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POSSIBILITIES FOR CRYPTOCURRENCIES IN THE INTERNATIONAL MONETARY SYSTEM

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ABSTRACT

The aim of this research was to understand and explain if cryptocurrencies are able to function better than the current monetary system, the probability of crypto currencies replacing or accompanying the current monetary system, and investigated the development that crypto currencies may initiate. This research explained the definition and background of crypto currencies, and delved into the changing tides that cryptocurrencies make in the traditional monetary markets. This research also aimed at comparing the traditional money to the crypto currencies, investigating their advantages, obstacles for use, and how it can transform into the future of financial investments.

The qualitative method was used to write the thesis. The information was taken from books on economics, research, theses, working papers, reports, scientific journals, and websites of tax boards, about cryptocurrencies, and others.

We concluded, that cryptocurrencies can be an alternative to the current monetary system, coexisting long-term alongside it, and even can replace state issued currencies. These changes requiring adapting cryptocurrencies to global economy, making a cryptocurrency that will meet the maximum needs of consumers and will be comfortable to use internationally.

Keywords: Cryptocurrency, Virtual currency, Monetary system, Money, Monetary Policy.

INTRODUCTION

Crypto Currencies are gaining increasing popularity globally with more and more countries legalizing them as approved means of payment, and the ripple effect of this legalization has in no small measure ensured an increase in the possibilities of these currencies and increases their opportunity to compete on a global scale against traditional money. There is also an increase in the number of new crypto currencies being floated on the investment market following the rapid appreciation of pioneer coins like Bitcoin, which appreciated at an unprecedented rate making it a top investment option for individuals looking for fast and returns on investments which require minimal efforts.

Some economists, including Alan Greenspan – former Chairman of the Federal Reserve of the United States, Nout Wellink – former president of the Central Bank of the Netherlands, and Robert James Shiller – Nobel laureate in Economic Sciences hold the opinion, that the virtual currency is a short-term enthusiasm or a financial bubble that will burst soon. (Степанова, Николаева 2016). Other experts, including the head of a division of The Federal Financial Monitoring Service of Russia E. Volovik, believe that the virtual currency is a threat to the financial system (Степанова, Николаева 2016). Supporters of cryptocurrencies are sure that they are a good alternative to fiat money, and that they are able to work without banks, and therefore, decrease expenses and save time. For example, Christine Lagarde, IMF Managing Director, says that cryptocurrencies may be more transparent, easier and safer to use than fiat money, and they should be considered seriously (Lagarde 2017). Many economists criticize the current fractional reserve banking system with the inherent maturity mismatch. Cryptomoney can become an alternative for this system. Also supporters of cryptocurrencies believe that cryptomoney is a good starting point for ending the monopoly power of central banks to issue money as, in their opinion, issuing of money should be decentralized and there should be free competition of currencies.

Cryptocurrencies are invented as money with a self-regulated system that is programmed and cannot be changed. It may be used for creating a stable automatic monetary system, and also allows to make transactions without a third party, that makes the transactions faster and cheaper. Unlike traditional methods of payments crypto currencies have been judged to be a safer means of transacting primarily due to its digital and encrypted nature, which makes it hard to steal. Also some crypto currencies can be used anonymously and online at the same time. The interest rate of some crypto currencies is much

higher, which translates into much more income for potential investors. Investing in crypto currencies has proved to be much easier than investing in the traditional investment market which requires more skill and professional expertise as against crypto currencies that require just an internet access and basic trading skills.

Nevertheless, the use of such currencies is associated with some difficulties. The value of most of cryptocurrencies depends directly on the supply and demand of it, and there is no institution, like a central bank, that manages them. So, they are highly volatile. This is the main danger of using crypto currency. After all, it can depreciate at one point, and in this case users are not insured against losing their money. Therefore, there is a need to investigate how much cryptocurrencies are able to complement or substitute the current monetary system and how efficient they can be as currencies.

The core aim of this research is to understand and explain if cryptocurrencies are able to function better than the current monetary system, the probability of crypto currencies replacing or accompanying the current monetary system, and investigates the development that crypto currencies may initiate. The research questions of this paper are focused on the possibility of cryptocurrencies being an alternative to the current monetary system, whether they can coexist long-term alongside it, or whether they might even replace state-issued currencies. What influence will crypto currencies likely have on our current monetary systems? How will they impact on the international monetary system and its perspectives? Whether and to what extent private money, can take over functions that have traditionally been performed by the state?

The first chapter "The definition of cryptocurrencies and the blockchain technology" presents what cryptocurrencies are, explains how they function, what are the main cryptocurrencies around, who issues them, what determines their supply, and their principles of operation. Also, it explains the mechanism of their work – the blockchain technology.

The second chapter "Cryptocurrencies in the monetary system" tries to answer the questions if cryptocurrencies have benefits in comparison with fiat money, if they can replace state-issued money or coexist long-term alongside it, and what influence cryptocurrencies will likely have on our current monetary systems. To answer these questions, we compared functions of money with functions of cryptocurrencies, and discussed advantages and obstacles standing in the way of cryptocurrencies as

well as efforts to overcome them. By this we understand whether cryptocurrencies and what cryptocurrencies are able to perform money's functions. Then we try to answer the question whether and to what extent private money, i.e. market institutions, can take over functions that have traditionally been performed by the state. For this reason, we compare cryptocurrencies with the existed free banking system, when every bank could issue their own currency. Finally, we come to the question whether governmental regulation is needed and research how governments of different countries treat cryptocurrencies today.

The qualitative method was used to write the thesis. The information was taken from books on economics, research, theses, working papers, reports, scientific journals, and websites of tax boards, about cryptocurrencies, and others.

1. THE DEFINITION OF CRYPTOCURRENCIES AND THE BLOCKCHAIN TECHNOLOGY

1.1. Definition of the technology

Cryptocurrencies, in very simple terms are an online version of money, an asset that has no physical form like the traditional notes and coins but a digital asset that can be accessed only through designated portals. Cryptocurrencies derived their name from the word Cryptography, which arose as a result of the nature of these currencies as there is heavy reliance on cryptographs to ensure the encryptions of transactions as a safety and security feature which also control the production of the currency. This is a rigorously monitored process, which relies on the Block chain technology to achieve this feat. The Block chain technology is described in the next subchapter.

According to Patrick Schuettel, (2017), cryptocurrencies are defined as digital assets, which are fashioned to function as an alternative to the traditional means of financial exchange, and it uses cryptography as the key means by which it secures its transactions from theft and hackers, check the creation of additional units to reduce saturation in the market which reduces its market value, and as a means to verify the transfer of assets from one entity to another. Crypto currencies due to its nomenclature have been categorized as a subdivision of digital currencies and have, over time, earned the classification as both an alternative to the known traditional currencies and virtual currencies.

Satoshi Nakamoto (2008), the founder of the first cryptocurrency Bitcoin, defines an electronic coin as a chain of digital signatures. To transfer the coin to another account the holder digitally sings a hash code of the previous exchange and the public key of the next holder and adds them to the end of the coin code (see figure 1). The receiver can check signatures to check the chain of possessions. But the signatures here are not signatures in a usual understanding: they ensure that only the owner of the account can move coins out of the account, but they do not contain any personal information, so the users usually stay anonymous.

