Bank of Russia

TOKENISED DEPOSITS

Working paper

Moscow
2023

CONTENTS

The material was prepared by the Financial Market Strategy Department.
The reference to the Bank of Russia is mandatory if you intend to use this paper.

Cover photo: Shutterstock/FOTODOM
12 Neglinnaya Street, Moscow, 107016
Bank of Russia website: www.cbr.ru

INTRODUCTION

The Bank of Russia continues to publish documents on various aspects of application of financial market innovations[1] and presents a paper on current debates on the tokenisation of cashless money in commercial bank accounts.

The digitalisation of the economy and the rapid development of technologies and ecosystems can significantly change the general landscape of the financial market. In these settings, the use of the tokenisation technology is one of the issues requiring in-depth study and discussion.

Like any innovation process, the use of the tokenisation technology in the financial sphere needs thorough research in order to prevent any uncontrolled use of technologies which may cause excessive risks to public interests, on the one hand, and to unleash the creative potential of innovative solutions, on the other hand. This concerns both the tokenisation of a broad range of assets and claims and a relatively new discussion point – the application of tokenisation to commercial bank money.

This paper presents for discussion the outcomes of monitoring of the current international debate on tokenised commercial bank money, commonly used as tokenised deposits (hereinafter, TDs). The worldwide discussion of this topic is at the nascent stage unlike, for example, the issues of design and implementation of central bank digital currencies (CBDCs) which have been studied and piloted by regulators in different countries for several years already.

Because of the novelty of this phenomenon there does not yet exist a common terminology, and international sources contain different definitions of TDs. However, in general, they largely mean cashless money in bank accounts, which is accounted for and circulated using the tokenisation technology.

The paper clarifies the meaning of TD based on international debates in terms of their economic content, and also looks into their potential benefits and risks. Attention is also given to possible tokenisation models analysed in various sources to be applied to TD, and also to regulatory approaches to be used in the course of TD implementation.

It should be noted that as of now, there are still quite a few open issues and the global discussion is at the nascent stage. That said, available publications and commentaries on this issue evidence the existence of various opinions and divergences regarding TDs which are mainly associated with the maturity of payments and settlements, plans to implement central bank digital currencies in various jurisdictions and other national factors. Assessments of the feasibility of TD implementation will broadly depend on the above factors.

Today, discussions of TD issues show that the technology of cashless money tokenisation explored in this paper may have the biggest potential in those countries where payment and settlement innovations have not yet become widespread as regards the accessibility of various digital and online services to households and businesses in a 24/ 7 mode.

However, it is worth noting that TD development prospects broadly depend on market participants' needs and business strategies, which may be additionally facilitated by regulators through adjusting regulation and mitigating possible risks.

The focus should be on the further evolution of the TD discussion of both the tokenisation of cashless funds and a broader range of issues concerning the application of smart contract technologies and tokenisation in general in the financial sector.

[1] Earlier, the Bank of Russia published a series of papers on the development of modern digital financial innovations, namely consultation papers A Digital Ruble, Cryptocurrencies: Trends, Risks, and Regulation, Development of the Digital Asset Market in the Russian Federation, and an analytical paper Decentralised Finance.

It should be noted that this paper does not aim to cover all these issues, the focus of its attention being on a concrete phenomenon, that is the tokenisation of commercial bank money. Other topics related to the implementation of financial market innovations, including those based on smart contracts and the tokenisation of assets will be explored in the forthcoming papers of the Bank of Russia.

KEY POINTS

1. Currently, there is **an ever-growing global discussion of the potential application of digital technologies, including tokenisation and smart contracts,** to cashless money in commercial bank accounts. Since cashless funds held in banks constitute most of money supply and are used to make the bulk of payments and settlements in the economy, the application of such technologies deserve special attention and further study in terms of the trade-off between benefits and costs, and opportunities and risks for financial organisations, consumers and the general public.

2. **TD issues are characterised by a low degree of study and testing**. There is considerably less independent research into the subject of tokenisation of commercial bank money than of CBDCs and the tokenisation of financial assets. At the same time, all over the world, the traditional financial industry represented by major banks **has been testing the potential for installing various elements of tokenisation** into business processes for some time already. However, it is precisely the tokenisation of commercial bank money that is chiefly at the initial stage of professional discussion both among financial intermediaries and their associations, and also experts, international organisations and most regulators. At the present moment, it is evident that single approaches to these issues have not so far been elaborated and there are many divergences to be overcome.

3. Due to the novelty of the TDs phenomenon, it lacks a common terminology. In international sources, one can come across various definitions of TDs. However, in terms of the economic meaning, it is most often understood as **cashless money in bank accounts, which is accounted for and circulated using the tokenisation technology**. It should be noted that in the framework of this paper, the tokenisation of cashless funds does not imply the issuance by commercial banks of their own private means or instruments of payment, stablecoins, coupons, bonuses or other assets, which may be linked to and secured by the national currency, and have their own variable value. Still, certain sources consider instances of issuance and circulation in banking systems of tokens representing claims on funds denominated in national or foreign currencies held in accounts, which in essence is close to the notion of stablecoins.

4. As a new way of cashless money accounting and circulation, the tokenisation of cashless money in bank accounts is not expected to change its characteristics and **influence the economic properties of money, as TDs remain the same fiat cashless funds** and circulate within the regulated area, though they imply the existence of a new underlying technology. Importantly, in terms of their economic properties, **TDs still are cashless money, which is accounted for using the new underlying technology, so they are supposed to perform all the functions of money and be freely exchanged for cash and, in the future, for CBDCs**. Therefore, given their economic essence, TDs represent the same cashless funds held in accounts for clients, and it does not matter what type of technology banks use to account them. Moreover, in the process of money circulation, the tokenised funds may be converted into the conventional format of account entries without direct involvement of bank clients.

5. 5. The current international discussion includes the testing of a hypothesis that the tokenisation of commercial bank money could bring **additional capabilities to existing cashless settlement systems and future CBDCs, fostering the development of cutting-edge money circulation technologies**. It is noted that the feasibility and format of the possible TD implementation may depend both on the maturity of the national payment system and, in general, on **the plans of and approaches to the CBDC implementation project**, its scope, and the functionality of proposed solutions. In view of the above, discussions are underway to see into the potential effects of the TD use, as well as the promising areas of interaction between TDs and CBDCs. These are discussion points requiring additional verification and testing in practice.

6. In terms of architecture, approaches to the TDs platform arrangement are not unique and are considered in the context of the tokenisation phenomenon as a whole. Specifically, modern literature on this topic considers three possible basic tokenisation models:

– **A model of separate platforms** (one platform per credit institution/ group of credit institutions), referred to as Model 1 in the paper. This model assumes that tokenisation may be used within the bank internal environment, being in essence an organisational model used to record funds in accounts (as funds are currently accounted for in automated banking systems (ABS) and to ensure transactions across accounts. In this case, **the bank platform may have tokenised assets and smart contracts interacting therewith**, whereas interaction between various platforms may be executed through special protocols, i.e. bridges;

– **A model of a common platform**, credit institutions are connected to. This setup assumes that the common platform may support automated payments and interbank relations of credit institutions using smart contracts. The existing publications consider different options of a possible institutional implementation of this model, where the platform may be hosted by a consortium of banks or a regulator (referred to as Model 2 and Model 3 in the paper, respectively).

The three mentioned models may have both advantages and limitations in terms of the potential for the development of innovations and competition between participants. The issues of feasibility and advantages of the further development of models remain open, depending in part on the specifics of financial market evolution in a particular country. It should also be noted that in practice, TDs may be implemented using a combination of the specified models.

7. Another institutional and infrastructural issue which is actively debated is the possibility to converge TD platforms with other platforms, issuing tokenised assets and rights and CBDCs, in a single software environment. The interoperability of various platforms may be ensured through application programming interfaces (APIs) or the creation of a common universal platform.

8. Participants in international discussions also outline potential opportunities and limitations, and risks of the tokenisation of commercial bank money.

They specifically argue that the use of modern TD technologies can create opportunities to **speed up and simplify transactions, and potentially reduce their cost**, in part due to the increased automation of transactions, which will enable banks' competition at a new technological level. The automation of transactions may potentially allow users to control their funds more effectively and programme the conditions of transactions and settlements using smart contracts. Interestingly, smart contract practices have been actively developing on the basis of conventional bank technologies designed for accounting funds in bank accounts. Moreover, the advancement of TDs is considered to be able to enhance the potential and efficiency of the application of smart contracts in transactions with both tokenised financial and non-financial assets.

Meanwhile, it is assumed that the potential demand for TDs in certain jurisdictions hinges on how well the existing level of the cashless payments' development meets client needs, the prospects for the use of CBDCs, as well as the opportunities to circulate cryptocurrencies and stablecoins (if they are legalised in a particular jurisdiction).

Due to their potential advantages, TDs are a relatively complicated technological phenomenon. The practical implementation of TDs, especially in case of Models 2 and 3, **will require additional costs incurred by market participants, and measures to manage emerging risks and support competition**. TD-driven risks can be divided into general ones, for example, risks associated with the protection of competition, consumer rights, AML/ CFT/ CFPWMD and those related to the use of digital technologies in the financial sector (information security and data management risks, risks of non-performing smart contracts, etc.). Besides, while considering the use of the distributed ledger technology and blockchain to tokenise deposits, it is important to take into account that the processing power of these technologies is limited in terms of speed at present.

9. Once TDs are implemented, they **may influence the pace of money circulation and the monetary policy transmission mechanism**, since the application of latest technologies and smart contracts in

the monetary sphere is reflected in the ways of payment and transaction execution in the economy. Central banks may factor in all these effects in their economic projections for the purposes of monetary policy decision-making, as well as in the framework of monetary policy operational mechanisms related to the management of banking sector liquidity. The TD adoption is not expected to exert any material influence on the financial stability, given that information security risks associated with the applied technologies are properly monitored.

It is now discussed that in terms of credit institutions' resilience, banks using TDs may be subject to **the same financial stability and soundness ratios and requirements**, given that TDs remain the same cashless funds, with the only difference that they are accounted for with the help of new technologies. It is also noted that if TDs rely on another underlying technology, it **may call for the introduction of additional technical requirements** to ensure stability, seamless and uninterrupted payments, the free movement of clients, an efficient data management, consumer protection, and information security.

10. As TDs are only a form to account cashless funds, no considerable regulatory changes are expected to be needed to define their legal regime, if deemed feasible. At the same time, the degree of, and need for, the clarification of specific regulatory provisions depend on legal norms that are in place in various countries. All else equal, the TD implementation on a common platform may generally require greater legal changes.

11. To ensure the appropriate level of reliability and security of financial transactions using tokenisation it is also crucial to facilitate **the proper operation of smart contracts**. To do so, it appears necessary to assess the feasibility of introducing specific requirements for smart contracts and responsibility distribution for their operation.

12. Thus, various aspects and optimal formats of the TDs implementation (including advantages and risks currently discussed by market participants, international organisations and regulators worldwide) call for in-depth examination and analysis.

