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Cryptocurrencies vs Central Banks' Digital Currencies: The Role of Financial Literacy

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ABSTRACT

A bifurcation point has arisen in the transformation of the global monetary and financial system, associated with its further digital transformation: will it be based on private digital currencies like Bitcoin, or on the basis of central bank digital currencies (CBDC)? To a large extent, this depends on the willingness of economic agents to use virtual currencies. **The purpose** of the study is to explore the factors determining the attitude of economic agents to digital currencies and the impact of financial literacy on using these instruments as an investment object and means of payment. The authors use the following research **methods**: content analysis, retrospective analysis, methods of comparative cross-country analysis, and empirical research in the form of an online survey of graduate financial students. This study is one of the first to reveal differences in the assessment of their knowledge and readiness to use digital currencies of financial and non-financial students, as well as to confirm an adequate assessment of the risks and opportunities of different types of virtual currencies if students have financial knowledge. The research shows that the situation with the decision-making of economic agents on the use of cryptocurrencies and the CBDC differs: in the first case, the initiative comes from the economic agents themselves, who make decisions at their own peril and risk; in the second case, economic agents are confronted with the fact of the existence of the CBDC and the need to use them. The authors **conclude** that the population's low financial and digital literacy can create a mental barrier to the use of CBDC, complicating their implementation in national monetary systems. The lack of financial literacy leads to an exaggeration of their knowledge by participants in the cryptocurrency market.

Keywords: cryptocurrencies; digital currencies; financial literacy; financial inclusion; CBDC; Bitcoin

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INTRODUCTION

The era of great transformations is the twenties of the 21st century. In addition to reforming the global monetary and financial system (IMFS) and the international financial architecture, humanity has decided on a double transition: to a green and digital economy. As part of digitalization, which is changing all spheres of human life, it is planned to carry out a global monetary reform — the introduction of virtual currencies into national and international payment transactions. Changing the main element of monetary systems — the form of money — is a serious transformation of the entire monetary sphere.

The advent of Bitcoin marked the beginning of an era of virtual currencies, interpreted as "digital representations of value not issued by a central bank, credit institution or electronic money institution, which in some cases can be used as an alternative to money".[1] Their economic nature and capabilities have become the subject of close study [1, 2], but so far, researchers have not come to a consensus on whether bitcoin can be considered money. Most experts state that, being a financial asset, cryptocurrencies can serve as a means of payment, but they are not money in the full sense of the word, since they are not an obligation to anyone and have no intrinsic value and collateral, and do not implement most of the monetary functions [3, 4]. However, there is another point of view based on the fact that the technologies for the production and circulation of cryptocurrencies fully meet the requirements for "monetary material" and

[1] ECB. Virtual Currency Schemes — a further analysis. February 2015. URL: https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf (accessed on 11.03.2022).

reflect the development trends of monetary systems on a new technological basis [5], and cryptocurrencies themselves represent a modern stage in the development of electronic money, which is characterized by an exit from the jurisdiction of national states [6, p. 99]. In the context of monetary functions, the issue of the effectiveness of private currencies [7] was studied, including cryptocurrencies that function and compete with the money of central banks [8].

There is no consensus on whether cryptocurrencies are money, and among international organizations. Thus, FATF experts[2] consider cryptocurrencies as a kind of virtual currencies, which, in their opinion, cannot be considered a means of payment until they can be legally borrowed in any jurisdiction.[3] The Bank for International Settlements (BIS) stated in its annual report: "By now, it has become clear that cryptocurrencies are speculative assets, not money".[4]

We agree with the thesis that good money requires confidence in the stability of its value and that the institutional mechanisms of money emission are of great importance.[5] At the same time, we note the complexity of the theoretical analysis of cryptocurrencies in this context, due to the fact that this ambiguous innovative tool is difficult to include in traditional monetary theories.

However, in practice, many economic agents make their choice in favor of cryptocurrencies, using them as an investment asset and means of payment, which necessitates further scientific study of their economic nature, functions, and the reasons for such interest in very complex and risky financial instruments.

