SOCIĀLO ZINĀTŅU VĒSTNESIS
Social Sciences Bulletin / Вестник социальных наук
ISSN 1691-1881, eISSN 2592-8562
2023, 37(2)

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DIGITAL CURRENCIES AND FINANCIAL LITERACY: ESSAY ON SUSTAINABLE FINANCES' PERSPECTIVES

DOI: https://doi.org/10.9770/szv.2023.2(1)

For citation: Baltgailis J., Meņšikovs V., Šipilova V. (2023) Digital currencies and financial literacy: Essay on sustainable finances' perspectives. *Sociālo Zinātņu Vēstnesis / Social Sciences Bulletin,* 37(2): 7-24. https://doi.org/10.9770/szv.2023.2(1)

Nowadays, financial system is experiencing both technological and organizational changes. Moreover, the efforts to develop financial sector have to be in align with sustainability principles, especially, paying attention to financial stability, financial inclusion and climate change. Scientists and practitioners consider digital currencies as initiative of Fintech, which may be possible tool for developing sustainable finances. At the moment, opinions concerning positive and negative effects from digital currencies on financial system are shared. Additionally, technological and organizational changes of financial system have to be clear and understandable for society, i.e. potential customers of financial services. In the article, the authors consider the stimuli for possible changes in financial system, present positive and negative peculiarities of today's development tendencies, and indicate encouraging and hindering factors for application of digital currencies. Stability of financial system, financial data privacy, competition, appropriate business models are the issues, which are at the core of discussions devoted to the modern changes in financial system. In the light of modern changes in financial system, special attention has to be devoted to financial literacy. The article provides novelties in the field of sustainable finances. First, the article aims to join discussions on technological solutions for development of sustainable finances with focus on digital currencies and financial literacy. Second, the article analyses both academic and gray literature. Third, additional novel contribution of the article relates to the educational purpose, i.e. to present sustainable finances' perspectives for wide audience of researchers, practitioners, and students.

Keywords: financial sustainability, digital currencies, financial literacy, FinTech, financial stability, technological and organizational change.

Digitālā valūta un finanšu pratība: Eseja par ilgtspējīgo finanšu perspektīvām

Mūsdienās finanšu sistēma piedzīvo gan tehnoloģiskas, gan organizatoriskas pārmaiņas. Turklāt, finanšu sektora attīstībai ir jānotiek saskaņā ar ilgtspējas principiem, īpašu uzmanību pievēršot finanšu stabilitātei, iekļaujošiem finanšu pakalpojumiem un klimata pārmaiņām. Zinātnieki un praktiskās jomas pārstāvji uzskata digitālo valūtu par finanšu tehnoloģiju iniciatīvu, kura var kalpot par iespējamo instrumentu ilgtspējīgo finanšu attīstībai. Šobrīd viedokļi par digitālās valūtas pozitīvo un negatīvo ietekmi uz finanšu sistēmu dalās. Turklāt, finanšu sistēmas tehnoloģiskām un organizatoriskām pārmaiņām ir jābūt skaidrām un saprotamām sabiedrībai, t.i., potenciāliem finanšu pakalpojumu klientiem. Rakstā autori aplūko stimulus, kuri veicina iespējamās pārmaiņas finanšu sistēmā, iepazīstina ar mūsdienu attīstības tendenču pozitīvām un negatīvām īpatnībām un norāda uz digitālās valūtas pielietošanu veicinošiem un kavējošiem faktoriem. Finanšu sistēmas stabilitāte, finanšu datu privātums, konkurence, piemēroti uzņēmējdarbības modeļi – tie ir jautājumi, kuri atrodas mūsdienu finanšu sistēmas pārmaiņām veltīto diskusiju centrā. Ņemot vēra mūsdienu pārmaiņas finanšu sistēmā, īpaša uzmanība ir jāpievērš finanšu pratībai. Raksta jauninājumi finanšu ilgtspējas izpētes jomā ir saistīti, pirmkārt, ar iesaisti diskusijās par tehnoloģiskiem risinājumiem ilgtspējīgo finanšu attīstībā ar akcentu uz digitālo valūtu un finanšu pratību. Otrkārt, rakstā tiek analizēta gan akadēmiskā, gan pelēkā literatūra. Treškārt, raksta papildus jauninājums ir saistīts ar izglītojošo mērķi, t.i. prezentēt ilgtspējīgo finanšu perspektīvas plašākai pētnieku, praktiķu un studējošo auditorijai.

Atslēgas vārdi: finanšu ilgtspēja, digitālās valūtas, finanšu pratība, finanšu tehnoloģijas, finanšu stabilitāte, tehnoloģiskās un organizatoriskās pārmaiņas.

