MYKOLAS ROMERIS UNIVERSITY
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IDENTIFICATION OF THE FACTORS INFLUENCING THE PRICE OF BITCOIN

A master's thesis

Supervisor
doc. dr. R. Remeikienė

VILNIUS, 2017

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A master's thesis on Electronic Business Management
Study program: 621N20018

Supervisor
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… 12 2017

Performed by
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… 12 2017

VILNIUS, 2017

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INTRODUCTION

Relevance of the topic. There is a wide range of E-payment systems today, which have different platform bases: the Internet, mobile phones and tablets, digital storage cards. However, with the appearance and popularisation of cryptocurrencies modern E-payments ecosystem, which consists of such famous players as PayPal, Skrill American Express, Payoneer, Apple pay, Alipay, Google wallet, Bitpay, and others is being tested for durability.

According to (Nakamoto, 2008) electronic payment system based on cryptography provides any two willing parties of a deal with the opportunity to make a direct peer-to-peer transaction without the need of any kind of middlemen: corporations, banks or governments. Irreversible transactions can protect sellers from fraud, whereas fast and low fees transactions created to be friendly to buyers.

The head of the International Monetary Fund, Christine Lagarde, states that it is a time for the world's central banks and regulators to get serious about digital currencies. Global financial institutions are taking risks by not watching and understanding emerging financial technological products that are already starting to shake up the financial services and global payments system (Schulze, 2017).

The unique nature of cryptocurrencies opens a range of opportunities for financial market investors and ignoring digital currencies features may lead to the missing of the existing opportunity.

Level of scientific research. Primer scientific literature review shew that the topic of factors influencing the price of Bitcoin has a research gap.

(Ciaian, Rajcaniova, & Kancs, 2016) explored Bitcoin price formation by evaluating both the traditional determinants of currency price like market forces of supply and demand, and digital currencies specific factors like Bitcoin attractiveness for investors and users was published only in the year 2016.

Primer literature review has shown that all theory about cryptocurrencies divide factors influencing bitcoins prices into 3 groups: psychological factors, economic factors and technological factors.

Factors from psychological perspective were discussed among (Barber & Odean, 2008; Bouoiyour & Selmi, 2015; Ciaian et al., 2016; Garcia, Tessone, Mavrodiev, & Perony, 2014; Grullon, Kanatas, & Weston, 2004; Kancs, Ciaian, & Rajcaniova, 2015; Kristoufek, 2013, 2015), who found out that *investors' attractiveness in form of search queries* may be an early indicator for Bitcoin price movements and *news* that influence investors' attractiveness have a great impact on Bitcoin price formation.

Factors from economic perspective were discussed among (Buchholz, Delaney, Warren, & Parker, 2012; Ciaian et al., 2016; Kancs et al., 2015; Kristoufek, 2015; Palombizio & Morris, 2012; van Wijk, 2013). This group of authors has controversial points of view regarding significance of factors value in Bitcoin price formation. Some authors states *that global economic and financial*

indicators have both long- and short run significant impact; other states that they affect Bitcoin price only in short-term perspective; the third group demolishes the significance of theory at all.

On the other side, the significance of *supply and demand* role in Bitcoin price formatting was tested and confirmed by a variety of authors, who states that *Bitcoin use in exchange* and its *velocity in circulation* have the most significant impact in Bitcoin price formation.

Factors from technological perspective were discussed among (Böhme, Christin, Edelman, & Moore, 2015; Ciaian et al., 2016; Hayes, 2017; Kancs et al., 2015; Kristoufek, 2015; T. Moore & Christin, 2013; Taylor, 2013; Yermack, 2015). It was found by them that *Bitcoin network difficulty* presented with *Hash Rate (or energy efficiency)* that has a tendency to stimulate the increase of Bitcoin price and *the size of mining network (or its difficulty)* shows negative effect of pulling Bitcoin price down, plays a great role in Bitcoin price formation.

The authors also state that the factor of *Bitcoin network security* plays a role in price formatting as well. Due to its digital nature, Bitcoin is highly vulnerable to the threats like cyber-attacks that lead to dramatic drops in Bitcoin price .Such dips may scare away potential investors that in turn will decrease their demand for the asset, which will lead to the decrease in Bitcoin price.

To sum it up, primer scientific literature review leads to the conclusion that **there is no common opinion which factors among 3 perspectives have the most significant impact in Bitcoin price formation.**

Novelty. The research provided the solution to define the most significant factors influencing the price of Bitcoin among existing in scientific literature. The investment guidelines for conservative and aggressive trading were proposed in the fourth section: it described several investing strategies that investor may include in his investing portfolio. The example of potential investment portfolio that includes all these strategies was suggested at the end of the section. Besides, in recommendations part it was suggested: to get familiar with the concept of blockchain technology and peculiarities of at least TOP 10 cryptocurrencies by market capitalization; to use defined in empirical part 3 most significant factors of Bitcoin price formatting simultaneously while analyzing cryptocurrencies; to get familiar with the basics of risk-management, portfolio diversification, fundamental and technical analysis of financial markets before starting investing in cryptocurrencies; to be conservative at the very beginning of investing. Both the provided guidelines and suggestions have practical value that may help the willing investor to start investing in cryptocurrencies industry.

Research scientific problem. Which factors have the biggest impact on bitcoin price?

The object of the research. The factors of bitcoin price.

The main aim of the research. After the identification of the factors influencing the Bitcoin price fluctuations to propose the guidelines of investment decisions in Bitcoin and other cryptocurrencies.

In order to fulfill the main aim the following tasks were set:

1. To analyze theoretical aspects of the factors influencing the price of cryptocurrencies.
2. To present the methodology of the identification of the factors influencing the price of cryptocurrencies.
3. To evaluate the factors influencing the price of Bitcoin.
4. To construct the guidelines for investing in cryptocurrencies industry.

Research methods. Comparative and systematic scientific literature review, expert evaluation, statistical data analysis, prognostication method.

In the first part methodological framework is based on theoretical descriptive, comparative, analytical methods. These methods are applied to the analysis of the theoretical literature on the concept and origins of cryptocurrencies, their types, peculiarities and factors influencing the price of Bitcoin.

In the second part the methodology of the identification of the factors influencing the price of cryptocurrencies (the example of Bitcoin) was presented: expert evaluation method, interview, prognostication method. The aim this part was to find out how the experts evaluate defined factors of Bitcoin price formatting. This will help to make a ranking among factors from most to less important in Bitcoin price formatting. Besides, semi-structured interview if form of questionnaire were performed with representatives of financial markets in order to get scheme for basic rules of risk management and portfolio diversification. Statistical data analysis was applied, in order to make short-term prognostication of Bitcoin price.

In the third part empirical results were presented and structured.

In the fourth part, based on the gathered data from the first and third part of master thesis the guidelines for investing in cryptocurrencies industry were suggested.

1. THEORETICAL ASPECTS OF THE FACTORS INFLUENCING THE PRICE OF CRYPTOCURRENCIES

Before investigating the degree of value of digital currency price formatting factors, which opens opportunity for investing in cryptocurrency industry, it is appropriate to analyze the theoretical aspect of cryptography innovation.

1.1 The concept and origins of cryptocurrencies

In order to understand the concept of cryptocurrency, it might be useful to analyze its difference with fiat, virtual and digital currency at first.

Fiat currency is any 'legal tender', which means that it is set and issued by a central authority that people want to use as a medium of exchange for goods and services as long as it is regulated and people trust this central authority (European Central Bank, 2012).

Classical examples of fiat money may be: U.S. Dollar, Euro, Australian Dollar and Japanese Yen (see Fig.1).

Source: http://www.banknoteden.com/USA.html. Seen on: 17rd, October 2017

Figure 1. Central authority is backing its fiat money

On each front side of every U.S. dollar a statement may be found "This is legal tender for all debts, public and private". This phrase means that people may use this banknote for all legal purposes like tax paying, because the government states it is possible. With the Bitcoin things are going different.

Going further, **virtual currency** is a type of unregulated, digital money, which is issued and usually controlled by its developers, used and accepted among the members of a specific virtual community (European Central Bank, 2012, p. 14).

For example: Facebook credits for advertising and in-platform games, Angry birds coins.

Digital currency - is a type of virtual currency that is being produced and stored electronically. The US Department of Treasury also states that despite the fact that digital currency functions just like traditional currency, it has different features (Rose, 2015).

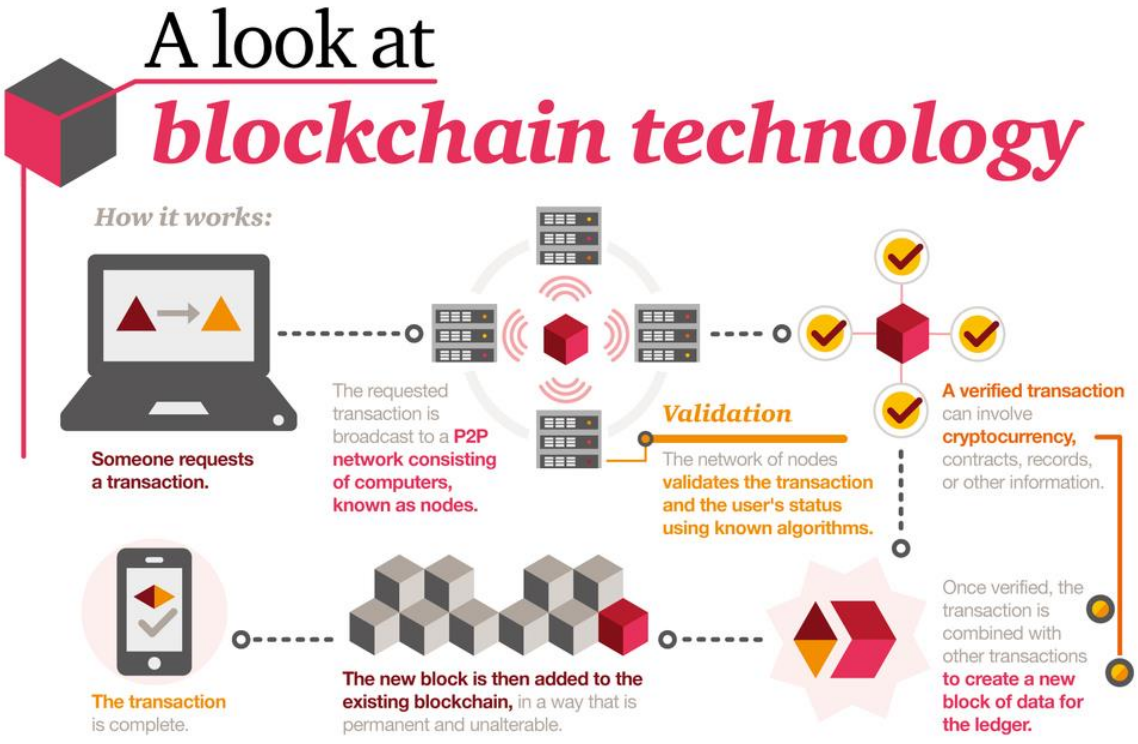
Great examples of this type of currencies may be digital points that be used by the clients of online casino like PokerStars that may be used for buying branded clothes and accessories, air miles that may be used to get discounts for flights provided by company issuer, digital points on mobile apps that allow people to get cheaper taxi ride or cheaper food in a restaurant line and many other alternatives.

Cryptocurrency - is a virtual system that functions like a medium of exchange that doesn't have intrinsic value and being produced and stored electronically in the blockchain, which creates and controls monetary units with the use of encryption techniques allowing to verify the transfer of funds (Farell, 2015; Quora, 2017).

Another thought is that it is a subset of digital currencies with the cryptography security system that makes it extremely difficult to falsify monetary units (Gilpin, 2014).

As long as all cryptocurrencies are created on the base of blockchain, it will be useful get familiar with its nature.

The blockchain is an impregnable digital ledger that may be programed to keep on track virtually everything of value: marriage licenses, certificates of birth and death, ownership contracts, medical history and much more that can be expressed in code (Tapscot, 2015).



Source: https://www.pwc.com/us/en/about-us/timeline/img/2015a-timeline.jpg. Seen on: 23rd, October 2017

Figure 2. How does bitcoin blockchain work

All transactions, which are stored digitally, related to cryptography and recorded in a 'blockchain' can be thought of as an accounting system (Gandal & Halaburda, 2014).

The blockchain (see Fig. 2) is a consistently growing digital ledger that has full information about addresses and balances gained from the genesis block (the earliest transactions ever executed) to the most recently created block. When transaction is in process, it is posted globally across millions of computers. Around the world there is a group of people called "miners", who have massive computer power 10 to 100 times bigger than Google worldwide. Every 10 minutes network obtains all the transactions organized into a list called a "block". Then the 'miners' using open-source software are trying to solve some tough problems in form of complex mathematical calculations. The first miner, who solves the 'problem' and validates the block, is rewarded in digital currency, in case of the Bitcoin blockchain - the Bitcoin. Further, this block is linked to the previous block and the previous block in a linear, chronological order that creates a chain of blocks. Here's where the name from blockchain comes from. Once the block is created, all transactions inside are being kept with a digital waxed seal. From the security reasons it means that if somebody wanted to hack a block, he would have to hack the entire history of blocks in that blockchain across millions of computers simultaneously, which are all using the highest level of encryption (Rotman, 2014; Swan, 2015; Tapscot, 2016).

Now, having explored the concept of cryptocurrencies, it might be useful to sum up the difference between Bitcoin (as the most known representative of cryptocurrencies) and E-money in the form of Table 1.