MATERIALS AND METHODS: PROBLEM STATEMENT

This paper aims to study the factors that determine the attitude of economic agents to digital currencies and the impact of financial literacy on the use of these instruments as an investment object and means of payment. The study used content analysis, retrospective analysis, methods of cross-country comparative analysis and empirical research in the form of an online survey of undergraduate students in finance and graduate students of the Financial University.

The emergence (2009), the spread and rapid growth in the turnover of cryptocurrencies, as well as their use as means of payment, caused concern among national and supranational currency regulators, who saw this new tool as a threat to the existing principles of the functioning of monetary systems. The transformation of the IMFS based on cryptocurrencies would narrow the ability to fulfill the targeted mandates of central banks, and ultimately undermine national sovereignty in the monetary sphere, since it involves the transfer of money from the control of central banks to technological and financial control of digital monopolists. An example is Facebook's Libra[6] cryptocurrency, whose high security and potential scale of use (3 billion Facebook users) could make it a viable supranational reserve cryptocurrency alternative to the dollar [9].

At present, a bifurcation point has emerged in the transformation of the IMFS, related to determining the ways of its further digital transformation: whether it will be based on *private* digital currencies like Bitcoin or Diem, or on the basis of *central bank digital currencies* (CBDC). The probability of the first option will depend, in our opinion, on the timing and success of the implementation of digital currency projects of central banks in various countries. In the case of a

[2] FATF — Financial Action Task Force.

[3] FATF. Virtual Currencies — Key Definitions and Potential AML/CFT Risks. June 2014. URL: https://www.fatf-gafi.org/documents/documents/virtual-currency-definitions-aml-cft-risk.html (accessed on 11.03.2022).

[4] BIS Annual Economic Report. June 2021. URL: https://www.bis.org/publ/arpdf/ar2021e.pdf (accessed on 11.03.2022).

[5] BIS Annual Economic Report. June 2018. P. 91. URL: https://www.bis.org/publ/arpdf/ar2018e.pdf (accessed on 11.03.2022).

[6] Blockchain payment system Libra Association, from 01.12.2021 renamed to Diem.

seamless introduction of the CBDC into the monetary systems of national states, the digitalization of the IMFS will follow this path, as it is safer and meets the interests of most countries. If problems and risks are identified that are critical for the use of the CBDC, the spontaneous expansion of the use of Bitcoin, other private digital currencies of the distributed ledger and their legalization in national jurisdictions will continue [10, p. 47].

The study of the available literature on the issue under study indicates a significant variety of forms and types of virtual currencies. Currently, they are usually divided into two large classes: convertible and non-convertible virtual currencies, depending on the possibility of their exchange for regular fiat money.[7] The former, in turn, are divided into centralized and decentralized (functioning on the basis of distributed ledger technology, DLT). Representatives of non-convertible virtual currencies are game currencies that cannot be converted into fiat money. We will not consider this class. Bitcoin is a *decentralized* convertible virtual currency. Central bank digital currencies, another representative of convertible virtual currencies, refer to *centralized* virtual currencies, which are central bank liabilities denominated in national currency, having a digital representation and capable of acting as legal tender, measure and means of payment. store of value [11, p. 5].

The strategic choice of digitalization models for the monetary and foreign exchange sector will largely determine the competitive positions of certain countries in the future IMFS and the key contours of this system itself. Realizing the threat, central banks around the world began to actively explore the possibilities of digital money and related distributed ledger technologies (DLT). In 2014, the central bank of Ecuador launched a project to explore electronic money and the possibility of making payments on the platform of the central bank. In 2015, the Central Bank of the Netherlands (De Nederlandsche Bank) began experimenting with the formation of money based on DLT. Meanwhile, the central banks of Great Britain, Canada, and Singapore were doing the same. Their general conclusion was the assertion that the degree of development of the distributed ledger technology does not yet allow its use within the payment systems of central banks [12, p. 5]. In this regard, other technologies and designs of central bank digital currencies (CBDC) began to be developed — a new form of money in the digital age as an alternative to private cryptocurrencies.

