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Central Bank Digital Currencies: Key Aspects and Impact on the Financial System

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ABSTRACT

This research discusses various issues associated with central bank digital currency that is identified as a new form of money. This paper aims to identify the key prerequisites for the issuance of central bank digital currencies, to discuss the key characteristics of central bank digital currencies and analyze the possible impact of central bank digital currencies on the financial system. The author uses the methods of synthesis, analysis, logical method, comparison, induction, deduction. The research highlights the key principles that should be considered when making decisions on the issuance of central bank digital currency. The paper emphasizes that the issuance of central bank digital currency can be successful if it has competitive advantages over existing forms of fiat money. The research identifies the main characteristics of central bank digital currencies. The paper discusses whether central banks should pay interest on fiat digital currencies. The author notes that the impact of central bank digital currencies on the financial system is expected to vary in different periods of time depending on the phase of the economic cycle and the level of interest rates in the economy. The research shows that central bank digital currency will stimulate the digitalization of the financial system while at the same time it will not create additional risks to financial stability. Introducing central bank digital currency is primarily aimed at promoting the efficient payment system. Further research is needed into mechanisms for the technical implementation of digital currency issuance, taking into account the possible risks associated with introducing fiat digital money.

Keywords: payment system; central bank digital currencies; issuing fiat digital currency; financial system; crypto-assets; monetary policy; central banks; financial stability; banking sector; digitalization

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INTRODUCTION

Digitalization remains one of the most important trends in the development of the modern global financial system. This is reflected in the emergence of new forms of payments and settlements, the development of the digital asset market, the entry of high-tech companies into the financial services market, as well as the emergence of new products and services in the global financial market. The use of digital technologies by credit institutions has led to significant changes in the banking services market and created the basis for the development of such products and services as mobile banking, instant payments, remote banking services and Internet banking [1]. The digitalization processes not only led to the emergence of new financial products and a significant change in the business

models of credit institutions, but also required a revision of many problems associated with the development of the monetary system, regulation of the activities of credit institutions, as well as the role of central banks in the modern economy.

The question of how central banks in developed and developing countries should respond to the digitalization of global finance and technological innovation in recent years is equally important. In particular, the rapid development of the digital asset market and the growing popularity of blockchain technology have made CBDCs increasingly relevant.

A significant number of central banks are currently considering the possibility of introducing CBDCs in the context of the digital transformation of global finance. Despite the fact that the problems of issuing CBDCs are new

for financial science, they are already attracting significant interest from both financial market participants and regulators. According to the Bank for International Settlements, all the world's leading central banks are conducting research on digital currencies and are at various stages of assessing the prospects for introducing the CBDCs into circulation. [2]. The European Central Bank, the Bank of Sweden, the Bank of Canada, the Bank of Russia, the Bank of England, the Reserve Bank of Australia, and the People's Bank of China are at different stages of deciding to issue CBDCs.

In particular, the Bank of Russia prepared a report on CBDCs and announced public consultations on the digital ruble.¹ As part of an ongoing study of digital money, the Bank of Russia also published the Concept of the Digital Ruble,² which defines the model of the digital ruble, the possible consequences of the digital ruble issue for the Russian economy, and the stages of further work on the project.

The Bank of Sweden has launched an e-krona pilot project that tests various approaches to issuing digital fiat money and assessing their possible impact on the financial system.³

The Bank of Canada is doing a lot of research on digital fiat money. At the same time, the Bank of Canada will not issue CBDCs in the near future and plans to continue researching digital currencies to develop a possible model for issuing digital currencies, as well as to define a system of criteria to assess the feasibility of issuing digital money in the context of solving the problems facing the central bank.⁴

The People's Bank of China is one of the leaders in digital money research and has

already decided to issue a digital yuan in the future. Currently, the infrastructure necessary for the circulation of the digital yuan is being created in China, and the digital yuan is being actively tested with the involvement of banks and individuals.

Research on CBDCs is also carried out by the Bank for International Settlements and the International Monetary Fund [3–6].

At the same time, no unambiguous answer has been formulated to the question of the expediency of issuing CBDCs. In many ways, questions remain about what characteristics national digital currencies should have if they are to be issued. In addition, issues related to assessing the impact of the issuance of CBDCs on the conditions of monetary policy and the possible consequences of their issue for the financial sector require separate consideration.

This paper justifies the need to issue CBDCs, identifying the key characteristics of CBDCs and the conditions for their successful issuance, as well as assessing the possible impact of CBDCs on the monetary policy pursued by the central bank.

CONCEPT AND BASIC CHARACTERISTICS OF CBDCs

Money is an essential element of the economic system. Physical cash and non-cash money have traditionally been viewed as the main forms of modern fiat money. Electronic money is a type of non-cash money that has arisen as a result of the development of financial relations at the present stage. The ongoing processes of digitalization of the global financial system are reflected in the growing popularity of blockchain technology and the emergence of a new type of asset — digital assets. The development of the digital asset market and the decline in the popularity of physical cash among economic entities in developed countries required central banks not only to formulate their attitude to this phenomenon but also to determine the directions for supporting digitalization processes. One of the areas of such support is the issuance of CBDCs.

¹ The Bank of Russia website. Digital ruble. Public Consultation Report. October 2020. URL: https://cbr.ru/StaticHtml/File/112957/Consultation_Paper_201013.pdf (accessed on 19.04.2021).

² Bank of Russia website. Digital ruble concept. April 2021. URL: https://cbr.ru/Content/Document/File/120075/concept_08042021.pdf (accessed on 19.04.2021).

³ E-krona pilot Phase 1. Sveriges Riksbank. April 2021. URL: <https://www.riksbank.se/globalassets/media/rapporter/e-krona/2021/e-krona-pilot-phase-1.pdf> (accessed on 19.04.2021).