Цифровая валюта и финансовая грамотность: Эссе о перспективах устойчивых финансов

В настоящее время финансовая система переживает как технологические, так и организационные изменения. Более того, усилия по развитию финансового сектора должны соответствовать принципам устойчивости, особенно в области финансовой стабильности, финансовой доступности и изменения климата. Ученые и практики рассматривают цифровые валюты, как инициативу финансовых технологий, которая может послужить возможным инструментом для развития устойчивых финансов. На данный момент мнения о положительном и отрицательном влиянии цифровой

ISSN 1691-1881, eISSN 2592-8562
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валюты на финансовую систему разделяются. Кроме того, технологические и организационные изменения финансовой системы должны быть обоснованными и понятными обществу, то есть потенциальным потребителям финансовых услуг. В статье авторы рассматривают стимулы возможных изменений в финансовой системе, представляют положительные и отрицательные особенности современных тенденций развития, указывают стимулирующие и сдерживающие факторы для применения цифровой валюты. Стабильность финансовой системы, конфиденциальность финансовых данных, конкуренция и подходящие бизнес-модели – вопросы, которые лежат в основе дискуссий, посвященных современным изменениям финансовой системы. В свете современных изменений финансовой системы особое внимание должно уделяться финансовой грамотности. Новизна данной статьи в области исследования устойчивых финансов проявляется, во-первых, в присоединении к дискуссиям о технологических решениях для развития устойчивых финансов с акцентом на цифровые валюты и финансовую грамотность. Во-вторых, в статье анализируется как академическая, так и серая литература. В-третьих, дополнительная новизна статьи связана с образовательной целью, т.е., представить широкой аудитории исследователей, практиков и студентов перспективы развития устойчивых финансов.

Ключевые слова: финансовая устойчивость, цифровая валюта, финансовая грамотность, финансовые технологии, финансовая стабильность, технологические и организационные изменения.

Introduction

What are the sustainable finances? Which tools have to be used for development of sustainable finances? Which reasons make sustainable finances topical? Which kind of changes sustainable finances stimulate in financial system? Which kind of financial literacy will be necessary in the future? Which kind of business model is more suitable for digital currencies? These questions are at the center of studies devoted to the modern financial system.

In their sense, sustainable finances includes environmental, social and governance aspects with the aim to change investment decisions in favor to long-term sustainable economic activities (European Commission n/d b).

The article aims to provide comprehensive view on stimuli, positive and negative peculiarities, encouraging and hindering factors in the terms of sustainable finances with focus on digital currencies. The novelty of the present study is to join discussions on technological solutions for development of sustainable finances with focus on digital currencies and financial literacy.

At the moment, discussions in the field of sustainable finances mostly focus on FinTech. Scientists consider FinTech as a tool for sustainable economic development (Awais et al. 2023; PwC 2021). Although, the analysis of social media of some firms in FinTech sector provides opposite viewpoint by indicating that attention to sustainable development goals is not sufficient (Franco-Riquelme, Rubalcaba 2021). All in all, positive effects as financial inclusion, lower costs of delivery, ease of access to capital markets, targeting investments, improving risk management, inculcate sustainable consumer behavior may be observed (Pwc 2021). One can add digital currencies in the list of the positive effects (e.g., Gupta et al. 2023). For example, digital currencies may ensure reduction of energy usage in payment systems (Agur et al. 2022) and widen financial inclusion (Pwc 2021), thus, contributing to sustainability goals.

It is noteworthy that intentions to develop sustainable finances and application of the newest technological solutions require improvements and adjustments in financial literacy (e.g., Siddik et al. 2023). Financial literacy (Lo Prete 2022) and customer readiness to financial opportunities created by FinTech (Mahmud, Joarder, Sakib 2023; Presthus, O'Malley 2017) are at the core of debates on sustainable finances. Higher levels of financial literacy allow for well-grounded financial decisions and wider financial inclusion. Availability of clear, trustable, and comprehensive information is one of the key elements that advices society and increases the level of literacy and knowledge.

The article is presented in a form of academic essay (what is practiced in the field of financial studies (e.g., Gendron, Smith-Lacroix 2015)) for ensuring structured story that provides answers to the questions mentioned above. Additional novel contribution of the article relates to the educational purpose, i.e. to present sustainable finances' perspectives for wide audience of researchers, practitioners, and students.

The article is organized in five sections. The second section is devoted to digital currencies by explaining stimuli for their creation and indicating development trends. This section includes peculiarities of behavior of financial market participants, variety of digital currencies and their peculiarities with special attention to central bank digital currencies, and fragility of the examples. The section discusses business models of financial markets and their appropriateness for digital currencies. The third section pays attention to central bank digital currency (CBDC) and its peculiarities. The fourth section is devoted to the financial literacy and financial inclusion by indicating that knowledge, readiness and acceptance are necessary for wide application of new technological solutions in daily financial operations. The fifth section offers conclusions.

