model for tokenized deposits that largely maintains the established two-tier financial system, with banks creating and providing private money to their customers on one hand and central banks providing money to settle payments among these financial intermediaries on the other.

However, alternatives to this model do exist and each gives rise to additional implications and considerations. For example, in a model whereby TDs are structured as bearer instruments (which can be held in a third party wallet, for example), settlement with central bank money may not be possible if the deposit token is transferred to a recipient that is not a customer of a commercial bank or payment service provider. It should be noted that such bearer-based models have not yet been proposed by any commercial banks, or considered by regulators or standard-setting bodies (BIS, 2023).

Settlement can also become more complex in the case where a TD is transferred between a sender from the issuer bank and a receiver holding an account or wallet with another bank (GBIC, 2023). Collateralization of TDs with reserves held in escrow at the central bank could enable settlement of TD transfers via movements of these reserves rather than the TDs themselves.

Nevertheless, these special cases of TD transfer remain largely theoretical at present. Both the Swiss and Italian central banks have argued that payments in TDs must be settled in risk-free central bank money; otherwise, they could reintroduce levels of counterparty risk not seen since the term 'Herstatt risk' was coined in the 1970s (Maechler & Moser, 2023; Angelini, 2023). As previously discussed, wCBDCs have the potential to both complement TDs as well as unlocking their full potential, by enabling easier, cheaper and faster settlement - for example, by enabling settlement outside of existing RTGS hours in the absence of 24/7 real-time payments infrastructure.

#### 5.5. Comparative Impact on Banks

Successful implementation of TDs might not solely hinge on the size of a bank, but rather their technological readiness and strategic approach to implementation. Larger banks with a more substantial consumer base may be well-positioned to feed network effects that can spur adoption, while some smaller and challenger banks, agile and technologically adept, may be in an advantageous position to implement TDs swiftly.

Given the recent decrease in commercial bank deposits (Schroeder, 2023), TDs could be seen as a strategic opportunity for banks to provide additional value and retain or attract deposits. Specific benefits of TDs for these banks include portfolio diversification, real-time and 24/7 automated risk management, increased transaction transparency, and real-time settlement.

## 6. Conclusion

The past 15 years have brought significant innovation in the areas of payments and digital money. Nevertheless, commercial banks - and the role that they play in credit and money creation - remain a crucial component in the efficient allocation of resources in the economy and in the transmission of monetary policy.

TDs represent an innovative fusion of traditional banking activities and digital innovation. The process of tokenization allows an issuer not only to define the characteristics of a digital asset, but also to define the rules governing how it is transferred. DLT-based platforms that support TDs alongside other digital assets, such as tokenized securities and CBDCs, could be used to compose and construct complex financial transactions and instruments. TDs have the potential to streamline cross-border transactions, support atomic settlement of digitized assets, enable programmable payments, interoperate with decentralized applications, and fundamentally improve the end-user experience.

Notwithstanding these potential benefits, the implementation and widespread adoption of TDs will involve careful navigation through a range of challenges and considerations, including financial stability risks, compliance with AML, KYC, and CFT regulations, and data protection and privacy considerations. Furthermore, questions arise as to how CBDCs, stablecoins, TDs can complement each other and co-exist

together in an ecosystem of new forms of digital money, and how they will sit alongside existing payments infrastructures including faster payments systems.

The exploration of TDs highlights the evolving complexity of the digital financial landscape. As this field continues to progress, it is imperative that researchers, policymakers, and industry leaders work in concert to define, address and manage these challenges effectively, constructively and creatively, and to explore solutions through collaborative sandboxes and pilots. Collaborative engagements of this nature will help ensure that tokenized deposits can preserve, complement, and expand the current successful two-tier model of money creation and provision into a future digital economy.

## 7. Recommendations

- Leverage what has been learnt in the last 15 years of monetary innovations with cryptocurrencies, stablecoins and central bank digital currencies.
- Recognize that TDs built on programmable platforms have technological capabilities such as programmability, composability and conditionality that are not possible with traditional banking ledgers and legacy payment and settlement systems.
- Acknowledge that TDs are most likely among monetary innovations to maintain the legal, regulatory and prudential framework that has allowed commercial banks, as regulated deposit taking institutions, to support money creation, economic growth and the transmission of monetary policy, which are cornerstones of the long established two-tier money and financial framework.
- Ensure that the regulatory framework supports an outcome whereby TDs are able to complement and combine in practice with other regulated forms of money, such as CBDCs, stablecoins and e-money.
- Consider the use of wholesale CBDCs as a settlement asset for TD transactions between different commercial banks, ensuring that central bank money remains the monetary anchor and helping to overcome the potential legacy limitations of reserves and RTGS systems.
- Promote academic and theoretical discussions of TDs and of the risks and challenges, proceeding on to the development of sandboxes and pilots that can support identification of the technological, legal and financial prerequisites

that are essential in supporting successful adoption of TDs and realization of their potential benefits.

• Consider, from the outset, the need to develop international coordination on TDs given the potential opportunity to improve cross border transfers and securities settlement, among others.

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