⁴ Contingency Planning for a Central Bank Digital Currency. Bank of Canada. February 2020. URL: <https://www.bankofcanada.ca/2020/02/contingency-planning-central-bank-digital-currency> (accessed on 19.04.2021).

In scientific publications in recent years, the term “cryptocurrency” has become very popular. It is important to note that the use of the word “currency” in this context is inaccurate since crypto assets are not currencies and cannot be considered money (Fig. 1). In particular, crypto assets do not fully fulfill the function of a measure of value and a store of value. Crypto asset prices are highly volatile. In addition, none of the crypto assets can be considered as a universal means of payment. Thus, crypto assets do not fulfill all the functions of modern fiat money, which is why this article uses the term “crypto assets”. CBDCs, on the other hand, is a new form of fiat money along with the existing forms of money — cash and non-cash money.

Due to the relatively small volume of the cryptoasset market compared to the traditional segments of the financial market and the low popularity among investors, digital assets do not significantly affect the stability of the financial systems of developed countries and do not change the conditions for conducting monetary policy. This conclusion was obtained by the author based on the research [7–9]. On the other hand, CBDCs, if issued, can have a significant impact on the financial system. The nature and degree of such influence will largely depend on the specific characteristics of CBDCs. In this regard, the assessment of such changes is possible only after determining the main characteristics of CBDC.

The presence of different, sometimes diametrically opposed points of view regarding the properties and desirable features of digital money makes it impossible at the moment to formulate a single definition of CBDC.

In this article, CBDC refers to the digital form of fiat money issued by a central bank and capable of performing all the functions of modern money. The CBDC is considered an accessible form of money for business entities and can be used by them to make payments or settlements at any time, including paying taxes, as well as direct P2P and P2B settlements.

Unlike modern non-cash money, which for individuals and companies is always tied to a bank

account, digital money can be stored in a separate electronic wallet or in an individual account with a central bank, and settlements using CBDCs can be carried out directly between business entities without opening an account in a bank [10].

When deciding on the feasibility of issuing CBDCs, it is important to assess how attractive this form of money will be, both from the point of view of the Central Bank and from the point of view of business entities.

The most important tasks of the central bank in modern conditions include: ensuring financial stability, promoting the development of the financial system, as well as the development of the payment system. The issue of the feasibility of CBDCs should also be considered taking into account the tasks and priorities facing the central bank, which are largely determined by the level of economic development and the current situation in the economy. At the same time, it is important to keep in mind the general principles that are relevant to all central banks considering issuing CBDCs.

According to the author, such principles are:

- ensuring financial stability. The issuance of CBDCs should contribute to the fulfillment of the tasks entrusted to it by the central bank and maintain financial stability;
- coexistence with existing forms of money. CBDCs should complement the currently existing forms of money in the interests of the end-users of financial services;
- maintaining and stimulating competition in the financial services market. The CBDC issuance should contribute to the development of an innovative environment, stimulate competition and ensure high quality of services provided;
- cooperation and interaction between regulators and economic actors. Issuing fiat digital money can only be successful if this instrument is attractive to business entities. The main parameters of CBDCs must meet the needs of financial market participants, which implies the interaction of all interested parties in the process of developing and implementing a project to create the CBDCs infrastructure required;

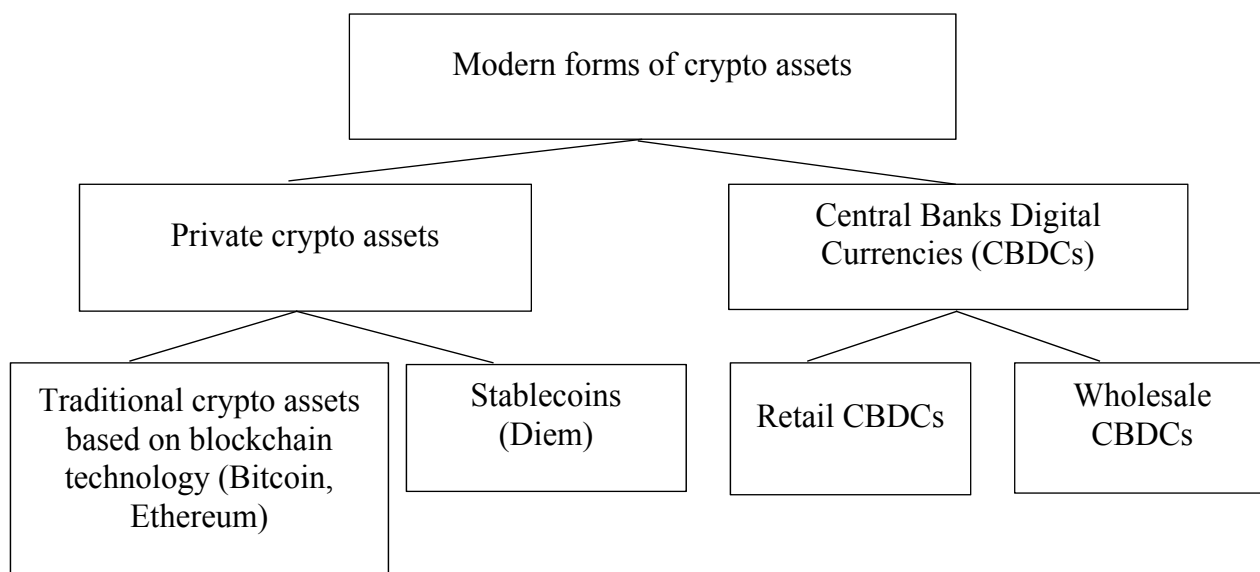


Fig. Classification of new forms of crypto-assets

Source: compiled by the author based on Dong He et al. Digital Money Across Borders: Macro-Financial Implications. IMF Staff Report. October 2020; Wouter Bossu et al. Legal Aspects of Central Bank Digital Currency: Central Bank and Monetary Law Considerations. IMF Working Paper. Nov. 2020.