Digital currencies: Stimuli for creation and overview of development trends

After the previous massive recession of the 1980s, the world economy has been growing, driven by the technological and business evolution that the advent of the Internet has brought about, as well as by globalization that has led to the rise of developing countries (Manyika et al. 2016). Later, especially after the 2008 crisis, monetary stimulus played a key role (Carstens 2019; Deloitte Ireland LLP 2023).

Now these sources of growth have been exhausted, and globalization and stimulus have been completely reversed. Meanwhile, many structural problems have not been resolved during this time and have only worsened. Chief among them are an aging population, slowing productivity growth and the effects of climate change. In the meantime, a new leap into the future, similar to the Internet economy, is not planned, in order to prevent a recession, three existing problems need to be dealt with: rising prices, quarantine in China and the energy crisis in Europe. Additionally, an issue on financial inclusion has to be solved as far as it affects economic growth (Daud, Ahmad 2023).

Given that nowadays the economic policy initiatives have to be in align with the climate change issues, long-term financial decisions have to rely on sustainability principles in environmental, social, governance, and economic aspects. Thus, financial sector is significant player of sustainable development (PwC 2021). In this context, one expects certain behavior from the participants of financial market. Particularly, application of the newest technologies for creation of digital currencies is the direction for development. However, besides positive peculiarities, one can see some negative peculiarities for financial stability, which appear as a result of possibility to introduce the newest technologies in financial system. Such peculiarities may appear in behavior of participants of financial markets.

Peculiarities of behavior of financial markets participants. Already at the beginning of the 21st century, banks began to "securitize" previous loans to finance new ones. This was initially concentrated on residential mortgages before moving on to other forms of bank liabilities. All this has led to the incorporation of numerous high-risk derivatives (secondary securities) into the economy (Field 2022). At the same time, as soon as the financiers realized that their obligations were worth little, they issued even more debt for their own refinancing. At the same time, the costs of the speculative bubble are mainly borne by society, because the process of bailing out banks during the 2008 crisis was carried out by governments at the expense of the state budget (Field 2022).

In this case, banks transfer their risks to society, knowing full well that their collapse will be a great burden for the economy, and, based on this logic, they believe that the state is obliged to take care of their salvation. With unparalleled securitization, the volume of securities transactions skyrocketed, spurring the IT development and setting off an entire industry – FinTech.

There is an opinion that with the help of FinTech, commercial banks could now use their huge balance sheets based on customer deposits for speculation, completely unconcerned about the growing risks and develop financial instruments of ever greater complexity, especially since the most qualified personnel are concentrated in the FinTech industry, able to actually implement almost any banking requests using digital currencies and blockchain technologies, and without special banking supervision and regulation (Baltgailis, Simakhova 2022).

The high risks generated by banking securitization can be assessed not only by the volume of issuance, bankruptcies in the real sector of production, job losses, but also by the amounts of money that governments had to inject into private banks, since they are "too big to fail": the quantitative easing (QE) schemes[1] that followed the crisis could have been used to prop up the economy, but ended up bailing out the banks again (Deloitte Ireland LLP 2023).

The forecast of the World Bank does not inspire optimism yet. Rising prices and high inflation will continue, the recession in Europe and the US will continue (A World Bank Group 2023). Negative effects appear due to crises of non-financial nature also, e.g., pandemic of covid-19 (Kakhkharov, Bianchi 2022), climate change (Dikau, Volz 2021), international sanctions (European Commission n/d a).

The coronavirus crisis has accelerated an already unsustainable fiscal trajectory, both because of its devastating effect on the economy and the necessary legislative response. Once countries have emerged from the pandemic, it will be critical to address the rising debt, and its structural factors. Under these conditions, the problem of ensuring the stability of the financial system will grow and many countries are turning their attention to the possibilities of digital currency (e.g., Hong, Yoon 2022). Nowadays, scientists actively discuss benefits and threats that may be topical for stability of financial system after introduction of digital currencies (e.g., Kumhof, Noone 2021).

Scientists indicate on significant technological and organizational changes in financial system. For example, Eichengreen (2022) highlights that cloud computing ensures storage and processing of financial data, artificial intelligence provides analysis of the data, and blockchain ensures security of the data.

Digital currencies will be part of the financial system in the future. In this context, scientists indicate that currency pluralism is rising (Ruddick 2023). Such development trends may create currency competition what is challenging for monetary policies (Fernández-Villaverde, Sanches 2019) and for overall financial stability (Dunbar 2023). Given topicality of digital currencies, scientists study possible effects and elaborate guidance for successful implementation (e.g., Kumhof, Noone 2021). Despite still ongoing debates, one can see that countries actively elaborate digital currencies (Sarmiento 2022) and even approve them for tax payments (e.g., Bibi 2023). Studies devoted to digital currencies mainly focus on applications and governance, critical underpinning technologies, digital financial services, and their effect on enterprises (Zou et al. 2023).