In 2018, a survey by the Bank for International Settlements (BIS) and the Committee on Payments and Market Infrastructures (CPMI) showed that most central banks consider the introduction of the CBDC only in conceptual terms, and few believe in their appearance in the short or medium term [13]. A year later, in 2019, of the 66 central banks surveyed (21 advanced economies, 45 emerging market jurisdictions, accounting for 75% of the world's population and 90% of global GDP), 80% reported that they already developing CBDC at one stage or another [1]. By mid-2020, pilot projects of three retail CBDCs had already been completed in the world, projects were under way in 28 countries, and the development of the CBDC concept was carried out in another 68 jurisdictions [12].

The People's Bank of China has advanced the furthest in the implementation of the CBDC project, which in 2020 tested the use of retail CBDC in several cities of the country, and from April 2021 launched the DCEP (Digital Currency Electronic Payment) application. In total, since 2014, more than 140 million personal digital wallets have been created in China, and the transaction volume has exceeded 62 billion yuan.[8] During the

[7] Overview of cryptocurrencies, ICO (initial coin offering), and approaches to their regulation. Bank of Russia, December 2017, Moscow. URL: http://www.cbr.ru/content/document/file/36009/rev_ico.pdf (accessed on 11.03.2022).

[8] URL: https://ria.ru/20220209/yuan-1771832356.html (accessed on 11.03.2022).

2022 Winter Olympics, more than 2 million yuan of payments were made daily using e-CNY,[9] both by residents of the country and foreign citizens. Representatives of the People's Bank of China noted that the growth of the market and the importance of cryptocurrencies was one of the factors in the decision to switch to digital currencies.[10] It can be stated that the CBDC is already a reality of the monetary sphere.

The concept of CBDC has been around for a long time. Back in 1987, the expediency of providing electronic money by central banks directly to economic agents was studied [14]. To date, a significant array of scientific publications has appeared, the authors of which have studied the role and place of the CBDC in the existing variety of forms and types of money, the feasibility of creating CBDCs, possible models and types of architecture of the payment system [15–18]. Russian specialists, developing the problems of CBDC, studied their economic nature, advantages and disadvantages [19–22], the impact on the financial system [23].

The introduction of digital currencies was agreed upon at the G20 Rome Summit, and the Bank of Russia announced its concept of the digital ruble and the specific stages of the implementation of this project: December 2021 — creation of a prototype digital ruble platform of the Bank of Russia; January 2022 — development of necessary changes in legislation; Q1 2022 — testing a prototype of a digital ruble platform together with financial market participants. In case of successful testing, further development of the CBR platform will take place[11]:

- connecting credit institutions and the Federal Treasury to the digital ruble platform of the Bank of Russia, carrying out C2C, C2B, B2C, B2B, G2B, B2G, C2G, G2C;
- connecting financial intermediaries, introducing an offline mode, ensuring the exchange of the digital ruble for foreign currency and the possibility of opening wallets for non-resident clients.

In this regard, the question arises about the readiness of economic agents for the practical use of virtual currencies. Last but not least, the success of introducing the CBDC into the national monetary systems, and, consequently, the possible directions for their further digital transformation, depends on this. The emphasis on financial literacy in our study is not accidental. The situation with the decision-making by business entities on the use of cryptocurrencies and CBDCs differs significantly.

In the first case, the initiative comes from the economic agents themselves, who make decisions about investing in cryptocurrencies or making (accepting) payments using them at their own peril and risk. How adequately do they assess this risk?

In the second case, the decision on the introduction and areas of use of the CBDC is made by the state represented by the central bank, and economic agents are faced with the fact of their existence in the country's monetary system. Will the population's financial literacy make it possible to quickly and painlessly introduce this new form of money into monetary and payment circulation? Won't this create a situation similar to trying to use QR codes during a pandemic?

