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Trends and Prospects for the Development of Blockchain and Cryptocurrencies in the Digital Economy

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Abstract:

The main aim of this article is to analyze the prerequisites for the development and the promotion of cryptocurrencies, covering the period from the emergence of the first forms of money to recent period.

The paper focuses on findings of comparative analysis of consumer value of precious metals, cash and non-cash money and cryptocurrencies as different forms of money. The authors provide comprehensive descriptions and expert quantitative estimates for each of the listed forms of money, as well as determine the place of cryptocurrency in the modern financial system as a means of payment.

The research presents a detailed analysis of the advantages and disadvantages of new technologies. The paper defines the status of cryptocurrencies in various countries of the world and names promising development trends. The authors determine the main obstacles hindering the circulation of cryptocurrencies in certain markets and assess the risks and prospects associated with the introduction and use of cryptocurrencies as a new form of money which aims at full/partial replacement of fiat money in the modern financial system.

As a conclusion it is noted that weak integration into the financial system is the main obstacle to major distribution of cryptocurrencies as a means of payment.

Keywords: *Bitcoin, cryptocurrency, finance, financial system, gold, money, payment system, precious metals.*

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1. Introduction

At the end of the 20th and the beginning of the 21st century, the world community took many steps towards the international division of labor, creation of supranational organizations, free economic zones, etc. The World Trade Organization and the European Union were established to ensure freedom of trade and enhance the economic strength of Europe. The system of international financial reporting standards (IFRS) was introduced to increase transparency and efficiency of the global financial market, facilitate the circulation of international financial resources and enable a higher number of investors to conduct various financial transactions of a different nature. In other words, the world financial system until recently has been moving towards centralization and globalization, which involved creating supranational state organizations and transnational corporations, many of those being de facto states in the state, considering their financial, legal and lobbying power.

The world strove for free trade, free circulation of factors of production and reached this goal. The economic processes caused by globalization of the modern world economy led to a significant stratification of society into the rich and the poor, to the situation when some states lost control over their economies, rising unemployment, uncontrolled emissions aiming to solve economic problems by means of money, the forced increase in public debt of weaker countries in supranational associations, decreasing expenditures of state budget and raising the retirement age in weak and subsidized countries to meet the requirements of supranational financial regulators and international financial organizations that assist in restructuring the public debt.

At the same time, with every new year the global system of economic relations was becoming cluttered with a huge number of intermediaries, hierarchical structures, lobbyists and groups of influence within the states that carried out control, regulation, licensing and prohibitive activities concerning decentralized finance. These processes led to the emergence of an anti-globalization momentum throughout the world. For instance, on March 29, 2017, the UK officially applied Article 50 of the Lisbon Treaty, which gives the right to any EU country to withdraw from the union, thus leaving the EU. A wave of anti-globalization sentiments swept across the world. After that, some countries and regions showed their interest in decentralization.

In general, the inclination to withdraw from the Union was expressed by Greece, Italy and France. In France, it was linked with the presidential elections, Marine Le Pen being one of the main candidates. Among her statements, the public remembered the following: *"The European Union will die because the people do not want it anymore. The time has come to defeat globalists"* (RBC, 2017). However, Emmanuel Macron, who advocates the development of intra-European relations, won the elections, and this reduced the risk of France's withdrawal from the EU. Nevertheless, Italy, Scotland and some other countries held referendums on issues

related to independence. In early 2018, the new US President, D. Trump introduced customs duties on steel and aluminum for a number of countries to provide conditions for re-creation of jobs in the United States. In addition to this, in his foreign policy, D. Trump made it very clear that it is time to admit that globalization has not only advantages for the US economy, but it is fraught with numerous drawbacks, and the time for radical changes has come.

All these events combined emphasize the significance of the new trend in the development of the socio-economic structure of the society. People are tired of the policy of total control, bans and restraint of economic activity. Practical decentralization has replaced globalization. The trend towards decentralization is stimulated by the worsening socio-economic state of the world economy as a whole and that of its weak links in particular.