Variety of digital currencies and their peculiarities. Nowadays, scientists and practitioners indicate on imperfections of digital currencies in terms of their suitability for wide application and transactions, for example, volatility of Bitcoin and fragile currency pegs of Stablecoin (The Economist 2023;

[1] The US Federal Reserve in 2008-2014 launched three different QE schemes for a total of $4.2 trillion. In the UK, the Bank of England in 2009-2012 conducted a QE of 375 billion pounds sterling, and in Europe, the ECB allocated 60 billion euros per month for these purposes from January 2015 to March 2017 (Wray, Nersisyan 2016).

Eichengreen 2022). And central bank digital currencies are a solution of a problems (Vecbaštiks, Dārziņš 2022).

The situation is exacerbated by the fact that private IT corporations have long been creating their payment systems (Endava 2023). And as their ecosystems develop, the risk of concentrating a huge amount of economic information and personal data in the hands of a limited number of companies (which is especially dangerous: foreign ones) increases. To counteract this threat, states are beginning to seize the initiative in the development of payment and settlement infrastructure and Big Data from the private sector and transnational business (European Central Bank 2023b). 100% of all central banks were either at the stage of creating digital currencies, or studied this possibility (Georgieva 2022) and, of course, most of them want to create a national project with a national currency.

Around 100 countries are exploring CBDCs at one level or another. Some researching, some testing, and a few already distributing CBDC to the public (Chhangani 2023).

In thinking about digital money, three categories are usefully distinguished – bitcoin, stablecoins, and central bank digital currencies (CBDC).

Bitcoin is the best known, though it has many rivals (The Economist 2023). Bitcoin is based on blockchain technology, their prices depend on supply and demand and may change significantly (e.g., The Economist 2023; Eichengreen 2022).

The second category is so-called Stablecoins. These are cryptocurrencies that are based on distributed ledger technology or a centralized system (e.g., Eichengreen 2022). Stablecoins may be converted at a fixed price, for example, into US dollar (Cunningham et al. 2020; Eichengreen 2022). Widely known example is Tether, where one Tether is worth one dollar (e.g., Eichengreen 2022).

The final category is made up of prospective central bank digital currencies (CBDCs). Central banks around the world, study, test or even implement CBDC projects. CBDC will have fixed value. It is planned that CBDC will be available for consumers in a form of token in digital wallets or in retail account at central banks (e.g., Chhangani 2023; Eichengreen 2022).

Sustainable financial development requires paying attention on digital currencies' energy consumption. In this context, eco-friendly cryptocurrencies, which have lower carbon footprint, are topical (e.g., IOTA, XRP, Chia) (Lacey 2022). Nowadays, sustainable financial sector needs cryptocurrencies with low environmental impact of transactions (e.g., Lacey 2022).

Changes in financial system are continuing. Scientists highlight that in the 20th century, two monetary transformations occurred – one institutional, and other technological (e.g., Eichengreen 2022). Institutional transformation included transition from fixed domestic-currency price of gold to central banks with their reputation and mandates to keep price and financial stability (e.g., Eichengreen 2022). In terms of technological transformation, online, mobile payments and nonbank digital payments changed opportunities and behavior of consumers (e.g., Eichengreen 2022).

The collapse of the crypto exchange FTX to a certain extent discredited the entire digital money industry, now the market is controlled by sellers – investors are afraid of new bankruptcies of large crypto projects, speculation about the financial problems of the Genesis crypto exchange has intensified, Hong Kong-registered cryptocurrency exchange Bitzlato, operating around the world, is suspected of facilitating the laundering of large amounts of criminal proceeds (Europol 2023).

According to the British magazine the Economist, in the light of scandals, valid use of crypto has to be find for ensuring interest from investors and users (The Economist 2022).

Royal (2023) indicate that Bitcoin deserves a place in investment portfolios, not unlike gold, because its returns are uncorrelated with those of other asset classes. The lower the correlation, the greater the diversification benefits of the investment. Nevertheless, this is different from saying that it will be used

ISSN 1691-1881, eISSN 2592-8562
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as money. Scientists indicate that Bitcoin is more suitable to be as niche investment product rather than widely used money (e.g., Eichengreen 2022). Stablecoins have stable value linked to dollar (e.g., Royal 2023; Eichengreen 2022). However, there is opinion that the issue of Stablecoins is expensive and unprofitable (e.g., Eichengreen 2022).

An issuer of Stablecoins may decide on collateral that is only a fraction of the value of its issued coins (e.g., Eichengreen 2022). Fractional reserve banks hold capital and reserves equal to only a portion of the loans they extend; they raise additional resources to fund their lending from depositors or on the wholesale interbank market. Similarly, central banks maintaining currency pegs, whether under the classical gold standard or today, have generally held gold and foreign exchange reserves equal to only a fraction of their currency emission.

Conceptually, CBDCs will become non-cash money, endowed with metadata (that is, some side information in addition to the main one) (European Central Bank 2023b).