- ensuring information security. The CBDC issuance involves the creation of an infrastructure capable of protecting potential users of digital money from cyberattacks and other information security threats.

CBDC issuance involves country specifics, in particular, the level of development of the financial system and consumer preferences. Nevertheless, a prerequisite for the demand for CBDCs among end-users is the presence of obvious competitive advantages in comparison with the currently existing forms of payments and settlements.

The presence of such competitive advantages, in particular, implies the availability of CBDCs for end consumers, wide opportunities for using CBDCs in making payments and settlements on an equal basis with other forms of money, low cost and ease of making payments, the equivalence of a new digital form of money and existing forms, the ability to seamlessly transfer money from one form to another, as well as the reliability and safety of digital money.

When defining the characteristics of CBDCs, it is also important to note that one of the reasons for the growing popularity of digital assets is the ability to conduct direct transactions between

participants without the involvement of financial intermediaries.

Consideration of various projects for the issuance of CBDCs allows classifying them into wholesale and retail [11, 12]. The main difference between retail and wholesale CBDCs is that access to retail CBDCs is open to a wide range of economic entities, including companies and individuals, while wholesale CBDCs are available only to credit institutions. The differences between wholesale and retail CBDCs are discussed in [13, p. 7–8].

Despite the fact that wholesale CBDCs in most studies also refer to digital money, according to the author, wholesale CBDCs are very close to existing non-cash money, which does not allow them to be fully attributed to the new form of digital money. Wholesale CBDCs are more likely to create the potential to further develop existing settlement and payment technologies. The wholesale CBDCs issuance does not imply significant changes to the financial infrastructure. Wholesale CBDCs do not have clear competitive advantages over payment and settlement systems operating in developed countries, which casts doubt on their relevance among end consumers. This conclusion is

consistent with the results of studies [14–16]. Comparative characteristics of retail digital money in comparison with cash and non-cash forms of money are presented in *Table 1*.

If issued, retail CBDCs create the basis for the development of digitalization processes and allow full use of the potential inherent in this form of money. The retail model of issuing digital money will make it popular among business entities and provide a competitive niche in the payment system for this instrument. Thus, when considering the CBDC issuance, it seems appropriate to take the model of retail CBDCs as a basis, taking into account the country specifics.

Retail CBDCs can be implemented both on the basis of tokens and on the basis of accounts [17]. In the second case, we are talking about opening accounts of economic entities in the central bank system. This approach to issuing digital money will not only require the creation of appropriate infrastructure but also create unwanted competition between credit institutions and the central bank. While CBDCs cannot provide absolute anonymity, token-based digital money issuance provides a higher level of privacy than account-based CBDCs. In addition, the issuance of token-based CBDCs will enable the innovative potential of digital money. In particular, this conclusion is consistent with the results of studies carried out by the Bank of Canada,⁵ the Bank of Russia⁶ and the Bank of Sweden.⁷

The issuance of token-based CBDCs, if implemented, will become a new stage in the development of payments and settlements, therefore it seems necessary to further study and subsequently test this technology in order to minimize possible risks for the financial system.

⁵ Charles M. Kahn, Francisco Rivadeneyra. Security and convenience of a central bank digital currency. Staff Analytical Note. Bank of Canada. October 2020. URL: <https://www.bankofcanada.ca/wp-content/uploads/2020/10/san2020-21.pdf> (accessed on 19.04.2021).

⁶ The Bank of Russia website. Digital ruble concept. April 2021. URL: https://cbr.ru/Content/Document/File/120075/concept_08042021.pdf (accessed on 19.04.2021).

⁷ E-krona pilot Phase 1. Sveriges Riksbank. April 2021. URL: <https://www.riksbank.se/globalassets/media/rapporter/e-krona/2021/e-krona-pilot-phase-1.pdf> (accessed on 19.04.2021).

Digital money created on the basis of tokens allows full use of smart contracts, which is especially important if necessary to ensure control over the intended use of funds. For these reasons, token-based retail digital money issuance is preferred.

PREREQUISITES FOR THE ISSUANCE OF CBDCs IN DEVELOPED COUNTRIES

Digitalization processes have led to significant changes in the financial systems of developed countries. In particular, new technologies have significantly influenced the development of payment and settlement systems. Instant payment systems have become widespread, allowing the bank's customers to make P2P and P2B transfers.

Digitalization processes in developed countries also influenced the preferences of business entities, which led to a decrease in the share of physical cash payments and an increase in the popularity of e-money. For example, in Sweden, the amount of physical cash in circulation to GDP has declined from 3% to 1% over the past ten years.⁸

The significant increase in the popularity of electronic payment systems using smartphones, such as ApplePay and GooglePay, confirms the popularity of digital technologies among businesses and indicates a continuing trend towards a decrease in the demand for cash in developed countries.

The rapid development of digitalization processes sets the central banks of developed countries the task of guaranteeing the stability and efficiency of the financial system in the new conditions, as well as creating additional competitive advantages for the national currency in the face of increasing foreign exchange competition in world financial market. The issuance of retail CBDCs in developed countries can help address these problems.

⁸ The Bank of Sweden website. URL: <https://www.riksbank.se/en-gb/payments-cash/payments-in-sweden/payments-in-sweden-2020/1.-the-payment-market-is-being-digitalised/> (accessed on 19.04.2021).