The priority motives of regulators in developing CBDC models vary from country to country. The main tasks for the central banks of most countries are similar: ensuring the safety and efficiency of domestic payments, financial stability, the effectiveness of the implementation of monetary policy and cross-border payments, as well as *the financial*

[9] e-CNY is the China's Central Bank digital currency.

[10] URL: http://cryptohamster.org/%D0%B2%D0%BE%D1%82%D1%81%D0%BA%D0%BE%D0%BB%D1%8C%D0%BA%D0%BE-%D1%86%D0%B8%D1%84%D1%80%D0%BE%D0%B2%D0%BE%D0%B3%D0%BE-%D1%8E%D0%B0%D0%BD%D1%8F%-D0%B8%D1%81%D0%BF%D0%BE%D0%BB%D1%8C%D0%B7%D0%BE%D0%B2 (accessed on 11.03.2022).

[11] The concept of the digital ruble. Bank of Russia. April 2021. P. 29. URL: http://www.cbr.ru/content/document/file/120075/concept_08042021.pdf (accessed on 11.03.2022).

inclusion of these instruments. However, K. Boar [1] notes that in developed countries, central banks are exploring the possibilities of CBDC mainly in order to ensure the safety and efficiency of domestic and external payments, they are also concerned about the impact of CBCB on financial stability. Whereas in *developing* countries, the most important task in the implementation of the CBDC, along with ensuring the security and efficiency of domestic payments, is to *ensure financial inclusion*, which is not among the priorities of developed countries. In general, for developing countries, CBDCs turned out to be more significant than for developed ones.[12]

Financial Inclusion is the state of the financial market, in which the entire capable population of the country, as well as small and medium-sized businesses, have a full opportunity to receive a basic set of financial services as defined by the G20 Global Partnership for Financial Inclusion (including payments, deposits, loans, and insurance).[13] It implies the presence of physical, price, mental, and assortment inclusion. In our study, we will focus only on *mental* inclusion, given the specific nature of new virtual financial instruments. Although for the population of developing countries, the issue of *physica*l inclusion is also very relevant, given the prevalence and cost of technical devices and software needed to access digital currencies. In many countries, a significant portion of the adult population still lacks access to digital payment options.[14]

Mental inclusion to financial products, services, and instruments implies an understanding of their properties, opportunities, and inherent risks. Therefore, it requires a certain level of *financial* literacy of economic agents. In addition, the use of virtual currencies also implies a certain level of *digital* literacy. The lack of financial and digital literacy can become a mental barrier to the use of virtual currencies, leading to the formation of inadequate behavior patterns, and forming a negative investment or payment experience [24].

FINANCIAL LITERACY WITH RESPECT TO VIRTUAL CURRENCIES AS A FACTOR OF THEIR USE

The cryptocurrency market attracts investors with the dynamics of its development and the possibility of obtaining high income. *Fig. 1* shows the growth of the aggregate index of cryptocurrencies, which includes the largest cryptocurrencies and is calculated by the Bloomberg together with the cryptocurrency bank Galaxy Digital Capital Management. Its composition as of March 2022 is shown in *Table 1*. At the bottom of *Fig. 1*, the evolution of Bitcoin's market capitalization from March 2020 to March 2022 is presented. The top graph shows that the dynamics of the aggregate index are largely determined by this cryptocurrency, which dominates the market.

The graph data shows that lockdowns during the COVID-19 pandemic gave a powerful impetus to the development of the cryptocurrency market: in just a year, from November 2020 to November 2021, the total capitalization of the global digital currency market, including stablecoins, grew 6.6 times — up to $ 2.9 trillion dollars. Bitcoin has the largest market share at 43%, or $ 1.2 trillion.[15]

Russian participants are very active in this market, being the leaders in the number of visits to the Binance digital currency exchange, and the annual volume of transactions with digital currencies of Russian citizens is about $ 5 billion dollars.[16]

The activity of Russian citizens in the cryptocurrency markets reflects, in our

[12] BIS Annual Economic Report. June 2018. P. 8. URL: https://www.bis.org/publ/arpdf/ar2018e.pdf (accessed on 11.03.2022).