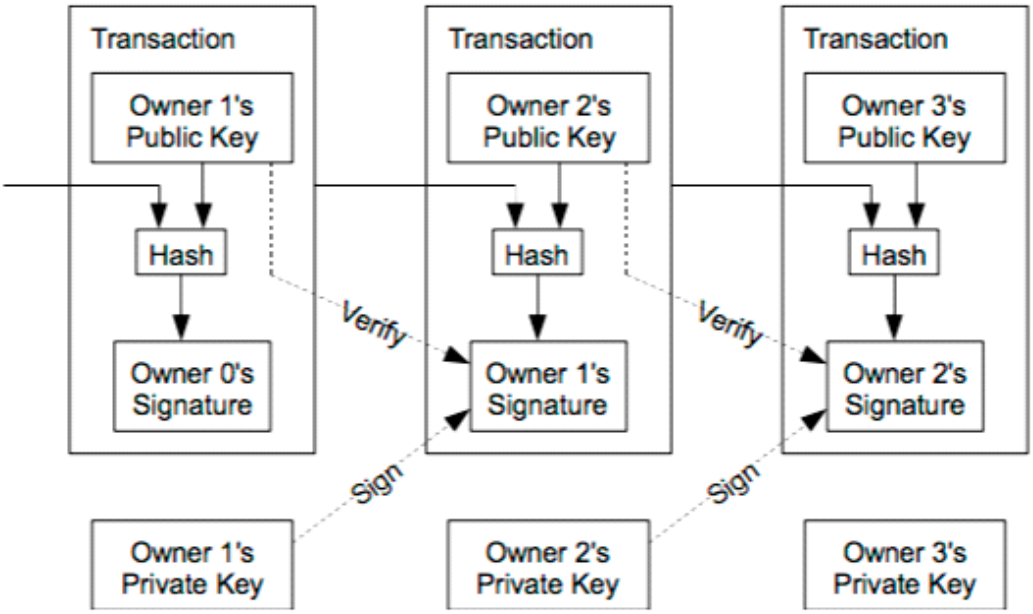

Figure 1. Transaction of a cryptocurrency to other owners

Source: Nakamoto (2008, 13)

Cryptocurrencies can be issued by anybody: a person, an organization, a company, or a state. The amount of new kind of currency can be any, depending on the will of an issuer. The amount can be fixed or not fixed, can be issued once or progressively. For example, the amount of bitcoins is limited to 21 million coins, but not all of them are issued yet, and each coin can be divided into 1 million parts. Another popular cryptocurrency Etherium is not limited in amount. The third most popular cryptocurrency, Ripple is limited to 100 billion coins that have been issued at one time. The amount of cryptomoney is limited in most cases.

Some crypto currencies are being issued by a process called mining. It usually requires computer resources, electricity, and time, which makes them scarce and thus, valuable for people. Liberation from a third party, complexity of mining, limited resource, decentralized storage, and the use of cryptography for security allow cryptocurrencies be valuable. Nevertheless, some cryptocurrencies do not require mining and their amount is not limited but they still remain valuable as people believe in the technology.

1.2. The block chain technology

Marco Iansiti and Karim R. Lakhani (2017) in the Harvard Business Review define block chains as "an open, distributed ledger that can record transactions between two parties efficiently and in a verifiable and permanent way". A block chain is an important part of the crypto currency set up and it represents a decentralized and distributed digital ledger which is used as a secure platform which functions as a module that records individual transactions across varying computers. This module promotes transparency as transactions, because transactions associated with block chains are created in such a way that records can not be changed or tampered with, without the revision of all other blocks and the consent of the network. (Armstrong 2016). These checks and balances created by the block chain network ensure transparency in cryptocurrency transactions as participants are allowed to verify and evaluate transactions without incurring additional cost as modifications done on the block chain network are validated by a collective alliance which is powered by strong sense of collective self-interests. (Catalini, Gans 2016).

Block chains have a decentralized system that eliminates the risks that emanates from a centralized information system, the decentralized module adopted by the block chain module reduces the vulnerability posed by hackers or by any other circumstances like natural disaster, bombed servers, etc. to a centralized system. The decentralized nature of the block chain also ensures that data is transparent to all parties involved. The sent information can be not only money, but also any documents or any other information in digital format. And the information itself is not accessible to everybody, but the note about the transaction is visible for all. As a security feature, the Blockchain has a public-key cryptography, this denotes a long, random string of numbers which also represents a private key of some sort. This key symbolizes a password which ensures its owner has unhindered access to their digital money or creates a platform for the interactions with various other avenues supported by the block chain. Data stored on the blockchain are highly encrypted and thus generally considered to be incorruptible.

1.3. Types of cryptocurrencies

There are more than 1200 cryptocurrencies today (Cryptocurrency Market Capitalizations), and market capitalization can be used to understand what the main cryptocurrencies are. It is calculated by multiplying the price in terms of dollars by the circulating supply. Circulating supply is approximation of the number of coins that are in the general public's hands (*Ibid.*). The current market capitalization of all cryptocurrencies is $378,754,782,785[1]. The greatest demand among traders and crypto-investors is enjoyed by the digital currencies represented in the top eleven of the capitalization rating. This is due to various factors, and the most important among them are high liquidity, stable growth rates, and prospects for further development. It is also worth noting that in the world of cryptocurrencies everything is changing very rapidly. Nevertheless, at the time of writing, the aggregate capitalization of the first eleven crypto currencies according to the analytical service coinmarketcap.com is $332,5 billion (*Ibid*.). The first eleven digital currencies occupy 88% of the total value of all the crypto-currencies presented on this service. Bitcoin's capitalization is $220,6 billion (*Ibid*.), that is more than half of the total value. The eleven crypto currencies with the biggest capitalization are shown below (see table 1).

[1] Market capitalization of Cryptocurrencies can be traced on https://coinmarketcap.com/charts/.

Table 1. The eleven crypto currencies with the biggest market capitalization in January 2017 (US$)

№	Name of a cryptocurrency	Market capitalization
1	Bitcoin (BTC)	220,568,382,765
2	Ethereum (ETH)	42,457,180,689
3	Bitcoin cash	24,841,791,497
4	IOTA	11,509,784,744
5	Ripple	9,342,642,124
6	Dash	5,667,908,725
7	Litecoin	5,550,700,095
8	Monero	4,556,989,452
9	Ethereum Classic (ETC)	2,885,586,669
10	NEM (XEM)	2,625,264,000
11	NEO	2,446,951,000

Source: Cryptocurrency Market Capitalizations (2018)

The difference in the currencies is useful for our further analysis. And as the cryptocurrencies are very different and each one is unique, we have shortly described them in appendix 1, but one kind of cryptocurrencies deserves special attention, it is called “stablecoins”. Stablecoin is a cryptocurrency, the value of which is determined not only by the supply and demand for it, but also by more established methods. As a rule, they were tied to either the value of the fiat currencies like Dollar and Euro, or commodities: oil, gold, etc. There are several interesting stablecoins projects. There is a project Tether, which is on the 17th place at the rank of capitalization, now it is almost $ 600 million. Tether uses blockchain technology but it is tied to the US Dollar – one tether is always one dollar. In Israel, they launched a start-up, which tries to make a crypto-currency, tied to oil. However, they are not very good at this, because they can not solve the problem of oil storage. There are projects that try to link the crypto currency to computing power, electricity, such as SONM. There are some cryptocurrencies that are tied to gold. For example, the OneGram project from Dubai. OneGram is tied to stored physical gold. There is also a project of the British Royal Mint Royal Mint Gold, in which one token is tied to one gram of gold. Another ambitious project is the American-Australian OZCoin. It is backed by 100 thousand ounces (slightly more than 2.8 tons) of 24 carat gold. And finally, the Venezuelan national cryptocurrencies are tied to raw materials, for now it is oil and gold, it is tied in terms of price and limitation of issue, but the state does not undertake to exchange the currency for the commodity.