Analysis of key characteristics of new forms of money

Characteristic	Forms of money		
	Cash	Non-cash money	CBDC
Issuer	The types of modern physical cash are coins and banknotes. The emission of banknotes and coins is carried out by the central bank. Physical cash is an unconditional obligation of the central bank to its owners	The emission of non-cash money is carried out by the central bank and credit institutions. Two types of modern non-cash money are deposit money and e-money. Deposit money exists in the form of entries on the personal accounts of their owners in banks. Deposit money is the balance of funds in bank accounts that can be used for settlements. A feature of e-money as a type of non-cash money is the use of modern electronic technologies for storing money, as well as for making settlements and payments	Wholesale and retail CBDCs can be considered as types of digital fiat money. Retail CBDCs, like physical cash, are an unconditional obligation of the central bank to their owners. The issuance of retail CBDCs is carried out by the central bank. Both central banks and credit organizations can act as issuers of wholesale CBDCs
Possibility to charge interest	Physical cash is an interest-free obligation of the central bank to its owners	Credit institutions pay interest on deposits. By setting rates on deposits, credit institutions have the ability to regulate the inflow of funds from clients	CBDCs can be either interest-bearing or non-interest-bearing. Interest-bearing retail CBDCs involve the payment of interest by the central bank in favor of the owners of CBDCs.
Anonymity	Physical cash is available to all economic entities and can provide them with complete anonymity, considering the requirements of the law	Cashless payments do not provide complete anonymity. When making non-cash payments, customer identification is required. At the same time, in developed countries, the legislation on bank secrecy guarantees the confidentiality of data on the operations	CBDCs, in contrast to cash payments, do not provide complete anonymity for economic entities. At the same time, the issuance of retail CBDCs on the basis of tokens provides a greater level of confidentiality for economic entities, in comparison with the issuance of CBDCs on the basis of accounts with the central bank
Online settlements and payments	Making settlements and payments online using cash is possible	Modern payment infrastructure allows online cashless payments using various technologies, including mobile banking and fast payment services	The issuance of digital money implies the possibility of online settlements, which will ensure the attractiveness of the infrastructure of CBDCs for economic entities
The ability to use smart contracts	Not available	Currently not available	The issuance of retail digital money based on tokens allows using the capabilities of smart contracts, which are digital codes and contain the necessary conditions for making payments and settlements

Table 1 (continued)

Characteristic	Forms of money		
	Cash	Non-cash money	CBDC
Possibility of direct payments P2P and P2B	Cash is used as a means of direct payments between economic entities	Currently, in many countries, as part of the development of financial infrastructure, projects have been implemented that allow transfers between individuals and payments in favor of companies.	Retail CBDCs offer direct P2P and P2B transfers

Source: compiled by the author.

One of the most important reasons for considering the CBDCs issuance is the diminishing role of physical cash in settlements and payments in developed countries. For developing countries, this trend is not so obvious. The popularity of cash in developing countries is largely due to the doubts of economic agents about the reliability of credit institutions and the ability of regulators to ensure financial stability in the long term.

Retail digital money can combine the versatility and ease of use of cash with the digital capabilities of telecommuting. Thus, the reduction in the use of physical cash in developed countries poses a challenge for central banks to issue a digital currency that ensures the stability and efficiency of the payment system in the context of the digitalization of the financial system and the decline in the popularity of physical cash among business entities.

Retail CBDCs, like physical cash, are a direct obligation of the central bank to the holder, which makes them a risk-free asset.

Non-cash money in bank accounts cannot be considered completely risk-free due to the fact that banks have credit risks. The deposit insurance systems created in developed countries, combined with a high degree of reliability of credit institutions, as well as the willingness of regulators to provide support to credit institutions in crisis conditions, significantly reduce the credit risks of banks. The conditions prevailing in developed countries make it possible to assert that the credit risks of banks are actually very low. However, we cannot speak of their complete absence.

National government bonds are also not a completely risk-free asset for economic entities,

since they have market risk. These circumstances are fundamentally important since, in the context of the digitalization of the financial system, it is important for the central banks of developed countries to offer the market a digital, risk-free form of money. Retail CBDCs can simultaneously serve as a risk-free asset for economic agents and act as a new form of money that meets the needs of the digital economy. In this context, it is important to note that the issuance of digital fiat money will help improve the reliability of the financial system, as economic entities will have access to a new risk-free asset that meets their needs.

The issuance of the retail CBDCs increases competition in the financial services market. The further strengthening of the role of systemically important banks and existing electronic payment systems, combined with a decrease in the popularity of cash, could in the long term lead to a monopolization of the payments market and a decrease in incentives for innovation on the part of large market participants.⁹ As a result of a possible monopolization of the market, there are also risks of growth in tariffs and a decrease in the quality of services provided.

Despite the fact that the payment services market in developed countries is currently competitive, nevertheless, central banks are faced with the task of eliminating the risks of market monopolization and creating additional prerequisites for increasing competition.

The emergence of retail CBDCs could be an additional factor contributing to increased

⁹ Annual Economic Report. Bank for International Settlements. June 2020. P. 67–89. URL: <https://www.bis.org/publ/arpdf/ar2020e.pdf> (accessed on 19.04.2021).

competition and the development of an innovative payment market. The issuance of CBDCs can, in the long term, reduce the impact on the market of large banks, existing mobile payment systems, as well as reduce the dominant position of such international payment and settlement systems as Visa and MasterCard. The development of the payment system based on increased competition in the payment and settlement market can give an additional impetus to the development of the financial system. Thus, the issuance of CBDCs contributes to the fulfillment of the central bank's function of promoting the development of the national payment system.

CBDC needs serious consideration in the context of the unprecedented support measures provided by the governments of developed countries in connection with the coronavirus pandemic. During a crisis, retail CBDCs can be used as a tool to provide direct government support to citizens. In such cases, the infrastructure of CBDCs can be used to make direct payments to G2P to support those affected by the crisis. Thus, retail digital money can become an additional mechanism for providing direct support to individuals, which can be competitive with traditional mechanisms in terms of convenience, transparency, and ease of use.