Table 1. Comparison between e-money and Bitcoin

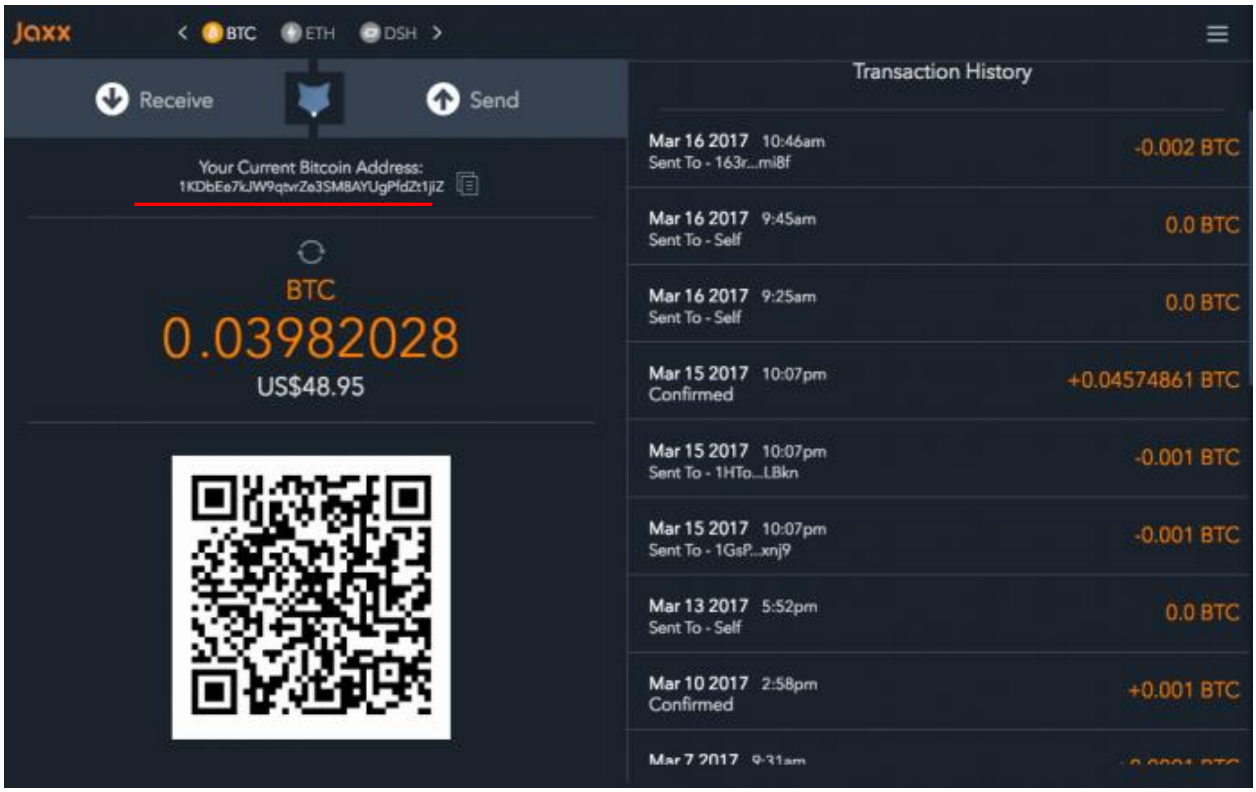
-	**E-Money**	**Bitcoin**
Format	Digital	Digital
Unit of account	Fiat currencies (USD, EUR, KES)	Bitcoins (BTC)
Customer identification	Financial Action Task Force (FATF) standards apply for customer identification (through such standards permit simplified measures for lower risk financial products)	Anonymous
Means of production	Digitally issued against fiat currency of central authority	Mined/mathematically generated
Issuer	Legally established e-money issuer (which may be a financial institution)	Community of people/miners

Source: (Rotman, 2014, p. 2)

In order to use Bitcoin whether for purchasing goods and services or for investment reasons, a special digital storage called 'wallet' have to be used. It is an application that serves user interface,

which controls access to the money of owner, who can manage his keys and addresses, keep the balance on record and make transactions to other wallets. Each transaction is being signed digitally (Antonopoulos, 2017).

In blockchain wallet (see Fig. 3) user can find the equivalent of his capital in Bitcoins, transactions history like in a bank account and the most interesting thing - his own current Bitcoin address. This address consists of 34 symbols: uppercase, lowercase and digits. If a person, who wants to send the user a certain sum in Bitcoins or other cryptocurrency will make a mistake in the sending address, his money will go in unknown direction. The opposite is fair, if the wallet owner will make the same mistake with address while buying goods or services, for example, he will lose his money without getting willing value.



Source: https://coinscage.com/best-litecoin-wallet/. Seen on: 7th, November 2017

Figure 3. Jaxx wallet interface

Cryptocurrencies introduce a new wave of thinking about money. It asks questions of why people agree to use digital money without the status of legal tender and regulatory enforcement authorities on voluntary basis. The appearance of cryptocurrencies solved two issues namely the problem of trust and double-spending. Furthermore, several countries have already recognized cryptocurrencies as legal payment methods, which stimulates merchants and retailers to accept Bitcoin and other types of cryptocurrencies. Following this trend of wide acceptance, prices and transaction volumes on cryptocurrency exchanges have been increasing recent years (Alvseike & Arne, 2017).

When the Bitcoin (see its logo in Annex 1) appeared in January 2009, it was noticed by almost no one except of the group of programmers who were participating in cryptography discussion groups.

In the 31st of October, 2008 several hundred members of a bleary mailing list, which consisted from cryptography experts got an e-mail from obscured man with the name Satoshi Nakamoto. He wrote that he was working on a new electronic peer-to-peer payment system with no trusted third party. His brief white paper was posted at a new Web site that he had registered two months earlier, Bitcoin.org, which described a currency system he named Bitcoin (Extance, 2015; Vigna & J. Casy, 2015).

The white paper (Nakamoto, 2008) mixed several already existing inventions like HashCash and b-money to create fully decentralized system that does not depend on a central authority for digital currency issuance or settlement and verification of transactions. The main peculiarity was to use "Proof-of-Work" algorithm - distributed computation system. It was created to perform massive voting every 10 minutes, allowing the decentralized network to get consensus about the status of transactions (Antonopoulos, 2017).

The first historical purchase of goods using Bitcoin was in 2009 when two pizzas were bought at a cost of 10,000. The pizzeria administration could not accept bitcoins directly, therefore, a middleman broker was enlisted who agreed to purchase the pizzas using a credit card (based on traditional currency) and accept the bitcoins (Bonneau et al., 2015). This amount of bitcoins is worth more than $70 million as of 7th November 2017.

Bitcoin's history has also a shadow of crime in its history related to the Silk Road.

This marketplace could be accessed only via the so-called 'dark web', an anonymous network that needed special software to use. Once accessed, it was possible to buy anything prohibited by law paying with Bitcoin. As the Silk Road was getting popular, the governments became interested in closing it, as long as they realized that Bitcoin is being used for illegal activity. Silk Road was 'buried' in 2013, in San Francisco by US authorities. Instead of hurting Bitcoin, this criminal image rather boosted its popularity (Santori, 2017; Yermack, 2015).

Bitcoin got high popularity at the beginning of 2011, whereas his progeny - various altcoins soon appeared (Farell, 2015).

Altcoin (see Fig. 4) is a clone of Bitcoin protocol with the range of modifications. Usually all of them have rules contradictory to Bitcoin and have their own genesis blocks. Most popular altcoins since their crating are Litecoin - modified Bitcoin's protocol, which increase transaction speed with the idea that it would be more useful for daily transactions, and Namecoin, which has special key-value storage. Theoretically, an altcoin may be set from an existing Bitcoin blockchain if its community wants to support a new set of rules for the network (Farell, 2015; Github, 2014).

Source: https://www.quora.com/What-are-the-important-technical-terms-around-bitcoin-and-block-chain. Seen on: 03rd, November 2017

Figure 4. Variety of altcoins

There is a wide range of altcoins today that suggest a range of beneficial features. However, there is short list of digital currencies that objectively represents the condition of cryptocurrency industry. They will be presented in the next subchapter.

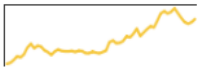
In summary, cryptocurrency is a virtual system that functions like a medium of exchange that is being produced and stored electronically in the blockchain, using encryption techniques to control the creation of monetary units and to verify the transfer of funds. The blockchain is an impregnable digital ledger that may be programed to keep on track virtually everything of value that may be expressed in code. The appearance of cryptocurrencies solved two issues namely the problem of trust and double-spending. Furthermore, several countries have already recognized cryptocurrencies as legal payment methods, which stimulates merchants and retailers to accept Bitcoin and other types of cryptocurrencies. The cryptocurrency history is ambiguous: despite the fact it has a criminal past, publicity, realizing that, boosted its acceptance of Bitcoin. Bitcoin got high popularity at the beginning of 2011, whereas his progeny - various altcoins soon appeared**.**

1.2 The types of cryptocurrencies

The appearance of Bitcoin set a timeline for creating a wide range of new digital currencies. According to coinmarketcap.com as of November 2017 there are more than 1250 types of cryptocurrencies.

To be objective in analyzing the most representative coins in sense of cryptocurrency industry, it might be useful to analyse only those that have the biggest market capitalization including the Bitcoin.

As of 4th November 2017 according to coinmarketcap.com there are the following in Figure 5 cryptocurrencies in top-10 ranking list by market capitalization.

#	Name	Market Cap	Price	Volume (24h)	Circulating Supply	Change (24h)	Price Graph (7d)
1	Bitcoin	$119 638 442 728	$7179.94	$2 705 930 000	16 662 875 BTC	-1.75%	
2	Ethereum	$28 958 626 517	$303.18	$551 022 000	95 516 913 ETH	1.66%	
3	Bitcoin Cash	$10 403 928 289	$620.74	$1 434 860 000	16 760 525 BCH	-5.79%	
4	Ripple	$7 873 573 195	$0.204341	$135 547 000	38 531 538 922 XRP *	-0.72%	
5	Litecoin	$2 989 610 662	$55.70	$111 002 000	53 675 657 LTC	1.11%	
6	Dash	$2 128 234 534	$277.54	$52 322 600	7 668 181 DASH	3.07%	
7	NEO	$1 771 360 500	$27.25	$32 564 000	65 000 000 NEO *	3.28%	
8	NEM	$1 573 785 000	$0.174865	$4 836 140	8 999 999 999 XEM *	4.65%	
9	Monero	$1 322 742 517	$86.41	$30 003 000	15 307 943 XMR	1.25%	
10	Ethereum Classic	$1 198 980 341	$12.35	$228 210 000	97 114 096 ETC	17.81%	

Source: https://coinmarketcap.com/. Seen on: 4th, November 2017

Figure 5. Top-10 cryptocurrencies by market capitalization

As long as the concept of Bitcoin was discussed in the previous subchapter, let's move to **the second coin in the list, Ethereum**.

According to Ethereum (ETH) (see Annex 2) official website ethereum.org it is a decentralized platform with *smart contracts*, which runs on a custom built blockchain that enables developers to create *decentralized applications*.

The main difference between Ethereum and Bitcoin lays in the technology that Ethereum project uses. It is called *"Ether"* - a form of payment made by the clients from a lots of industries to the machines of the platform executing the requested operations. Miners are working for it to *"fuel" the network.* In other words "Ether" is a technology that is being used by a variety of companies to create new programs. Launched in 2015.

The third place in the list holds Bitcoin Cash (see Annex 3).

According to official website www.bitcoincash.org Bitcoin Cash (BCC) is fully decentralized peer-to-peer electronic cash, made on the fork of Bitcoin. BCC protocol provides more transactions per second. It leads to *faster payments* and *lower fees* in relation with Bitcoin. It has the following key features: *On Chain Scalability* - the blocksize limit has been made with a default of 8MB; *New Transaction Signatures* - A new SigHash type provides replay protection, improved hardware wallet security, and more; *Emergency Difficulty Adjustment (EDA)* - allows miners to migrate from the legacy Bitcoin chain as desired, while providing protection against hashrate fluctuations

(measurement unit of the processing power of the blockchain network); *Decentralized Development* - is resistant to political and social attacks on protocol development. Launched in April 2017.

The forth place in the list is held by Ripple coin (see Annex 4).

According to official website ripple.com Ripple (XRP) was created to be a middleman for all global Forex transactions. Today it is being used *mainly by big players* like banks (UBS, UniCredit, Royal Bank of Canada etc.), payment providers, digital asset exchanges and corporates via RippleNet to *work with any store of value*. Unlike bockchain, RippleNet provides optional access to the world's one of the fastest and most scalable digital asset for payments, XRP. It takes XRP 4 seconds to settle a payment, whereas Ethereum and Bitcoin, for example, need more than 2 minutes and hour respectively. Another interesting fact is that *no mining involved* in the network. Launched in 2012.

The fifth place goes to Litecoin (see Annex 5).

According to official website litecoin.org Litecoin (LTC)is fully decentralized peer-to-peer Internet currency. It enables on-demand, near-zero cost payments to anyone in the world. Its *simple algorithm* allows everybody, who has computer, to take part in the network. The Litecoin blockchain is capable of handling *higher transaction volume* than its counterpart - Bitcoin. Litecoin network provides a support of large number of transactions without a need to be modified in the future. The Litecoin blockchain is programed to *produce 84 million litecoins,* which is 4 times as many currency units as Bitcoin and allows to *generate every block 4 times faster* respectively. Launched in 2011.

The sixth place holds Dash (see Annex 6).

According to official website www.dash.org Dash (DSH) is the revolutionary digital money system called *Decentralized Autonomous Organization (DAO)* that operated on the base of computer programs and *smart contracts*. Dash has *two-tier architecture* with "masternodes" and miners that helps the network to provide near-instant transactions (usually less than 1 second) and *upgraded anonymity*. The two-tier architecture is used in client-server systems, where the server responds to client requests directly, while using only its own resources. The server does not invoke third-party network applications and does not access third-party resources to perform any part of the request. Block rewards are being equally distributed between both "masternodes" and miners. At the same time 10% of every rewarded block goes to the treasure of DAO to provide development for the network. The innovations of Dash may make this coin much more consumer friendly than other contenders. Launched in 2014.

The seventh place goes to NEO coin (see Annex 7).

According to official website neo.org NEO is a non-profit community-based blockchain project that utilizes blockchain technology and digital identity to digitize assets, to automate the management of digital assets using *smart contracts*, and to realize a "smart economy" with a distributed network. Users of NEO are able to register, trade, and circulate multiple types of assets. The connection

between digital and physical assets is being approved through *digital identity*. Assets registered through a validated digital identity are *protected by law.* Launched in 2016.

The eights place holds NEM coin (see Annex 8).

According to official website nem.io NEM (XEM) is a community-oriented peer-to-peer cryptocurrency, which runs on blockchain called "Smart Asset System". What make it different from the Bitcoin is: *proof-of-importance* (POI) algorithm, which solves the problem of high electricity spending. It allows its clients to work without having a full copy of the NEM system; *Multisignature transactions* that require multiple users to sign a transaction before it can be broadcast onto the blockchain; *Mosaics* – custom assets on the NEM "Smart Asset System", which customer may use to represent lots of simple things: a coin, a signature, a status update or more; *Supernodes system* that rewards people for running high powered nodes that serve light wallets with data quickly and securely; *simple RESTful JSON calls* to an *API* Gateway Server, which makes it easier to create the client apps, or interface servers to the blockchain. Launched in 2015.