13. In particular, current TD debates show that the tokenisation of deposits analysed in this paper may have the biggest potential in those countries where innovations in payments and settlements have not yet become widespread as regards the accessibility of various digital and online services in a 24/ 7 mode to households and businesses. Additional effects of the TD implementation may be less evident in Russia given its high level of payment and settlement digitalisation, the active development of the Faster Payments System (SBP) and the implementation of the digital ruble project. However, considering the rapid development of technology and interrelations between the Russian financial market and the global economy, it is essential to explore and assess TDs further, including various aspects of the international debate.

It is worth noting that, in general, the TDs development prospects largely depend on the needs and business strategies of market participants. Regulators may create additional conditions for this process by adjusting regulatory framework and mitigating possible risks.

14. Further out, the Bank of Russia will continue to monitor and discuss with the general public most pressing issues related to the application of innovations in the financial market. That said, this paper does not seek to highlight all issues related to the active spreading of tokenisation, blockchain, smart contracts, but focuses on a specific phenomenon, that is, the tokenisation of deposits. Other issues, including the application of smart contracts and the tokenisation of financial assets, will be covered by forthcoming Bank of Russia publications as part of this series.

1. TOKENISED DEPOSITS: BACKGROUND FOR DISCUSSIONS AND CONCEPT

1.1. Background for TD discussions

In the modern economy, national currencies circulate in two forms: cash issued by central banks and cashless funds, i.e. funds in the form of entries in accounts with commercial and central banks. Commercial banks have accounts with central banks (correspondent accounts), which are used for settlements between banks, and also between banks and the central bank.[1]

Today, many central banks explore the subject of issuing national currencies in a digital form. CBDC projects differ from country to country depending on underlying models.[2] As a rule, the issuance of CBDCs is supposed to be in the form of a special digital code or a digital record on the central bank's platform, where e-wallets are opened for users to transfer funds between them (the range of users is determined by the model selected).

In this situation, as various countries set out to elaborate projects and explore the options to issue CBDCs, both market participants and experts, and international organisations and regulators start to discuss the potential of using cutting-edge digital technologies in relation to commercial bank money increasingly more often.

The number of special studies of tokenised commercial bank deposits[3] is by far smaller than of CBDCs[4] and the tokenisation of financial assets. As a rule, these are articles or chapters from various papers on the money revolution and the new era of finance, where the tokenisation of deposits is explored among other phenomena and viewed as an alternative to secured stablecoins or a supplement to CBDCs.[5]

In general, when speaking about tokenised means of payment, representatives of foreign regulators[6] single out three areas of interest: national CBDCs, TDs and stablecoins. Against this background, tokenised funds in commercial banks (various sources also often use the term 'tokenised bank deposits') are considered as an optimal and less complicated variant in terms of regulation and singleness, compared to bank and non-bank stablecoins, including due to the possibility to control intermediaries and mechanisms to protect clients, for example, through deposit insurance programmes.[7]

---

[1] In Russia, funds in accounts with the Bank of Russia are also held by the Federal Treasury and a few economic agents due to the specific nature of their activity. More information about the modern forms of money and the evolution of its role and forms is available in the Bank of Russia's consultation paper A Digital Ruble (Boxes 1–3).

[2] Countries, exploring/ testing the option of issuing CBDCs, consider both a retail model, which assumes that the central bank digital currency will be available to a broad range of users, i.e. households and businesses (this model prevails), and wholesale models, under which central bank digital currencies circulate between financial institutions.

[3] Finance&Development (September 2022).

[4] CBDC projects have already been piloted in China, are being approved in South Korea and Sweden, and are being explored in the US, Canada, the euro area, Denmark, Switzerland, Iceland, and the UK.

[5] Tony McLaughlin. The Digital Money Format War; Jon Cunliffe, Bank of England (2023). The shape of things to come: innovation in payments and money; BIS (2022). Annual Economic Report. III. The future monetary system.

[6] Jon Cunliffe, Bank of England (2023). The shape of things to come: innovation in payments and money; BIS (2022). Annual Economic Report. III. The future monetary system.

[7] New York Fed (2022). R. Garratt, M. Lee, A. Martin, and J. Torregrossa. The Future of Payments Is Not Stablecoins.

Box 1. The Regulated Liability Network concept

In 2022, The regulated liability network: digital sovereign currency 2022 (RLN) concept elaborated by a group of financial market participants (representatives of SWIFT, BNY Mellon, HSBC, Lloyds Bank, Wells Fargo, City, TD Bank, etc.) explored the design of a network operating on the basis of distributed ledger technology and intended to effect settlements between financial institutions using regulated tokenised liabilities (for example, deposits).

Describing an 'always on' programmable infrastructure, the RLN concept explores the conjunction of shared ledger technology and the sovereign currency system and offers potential for a new global regulated settlement infrastructure.

Between November 2022 and July 2023, market participants and the Federal Reserve Bank of New York tested the feasibility of using distributed ledger technology to enhance financial services and to analyse technical and functional aspects of the design of such a system.

As part of this research, the working group elaborated a distributed ledger-based network in a test environment to perform settlements between financial institutions using tokenised liabilities of regulated commercial banks and the central bank.

Two use cases were considered:

- *Domestic interbank payments*. Researchers simulated wholesale payments between commercial banks to prove the functionality of a hypothetical payment system. Transactions were denominated in tokenised money of commercial banks and were settled using a hypothetical wholesale central bank digital currency.
- *Cross-border payments in US dollars*. Researchers explored schemes of wholesale payments outside the US to assess the potential of the concept and enhance the experience of using US dollars as an international trade and settlement currency.

Key conclusions:[1]

- *Business aspect*. The concept has the potential to deliver improvements in the processing of wholesale payments due to its ability to synchronise US dollar-denominated payments and facilitate settlements on a near-real time, 24 hours a day, 7 days a week basis.
- *Legal aspect*. The use of shared ledger technology, including tokens, to record and transfer ownership to CBDCs and TDs should not change the legal treatment of such deposits. Final conclusions will require further analysis, however, researchers have not identified any insuperable legal impediments under existing US legal frameworks that would prevent the establishment of an RLN system as contemplated in the concept, especially in case of the technological neutrality of legal instruments.
- Technical aspect. The proposed architecture is able to arrange CBDCs and TDs movements between participants through atomic settlements,[2] to deliver the benefits of settlement finality, a single source of truth, standard transactions, and privacy for all participants of the network.

[1] Detailed findings of the experiment are available at https://www.rlnuspoc.org/home#subpage/introduction/section/zh487

[2] Atomic settlements assume that the transfer and receipt (crediting) of funds constitute one and the same transaction. No transfer will occur in the absence of funds receipt (crediting).

This issue becomes ever more relevant in view of the increasingly wider spread of smart contracts operating as part of information systems in the financial industry and the use of tokenisation, which can materially improve payment and settlement mechanisms and take the automatic execution of embedded conditions of contracts and transactions to a new level. Thus, it is expected that the innovative underlying technology will raise the efficiency of smart contracts application, which have already been actively used on the basis of traditional deposit accounting technologies.

Testing tokenisation capabilities is a general trend, which is not limited to the tokenisation of deposits. Various countries are actively developing the segment of digital assets and claims, which generally facilitates the penetration of tokenisation technologies into the economy and financial industry. Various pilot projects are already emerging. Box 5 presents existing blockchain and smart contracts use cases by market participants.

As for the use of tokenised deposits, such options are being considered increasingly more often worldwide. Work is underway to study the prospects for increasing the speed of payments and settlements using money held in bank accounts and the potential for using smart contracts, to

improve the quality of service and expand the range of services for households and businesses based on new technologies.

Concurrently, experts are discussing the need and necessity to clarify the regulation of the banking sector and money circulation in response to the further application of digital technologies to the circulation of funds held in bank accounts.

That said, the potential for using TDs in any jurisdiction depends on the maturity of cashless payments, CBDC implementation and development outlook, the frequency of using cryptocurrencies and stablecoins in settlements (in case they are legalised in some jurisdictions). For example, it is noted, that should CBDCs are introduced, banks will be able to tokenise deposits in the framework of Model 1 described in Section 2 of this paper, by making interbank transfers denominated in CBDCs without the need to invest more money in the creation of additional common market solutions (Models 2 and 3).

Also, it is necessary to assess the trade-off between the opportunities, benefits and costs of application of new technologies in this sphere and potential risks to the banking sector, bank clients, money circulation in general, certain aspects of macroeconomic policy, as well as the impact on competition.

All these issues deserve attention and further exploration, given that bank deposits represent the bulk of money supply and are used to make the bigger portion of payments and settlements in the economy today.

1.2. The TD concept

Banks may use various technological means to account cashless money, however, all these do not change the economic essence of this money. At the same time, technologies possess their own potential benefits and related risks, which will be detailed in Section 3.

Due to the novelty of the TD phenomenon, it lacks a common terminology. In international sources, one can come across various definitions. However, in terms of the economic meaning, TDs are most often understood as **commercial bank money accounted for and circulated using the tokenisation technology**. As for commercial bank money, it may be referred to as 'tokenised money' in this paper. Moreover, in various sources, different combinations of words stand for TDs – from 'tokenised deposits' to 'programmable money' (one of such use cases is given in Box 2). In terms of the economic sense of this phenomenon, tokenisation is assumed to govern the accounting and circulation of commercial bank money. Experts are also exploring models of tokenisation providing for the locking of funds and the issue of a specific token for them. However, such tokenised funds are essentially close to stablecoins and are out of the scope of this paper.

Box 2. The deposit token concept presented in the paper by the Swiss Bankers Association

While discussing the digital transformation of payments in its paper,[1] the Swiss Bankers Association (SBA) introduces its own concept of the 'Deposit Token' (DT), which is programmable money.

According to the DT concept proposed by the SBA, the DT is a token issued by properly regulated and supervised institutions in order to preserve financial stability and ensure investor protection.

Concurrently, the DT will be a digital form of the Swiss franc based on the public blockchain technology that can be enhanced with programmable functions.

The document outlines three DT use cases:

1) The DT as the cash leg for digital asset transactions;
2) The DT as a vehicle for 'payments of the future' and a catalyst for further innovation;
3) The DT as a means of payment in the new DLT-based financial ecosystem.

[1] Swiss Bankers Association (2023). The Deposit Token.

It is worth noting that tokenisation and the use of DLT are also considered with regard to financial instruments and financial and real assets. In this case, tokenisation is often viewed as the creation in modern IT systems of a digital representation of rights to a certain asset (for example, a security, a work of art, and real estate). The Bank of Russia plans to analyse the current debates on these issues in its future papers.

Thus, the outcomes of today's discussions brings us to the conclusion that the **the tokenisation of commercial bank money is another technological framework to record and circulate cashless money**. Money in commercial bank accounts is in a non-cash form, and its tokenisation only implies the potential for processing it using modern technologies. In particular, this approach is considered by the Bank for International Settlements, which defines tokenised deposits as the representation of bank deposits on a programmable platform as claims on commercial banks.[8]

In this regard, in terms of economic essence, it does not matter for bank clients in what form and on what technological platform banks record monetary funds in their systems; for households and businesses, it is important that banks perform their obligations in full and ensure a high level and quality of services.

The possibility of free and equal exchange of one national currency unit for another irrespective of their forms and underlying technologies ensures the universal nature and the singleness of money.

In view of the above, modern authors stress that commercial bank money perform all the functions of money, namely to be a means of circulation (payment), a measure and a store of value along with cash and CBDCs, in the future, irrespective of the form of its accounting.