Digitalization processes pose challenges for central banks to ensure access to high-quality and modern financial services for businesses that need them. As the economy develops and the well-being of the population grows, continuous and guaranteed access to high-quality financial services becomes more and more important for economic agents. The higher the level of economic development and well-being of the population and, accordingly, the higher the demand for financial services, the more priority this task becomes for the central bank. The issuance of CBDCs can contribute to its solution if this form of money is attractive and can earn the trust of consumers.

The overwhelming majority of the population of developed countries has access to modern payment and settlement technologies. For

example, in the United States, 95% of the adult population has an account with a credit institution,¹⁰ in Sweden this figure exceeds 99%.¹¹

In developing countries, on the contrary, a significant part of the population does not use the services of credit institutions. In particular, a significant part of the population in developing countries still does not have a bank account and does not use modern payment technologies. According to the author, this situation in developing countries may be partly related to low levels of financial literacy, accessibility and level of development of financial services, but, first of all, this is due to insufficient demand for these services due to low incomes of the population. The demand for financial services in developing countries will grow as incomes and quality of life rise.

On the one hand, an increase in the welfare of the population contributes to an increase in demand for digital technologies, on the other hand, the development of digitalization processes contributes to economic development and creates additional competitive advantages for the economies of the developed countries.

Facilitating digitalization of the financial system includes central bank policies to remove potential barriers to digital access by fostering the innovative development of the payment system.

The CBDC issuance in retail form creates the preconditions for the existence of various payment instruments, competing with each other, which allows economic entities to choose the most suitable instrument for them. The CBDC issuance is able not only to support the digitalization of the financial system but also to provide access for economic entities to an additional settlement system based on the use of digital money.

Thus, retail CBDCs are designed to guarantee in the future access of economic entities to

¹⁰ How America Banks: Household Use of Banking and Financial Services. 2019 FDIC Survey. URL: <https://www.fdic.gov/analysis/household-survey/2019report.pdf> (accessed on: 19.04.2021).

¹¹ URL: <https://data.worldbank.org/indicator/FX.OWN.TOTL.ZS> (accessed on 19.04.2021).

modern technologies for making payments using a digital form of money available to economic entities, which is a top priority for central banks of developed countries in the face of the growing prosperity of economic entities and processes of digitalization of the economy.

CBDC-based payments allow creating prerequisites for optimizing the interaction of sellers and buyers based on the use of digital technologies, which will increase sales, as well as create preconditions for the development of the financial system and economic growth. The development of retail payment systems based on the use of digital money can be considered as a factor contributing to the development of channels for the sale of goods and services, which is especially important for the economies of developed countries, where final consumption expenditures form the basis of GDP. The issuance of digital money can have a positive effect on both the state of the financial system and the real sector of the economy.

The development of the crypto asset market, with the timely adoption of government regulation measures, does not create risks for the financial stability of developed countries. Moreover, the development of the crypto asset market can enhance the competitive advantages of financial systems. Private crypto assets and CBDCs do not compete with each other but complement each other. CBDCs act as a full-fledged form of fiat money, and private digital assets as a possible investment target for a limited number of investors. It is important to note that despite the growing popularity of crypto assets, their capitalization remains insignificant compared to traditional assets, and they will not play a significant role in the global financial market for the foreseeable future.

Fostering digitalization of the financial system involves a two-pronged approach by central banks and national governments, combining measures to stimulate digitalization through the issuance of CBDCs and government regulation of digital assets.

The issuance of CBDCs and measures of state regulation of crypto assets are designed

to facilitate the further development of digitalization processes, which will allow business entities to gain access to both private crypto assets and fiat digital money.

In this context, it is important to note that the development of the business of social networks and messengers objectively contributes to the digitalization of the financial systems of developed countries. In particular, the social network Facebook is considering a project to launch the stablecoin Diem,¹² formerly known as Libra. By now, the requirements of the regulators have been considered, the launch of Diem is scheduled for 2021.

Papers [18–21] indicate that private crypto assets can be viewed as a potential threat to financial stability, can create problems for central banks in their monetary policy, and contribute to the crowding out of the national currency by crypto assets. In particular, such a threat can come from bitcoin, as well as from stablecoins.

According to the author, the possible emergence of stablecoins similar to Diem does not pose risks to the financial stability of developed countries. Moreover, such stablecoins can enhance the competitive advantages of the currencies of developed countries through the development of digital services provided by private companies, which will make the corresponding fiat currencies more attractive and have a positive impact on the competitiveness of these countries.

At the same time, the issuance of retail CBDCs by central banks of developed countries with the admission of non-residents to them, as well as the launch of stablecoins based on fiat money from developed countries, can create additional risks for developing countries. If such CBDCs and stablecoins are successful, payment systems based on them can create additional competition for the currencies of developing countries. In the absence of financial stability and distrust of economic entities in the ongoing

¹² Сайт Diem. URL: <https://www.diem.com/en-us/learn-faqs/> (accessed on 19.04.2021).

monetary policy, the risks of mass exodus of economic entities from the national currencies of developing countries will increase, since stablecoins and CBDCs of developed countries can become additional convenient tools for such actions. These circumstances highlight the need to ensure financial stability, create an attractive business environment and work on the development of payment systems in developing countries. If the projects of CBDCs in developed countries are successful, the central banks of developing countries are also preferable to be ready to issue them, which emphasizes the need for a comprehensive study of issues related to the issuance and circulation of digital money.

Support for digitalization processes should be aimed at strengthening the competitiveness of the national economy and increasing the attractiveness of the national currency for investors. When pursuing policies aimed at stimulating digitalization processes, it is also important to take into account the risks associated with this phenomenon [22]. Pursuing a policy aimed at strengthening competitive advantages for the economies of developed countries involves stimulating digitalization processes through the issuance of CBDCs and taking regulatory measures in relation to the digital asset market aimed at ensuring the rights of investors and ensuring financial stability. In this context, the issuance of CBDCs will contribute to the development of digitalization processes and ensure financial stability.