An example of metadata in cash circulation is the serial number of a banknote. A paper bill acts as a confirmation that its holder has a certain number of monetary units. And the serial number (which does not affect the implementation of payments in any way) is used by central banks as an additional degree of protection, as well as for the analysis of money circulation in geographical, sectoral and temporal terms.

The metadata will turn the CBCS into so-called "colored" monetary units. Central banks will be able to integrate automated algorithms into the processes of emission, circulation and sterilization (that is, transfer to a less liquid form up to the withdrawal from circulation and destruction) of this form of money. The Markets in Crypto-Assets (MiCA) Regulation will introduce a new regulatory framework for European crypto-assets. Critically, MiCA aims to protect investors and ensure financial stability while allowing innovation and fostering the attractiveness of the crypto-asset sector (European Council 2023). MiCA will bring issuers of certain types of crypto-assets into the regulatory framework (Boucheta, Joseph 2023). According to 'Fintech Latvia' (2023): "A tokenized security (security token) is a coupon (token) that represents and gives rights of ownership over a virtual security." For example, buying token shares gives the owner the same rights as buying shares listed on a regulated market. The main difference relates to the underlying technology of tokenized security structures (blockchain), which makes security available only in digital form (FinTech Latvia 2023). Specifically, MiCA will establish new rules for stablecoins including Asset-Referenced Tokens (ARTs), E-Money Tokens (EMTs) and utility tokens (Boucheta, Joseph 2023).

Fragility of the Examples. Nowadays, fragility of digital currencies is studied in the context of environmental impact of transactions and risks for financial stability.

Initiative to reduce carbon footprint of cryptocurrencies resulted in "Crypto Climate Accord" with intentions to decarbonise the industry (e.g., Lacey 2022; Cryptoclimate.org n/d). The initiative covers representatives from the sectors of crypto, finance, energy, climate with the aim to use 100% renewable energy for crypto (Cryptoclimate.org n/d).

The examples of digital currencies demonstrates possible negative effects on financial stability. For example, Eichengreen (2022) indicates that in case of any doubts about sustainability of a currency peg, investors' behavior to avoid losses may affect behavior of central banks in terms of their reserves.

To avoid the destabilizing consequences of this bank-run problem, governments today insure retail deposits up to a specified ceiling, and central banks act as lenders of last resort to aid embattled financial institutions (European Central Bank 2023b). Requirements for banks that are eligible for assistance intend to limit possible instability. For the stablecoin issuers, similar protective measures may be available in case of participation in charters or their equivalent (e.g., Eichengreen 2022).

Another way is to hold some of the collateral that backs the stablecoin, not in cash, but in interest-earning assets. In this case, the stablecoin issuer would act as a kind of money market mutual fund (e.g., Eichengreen 2022).

Money market mutual funds pool their customers' share purchases. They use the proceeds to purchase treasury bills and commercial paper, making money on the spread between the interest earned on these investments and that paid to their clients. Like an issuer of stablecoins, they promise their customers that shares are redeemable at par. They raise funds to finance the buyout by selling an appropriate amount of liquid securities (Eichengreen 2022).

The problem with this business model became evident in the global financial crisis of 2008, when normally liquid investments abruptly became illiquid (Field 2022). In case, when everyone aims to sell the commercial paper but there is no demand, or if the commercial paper can only be sold at a significant loss, the fund will not have the resources to fulfill its promise to buy back the shares at par (e.g., Eichengreen 2022).

However, in case when a stablecoin is not fully stable and cannot be redeemed for dollars on demand in unlimited quantities it will not be an attractive alternative to Federal Reserve money. Similarly, share in a money market mutual fund cannot substitute cash completely (Eichengreen 2022).

In terms of CBDC, the potential risk is that the state, which has become a leader in this technology, will be able to offer this tool to non-residents to service transactions in other countries. The circulation of digital currencies can occur only on the servers of the issuer. This means that information about transactions will not be able to go to the tax authorities of the states of residence of foreign users. In addition, foreign digital currencies may be able to "displace" a part of cash and non-cash national monetary units, contributing to the imbalance of monetary circulation. The issuer of a digital currency that is in demand in foreign markets will also be able to influence its foreign users. For example, to offer interest-free (or even negative rate) trade credit to foreign buyers of products of domestic manufacturers or service providers. Therefore, appropriate models of CBDC are required for ensuring monetary stability.

The next section is devoted to peculiarities of development of CBDC.

Central bank digital currency and FinTech: Development perspectives and business models

Researchers recognize central bank digital currencies (CBDC) as FinTech initiative (e.g., Gupta et al. 2023), which is able to increase the quality of financial system in terms of inclusion, costs, environment (e.g., Gupta et al. 2023; PwC 2021). On the other side, potential costumers' ability and interest to use as well as risks for financial stability are at the center of scientific studies (e.g., Sarmiento 2022; Li 2022; Ngo et al. 2022; Gupta et al. 2023).

