

**GCPMED 2020**  
**Global Challenges and Prospects of the Modern Economic**  
**Development**

**DIGITAL RUBLE: DIGITAL CURRENCY MODEL OF CENTRAL**  
**BANKS**

E. L. Sidorenko (a)\*  
\*Corresponding author

(a) Moscow State Institute of International Relations (University) of the Ministry of Foreign Affairs, Vernadsky Av.,  
76, Moscow, Russia, 12011979@list.ru

**Abstract**

The idea of the emergence of a digital currency of Central banks (CBDC) as a new financial instrument is in the focus of interests of financial institutions in most countries of the world. This is due to the need to create a more mobile and transparent payment system, minimize transaction costs, remove economic restrictions and find an alternative to the US dollar as the main means of international settlements. However, despite the existing interest, the question of what the digital currency of central banks should be is not only not resolved, but also not properly raised. There is no understanding of whether each state should have such a currency, or whether its issuance in individual countries is sufficient, how the new money model will affect the two-tier global financial system, and what legal risks it may entail. This paper discusses key issues related to the development and implementation of the digital currency of central authorities (CBDC) in the financial system of the Russian Federation. The main focus is on assessing the economic benefits and risks of individual CBDC concepts. The analysis of these issues allowed to suggest the economic and legal architecture of the digital ruble and identify a number of issues that should be resolved at the legislative level when introducing it into the financial system. It is significant that the author addresses not only general theoretical questions about the possibility and feasibility of introducing a digital ruble, but also considers existing models in the world.

2357-1330 © 2021 Published by European Publisher.

*Keywords:* Central bank' digital currency (CBDC), cybersecurity, financial control, financial system, money laundering



## 1. Introduction

In the context of an active digital transformation of the financial regulation and control system, the very idea of introducing a digital currency of central banks seems logical and timely. For the first time, the possibility of expanding the concept of money due to the appearance of a new tool was discussed in 2017 at the peak of the growing interest of large financial players in the cryptocurrency. According to Bank for International Settlements (BIS) data (Bank for International Settlements (BIS), 2020a), more than 60% of central banks have started to show interest to this instrument. By 2020, this number has increased to 80% of central banks with a coverage of 90% of the world's population.

In some states, the discussion of the CBDC concept has already gone beyond theory and has been implemented in a test mode. In particular, South Korea, the Bahamas, Canada and Sweden are experimenting with a new digital currency, and China has already introduced the digital yuan as a pilot project. In autumn, the European Central Bank announced its readiness to develop a CBDC. The US Federal settlement service has announced works to explore the possibilities of CBDC as an alternative to cash (Mester, 2020).

The reason for the activation of the discussion was the emergence of fundamentally new payment solutions that can compete with regulators. First of all, we are talking about the announcement of the Facebook digital currency (Libra), which has put the government of various countries in danger of the emergence of new money on the non-financial market with a large coverage of potential consumers and the inability to ensure compliance with the rules of foreign economic activity.

The second threat was the growth of international trading platforms and the emergence of a domestic financial and legal system of digital platforms. In particular, the sharp growth of payment platforms (Alipay and WeChat Pay) has led to the fact that a significant amount of cash payments has gone to digital platforms and has caused concern of central banks.

Banks' interest in CBDC is also growing due to the fact that the number of non-cash payments has sharply increased in the context of the pandemic (Kiselev, 2019), and the transition to a "remote" economy has forced regulators to look for fundamentally new models of mutual settlements while maintaining state control over monetary policy and ensuring the security of settlements.

## 2. Problem Statement

Pointing out among the advantages of CBDC the security and sustainability of payments, financial stability, and efficiency of cross-border payments and increasing their availability, most central banks have not yet decided on what economic model can be used as the basis for CBDC.