2. Methodology

This research aims to explore the issues of emergence and active promotion of blockchain technology and various cryptocurrencies after the global financial crisis of 2007-2008. The blockchain technology itself and the issues of cryptography as such are not covered in this study. The authors aim to determine economic and financial reasons for the emergence of such a phenomenon as cryptocurrencies, as well as to assess the degree of their integration into the modern financial system and the prospects for participation in monetary circulation as a full-fledged money of the digital economy of the future. In other words, in this paper, the authors made a comparative analysis of various forms of money that evolved throughout history, including cryptocurrencies in their present form. In addition, the authors discuss the reasons for increasing popularity of cryptocurrencies in the post-crisis period, emphasizing the role of the ultra easy monetary policy of the world's leading central banks in inflating price bubbles in the market of crypto-currencies.

Russian and international researchers have studied the concept of money and cryptocurrencies in detail (Albekov *et al.*, 2017; Vlasov, 2017; Vovchenko *et al.*, 2017a; 2017b; 2017c). Economic theory considers at least five basic properties of money representing the features of the universal equivalent of value:

1) divisibility (fractionality);
2) portability (ease of use in monetary circulation);
3) durability (wearing quality);
4) recognizability (of its form);
5) standardization (monetary units of the same denomination should have the same value).

In the 15-16 centuries AD gold was accepted as the universal equivalent since it had unique physical properties. As a result, despite the high market value and at the same

time a relatively low use value (for that period), this yellow metal took the role of the universal measure of value in commodity-money relations.

Over time, society conducted numerous experiments, in the course of which gold was replaced with bills of exchange, mortgages, paper bills or credit money (banknotes) since in circulation gold coins are way below credit money for most of the five properties of the universal equivalent. Initially, the monetary system was organized in such a way that issuance of banknotes was backed with precious metals, and the emission of money was carried out in decentralized manner by various banks. This was followed by the emergence of the central issuer represented by governments, and private currencies were banned. Then came the moment (in the mid-1971), when the world community decided to abolish the Bretton Woods agreement and completely stop any backing of currencies. The main reasons for going off gold include the following:

1. It is impossible to launch fast additional issuance for the needs of money circulation (the demand for money is growing parallel to increasing turnover for its maintenance);
2. Transportation of precious metals is technically difficult and expensive (it requires alarm systems and good security, high load-carrying capacity is required for transportation of a large amount of precious metals);
3. Loss of gold coins caused a disruption in monetary circulation and its restoration required minting and putting into circulation a new similar amount of gold, which was difficult due to the scarcity of this resource;
4. Coins made of precious metal are subject to wear and tear during circulation (including deliberate cutting of coins), the real value of the reduced amount of metal did not comply with the nominal value of the coin;
5. Debasement of coinage disrupted monetary circulation.

Having summarized the problems arising in various money circulation systems, the authors developed a list of the ten most important criteria which were used to conduct a comparative analysis of precious metals, fiat cash, non-cash money, and cryptocurrency.

The research methods used in this article included a review of scientific publications and research papers on cryptocurrencies and blockchain; synthesis and analysis of the acquired data, SWOT-analysis of the properties of traditional money, cryptocurrency and gold, as well as comparison, formalization and specification of the results obtained.

3. Results and discussion

Considering the lack of confidence to financial intermediaries and realization that the current world monetary system has turned inadequate and morally obsolete and it cannot meet the challenges of the modern economy, the public has again become

more interested in blockchain and cryptocurrencies. Curiously enough, the new technology of storage and data exchange – blockchain – appeared before the beginning of the global financial crisis of 2007-2008. Different sources tend to use fairly complex definitions of this term; sometimes it even seems that it is done intentionally to increase the significance and practical importance of this technology.

One of the definitions states that *"blockchain is a multifunctional and multilevel information technology designed to keep track of various assets"*. Blockchain in its present form can become an alternative to the traditional system of bank transfers. Blockchain creates new opportunities for searching, managing, evaluating and transferring any discrete units and is a new organizational paradigm for coordinating any kind of human activity; some people compare it with the structure of DNA in human blood. There is a new economic phenomenon that emerged along with blockchain technology – cryptocurrency, and Bitcoin was its first example. The term 'Bitcoin' covers three concepts that altogether form a payment system built on the basis of cryptocurrency: a cryptocurrency, a protocol, a client and log file. Table 1 shows the main components of blockchain technology.