COMPARISON OF MONEY CHARACTERISTICS *Table 1*

		Money issued by a central bank		Money recorded in bank accounts*	
Form		Cash currency	Central bank digital currency	Conventional cashless funds in accounts	TDs
Issuer		Central bank	Central bank	Account-holding bank	Account-holding bank
Organisational and technical characteristics					
Carrier		Protected note/ coin	A digital record or a digital code on the regulator's information platform	A digital record in the bank data base	A digital code on the information platform of a bank or an independent operator
Place of storage		Wallet/ bank safe deposit box	Account	Account	Account
Personalisation		Bearer	Personalised	Personalised	Personalised
Interoperability with smart contracts		–	✓	✓ (depends on the interoperability of various platforms)	✓
Economic characteristics					
Means of payment	**online**	–	✓	✓	✓
	offline	✓	– (undergoing various stages of discussion and design)	–	–
Stability of value		✓	✓	✓	✓
Measure of value		✓	✓	✓	✓
Store of value		Interest-free	Interest-free	Interest-bearing	Interest-bearing

** Being a special case, the depositing of funds in accounts with the central bank is not considered in this paper.*

[8] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

At the current stage, experts argue that, in absence of any new economic essence, tokenised deposits may still become an element of the further development of money circulation technologies,[9] thereby expanding the potential for the use and subsequent improvement of cutting-edge financial innovations in the financial sector and the economy, creating new opportunities for economic agents, including in the area of automation of financial transactions under smart contracts (see Section 3 for more details).

At present, the world practice lacks a comprehensive description of the circulation of tokenised money. Researchers are looking into various aspects of a potential system, such as token backing (liquidity locked), issuers' role, approaches to accounting (native/ non-native tokens).

Available sources abound in speculations about the 'programmable money' concept. **It is worth noting that the point is to facilitate the programmability or automation of the terms of transactions and payments rather than monetary units**, which may be accounted for by banks through tokenisation tools. These terms of transactions are recorded in a digital system and are further applied to tokenised deposits. It is also important that, similar to CBDCs, the use of the TDs, which may be deployed using several different options, does not influence the properties of monetary units. Currently available sources do not yet describe in details the types of tokens to be used for the tokenisation of money. Such tokens may include fungible tokens (without an identifier) and non-fungible ones (with an identifier). To draw an analogy, we can mention existing cash: banknotes possess unique numbers, whereas coins do not, but both banknotes and coins are equal means of payment.

In other words, the economic meaning of the programming of transaction and payment terms reproduces the existing possibilities of establishing conditions for the automated execution of new operations and monitoring of executed ones, including transactions with commercial bank money (for example, banking support for public procurement contracts, securitisation of car loans).

In general, in terms of economic content, smart contracts may be used with various types of money: traditional cashless funds in the form of records in accounts, projected CBDCs or the TDs discussed.

Contractual terms may be recorded on paper or electronically, specifying the amount of money, to which this contract refers. However, unlike contracts existing in digital environment, where their execution can be launched automatically, the performance of the terms of contracts executed on paper or in a conventional electronic form requires additional actions from parties to the contract or intermediaries serving them. In this case, smart contracts do not constitute a global novation. The existing systems of cashless settlements are already using them partially. More information about the possible application of smart contracts in the digital environment is available in Section 3 (Box 7).

The use of TDs calls for corresponding technological and legal frameworks and conditions so that cashless funds recorded on a new technological platform perform the functions of money. For this purpose, TDs as cashless funds must perform the function of a universal equivalent and possess the properties of 'absolute' liquidity. This may be achieved, if TDs do not possess any initial unique features and may be quickly exchanged on a 1:1 basis for cash and for CBDCs in the future, irrespective of underlying accounting principles.

It should be specifically noted that the tokenisation of deposits does not imply the issuance by commercial banks of their private means or instruments of payment, stablecoins, coupons, bonuses or other assets, which may be linked to and secured by the fiat currency and have their own variable exchange rate. See Boxes 3 and 4 for more detailed information on the place of TDs in the financial asset typology, and also why TDs are not stablecoins, that are much discussed in this context. By their inherent properties, TDs and stablecoins are radically different instruments.

[9] BIS (2022). Annual Economic Report. III. The future monetary system.

The non-expediency to implement the 'private individual money' model, which is essentially similar to existing stablecoins, is particularly stressed in BIS publications.[10] The authors note that TDs, which are denominated in central bank money and are not bearer instruments, are conducive to the singleness of money without doing any damage to the functionality of payments programmed using smart contracts, compared to stablecoins.

As opposed, for example, to private stablecoins, the systemic trust in TDs may be ensured thanks to the fiat nature of commercial bank money.[11] This means that all cashless funds, recorded using traditional or new technological means, are supposed to be universal/ interoperable from the economic point of view, with their reliability to be based on the regulation by the central bank and trust in the regulator (though TDs, being cashless money, are liabilities of a specific bank).

Thus, TDs are not essentially a new product, but are a technological evolution of existing commercial bank money, as in fact, they are only a digital representation of commercial bank money within new types of information systems.[12]

That said, it is necessary to take into account the fact that the potential for using TDs in specific jurisdictions depends on the maturity of cashless payments, CBDC implementation and development outlook,[13] and the use of cryptocurrencies and stablecoins in settlements (in case they are legalised in relevant jurisdictions). For example, in 2022, Japan made a decision to introduce TDs simultaneously with the decision to adopt regulation on special payment stablecoins, which may be issued by payment system operators. The discussion of TD implementation in Singapore and Hong Kong proceeded along the same lines.[14]

The tokenisation of deposits analysed in this paper may have the biggest potential in those countries where innovations in payments and settlements have not yet become widespread as regards the accessibility of various digital and online services in a 24/ 7 mode to households and businesses. However, in Russia, given the high level of digitalisation of payments and settlements, the active development of the Faster Payments System (SBP), and the implementation of the digital ruble project, additional effects of the TD adoption may be less evident and require further assessment and exploration.

[10] BIS (2023). R. Garratt, H.S. Shin. Stablecoins versus tokenised deposits: implications for the singleness of money.

[11] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

[12] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

[13] In particular, in the paper BIS (2023). Annual Economic Report. III. 'Blueprint for the future monetary system: improving the old, enabling the new', researchers assess wholesale CBDCs as a more appropriate form to introduce tokenised deposits.

[14] Payment Services Act of Japan, discussion outcomes of the consultation paper of the Monetary Authority of Singapore (MAS) and Conclusion of Discussion Paper on Crypto-assets and Stablecoins of Hong Kong Monetary Authority (HKMA).

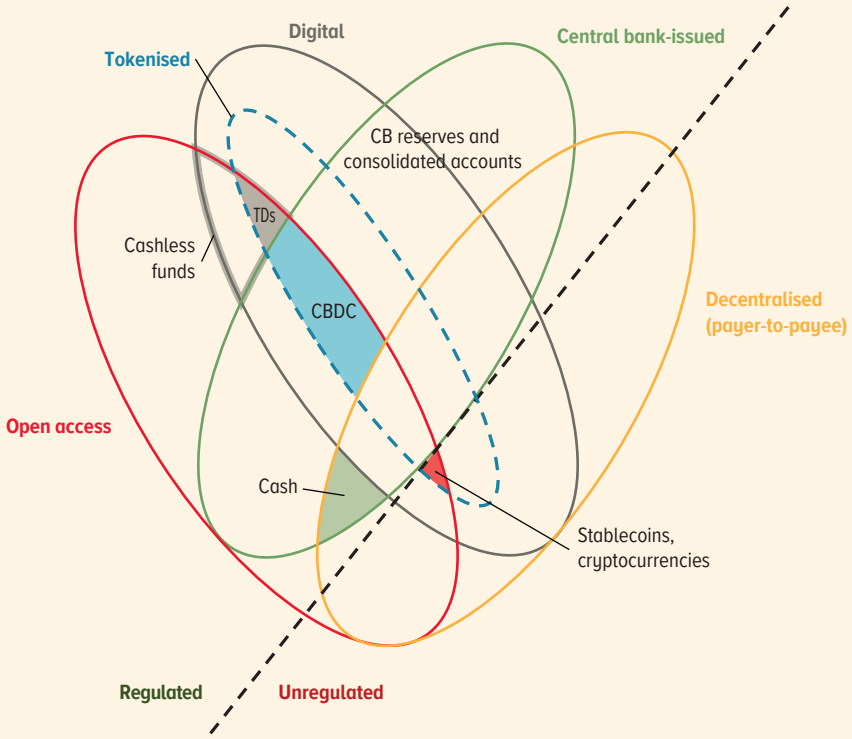
Box 3. TDs in the taxonomy of financial assets

The 'money flow' diagram (see the Chart) presents various types of liquid financial assets. In particular, this classification shows that the emergence of new tokenisation technologies expands the forms of commercial bank money accounting. The diagram also shows other assets, which are outside the regulated perimeter and are not money, as they cannot be used as means of payment. This is an updated classification of liquid financial assets presented by Bech and Garratt (2017)[1] and in the consultation paper 'A Digital Ruble'.[2]

The 'money flower' taxonomy is based on accessibility (the possibility of use by individuals), form (digital, including tokenised, or physical), issuer (central bank or private issuers), transfer mechanism (centralised or decentralised), and the scope of regulation (regulated money and unregulated quasi cash).

According to the updated taxonomy, TDs are classified as both banks deposits and 'tokenised' form of funds (sub-set of digital assets).

THE 'MONEY FLOWER' OF FINANCIAL ASSETS



[1] Bech M. and Garratt R. (2017). Central bank cryptocurrencies. BIS Quarterly review.

[2] Bank of Russia (2020). Consultation paper 'A Digital Ruble'.

Box 4. Why TDs are not private money

Given the corresponding legal and regulatory requirements for the use of tokenised deposits by banks are satisfied, TDs are universal units of a national currency. In this situation, it becomes necessary to rule out a mere chance that TDs might be positioned or viewed by banks as private payment instruments or private means of payment.

In the classical understanding, *private payment instruments* may include, for example, promissory notes with no maturity dates issued by banks, which means that, when issuing them, banks act as private individuals, who commit to pay a certain amount of money. According to applicable legislation, coupons,

bonuses, and various 'bonus currencies' are not a universal legal tender in most countries, as their utilitarian and economic value is limited to the platforms and ecosystems of their circulation, and they cannot be used to pay for goods, works and services all over the territory of any given country.

Certain sources consider instances of issuance and circulation in banking systems of tokens representing claims on deposits denominated in the national or a foreign currency, which is close to the notion of stablecoins.

Stablecoins are a collective concept and do not possess any common well-established definition.[1] Backed stablecoins are digital assets that aim to maintain a stable value which is linked to that of another asset (fiat currency, precious metals, etc.) or a basket of various assets. Most existing stablecoins are linked to fiat currencies. There are also non-backed (algorithmic) stablecoins, the issuance and supply of which are regulated by automatic and programmable mechanisms (a specific issuer may be absent). However, it is not entirely correct to compare them with TDs, as the holders of algorithmic stablecoins do not have the right of claim on their issuers.