[13] Bank of Russia. URL: http://www.cbr.ru/develop/development_affor/dic/#highlight (accessed on 11.03.2022).

[14] BIS Annual Economic Report. June 2021. P. 69. URL: https://www.bis.org/publ/arpdf/ar2021e.htm (accessed on 11.03.2022).

[15] Bank of Russia. Financial Stability Review Q2–Q3 2021, P. 40. URL: https://www.cbr.ru/Collection/Collection/File/39346/2_3_q_2021.pdf (accessed on 11.03.2022).

[16] Там же, с. 41.

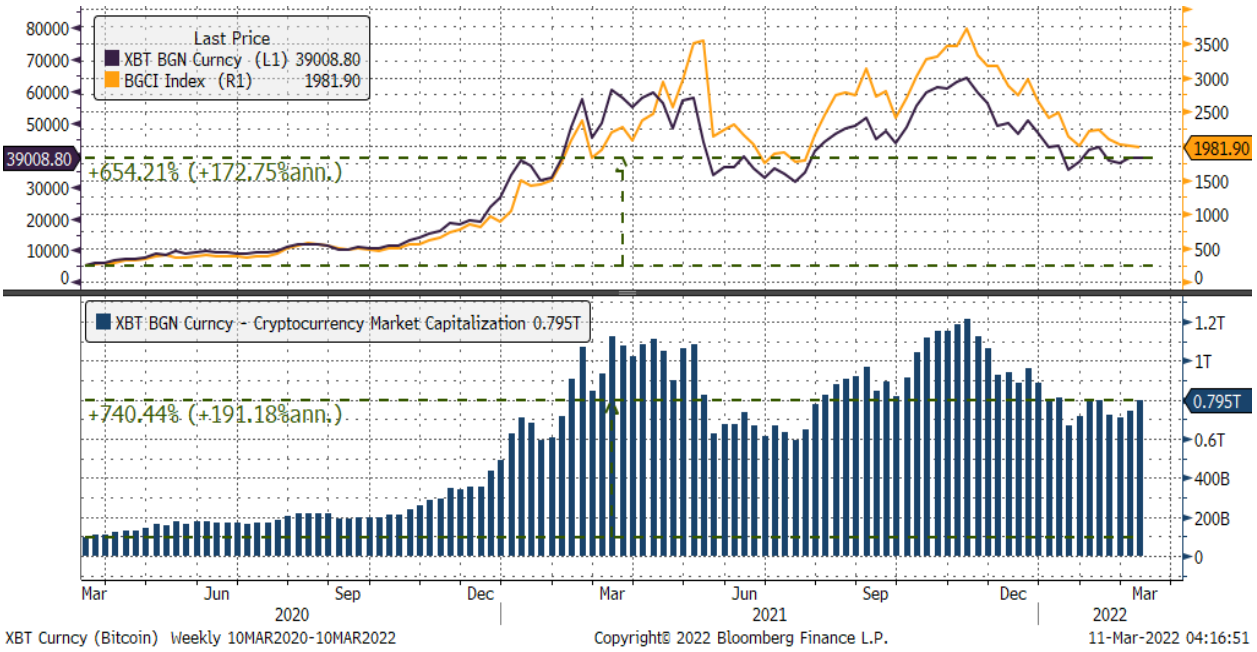

Fig. **Comparative dynamics of the aggregated crypto-index (BGCI Index) and its main component — Bitcoin (XBT Currency) in the cryptocurrency market (Market capitalization in trillion dollars)**

Source: compiled by the authors based on Bloomberg statistics (accessed on 11.03.2022).

opinion, the general trend of increased activity of individuals in the financial markets during the period of low-interest rates and coronavirus restrictions, with a low overall level of financial literacy, as well as an increased appetite for risk.