It must be remembered that the central bank digital currency is another digital form of bank money. It differs from the balances in traditional reserve or current accounts in that this digital payment instrument denominated in the national unit of account is a direct obligation of the central bank and, in principle, can eventually replace the existing currency in both its non-cash and cash form.

The study in this area is coordinated by a Committee of the Supranational Bank for International Settlements in Basel (BIS). Central banks promote their digital currencies aiming to be an addition to the already existing settlement systems. Although, retail CBDC may change the rules of financial market.

Another option is to make a digital euro based on deposit accounts directly with the central bank (European Central Bank 2023b). Technologically, this will not be an innovative phenomenon, although a huge number of accounts will have to be opened. If we talk about the Eurozone, the European Central

ISSN 1691-1881, eISSN 2592-8562
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Bank (ECB) will have to increase deposit accounts from about 10 thousand to 300-500 million – that is, residents of the Eurozone will be able to have accounts not in a commercial bank, but directly in the ECB (European Central Bank 2023b). This type of CBDC will allow the ECB to control all transfers between users, which, among other things, will allow to combat money laundering and other illegal operations.

In the world, in addition to China, there are already several "pilots" of retail digital currencies. For example, e-krona is being tested in Sweden, the country with one of the lowest shares of cash use (about 5% of all household payments). Digital Swedish krona is implemented on the basis of the R3 Corda blockchain. In Uruguay, they decided to use not the blockchain, but digital wallets from the state telecommunications company Antel. Experiments on the retail use of CBDCs were conducted by the central banks of Ukraine, the Bahamas, etc. In the first half of 2023, sixty countries are in the advanced stage of development, and over twenty central banks have started their own pilot projects, including, for example, Brazil, Japan etc. (Chhangani 2023).

Commercial CBDCs are, in fact, a technological development of an already existing practice, when the central bank issues electronic money and opens banks access to this "virtual" money. The most famous commercial CBDC projects today are carried out by the central banks of Japan, Canada, the Eurozone, as well as financial institutions in Singapore and Hong Kong.

Agustine Carstens, general manager of Bank for International Settlements (BIS) described the process this way in a market-based system, the private sector remains the main engine of the economy (Carstens 2022). In today's two-tier monetary system, deposits are the most common form of money held by the public because cash holdings are relatively small. Banks, in turn, place their own deposits with the central bank as "bank reserves" (e.g., Carstens 2022; Eichengreen 2022).

In this case, central banks provide an open, neutral, trusted and stable platform. Private companies use their ingenuity and dynamism to develop new payment methods and financial products and services. This combination has been a powerful driver of innovation and welfare. CBDC may provide inclusive economy but at the same time threaten data privacy (e.g., Carstens 2022).

Scientists and practitioners indicate theoretical scenarios for the future development of money (e.g., Carstens 2022): high competition between stablecoins and between stablecoins and national currencies, fragmentation of the monetary system; crypto and decentralized financial system without intermediaries; application of technologies for development of open and global monetary and financial system.

Using expiring CBDCs, after which they become useless, central banks can accelerate the spending of funds by market participants or expand consumer demand in privileged industries, such as green energy, or choose to apply positive and negative interest rates for digital currencies (Vecbaštiks, Dārziņš 2022), such a methodology will also limit inflation, since the digital money supply will be automatically sanitized at the right time (European Central Bank 2023b).

Currently, in most countries of the world there is a two-tier banking system. The first level is the central bank, which has a monopoly on the issue of national currency in cash and is the government's agent for the placement of government debt obligations, as well as the lender of last resort to banks.

The second level is commercial banks that provide payment and settlement and credit and deposit services to citizens and organizations.

In turn, payment and settlement operations and non-cash circulation are based on the system of interbank payments. Digital currencies of central banks, as the name suggests, assume the existence of a monopoly of central banks on their issuance and make it unnecessary for commercial banks to multiply the money supply. Thus, the central bank will be the creator, operator, and custodian of the pool of digital currencies.

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The role of commercial banks in such a system is to check customers and their operations for compliance with the requirements of the legislation on combating the legalization of illegally obtained income. They will also provide customers with payment and settlement infrastructure for transforming their funds from one form to another (cash, non-cash, and digital). In the future, such a system may lead to the fact that central banks will provide the non-financial sector of the economy not only with settlement, but also with credit and deposit services. This will make the traditional business model of banks uncompetitive and therefore many of them are already actively investing in ecosystems and FinTech (Baltgailis, Simakhova 2022).

The expansion of the money supply or the so-called QE procedures, combined with the loss of confidence in the issuer and any confidence in its reliability, is always a precursor to any economic decline (Deloitte Ireland LLP 2023). In addition to the fact that there is a token-based CBDC option to ensure anonymity, given the interest of central banks for minimizing criminal transactions and tax evasion, anonymity may be excluded.