As opposed to stablecoins,[2] TDs are always created by banks, the stability of which is maintained by the existing regulation and supervision. The TD issuance and circulation is assumed to be regulated predominantly by existing requirements, which are currently used to regulate the circulation of cashless funds in banks in the form of account entries. This also brings us to the conclusion that, unlike stablecoins, the TD issuance does not require the preliminary allocation and locking of liquidity in a special pool (several authors note that some banks may issue tokens backed by liquid assets, however, such tokenised assets are close to stablecoins by nature and fall outside the scope of this paper). Concurrently, TDs may be insured like ordinary deposits.

TDs can be viewed as money with universal properties and, in this case, should be legal tender which is accepted at face value, liquid and freely exchangeable, including, for cash and CBDCs, once they are adopted.

COMPARISON OF KEY CHARACTERISTICS OF STABLECOINS AND TDS

N°	Characteristic	Stablecoins	TDs
1	Issuer	Financial and non-financial organisations	Commercial banks
2	Liquidity locking	Needed (collateral/ reserves)	Not needed (secured by assets of the issuing bank)*
3	Insurance coverage	Not specified	Within the limits of the deposit insurance system
4	Monetary unit	No (quasi cash)	Yes
5	Means of payment	Subject to applicable legislation	Yes
6	Exchange for cash and CBDCs	Not guaranteed	Exchange for cash and CBDCs (once they are adopted) on a 1:1 basis
7	Settlement speed	Instantaneous within one system Depends on a technology in case of interbank settlements	Instantaneous inside a bank Depends on a technology in case of interbank transfers
8	Interest accrual to the holder	Depends on a regulation (for example, explicitly prohibited in the euro area for stablecoins linked to a fiat currency)	May be offered (similar to deposits)

** Experts also discuss tokenisation models involving blocking cashless funds and issuing separate tokens to match the blocked funds. However, such tokenised funds are close by their essence to stablecoins and fall out of the scope of this paper.*

[1] FSB (2023). High level Recommendations for the Regulation, Supervision and Oversight of Global Stablecoin Arrangements: Final report.

[2] See also BIS (2023). R. Garratt, H.S. Shin. Stablecoins versus tokenised deposits: implications for the singleness of money.

Box 5. Tokenisation use cases in market participants' payment-related activities

The conventional financial industry represented by major Western banks has been testing the potential for embedding tokenisation into business processes for some time already. The use of these technologies in payments is viewed by them as one of the ways to improve the efficiency of customer services. According to the Bank of America, tokenisation may transform financial and non-financial infrastructure, as well as financial markets over the next 5–15 years.

Nonetheless, there are several infrastructure projects based on the new underlying technology, for example, blockchain-based Onyx platform created by J.P. Morgan for wholesale payments. The JPM Coin, a product solution operating on the platform, is a payment rail and deposit account ledger, that allows participating J.P. Morgan clients to transfer US dollars within the ecosystem of the bank. The system has the capability to support advance payment types like Delivery versus Payment (DvP), Payment versus Payment (PvP) and machine-to-machine payments, and to help solve common hurdles of traditional cross-border payments.

Despite the fact that the JPM Coin is often referred to as a stablecoin by media, according to its creators, it does not fall under this concept and is defined as a 'deposit token'. At present, the Onyx page defines the JPM Coin as programmable money. However, given its other characteristics, it is actually tokenised deposits:

- The JPM Coin is not a cryptocurrency, by its essence, it is closer to a certificate of deposit with additional properties enhanced by new technologies;
- JPM Coins certify rights to the funds deposited in accounts insured by the Federal Deposit Insurance Corporation (it insures corporate accounts to an amount of $250,000);
- Only large corporate clients of a bank may use the JPM Coin; to do this, they are to obtain a special permission.

In January 2022, the Central Bank of Bahrain announced the successful completion of the test with the JPM Coin. Bank ABC, a commercial bank based in Bahrain, and its customer Aluminium Bahrain (ALBA) used a blockchain system to initiate real-time payments denominated in US dollars to benefit ALBA's counterparties in the United States, also holding bank accounts with J.P. Morgan.

Concurrently with its own project, in April 2021, J.P. Morgan, together with DBS Bank and Temasek investment company informed about the Partior platform project, mainly focused on leveraging blockchain technology and digitalising commercial bank money (M1) to reduce current costs of cross-border payments, trade transactions and foreign exchange settlements. The Partior platform is also aimed at developing wholesale payments rails to enable 'atomic' or instantaneous settlements of payments under various types of financial transactions.

Another example of a pilot is the Project Guardian, which aims to study the potential and use cases of decentralised finance (DeFi) in wholesale funding markets. In the framework of the project, DBS Bank (Singapore), J.P. Morgan (the US) and SBI Digital Asset Holdings (Japan) conducted transactions with foreign exchange and sovereign bonds using liquidity pools consisting of tokenised government securities of Singapore and Japan, as well as the Japanese yen and Singapore dollar. The parties successfully conducted a live cross-currency trade using tokenised deposits denominated in the Japanese yen and Singapore dollar, as well as simulated buy/ sell transactions with tokenised government bonds. The pilot outcomes confirmed that cross-currency transactions with tokenised assets could be conducted instantaneously and directly between parties, eliminating the costs associated with involving clearing and settlement intermediaries, as well as managing bilateral trade relations between counterparties.

2. TOKENISATION ARCHITECTURE APPROACHES

According to current debate, in terms of architecture, tokenisation models differ depending on credit institutions' needs, market participants' interaction rules, the number of platforms, and the roles of regulators.[1] The discussion of this issue has just started. Globally, there are only individual pilot projects implemented by market participants. However, there is a general consensus that the role of regulators should be primarily considered in light of their financial stability objectives, regulatory and supervisory functions.

Given the new underlying technology, various sources treat tokenised commercial bank money as fiat money that circulates within a regulated area. The format of the potential TD implementation in a country may largely depend on the development of relevant CBDC adoption projects, their scope, and the functionality of proposed solutions, which will provide incentives to market participants, primarily credit institutions, to develop innovations and their own payment and settlement projects. To this end, it appears necessary to explore and define the TDs' functional niche and prospective areas of the TD and CBDC interaction.

In addition, according to available studies, another crucial issue is the level of market participants' competencies and confidence in the tokenisation technology.

Speaking of architecture, approaches to platforms' arrangements are considered in the context of the tokenisation phenomenon as a whole. The architecture of the tokenisation of money is often considered in the same way as the tokenisation of assets.

Based on a few currently existing efforts to tokenise bank money in the world and tokenisation formats discussed by regulators and international organisations, there are two possible basic approaches to the tokenisation architecture that may be applied to TDs as well (interim/ combined solutions are also possible as competing options):

– **A model of separate platforms** (one platform per credit institution/ group of credit institutions). In this case, TDs will be a balance sheet entry of funds represented by the tokenisation technology,[2] which may give a bank an advantage in automating payments and transactions.

– **A model of a common platform** credit institutions are connected to.

Such systems are supposed to ensure a broad interoperability of smart contracts and support TD settlements on the platform. However, there needs to be a consensus regarding the elaboration of common rules and standards.[3]

The existing TD use cases at a bank or a banking group are mainly run in a test mode. A possible example is the USDF Consortium (including New York Community Bank, NBH Bank, FirstBank, Webster Bank, Synovus Bank, Figure Technologies Inc. and JAM FINTOP). The proposed concept addresses the problems of the composability of tokenised bank deposits (USDF), eliminates barriers in the financial system and unlocks financial possibilities of the tokenisation technology. As stated by the USDF Consortium, its strategy is aimed at creating new payment systems for consumers to make transactions on blockchain platforms and for banks to maintain their important role in the financial ecosystem.

Such initiatives may grow apart in the future and have no connection with other parts of the financial system. At the moment, these initiatives lack in proven approaches to the interaction with national digital currency platforms.

The success of the tokenisation rests on the confidence in fiat currency, which is based on the confidence in money issued by a central bank, and the ability to knit together key elements of a

[1] Further details on the transformation of the regulator's role following the implementation of TDs are presented in Section 5.

[2] Olywer Wyman (2022). Deposit Tokens. A foundation for Stable digital money.

[3] IMF (2023). Tobias Adrian, Tommaso Mancini Griffoli. The Rise of Payment and Contracting Platforms.

financial system.[4] Speaking of global prospects, community representatives[5] highlight the potential development of a common platform to ensure convertibility, to lower possible barriers and to potentially use such system as a basis for cross-border payments. A similar model of such platform is also considered by the Association of German banks.[6]

Nevertheless, as discussed below, the situation may give rise to competition issues and consequently be considered in light of the long-term competitive development of financial innovations.

In the context of infrastructure development, experts also discuss options to merge TD platforms with other platforms, issuing tokenised assets and rights and central bank digital currencies, in a single software environment, as well as the interoperability of various platforms or the creation of a common multipurpose platform. This aspect may be further explored in a separate study of the asset tokenisation.

2.1. Separate platforms (Model 1)

In Model 1, each credit institution is assumed to implement the tokenisation on its own, with no common platform to be created, i.e. credit institutions open accounts for their clients in their in-house information systems based on either their own or common market standards (compliant with the statutory requirements for opening and maintaining accounts).

Thus, Model 1 implies that tokenisation is implemented in the bank internal environment and serves as an organisational model for accounting funds and ensuring transactions across accounts. In this case, each TD platform may have tokenised money and related smart contracts. Various platforms are assumed to interact via bridges market participants may create/ use based on their business priorities. If interaction is multilateral (in case of multiple platforms) and there is a single interaction standard, such interaction may be arranged using Open Application Programming Interfaces (Open APIs).

It is assumed that funds will be transferred from banks in a traditional cashless form or potentially in the form of CBDCs rather than in a tokenised format. This will help ensure the singleness of money.

The key disadvantage of this model is that smart contracts will be limited to banks' platforms where they are created and executed. For instance, TD transfers may be atomic within one platform, while transfers from one platform to another will still bear a risk that a payment may be sent to but never received by a payee. Therefore, it appears difficult to ensure the interoperability of smart contracts from various platforms as it has been done in the digital asset market.

However, it is worth noting that it is irrelevant to a user which underlying technology a bank uses to record cashless money. Moreover, in the course of money circulation, tokenised funds may be converted into the conventional format of account entries without direct involvement of bank clients.

In fact, a bank should be able to choose the most efficient technological format of money accounting based on its customer service needs. In this respect, the cashless money circulation will remain seamless for bank clients after the adoption of TDs.

Based on the adoption method, the role of a regulator may differ from monitoring and giving possible guidance on how to create a single standard for setting up TDs in bank information systems, to embedding such standard in regulation.

---

[4] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

[5] The German Banking Industry Committee (2022). Working Paper on Commercial Bank Money Token. The opinions of representatives of SWIFT, BNY Mellon, HSBC, Lloyds Bank, Wells Fargo, Citi, TD Bank and other banks on The Regulated Liability Network: Digital Sovereign Currency 2022 concept are available on the project website.

[6] The German Banking Industry Committee (2022). Working Paper on Commercial Bank Money Token.

From an end-user perspective, this model has functionality to automate payments using smart contracts within one credit institution. Alternatively, if there is interoperability between several platforms, such automation will be limited to the boundaries of these platforms.

Notably, this may cover the major part of the needs, for example, those arising from the processing of smart contracts for digital assets on a platform where a bank is both an account holder and an operator of a digital asset information system. On the other hand, the model has considerable limitations related to the interoperability of various systems (as opposed to Models 2 and 3 as we show below).