Table 1. *Levels of blockchain technology by the example of Bitcoin*

Cryptocurrency	Internal currency, accounting unit or means of payment integrated in the blockchain system. Cryptocurrency can be bought or sold on the market.	Bitcoin, Litecoin, Ethereum, Ripple and other cryptocurrencies.
Bitcoin protocol and client	A protocol using the basic blockchain technology which describes the procedure of assets transfer from one owner to another in the chain of blocks. It is also a network that represents a collection of computers all over the world on which BitcoinCore software is installed to check transactions and blocks.	Programs performing operations with cryptocurrencies
Bitcoin blockchain	The base platform for blockchain technology. The Bitcoin registry contains all records made over its whole lifespan.	Basic decentralized transaction log in the blockchain network.

The public did not accept blockchain technology and cryptocurrencies as a class of assets straight away, but only after a set of necessary and sufficient conditions was formulated:

1. The development of blockchain technology reached an acceptable level of efficiency (over nine years of practical implementation of Bitcoin technology, only one critical vulnerability was found, as a result of which a hacker received 92 billion bitcoins on one account). Fixing the error required the rollback of the entire financial transaction history in the Bitcoin network for a day);
2. The financial crisis of 2007-2008 showed drawbacks in the financial intermediation system, inefficiency (slowness) of the modern system of bank

transfers (especially cross-border ones), with a relatively high cost of services of financial intermediaries;
3. The financial sphere has become overregulated: it requires a large number of certificates and confirmations of the sources of funds origin for conducting a transaction;
4. There is a clearly visible trend towards anti-globalization and financial decentralization in the global community which is developing in a number of areas;
5. The apparent desire of the leading G10 countries to change the status of the US dollar in the world monetary system;
6. The policy of quantitative easing (QE) or the policy of "coercion to risk" conducted by world central banks after the crisis of 2007-2008 has reached its main goal – to restore the economy to the pre-crisis levels; at the same time, there has been too much cheap and affordable liquidity in the world economy, while the yields of traditional assets have become low, resulting in an artificially created situation when investors were stimulated to take risks of investing in a new high-risk class of assets – cryptocurrencies (Table 2).

Currently, the world community has different opinions on the official status and the mission of cryptocurrencies. After the collapse of Japan cryptocurrency exchange Mt. Gox in 2014, the governments of different countries divided into three ideological groups (The Central Bank of the Russian Federation, 2014):

1. The country bans cryptocurrencies and ICO (China, Bangladesh, Iceland, Lebanon, Vietnam, Thailand, Bolivia, Ecuador, Kyrgyzstan, Indonesia);
2. The country allows cryptocurrencies and ICO, but only through special intermediaries (exchanges and exchange offices), and they are subject to licensing (USA, Canada, UK, Australia, Estonia, Denmark, South Korea, Sweden, Netherlands, Finland, Belarus).
3. The current status of cryptocurrency and blockchain is not defined, while the state is interested in their legalization and is working on the relevant regulatory framework (Russia, Belgium, Colombia, Czech Republic, Germany, New Zealand, Israel, Ukraine, France, Croatia, Belgium, Poland, Hong Kong, Slovenia, Turkey, Singapore, Switzerland, Spain).

In our opinion, this difference in opinions on the status and prospects of cryptocurrencies is due to the fact that such questions as "Why does the society need cryptocurrencies?", "What public problem is being solved by cryptocurrencies?", "In what way and to what extent are crypto currencies better, more efficient and safer than traditional money and payment systems so that they can justly replace them?" still remain pending and do not have an unambiguous answer. Adherents of cryptocurrencies and blockchain point out to their undeniable practical importance in the future economy (the Internet of things, internet machines, etc.). However, until now there have been no real examples of any value of cryptocurrencies except episodic stories of success connected with speculation in the market. For instance, J. Stiglitz in his interview at the end of 2017 says that "Bitcoin is successful only

because of its potential for circumvention, lack of oversight. So it seems to me it ought to be outlawed. It doesn't serve any socially useful function" (Costelloe, 2017).