In fact, three main models can be proposed:

- direct calculation (quasi-commercial bank model). CBDCs are issued and managed by the central bank. In this case, the central bank, contrary to the two-level financial system, enters into direct communication with economic agents (individuals and legal entities), serves retail payments and maintains a register of all transactions, that is, performs the settlement functions of a commercial bank;

- hybrid service model. It assumes that retail payments are handled by a commercial bank, and the central bank maintains a transaction register and provides technical security for payments. With this

approach, the two-level financial system suffers less, but the question arises in which cases the wallets of consumers are kept by the central bank, and in which cases – by the commercial bank;

- intermediary model (quasi-cashless settlement model). According to this theory, the digital currency of central banks is considered as a new mean of transporting money, a kind of alternative to non-cash payments. In this case, commercial banks retain all the advantages of non-cash funds: both the mechanism of transfer through the registers of a commercial bank and the ability to track payments. In this model, the binding of the currency to the central bank is more of a marketing nature and is aimed at increasing public confidence in the new payment instrument.

Depending on the characteristics of users, there are two main options for implementation CBDC:

- retail CBDC is a currency available to a wide range of users, including retail sales;
- wholesale is a currency available to a limited number of users (professional market participants and credit institutions) (George, 2020).

The CBDC classification, built on the infrastructure of the digital coin, also offers to build a model of the digital ruble.

Conditionally, we can distinguish a model based on a centralized database and distributed registry technology (blockchain). It is obvious that even in the case of the introduction of distributed registry technology, the system is unlikely to be built on DLT open access. In this case, the differences between the digital currency of banks and private cryptocurrency will be smoothed out.

The CBDC analysis will be incomplete without evaluating such parameters of ITS operation as the user access mechanism and the marketing component of the model. An important question is how the transaction will be identified: through the user account or using a digital token and its implementation in the registry (Sidorenko, 2020).

In fact, the answer to it leads to the solution of one of the key questions of the CBDC: whether IT will be close to non-cash payments or will duplicate the properties of cash in terms of its anonymity (Khisamova et al., 2019).

Whatever direction is chosen, it involves a detailed study of the marketing component. In order for the digital ruble to be interesting for financial market participants, it must perform clear and predictable economic functions and not come into direct contradiction with the two-level financial system of the state.

Finally, for an open discussion of the benefits and risks of digital steering, it is important to answer the question of whether CBDC will be used only on the domestic market or in cross-border settlements. Part of the legal risks associated with the restructuring of the regulation of foreign economic activity, as well as changes in the currency regulation and control regime, depend on this.

According to the researchers, "the issuance of CBDC by one state will have an impact not only on the economy of the issuing country, but also on the international economy as a whole. In particular, shocks in the issuing country's economy will have a greater impact on the economies of the countries with which the issuing country is most connected through its CBDC. A coin that penetrates the monetary circulation of other countries will cause a reduction in the economic freedom of the financial regulators of these countries. As a result, local central banks will need to respond twice as actively to inflation and other processes in the country (Ferrari et al., 2020).

In addition, if the digital ruble is introduced into the system of interstate settlements, a fundamentally new task may arise – giving the digital currency the properties of a single unit of account at the level of interstate unions. And in this situation, the legal restructuring of the digital ruble architecture will be extremely complicated.

### **3. Research Questions**

The above-mentioned methodological foundations for studying CBDC allow us to look at the problem from the position of justifying the introduction of a new payment instrument into the modern system. In the case of a positive answer to this question, it is important to understand exactly in what link (process) the digital currency should be integrated into and whether it poses a danger to the two-level financial system.

As you know, the monetary system has a debt nature, and by increasing and decreasing the supply of currency, the Central Bank regulates the exchange rate and ensures the stability of the ruble. Will the introduction of the digital ruble allow this policy to be continued and will it not cause new risks of currency regulation?

It is clear that the competitive advantages of CBDC will directly depend on the design of the digital currency. However, here it is important to answer the question of which of the advantages of CBDC should be a priority for the state: preserving the value, ensuring anonymity of payments, improving control over operations by commercial banks that consider CBDC as an analogue of non-cash funds.

Obviously, each of these issues needs a detailed analysis, including on the basis of a review of already tested CBDC models.