2.2 Common platform (Models 2 and 3)

This setup assumes that credit institutions may programme the terms of payments and use smart contracts within interbank relations on a common platform. Notably, it appears necessary to discuss whether all banks should decide at their own discretion to join the platform and accept its rules, or such membership should be mandatory.

This model assumes that credit institutions keep their internal TD records in a shared distributed ledger, while funds may be transferred between credit institutions both in tokenised and non-tokenised forms. Moreover, no special arrangements should be made to ensure the exchange of smart contract information between individual credit institutions, as each of them should be a member of a common platform of an established standard.

As the functional interoperability is critical for facilitating interaction between banks, the development of a common platform involves a number of legal, methodological, organisational and technological issues:

- Establishing a unified token standard, including token issue and redemption (burning);[7]
- Creating a cross-cutting tool to set payment terms;
- Ensuring AML/ CFT/ CFPWMD compliance of smart contracts (for example, whitelisting, etc.);
- Facilitating bank-to-bank payments;
- Creating benefits for clients and platform members;
- Setting services prices, etc.

Given the current level of debate on the tokenisation of deposits, there are **several possible ways to implement this model at the institutional level**, whereby the platform may be hosted by a regulator or a bank consortium:[8]

1. Common platform of a bank consortium (Model 2)

This approach does not involve considerable public expenditure but requires investment and coordinated efforts from market participants. This model also facilitates the creation of a flexible tool based on the needs of platform members. However, regulators have yet to decide on the nature of their participation in the arrangement of the platform and in the preparation of standards and requirements for information security, consumers' rights protection and competition support.

There are common platforms designed by market participants abroad (for example, the common blockchain platform of the USDF Consortium).[9] Such platforms are thought to be more promising[10] in terms of the development of financial technologies using the tokenisation technology.

---

[7] Token redemption (burning) means detokenisation, i.e. the conversion of assets from the tokenised format into a traditional one involving a simultaneous removal of conventional units, namely tokens, and making a corresponding record on a blockchain.

[8] Swiss Bankers Association (2023). The Deposit Token; The German Banking Industry Committee (2022). Working Paper on Commercial Bank Money Token.

[9] Further details are available at USDF Consortium.

[10] Further details are available at The regulated liability network.

2. Regulator's common platform (Model 3)

This approach enables market participants to launch new software solutions to meet consumer needs based on an infrastructure which is created and controlled by a regulator and equally accessible to all market participants.

Speaking of opportunities to foster competition in the financial market, the TD architecture based on the common platform under Models 2 and 3 may promote the emergence of fintech start-ups and broaden opportunities for non-bank payment service providers. This development pattern follows the global trend of using smart contracts and the emergence of decentralised market participants, operating on public blockchain platforms. Such market participants are able to make products that are similar to banking products the creation of which requires high computational capacities, without sizeable initial investment in the IT infrastructure and operating expenses.

However, it is the competition issues that become pressing in this situation, as the common platform may produce different effects. For instance, to implement new types of smart contracts and software solutions, banks will have to get an approval from the platform operator. This may considerably impede their customer service capacity, especially if competing banks are members of a consortium and set the platform access rules and fees themselves (in case of Model 2). Further details on risks to competition are presented in Subsection 3.2.

Moreover, it is important to emphasise that the format and the practicability of the potential TD implementation may depend on both the maturity of the national payment system and **the implementation and development of the CBDC project**, including the scope and functionality of proposed solutions.

KEY DIFFERENCES IN TD MODELS *Table 2*

Key differences in TD models	Separate platforms (Model 1)	Common platform (Models 2 and 3)
Interoperability of tokens issued by various credit institutions	**None/ limited (for cross-platform interactions)** Tokens circulate within a specific information system and serve as monetary units of account only in this system. The development of the cross-platform interaction may partially solve the problem of bank-to-bank payments in TDs	**High** Tokens are multi-purpose and liquid instruments (provided all banks are connected to the platform, which implies that tokens are specified as the legal tender in the regulation and it is mandatory for banks to join the platform)*
Interoperability of smart contracts	**Limited** Smart contracts are applicable within the platform boundaries only	**High** Smart contracts between banks and their clients may be concluded without limitation
Amendments to regulation	**Targeted**	**Essential**
Regulator participation	**Indirect** A regulator performs its usual supervisory functions. Credit institutions set up platforms themselves and choose the formats of token issuance. If 'bridges' are arranged, the level of regulator participation may be considerable	**Direct** A regulator may be the operator of the common platform (if the latter is established by the regulator – Model 3), may draft standards and set out the regulatory framework for the platform establishment (including by a consortium of founding members – Model 2)

** Experts are also exploring models of tokenisation providing for the locking of funds and the issue of a specific token for them. However, such tokenised funds are essentially close to stablecoins and are out of the scope of this paper.*

Given the proposed concept, Model 1 basically performs the functions of those payment systems that already operate in various countries on the new underlying technology.

In Models 2 and 3, and CBDCs, all transactions are made in the common environment, i.e. programmable payments may be executed using smart contracts at the level of the entire system rather than of one bank, transactions are made instantaneously as soon as the AML/ CFT/ CFPWMD compliance procedures are completed and payment conditions (if any) are met. This unlocks new functionalities for payment services consumers (in addition to the CBDC capabilities).

In Models 2 and 3, as well as in Model 1, the speed and efficiency of payments greatly depend on payment mechanisms used by banks, the maturity of bank-to-bank payments clearing, and banks' willingness to take credit risk on each other.

It appears necessary to assess the models' advantages in terms of the speed of payments and cost efficiency, as smart contracts are not used in all payments. In addition, Models 2 and 3 have technological limitations on the platform building related to the storage and processing of data per unit of time. To merge bank-to-bank payments with payments inside each credit institution, it is necessary to build a very heavy platform, the capacity and functionality of which should be a way above the existing peer platforms.

Moreover, it is the issue of ensuring confidentiality and bank secrecy that is critically important in the context of building any platform, especially a centralised one. This issue is actively discussed as well.

That is why the tokenisation of a large part of bank's liabilities to its clients in the form of TDs under each of the models has its own merits and drawbacks of both technical and economic nature.

There are no optimal common models for tokenising commercial bank money. For instance, when considering various ways to implement tokenisation, the Bank for International Settlements focuses on the creation of a common platform,[11] whereas the International Monetary Fund (IMF) supports the option of a platform established by a regulator, calling such platform a public good. Analysing the option of building a common platform among a consortium of banks, the IMF identifies material risks, first of all, to competition, since such a platform may be designed to meet the needs of a narrow circle of banks operating the platform.[12]

There is no general consensus on how to combine the tokenisation of money with the tokenisation of assets and rights, and the CBDC issuance. Experts currently discuss scenarios of building both siloed stand-alone infrastructures to be made compatible via APIs, and a unified universal ledger.[13]

Experts voice pros and cons of using existing public blockchains.

This goes to show that these issues should be considered in a comprehensive manner, including in view of TD risks and benefits presented in the next section hereof.[14]

Box 6. The tokenisation of commercial bank money: illustrations from international research

Experts currently discuss various ways to tokenise money in bank accounts.

1. In its white paper,[1] the Swiss Bankers Association (SBA) presents three potential deposit token variants with different economic, legal and technical features: 'standardised token', 'joint token', and 'coloured token'.

Authors outline that the 'coloured token' variant may come with a high potential for adverse effects on financial stability, and a restricted fungibility among different tokens, as the latter are issued by specific banks based on their own principles and standards. In the authors' opinion, the most promising variant is a 'joint token'[2] issued by a consortium of banks. This token has potential for money creation by banks like the existing cashless payment system.

[1] Swiss Bankers Association (2023). The Deposit Token.

[2] It is not fully in line with the TD definition herein.

[11] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

[12] IMF (2023). Tobias Adrian, Tommaso Mancini Griffoli. The Rise of Payment and Contracting Platforms.

[13] These approaches are explored, for example, in the technical whitepaper by the Monetary Authority of Singapore (MAS) proposing, among other things, the use of a common protocol that is designed to work with different types of systems (distributed ledger technology and other solutions) and forms of digital money (CBDCs, tokenised bank deposits and regulated stablecoins), and in the BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new proposing (as one of three options) a new type of financial market infrastructure – a unified ledger – that combines CBDCs, tokenised deposits and other tokenised claims on financial and real assets on a common platform. Please also see the description of The regulated liability network: digital sovereign currency 2022 concept at the website of a financial market participant group (representatives of SWIFT, BNY Mellon, HSBC, Lloyds Bank, Wells Fargo, Citi, TD Bank and others).

[14] The Bank of Russia intends to specifically explore the tokenisation of financial assets and its prospects in the context of its compatibility with the tokenisation of deposits and future CBDCs, among others, in its next publications in this series.

2. The German Banking Industry Committee (GBIC) details several aspects regarding the implementation scenarios of a Commercial Bank Money Token (CBMT) in its Working Paper on Commercial Bank Money Token (December 2022),[3] which acts as a follow-up to the CBMT concept laid down in the whitepaper 'Europe needs new money – an ecosystem of CBDC, tokenised commercial bank money and trigger solutions'[4] (released by the GBIC in July 2021). The working paper supports discussions on the role of the tokenised money in the economy of the future and indicates that it is necessary to adjust payments systems to business processes based on the distributed ledger technology in addition or as an alternative to CBDCs.

3. Euroclear and the European Central Bank (ECB) discuss the tokenisation of cash and cashless money, and securities on the platform of the distributed financial market infrastructure (DFMI)[5] and the reasonability of implementing one of possible scenarios.

4. The SWIFT financial messaging system presented findings from an experiment in the tokenisation of assets. 4. Specifically, SWIFT and its collaborators explored 70 scenarios simulating market issuance and secondary market transfers of tokenised equities, bonds and cash. The experiment demonstrated that the SWIFT infrastructure could be used to create, transfer and redeem tokens, and ensure interoperability between different asset tokenisation platforms and the existing infrastructure.

---

[3] The German Banking Industry Committee (GBIC). Working Paper on Commercial Bank Money Token.

[4] The German Banking Industry Committee (GBIC). Europe needs new money – an ecosystem of CBDC, tokenised commercial bank money and trigger solutions.

[5] The ECB presentation on the Euroclear ecosystem project leveraging the distributed ledger technology to issue of cash tokens, among other things.

3. TD RISKS AND BENEFITS

As current bank payment tools unrelated to tokenisation have external add-ons and plug-ins, such as APIs, they are occasionally used in advanced automated payments and smart contracts, and are strong enough to meet future technology challenges.

Along with private bank initiatives, instant payment solutions (e.g. the Faster Payments System and FedNow) and retail CBDCs projects implemented by central banks may satisfy most needs of users and fintech developers, depending on the agility and accessibility of such programmes.

Therefore, it is vital that potential gains and risks of the tokenisation of commercial bank money be explored further and discussed in-depth with market participants, among other stakeholders. There is still an open question: **does the tokenisation of commercial bank money have any advantages over the existing cashless payment solutions that may be the key driver of the TD implementation?**

Nowadays, global experts actively discuss and make practical attempts to assess the potential and the broad use of emerging tokenisation technologies in currency circulation, payments and settlements. The tokenisation of commercial bank money is still understudied.