The ninth place is being held by Monero coin (see Annex 9).

According to official website getmonero.org Monero (XMR) is a peer-to-peer decentralized cryptocurrency, which is made on the basis of Bitmonero. The next key features make it different from Bitcoin are: *Stealth address* - clients transactions cannot be linked back to them, which makes the system much more secure; *Ring signatures* - each transaction is being covered by digital signatures that obfuscate the amounts, origins, and destinations of all transactions with the Monero coins. Launched in 2014.

The **last tenth place** in the list goes to Ethereum Classic (see Annex 10).

According to official website ethereumclassic.github.io Ethereum Classic (ETC) is a continuation of the original Ethereum blockchain, meaning it has the same capabilities. What makes it different from the Ethereum project is different principle called "Code is Law" that gives users the opportunity to enter into a new blockchain-based jurisdiction where agreements are governed by code. Launched in 2015.

To keep the main features of all crypto currencies structured, it might be useful to create a comparison among Bitcoin and its closest contenders my market capitalization in the form of Table 2.

Table 2. Comparison between key features of Bitcoin and his main competitors-altcoins

№ of feature	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Bitcoin	No double-spending problem	Trust guarantee	Blockchain - the core technology	Peer-to-peer payments worldwide	Decentra-lized	Low transation fees	Anoni-mity	Global availability
Key features different from Bitcoin								
Ethereum	Webplatform to create blockchain applications	Smart contracts	Being used in multiple industries	"Ether" fuels the network	-	-	-	-
Bitcoin Cash	On Chain Scalability	New Transaction signatures	Emergency Difficulty Adjustment	-	-	-	-	-
Ripple	Global adjustment network	Operates with any store of value	Is being used by many institutions	No mining in the network	-	-	-	-
Litecoin	Simple cryptography technology	Higher transaction volume	84 million litecoins supply	4x faster block generation	-	-	-	-
Dash	Smart contracts	Two-tier architecture	Upgraded anonymity	Decentralized Autonomous Organization	-	-	-	-
NEO	Smart contracts	Digital identity	Assets protected by Law	-	-	-	-	-
NEM	Proof-of-importance algorithm	Multisignature transactions	Supernodes system	Simple RESTful JSON calls to API	-	-	-	-
Monero	Stealth address	Ring signatures	-	-	-	-	-	-
Ethereum classic	Webplatform to create blockchain applications	Smart contracts	Being used in multiple undustries	"Ether" fuels the network	-	-	-	-

Source: created by author on the basis on information from the official top-10 cryptocurrencies websites

In summary, there are more than 1250 cryptocurrencies today. In this subchapter top-10 cryptocurrencies by market capitalization as of 4th, November 2017 were analyzed. Altogether they objectively represent the condition of cryptocurrency industry as long as they have highest market capitalization. All their unique features were identified and structured in the form of comparison table. Gathered data will be used in practical part while creating the guidelines for investing in cryptocurrencies.

1.3 Peculiarities of cryptocurrencies

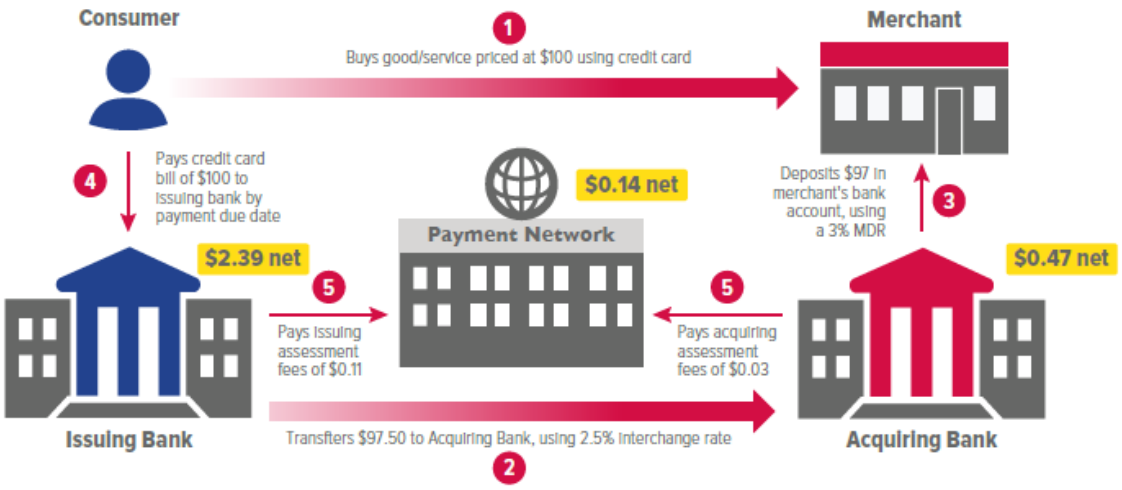
With the early appearance of Bitcoin and his various progeny in form of altcoins, lots of questions appeared regarding their advantages and risks. However, today it is possible to find common points of views regarding this topic among large number of scientists or even institutions.

The key cryptocurrencies advantages will be presented in the following list.

1. **Low transaction fees and speed of payments.** According to (Nakamoto, 2008) Bitcoin was created exactly to provide such a kind of innovations. These key features allows people from all over the world to work without any kind of "intermediaries" like banks, corporations, brokers, lawyers and others that have always increased the fees of already costly transactions. Today customers and corporations have options whether to use instant payments and pay a little extra for the time saved or have a little or even no fees for the transaction that takes longer time, everything depends on the type of cryptocurrency that is going to be used. People are able to pay with cryptocurrencies anytime, anywhere to everybody they want to (Antonopoulos, 2017; Grinberg, 2011; W. Moore & Stephen, 2015).

A great example may be the case, when an expat from Philippines that works in U.S is trying to find an option how to send earned money to his relatives: money-transfer company like Western Union, SWIFT transaction or Bitcoin transaction. If he chooses among 1st or 2nd option, the transaction will be proceed in 3-5 days only with the total commission rate of 5-10% of the sum, whereas using 'ABRA' app, for example, it will take him a few seconds to transact willing amount of money to the family in Bitcoins with the total cost of 2% from the sending amount (Tapscot, 2016).

2. **Global settlement with commercial benefits.** The two most important fees in card networks are interchange and merchant discount rate (MDR) (see Fig. 6).



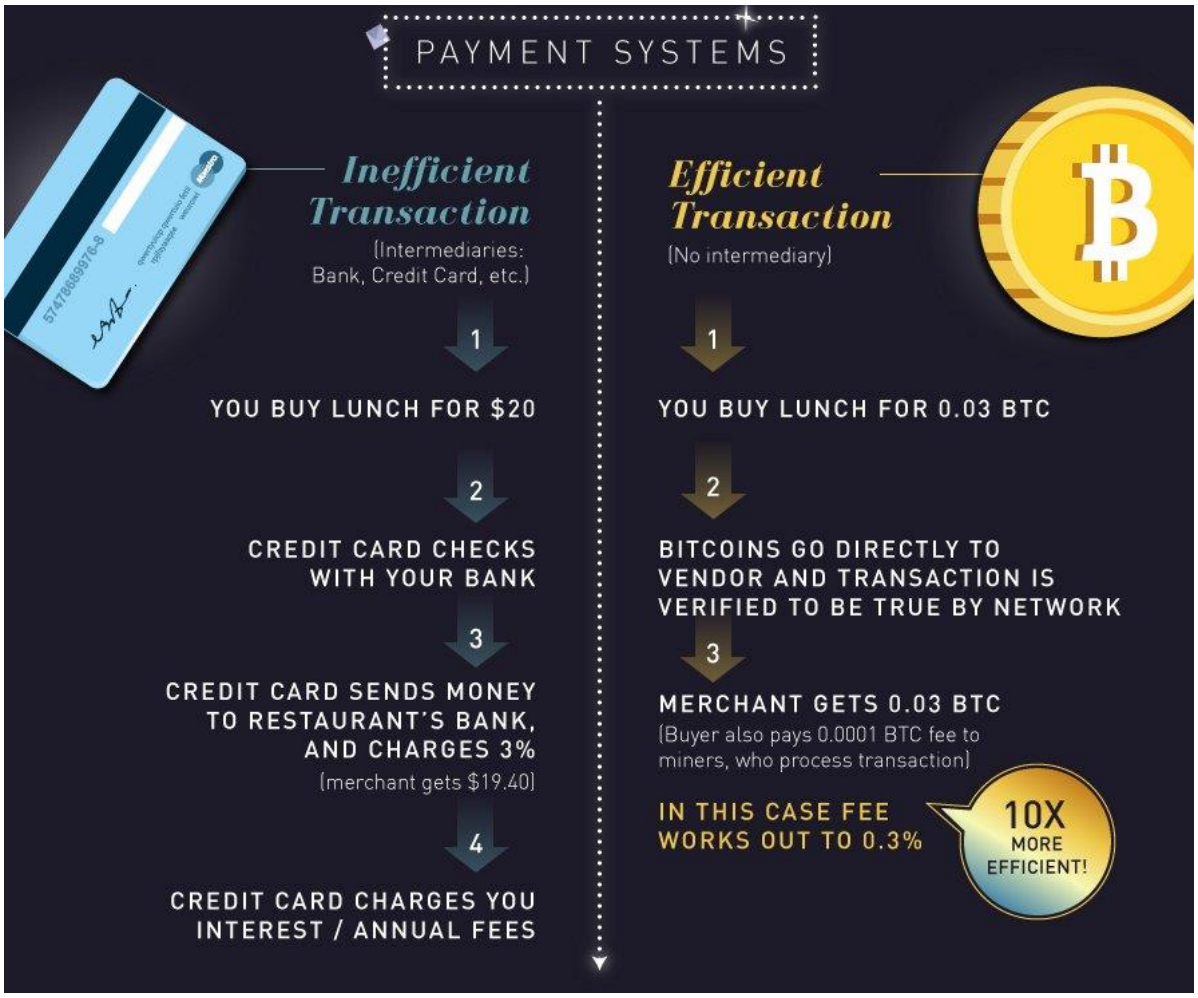
Source: (Saxena, 2014, p. 8)

Figure 6. Card network economics

As its name implies, the MDR is the fee that a merchant pays to accept a card payment

transaction. Often this is a percentage based on the purchase price of the good or service being sold (e.g., 3%) and sometimes includes a fixed fee for each transaction (e.g., $0.20) (Saxena, 2014, p. 8).

According to Figure 7 we can see that using credit card network merchants are keeping unwilling losses. However, with commercial benefits that Bitcoin and altcoins blokchain holds - the minimal transaction fees in comparison with credit card payment method open great opportunity for merchants that have low margin rate to keep bigger profits (see the example in Fig. 6) (Harvey, 2015; Nasdaq, 2017).



Source: http://tabletsandtech.com/116/bitcoin-vs-visa-transaction-fees/. Seen on: 5th, November 2017

Figure 7. Bitcoin vs. Visa - Transaction fees

As it may be noticed from Figure 6, in local example, using Bitcoin network would be 10 times more efficient than visa credit card network.

Another interesting occasion may be the news from Money 20/20, a yearly conference dedicated to new ways to spend, save, manage, share, borrow and protect money.

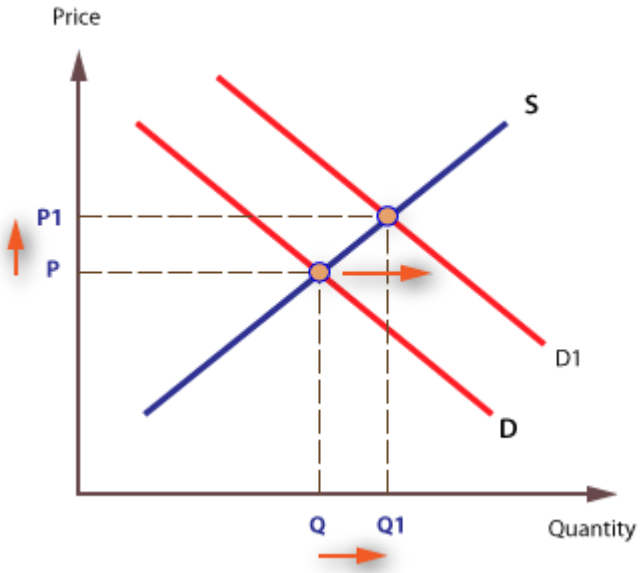
In the Ocotber 2017 it organized the race between 5 participants to test 5 payment types: Bitcoin, Gold, cash, contactless smart phone and chip and pin. Contenders had to make a short travel and get

from Toronto, Canada to Las Vegas, Nevada in 7 days to the date of conference opening. To many conference participants' surprise Bitcoin won the race (Money20/20, 2017).

Another benefit feature is that cryptocurrency network allows people from developing countries that do not have bank accounts, to access the blockchain network with mobile phones and run financial transactions at micropayment level in amounts less than 1 Dollar cent (Harvey, 2015; Poon & Dryja, 2016).

3. User control and inflationary nature of cryptocurrencies. The efficiency of cryptocurrencies network lays in its "push" mechanism that makes it possible for network participants with their private keys of owned cryptocurrency wallets to send only needed amount of money for goods and services to the merchant instead of all data about their identity like physical address and names. On the opposite side, credit card network force them to do so (Nian & Chuen, 2015; Rosic, 2016).

Another useful feature for economics may be the inflationary nature of cryptocurrencies. It is because of their programed fixed supply. Unlike fiat currencies that may be managed by governments and central bank's monetary and fiscal policy decisions, Bitcoin, for example, have a limited supply of 21 million Bitcoins. With the increasing demand not only from people but institutions as well, the price will keep growing with the high probability point (see Fig.8). It may be explained by the macroeconomics theory (Farell, 2015; Rotman, 2014).



Source: www.economicsonline.co.uk/Competitive_markets/Market_equilibrium.html

Figure 8. Demand shifts right

According to Adam Smith book 'Wealth of nations', the exceeding demand over fixed supply leads to the increasing of the price of the good. This leads to the conclusion that having bought Bitcoin or altcoin today, in theory, it will be beneficial for owner to spend it in the future as long as the value of crypto currency as a medium of exchange will be higher, because its supply is always fixed, which

means it is inflationary.

The main risks that crypto currencies hold will be presented in the following list.