The common feature of cryptocurrencies is that they are electronic peer-to-peer units that can be sent from one electronic wallet to another without a third party, such as a bank. The main differences are the following. Firstly, some of cryptocurrencies are being made by ‘mining’ by anyone who wills to mine and it requires some computer resources, electricity, and time, while others are issued by a founder. Secondly, some cryptocurrencies are limited in their amount, and others are not limited. Thirdly, the value of some cryptocurrencies is determined only by supply and demand for it, but others are determined also by more stable units like dollars, gold, oil, and other commodities, and this is why their value is quite stable. The latter are called stablecoins. Fourthly, some cryptocurrencies can only be sent, received and stored while others can be used in creating smart-contracts: applications that run exactly as programmed without any possibility of fraud, censorship, downtime, or third party interference. So there are different types of crypto money that can be used for different purposes and attract different audiences. In general, the market of cryptocurrencies is getting larger and richer.

2. CRYPTOCURRENCIES IN THE MONETARY SYSTEM

In this chapter we try to answer the questions: Can cryptocurrencies replace state-issued money? Can they coexist long-term alongside it? What influence will crypto currencies likely have on our current monetary systems? To answer these questions, we compared functions of money with functions of cryptocurrencies, and discussed obstacles standing in the way of cryptocurrencies as well as efforts to overcome them. By this we understand whether cryptocurrencies and what cryptocurrencies would be able to perform money's functions. Then we try to answer the question whether and to what extent private money, i.e. market institutions, can take over functions that have traditionally been performed by the state. For this reason, we compare cryptocurrencies with free banking system, when every bank could issue its own currency. Finally, we come to the question whether governmental regulation is needed and how governments of different countries treat cryptocurrencies today.

2.1. Comparison of functions for cryptocurrencies and functions for fiat money

To understand whether cryptocurrencies are going to replace regular money, a comparison of functions of fiat money with functions for cryptocurrencies should be done. This subchapter tries to answer the question: how likely is that cryptocurrencies will be able to perform all the functions of money. We took functions for money from the textbooks Macroeconomics by Mankiw (2005) and Principles of Macroeconomics by Greenlaw, S.A., and Taylor T. (2014), and we distinguished functions for cryptocurrencies on our own.

Table 1. Comparison functions for cryptocurrencies and functions for fiat money

	Fiat money	Cryptocurrencies
Medium of exchange	+	+
Store of value	+	+ -
Unit of account	+	+ -
Standard of deferred payment	+	+ -
Peer-to peer transactions	+	+
Anonymity of use	+ (cash) - (via banking/money transfer system)	+ -
Earning money by mining	-	+

Sources: Mankiw (2005, 187), Greenlaw, Taylor (2014, 215).

Notes:

"+" – fiat money or cryptocurrencies possess the function
"-" – fiat money or cryptocurrencies does not possess the function
"+ -" – a currency may obtain the function depending on the cryptocurrency

The first function of money is that it serves as a **medium of exchange**, which means that money is an intermediary between the seller and the buyer. "To serve as a medium of exchange, money must be very widely accepted as a method of payment" (Greenlaw, Taylor 2014). Cryptocurencies can be a currency in this sense, but usually they are not used as the means of indirect exchange. Many shops, cafes, bars, online services and businesses accept payments in cryptocurrencies, especially bitcoins (Where can I spend bitcoin? 2017). Cuthbertson states that BTC was accepted by around 100,000 sellers worldwide already in 2015, and this number has been growing in recent years. Especially, Bitcoins are widely used for illicit transactions, and what is illicit depends on the will of governments. But as the currencies are getting more and more expensive, no one wants to pay with them. The phenomenon is called Gresham's law: when no one wants to pay with a currency that is constantly and significantly becoming more valuable. Nevertheless, stablecoins easily can perform this function more efficiently if there will be a guarantor of their stability, like a government or a trustworthy company.

Second, money serves as a **store of value** (Mankiw 2015). It means that they will represent the same value also in the future. In economies with inflation, money loses purchasing power over time. At the same time, most of crypto currencies are not stable but very volatile and it makes them difficult to

use as store of value, but attractive to be used as investments and an item for trading. Nevertheless, cryptocurrencies are used as a store of value (Vora 2015), and those crypto currencies which are limited in issuing, like bitcoin, are expected to become more stable in the future. Again, stablecoins easily can perform this function more efficiently if there will be a guarantor of their stability, like a government or a trustable company.

Next, money serves as a **unit of account**, which means that all values, goods and services, may be measured by money (Mankiw 2015). Money acts as a common accounting method that simplifies thinking about trade. Unstable cryptocurrencies cannot serve like a unit of account while stablecoins are able to implement this function.

Another function of money is a **standard of deferred payment**. "This means that if money is usable today to make purchases, it must also be acceptable to make purchases today that will be paid in the future." (Greenlaw, Taylor 2014). Loans are stated in terms of money and the standard of deferred payment allows to buy goods and services today and pay in the future. But cryptocurrencies are not used to issue loans and to make credit payments yet, because they are very volatile and unstable – no one knows what will happen to them tomorrow. Moreover, cryptocurrencies do not have a lender of last resort that can bail in in case of bankruptcy. Also stablecoins are more convenient for this function as they try to deal with the crucial weakness of cryptocurrencies - extreme volatility. We believe that, in the future if stable crypto-currencies become a legal means of payment at the level of states and the world economy, they will be able to service credit relations.

The other functions of cryptocurrencies are **peer-to peer transactions** and **anonymity of use**. Crypto money is transferred directly to another electronic wallet. Yet, usage of some cryptocurrencies does not imply identifications of users. Address Bitcoin is not tied to the owner at the protocol level. When working with banks or other payment systems, the wallet is associated with the identity of the owner. In the situation with Bitcoin and many other cryptocurrencies, but not all of them, each user has the right to generate a new address, as well as a secret key, without transmitting information anywhere. If the miners agree to include data in the block, anyone can transfer the crypto currency to another address and not disclose personal information. Usually it causes usage of them in black market and illegal trade, but on the other hand, it may be beneficial in some cases. For example, in some countries some harmless drugs are illegal, but people have an opportunity to sell and buy them thanks to

cryptocurrencies. There are websites, like SilkRoad and Atlantis in the US, where anyone can pay for drugs with bitcoins or litecoins or other crypto coins. Nevertheless, the issue is more about inappropriate drug legislation of the countries, and this is what should be improved, rather than anonymity of cryptocurrencies. Cash is also anonymous, but cash cannot be sent online. Nevertheless, anonymity allows usage crypto money in money laundering and illegal trade such as drugs, arms, organs, chemicals, human trafficking, and fake documents. And anonymity makes it easy to avoid paying taxes. So anonymity might make them attractive to some in the market, and it actually represents a threat to society, but it might also provoke governmental regulation.