There should be a comprehensive cost-benefit analysis of the tokenisation of cashless money as applied to traditional financial market participants and of possible scenarios of its implementation given that eventually, this system may be built only based on financial institutions' commitment and engagement.

TD properties largely depend on the institutional model of their implementation (see Section 2). For instance, the TDs under Model 1, as opposed to Models 2 and 3, are likely to be used only in transactions between customers of a bank that uses the TD technology, due to limited boundaries of its implementation. Public demand for such solution may be generally low. Smart contracts with such TDs may have a low interoperability between bank platforms, though their use may make the execution of customer-to-customer operations and transactions within one bank more efficient. As Models 2 and 3 involve a broad range of banks and a common platform, they appear to be more promising in terms of the future development of international settlements. However, they imply higher implementation costs, lower competition, and require considerable further adjustments of legal aspects.

There is a general understanding that when designing TDs, banks should not only ensure the same opportunities of their use as in the case of account entries but also expand the potential of cashless money, including in terms of reliability, convenience, user-friendliness, as well as maturities and formats of settlements. Only in this case, TDs may be in demand among economic agents along with existing settlement systems.

The current global debate includes the testing of a hypothesis that the tokenisation of commercial bank money may bring **extra benefits** to existing cashless settlement systems and CBDCs, with the speed of their spread largely depending on network effects associated with their adoption.

As we note above, the potential of the TD use in a particular jurisdiction greatly depends on the maturity of cashless payments, the adoption of CBDCs, and the use of cryptocurrencies and stablecoins in settlements (if the latter are legal in the given jurisdiction).

This Section details TD risks and benefits, which are discussed at the present stage.

3.1. TD benefits

In the existing practice, the institutional model of the TD implementation is considered in the context of market needs and extra opportunities it may give to market participants compared to the existing settlement solutions and payments tools. Potential gains from TDs as cashless funds are directly related to a different underlying technology, namely an opportunity to use money in information systems based on tokenisation and the use of smart contracts.

It is noted that the technological effectiveness and digital capabilities of money in commercial bank accounts should not be considerably lower than CBDC capabilities. Due to tokenisation, money created by commercial banks will still be attractive to economic agents owing not only to interest payments but also to the opportunity to use smart contracts (where they are necessary).

Current TD debates cover various potential merits of tokenisation. Based on available sources, one may conclude that using the latest digital technologies, TDs may be designed in such a way as to:

1. **Cut transaction costs**. Fees are likely to decrease[1] as a result of the automation of settlements, the seamless sequential execution of transaction chains under smart contracts, etc.[2] In Models 2 and 3 or in Model 1 (provided it is interoperable enough), a 'smart contract to smart contract' arrangement may provide to consumers the seamless execution of automated transactions between customers of different banks, let alone of one bank. Moreover, TDs and smart contracts will make it possible to automate the collection of mandatory payments (including taxes, customs duties).

The automation and atomic settlements[3] may enable banks to cut costs related to paperwork, operating activities, control, and risk management.

2. **Speed up and simplify the execution of transactions**. At the moment, information and financial flows are separated in payments, whereas TD-based smart contracts enable their merger (the automation[4] may make the preparation and verification of documentation quicker and cheaper, compared to some existing settlement systems). Owing to atomic settlements, payments are made in full and, without doubt, automatically, mitigating the risk of contract non-execution.[5] This may benefit a number of finance areas, such as secured lending, trade settlements, escrow accounts, securitisation, etc.[6] In turn, quicker and cheaper transactions may potentially reduce the cost of lending and expand the investor base.[7] The new system will help banks simplify their control and clearing functions.[8]

3. **Create conditions for designing new products and services,[9] including in Web 3.0[10] and the Internet of things.**[11] As TD transactions are automated, TDs will help market participants focus on offering more cost efficient and convenient as well as cutting-edge financial services and solutions.[12] TDs are able to boost the development of packaged services, especially of those products and services the terms of which are interrelated. In particular, as their architecture is initially designed to rely on digital financial technologies, TDs may enhance functional agility of digital asset processing.

The Fintech sector is supposed to become the source for creating even more innovative smart contracts to serve as the basis for the above solutions and services (including smart contracts supporting the packaging of complex financial products and services, payment tokens, investment tokens (digital financial assets), artificial intelligence algorithms and data from the external world, for example, temperature sensor data). Further details on smart contracts, their role and advantages are presented in Box 7.

---

[1] Olywer Wyman, J.P. Morgan (2022). Deposit Tokens. A foundation for Stable digital money; Swiss Bankers Association (2023). The Deposit Token.

[2] BIS (2023). Bulletin, No. 72. The tokenisation continuum; The German Banking Industry Committee (2021). Europe needs new money – an ecosystem of CBDC, tokenised commercial bank money and trigger solutions.

[3] Atomic settlements are settlements where assets are transferred and received (credited) as part of one transaction (the transfer of assets occurs only upon the receipt (crediting) thereof).

[4] Olywer Wyman, J.P. Morgan (2022). Deposit Tokens. A foundation for Stable digital money; at the USDF Consortium website.

[5] Swiss Bankers Association (2023). The Deposit Token.

[6] BIS (2023). Bulletin, No. 72. The tokenisation continuum.

[7] Further details are available at USDF Consortium.

[8] Olywer Wyman (2022). Deposit Tokens. A foundation for Stable digital money; Swiss Bankers Association (2023). The Deposit Token.

[9] The German Banking Industry Committee (2021). Europe needs new money – an ecosystem of CBDC, tokenised commercial bank money and trigger solutions.

[10] Web 3.0 is a concept based on the decentralised storage of information using the blockchain technology.

[11] The Internet of things is a network of devices that connect and exchange data with other devices and services via Internet.

[12] IMF (2023). Tobias Adrian, Tommaso Mancini Griffoli. The Rise of Payment and Contracting Platforms.

4. **Enhance money controls and the programmability of settlement conditions using smart contracts.** One of the drivers of the TD development may be the enhancement of the programmability of payments under smart contracts,[13] including as regards the automation of controls and transaction settlements, the faster execution of transactions, the routing of cash flows, the setting-up of anti-fraud tools, etc.[14] Moreover, the use of smart contracts is already developing actively based on conventional technologies. The application of the tokenisation technology is assumed to improve the efficiency of transactions and expand opportunities to design and leverage smart contracts.

5. **Maintain conventional customer experience upon the emergence of new opportunities.** It is possible to design TDs in such a way so that they can be used via conventional payment applications and remote banking tools (online or mobile bank apps). Therefore, there may be no mental blocks for clients to start using TDs (the platform operator is supposed to adapt TDs in terms of technology). However, given their economic essence, TDs represent the same cashless funds for bank clients and it does not matter what type of technology banks use to account them. Moreover, in the process of money circulation, tokenised funds may be converted into the conventional format of account entries without direct involvement of bank clients. The most important thing is that banks use regulatory compliant solutions. This should be ensured by financial market regulators.

Thus, clients may have access to both conventional banking services, including interest bearing accounts, the deposit insurance mechanism, and new solutions, such as programmable transaction terms under smart contract templates (with no involvement of bank employees), atomic settlements, complex algorithm-based rules of debits, automated 'delivery versus payment' (DVP) transactions without intermediaries, simultaneous and instantaneous execution of several correlated operations (transactions).

6. **Leverage the potential of technologies to ensure a secure and informed environment.**[15] Under Model 1, the system belongs to a bank itself, whereas under Models 2 and 3, all data are stored in the common system, which may be made accessible on a constant basis as a 24/ 7/ 365 service (subject to personal data and bank secrecy protection requirements, several elements must be coded to remove a third-party access). The risk of information distortion may be mitigated by the blockchain technology itself,[16] as it does not allow any changes in data on executed transactions, as well as by the establishment of security management requirements (however, the common platform involves large possible losses in the event of its hacking).

7. **Produce an alternative solution to quasi cash.** TDs may be viewed as a legal alternative solution to the existing quasi cash which is beyond the scope of regulation and is used by individuals and companies increasingly more often.[17]

8. **Create conditions for broader prospects of international payments.** The tokenisation of commercial bank money has just started being discussed. Nevertheless, the current debate already has it that the global development of such systems inherently gives rise to the question whether it is possible to ensure cross-border links between them.[18] The development of such links may reduce reliance on conventional systems and related currencies, as well as enhance the resilience and competitiveness of the financial system globally.[19]

---

[13] Further details are available at USDF Consortium project website.

[14] Ibid.

[15] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

[16] Regulated Liability Network (2022). Digital Sovereign Currency.

[17] BIS (2023). R. Garratt, H.S. Shin. Stablecoins versus tokenised deposits: implications for the singleness of money.

[18] See, for example, IMF (2023). Tobias Adrian, Tommaso Mancini Griffoli. The Rise of Payment and Contracting Platforms. BIS (2023). Tobias Adrian, Rodney Garratt, Tommaso Mancini Griffoli. Trust bridges and money flows.

[19] ONYX by J.P Morgan.

3.2. TD limitations and risks

Despite its potential advantages, the TD system is a technologically complex solution, especially if implemented under Models 2 and 3. The costs and benefits of the creation of a new infrastructure, the impact of new settlement rails and automation on the efficiency of financial market participant operations, competition, competencies, security, and the confidentiality of client data (information) are among those issues that should be explored and addressed by policymakers within the arrangement of tokenised cashless money in the economy.

Specifically, a possible drawback of TDs usage may be a high cost of their implementation under the above models by banks. TDs are a technologically complex product requiring heavy investment, as they involve the development of a platform banks will connect to, and training and hiring people with necessary competencies. That is why some small credit institutions may find it difficult to both join the platform to use TDs and compete with larger and more technologically advanced credit institutions (on top of that, it may divert resources from the development and improvement of consumer properties of their services). Moreover, despite all possible advantages, the adjustment of existing monitoring and control systems to the new technological setup may involve additional public expenditure.

TD deployment costs and measures to manage emerging risks may differ, depending on a specific solution and an implementation model. The option to build a common platform may be more efficient in terms of the total cost of its creation (especially, for small and medium-sized participants), but for individual participants, it may prove to be more expensive to join an external platform than to produce an in-house solution. Both users and service providers need to have special expertise to manage specific TD risks.

Having spent money on the new underlying technology, market participants may find themselves in a situation when some clients would still prefer familiar forms of cashless money, especially given the current limited capacity of the blockchain technology, which may be very evident in the case of building a centralised TD platform.[20]

Based on available research, TD risks may be divided into common risks, for example, those related to information security, consumers' rights protection and AML/ CFT/ CFPWMD, and specific technology risks:

- **Operational risks.** The implementation of the new underlying technology and its use in settlements may make technology failures more probable and the scale of their consequences larger.
- **Risk associated with the vulnerabilities of tokens and the tokenisation technology**. For various reasons, there may be an unauthorised issue/ destruction of tokens, violations of their authenticity, legitimacy, and double spending.
- **Risk to the anonymity and confidentiality of TD transactions** (breaches of bank secrecy and trade secrets).[21] The risk is associated with a necessity to separate access for third parties and other agents to confidential transaction data. The memory of a blockchain platform where TDs are to be processed has extra risks associated with the leakage of sensitive information (of both households and firms). This raises the issues of the necessity to use personal data and to ensure bank secrecy and appropriate regulation. The TD system should ensure the confidentiality of information rather

[20] For instance, popular public blockchain platforms have some technological limitations preventing them from handling a large number of transactions per unit of time (bitcoin is able to process only seven transactions per second (TPS) (see the Crypto.com website). Contrastingly, conventional payment instruments process transactions much more quickly (Visa can handle more than 65,000 TPS (see the Visa presentation). It is worth noting, however, that some pilot projects leveraging the blockchain technology, such as OpenCBDC with the completed Project Hamilton processing 1.7 million TPS and existing blockchain platforms, for example, Solana handling 65,000 TPS (see the Blockchain Council website), process transactions as quickly as conventional payment mechanisms.