Table 2. *Dynamics of bitcoin market indicators in the context of changes in the monetary policy of the US Federal Reserve for the period from 2012 to September 2018*

Indicator	units	Jan 2012	Jan 2013	Jan 2014	Jan 2015	Jan 2016	Jan 2017	Jan 2018	Sept 2018	SL
Cost of bitcoin	USD	6	14	747	317	432	1 023	15 100	6 450	
	*		9	733	-430	115	591	14 077	-8 650	
	**		154.5%	5235.7%	-57.6%	36.3%	136.8%	1376.1%	-57.3%	
Total volume of bitcoin in circulation	thous.	8 030	10 621	12 229	13 671	15 032	16 081	16 778	17 267	
	*		2 591	1 608	1 442	1 361	1 049	697	489	
	**		32.3%	15.1%	11.8%	10.0%	7.0%	4.3%	2.9%	
Bitcoin capitalization	USD mln	44	149	9 135	4 334	6 494	16 451	253 348	111 372	
	*		105	8 986	-4 801	2 160	9 957	236 897	-141 976	
	**		236.7%	6043.5%	-52.6%	49.8%	153.3%	1440.0%	-56.0%	
Transactions per day	thous.	5 600	38 990	41 480	72 230	123 600	301 600	340 980	234 200	
	*		33 390	2 490	30 750	51 370	178 000	39 380	-106 780	
	**		596.3%	6.4%	74.1%	71.1%	144.0%	13.1%	-31.3%	
Cost of one transaction (miners commission)	USD	8	1	90	18	10	7	123	52	
	*		-7	89	-72	-9	-2	116	-71	
	**		-87.5%	9275.0%	-80.0%	-47.2%	-22.1%	1562.2%	-57.7%	
Total miners commission per day	BTC	14	43	184	11	20	118	649	20	
	*		29	141	-173	9	98	531	-629	
	**		207.1%	327.9%	-94.0%	81.8%	490.0%	450.0%	-96.9%	
Total miners commission per day	USD	77	602	137 448	3 487	8 640	120 714	9 799 900	129 000	
	*		525	136 846	-133 961	5 153	112 074	9 679 186	-9 670 900	
	**		681.8%	22731.9%	-97.5%	147.8%	1297.2%	8018.3%	-98.7%	
Total miners commission to transactions volume	%	7.40%	1.65%	3.02%	4.48%	2.62%	1.19%	1.23%	0.97%	
	pp		-5.75%	1.37%	1.46%	-1.86%	-1.43%	0.04%	-0.26%	
US FRS interest rate		0.25%	0.25%	0.25%	0.25%	0.50%	0.75%	1.50%	2.25%	
US FRS balance	USD bln	2 918	2 929	4 028	4 500	4 487	4 453	4 444	4 211	
	*		11	1 099	472	-13	-34	-9	-233	
	**		0.4%	37.5%	11.7%	-0.3%	-0.8%	-0.2%	-5.2%	

Note: ** - an absolute change year by year, in the same units as those of compared indicators, except as noted,* ** *- relative change year by year, calculated as growth rate (year1/year0-1), unit of measure - %*

Source: *Compiled by the authors using Blockchain, 2018; Board of Governors of the Federal Reserve System, 2018.*

Today, cryptocurrencies are poorly integrated in the modern financial system and are actually used only for financial speculation. Even provided that the cryptocurrency market is actively developing, it still represents a sort of financial "Wild West":

insider trading methods are widely applied there, market manipulations with cryptocurrency rates are carried out without bans or restrains (the so-called "pump and dump" technique), financial intermediaries use cryptocurrencies to bypass various prohibitions, for tax evasion, financing illegal activities, and other illegal actions.

Some countries are really optimistic about the development potential of blockchain and national cryptocurrencies. For example, in early 2018 Venezuela launched national crypto currency "El Petro", and some other countries are also considering the possibility of issuing their national cryptocurrencies. But is cryptocurrency really much better than other forms of money? Table 3 presents a comparative analysis of precious metals, fiat money (cash and non-cash forms), and cryptocurrency for a number of characteristics.

Table 3. *Comparative analysis of properties of traditional money, gold and cryptocurrency*

Money properties	Gold, including precious metals	Traditional credit money		Cryptocurrencies
		Cash	Non-cash (e-money)	
1. Divisibility (fractionality)	2.0	4	5.0	5.0
	below average	high	highest	highest
2. Portability (ease of use in monetary circulation)	2	3	5	4
	below average	above average	highest	high
3. Durability	2	3	5	5
	below average	above average	highest	highest
4. Recognizability	3	3.5	5	3.5
	above average	above average	highest	above average
5. Standardization	2.5	4	5	5
	average	high	highest	highest
6. Security and internal (consumer) value	5	2.5	2.5	1.5
	highest	average	average	below average
7. Integration level of the instrument as a money type into the existing financial system	2	3	5	2
	low	above average	highest	low
8. Speed, ease, and requirements (on provision of documents and statements,	1	2.5	4.5	3.5