Cryptocurrencies are also associated with **ease of use**. First of all, they are accessible to everyone who has internet. To own an unlimited access to banking services, a person has to be 18 years old, but to have a cryptocurrency wallet a person needs only a device with internet. To get a debit card or a bank account in the internet a person has to go to a bank to open it, to visit a bank from time to time and to pay a commission to a bank. To get a cryptocurrency wallet a person needs only a device with internet, which is very convenient for remote areas where there are no banks. To pay with a card in a shop, a person needs to have a card, a shop needs to have a terminal and special online net, or a company needs to have a bank account, and transactions demand time and incur fees. To pay with a cryptocurrency, both sides need only a device with internet. Nevertheless, usually to get some cryptocurrency one needs to exchange them for usual money. There are several ways to do it: buy online, buy offline via special providers, and use special ATMs. The easiest way to do it nowadays is to buy online, and for this, one needs a bank account anyway. The other variant is using ATMs. And according to the Bitcoin ITM Map[2], there are 2282 bitcoin ATMs and 40058 other offline services in 63 countries, and numerous providers doing this. Some providers are using existing networks of traditional bank ATMs, or existing network of mobile payment terminals, others use retail chains and allow to buy bitcoins via cashier desk.

The other pleasant thing in using cryptomoney is no or small time delay in transactions for private customers. Also, transactions between banks and especially international transactions between private customers (but not for professional traders) take time, sometimes several days or weeks, while transaction of a cryptocurrency is instantaneous or take up to 20 minutes. It is especially comfortable

[2] Bitcoin ITM Map coinatmradar.com

for international transactions. For their implementation, the intermediary of banks and other financial agencies is not required (Stepanova *et al* 2016).

Also, using cryptocurrencies may be cheaper than using bank services. To transfer money by a current banking system or special organizations like Western Union or TransferWise, a fee is usually taken, especially if it is an international transaction. Alternatively, using a cryptocurrency implies the absence of fees worldwide, but it works only if users use the same cryptocurrency. Although there is no fee, most people are expected to use third-party services that maintain their wallets, and the services take some fee, but it is usually smaller than international transaction fees at others existing payment systems. (Ólafsson 2014). Also in case of using cryptocurrencies there is no need to pay an annual fee for service as compared to banks.

One more benefit that cryptocurrency may bring is **transparency** in the economy and any spending. All state spending can be traced through the whole system, through the whole chain of financial and economic calculations, up to the payment of wages to the employee who worked on the construction project, the public can see how government spending was spent, to whom and for what reason they went.

Another function of cryptocurrencies, which fiat money does not have is **earning money by mining**. Some of cryptocurrencies require 'mining', making them with a video card and electricity, and miners can earn by this process when mining is cheaper than the market price of a currency. It takes less effort and time than normal work as electronic devices and special programs do the work.

2.2. Obstacles to cryptocurrencies and the means to overcome them

As we can see from the analysis above, the main obstacle to using cryptomoney instead of fiat money is **volatility** of the former. The value of most cryptocurrencies, including Bitcoin, depends directly on their supply and demand. On the other hand, volatility is a pro for traders as it makes good opportunities for earning by trading at exchanges. There are two solutions to this problem. One of them is stablecoins, and the other is national cryptocurrencies regulated by central banks. The later

can be equal to the state currency but use principles of work of cryptocurrencies, e.g. the blockchain technology, cryptography and avoidance of a third party in transactions.

Stable cryptocurrencies may be in demand by citizens of countries that experience hyper-inflation like Venezuela, Sudan, Syria and others. Usually there is the adoption of dollars by the public in such situations, but cryptocurrencies can replace dollars in such cases due to the following reasons. Firstly, because of the advantages listed above. Secondly, there will be the possibility to buy them online, it is easier and safer than buying dollars at black markets as it usually happens in such countries now. Besides, it would be easy to transfer them and convert them to any other currency online. Thirdly, if the currency is widespread, it would be possible to use it for online and offline purchases inside the country and abroad, nevertheless, there is no reliable internet access in some countries yet.

Also, there is **distrust of cryptocurrencies and unpredictability**. Cryptocurrencies are a relatively new phenomenon, the first one, Bitcoin, was issued in 2009, and there is still mistrust of them among governments, the population and businesses because of its young age. It is also associated with the absence of single issuer, centralized regulator, who would be responsible for it. Moreover, anonymity of usage of cryptocurrencies makes them unsafe for the population. Because of the mistrust, some governments restrict usage of them, others forewarn the population that usage of them is unsafe, and all this prevent widespread international use of them.

Mistrust is associated with the following factors. The first is anonymity of users, and that can be resolved as we described above. The second is the difficulty of foreseeing the behavior of governments and the market with respect to the crypto-currency – this can be solved by writing regulating laws inside countries and international agreements, and this process has been already started and needs some time. The third is distrust of the technology: what if it fails and all investments into cryptomoney disappear? That can be resolved by appointment of a special body that would be responsible for the technology and money of the population. Another way is to give governmental licenses for cryptocurrency exchanges, so that they will be responsible for transactions, and responsibility will be distributed; this practice is already used in some countries like Japan or Luxembourg.

Another big issue about cryptocurrencies is **security**. In some cases, only an owner owns and manages them. If a person stores money in a bank account or PayPal, for example, the bank or PayPal can freeze the person's account for different reasons such as suspicious or illegal activity, unpaid debts through creditors or to the government. And then the person has to manage the problem. In the case with a cryptocurrency, in theory, no one can freeze it or block transactions. One needs to have a "wallet" to keep their cryptomoney. There are two types of wallets: hot and cold. A hot wallet is online storage wallet, and it is accessible from anywhere from the web. In fact, it is a storage at an exchange. This kind of wallet is relatively easy to hack and not recommended for use, but it is widely used for trading as it allows making transactions faster than using cold wallets and does not occupy storage at personal computers. For example, most of bitcoins stolen from Mt. Gox were kept at hot wallets (Ogun 2015). Cold wallets are stored on a user's computers, and they are more secure, but they occupy a lot of storage on computers: at the moment of writing it is about 80GB for bitcoin's wallet regardless of the number of coins and their weight is growing, also transactions may take longer time, and cold wallets are not available on phones or tablets (Sharma 2017). Anyway, wallet services do not freeze money on wallets, but a person can lose keys for a wallet or web-based wallet service can lose it, or cryptomoney can be stolen by hackers, which is more likely if a hot wallet is used. The other unpleasant thing that can happen with fiat money – governments can limit the amount of export or transfer of money from the country, cannot happen with a cryptocurrency.

On the other hand, cryptocurrencies can be hacked and stolen so they are liable to fraud, technical glitches, malware, and hacker's attacks. Since it is a digital item, it always can be hacked. There were several widely publicized stories about hacks of cryptocurrencies when owners lost their cryptomoney. For example, the fall of Mt.Gox - a digital currency exchange that transacted between Bitcoin crypto currency and national currencies. As of August 2013, about 47% of all transactions in the Bitcoin network were made through their site. In 2011 hackers stole between 200000 to 850000 coins according to different sources, and in 2013 it was found out hackers stole about 850 000 btc, but 200 000 btc were found later. By the end of 2013, the debt of this exchange to its users was 650 000 bitcoins, it is 63,6 million US dollars, in 2014 the exchange was closed. (Pagliery 2014, 163-164). Another one of the world's biggest digital theft of cryptocurrencies happened at Coincheck exchange in January 2018. Hackers stole NEM cryptocurrency worth $660 million, and the exchanges promised to return about $523 million to investors. Again, the stolen money was kept in hot wallets,

as in the case of Mt.Gox. (Coincheck official website). It is impossible to falsify a crypto currency as compared with cash. But cash cannot be hacked in comparison with crypto currencies.