1. **Lack of the regulation.** With the appearance of cryptocurrencies network its anonymous feature opened the door for criminal world for money laundering, fraud and theft. It may be shown up in variety of forms: stealing blockchain users' wallets, attacking local group of people or even the whole infrastructures with the use of malware and botnets (Brown, 2016; European Central Bank, 2012).

Inability of governments to track the activities in the cryptocurrency network brought new cases of unprecedented hackers attack. In summer 2017 according to Ukrainian news website www.segodnya.ua there was a massive hackers attack on more than 60 countries with the ransomware virus that made a total loss of 8 billiard dollars. The virus was blocking computers with the claim that a sum of 300$ in Bitcoins should be send to the encoded address in order to get the keys to unlock files.

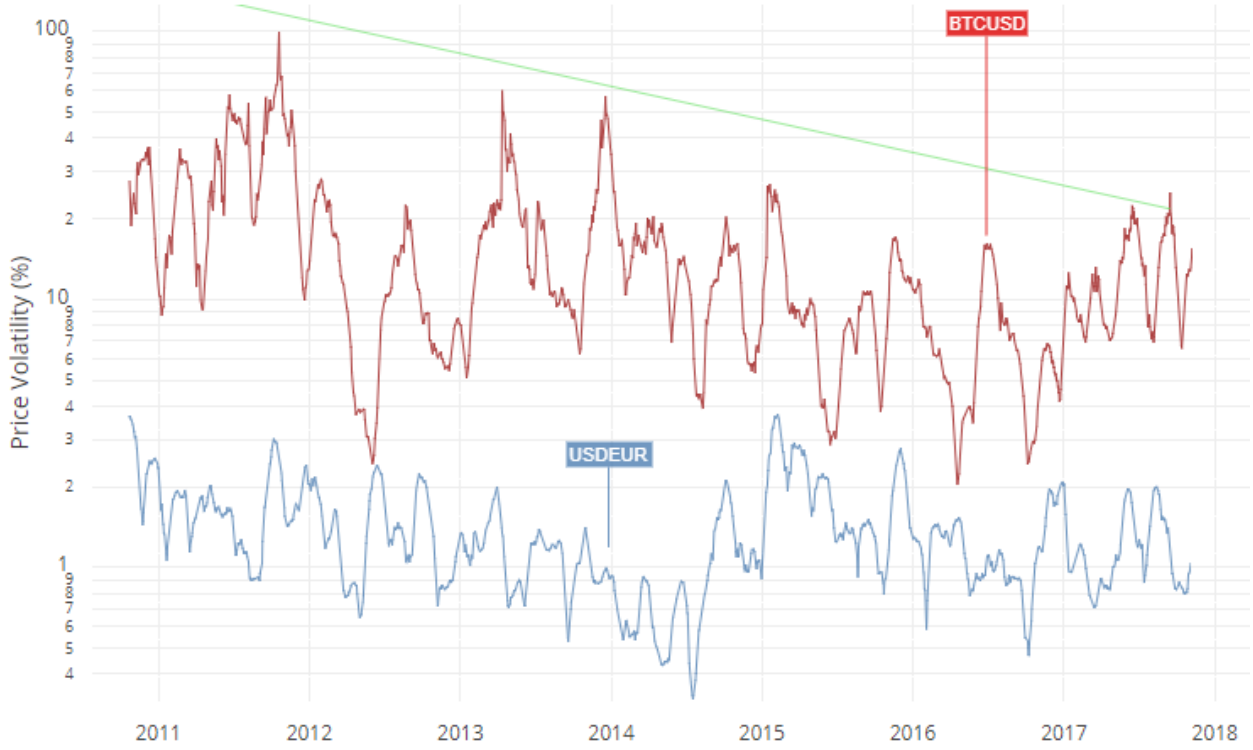
2. **Low level of buyer protection.** According to the nature of Bitcoin and other cryptocurrencies all transaction made in the blockchain are irrevocable, which means that if a person chooses wrong address to send coins, his money won't be back, unless receiver will send it back. The same final may occur, if the person loses his key for the wallet. At the same time, to make this risk lower, some companies accepting traditional electronic payments in return for bitcoin may require purchaser to prolong identity verification and trustability checks, which lasts for several days or weeks (Antonopoulos, 2017; Bonneau et al., 2015).

3. **Store of value.** Cryptocurrencies have very high time series volatility and is being traded for different prices on large number of exchanges without a centralized price aggregation mechanism. These price fluctuations may cause a substitution effect, when demand vector is being changed to other cryptocurrencies (Gandal & Halaburda, 2014; Ramis, Sherwin, & Pantoja, 2016, p. 5).

High price volatility makes it difficult to keep cryptocurrencies as a store of value. Usually after merchants accept cryptocurrencies as a medium of exchange, they convert them into traditional currency very quickly in order to avoid unwilling losses (Nian & Chuen, 2015).

However, price fluctuations may open a great opportunity for investors to put crypto currencies into their investment portfolio (Tchir, 2017).

In the following Figure 9 it may be seen how sharp volatility of Bitcoin is comparing to EUR/USD forex pair.



Source: created by author with the help of https://plot.ly and http://woobull.com/

Figure 9. Bitcoin vs. EUR/USD 60-Day volatility

According to the found data it may be noted that the maximum volatility rate for Bitcoin was 100% in October 2011, whereas EUR/USD had less than 3% at the same month. Going further, it may be seen that Bitcoin volatility index is keeping higher for the whole analyzed period, which makes it difficult not only to keep Bitcoin as a store of value, but as unit of account as well.

4. Unit of account. All traditional money has this feature. It means that it has an ability to measure the value of goods or services like kilograms measure the weight of things. When it comes to Bitcoin or other cryptocurrencies such a problem appears that it is too hard for customers to percept the prices in Bitcoins, for example, and it is too expensive for merchants to make recalculations of the goods prices due to high day-today volatility of the digital currency (Alvseike & Arne, 2017; Yermack, 2015).

If the price for milk in the shop was shown as 0.0002103 BTC, which is equal to 1.5$, the customer would probably be confused. Going further, if some good news raises price of Bitcoin, just for example, in 12%, the merchant will need to make the recalculation, get a new price 0.0002103*1.12=0.0002355 BTC and make a new price ticket. In this example only 1 product was analyzed. It can be hardly imagined, what it would look like, if merchant was going to refresh the prices for all goods in his store.

In summary, in this subchapter main peculiarities were analyzed. A conclusion may be done that cryptocurrencies are not functioning as traditional money, being at the same time accepted as a medium of exchange. Digital currency seems to have a great potential to change the electronic

payment system, being at the same time attractive in sense of investment asset. However, its ambiguity provides a range of risks for blockchain users or even institutions like banks or governments.

1.4 Factors influencing the price of Bitcoin

As long as there are several groups of factors that are influencing Bitcoin price, we will analyze them step by step.

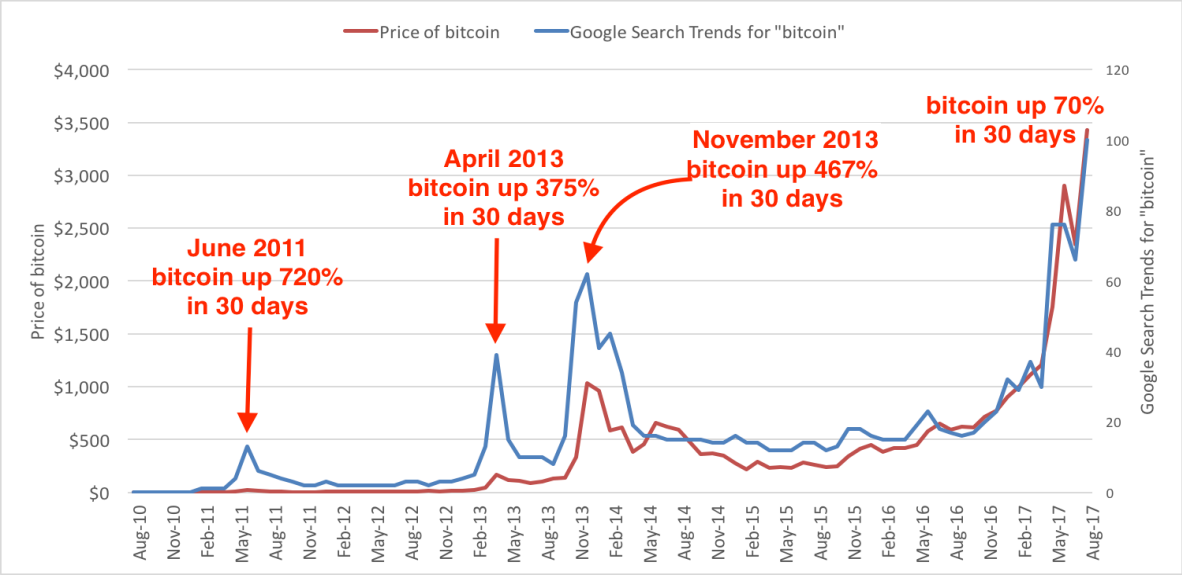
1.4.1 Psychological factors

1. Investors' attractiveness in form of search queries

It is impossible to investigate Bitcoin price formation with standard supply and demand economic theories that form the price formation of traditional currency. It is explained by the fact that Bitcoin is fully decentralized and thus is separated from the real economy. Going further, supply and demand ratio for Bitcoin is driven by speculative behavior of investors as long as there is no interest rate for the cryptocurrencies, which leads to the conclusion that profits can be earned only from price changes (Kristoufek, 2013).

According to (Ciaian et al., 2016; Garcia et al., 2014; Kristoufek, 2013, 2015) Bitcoin's growing popularity stimulates higher search volumes, which, as a sequence, leads to increased social media activity regarding the topic of Bitcoin.

The early adopters of growing public attention are dominated by speculators, trend chasers, short-term investors and noise traders. The cryptocurrency industry, therefore, is being driven exceptionally by the investors' faith in the eternal growth (Kristoufek, 2013).



Source: https://ei.marketwatch.com//Multimedia/2017/08/15/Photos/NS/MW-FS398_BTCGOO_20170815143702_NS.png?uuid=ba9b6ff0-81e8-11e7-b5f4-9c8e992d421e Seen on: 8th, November 2017

Figure 10. Bitcoin price vs. Google trend search queries

This 'faith' for bullish Bitcoin price trend was analyzed with the Google Trends data and frequency of visits on the Wikipedia page on Bitcoin. As a result, strong bidirectional relationships between the Bitcoin prices and searches were found. In fact, not only the search queries influence the prices, but also vice versa. It was defined that, if the prices are above trend, the raising interest forces the prices further atop. On the other side, if they are below the trend, the raising interest rate pushes the prices even lower. That leads to the conclusion that 'investors' attractiveness has a considerable role in interpreting Bitcoin price formation (Bouoiyour & Selmi, 2015; Garcia et al., 2014; Kristoufek, 2013, 2015).

Also (Kancs et al., 2015) states that the strong impact of Wikipedia views on Bitcoin price may be an indicator of speculative short-term behavior of investors.

According to Figure 10 it may be noted that Bitcoin have a belated reaction to the splashes of information demand (or spikes). In the year 2011 after the spike appeared, in 30 days Bitcoin rocketed its value by 720%. Respectively in 30 days, in April 2013 – up to 375%, in November 2013 – up to 467%, in middle of February – up to 70%

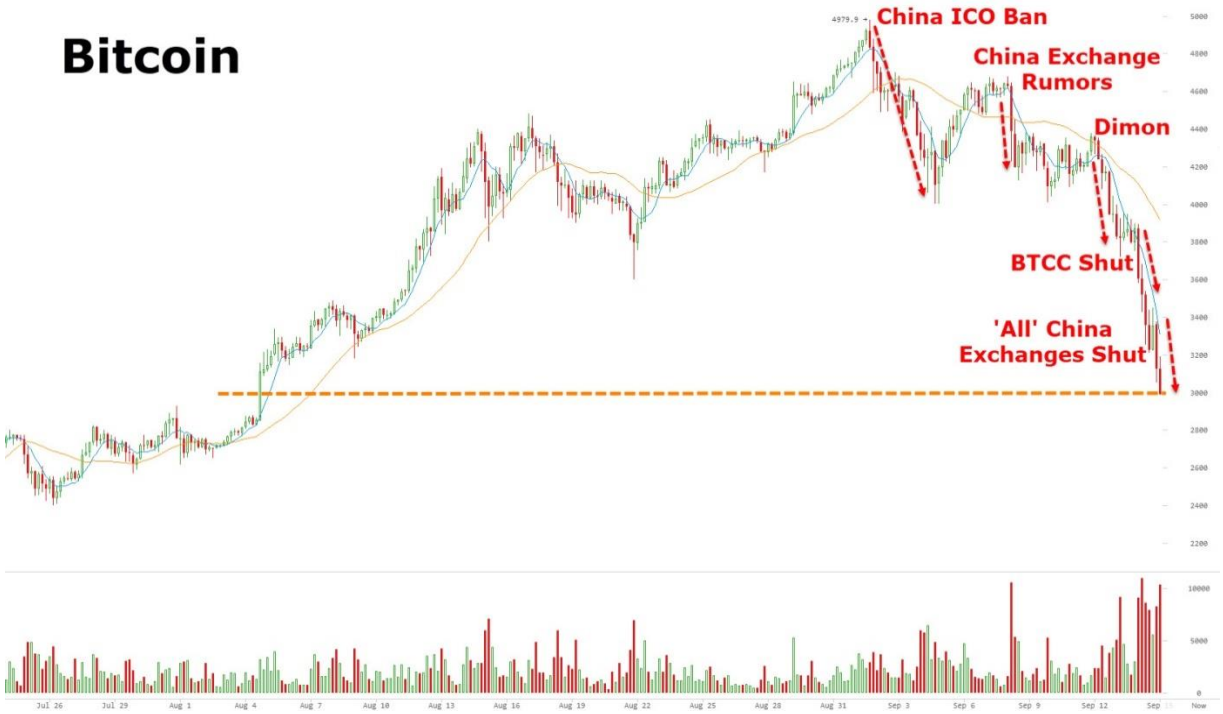
Spikes in bitcoin information demand seem to correspond with major events. It is a natural response from investors willing to reduce the obliqueness caused by the event. User search activity reacts faster to bad news, such as a security violation in a Bitcoin exchange, than price. In this regard, search spikes are early indicators of price drops (Garcia et al., 2014; Puri, 2016; Tjernstr & Stråle Johansson, 2014).