including anonymity of the transaction) to the participants of the transaction when carrying out operations, including cross-border ones		low	average	above average	above average
9. Commissions and financial costs when performing operations, including cross-border ones		1	5	4	2
		high	lowest	low	high
10. Security of parties during operations, including cross-border ones		3	2.5	4.5	3.5
		above average	average	above average	above average
Total	(max = 50 points)	23.5	33	45.5	35
			Average for cash and non-cash money = 39.25		
	(max = 100%)	47%	66%	91%	70%
			Average for cash and non-cash money = 78.5%		

Comparative analysis shows that cryptocurrency as a form of money takes the second position among the analyzed instruments. Modern non-cash money are way ahead other types and occupy the first place. Let us consider each of the ten items in Table 3 in greater detail.

Divisibility: Cryptocurrency, like non-cash money, has the highest degree of divisibility (5 out of 5) and outperforms cash and precious metals by this indicator.

Portability: Cryptocurrencies have a high degree of portability (4 out of 5), but in our opinion, they lose to modern non-cash money in this capacity, as they are poorly integrated into the financial circulation and financial system. Difficulties in transactions with cryptocurrencies, as in the case of electronic money, can arise only if there are some infrastructure problems: connection problems, the lack of ATMs and payment terminals for electronic money, cryptocurrency exchanges deny the residents of the countries under international sanctions access to transactions and etc. Cross-border transfers with cryptocurrencies are not faster than modern payment systems.

Durability: Non-cash money and cryptocurrencies have the highest durability and wearing quality (5 out of 5) since they represent records on the corresponding accounts and in registers made in electronic form. Moreover, according to cryptocurrency developers, cryptocurrency decentralization gives them a certain advantage over non-cash fiat money due to the fact that all information about cryptocurrencies is copied and simultaneously stored on all nodes of the cryptocurrency network, providing additional protection against data loss, while data on accounts balance of fiat money is stored on centralized servers.

Recognizability: Cryptocurrencies are a relatively new phenomenon, moreover, their functioning is based on the principle of decentralization, and in this respect they are inferior to traditional non-cash money (3.5 out of 5) since users bear all the risks and difficulties associated with the recognizability of cryptocurrencies (the number of which is comparable to the number of fiat currencies), as well as principles of blockchain (the payer and the payee).

Standardization: Standardization of cash, non-cash money and cryptocurrencies is approximately the same and ranks the highest (5 of 5 each). Cryptocurrencies have their own unique code, standard programs for making transactions and storing valuables in digital wallets.

Security and internal (consumer) value: In our opinion, cryptocurrencies are the least secure form of money, according to the data presented in Table 2 (1.5 out of 5). One should differentiate between the concepts of virtual coins and blockchain technology which enables their circulation in the cryptocurrency market. Blockchain technology allows one to record, store and exchange property rights for virtual values that are in circulation in the cryptocurrency market (this refers to the protocol and the payment system).

The owner of cryptocoins has the right to own and use blockchain technology and the payment system as such, since it belongs to all network participants (the principle of decentralization). In this case, a single network user cannot be responsible for its maintenance, regulation, development, etc. Cryptocurrencies (coins) give rights to own and dispose of virtual values that circulate within the network on the basis of blockchain technology. Cryptocoins themselves, like fiat money, do not have intrinsic value, and the demand for them depends on the consumer value of a particular blockchain technology. In turn, the consumer value and investment attractiveness of a particular blockchain technology in the market of cryptocurrencies are determined by the technological effectiveness of its protocol (program code) as a system of accounting and redistribution of values, the scarcity of virtual coins generated within it, the prospects for network development, etc.

The higher the consumer value of blockchain technology is, the higher is the demand for its services and the greater is the volume of virtual values that can circulate on its basis. Thus, cryptocurrencies, like traditional cash and non-cash money, do not have intrinsic value, but they are nominally secured by the technological effectiveness of the blockchain network and the efficiency of the payment system that operates on its basis.