[21] See, for example, IMF (2023). Tobias Adrian, Tommaso Mancini Griffoli. The Rise of Payment and Contracting Platforms.

than offer the full anonymity of transactions (like existing settlement systems and instruments).[22] In case of the centralised platform option, implications of leakage/ hacking may be more severe given its larger scale, compared to separate platforms under Model 1.

- **Risk of misconduct due to no smart contract control.** Like any other financial innovation, the adoption of TDs may involve misconduct by market participants and other entities, as in this particular case, there is no control over the proper execution of smart contracts, among other factors.
- **Risk of monopolisation.** Uncontrolled activities of major market participants to build TD platforms under Models 1 and 2 may enhance the market power of individual already large financial market participants even more. If a TD platform is controlled by one bank/ a consortium of banks, its public efficiency may be lost in the long run as a result of the market monopolisation even if such control fosters the technological development of the industry in the short term.

The risk of monopolisation is especially evident when a common platform is built. It is critically important to prevent discriminatory practices where certain credit institutions (members of a consortium under Model 2, first of all) may have a preferential access to the platform, while others may have to struggle with unreasonably high barriers (including in the form of overpriced fees) in order to join such a platform. Another problem is that some powerful market participants may avoid joining the platform, considerably reducing the benefits from its use.[23]

Moreover, when exploring such phenomena it is important to take into account risks to competition not only in the financial market but in the IT market too, as the latter may be affected by major financial institutions acting as both vendors (if they are developers/ operators) and consumers.

Risk of limited consumer choice (tying). Market participants may deliberately increase switching barriers between financial institutions for consumers through policies and conditions stipulated in programmable payments based on smart contracts. Specifically, banks may link TD terms of use with purchases of other products and services. As a result, clients may find themselves 'confined' to one bank, one ecosystem or banking group offering TD-related services (one of the implications of such 'confinement' may be the hard selling of unwanted/ low-profit products to clients).

The TD adoption in a particular jurisdiction requires the creation and development of controls and risk mitigation tools. To this end, it is necessary to additionally explore each of the above risk groups in detail.

Box 7. Smart contracts, their role and advantages

Smart contracts enable the drafting of a contract in the form of a computer programme that is capable of operating automatically without any intermediaries. Smart contracts are usually stored on blockchain and executed pursuant to consensus rules embedded in an information system (information systems). They may be also used in the current cashless payment system, but are not absolutely necessary to make all payments.

Their role in tokenisation

Smart contracts are a tool to issue and redeem tokens (the automation of units of account). Each token is issued and redeemed via the execution of an algorithm embedded in a smart contract. Smart contracts are also a tool to programme transaction terms, including terms for transferring tokens from one account to another (the automation of payments).

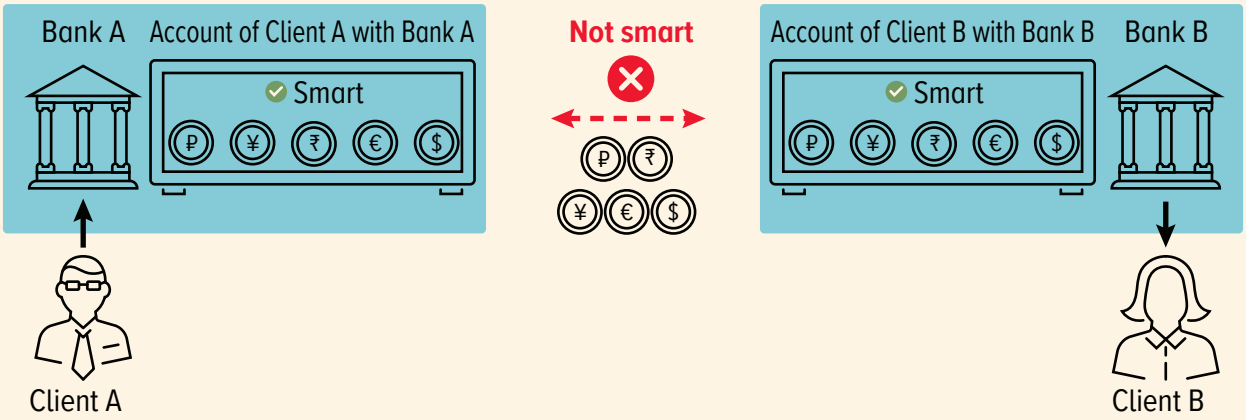
Current state and advantages of smart contracts

The use of smart contracts brings the automation of payments to the next level of quality, improving their efficiency and reliability.

[22] See, for example, BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

[23] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

SMART CONTRACTS IN PROCESSING CONVENTIONAL CASHLESS MONEY *Chart 1*



Nowadays, some banks already leverage smart contracts to make cashless payments in their in-house information systems. For example, they automate control and settlements under client business agreements and transactions.

However, as practice shows, smart contracts have limited capabilities to handle transactions involving several banks. Limitations of conventional cashless payments result from the absence of the unification (standardisation) of smart contracts. It may be very difficult to align smart contracts issued in different information systems. That is why when making conventional cashless settlements, a smart contract may be unfailingly executed only within the boundaries of a bank that has produced such a smart contract. It is the diversity of smart contracts that may be the reason why a sending bank is unable to undertake to a receiving bank that the smart contract of the latter will be executed. Therefore, the efficient use of smart contracts rests on the foundation of trust in the reliability of smart contracts not only of a sending bank but of a receiving bank too (Chart 1).

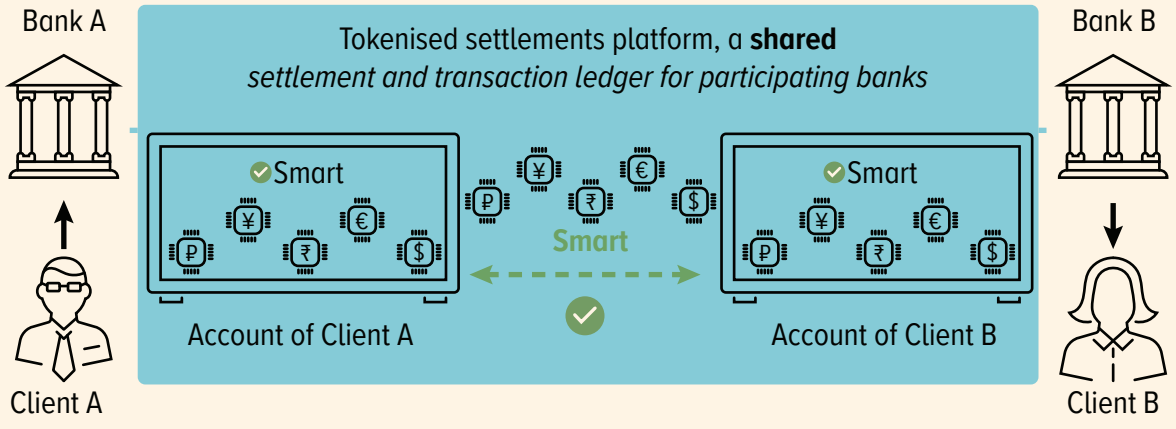
The system of tokenised settlements may be designed with a high level of standardisation. Participating banks or certain fintech participants will create/ place smart contracts in accordance with platform rules, whereas the platform, in turn, will check whether its participants are compliant with these rules. This will ensure the interoperability of smart contracts (Chart 2).

If an adequate level of interaction between smart contracts is ensured, there will be conditions conducive to the following.

New products and services

The Fintech sector may become the source for creating even more innovative smart contracts, for example, those composable enough to configure financial products like Lego from various tokens, such as

SMART CONTRACTS IN TD APPLICATION *Chart 2*



payment and investment tokens (for instance, digital financial assets), artificial intelligence algorithms, and data from the external world.

Disintermediation and risk mitigation

For the purposes of tokenised settlements, the programmability of payment conditions using smart contracts will make it possible to reduce the need of economic agents in engaging intermediaries and consequently mitigate the intermediary risk. The example is the tokenisation of securitisation of borrowed money obligations whereby smart contracts enable the automated bundling of borrower payments and subsequent allocation of received funds to investors.[1]

Composability with new real-economy business models

Some studies note that conventional payment channels may hinder the digitalisation of economic activities.[2] For instance, the tokenisation of settlements of transactions with digital assets and rights, as well as the tokenisation of payments made under such instruments will help simplify these transactions, ensuring seamless money flows. In the future, such seamlessness may be instrumental in creating conditions for expanding the base of real-economy investors and cutting the cost of their borrowings.

[1] BIS (2023). Bulletin, No. 72. The tokenisation continuum.

[2] Swiss Bankers Association (2023). The Deposit Token.

4. THE ROLE OF TDS IN THE ECONOMIC SYSTEM AND SOME ASPECTS OF MACROECONOMIC POLICY

4.1. Preservation of the two-tier banking system

The role of tokenised deposits in the financial market's evolution has just got in the focus of attention. Some authors note that the creation of modern money (CBDCs and commercial bank money) using innovative technologies may foster **the balanced development of the financial system and the well-established two-tier banking system**.[1]

To achieve this, it is assumed that the technological effectiveness and digital capabilities of commercial bank money should not be considerably inferior to CBDC capabilities. The tokenisation of commercial bank money may add impetus to preserving the attractiveness of money created by commercial banks for economic agents not only due to the possibility of interest payments, but also due to the opportunity to use the advantages of modern digital technologies.

Besides, recent publications prepared by market participants and regulators emphasise that by creating digital currencies central banks are mainly seeking to deliver to the public a more convenient and functional modern means of payment that would complement existing cash. Central banks do not aim to, and should not, take upon themselves financial sector functions to serve and meet diverse needs of households and businesses for various services and high-quality solutions. **The TD advancement may equip banks with additional functionalities to design solutions and services using new technologies.**

Commercial bank money makes up the bulk of money supply. Maintaining the attractiveness of cashless money, including in the form of TDs, created specifically in the banking system, is one of the factors **supporting the potential of lending to the economy by the banking sector and preserving the functions of banks to reallocate capital between sectors of the economy**.

Moreover, the two-tier system and credit institutions' obligations to independently conduct client identification will also help **preserve the confidentiality of bank clients and the privacy of their transaction data**.

4.2. TDs and monetary policy

With the help of monetary policy, central banks ensure sustainably low inflation and support the purchasing power of their currencies. Monetary policy influences inflation via the financial sector, therefore any innovations in money circulation and the financial sector require the evaluation of their potential impact on the conditions of monetary policy.