2. The factor of news

It is possible that temporal correlation between search volume and price is provided by the media, which reports on increases of price, thereby boosting users' interest and affecting their search activity. Appearing news impacts Bitcoin price positively, which could be a result of an increased trust among searchers' community (Garcia et al., 2014; Kancs et al., 2015).

Public information that is provided by product market advertisements tends to be very important in investor decisions. If advertising promotes the beneficial features of assets to new users, it may also affect the demand for this asset. The more investors are feeling confident in their ability to identify an instrument worth of investment, the more they are interested about the asset and its industry (Grullon et al., 2004).

. While they do not purchase every asset that catches their attention, they buy a few of those that they are not familiar to. Such emotional decisions may temporarily inflate an asset price, which will lead to disappointing following sequences (Barber & Odean, 2008).



Source: http://ift.tt/2wfPWMt. Seen on: 8th, November 2017

Figure 11. Bitcoin reacts on news form China

These theories may be proved by the reaction of Bitcoin price on bad news from China Government in September 2017 about shuttering down their exchanges (see Fig.11). As a result Bitcoin fell in price by 40% from 5000$ to 3000$ in just 2 weeks. After this pullback Bitcoin continued to scrap higher and made a new historical maximum of its price almost $8000 in less than 2 months after. That leads to the conclusion that governance plays a short-term role in Bitcoin price formation, but from news perspective, because Bitcoin ecosystem shows its power over it.

In summary, empirical results of mentioned authors have a common positive opinion regarding significance of investors' attractiveness in form of search queries in Bitcoin price formation. The factors were tested with the analysis of Google Trends data and frequency of visits on the Wikipedia page on Bitcoin. As a result, strong bidirectional relationships between the Bitcoin prices and searches were found. That leads to the conclusion that 'investors' attractiveness has a considerable role in interpreting Bitcoin price formation

News factor has a positive evaluation as well, because it may be recognized as advertisement for investors about existing asset, Bitcoin. The more investors are feeling confident in their ability to identify an instrument worth of investment, the more they are interested about the asset and its industry. The majority of investors are buying only those assets that have recently caught their

attention. Such a behavior may temporarily inflate an asset price, which will lead to disappointing following sequences

1.4.2 Economic factors

According to primer scientific literature review, there have been discussed only two types of Economic factors that may influence the price if Bitcoin.

1. Global macroeconomic and financial development

According to (Palombizio & Morris, 2012; van Wijk, 2013) the main role of Bitcoin price formation goes to financial development and global macroeconomic.

Van Wijik (2013) states that the value of macroeconomic and financial indicators on the leading cryptocurrency price is working through several main financial indicators: the Dow Jones Index, the euro-dollar price index, and the oil price, which altogether have the strongest impact on the price of the Bitcoin in the long term period, are related to the U.S. economy and therefore should be analyzed closely when investing in the Bitcoin. Besides, the Dow Jones Index has an impact on the Bitcoin price in the short term period.

Palombizio & Morris, (2012) from their side agree that oil price is one of the leading Bitcoin price indicators. When the oil price trend is being changed, Bitcoin price may catch the attention of investors.

However, Kancs et al., (2015) empirical studies do not agree that the global macro-financial development may be affect Bitcoin value. Once supply and demand variables and investors interest in Bitcoin was tested, the impact of global macroeconomics and financial development became statistically minor. It is explained by the fact that macroeconomic trends are not reflected in Bitcoin price movement, which makes it hard to hedge its price volatility.

At the same time Ciaian et al., (2016) found out that financial indicators provided by Van Wijik, (2013) have an impact only on a short-term period. On the other side, in the long-term perspective they do not have an impact on the Bitcoin price.

2. Bitcoin supply and demand

According to (Buchholz et al., 2012) the significant indicator of Bitcoin price formation may be its supply and demand. The cryptocurrency supply defines such amount of units in circulation, which creates a deficit on the market. Bitcoin demand is mainly defined by the rate of Bitcoin use in exchanges (Bitcoin economy), which includes the total number of transaction and addresses used per one day; and the velocity of units' circulation. (Kancs et al., 2015) According to Bouoiyour & Selmi, (2015) the velocity determines at which frequency one unit of Bitcoin is being exchanged for goods and services. Further going, according to quantity, the price of Bitcoin falls with the decreasing of

velocity. In contrast the price of cryptocurrency increases with the usage in exchanges (Kancs et al., 2015).

The empirical results of (Ciaian et al., 2016; Kancs et al., 2015) confirms market fundamentals of Bitcoin have an important impact on cryptocurrency price. Supply and demand are the key factors in defining Bitcoin price stability: the use of Bitcoin in exchange (Bitcoin economy) and the velocity of its circulation, have the most significant impact on Bitcoin price. Considering the fact that supply of Bitcoin is exogenous, in the future the key indicators of Bitcoin price development will be demand drivers.

Kristoufek, (2015) empirical results shew that if it is used more for trading activity, Bitcoin reacts to it in the long run and the raising price forces the exchange transactions in the short run. Another fact is that increasing potential of prices boost demand for the currency at the exchanges. To sum it up, in the long run Bitcoin behaves according to the standard economic theory quantity theory of money, but it is tends to bubbles and sharp falls in the short run.

In summary, the controversial conclusions regarding global economic and financial indicators as important Bitcoin price formatting factors may approve the fact that today there is a disagreement among authors regarding the value of factors: some argue that most U.S. representative indicators like Dow Jones Index, the euro-dollar price index, and the oil price both long- and short run significant impact; other states that they affect Bitcoin price only in short-term perspective; the third group demolishes the significance of theory at all.

On the other side, the significance of supply and demand role in Bitcoin price formatting was tested and confirmed by a variety of authors, who states that Bitcoin use in exchange and its velocity in circulation have the most significant impact in Bitcoin price formation.

1.4.3 Technological factors

According to primer scientific literature review, there are 2 types of technological factors that may influence the price if Bitcoin.

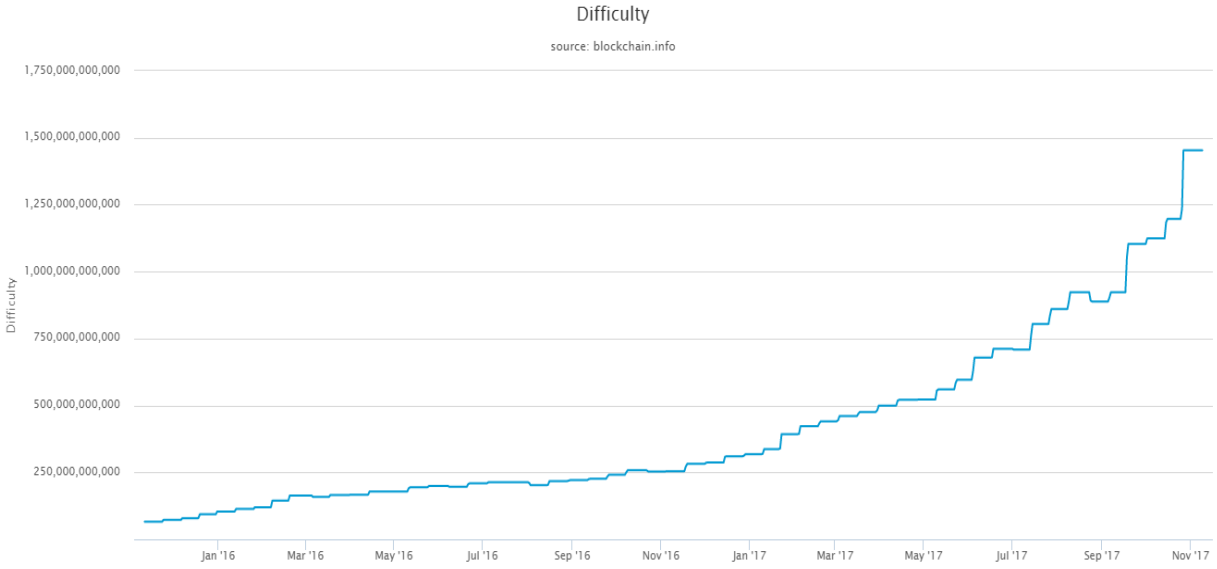
1. Bitcoin system difficulty

Network difficulty represents the current computational power of the Bitcoin system measured in hashes. The difficulty, therefore, is provided by minimal needed computational efficiency of network users. On the other side, the hash rate reflects another measure of system productivity, which is represented in the system difficulty. The network difficulty is recalculated every 2016 blocks of 10 minutes, which is almost two weeks (Kristoufek, 2015)**.**

As miners update the block chain, their computational efforts carry significant costs. In particular, the computerized proof-of-work calculations consume more than 173 megawatts of

electricity unceasingly, which is approximately $178 million per year averagely comparing to US residential prices for electricity. These computational costs have been growing stably. As more miners join the Bitcoin system, the network puzzles automatically become much more difficult, complicating computing and electricity requirements (Böhme et al., 2015)**.**

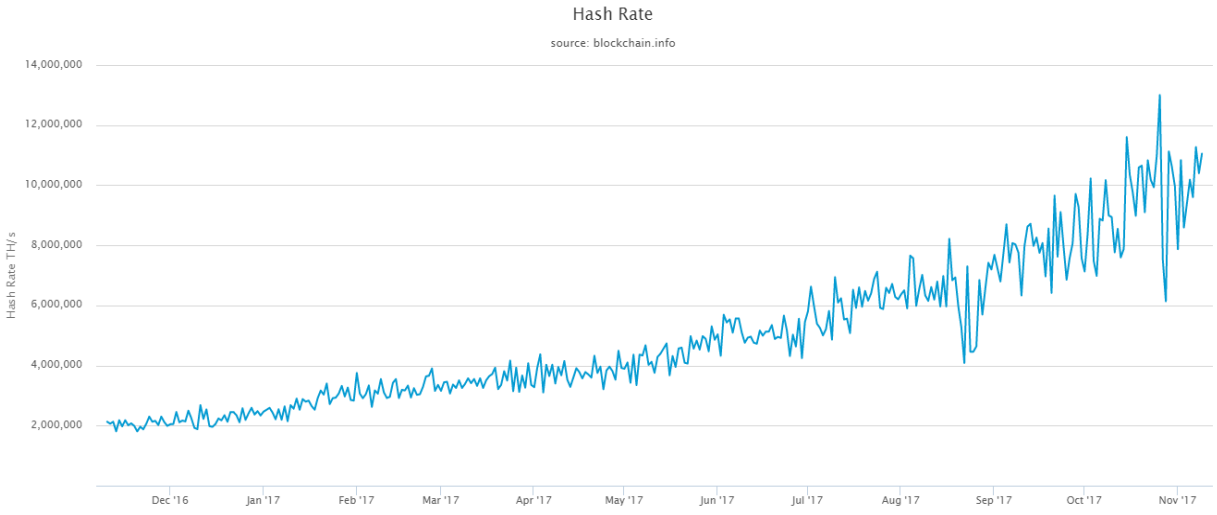
Bitcoin network difficulty may be visualized with the Figure 12 that represents the upward trend. It may be seen that for the last two years network difficulty has been increasing stably.



Source: blockchain.info. Seen on: 10th, November 2017

Figure 12. Bitcoin network difficulty trend

On the other side, Figure 13 shows that Hash Rate upward trend has high volatility periods in its formation.



Source: blockchain.info. Seen on: 10th, November 2017

Figure 13. Bitcoin network Hash Rate trend

According to (Taylor, 2013) there is a relationship between the use of Bitcoin in exchange with mining profitability. During the drops, less energy efficient miners are disconnected from the network,

and the difficulty lowers as a result, and the opposite is true. Bitcoin machines have a very attractive value proposition: miners purchase the machine; it makes them lots of money.

Mining, hence, can be seen as a type of investment in cryptocurrency. The potential owner of machine invests in the hardware and gains the Bitcoin units indirectly through mining. Two possible effects are present there. The raising price of the Bitcoin can stimulate market participants to start investing in mining, which leads to an increased hash rate higher difficulty as a result. In contrast, the increasing difficulty and hash rate lead to increasing cost demands for hardware and electricity. That force miners to leave the mining pool. Those miners, who formerly mined Bitcoins can become Bitcoin purchasers and thus increase demand for cryptocurrency. This, as a result, may increase the Bitcoin price (Kristoufek, 2015).

In addition, empirical results of (Hayes, 2017) shew that due to technological progress mining efficiency increases. In turn, it lowers the cost of production and shows negative effect of pulling price down. In contrast, the additional hashing power added to the global mining network has a tendency to increase the mining difficulty, which is positively reflected in the price. The question is which factor is dominating: technological improvements that increase energy efficiency or the mining network difficulty.

Another question appears what will happen to Bitcoin price after the producing of the last Bitcoin. According to Kancs et al., (2015) the current algorithm shows that it will happen in the year 2140.

2. Bitcoin system security

Considering the fact that Internet is a vital part for Bitcoin transactions, cyber-security may be its main challenge. Cyber-attacks have a power to lead Bitcoin to its collapse. Being a digital currency, Bitcoin is more pregnable to cyber-attacks comparing to fiat money. Bitcoin has different characteristics comparing to traditional currencies in modern economies. Cryptocurrency cannot be stored in a bank, and instead. Users of a system are forced to keep their digital currency savings in “digital wallets” that have both high expenses maintain and vulnerable to hackers-predators. Besides, no form of insurance is proposed for owners of Bitcoin units, which seems to be a different world comparing those conditions that are hold by banks most economies (Ciaian et al., 2016; Yermack, 2015).

The interesting fact show empirical results of (T. Moore & Christin, 2013) work: authors tested 40 Bitcoin exchanges and found out that 18 of them were shut down after cyber-attacks.

A good example of cyber-attack victim may be once the world’s biggest cryptocurrency exchange, MtGox. It collapsed in February 2014 and created a total loss of 850 thousand Bitcoins. Which is equivalent to the $765 million U.S. Dollars as of Bitcoin price before the fall $900 per one unit.

The reaction of Bitcoin price to cyber-attack may be seen on the Figure 14.

Source: https://coinreport.net/wp-content/uploads/2014/03/mtgox-rise-and-fall.png. Seen on 10th, November 2017

Figure 14. The rise and fall of MtGox exchange

Such a reaction leads to the conclusion that bad news about Bitcoin network system security like cyber-attacks may reduce investors' interest in Bitcoin, which leads to the fall of an asset price.