Integration level of the instrument as a money type into the existing financial system: Currently, cryptocurrencies are poorly integrated into the global financial system (2 out of 5). None of cryptocurrencies has been used as a full-fledged money and is not directly incorporated in all areas of the global financial system. Derivative financial instruments (futures and cryptocurrency ETF) were created in 2017, and

formally this class of assets appeared as an investment option on traditional financial exchanges in the USA. In addition to this, cryptocurrencies have recently been tested as a payment instrument in the market of goods and services, as well as a tool for paying taxes. Some countries (though their number is small) recognize cryptocurrency as an official means of payment (Japan, South Korea, the United States, etc.). Some states of the USA (Arizona) claimed that they accept cryptocurrencies for paying taxes. Besides, a number of transnational corporations also stated that they began accepting cryptocurrencies as payment for the goods and services they sell.

The problem with cryptocurrencies is that their market rate is highly volatile, which makes this tool unsuitable for planning, concluding long-term contracts, using them for pension payments, etc. The problem of high volatility of exchange rates of cryptocurrencies is currently solved by a low-tech solution – crypto currencies are either sold on the market or transferred to a third party participating in the transaction, while a company or public legal entity that accepts cryptocurrency payments receive income in the form of fiat money during a commodity-money transaction (like before). In other words, sellers of goods and services or recipients of payments do not accumulate cryptocurrencies, but tend to get rid of them immediately, converting received virtual coins to fiat money on exchanges or by other means available to them.

Speed, ease, and requirements: Cryptocurrencies compete with non-cash money in terms of speed, convenience and anonymity (3.5 out of 5). The growing popularity of cryptocurrencies was accompanied by aggressive advertising of certain benefits and advantages over fiat money they give their users such as anonymity, high transaction speed, low fees, no intermediaries involved, etc. However, in comparison to other forms of money, all of the above advantages of cryptocurrency are now either completely lost, or are only relevant for certain aspects. Most governments today are pursuing a policy which implies that in the foreseeable future, transactions with cryptocurrencies can be carried out primarily through licensed exchanges that will require clients to provide a full package of identification documents.

At the market of cryptocurrencies, transfer of values is conducted fairly fast; however, in the conditions of insufficient integration of cryptocurrencies into the modern financial system, it is necessary to take into account the additional time costs for the procedures of adding and withdrawing money into the cryptocurrency financial system. Comparing modern indicators of transactions speed of traditional payment systems and payment systems created on the basis of cryptocurrencies, one can see that cryptocurrencies have not yet beaten traditional payment systems such as VISA, Mastercard, etc.

When using cryptocurrencies as a payment instrument, people may face a lot of difficulties: the market infrastructure is inefficient, there are constant failures, delays, mistakes, and frauds on the market. The level of customer service at

cryptocurrency exchanges is relatively low. These features of the cryptocurrency system require market participants to have a high level of financial literacy and relevant qualifications since in the event of an operational error in most cases the transaction cannot be rolled back, which may lead to clients' losing all their cryptocurrency assets.

With the growing load on various blockchain networks, it also becomes obvious that the capacity of all cryptocurrencies is fairly limited. For example, Bitcoin has exhausted its capacity and is hopelessly losing in transaction speed to many altcoins. Most likely, in 2018 cryptocurrency Ethereum will face the same problems. While developers have no idea how to practically implement this and whether it is possible, which represents a serious urgent challenge for the future of blockchain technology.

Commissions and expenses when performing operations, including cross-border ones: Payments and remittances in cryptocurrencies are associated with fairly high commissions (2 out of 5). The size of the commission depends on the operating terms of the payment system of a particular cryptocurrency. The smaller the transaction amount is and the more often operations with cryptocurrency wallets are conducted, the higher the commission and the more unprofitable using this cryptocurrency is. For example, at the time of the study, to transfer bitcoins worth BTC 0.01, one would have to pay a commission of BTC 0.004178, that is about 42%.

This requirement can be explained by the fact that with a low commission it is highly probable that the transaction will not be confirmed by blockchain, especially if the network is overloaded and there are already a lot of transactions waiting for confirmation in the queue. Obviously, with such high commissions, bitcoin is an extremely unattractive medium of circulation, provided that cryptocurrencies are massively introduced into the processes of commodity-money exchange. On the other hand, considering transactions between large players of the financial market, the payment system based on cryptocurrency looks more attractive than the traditional format of non-cash settlements regarding the size of commissions and the speed of money flow. Costs for transactions with cryptocurrencies that are not conducted within the same blockchain, but outside it (for example, when buying goods and services with cryptocurrencies) range from 5% to 30% of the transfer amount.