### **4. Purpose of the Study**

The purpose of this study is to define the framework for studying the digital ruble as a new financial and legal phenomenon. The study is devoted to the search for answers to the questions whether it is justified from an economic and legal point of view to open CBDC access to the balance sheet of central banks, whether it is permissible to include non-financial organizations and individuals in traditional interbank relations, etc.

Creating a digital ruble model will inevitably pose a risk to financial stability. However, due to the novelty of this model of money, it is not yet possible to understand the nature of risks. One thing is clear: changing the architecture of the modern financial system will change the nature of the risks. Obviously, this should be taken into account in the design of the digital ruble model within the framework of our proposed concept.

### **5. Research Methods**

The research methodology is based on the use of dialectical logic, multi-level, complex and systematic approaches. General scientific methods, scientific abstraction, analysis and synthesis, grouping, comparison, qualitative and quantitative expert assessments were used in the study. The apparatus of financial mathematics, financial and economic analysis, and the modeling method were used. Based on the

construction of models of monetary policy of central banks and the use of the forecast method, various scenarios for the implementation of CBDC are considered.

The systematic method allowed us to consider them through the prism of stable internal relations and to present CBDC as an internally structured economic and legal model. The risk-oriented approach used in the study allowed us to consider the main economic and legal risks of a new financial instrument and suggest ways to minimize them. Together, the methods used made it possible to formulate the most possible scenario for the development of the concept of the digital ruble and to identify the main directions of its implementation in the Russian economy and law.

## 6. Findings

Before revealing the concept of the digital ruble, it is important to determine the ideological basis on which it can be based. In this regard, it is important to mention the Bank of England's digital currency report of March 12, 2020 (Bank of England, 2020). The bank has clearly defined that when talking about CBDC, it means retail CBDCs, that is, available for use by ordinary citizens. On the contrary, the existing "digital money of the central bank", they are also reserves available for commercial banks, are not CBDC. Thus, he excluded the recognition of such a currency as a digital analogue of non-cash payments.

In addition, the Bank of England suggests linking CBDC to the fiat currency and treat them as an analogue of cash. Thus, the regulator has removed another important issue in the architecture of digital currency – the question of whether it is possible to regulate and preserve its value by charging interest or differentiated remuneration depending on the amount of funds in the digital wallet.

Among the advantages of the digital currency, the Bank of England called the speed and reliability of payments and competitiveness in relation to stablecoins. It is proposed to minimize obvious risks for commercial organizations by refusing to pay interest rates on deposits. This will help to keep the deposit holders and to prevent the mass outflow to digital currency, provided by a mega-regulator.

The Bank of England suggests creating a CBDC and a minimum digital platform for payments in CBDC. Providers of payment interface (PIP) secure an opportunity to use CBDC by ordinary citizens. In addition to the actual payments, PIP will be able to create additional systems, such as programmed money, micropayments, smart contracts, etc. PIP will be bound by regulations that will reduce possible risks. The Bank of England indicates that its possible CBDC will not necessarily be based on blockchain, although it recognizes the convenience of blockchain in a number of aspects, such as decentralization and cyber-sustainability.

In October 2020, a joint report was also published, with the participation of the Bank of England, and the central banks of Japan, Sweden, Switzerland, Canada, the European Union, the US Federal Reserve System and the Bank for International Settlements. They proposed standards (principles) for creating a digital currency of central banks (CBDC) (Bank for International Settlements (BIS), 2020b).

The report, in particular, notes that CBDC should not harm the country's financial system, but increase its stability and flexibility; not interfere with payments in other, more traditional forms (primarily in cash), but expand the capabilities of the supervising central bank.

The authors point directly to the threat of "digital dollarization", where cryptocurrencies, stablecoins or foreign CBDC can hinder consumers, monetary stability and even displace local money. The national

digital currency, according to the developers, is designed to prevent this. The report lists several qualities that a CBDC must have in order to meet the stated standards. Among them is resistance to cyber attacks, equality with other payment methods and full legal regulation.