In general, despite this threat, ordinary online banks still function successfully. Similar to deposit insurance for regular bank accounts, insurance for crypto money can be implemented. Although this risk is always there, like the risk of robbery of a physical bank, it is not an obstacle to the implementation of this system.

So, **money** serves as a medium of exchange, store of value, unit of account, standard of deferred payment, and a unit to be sent internationally, for anonymous transactions. **Cryptocurrencies** may serve as a medium of exchange, store of value, unit of account, a unit for transactions, for anonymous transactions, to earning money by mining. Cryptocurrencies have a number of advantages compared with money, but it depends on a crypto currency as there are many of them and they are different; in some cases, stablecoins have advantage, in other cases – volatile crypto currencies are more advanced. In general, stablecoins are able to perform all money's functions while non-stable cryptocurrencies are more suitable for investments and speculation on stock exchanges. Also there are some obstacles to the use of cryptocoins: volatility, mistrust of cryptocurrencies and unpredictability, and the security issue. To overcome the obstacles and perform the functions of money, there should be a guarantor of their stability, like a government or a trustable company. Therefore, one possible kind of stablecoins is a state cryptocurrency. Anyway, some degree of governmental regulation is needed when it comes to illegal use of cryptocurrencies, and responsibility for the money.

The interesting question is if a stable system of private cryptomoney possible or whether it would require some form of state backing in terms of economic regulation. History has already known the experience of freely issued and not-regulated by a lender of last resort money, the system was called Free Banking, and we will look at it closer in the following chapter.

3. CRYPTOCURRENCIES AND GOVERNMENTAL REGULATION

3.1. Cryptocurrencies and Free banking

In essence, the idea was very similar to cryptocurrencies: that any body could issue money, and the money supply was not regulated and interfered with by legislation. In fact, free banking was never absolutely free and was regulated by states in different degree. Free banking systems existed generally in the 19th century with different degrees of government intervention in the USA, Canada, Switzerland, France, Ireland, Scotland, Australia, Sweden, Colombia, Chile and other countries. During Free banking times, money from different banks was backed by gold or money of a central bank. Kevin Down (1992) has investigated Free banking in Australia, Canada, Colombia, Foochow city in China, Revolutionary France, Ireland, Scotland, Switzerland, and the US in his book "The experience of Free banking" and came to the conclusion that "Free banking ended because it was suppressed for essentially political reasons, more often than not because it was a barrier to the government's desire to extract seigniorage revenues, and not because it 'failed' economically." (Down, 1992, 4) The book "Unregulated banking" edited by Forrest Capie and Geoffrey E.Wood (1991) says that bank regulation can bring few benefits and it is costly so they suggest only a limited use of it. Then they say, some papers came to the conclusion that a lender of last resort was necessary, while in other cases, researched by Eugene White and Hugh Rockoff, a "stable banking system worked well in most difficult circumstances without a lender of last resort." (Capie, Wood, xx). Hugh Rockoff considers the USA's experience with free banking and consider whether it is advisable to come back to the free banking system. "His conclusion is that the evidence is neither wholly in favour nor wholly against. There were plainly some good features of the banking system in this period. Growth of the monetary base was, in this phase, controlled by a 'semi-automatic mechanism' - the bimetallic standard. This produced growth of the base which was both steadier and slower than has been the US experience with fiat money." (Capie, Wood, xix). Hugh Rockoff concluded that the banking system should be regulated by a monetary rule under any circumstances, and the absence of free entry to banking certainly contributed to the development of the economy. (Capie, Wood, xix). Jill M. Hendricson (2011) in her book "Regulation and Instability" writes that "the intervention of government in financial markets makes them less stable and not more. Indeed, many believe that without government intervention, banks would hold more capital, and invest more in money markets

where they can quickly turn their assets into liquidity. Indeed, the historical evidence is that this is what banks did when less regulated." (Hendricson, 2011, 247)

Therefore, there are very different opinions on the effectiveness of free banking and the necessity of a lender of last resort, but every country that has tried this has come to state-issued money. Anyway, in the previous chapter we came to the conclusion that some degree of governmental regulation is needed when it comes to illegal use of cryptocurrencies, and responsibility for the money. Some countries have already been regulating cryptocurrencies, and at the next subchapter we will research this question.

3.2. Governmental regulation and status of cryptocurrencies in different countries

Cryptocurrencies are a new phenomenon that touches the wallets of millions of people and different spheres of life: banking, trading, illegal trade, business, IT, labour market, and others. It is logical, that cryptomoney would entail some governmental regulation. Moreover, some safety guarantees from governments would promote cryptocurrencies. This subchapter considers what regulation cryptocoins have already provoked in different countries.

Whether cryptocurrencies can replace state-issued money, in broad terms, would also depend on whether governments will allow them to assume those functions. Cryptocurrencies are a big subject of discussion for governments at the moment, and their legal status is still changing or undefined in different countries, while some countries have concrete laws about it. Some governments see them as innovation that can develop a country's economy, others see them as the ultimate threat for the safety of the economy and citizens, other countries do not regulate them at all, and many are developing laws about them (Regulation of Bitcoin... 2016). The legal status of crypto money varies too from method of payment to commodity. Also, different departments, government agencies and courts classify cryptocurrencies differently even inside one country. In general, countries can be divided into three categories depending on legal status of cryptocurrencies: those that forbid them, those that recognize them, and those that doubt. Below we will consider these categories in more detail with the examples of some concrete countries. Take into account that these laws and the status are changing very rapidly and the information below may be outdated soon.

Forbidden. Bangladesh. Bitcoin was banned quite simply: they referred to legislation on combating money laundering and financing of terrorism and threatened with prison sentences (*Ibid*.).
Bolivia. In 2014, the Central Bank issued a resolution that prohibits the turnover of bitcoins in the territory of the State (*Ibid*.).

Kyrgyzstan. "In accordance with the legislation of the Kyrgyz Republic, the only legal means of payment on the territory of ... the country is the national currency of Kyrgyzstan - Som. The use of "virtual currency", bitcoin, in particular, as a mean of payment in the Kyrgyz Republic is a violation of the law ... " (*Ibid*.).

South Korea, one of the largest by the volume of trading in crypto currency markets, banned any transactions of virtual currencies from anonymous bank accounts. Owners of virtual wallets will have to bind them to real bank accounts and confirm their identity. Foreigners and minors are prohibited from investing in the market of crypto-currency in the territory of South Korea. The decision of the authorities is aimed at stopping the use of the crypto currency market for money laundering. In addition, the Commission for Financial Services of South Korea banned all primary placements in tokens (ICO) in the country and stated the need for strict control over trade operations with crypto-currencies. Similarly, the country's authorities report the intention to completely prohibit operations with crypto-currencies on domestic exchanges in connection with major hacker attacks on crypto-exchange exchanges.