Security of parties during operations, including cross-border ones: Cryptocurrencies users are less protected than clients of the banking system since the unit is decentralized and all risks of conducting operations are borne by the buyer and the seller (3.5 out of 5). Cryptocurrency values stored in virtual wallets can be lost easily when one loses keys due to carelessness or as a result of a hacker attack. All operations with cryptocurrencies are irrevocable since there is no financial intermediary or central counterparty which could force the recipient to return the amount of money obtained by mistake.

In the event of a serious financial crisis, cryptocurrency holders are totally unprotected, like the holders of fiat money. During periods of severe unrest in the market, cryptocurrencies have repeatedly had issues with blocking customer accounts, bans on assets withdrawal, problems with mining gaps (Carlsten *et al.*, 2016), and other problems that are inherent in the modern banking system. In other words, the development level of modern infrastructure in the market of cryptocurrencies is not sufficient to practically use the theoretical advantages of this form of money. In case of problems in the banking system, holders of cryptocurrencies will have difficulties in using their financial resources.

Finally, the most significant shortcoming of blockchain and all cryptocurrencies, in our opinion, is the technological weakness in their protocols. To be more exact, the protocol enabling the operation of the financial mechanism of blockchain does not set or formalize rules for the verification of the transaction. When a transaction between the parties is made, its time is not normalized since blockchain does not contain the requirement that guarantees the completion of the transaction. Blockchain is built on the principle of voluntary participation and decentralization. Blockchain protocol allows the situation when the process of transaction confirmation can last for an indefinite period of time, while the miners network can ignore the transaction if the commission specified in its conditions is too small. In other words, miners are not obliged to handle all transactions, but, most likely, will do it for a certain period of time if it makes sense for them to carry out mining from the economic point of view.

This drawback of practical implementation of blockchain means a very serious threat to the stability of the whole cryptocurrency market, which was called "Attack 51%". This term denotes the situation when the defensive mechanism of the market is violated – decentralization of the system – control over all blockchain is taken by one pool of miners and an uncontrolled monopoly is formed on the market. Possessing the "controlling interest" of hashrate with the largest share of computing capacities creates a threat of attack on the net for the purposes of personal benefit.

When different miners simultaneously create two blocks, both consider their block to be the only correct one, after which they start sending it all over the network. Out of these doubled blocks, it is a more complex one that is saved, while the second one is discarded. The block created by the powerful system, which in case of Attack 51% always belongs to the holder of the "controlling interest" of hashrate, is always more complex. Moreover, when managing the overwhelming majority of hashrates, miners can fully regulate the network: add new blocks, manipulate two-way operations, do not confirm new transactions, and use the same coin several times, reversing the operations performed with it.

However, the attacking party will not be able to change information in the already added blocks and generate new cryptocurrencies. This vulnerability of blockchain is still relevant and has not been technologically fixed; therefore, it is a source and one

of the reasons for the uncertainty of the blockchain in the field of finance, high volatility in the cryptocurrency market, public concerns with further steps aimed at integrating blockchain into the global financial system. Moreover, such situations have already occurred. For instance, in May 2018, an unknown hacker seized more than 51% of Bitcoin Gold's blocking capacity and earned over USD 18 million through double spending.

4. Conclusion

The conducted assessment of the strengths and weaknesses of cryptocurrencies in comparison with fiat money and precious metals has shown that fiat money is the best form which has been used for quite a long time and as a whole is quite successful at enabling all stages of social reproduction and related financial processes. Our research shows that fiat money (the aggregate money supply in cash and non-cash forms) outplays cryptocurrencies and precious metals in terms of its consumer properties.

The situation when a large number of consumers starts using alternatives to fiat currency may limit the ability of monetary authorities to ensure macroprudential stability and economic growth. If only a certain share of population begins to carry out all transactions in bitcoins, this can lead to fragmentation of the economy; if all citizens do this simultaneously – central banks will not be able to use the transmission mechanism to stimulate the economy through the discount rate. In addition to this, the unstable rate of bitcoin can lead to a depreciation of assets in a short time and thereby result in bankruptcies and non-payments. Consequently, one of the most important challenges for the society concerning the introduction of cryptocurrency and blockchain into the financial system as the world's main currency is the development of a new adequate global financial architecture that will ensure the stability of the financial mechanism being created and the ability to conduct adequate monetary policy, if necessary.