## 7. Conclusion

The above-mentioned questions allow us to determine the starting points on which the concept of the digital ruble should be built. But first of all, it is important to determine what advantages Russia sees for itself in this tool. Most CBDC projects are implemented in countries with a highly digitalized society and high potential for innovation. Work with retail CBDC is more active in countries where the informal economy sector is larger (Auer et al., 2020). It is obvious that despite the noticeable digitalization of the Russian financial system, its informal sector of the economy is extremely insignificant. In this regard, it would be a mistake to believe that when the digital ruble is issued, the Central Bank of Russia will be able to shift its service to the private sector. It is also unclear whether this private sector can be made up of commercial banks or private technology companies.

In 2017, the Bank of Russia launched the Masterchain project, which brought together large commercial banks. However, even though it has implemented a number of interesting digital projects in the banking sector, this organization will not be able to take responsibility for the use of the digital ruble due to the lack of common interest of participants. In this regard, it is probably untimely to talk about public-private partnership in the sphere of digital ruble turnover in Russia (Barresi & Zatti, 2020).

By creating a CBDC, the Central Bank must decide what it wants in the end – a new monetary or payment system. For the payment system, it is enough to allow individuals to issue stablecoins. While the monetary system can be implemented in countries with advanced fintech, and with complex access to bank accounts (Zetzsche et al., 2020).

In the report of the Bank of Russia (2020) "Digital ruble: A report for public consultations", four models of the digital ruble were proposed:

- Model A corresponds to the traditional two-level financial model. The central bank issues a digital ruble, opens wallets to banks for interbank settlements and operations. This model does not allow us to consider the digital ruble as a retail instrument and does not give additional advantages to banks and users. And for this reason it was rejected by the central bank;

- Model B consists in the fact that the Bank of Russia opens and maintains electronic wallets of users (companies and individuals). In addition to monitoring the security of wallets, it takes over the control and cash services. This system excludes commercial banks from settlements and places a heavy burden on the mega-regulator in terms of servicing the wallets of individuals. Nevertheless, at the same time, this model has one undoubted advantage – most payments between individuals will be carried out under the strict control of the Bank of Russia. And quickly introduced support of the digital ruble (for example, by charging interest for use, etc.) will ensure a controlled balance of digital cash and non-cash funds;

- Model C differs in that commercial banks act as intermediaries between the central bank issuing money and users. They initiate the opening of electronic wallets by customers and the implementation of settlements on them. The problem, however, is that this model assumes a detailed and complete separation

of the competencies and responsibilities of the central bank and commercial banks for opening, maintaining accounts, ensuring the security of payments, and controlling AML/CFT;

- Model D assumes that the central bank creates and maintains the wallets of commercial banks, and the banks themselves open the wallets of customers and make payments on them. In this case, it is the commercial ones who are responsible for the security of payments, AML/CFT, the quality of payment applications, etc. This model is much more beneficial for banks than model C, since they are assigned fairly clear and transparent functions of financial control over users. However, the introduction of this system will inevitably cause a radical redistribution of forces on the financial market: small and medium-sized banks will not be able to compete with technologically strong credit institutions in the fight for the market of digital wallets, and competition with the central bank - for the market of retail payments in cashless payments.

Meanwhile, there is a reason to say that in the near future the Bank of Russia will start implementing either model C or model D. This is due to the fact that the modern Russian banking system simply cannot afford to bring down the market of non-cash payments and bank deposits due to some stagnation of the market and a decrease in the volume of cash flows.

In the context of a pandemic, users are much more interested in the reliability of the bank than in the profitability of their receivable accounts. In this regard, in the event of the emergence of a digital ruble secured by the obligations of the Central Bank, commercial banks risk being left without cash deposits and losing large volumes of non-cash payments and their services. In this case, there is a great risk to bring down the economy of commercial banks and significantly reduce the amount of profit received from servicing accounts of individuals and legal entities, issuing loans, etc. Taking into account these circumstances, the Bank of Russia does not see it possible to completely exclude commercial banks from the system of circulation of the digital ruble.