Recognized. More and more countries are recognizing cryptocurrencies and allow the use of them. The brightest example is new Venezuelan state stable cryptocurrency called Petro. In February 2018, Venezuela launched the sale of the national crypto currency the Petro, becoming the first country with state crypto currency. According to Article 4 of Decree No. 3.196 published in the Official Gazette, a Petro is equivalent to a "purchase-sale contract for one barrel of oil from the Venezuelan crude oil basket or any commodities decided by the Nation." Today the Petro is the stablecoin that is backed with Venezuelan oil, one Petro is equal the price of one barrel of Venezuelan oil estimated by the Venezuelan government, meaning the petro is worth whatever the Venezuelan government wants it to be. The petro is not backed by worldwide cost of oil or any other international standard. The Venezuelan authorities promise it will be possible to pay for goods and services, taxes, fees and duties

for public services with the Petro. Nonetheless, it is impossible to buy the Petro with Venezuelan bolivar, but it is possible to buy it with other cryptocurrencies, US dollar, Euro, Russian ruble, Yuan, and Turkish lira. According to the authorities, Petro should help bring Venezuela out of the protracted economic crisis, circumvent international sanctions and attract foreign investment in the form of foreign currency. Petro is promoted by Venezuelan president, but Venezuela's National Assembly, headed by the opposition, declared the Petro null, and said it will not acknowledge it. (Chohan 2018).

Belarus became the first country in the world to legalize smart contracts and abolished income tax for miners and operations with tokens. Individuals are allowed to own tokens, mine them, store, exchange, buy, sell for Belarusian roubles, foreign currency and electronic money. Moreover, tokens can be given and bequeathed. The main goal is to create the conditions under which world IT companies would come to the country, open their representative offices, development centres, and create a product that is in demand throughout the world. Additional goals are investments in the future of the country, first of all, training IT specialists, and the introduction of modern financial instruments and technologies. Capital and smart and talented people from all over the world are expected be attracted to the country.

Some countries recognize them as foreign currencies (Argentina), others as intangible asset, for example in Australia (Backing Australian FinTech, 2016), or Canada (Library of congress, 2016), or financial assets (Bulgaria), Some as 'unit of financial accounting' (Germany), property (Israel), the analogue of game currencies (Croatia). (Regulation of Bitcoin... 2016). And at the same time, some countries such as Bangladesh and Canada are applying legislation to counteract legalization and financing of terrorism for cryptocurrencies. Also, at the time of writing, France, Russia, Japan, and India are preparing laws on cryptocurrencies. In most of the countries that recognize them there is a tax on income from cryptocurrencies.

In Luxembourg, Bitcoin is considered standard money, "since they are accepted as a means of payment of goods and services by a sufficiently large group of people", but it is not a legal tender; no one has the right to operate within the country without a license (Luxemburg Financial Sector Supervisory Commission 2014). Luxembourg became the first state in the world where a license was issued to conduct financial activities related to crypto currency in 2016 (Regulation of Bitcoin... 2016).

In the USA there are several points of view on what is crypto money: first, in 2013 the US Treasury recognized the status of a virtual currency for bitcoin (Calvery 2013); secondly, the U.S. Commodity Futures Trading Commission said that bitcoin is a commodity (Keynote Remarks 2017). Also the New York State Department of Financial Services launched a special license for Bitcoin exchange, which allows it to be opened legally to customers across the country (Popper 2015).

In Finland, bitcoin and analogs are not official money, but means of payment. At the same time, losses from operations with bitcoin cannot be taken into account in tax deductions. In addition, the income received from peer-to-peer transactions was previously considered a tax on capital. Since 2014, bitcoin has been recognized as a financial service, and after that it was exempted from value added tax. (Arvonlisäverotus 2014).

In Sweden, cryptocurrencies are considered a mean of payment. For taxpayers, taxation is possible, if the activity brings a regular profit, if a miner can mine more than 25 btc a year. At the same time, income from "mining" is qualified as income from labor, rather than entrepreneurial activities. Also, Swedish tax authorities insist that bitcoin is a digital currency, and therefore, transactions that are prohibited by law with the use of money, should be prohibited when working with bitcoin. (Value Added Tax 2013).

Since April 2017, Japan treats bitcoins and other virtual currencies as methods of payment, not a legally-recognized currency. Bitcoin will continue to be treated as an asset unless there are future revisions or directives to Japanese tax law. (Virtual Currency Act).

Doubting countries**,** as a rule, do not regulate them at all (Brazil, Greece, Hong Kong, Denmark, Russian Federation, India, Indonesia, Jordan, Ireland, Cyprus), or tax only business activities for buying and exchanging btc, but do not tax private trade (UK), or tax large transactions of individuals and transactions of non-individuals (Italy). In China only individuals can use btc and organizations cannot. For example, in Denmark the Office of Financial Supervision of the Kingdom expressed a very specific position: first, bitcoin is not a currency; second, there will be no regulation of the turnover in the country. In addition, transactions with btc are not taxed. (Regulation of Bitcoin 2016).

In general, a few countries have forbidden using cryptocurrencies at all, but in fact people still can use them individually, and it is almost impossible to prevent using cryptomoney by individuals, most countries do not regulate cryptocurrencies or regulate them only for the purpose of taxation, and third recognized cryptomoney as a commodity, property, intangible asset, financial assets, method of payment, foreign currency, digital currency, virtual currency, or game currency. And Venezuela even issued the the national crypto currency with the aim of raising foreign currency. Still, many countries are in the process of regulating cryptocurrencies and it is only matter of time.

SUMMARY AND CONCLUSIONS

The aim of this research was to understand and explain if cryptocurrencies are able to function better than the current monetary system, probability of the cryptocurrencies to replace the current monetary system or to accompany it, and investigate the development that crypto currencies may initiate. This research explains the definition and background of crypto currencies, and delves into the changing tides that crypto currencies make in the traditional monetary markets. This research also aims at comparing the traditional money to the crypto currencies, investigating their advantages, obstacles for use, and how it can transform into the future of monetary investments.

Why would cryptocurrencies be used instead of fiat money? The first have some advantages. In our opinion there are two main reasons. First, cryptocurrencies do not need a third party such as a bank, money transfers directly from one user to another. Therefore, the transactions are cheaper and faster, especially when it concerns international transactions, there are less procedures, and there is less chance for any mistakes and frauds. But there should be a body, that would be responsible for the money and regulation of the system. This body can be either a state organization or private company. Secondly, blockchain technology records all transactions, and therefore it can provide transparency of spending and decrease corruption. These reasons are quite convincing to change fiat money to crypto money. But these reasons are not convenient for banks and we can assume that banks will prevent widespread use of cryptocurrencies.

What else can the world win if a blockchain monetary system come into force?

- More accessible system, where all issues can be solved by the internet.
- Can promote investment in the economies of countries.
- Open opportunities for avoiding sanctions for those who want to finance some projects in the country to which sanctions are imposed.
- Cryptocurrencies work on the blockchain technology, that is a decentralized system. If something happened to one or several servers, it does not affect the system and users.

There is one characteristic of cryptocurrencies that can be attributed to both: the advantages and disadvantages. This is anonymity of use. We think that in order to make them safer to society, it is reasonable to take steps to prevent anonymous use, as is already done in some countries.

Can cryptocurrencies be used instead of fiat money? We have compared functions of money with functions of cryptocurrencies and came to the conclusion that some cryptocurrencies are able to perform all functions of money, but they must be stable. Stable cryptocurrencies are also called stablecoins, and these are cryptomoney, the value of which is determined not only by the supply and demand for it, but also by more established methods. As a rule, they are tied to either the value of the fiat currencies like dollar and euro, or commodities: oil, gold, and etc.