In summary, empirical results of mentioned authors have a common positive opinion regarding importance of Bitcoin network difficulty: Hash Rate (or energy efficiency) that has a tendency to stimulate the increase of Bitcoin price and the size of mining network (or its difficulty) that due to increasing mining efficiency turns it lowers the cost of production and shows negative effect of pulling Bitcoin price down. However, it is not clear today which factor will outrun another.

The factor of Bitcoin network security plays a role in price formatting as well. Due to its digital nature, Bitcoin is highly vulnerable to the threats like cyber-attacks that lead to dramatic drops in Bitcoin price .Such dips may scare away potential investors that in turn will decrease their demand for the asset, which will lead to the decrease in Bitcoin price.

2 THE METHODOLOGY OF THE IDENTIFICATION OF THE FACTORS INFLUENCING THE PRICE OF CRYPTOCURRENCIES

2.1. Research methodology

Problem of the research. Bitcoin price formation factors play crucial role in making investment decisions in cryptocurrency industry and today there is a common opinion exists about which factors have an influence on Bitcoin price. However, the degree of factors' importance seems to have a research gap as long as it does not determined by scientific literature.

The object of the research. Factors influencing the price of Bitcoin.

Goal of the research. With the help of expert evaluation, to figure out the most important factors in Bitcoin price formation; to interview competent investors in financial markets in order to get an accurate scheme for risk management and diversification of investment portfolio, estimate the potential price of Bitcoin for the end of 2 months: December 2017 and January 2018

The tasks of the research:

To perform the survey of experts' evaluation that will help to identify the most important factors in Bitcoin price formation.

To perform an interview with the representatives of financial markets, in order to get an accurate scheme for risk management and diversification of investment portfolio.

To estimate the potential price of Bitcoin for the 2 months: December 2017 and January 2018.

Both qualitative and quantitative methodology was applied to solve the problem of the research

Qualitative research methods were chosen as long as it allows examining respondents experience in detail, while using such a specific set of research methods as focus group discussions, in-depth interview, observation, expert evaluation and more. The main feature of qualitative research is that it allows to identify challenges from the perspective of given study participants. That provides the researcher an opportunity to understand the meanings and interpretations that respondents give to behavior, objects or events (Hennink, Huttler, & Bailey, 2011).

Quantitative research method was chosen as long as it involves the gathering of data so that information can be quantified and subjected to statistical processing in order to make prognostication (C. Williams, 2007).

2.2. The methodology of expert evaluation

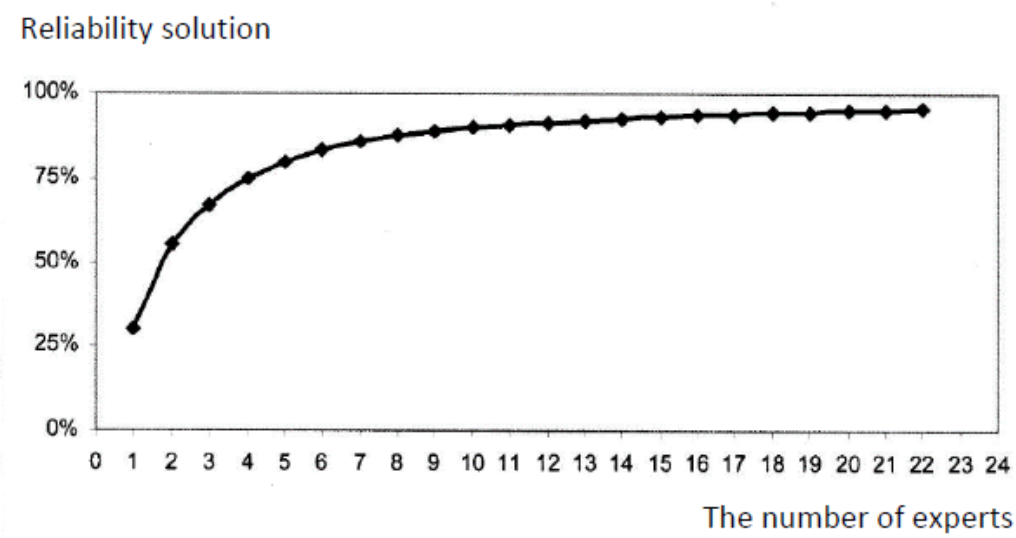
The method of expert evaluation is one of the most widespread insights methods that are being used to close defined knowledge gap. This procedure allows to combine opinions of individual experts and to formulate a joint solution (Benini et al., 2017; Burinskiene & Rudzkiene, 2009).

According to (Burinskiene & Rudzkiene, 2009, p. 14) an expert (lat. *expertus* - experienced) is a source of quality information that has accumulated a large amount of rationally processed information, meaning he has enough experience and knowledge and may count on his intuition.

In their studies Burinskiene & Rudzkiene, (2009) mentioned (Bardauskiene, 2007), who states that there is a wide range of methods applied to receive estimations by experts. In some cases an expert is being involved individually, sometimes without even knowing that he/she is supporting research as an expert. Such conditions help to avoid an impact of known authorities' opinion. In some scenarios experts are gathered together and discuss a case, evaluate the expressed reasoning and discard the wrong one. In some cases the total amount of experts is strictly constant and calculated.

In their studies (Remeikiene & Gaspareniene, 2017) stated that requirements of experts selecting range may lay between 5-100 experts depending on the main aim of the case and the competence of experts, whereas mentioned in their research authors (Libby & Blashfield, 1978) proved that small expert groups may be as good in their judgements accuracy as large groups of experts. The optimal number of experts suggested is lying between 5-9 persons. If the accuracy provided by 5-9 experts is uncertain, it would be appropriate to enhance competence of participants rather than to increase their quantity within a group.

The described impact of the number of experts on reliability of evaluation may be seen on Figure 15.



Source: Remeikiene & Gaspareniene, (2017), p.158

Figure 15. The impact of the number of experts on reliability of evaluation

2.2.1 Expert selection criteria

According to scientific literature, (Benini et al., 2017; Remeikiene & Gaspareniene, 2017) refer to the importance of experts' competence, which may be expressed in their objective knowledge in the researched topic, professional creativity, thinking flexibility, reliability and much more. Hence, this research was focused not on the survey volume, but on the professionalism of experts: their experience in researched area, their competence in the thematic of cryptocurrency industry. Considering the mentioned standards, 14 people were included in the expert group.

In order to obtain objective results of empirical research and define the significance of each analyzed factor in Bitcoin price formation, accurate expert portrait was defined. It was decided that the most important selecting criteria of experts in this concrete case are:

- an expert can objectively represent the cryptocurrency industry, meaning he has relevant knowledge about Bitcoin blockchain ecosystem;
- an expert current experience in the topic of cryptocurrencies is at least 1 year.

These research limitations were overcome by choosing Snowball sampling. As (Vogt, 2005) states a Snowball sampling (also called network sampling) - a qualitative research method in which one expert gives a link to another one, the second suggests third expert contacts, and so on. This is an especially useful method when there is a need in contacts of people with unusual experiences or characteristics, who probably knows one another.

Another opinion is coming from (Atkinson & Flint, 2011), who state that Snowball sampling technique is an informal approach to get the target group, which helps to define a hidden population. This method is widely used in qualitative research, mostly in an interview. Network sampling method may be used as a more formal methodology for making conclusions about the individuals that are hard to reach in the population, unlike household surveys.

The experts in cryptocurrency thematic were questioned using the Snowball sampling method.

2.2.2 Organization of the survey.

The survey of the experts was performed indirectly (by e-mail, messages in social networks: LinkedIn and Facebook) with the use of online questionnaire prepared in advance (see Appendix 11) with the help of pollmill.com

It was decided to use this website as long as it allows exporting gathered data from survey to Excel and SPSS. Besides, online form of questionnaire allows to safe respondents' time is accessible from mobile phones.

The experts' questionnaire consists of 2 parts.

The goal of **the first part** was to get general information about experts.

In the first question (closed question) experts were asked to indicate their highest level of education. This question is considered to be relevant as long as appropriate level of background increases the trust to the competence of selected experts.

In the second question (closed question) experts were asked what their current experience in the topic of cryptocurrencies is. It was decided to set intervals of 2 years, as long as the topic of cryptocurrencies is relatively new and was set in the year 2009 with the appearance of Bitcoin.

In the third question (closed question) experts were asked if they are using Bitcoins in their business. This question is considered to be important as long as positive answer from expert will increase the trust to the competence of selected expert, because without the use of Bitcoin expert opinion regarding Bitcoin price formatting factors could be hardly objective.

The second part of the questionnaire was dedicated to the defined from literature review factors influencing Bitcoin price formatting, particularly, their significance. It was decided to not include the economic factor of *global economic and financial indicators* in the questionnaire as long as there is no common scientific opinion regarding its role in Bitcoin price formation.

The first question (closed question) is considered to be the key one as long as it was designed to close the scientific gap regarding significance of Bitcoin price formatting factors from 3 perspectives at once: psychological, economic, technological.

The selected experts for this research were to evaluate 7 factors on the scale from 1 to 5 (numerical value 1 - "Totally disagree", numerical value 5 - "Totally agree". Depending on the opinion's strength, the experts were able to choose the intermediate numerical values 2, 3 or 4.

As long as some of the factors have specific terminology and are extracted from the context of the research from theoretical part, it was decided to provide definitions and mechanics of Bitcoin price formatting of each factor. That helped to exclude potential misunderstandings from experts.

The second question (closed question) was designed to define the potential future of Bitcoin. This question is considered to be important, because Bitcoin is the key cryptocurrency and is the object of this research.

The third question (closed multiple-choice question) was designed to figure out which factors among provided for expert evaluation respondents would check to make investment decisions in Bitcoin. This question is considered to be important, because it will help to create guidelines for investing in Bitcoin.

The fourth question (closed multiple-choice question) was designed to figure out what experts think about potential future of cryptocurrencies industry. This question is considered to be important, because the positive evaluation of the industry opened the opportunities for creating investment guidelines not only in the Bitcoin, but the whole cryptocurrencies industry. Having decided to invest in

the cryptocurrencies industry, the investor should evaluate his investing portfolio, which means that it is necessary to investigate the whole industry to find out, in which ways money can be invested: trading, investing in trading fund, index fund, physical or cloud mining and much more.

2.2.3 The analysis and interpretation of the results.

The data collected during the expert evaluation were analyzed with the statistical program SPSS (*Statistical Package for Social Sciences*) and Microsoft Excel software package. The structure of estimated numerical values was allocated in a special table (see Table 3).

Table 3. The matrix of the results of expert evaluation

Experts	**Factors (V)**					
	1	2	…	i	…	N
1	V_{11}	V_{12}	…	V_{1i}	…	V_{1n}
2	V_{21}	V_{22}	…	V_{2i}	…	V_{2n}
…	…	…	…	…	…	…
J	V_{j1}	V_{j2}	…	V_{ji}	…	V_{jn}
…	…	…	…	…	…	…
M	V_{m1}	V_{m2}	…	V_{mi}	…	V_{mn}
Chronbach's Alpha	For the whole questionnaire					
Kendall's coefficient of concordance, W	For the whole questionnaire					
P-value	V_{p1}	V_{p2}	…	V_{pi}	…	V_{pn}

Source: created by author

In Table 3, **Vjn** represents what level of importance was given by the **J-th** expert to the **N-th** factor in the questionnaire. **Vmn** represens the mean of **N-th** factor in questionnaire and **Vpn** – the significance of **N-th** factor. The data in the Table is structured.

While introducing the results of the expert evaluation, the attention should be focused on interpretation of *Cronbach's alpha* coefficient. *Cronbach alpha* coefficient defines whether the questionnaire precisely reflects the researched object. Some authors, for example, Nunnally & Bernstein, (1994) state that *Cronbach alpha* coefficient should be not lower than 0.7, while other scientists like (Malhorta & Birks, 2006) believe that the critical bound of a questionnaire's reliability is 0.6. Choosing the critical threshold is a subjective matter, and during this process the specific nature of the research study and qualitative aspects may be taken into account. For this empirical study, 0.6 was selected as the lowest value of *Cronbach alpha* coefficient.

Kendall`s coefficient of concordance (W) reflects every statements` importance and concordance of the experts` opinions, has been determined. Kendall`s coefficient of concordance may vary in the

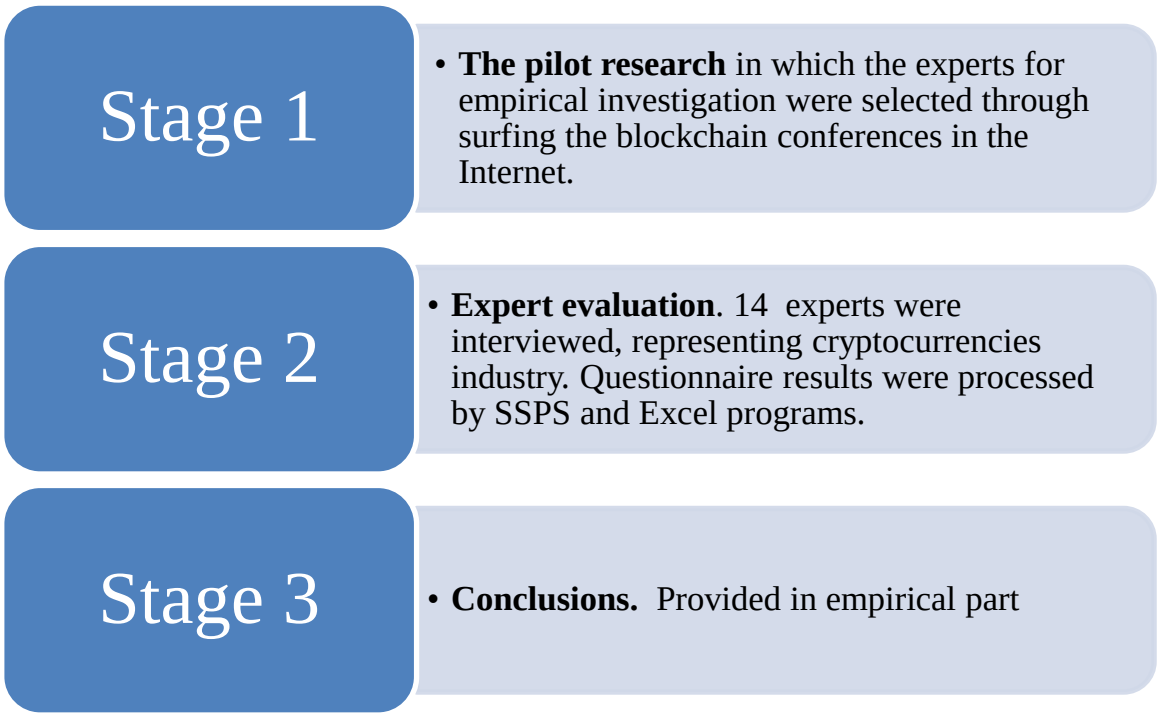
diapason of 0≤W ≤1. The ratio closer to 1 defines that more opinions of the experts concur. If W ≤ 0.6, it is expected that the expert evaluation results are unreliable.