Already now a step has been taken to this quite within the framework of laws, such as international and implemented in most countries procedures Foreign Account Tax Compliance Act (FATCA) (PwC Latvija 2023), Automatic Exchange of Information (AEOI) (OECD 2015), Base erosion and profit shifting (BEPS) (OECD 2023), creating conditions for the control of tax payments in the field of international business and corporate activities and providing access to real control over the assets of companies and individuals.

A second argument for introducing a CBDC, mooted by US Treasury Secretary Janet Yellen among others, is in order to enhance financial inclusion (CSIS 2023). Treasury Department had difficulty getting covid-19 stimulus checks to individuals who had not filed a tax return and did not have a bank account. Although nearly five percent of Americans are unbanked, almost everyone has a smartphone. If they all downloaded a digital wallet that automatically registered with the Federal Reserve, the government could deposit digital dollars into it directly (e.g., CSIS 2023; Bennett 2023).

Concerning the financial stability (e.g., Dunbar 2023), researchers already elaborate guidance for introduction of CBDC for addressing possible risks by indicating that following conservative core principles are beneficiary for financial system (e.g., Kumhof, Noone 2021). Implications from already gained experience highlight several key aspects for introduction of CBDC – reputation of central banks, financial inclusion, simple technological solutions, security, usage of token, small payments and transfers (e.g., Sarmiento 2022). Researchers also conclude that not only technological but also cultural aspects have to be taken into account while introducing CBDC (e.g., Sarmiento 2022). Although, researchers indicate that CBDC while is uncertain for today's financial system provide significant risks for its stability (e.g., Dunbar 2023).

Fragility of financial stability – growing public debt. Issues that relate to financial stability worldwide include rapidly increasing public debts. For example, the U.S. government has not defaulted on its debt, but the debt ceiling has been raised 22 times from 1997 to 2022, according to the Government Accountability Office (CNBC 2023) and there are aims to increase the debt limit. GDP covers only 82% of U.S. debt, plus the budget deficit and trade deficit. Total debt of the United States, which also includes the debts of private business, is almost four times higher than GDP. It was derivatives that introduced financial crisis of 2008, they were the first to be sold by participants in the speculative market. At the same time, among the main components that formed the US GDP during that time, only 11% was manufacturing and construction, almost 35% was professional services and finance (Stiglitz et al. 2010).

There is a tendency to increase the debt burden in almost all countries of the world. For example, in the European Union, debt already accounts for 85% of the GDP of all EU countries, Belgium, France,

Italy, Greece have already overcome the 100% debt barrier to GDP, and other EU countries are actively accumulating debts (Statista n/d).

For example, the Latvian edition of *"*Dienas Bizness*"* (Kots et al. 2022) claims that "A particularly rapid increase in government debt was observed in 2021." In general, over the past 20 years, a rapid jump in debt occurred in the crisis of 2007-2011, after which there was only one small decline in 2015, and then a constant increase. Over the past three years, the government's debt has grown by almost 4 billion euros (36%) and fiscal revenues by only 330 million euros (3%) (Kots et al. 2022). And this is despite the fact that in all sectors the turnover of the largest enterprises in Latvia in 2021 increased compared to 2020 (Firmas.LV, LETA 2022).[2]

So far, there are no prospects for returning public debts in the United States – over 120% of GDP, Greece – over 178% or Japan – over 225% (CEIC n/d), while in the context of crisis phenomena and falling GDP (of course, some countries have a slight increase in GDP, but as a rule this is due to rising energy prices).

Growing public debts reducing attractiveness of economies for investors. In the context, scientists pay attention for monetary regulation (e.g., Mathai n/d; European Central Bank 2023b) and its effectiveness (e.g., financial crisis 2007-2008 and sovereign debt crisis 2009-2015) (e.g., Kouretas et al. 2022), and modernization of economies through the newest technologies, e.g. cryptocurrencies (green economy development) (e.g., Sharif et al. 2023).

Financial literacy and financial inclusion

In the context of digital currencies, the issues on financial stability and competition are at the core of debates at governance level, and financial literacy, perception and acceptance at the end users level. In general, digital currencies are understood as one of the tools for ensuring sustainable finances and financial inclusion what in overall are directed towards sustainable development.

Financial literacy of individuals and enterprises predicts financial well-being (e.g., Kumar et al. 2023). Nowadays, besides knowledge of financial nature, individuals and enterprises need to be educated in digital (technological) (Kumar et al. 2023) and sustainability principles (e.g., Gedvilaitė et al. 2022). Moreover, literacy is among factors, which affects perception of possibilities provided by the newest technologies, for example, FinTech. Ngo et al. (2022) conclude that technological literacy is significant for perception of digital currencies (e.g., CBDC). In this regard, researchers find out that higher financial and digital literacy stimulate usage of digital payment tools and platforms (Lo Prete 2022), affect financial decisions and perceived financial well-being (e.g., Kumar et al. 2023). Additionally, modern labor market needs financially and digitally literate workforce (e.g., Reddy et al. 2023).