ASSESSING THE IMPACT OF CBDCs ON THE FINANCIAL SYSTEM

The degree of influence of CBDCs on the financial system and the conditions for conducting monetary policy will be largely determined by the characteristics of the new form of money and its demand among economic entities. One of the most difficult issues requiring consideration in the framework of the implementation of projects for the issuance of retail CBDCs is the possibility of issuing interest-bearing CBDC

[23–25]. This issue is key when deciding on the feasibility of issuing CBDCs and goes far beyond the discussion about the possible characteristics of digital currencies.

Arguments in favor of issuing interest-bearing retail CBDCs are primarily related to the search for opportunities to improve transmission mechanism in the conduct of monetary policy by reducing the effective lower bound of the interest rate. The effective lower bound is understood as the key rate of the central bank, below which its further reduction is not effective due to limitations in the transmission mechanism.

The problem of an effective lower bound remains relevant and should be taken into account when conducting a stimulating monetary policy in developed countries [26, 27]. At the same time, at present, there is no consensus about the degree of importance of this problem and the ways of its solution. Nevertheless, it can be argued that an effective lower bound may, in certain situations, create difficulties in the implementation of a stimulating monetary policy by central banks of developed countries. A decrease in rates below the effective border ceases to have a stimulating effect on the economy.

The existence of an effective lower bound is explained by the fact that economic agents can convert funds into cash and thus avoid negative interest rates, which reduces the effect of the introduction of negative interest rates by central banks.

The effective lower bound of the interest rate for the economies of developed countries can be either close to zero or below zero due to two important circumstances. Firstly, keeping cash for credit institutions is associated with certain costs. Secondly, developed countries are characterized by a high degree of involvement of business entities in the financial market, therefore, the possibility of permanent transactions with financial instruments is of particular importance for them. These circumstances significantly reduce the attractiveness of cash for business entities in developed countries.

Some studies suggest that central banks of developed countries in a deep economic crisis may need to reduce rates to levels well below zero values [28, 29]. For such a reduction in rates to have the necessary stimulating effect, an increase in the efficiency of the transmission mechanism is required.

The issuance of interest-bearing retail CBDCs can be seen as an instrument that can significantly increase the sensitivity of the economy to central bank interest rates and thus improve the efficiency of the transmission mechanism. It is important to note that the interest rate of CBDCs should not be higher than the deposit rate of the central bank so that economic entities do not have arbitrage opportunities. Issuing interest-bearing digital money also implies the possibility of an economic entity “receiving” a negative interest rate if the central bank’s deposit rate also becomes negative. Due to the fact that the rate charged on balances on digital money will be available to companies and individuals, lending institutions will promptly adjust rates on deposits and other products in accordance with changes in central bank rates. Changes in central bank rates will lead to rate changes in the economy much faster. Thus, interest payments on CBDCs can help strengthen monetary transmission mechanism and enhance the ability of central banks in developed countries to pursue stimulating monetary policy in the face of negative interest rates [30].

According to the author, considering CBDCs in the context of solving the problem of strengthening the transmission mechanism is difficult, since the availability of physical cash will further limit the ability to set negative interest rates below a certain level. Consequently, in practice, it is possible to achieve a significant enhancement of the transmission mechanism by issuing fiat digital money only if physical cash is canceled and replaced by CBDCs, which, of course, is not justified and contradicts the main objectives of issuing CBDCs. The abolition of physical cash will create risks for financial stability and reduce the confidence of economic agents in the financial system.

In addition, the issuance of CBDCs with the possibility of charging interest can amplify the processes of disintermediation many times over, since digital money will directly compete with bank deposits. Charging interest on digital money will mean that banks will effectively be forced to compete with the central bank in the market for banking products. The movement of funds between bank deposits and CBDCs will also increase the volatility of bank liabilities.

To preserve the resource base, credit institutions may face the need to significantly increase deposit rates and increase the share of wholesale financing in the balance sheet structure. Heightened disintermediation processes, combined with a reduction in the resource base, will lead to a deterioration in the credit quality of banks and create risks for financial stability. A decrease in liabilities and an increase in their volatility may cause a reduction in lending to business entities from the banking system. To mitigate the negative impact, central banks may need to significantly increase the volume of liquidity provision to the banking system through repo transactions. The increase in the limits on repo transactions, in turn, will require an expansion of the list of instruments that can be accepted as collateral for transactions. In connection with the increase in the limits on repo transactions, the problem of the credit quality of collateral may arise. The need to provide banks with additional liquidity from the central bank can increase credit risks for the central bank and increase the dependence of banks on financing from the central bank.

Charging interest on CBDC will not lead to a significant improvement in the transmission mechanism in the long term. It will also cause significant problems for the financial system and complicate the implementation of monetary policy.

The issuance of non-interest-bearing CBDC is preferable. One of the most important consequences of such a decision for the financial system will be the de facto zero lower bound for nominal interest rates. In the absence of restrictions on transactions with CBDCs, as well

as in compliance with the principles of equality and equivalence of CBDCs and existing forms of money, business entities will prefer to convert funds into CBDCs in order to avoid negative interest rates. For the same reason, it will be impossible to have negative returns in the government debt market. The establishment of a zero lower bound for nominal interest rates, in the author's opinion, will not lead to an increase in risks to financial stability and will not create significant risks when conducting accommodative monetary policy by central banks of developed countries.

A negative interest rate policy, as opposed to a zero interest rate policy, is a controversial approach to stimulating monetary policy, and the possible positive effects of such a policy remain unproven [31, 32]. In particular, the successful use of a wide range of stimulating monetary policy instruments by the US Federal Reserve both during the global economic crisis of 2008 and in the context of the coronavirus pandemic did not provide for a policy of negative interest rates.