For hypothesis testing, 0.05 was selected as the level of significance. Indicator distinctions were taken statistically significant if p <0.05.

The quality of expert evaluation depends on the expert`s individual level of professional knowledge and the number of participants in the group. Making an assumption that experts competence is high and their responses are adequate, it may be stated that the involving more experts will increase reliability of survey results.

Confirmation or rejection of the hypothesis and development of the conclusions are the final stage of the empirical study. Its accuracy depends on how well the previous steps were done. It is apparent that errors in calculations or wrong conduct of empirical studies may lead to false hypothesis testing results, and mistakenly formulated hypotheses can lead to irrelevance of conclusions.

The logic structure of the research may be seen in Figure 16.



Source: created by author

Figure 16. Expert evaluation empirical research logic scheme

In summary, expert evaluation method was chosen to define the most valuable factors influencing the price of Bitcoin. The methodology of method was presented and it was decided that the range of 5-9 experts will be enough to make an objective research. The most important expert selection criteria were: an expert can objectively represent the cryptocurrency industry, meaning he has relevant knowledge about Bitcoin blockchain ecosystem; an expert current experience in the topic of cryptocurrencies is at least 1 year. The research limitations were overcome by choosing Snowball sampling. Pilot research was done and experts were found on blockchain conferences. 14 experts were

interviewed. Questionnaire consists of two parts: the first part was dedicated to get general information about experts; the second part of the questionnaire was dedicated to the defined from literature review factors influencing Bitcoin price formatting, particularly, their significance. Questionnaire results were processed by SSPS and Excel programs. The analysis and interpretation of the results was presented. Conclusions were done in empirical part.

2.3 The methodology of interview

The term *interview* has a recent origin. It appeared in the seventeenth century. An interview is literally *inter-view* is an exchange of views between two persons having conversation about a topic of common interest. It requires a careful listening approach with the aim to obtain accurately tested knowledge. Sociologists and anthropologists have been using informal interview for a long time in order to obtain knowledge from their informants. For the last few decades an interview became a common research method (Kvale, 2007).

According to Wilson, (2014) there are 3 main interview methods that provide effective and efficient interviews: *structured interviews, semi-structured interviews,* and *unstructured interviews*.

Structured interview is useful for the following:

• Gathering general information about demographics (e.g., years of experience, gender, professional affiliations, education), behaviors (e.g., "how often do you call technical support in each month?"), and relationships (e.g., "who are you working with on a major project?").

• Evaluating knowledge about a held by an individual or group of individuals.

• Obtaining focused information about stakeholders and their opinions regarding a product, process or set.

• Asking specific questions after realizing the broad issues of a certain product, domain, or project.

• Gathering uniform data from a large sample of participants and organizations.

• Comparing results among different groups of users on a fixed set of answers. For example, researcher might want to compare how well different groups of users match on satisfaction scores (Wilson, 2014).

In other words, the structured interview is based on a questionnaire with a range of questions, asked in the same order and way of all interviewees of the research, with little flexibility available to the interviewer. The main aim is for interviewers to gather comparable information from a potentially large number of subjects. This interview method is often subjected to statistical methods of analysis (Edwards & Holland, 2013).

Semi-structured interview is useful for the following:

• Gather opinions, facts, and attitudes.

•Obtain data on topics where the interviewer is relatively sure that the relevant problems have been identified, but still suggests raising new issues that are important to users through open-ended questions.

• Gather data when it is not possible to observe behavior directly because of timing, privacy, hazards, or other factors.

• Understand user goals.

• Gather information about task flow, tasks, and work artifacts such as job aids, best practices documents, forms, equipment, workflow diagrams, photographs, signs, and posters.

• Gather data on complex issues where probing and clarification of answers are required (Wilson, 2014).

In other words, in a classical semi-structured interview the researcher has a list of questions or number of topics he wants to cover in the interview. There is flexibility in how and when the questions are put and how the interviewee can respond. The researcher can probe answers, "hunting" a line of discussion opened up by the interviewee, and a dialogue can be steered. In general the researcher is interested in the context and content of the interview, how the interviewee understands the topic under dialog and what they want to share with the interviewer (Edwards & Holland, 2013).

Unstructured interview is useful for the following:

• Obtain data on general themes rather than specific questions.

• Develop new insights about the user's testing of technology.

• Investigate a new product and find out a sense of first impressions and features that attract the eye of the user.

• Explore a new area where researcher is not certain of the main issues that users and other stakeholders are facing.

• Obtain information on sensitive topics (Wilson, 2014).

In other words, in the unstructured interview the interviewer clearly has aims for the research and a topic of study, but the key feature of the method is to allow the interviewee to talk from their own perspective using their own point of view and ideas and meanings that are familiar to them. Flexibility is the key with the researcher able to answer to the interviewee, to develop unexpected themes and regulate the content of interviews and possibly the accent of the research as a result of issues that turn up in any interview (Edwards & Holland, 2013).

Considering the fact that the main aim of conducted research was to get an accurate scheme for risk management and diversification of investment portfolio, **it was decided to choose semi-structured interview** as long as specific opinion was needed for this topic from experienced participants of financial markets.

2.3.1 Interviewees selection criteria

Primer literature review (King & Horrocks, 2010; Wilson, 2014) shew that the most appropriate way to conduct an interview was to make a **mix among dimensional sampling and purposive sampling**.

Dimensional sampling. Researcher tries to include participants who fit the critical dimensions of his study (time spent as a marketing manager, time using a particular car, experience with a set of mobile apps).

Purposive sampling. Researcher chooses people by interest, qualifications, or typicality (they have a common profile of the types of participants who are likely to be typical users of a product). For example, if researcher is trying to understand how experts in a particular field work on complex projects, you might seek out the "best of the best" and use them for his interview (Wilson, 2014).

In order to obtain objective results of empirical research and get an accurate scheme for risk management and diversification of investment portfolio, accurate expert portrait was defined. It was decided that the most important selecting criteria of interviewees in this concrete case are:

- an expert has an experience of investing in financial markets at least 2 years;
- an expert current ROI (return of investments) is above zero.

Primer literature review (Edwards & Holland, 2013; King & Horrocks, 2010; Kvale, 2007; Wilson, 2014) shew that the best answer for "How many interviewees do I need?" is "As many as necessary to find out what you need to know". As long as the number of interviewees depends on the purpose of the study, it was decided that gathering data from 7 experts, who has a sufficient experience in the field of investments and has positive ROI of their trades.

2.3.2. Organization of the interview

The survey of the experts was performed indirectly (by e-mail, messages in social network: Facebook) with the use of online questionnaire prepared in advance (see Appendix 12) with the help of pollmill.com

It was decided to use this website as long as it allows exporting gathered data from survey to Excel and SPSS. Besides, online form of questionnaire allows to safe respondents' time and is accessible from mobile phones.

The experts' questionnaire consists of 3 parts.

The goal of **the first part** was to get general information about experts:

In the first question (closed question) interviewees were asked what their current experience in the topic of investments is. This question is considered to be relevant as long as it emphasize participants' expert level in the researched topic.

In the second question (closed question) experts were asked to select a range, where their yearly ROI was allocated. This question is considered to be relevant as long as having positive ROI was the second important expert selecting criteria. The higher level of ROI interviewees have, the more important their opinions are.

The second part of the questionnaire was dedicated to the collecting data about main basic rules of risk management and portfolio diversification while investing in financial markets: appropriate seed capital for starting making investments/trades in financial markets *(the questionnaire's 1 question),* the limit (in percentage) of total capital that is appropriate to use at the time *(the questionnaire's 2 question),* which part of his capital (in percentage) investor would keep in one market/industry *(the questionnaire's 3 question),* how many instruments would investor trade at the same time in one market *(the questionnaire's 4 question),* the highest percentage of total capital loss that investor should take while making 1 trade *(the questionnaire's 5 question),* appropriate risk/reward ratio investor (or trader) should seek *(the questionnaire's 6 question),* appropriate leverage that trader should use *(the questionnaire's 7 question),* do interviewees use investment rebalancing of their current long-term position. If yes, how many times per month *(the questionnaire's 8 question),* appropriate percentage of yearly generated profit to reinvest for the next year of investments/trades *(the questionnaire's 9 question),* which yearly ROI should investor be satisfied to achieve *(the questionnaire's 10 question).*

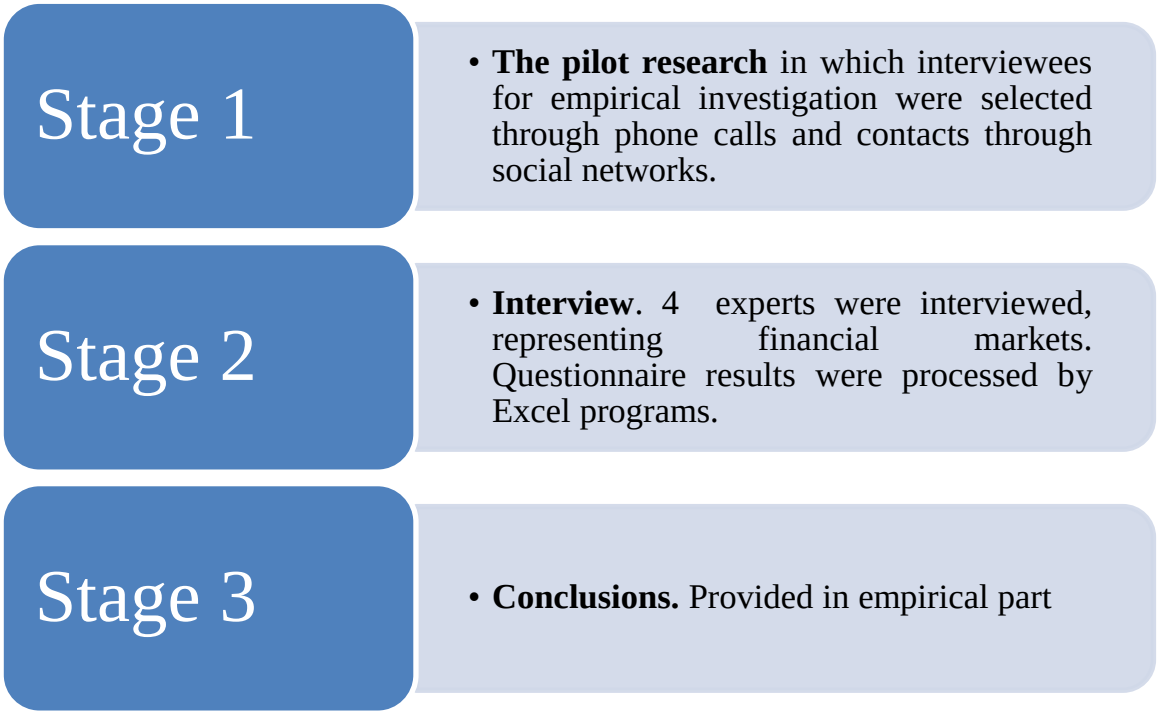
Clarifying question was used in question 2 and 7.

The third part of the questionnaire was dedicated to collecting interviewees' opinions about potential investments in cryptocurrency industry: if expert invested in cryptocurrencies industry, which percentage of total capital he would invest in it markets *(the questionnaire's 1 question),* if expert invested in cryptocurrencies industry, how he would diversify his investment portfolio *(the questionnaire's 2 question),* if interviewee invested in cryptocurrency industry, which leverage he would use for trading *(the questionnaire's 3 question),* how would investor diversify his invested capital in cryptocurrencies industry between conservative trading and aggressive trading (in percentage) *(the questionnaire's 4 question).*

Clarifying question was used in questions 2, 3, and 4.

The results of interview are presented in the final stage of empirical part of the research.

The logic structure of the research may be seen in Figure 17.



Source: created by author

Figure 17. Interview empirical research logic scheme

Summary: interview method was chosen to get an accurate scheme for risk management and diversification of investment portfolio that helped to create an investing guideline in cryptocurrencies industry. The methodology of method was presented and it was decided to choose semi-structured interview as long as specific opinion was needed for this topic from experienced participants of financial markets. The most important interviewees selection criteria were: an expert has an experience of investing in financial markets at least 2 years; an expert current ROI (return of investments) is above zero. It was decided that the most appropriate way to conduct an interview was to make a mix among dimensional sampling and purposive sampling. Pilot research was done and experts were found through phone calls and contacts through social networks. 4 experts were interviewed. Questionnaire consists of 3 parts: the first part was dedicated to get general information about experts; the second part of the questionnaire was dedicated to the collecting data about main basic rules of risk management and portfolio diversification while investing in financial markets; the third part of the questionnaire was dedicated to collecting interviewees' opinions about potential investments in cryptocurrency industry. Questionnaire results were processed by Excel programs. Conclusions were done in empirical part.