OECD research indicates a relatively low level of financial literacy in the world population as a whole. The OECD financial literacy assessment methodology includes three components: financial knowledge, financial behavior, and financial attitudes that shape attitudes toward long-term financial planning. According to an OECD study, the index of basic financial knowledge of Russians is higher than the world average, while financial behavior and financial planning are lower.[17] In our opinion, such results are due to the low incomes of many Russian citizens, which determine the presence (or absence) of demand for investment financial products and the experience of using them. According to a survey by the Bank of Russia, 17% of citizens do not have savings.[18]

The problem of financial literacy of cryptocurrency market participants is of interest to researchers; many publications were devoted to it in 2020–2021. G. Panos, T. Karkkainen, A. Atkinson [25], studying the impact of financial literacy on the ownership of cryptocurrencies based on data from 15 countries, revealed a negative relationship. The authors concluded that the demand for cryptocurrencies among the population is largely due to the inexperience of users.

A study of factors influencing the use of cryptocurrencies by households [26] did not show a significant impact of financial literacy on the desire to operate cryptocurrencies; the expectation of profitability of operations was more important.

H. Zhao and L. Zhang [27] found that investment experience has a greater influence on investment in cryptocurrency than

[17] OECD/INFE 2020 International Survey of Adult Financial Literacy. URL: https://www.oecd.org/financial/education/oecd-infe-2020-international-survey-of-adult-financial-literacy.pdf (accessed on 11.03.2022).

[18] The attitude of the Russian population to various means of payment. Results of sociological research for 2020. URL: https://www.cbr.ru/Collection/Collection/File/35422/results_2020.pdf (accessed on 11.03.2022).

financial literacy, although the experience of owning risky assets indirectly influenced the formation of a connection between subjective financial knowledge and behavior when investing in cryptocurrency.

Q. T. Pham et al. [28] also concluded that socio-demographic factors and financial literacy do not affect the intention to invest in cryptocurrencies.

Of particular interest is the study of millennials' awareness[19] of various investment asset classes, with a special focus on cryptocurrencies, given this generation's propensity for digital technologies [29]. This study showed that market participants were generally aware of the level of risk of the chosen financial products, but their main motivation was to achieve the target return. By early 2022, 48% of U.S. millennial households owned crypto, compared to 20% of the country's adult population as a whole.[20]

Thus, it seems that a significant part of cryptocurrency users do not have the financial literacy necessary for these operations, and their main motive is the desire to obtain high returns. More active in relation to cryptocurrencies are representatives of the younger generation, in particular millennials, who are ready to take on increased risks and are well-versed in the world of digital technologies.

In this regard, the authors conducted a study, the purpose of which was to identify the degree of awareness of students with financial knowledge regarding virtual money, their understanding of the differences between cryptocurrencies and the CBDC, and their willingness to use these tools.

Table 1

Composition of the Global BGCI Index as of March 2022

Cryptocurrency	Ticker	Index constituent weights, %
Bitcoin	BTC	35
Ethereum	ETH	35
Cardano	ADA	6.66
Solana	SOL	6.11
Avalanche	AVAX	4.14
Polkadot	DOT	3.51
Polygon	MATIC	2.48
Cosmos	ATOM	1.64
Litecoin	LTC	1.64
Chainlink	LINK	1.40
Uniswap	UNI	1.25
Algorand	ALGO	1.16

Source: Bloomberg statistics (accessed on 11.03.2022).

RESEARCH RESULTS: UNDERSTANDING DIFFERENCES REGARDING TYPES OF VIRTUAL CURRENCIES

The online survey was completed by 222 undergraduate students and graduate students in finance. The survey results showed the following. Answers are given as a percentage of the total number of respondents.

First of all, we found that the level of trust in the traditional financial system and fiat money remains high at 56% and 57% respectively. However, 38% of respondents believe that the latter have outlived themselves.

The preferred payment methods are mobile and card payments relatively equally (45% and 49%). Cash payments seem obsolete (3%), while payments using cryptocurrencies seem exotic (3.6%).

The study showed that students are equally familiar with both cryptocurrencies and CBDC (36% and 37%).

[19] Millennials, or Generation Y, are the generation of people born between 1980 and 2000, the generation of the digital age.