When assessing the impact of the issuance of CBDCs on the financial system and the conditions for conducting monetary policy, the key issue is the payment of interest on digital money. In the event of the retail CBDCs issuance with interest paid by the central bank, this impact would be significant and mostly negative. Non-interest-bearing retail CBDC will also have some impact on the financial system and the monetary policy environment, but the impact will be significantly less.

In this paper, the author substantiates the advisability of issuing non-interest-bearing fiat digital money, so it is important, first of all, to assess the impact of this version of CBDCs on the financial system. It should also be noted that the impact of the central bank's digital currency on the financial system at different periods of time will be different depending on the phases of the economic cycle and the level of interest rates in the economy.

The issuance of non-interest bearing CBDCs will allow financially stable banks to maintain

their resource base, in case they adjust their business models taking into account the growing competition in the payments market. In a situation of economic growth and positive interest rates, the demand for digital fiat money will be determined, first of all, by the extent to which the payment systems, settlements and additional services created on their basis will attract business entities, i.e. how attractive CBDC will be as a means of payment. In such an environment, digital fiat money will be perceived by consumers as an "electronic banknote" and, possibly, a more convenient alternative to cash and existing retail payment systems. Conversion of a certain part of the cash to CBDCs will not affect the bank performance indicators. In addition, the transfer of money from cash to CBDCs will not significantly affect the transfer mechanism and the terms of the monetary policy.

The issuance of non-interest-bearing CBDC will not lead to a significant reduction in the deposit base of credit institutions, since positive interest rates will be charged on deposits. In a situation characterized by sustainable economic growth, positive interest rates and financial stability, clients of financially stable credit institutions will not abandon interest-bearing bank deposits in favor of CBDCs that do not carry interest.

At the same time, increased competition in the payment and settlement market due to the issuance of CBDC and the development of the digital services market may cause some outflow of customer funds from accounts with credit institutions. This outflow may not be significant due to the interest-free nature of CBDCs and will be replaced by wholesale funding or offset in the short term by providing credit institutions with additional liquidity through repo transactions with the central bank. In the medium term, credit institutions will be able to make the necessary changes to their business models, offering business entities products and services based on the use of CBDCs, as well as adjusting approaches to asset and liability management.

In the face of an economic downturn, central banks in developed countries are pursuing

stimulating monetary policies that combine both traditional and unconventional stimulus measures. In order to stimulate economic activity and maintain financial stability, central banks of developed countries seek to reduce the level of interest rates in the economy and stabilize the situation in the financial market. Periods of economic downturns may be accompanied by a deterioration in the credit quality of financial institutions, which may also require central banks to take timely measures to support them.

In a situation of economic downturn and low interest rates due to the stimulating monetary policy of central banks, the impact of the central bank's digital currency on the financial system may slightly increase. Since the issuance of CBDCs without the possibility of calculating interest actually sets a lower zero bound for interest rates, then when the level of nominal interest rates in the economy approaches zero, the relative attractiveness of digital money compared to cash will increase. In an economic downturn and close to zero interest rates, the demand for CBDC may slightly increase, since this form of money may be perceived by some financial market participants as a risk-free asset, which is much more convenient in comparison with cash. In the event of an increase in risks to financial stability and deterioration of the credit quality of banks during a recession, economic entities can increase investments in CBDCs by withdrawing funds from banks that could potentially face financial problems. The outflow of customer funds from bank accounts will increase the need for repo transactions with the central bank and attract additional wholesale financing in the financial market. These circumstances must be considered when conducting monetary policy, as well as policies to maintain financial stability.

Thus, in a recession, digital money can have some impact on the financial system. However, according to the author, it is important not to overestimate the degree of such influence and not to consider it as a negative factor. First of all, it should be noted that CBDCs do not create

new risks for the financial system due to the fact that fiat digital money can be considered as the least risky asset in comparison with other types of assets. The transfer of part of the funds of economic entities to CBDC does not lead to an increase in risks for them. In addition, the possibility of an outflow of funds from credit institutions due to the deterioration of their credit quality exists regardless of the presence of CBDCs in the monetary system. In the face of growing risks of credit institutions, economic entities currently have the opportunity to withdraw their funds from deposit accounts and use them, for example, to purchase government bonds. In addition, CBDC is not the most attractive alternative to bank deposits for economic entities, since CBDC does not bear interest and there is no growth potential for the market value. According to the author, the issuance of CBDCs without charging interest by the central bank does not create new risks for credit institutions in a recession, since the root cause of a possible outflow of customer funds is potential problems in credit institutions due to insufficient adaptability of business models to a worsening economic situation in a recession, but not due to presence of fiat digital money in the monetary system.

The issuance of non-interest-bearing CBDCs cannot lead to the loss of financial stability of credit institutions with high credit quality or cause an increase in risks to financial stability. In this context, it is important to note the importance of the central bank's policy to maintain financial stability and ensure the stability of the banking system.

The issuance of non-interest-bearing CBDCs, in general, will have a positive impact on the development of the financial system by increasing competition in the payment and settlement market, stimulating the digitalization of the financial system, and will also contribute to ensuring financial stability. The potential positive effects of the issuance of retail CBDC are summarized in *Table 2*.

An important additional argument in favor of issuing digital fiat money by central banks of

developed countries is given in research [33, p. 15]. The presence of CBDCs will make it possible to quickly reorganize problem credit institutions. The technical advantages of digital money will allow regulators to make payments faster in favor of depositors of such banks, thus avoiding the effect of “infection” of the financial system and the emergence of threats to financial stability. Thus, the use of CBDC creates prerequisites for strengthening the confidence of business entities in the financial system and reducing risks to financial stability.