Considering the fact that, from the economic point of view, TDs are cashless money in bank accounts, which are only recorded on another technological platform; their introduction is not assumed to seriously affect the banking sector liquidity.[2]

It is noted that the issuance of TDs, which possess the similar – compared to CBDCs – technological properties and possibilities to create customer solutions and services, can become a natural factor underlying the balanced development of money circulation and will mitigate the risks of liquidity fluctuations within the banking sector, which may by prompted by the CBDC adoption, especially at the initial stages of the adjustment of the financial system.[3] At the same time, central

[1] The issues of not just preserving but potentially strengthening the advantages of the two-tier banking system are considered, for example, in BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new.

[2] Ibid.

[3] The German Banking Industry Committee (2021). Europe needs new money – an ecosystem of CBDC, tokenised commercial bank money and trigger solutions.

banks can effectively use their operational procedures to manage money market rates and ensure the clear transmission of the monetary policy signal from the central bank's policy rate to money market rates and then to the financial sector and the economy.

It is worth mentioning that the use of different terms of smart contracts does not produce any considerable effect on the banking sector liquidity. This is due to the fact that the terms apply to the funds of clients participating in transactions, which are recorded on the liabilities side of credit institutions' balance sheets. These terms do not apply to the assets side of banks' balance sheets, which means that they do not affect their liquidity.

More active use of tokenised assets and deposits, as well as smart contracts, may cause additional changes in the processes of payments and transactions in the economy, which will in turn affect the speed of money circulation, and various elements of the monetary policy transmission mechanism.[4] It is expected that these changes will be gradual and may be taken into account by central banks when modelling and forecasting the processes in the financial sector and the economy, which will in turn influence monetary policy decisions (like other factors producing a structural impact on the modern economy and the financial sector).

However, considering the fact that the TD phenomenon is still being discussed, as of now, there are no data[5] providing empirical foundation for the said conclusions, which proves the need to conduct further monitoring and analysis.

4.3. TDs and financial stability

In terms of ensuring systemic financial stability and sustainability of financial intermediaries, banks using TDs **may be subject to the same ratios and requirements set by central banks both for financial sustainability and soundness, and for the use of conventional deposits**, considering the fact that tokenised deposits are essentially identical to conventional account entries.[6]

Thus, trust in banks and private money created by them is maintained through regulation. Under standard conditions, this trust is comparable to the trust is money issued directly by central banks (it means that economic agents view different forms of one and the same monetary unit as identical to each other).

At the same time, the use of a different underlying technology may call for additional requirements in order to ensure stability, seamless and uninterrupted payments, freedom of movement of clients, as well as the exchange of required data between banks and regulators.

Due to the use of tokenised deposits potential, **the automation of the terms of transactions through smart contracts may be concentrated in a regulated transparent banking environment, with a limited spread of these practices outside the banking infrastructure**. This will help preserve the regulator's ability to protect the rights of payment participants and ensure the singleness of the payment infrastructure, and mitigate the risks of using quasi cash.

Notably, the realization of risks to the TD functionality may cause a decline in households' trust not only in banks, but also in the financial system as a whole. There are bank run risks, which may lead to negative consequences for the entire financial system and reduce its ability to provide financial resources to the real sector of the economy.

In this case, the regulator may use the instruments of micro- and macroprudential policy, temporary support mechanisms designed for individual credit institutions in order to off-set systemic negative effects. However, like in the case of monetary policy, the assessment of the TD impact on financial stability remains an open issue.[7]

---

[4] Olywer Wyman (2022). Deposit Tokens. A foundation for Stable digital money.

[5] Ibid.

[6] Ibid.

[7] Swiss Bankers Association (2023). The Deposit Token.

5. LEGAL ASPECTS OF TOKENISED COMMERCIAL BANK MONEY

The tokenisation of commercial bank money raises **new issues** for law and policy makers in different countries.

First, these are the issues related to the legal framework of a tokenised liability between a bank and a client.

From a legal perspective, TDs are the commercial bank's liability to pay an amount of money to a client on certain occasions, which fully corresponds to the logic of cashless money. If clients of different banks transfer TDs from one to another, the sending bank's credit risk is not transferred to the recipient of this money, so it is the bank of the recipient that becomes liable to the recipient. Thus, no new legal framework is needed to record a TD liability between a bank and a client. TDs are money, so the underlying technology to keep records of bank liabilities to clients is supposed to change. The legal framework issues are mentioned in international research usually in relation to stablecoins, which are not money.

Second, there are issues related to the regulation of tokenised liabilities recordkeeping and circulation. Models 2 and 3 envisage the creation of a common platform. A particular liability between a bank and a client may be recognised in the information system of a relevant bank, whereas such liability may circulate on the common platform. Alternatively, both the recordkeeping and the circulation will be arranged on the common platform. In the international practice, the first approach is called non-native, the second one – native.[1,2] It is noted that the second approach has a legal uncertainty as to whether it is reasonable to solely rely on a record on a blockchain (a common platform) to confirm the existence of a relevant liability.[3] For instance, the native approach was tested within the Guardian Project[4] where tokenised deposit transactions in Singapore dollars were tested on the Polygon public blockchain, with J.P. Morgan acting as an issuing bank.

Third, there are issues related to the regulation of smart contracts that are one of the key technological advantages of TDs. To ensure the reliability and security of financial transactions, it is important to secure the proper operation of smart contracts. To this end, it seems necessary to assess whether it is reasonable to set certain requirements for smart contracts and responsibility distribution for their functioning, for example, requirements for the accessibility of the code, nomination of entities responsible for the code compliance with the conditions agreed in a language easy-to-understand for ordinary people (natural language). In addition, a special focus should be on smart contracts, as they may form chains and a disruption in any of them may trigger the execution of wrong contracts and vice versa.[5]

Apart from the above, the tokenisation of money is likely to require further adjustments in the AML / CTF / CFPWMD regulation and confidentiality compliance. On the one hand, experts discuss that the use of a common platform for the purposes of TDs, tokenised assets, and CBDCs may propel the AML / CTF / CFPWMD compliance to the next level.[6] On the other hand, the key task is to maintain bank secrecy and trade secrets, since the proposed use of the platforms should not result in the disclosure of information on bank clients and their transactions to third parties.[7]

---

[1] Olywer Wyman (2022). Deposit Tokens. A foundation for Stable digital money.

[2] MAS, BIS (2023). Project Guardian // Enabling Open and Interoperable Networks.

[3] J.P. Morgan (2022). Institutional DeFi: The Next Generation of Finance?

[4] MAS, BIS (2023). Project Guardian // Enabling Open and Interoperable Networks.

[5] IMF (2023). Tobias Adrian, Tommaso Mancini Griffoli. The Rise of Payment and Contracting Platforms.

[6] BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new; Swiss Bankers Association (2023). The Deposit Token.

[7] Ibid.

REFERENCES

1. Bank of England (2023). Jon Cunliffe. The shape of things to come: innovation in payments and money
2. Bech M. and Garratt R. (2017). BIS Quarterly review. Central bank cryptocurrencies
3. BIS (2022). Annual Economic Report. III. The future monetary system
4. BIS Bulletin, No. 72 (2023). I. Aldasoro, S. Doerr, L. Gambacorta, R. Garratt, P.K. Wilkens. The tokenisation continuum
5. BIS Bulletin, No. 73 (2023). R. Garratt, H.S. Shin. Stablecoins versus tokenised deposits: implications for the singleness of money
6. BIS (2023). Annual Economic Report. III. Blueprint for the future monetary system: improving the old, enabling the new
7. Central Bank of Bahrain (2022). Central bank of Bahrain, Alba, bank Abc and Onyx by J.P. Morgan complete test with blockchain based JPM Coin system
8. Citigroup Inc. (2021). T. McLaughlin. The Digital Money Format War
9. European Central Bank (2022). Tokenisation of cash and securities
10. Finance&Development (2022). A Quarterly Publication of the International Monetary Fund. No. 3
11. FSB (2023). High level Recommendations for the Regulation, Supervision and Oversight of Global Stablecoin Arrangements: Final report
12. IMF (2023). Tobias Adrian, Tommaso Mancini Griffoli. The Rise of Payment and Contracting Platforms
13. J.P. Morgan (2021). DBS, J.P. Morgan and Temasek to establish platform to transform interbank value movements in a new digital era
14. J.P. Morgan (2022). Institutional DeFi: The Next Generation of Finance?
15. J.P. Morgan. Onyx by J.P. Morgan (project website)
16. Monetary Authority of Singapore (2022). Consultation paper. Proposed Regulatory Measures for digital payment token services
17. Monetary Authority of Singapore (2023). Technical whitepaper. Purpose bound money (PBM)
18. Monetary Authority of Singapore (2023). Project Guardian // Enabling Open and Interoperable Networks
19. New York Fed (2022). R. Garratt, M. Lee, A. Martin, and J. Torregrossa. The Future of Payments Is Not Stablecoins
20. Olywer Wyman (2022). Deposit Tokens. A foundation for Stable digital money
21. Regulated Liability Network (2022). Whitepaper. Digital Sovereign Currency
22. Swiss Bankers Association (2023). Whitepaper. The Deposit Token
23. The German Banking Industry Committee (2021). Europe needs new money – an ecosystem of CBDC, tokenised commercial bank money and trigger solutions
24. The German Banking Industry Committee (2022). Working Paper on Commercial Bank Money Token
25. USDF Consortium (project website)

GLOSSARY

Atomic settlements are settlements where assets are transferred and received (credited) as part of one indivisible transaction (the transfer of assets occurs only upon the receipt (crediting) thereof).

Blockchain is a way to structure data as a chain (sequence) of cryptographically connected blocks of transactions, used in the implementation of distributed ledger networks. Each subsequent block contains encrypted information from the previous block to ensure the consistency and permanence of records.

Central bank digital currency (CBDC) is a national currency issued by a central bank in a digital format.

Decentralised finance (DeFi) is a finance model designed to eliminate intermediaries, where transactions are carried out automatically through smart contracts based on distributed ledger technology (DLT), and users can directly control their assets.

Distributed ledger technology is a technology which enables the distribution of information among all participants of a network.

Fungible tokens are digital assets with standard and identical parameters recorded in a distributed ledger.

Native token is a token representing an asset for which the blockchain is the primary ledger.

Non-fungible token is a digital asset with a unique identification code recorded in the distributed ledger, which may serve as a confirmation of the non-fungible token owner's right to a unique tangible or non-tangible asset and/or may certify its authenticity.

Non-native token is a token representing assets which are primarily recorded in a ledger outside the blockchain (network).

Programmable payments means money accounting solutions that make it possible to know in advance the directions and/or terms of money transactions using smart contracts.

Smart contract is a digital representation of a set of parties' mutual obligations, including a transaction protocol, where all or part of the conditions are recorded, executed, confirmed and/or ensured by a computer algorithm automatically within a specialised information system.

Token is a digital code which is issued and circulated in an information system (blockchain) in accordance with the rules (algorithms) of a platform.

Tokenisation is the process of digitalisation of asset rights and their conversion into a machine-readable format (token) allowing the storage of information about such rights and transactions with them in an information system (blockchain) to ensure their fast and secure processing.

Tokenised deposits (TDs) are the digital format of bank deposits, which are accounted for and circulated using the tokenisation technology, including to programme financial operations.

Token redemption (burning) means detokenisation, i.e. the conversion of assets from the tokenised format into a traditional one involving a simultaneous removal of conventional units, namely tokens, and making a corresponding record on a blockchain.