Also, there are some obstacles on the way of development of cryptocurrencies into full-fledged money. The first is volatility, and it can be overcome by use of stablecoins. The second is mistrust of cryptocurrencies and unpredictability as well as difficulty of foreseeing the behaviour of governments and the market with respect to the cryptocurrency. This can be resolved by regulating cryptomoney by laws and appointment of the responsible organization, it can be an issuer of a currency or exchanges. The last is hacker attacks but this can be controlled as it is controlled now in case of ordinary online banks. Although this risk is always there, like the risk of robbery of a physical bank, it is not an obstacle to the implementation of this system. So, all the obstacles can be resolved.

Thus, we can draw the conclusion, that cryptocurrencies can be an alternative to the current monetary system, coexisting long-term alongside it, and even can replace state issued currencies. These changes need adopting cryptocurrencies to global economy, making a cryptocurrency that will meet the maximum needs of consumers and will be comfortable to use internationally.

There are two main variants of how cryptomoney can be regulated: (1) regulation of existing and potential free market cryptocurrencies, or (2) a governmental cryptocurrency. It would be comfortable, if there is one or several international cryptocurrencies, like it is now, and each person, firm or an organisation may have several wallets with different currencies, and there is no need to constantly exchange one currency for another. Furthermore, a currency requires international legitimacy if it is to serve in international trade. In order to save one of the main advantage of cryptocurrencies, working universally, cooperation between countries is very important.

Nevertheless, as we can see from the experience of free banking, central banks are not inclined to share the function of money emission, and they also may prevent widespread use of cryptocurrencies. But they can issue their own cryptocurrencies, that can also be beneficial for society because of the reasons above. But in this case, one of the main ideas of the crypto currency - the end of the monopoly power of central banks to issue and regulate money, remains not implemented.

If different cryptocurrencies are used instead or together with fiat money, their users should be confident in their stability and that cryptomoney issuers would not go bankrupt, then some governmental regulation is still needed in order to protect users. Nevertheless, the question about credit system in cryptocurrency monetary system remains open. Cryptocurrency system needs less regulation, and therefore, less spending on regulation, hence it can offer loans on better conditions than banks with fiat money. Then there are different cases. First, if there is a central bank's cryptocurrency, then the current the fractional-reserve banking system with a central bank in role of a lender of last resort can remain. Second, if there are different independent cryptocurrencies will the fractional-reserve banking system or full-reserve banking be used? Hence, will there a lender of last resort be needed and who will take its functions: a central bank or an independent organization? Can an independent organization be effective for such functions? These are questions for further research.

In our opinion, it is important not to create unnecessary barriers, but to create conditions for improving the financial system and use cryptocurrencies to develop the economies of countries and optimize the processes associated with money. Regulation should protect the interests of citizens and business, prevent money laundering and avoiding taxation. Governments should regulate cryptocurrencies in order to protect users from fraud, at the same time allowing room for innovation. Therefore, at the present time the main issue is to create a legislative base, which will have to undergo significant changes in the event that the world community recognizes the right of cryptocurrency to life in the global banking system.

LIST OF REFERENCES

Acheson, N. (2015). *What Can You Buy with Bitcoin?* Accessible: , 30 November 2017

Armstrong S. (2016). *Move over Bitcoin, the blockchain is only just getting started.* Wired. Accessible: http://www.wired.co.uk/article/unlock-the-blockchain , 10 March 2018

Arvonlisäverotus KVL:2014/34. (2014). Finnish Tax Department. Accessible: , 30 November 2017

Backing Australian FinTech. (2016). (Analytical paper). Australian Government. Accessible: http://fintech.treasury.gov.au/files/2016/03/Fintech-March-2016-v3.pdf , 30 November 2017

Bitcoin cash official website. Accessible: , 30 November 2017

Bitcoin official website. Accessible: , 30 November 2017

Calvery, J.S. (2013). *Statement of Jennifer Shasky Calvery, Director, Financial Crimes Enforcement Network, United States Department of the Treasury*. Accessible: , 30 November 2017

Catalini, C., Gans, J. (2016). *Some simple economics of the blockchain.* Nber Working paper series. Cambridge: National Bureau of Economic Research. Accessible: http://www.nber.org/papers/w22952.pdf , 10 March 2018

Chohan, U.W. (2018) Cryptocurrencies as Asset-Backed Instruments: The Venezuelan Petro. Discussion Paper Series: Notes on the 21s t Century. University of New South Wales, Canberra. School of Business and Economics.

Cryptocurrency Market Capitalizations. (2017). Coin Market Capitalization website Accessible: https://coinmarketcap.com , 10 March 2018

Cuthbertson, A. (2015). *Bitcoin Now Accepted by 100,000 Merchants Worldwide.* International Business Times. Accessible: , 10 March 2018

Dash official website. Accessible: , 30 November 2017

Dowd K. (1992). *Experience of Free Banking*. London: Routledge.

Ethereum Classic official website. Accessible: , 30 November 2017

Etherium official website. Accessible: , 30 November 2017

Franco, P. (2015). *Understanding Bitcoin: Cryptography, Engineering and Economics.* Cornwall: TJ International Ltd.

Gans, J., Halaburda, (2013). Some Economics of Private Digital Currency. (Working Paper). Bank of Canada, Currency Department, Ottawa. Accessible: , 30 November 2017

Greenlaw, S.A., Taylor T. (2014). *Principles of Macroeconomics*. Houston: OpenStax College.

Hendrickson J.M. (2011). *Regulation and Instability in U.S. Commercial Banking. A History of crises.* 1st ed. New York: Palgrave Macmillan.

Iansiti M., Lakhani K.R. (2017). *The Truth about Blockchain*. The Harvard Business Review. Accessible: https://hbr.org/2017/01/the-truth-about-blockchain , 10 March 2018

Investor Bulletin: Initial Coin Offerings. (2017). The US Security and Exchange Commission. Accessible: 10 March 2018

IOTA official website. Accessible: , 30 November 2017

Keynote Remarks of Commissioner Brian Quintenz before the Symphony Innovate 2017 Conference. (2017). U.S. Commodity Futures Trading Comission. Accessible: , 30 November 2017

Lagarde, C. (2017). *Central Banking and Fintech — A Brave New World?* International Monetary Fund Website. Accessible: , 30 November 2017

Litecoin official website. Accessible: , 30 November 2017

Monero official website. Accessible: , 30 November 2017

Nakomoto, S. (2008). *Bitcoin: a Peer-to-Peer Electronic Cash System.* Accessible: , 30 November 2017

Neldner, M. (1992). The experience of free banking. - *Weltwirtschaftliches Archiv*, Vol. 128, Issue 4, 749–756. Accessible: https://doi.org/10.1007/BF02707305 , 10 March 2018

NEM official website. Accessible: , 30 November 2017

NEO official website. Accessible: , 30 November 2017

Nilsson, K. (2015). *The missing MtGox*. Accessible: bitcoins , 10 December 2017

Ólafsson I.A. (2014) Is Bitcoin money? An analysis from the Austrian school of economic thought. (Master theses). School of Social Sciences at the University of Iceland. Department of Economics. Reykjavík. Accessible: , 30 November 2017

Pagliery J. (2014). *Bitcoin: And the Future of Money.* Chicago: Triumph Books.