[20] URL: https://cryptohamster.org/%d0%bd%d0%b8%d0%b7%d0%ba%d0%be%d0%b5-%d1%84%d0%b8%d0%bd%d0%b0%d0%bd%d1%81%d0%be%d0%b2%d0%be%d0%b5-%d0%b1%d0%bb%d0%b0%d0%b3%d0%be%d0%bf%d0%be%d0%bb%d1%83%d1%87%d0%b8%d0%b5-%d0%bc%d0%b8%d0%bb%d0%bb/ (accessed on 11.03.2022).

Interestingly, 29% of the students surveyed *have experience with cryptocurrencies*, mainly as an investment object (24%).

About 30% of respondents are ready to receive a salary in the CBDC and 20% agree to a salary in cryptocurrency. This share generally correlates with the share of those who believe that cryptocurrencies can already replace fiat money: 27%. However, only 4.5% of respondents consider cryptocurrencies to be a means of payment. The majority — 65% — consider them both a financial asset and a means of payment.

The position of respondents regarding the need to regulate the cryptocurrency market is interesting: 81% believe that this should be done. At the same time, 47% believe that this should be done by central banks and 37% — by other organizations.

The survey results also showed that, according to students, the introduction of the CBDC is important both for success in the most important industries and key markets (53%) and for geopolitical reasons (75%).

However, despite the fact that 61% of respondents know little about the CBDC, they believe that they can be introduced to the national (65%) and international (55%) payment turnover. Preference for cryptocurrency in this context is given by 18 and 31%, respectively. It can be stated that those of the students who had experience with cryptocurrencies (29%) prefer it, rather than the CBDC, as a new form of money.

Similar studies were carried out in other countries, which indicates the presence of a problem that causes concern among specialists. We have access to data from a survey conducted at 6 universities in Germany, China, Poland, and Russia among *non-finance* students with *no banking (financial) training* or special knowledge about virtual currencies.[21]

A comparison of the results of this study with ours showed a significantly greater propensity for cash settlements in Germany and Poland than in Russia and even more so in China. There is evidence that Germans often resort to cash payments to reduce their digital footprint.

Interestingly, about a quarter of respondents see the potential of cryptocurrencies as a replacement for traditional central bank money, similar to our study.

However, it should be noted that if in our study only 37% of respondents said that they know a lot about virtual currencies, then in the study of our Western colleagues there are much more of them: in Germany — 65%, in Poland — 78%, in China — 60%. It seems that the majority of non-major students overestimate their knowledge of these issues.

CONCLUSIONS

The paper considers the phenomenon of convertible virtual currencies, the use of which will determine the direction of the digital transformation of the IMFS.

The study was aimed at determining the degree of influence of financial literacy on the use of digital currencies as an investment object and means of payment in the context of the successful introduction of the CBDC into national monetary systems. Based on the study of publications on the research topic, the results of an online survey of undergraduate students in finance, and cross-country comparisons, the authors came to the following conclusions.

The link between financial literacy and investment in cryptocurrencies is almost non-existent, or vice versa. A significant part of cryptocurrency users do not have the financial literacy necessary for these operations, and their main motive is the desire for high profits. The younger generation is more active in cryptocurrencies.

The younger generation is more active in cryptocurrencies.

[21] Report by D. Hummel "Digitalization — challenges for regulators and financial literacy" at the II International Scientific and Practical Conference (ISPC) "Transformation of Financial Markets and Financial Systems in the Digital Economy". Moscow, Financial University, 14–15.10.2020.

The lack of financial training and low financial literacy, as well as the lack of experience in financial investment, lead to a reassessment of their knowledge by participants in the cryptocurrency market, confirming the Dunning-Kruger effect.[22] The presence of financial knowledge contributes to a more adequate assessment of the opportunities and risks of virtual currencies and an understanding of the features of their different types.

A large number of unqualified investors with low financial literacy and high-risk appetite in the cryptocurrency market can lead to increased volatility, increased financial instability with the growth of market volumes, and negative social consequences.