In the framework of model C, their functionality is seen in providing technical functions, and in the framework of model D – in giving them the status of an active participant in this turnover. It is not clear, however, how the responsibility will be distributed among the participants of this market, and what final advantages the digital ruble will give directly to commercial banks. Currently, the Bank of Russia does not provide answers to these questions. However, it is obvious that the key functionality of commercial banks in this area is still official-operational support for the turnover of the digital ruble. The introduction of this new feature will undoubtedly stimulate the development of fintech and increase competition between technologically advanced banks. But it is not yet clear what economic effect this work will have for the banks, creating competition within themselves for their services.

It is also important to pay attention to the fact that whatever model of the digital ruble is chosen, Russia will have to face the need to review the entire system of risks and develop new information security technologies in terms of preventing attacks on operators, and owners of digital wallets.

## References

- Auer, R., Cornelli, G., & Frost, J. (2020). Rise of the central bank digital currencies: Drivers, approaches and technologies. BIS Working Paper, 880. <https://www.bis.org/publ/work880.htm>
- Bank for International Settlements (BIS) (2020a). BIS innovation hub to expand to new locations in Europe and North America. <https://www.bis.org/press/p200630a.htm>

- Bank for International Settlements (BIS) (2020b). Central bank digital currencies: Foundational principles and core features. <https://www.bis.org/publ/othp33.pdf>
- Bank of England (2020). Discussion paper: Central bank digital currency: Opportunities, challenges and design. <https://www.bankofengland.co.uk/-/media/boe/files/paper/2020/central-bank-digital-currency-opportunities-challenges-and-design.pdf>
- Bank of Russia (2020). Digital ruble: A report for public consultations. [https://cbr.ru/analytics/d\\_ok/dig\\_ruble/](https://cbr.ru/analytics/d_ok/dig_ruble/)
- Barresi, R. G., & Zatti, F. (2020). The importance of where central bank digital currencies are custodied: Exploring the need of a universal access device. <https://ssrn.com/abstract=3691263>
- Ferrari, M. M., Mehl, A., & Stracca, L. (2020). Central bank digital currency in an open economy. ECB Working Paper No. 20202488. <https://ssrn.com/abstract=3733463>
- George, E. (2020). Pondering payments: Challenges of reaching all Americans. KC Fed Policy Perspectives. [https://www.kansascityfed.org/~media/files/publicat/speeches/2020/-policy\\_perspectives\\_6\\_30\\_20.pdf?la=en](https://www.kansascityfed.org/~media/files/publicat/speeches/2020/-policy_perspectives_6_30_20.pdf?la=en)
- Khisamova, Z. I., Begishev, I. R., & Sidorenko, E. L. (2019). Artificial intelligence and problems of ensuring cyber security. *International Journal of Cyber Criminology*, 13(2), 564-577. <https://doi.org/10.5281/zenodo.3709267>
- Kiselev, A. (2019). *Is there a future for central bank digital currencies?* Bank of Russia.
- Mester, L.J. (2020). Payments and the pandemic. <https://www.clevelandfed.org/en/newsroom-and-events/speeches/sp-20200923-payments-and-the-pandemic.aspx#D10>
- Sidorenko, E. L. (2020). Stablecoin as a new financial instrument. In S. Ashmarina, M. Vochozka, & V. Mantulenko (Eds.), *Digital Age: Chances, Challenges and Future. Lecture Notes in Networks and Systems*, 84 (pp. 630–638). Springer. [https://doi.org/10.1007/978-3-030-27015-5\\_75](https://doi.org/10.1007/978-3-030-27015-5_75)
- Zetsche, D. A., Buckley, R. P., Arner, D. W., Didenko, A. N., & van Romburg, L. (2020). Sovereign digital currencies: The future of money and payments? University of Hong Kong Faculty of Law Research Paper No. 2020/053. <https://ssrn.com/abstract=3714386>