Popper, N. (2015). *Bitcoin Exchange Receives First License in New York State.* The New York Times. Accessible: , 30 November 2017

Regulation of Bitcoin in Selected Jurisdictions. (2016). Library of congress. Accessible: http://www.loc.gov/law/help/bitcoin-survey/#spain , 30 November 2017

Ripple official website. Accessible: , 30 November 2017

Rogojanu A., Badea L. (2014). The issue of competing currencies. Case study – Bitcoin. - *Theoretical and Applied Economics*, Vol. 21 (2014), No. 3(590), 129-147. Accessible: http://store.ectap.ro/articole/946.pdf , 10 March 2018

Sechrest L.J. (2008). *Free Banking: Theory, History, and a Laissez-Faire Model.* Westport: Quorum books. Accessible: https://mises.org/library/free-banking-theory-history-and-laissez-faire-model-0 , 10 December 2017

Sharma, T. (2017). *Hot Wallet vs Cold Wallet*. Accessible: , 10 December 2017

State and Financial Systems in Europe and the USA. (2010). / Ed. S.Battilossi, J.Reis. Farnham: Ashgate Publishing Limited.

Statement. Virtual Currencies. (2014). Luxemburg Financial Sector Supervisory Commission. Accessible: , 10 December 2017

Sudra, P. (2012). Economics of Bitcoin: is Bitcoin an alternative to Fiat Currencies and Gold? (Diploma Thesis). WU Vienna University of Economics and Business. Vienna. Accessible: , 30 November 2017

Terrorist Use of Cyberspace and Cyber Terrorism: New Challenges and Responses. (2015). / Ed. M.N. Ogun. Amsterdam: IOS Press. Accessible: , 10 December 2017

Unregulated Banking. Chaos or Order? (1991). / Ed. F.Capie, G.E.Wood. 1st ed. New York: St. Martin's Press.

Value Added Tax: Trade with Bitcoins. (2013). Finnish Tax Board. Accessible: , 30 November 2017

Virtual Currencies Key Definitions and Potential AML/CFT Risks. FATF Report. (2014). Financial Action Task Force. Paris. Accessible: , 30 November 2017

Virtual Currency Act. Japanese Financial Services Agency. Accessible: , 30 November 2017

Virtual Currency Schemes. (2012) European Central Bank. Frankfurt am Main. Accessible: , 30 November 2017

Virtual currency: risks and regulation. (2014). The Clearing house, Independent Community Bankers of America. Accessible: , 10 December 2017

Vora G. (2015). Cryptocurrencies: Are Disruptive Financial Innovations Here? - *Scientific Research Publishing Inc.*, *Modern Economy*, Vol.06, No.07(2015), 816-832. Accessible: , 10 March 2018

Where can I spend bitcoin? (2017). Accessible: , 30 November 2017

Степанова Д. И., Николаева Т. Е., Иволгина Н.В. (2016). Особенности организации направления развития криптовалютных платёжных систем. – *Финансы и кредит*, 10 (2016), 33–45.

APPENDICES

Appendix 1. Description of the cryptocurrencies with the biggest capitalization rate.

Bitcoin (BTC) is a crypto currency that can only be sent, received and stored. This currency appeared on the market first, and, therefore, ranks first in popularity, capitalization and the highest unit value in terms of dollar. At the same time it has many disadvantages inherent in the architecture itself: it is slow, difficult to mine, it requires a lot of computing power to mining, plenty of storage to store information about transactions, and the cryptography can be hacked. (Bitcoin official website 2017)

Ethereum (ETH) is the second cryptocurrency in terms of popularity, and the main rival of bitcoin. Probably, this currency has more prospects. While bitcoin can act only as a means of exchange and storage, "Ethereum is a decentralized platform that runs smart contracts: applications that run exactly as programmed without any possibility of fraud, censorship, downtime, or third party interference" (Etherium official website). Now this platform is the most popular in the world when building a smart (blockchain) economy, and is used with numerous Initial Coin Offerings (ICO). ICO is a form of attracting investments in the form of selling to investors a fixed number of new units of crypto-currencies received by a single or accelerated emission. Ethereum inherited almost all the diseases of bitcoin: it is faster - it updates every 10 seconds (that is 60 times faster), but it has the same scaling problems, power consumption and storage. (*Ibid.)*

Bitcoin cash is the "alternative to bitcoin" that appeared as a result of the fork – division of a cryptocurrency into two. So, on August 1, the bitcoin blockchain was divided into two chains and a new digital asset - Bitcoin Cash, which has a common history with bitcoin appeared. Unlike Bitcoin, Bitcoin Cash is faster and has a number of other technical improvements. (Official Bitcoin cash website 2017)

IOTA offers a fundamentally new paradigm. The very principle of work is innovative. IOTA is made on the principle of a web and infinitely scales. In order to perform a bitcoin transaction, the miner must do some work to confirm the transaction: to spend time, a huge amount of energy and allocate space for storage. In the case of IOTA, one can independently confirm the transaction using a device,

for example, a regular phone. One smartphone confirms two other transactions. Those transactions confirm two others. And so on. The more users, the faster and better the network works. There is no limit to scalability, no miners are needed, so transactions are free. There is no need to pay a commission to miners and spend computing power. (IOTA official website 2017)

Ripple is a payment and currency exchange system that has its own cryptocurrency. Ripple has its own protocol which allows to make transactions fast, safe and cheap, and it is already competing with SWIFT and Western Union. The advantage of this currency is that it is used by banks, for example SEB, BMO, UniCredit, Standard Chartered, AKBank, and others, and with transfer money system, foreign exchange brokers and international payment providers like TransferGo and Currencies Direct. Ripple propose banks and other clients to use their technology to make fast and cheap transactions. However, it is not decentralized. A certain amount of coins had been issued by the founders, and new coins can not be mined. Ripple has a huge speed advantage over BTC and ETH, but the operations are not so transparent. (Ripple official website 2017)

Dash is the crypto currency whose transactions are completely anonymous. Dash works faster than Bitcoin and has a number of software advantages, which allow providing a variety of decentralized services, like instant transactions, privacy and governance, while eliminating the threat of low-cost network attacks. (Dash official website 2017)

Unlike bitcoin, **Monero** emission is not limited, but transactions take up several times more space than bitcoin. In general, it has low-cost transactions and good transaction speed. (Monero official website)

Ethereum Classic (ETC) is an absolute analog of Ethereum. In 2016, an attack on the Ethereum was carried out, and some amount of this cryptocurrency was stolen. To return the funds, the developers of the Ethereum proposed to make changes in the blockchain. This decision was met with some resistance as it contradicts the very idea of blockchain, that it must be unchangeable. And as a compromise, the blockchain was duplicated, so the original Ethereum could remain unchanged. So, the technology was divided into two parallel cryptocurrencies. The original blockchain was called Ethereum classic, and the new one is Ethereum. (Ethereum Classic official website)

Litecoin (LTC) is a cryptocurrency, which is very similar to bitcoin in all respects. The key difference for users is that litecoins are generated four times faster than bitcoins. (Litecoin official website 2017)

NEM (XEM) is mainly used in Japan, where it is officially allowed to buy and sell goods for crypto currency. The number of coins is always one less than 9 billion, additional emission is not provided for, so there is no mining here. A major jump in the NEM course occurred in May 2017, when a closed Mijin platform was created on the basis of NEM, through which Japanese banks can conduct secure transactions. NEM is built on the example of bitcoin, there are no fundamental differences in architecture, but it works faster. (NEM official website)

NEO is similar to Ethereum in terms of the ability to create smart contracts and pay for them with this currency. The main difference from Ethereum is that to work with Ethereum a programmer must know Solidary language, but NEO supports many languages, that allows to attract more developers. So far NEO cooperates with such large corporations as Microsoft and Alibaba. (NEO official website 2017)