The issuance of CBDCs, first of all, should be considered within the framework of solving the problem of the development of the payment system. Considering CBDC in the context of improving monetary policy instruments is not an optimal solution. Therefore, the main criterion for the effectiveness of the issuance of CBDCs is the extent to which the issuance of digital money will have a positive impact on the development of the payment system. To solve this problem, fiat digital money should act as a digital currency available to business entities without any restrictions, issued on the basis of tokens and not involving the payment of interest by the central bank in favor of the holders. The issuance of CBDCs with such parameters will not lead to an increase in risks in the financial systems of developed countries, but, of course, will require credit institutions to adjust their business models in connection with the intensification of competition in the payment and settlement market.

CONCLUSIONS

The paper considers topical issues related to digital fiat money. In connection with the processes of digitalization of the economy, growth in the well-being of the population, a decrease in the popularity of physical cash and a high level of trust of business entities in the financial system, consideration of the issuance of digital money is becoming especially relevant for central banks of developed countries. The paper substantiates the need for central banks of developed countries to issue digital currency as a new form of fiat money. CBDCs will stimulate

competition in the payment and settlement markets, create additional competitive advantages for currencies in the face of increasing global foreign exchange competition, can be used as a tool to provide direct support to economic entities in crisis conditions, and will also act as a risk-free form of money that meets the needs of the digital economy.

The CBDC issuance involves considering a large number of factors related to the peculiarities of the development of national financial systems, consumer preferences, as well as the current situation in the economy.

In defining the characteristics of CBDCs, it is important to consider that the issuance of CBDCs can only be successful if digital money has clear competitive advantages over existing forms of money.

The use of a retail model for issuing CBDCs is preferable since this model will make it possible to take full advantages of digital technologies and ensure the attractiveness of this tool for business entities.

The study formulates general principles that must be considered when deciding on the issuance of CBDCs. This includes:

- ensuring financial stability;
- coexistence with other forms of money;
- maintaining and stimulating competition in the financial services market;
- cooperation and interaction between regulators and economic actors;
- ensuring information security.

The paper defines the main characteristics of digital money that correspond to these principles and ensure the development of the payment system. This includes:

- direct access for economic agents;
- issue based on tokens.

In addition, the issuance of digital currency does not imply the possibility of interest payment by the central bank in favor of the holders.

The degree of influence of the digital currency of the central bank on the financial system and the conditions for conducting monetary policy will depend on the parameters of CBDCs, the

Table 2

Assessment of the positive impact of retail CBDCs

Positive impact of retail CBDCs	Description
Increased competition in the financial services market	The issuance of CBDCs will contribute to the development of competition through the creation of new payment and settlement instruments available to a wide range of economic entities. The infrastructure created on the basis of CBDC will allow financial service providers to create additional services based on the introduction of innovations. Growing competition will help reduce the cost of services provided and improve their quality, as well as increase the reliability of the payment infrastructure. Competition among service providers in the payment and settlement market is the basis for the creation and development of products that meet the needs of economic entities
The issuance of retail CBDCs, combining the advantages of physical cash and non-cash forms of money	Retail digital money issued by a central bank can combine the advantages of non-cash money, associated with the ability to make remote payments and transfers, and physical cash, which allows settlements without access to the Internet. Retail CBDCs will function as a means of payment, a medium of exchange, a measure of value, and a store of value, serving as another and equivalent form of money
Stimulating the processes of digitalization of the financial system	The processes of digitalization of the financial system contribute to an increase in the quality and diversity of financial services, which poses the task of stimulating these processes for central banks. One of the directions of such stimulation is the issuance of CBDCs. Retail CBDCs can become the basis for the development of new types of financial services and services that meet the needs of the digital economy
Formation of prerequisites for ensuring financial stability	The issuance of retail CBDCs could have long-term positive effects on financial stability. The confidence of economic agents in the financial system is an important condition for strengthening financial stability. The ability to conveniently and quickly convert non-cash money into digital fiat money, which is an obligation of the central bank to their owners, will increase the confidence of economic entities in the financial system, and, therefore, will contribute to the achievement of financial stability
Use as a tool for direct support of economic agents from the government	The use of retail CBDCs to provide direct support to citizens from the government in a crisis creates additional opportunities to improve the efficiency of this process in terms of convenience, transparency and ease of use of digital money
Ability to use smart contracts	The issuance of token-based retail CBDCs provides the basis for the development of financial products and services created using smart contracts. Smart contracts make it possible to simplify settlements for contractual obligations and automate control over their execution. If necessary, smart contracts can also be used to control the targeted use of funds. The issuance of retail CBDCs with the ability to use smart contracts will contribute to the development of a settlement and payment system based on the use of digital technologies
Ensuring access to high-quality financial services for economic entities that have a demand for them	The infrastructure created for CBDC will ensure the development of the financial services market based on innovations, as well as create additional opportunities for economic entities to make payments and settlements. Expanding the list of settlement instruments available to consumers will contribute to the development of a competitive environment and increase the availability of financial services
Increasing the attractiveness of the national currency in the face of heightened global foreign exchange competition	The issuance of fiat digital money will contribute to the development of payment and settlement technologies, the emergence of new products and services, thus ensuring the growth of the attractiveness of national currencies in the context of international currency competition. Retail CBDCs can become one of the factors that provide countries with a competitive advantage in the provision of financial services. Thus, the issuance of digital money can be considered an important element of the development strategy of the financial sector

Source: compiled by the author.

main of which is the ability to pay interest on digital money from the central bank. The issuance of non-interest-bearing CBDCs will have a positive effect on the development of the financial system and will not lead to additional risks to financial stability. The creation of a

new payment infrastructure based on CBDC will not lead to a significant outflow of funds from accounts with credit institutions and will help the central bank to fulfill its functions of developing the payment system and ensuring financial stability.

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