The presented study is one of the first to reveal differences in the assessment of their knowledge and readiness to use digital currencies by students of financial and non-financial specialties, and also confirms a more balanced assessment of the risks and opportunities of different types of virtual currencies if they have financial knowledge.

Also, the contribution of the authors is to identify social and financial risks due to insufficient financial literacy of the population when using cryptocurrencies and CBDCs: in the first case — when making investment decisions, in the second — in a situation where they should be applied when issued by the Central Bank. Low financial and digital literacy of the population can create a mental barrier to the use of CBDCs, complicating their implementation in national monetary systems.

The results of this study may be useful in developing a strategy for the introduction of the CCDC into the national monetary systems and the development of the financial market of the Russian Federation in order to reduce the social and financial risks of the population when using virtual currencies, reputational risks of the Central Bank, as well as in training programs for financial specialists and programs to improve the financial literacy of the population.

Further research into the phenomenon of virtual currencies can be aimed at studying their economic essence and functions, the issues of regulating their circulation and taxation, as well as the experience of practical use of the CBDC of China.

[22] The Dunning-Kruger effect describes the tendency for people with little knowledge to overestimate their own knowledge, and people with more knowledge to overestimate the knowledge of others.

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Appendix

Survey results

No.	Question	Respondents' answers		
			%	Number of students
1	What is your level of confidence in the traditional financial system based on money issued by the Central Bank?	High	56	125
		Low	24	54
		Don't know	20	43
2	Do you think that traditional money is obsolete?	Yes	38	84
		No	57	126
		Don't know	5	12
3	Which currencies issued by central banks do you trust the most?	Dollar	55	122
		Euro	30	67
		Yuan	8	18
		Russian ruble	7	15
4	Which payment method do you prefer?	Cash	3	6
		Credit card	49	109
		Mobile payment	44	99
		Cryptocurrency	4	8
5	What do you know about digital currencies?	A lot	37	83
		Few	61	135
		Nothing	2	4
6	What do you know about cryptocurrencies?	A lot	35	79
		Few	63	139
		Nothing	2	4
7	Are you interested in making transactions using cryptocurrency?	Yes	43	96
		No	42	93
		Don't know	15	33

Appendix (continued)

No.	Question	Respondents' answers		
			%	Number of students
8	Have you had any experience using cryptocurrencies …	as a means of payment?	5	12
		as a financial asset?	24	53
		no user experience	71	157
9	Would you agree to receive a salary in cryptocurrency?	Yes	20	44
		No	59	131
		Don't know	21	46
10	Would you agree to receive a salary in digital rubles issued by the Central Bank?	Yes	30	67
		No	49	108
		Don't know	21	46
11	Do you think that cryptocurrencies can replace money issued by central banks?	Yes	27	60
		No	61	135
		Don't know	12	27
12	Is there any need for any regulation of the cryptocurrency market?	Yes	65	79
		No	25	31
		Don't know	10	12
13	Do you agree with the thesis that digital money, i.e. e-euro, e-yuan, etc., is essential for success in key industries (engineering, finance, medicine, IT technology)?	Yes	53	118
		No	22	49
		Don't know	25	54
14	Do you think there are geopolitical reasons for the development and adoption of the Central bank digital currency?	Yes	75	167
		No	9	19
		Don't know	16	35
15	Are cryptocurrencies …	means of payment?	5	10
		a financial asset?	25	56
		both a means of payment and a financial asset?	65	144
		other	5	11
16	Should the cryptocurrency market be regulated …	by central banks?	47	104
		by other organizations?	37	82
		shouldn't be regulated …	16	34

Appendix (continued)

No.	Question	Respondents' answers		
			%	Number of students
17	In your opinion, in the national payment turnover …	it is preferable to introduce the Central Bank digital currency	66	145
		it is preferable to introduce cryptocurrency	18	40
		other	16	35
18	In your opinion, in the international payment turnover …	it is preferable to introduce the Central Bank digital currency	56	122
		it is preferable to introduce cryptocurrency	31	69
		other	13	28

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