The mission of crypto-currencies, built on the principles of decentralization, contradicts and, moreover, is incompatible with the principles and values of the current financial system. Studying scientific works and publications on this issue, the authors identified certain specifics of the motivation of the so-called crypto enthusiasts. This allowed the authors to formulate the prerequisites for the worldwide popularization of cryptocurrency after the global financial crisis of 2007-2008 – a trend towards total decentralization in society accompanied by increasing "public fatigue" from the yoke of centralized control, regulation, taxation, prohibitive activities of market regulators, etc.

The conducted research enabled the authors to conclude that, on the one hand, blockchain is a technological innovation. On the other hand, its modern practical implementation in the field of finance led to the formation of such a local financial (monetary) system that is built not only on the principles of free market and ideal

competition, but also lets cryptocurrency users enjoy a complete lack of control and non-interference by the state in financial processes. In fact, the world of cryptocurrency in its first iteration was a step towards financial anarchy, a world in which economic entities can be anonymous, do not have to pay taxes, can function separately from society, pursue their own profit, etc.

Therefore, at present, this sphere of finance is subject to increasing attention and control from the state: the regulatory and legal framework of blockchain and cryptocurrencies are being developed and improved, requirements for participants in transactions in cryptocurrencies are increased, and links between cryptocurrencies and the current financial system are being established. It is already possible to claim that cryptocurrencies have turned from anonymous means of payment, which cannot be withdrawn from the owner, into personalized and transparent financial resources that are accessible and open to the actions of state regulators.

Moreover, the first attempts were made to develop a financial infrastructure for tax payment using cryptocurrencies (in the USA), to issue sovereign cryptocurrencies, as well as to offer alternatives to decentralized cryptocurrencies (for example, Ripple cryptocurrency) designed to improve payment services with blockchain, but at the same time providing the option of centralized regulation of the proposed system.

Poor security of parties in transactions with cryptocurrency is the Achilles heel of blockchain as future money and an insurmountable obstacle to total replacement of fiat money with cryptocurrency. In our view, the most important drawback of modern cryptocurrency is that the protocols behind them are not fully developed from a technological point of view, at a level sufficient for their massive use in commodity-money exchange around the world.

Blockchain technology has its specific vulnerabilities and drawbacks, the most dangerous of which is the fact that there is no strict time frame for a transaction and, even worse, there is no guarantee that the transaction will actually be made by the system. In practice, the transaction can freeze, be rejected or even get lost. In fact, under certain conditions this problem may turn into a more acute threat to blockchain. For instance, as mining pools are becoming larger and more global, which occurs due to the exponential growth of competition accompanied by small miners being gradually driven out from the market, the risk of 51% Attack is increasing. In the world of fiat money, these problems are solved centrally by an independent regulator, while in the world of cryptocurrencies they create serious risks and uncertainty for the entire financial system.

The solution of these problems is theoretically possible, for example, by adjusting the financial mechanism of blockchain, which consists in moving from principles of decentralization to more stringent state regulation of the market of cryptocurrencies and mining. Apparently, such a decision presupposes cryptocurrencies losing their

present role in the financial market and creation of new types of cryptocurrencies, which actually will be centralized and controlled by the state.

On the basis of the research conducted, the authors can conclude that cryptocurrencies are being actively introduced by crypto enthusiasts in daily life; they are still to find their place and areas to activate their synergetic effect in the financial system. However, cryptocurrencies are not yet ready to fully replace fiat money due to a number of objective reasons.

Apparently, the nearest perspective for cryptocurrency will be more stringent legal regulation of the state and functioning in the world of finance as a legal alternative payment system. Perhaps, in the longer run, provided the technological flaws of blockchain protocol are fixed, a balanced compromise between the decentralized nature of cryptocurrency and the reality of the centralized economy is reached and the necessary experience concerning the practical application of cryptocurrencies in finance is accumulated, the role of cryptocurrency will become more significant.

At the same time, the radical reform of the world financial system and the complete withdrawal from cash and non-cash fiat money are likely to occur only after cryptocurrency becomes a more efficient form of money (currently, this requirement has not been met), and this will enable to develop a fundamentally new concept of the mechanism for the functioning of global finance.

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