Perception and acceptance of digital currencies by end users is significant for wide application. Certain effects appear from financial and digital literacy. However, besides knowledge about alternative financial instruments (e.g., Najib et al. 2021), researchers indicate on such factors as trust, willingness,

[2] The idea of getting your money back through the rapid development of FinTech will do little without active foreign investment and the necessary number of personnel. Latvia only a decade ago positioned itself as the banking center of Northern Europe, lagged behind in the field of financial technology not only from the traditionally advanced in terms of information Sweden and Denmark, but also from Spain and Poland (Valsts kanceleja 2022). According to the Ministry of Finance of the Republic of Latvia, only 7% of legal entities use artificial intelligence technology, 5% - big data, 1% - blockchain, cryptocurrency encryption system and for other needs (Valsts kanceleja 2022). Only 14 out of 125 financial market participants in Latvia use "data cloud" technologies, which save server capacity and, accordingly, reduce the cost of services. In Western Europe, more than half of the market already uses them (Ministry of Finance of Republic of Latvia 2023).

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safety, readiness, socio-economic conditions, awaiting for others to start use, saving time and money, ease of use (e.g., Najib et al. 2021; Presthus, O'Malley 2017; Mahmud et al. 2023). Given variety of factors, which stimulate or hinder end users' interest to use digital currencies, researchers forecast households' demand for digital currencies, particularly CBDC, in very wide range (Li 2022). Acceptance of digital currencies is linked to perception of innovation in general (Presthus, O'Malley 2017). Although, researchers provide viewpoint based on official document analysis that industry of digital payment infrastructure mostly stimulates customers to be interested in application of such practice rather than customers initiate it (Ferrari 2022). However, research findings indicate that digital technologies positively affect economic growth (Daud, Ahmad 2023).

Additionally, financial inclusion is considered as economic growth stimulating factor (Daud, Ahmad 2023). In this context, it is noteworthy to indicate exclusion of more than one third of world population from formal financial system (Sapovadia 2018). Sufficient level of financial literacy may contribute to financial inclusion.

The new Principles complement the 2010 G20 Principles for Innovative Financial Inclusion (Pacetti 2016), which were critical in drawing global attention to the issue of financial inclusion and spurring initial policy actions.

The new 2016 Principles are intended to catalyze country-level actions by G20 governments to drive financial inclusion using digital technologies, including through country action plans. Governments play a critical role in creating the enabling conditions for financial service providers to reach financially excluded customers while also ensuring that risks are minimized and protection against fraud, cybercrime, over-indebtedness, and unethical business practices is ensured (GPFI 2016).

The World Bank formulates what financial inclusion means: "Financial inclusion means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way" (The World Bank 2014, 2016, n/d). According to the World Bank: "Digital technologies offer a powerful solution for expanding access to financial services to the estimated two billion adults globally who are still excluded from the formal financial system" (GPFI 2016).

Digital technologies are considered as tools for connecting more people at lower costs and contributing to reduction of poverty (The World Bank 2016, 2022). Financial access is crucial for households and business for meeting daily needs and realizing long-term goals. For improving quality of life, individuals actively use credit, insurance, invest in education and health, and manage risks (e.g., GPFI 2016).

The ongoing covid-19 crisis has also reinforced the need for increased digital financial inclusion with services that are suitable for consumers' needs and low costs for providers (The World Bank 2022). "Digital financial services — including those involving the use of mobile phones — have now been launched in more than 80 countries, with some reaching significant scale" (The World Bank 2014). This allows poor and underserved customers to receive financial services by using mobile phone or other digital technology (GPFI 2016).

Conclusions

The analysis if wide range of sources (academic and gray literature) allows for several highlights. Nowadays, financial system experiences rapid technological and organizational changes, which have to be in align with sustainability principles and focus on financial stability, financial inclusion, and climate change.

The main reasons for the possible introduction of digital currencies will be the following: create a stable economy with a stable currency tied to the real economic capabilities of the country; limit the expansion of private IT companies to form private crypto money, seize the initiative from them; to create an inclusive financial system, which, in addition to combating the shadow economy and attempts to involve people who are not covered by the legal financial system in business activity, will make it possible to control financial activities in the global aspect; to maintain the dominant position of the world's major currencies in the international market by reformatting them into a new digital format.

According to scientific thought and practical implications, digital currencies are considered as possible solution for development of sustainable finances. Given rapid technological and organizational changes within financial system, new requirements to financial literacy in the future are topical.

Researchers study business models that are practiced in financial sector for better understanding how to introduce digital currencies as initiative at countries' not only private sector's level without risks for financial and monetary stability. Additionally, it is noteworthy to raise knowledge, interest and literacy of potential end-users.

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