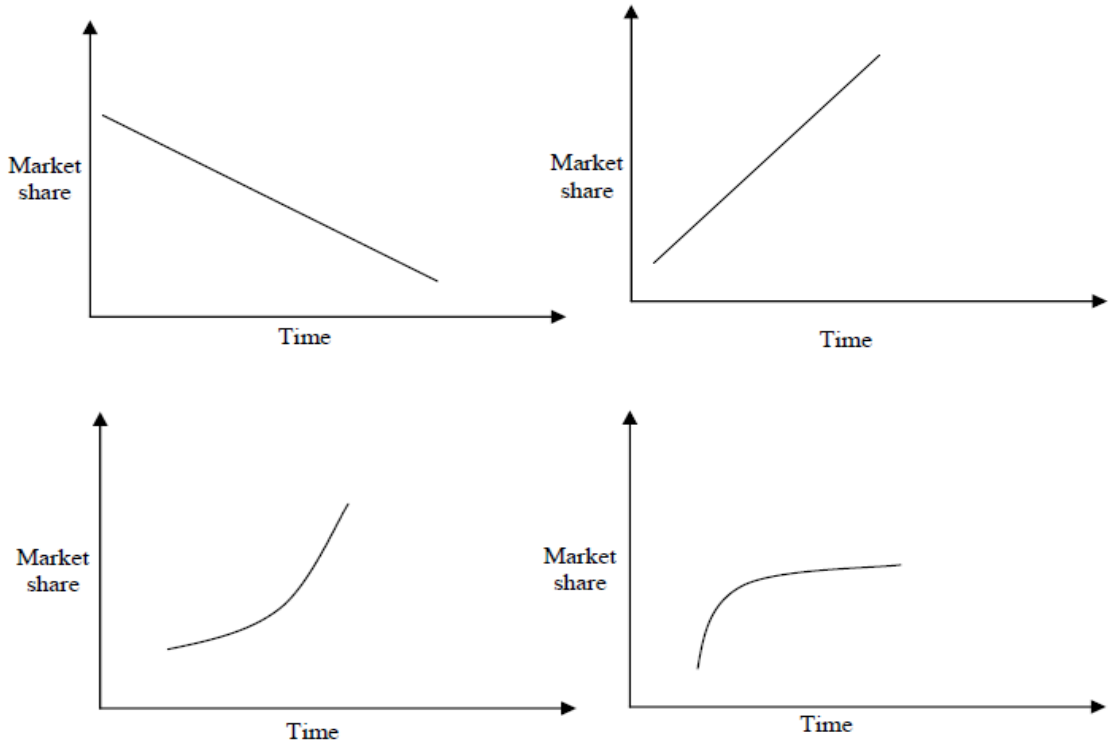
2.4. Methodology of Holt's Exponential Smoothing

This quantitative method is *historical or time series forecasting method*. Quantitative nature of the time series support requires the use of mathematical and statistical models as main forecasting tool. By using such techniques accuracy may be reached for forecasted periods (Ballou, 2004)**.**

Brillinger, (2000) defines time series as stretch of values on the same scale indexed by a time-like parameter.

According to Williams, (2015) there are four components to a time series: the trend, the cyclical variation, the seasonal variation, and the irregular variation. However, there are only 2 most important of them that should be defined before choosing prognostication method: **the trend** and **seasonality** (Gardner, 2006).

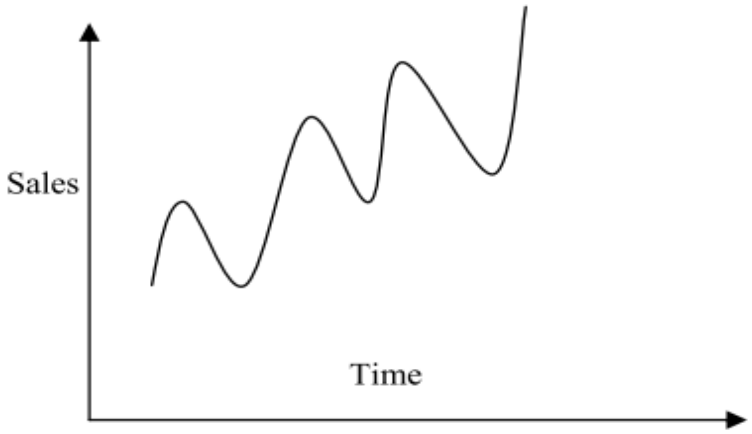
According to Ravi, (2009) trends relate to the long-term persistent movements/tendencies in data like price increases, growths in market shares, and population growth. An example of a decreasing linear trend is shown in Figure 18.



Source: (Ravi, 2009, p. 149)

Figure 18. Time series trends

Seasonality may be periodic, repetitive variations in time-series (see Fig. 19), which appear because of buying (or consuming) patterns and social habits, during different times of the year. The demand for products e.g., soft drinks, refrigerators, also exhibits seasonal variations (T. A. Williams, 2015).



Source: (Ravi, 2009, p. 149)

Figure 19. The example of time series seasonality

Primer literature review (Obryan, 2017) shew that during empirical studies it was found statistically that Bitcoin price does not have an actual pattern over time.

Hence, considering the fact that Bitcoin price has an upward trend (see Fig. 20), it was decided to use Holt's Exponential Smoothing.

Source: created by author with investing.com tools

Figure 20. Upward trend of Bitcoin price

2.4.1 Research design

Holt's two parameter exponential smoothing (Holt, 2004) is best applied to time series that have a prevalent linear trend but does not exhibit seasonal behavior. The smoothing constant α is used to

control speed of adaptation to local level, a second smoothing constant β is introduced to control degree of local trend carried through to multi-step-ahead forecast periods.

The recursive form of the equation can be written as,

$$A_t = \alpha y_t + (1 - \alpha)(A_{t-1} - T_{t-1}) \quad (1)$$

$$T_t = \beta(A_t - T_{t-1}) + (1 - \beta)T_{t-1} \quad (2)$$

$$\widehat{F_t}(m) = A_t + T_t m \quad (4)$$

where y_t = the time series in period t, A_t = level, T_t = trend, α = smoothing coefficient for level, β = smoothing coefficient for trend, and $\hat{F}_t(m)$ smoothed forecast value for y (Lattyak & Stokes, 2011).

If A_1 is given with the started investigated price of Bitcoin, T_1 should be found by special calculation called "initialization":

$$A_1 = y_1 \quad T_1 = \frac{(y_2 - y_1) + (y_4 - y_3)}{2} \quad (5)$$

In order to find the best α and β, they were be estimated by minimizing the sum of squared one-step-ahead forecast errors (SSE):

$$SSE = \sum_{t=1}^{T} (Y_t - Y_{tIt-1})^2, \quad (6)$$

where T is the number of observations in the training data. Calculation of SSE allows to use the most appropriate α and β for trend estimation. Their Sum must equal 1 (Wang, 2006).

2.4.2 The analysis and interpretation of the results.

The calculation of estimated Bitcoin price was done with Microsoft Excel software package (see Appendix 13 and 14). It was decided to use data of Bitcoin price for the last year (01.12.16-01.1217), in order to make trend projection with high degree of accuracy. The structure of estimated numerical values was allocated in a special Table 4.

Table 4. The results of Bitcoin price estimation

Date	Price	A_t	T_t	Forecast	Error	$Error^2$	Alpha	N
D_1	P_1	A_{t1}	T_{t1}	F_1	E1	E^2_1	Betta	1-N
D_2	P_2	A_{t2}	T_{t2}	F_2	E2	E^2_1		
…	…	…	…	…	…	…		
…	P_n	A_{tn}	T_{tn}	…	E_n	E^2_n		
…	N/A	N/A	N/A	…	N/A	N/A		
…	N/A	N/A	N/A	…	N/A	N/A		
D_n	N/A	N/A	N/A	F_n	N/A	N/A		

Source: created by author

In the table **Dn** represents the date of the analyzed period, **Pn** represents the last available actual price, **Atn** - the last calculated selected level, **Ttn** – the last calculated trend, **Fn** - the last calculated forecasted price, **En** – the last calculated error for estimation, $\mathbf{E^2n}$ – the last calculated square root of

selected error, **Alpha (α)** is given as some numeric value from 0.1-0.9, **Beta (β)** is given as 1-numeric value of Alpha.

N/A (not available) is mentioned as long as it is impossible to test accuracy of calculated Bitcoin price estimation, because there is no factual data available.

The appropriate Alpha and Beta for estimation were defined while calculating the SSE. The calculation is presented in the Table 5.

Table 5. Determination of Alpha and Beta for accurate Bitcoin price projection

		Beta								
	SSE	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9
Alpha	0,1	N_1	...	...	...	...	...	...	...	...
	0,2	...	N_2	...	...	...	...	...	...	...
	0,3	...	...	N_3	...	...	...	...	...	...
	0,4	...	...	...	N_4	...	...	...	...	...
	0,5	...	...	...	...	N_5	...	...	...	...
	0,6	...	...	...	...	...	N_6	...	...	...
	0,7	...	...	...	...	...	...	N_7	...	...
	0,8	...	...	...	...	...	...	...	N_8	...
	0,9	...	...	...	...	...	...	...	...	N_n

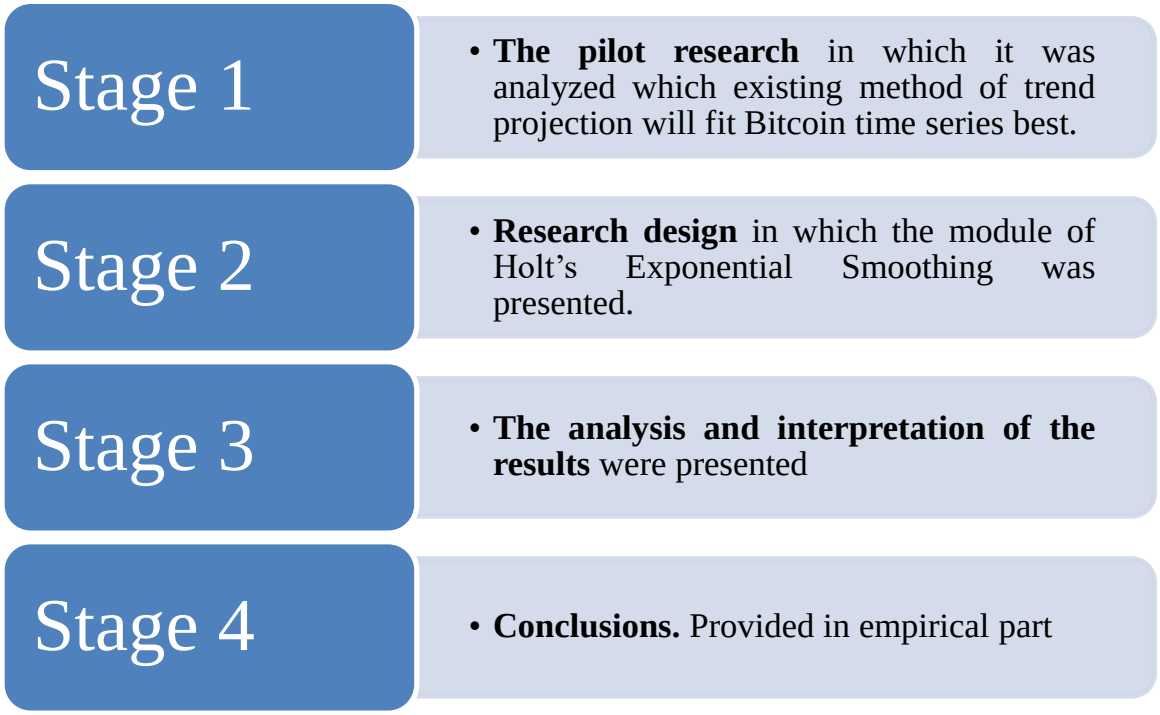
Source: created by author

The sense of this operation lays in determination the most accurate pair of Alpha and Beta numeric values. The right way to do it is to calculate SSE for different Alpha and Beta values for all possible pairs e.g., 0.1/0.9, 0.4/0.6. Then we need to find the minimal value of SSE that will define the pair of Alpha and Beta we will use for making new accurate forecast for Bitcoin price formation.

According to Hamilton, (2017) the ordinary least squares estimators are fair and have the smallest variance within the class of linear unbiased estimator, meaning they provide the most accurate estimations.

The results of forecast will be presented in form of graph will empirical part. Explanation of the gathered results will be presented as well.

The logic structure of the research is presented if the Figure 21.



Source: created by author

Figure 21. Holt's Exponential Smoothing empirical research logic scheme

In summary, it was decided to choose time series method called Holt's Exponential Smoothing for estimating the price of Bitcoin for the end of 2 months: December 2017 and January 2018. The main components of times series: trends and seasonality were analyzed before choosing the method. Holt's Exponential Smoothing was chosen as it works efficiently with time series that have trend, but doesn't have seasonality. Research design, analysis and interpretation of the results were presented as well. The results of estimation will be illustrated in empirical part.

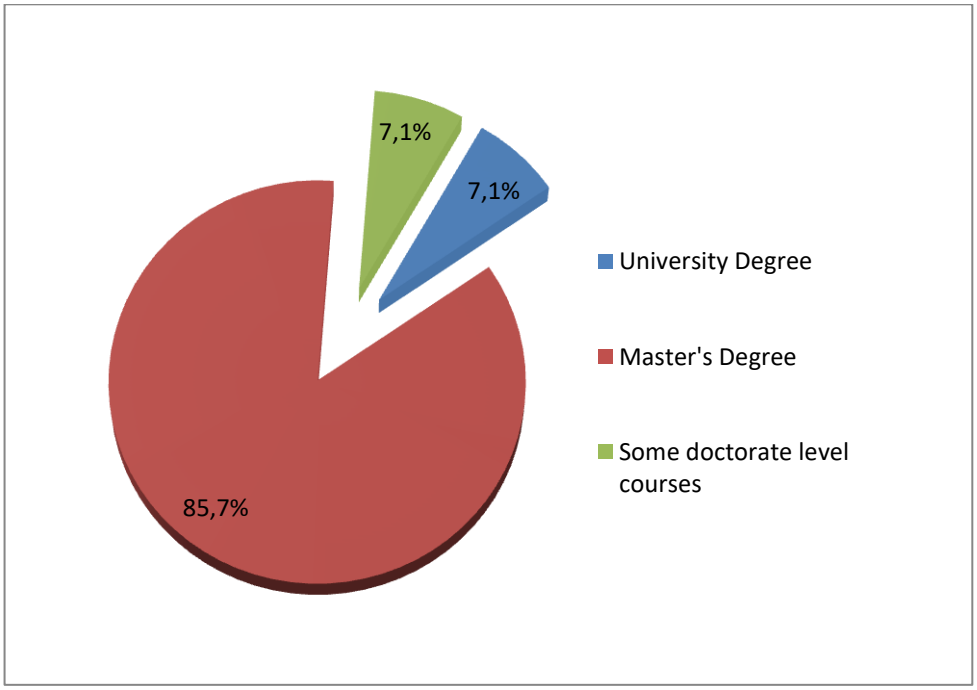
3. THE EMPIRICAL RESULTS OF THE IDENTIFICATION OF THE FACTORS INFLUENCING THE PRICE OF CRYPTOCURRENCIES

3.1 Expert evaluation results

The first part of the questionnaire was designed to gather general information about the experts. The initial author idea was to interview the experts, who can objectively represent the cryptocurrency industry, having relevant knowledge about Bitcoin blockchain ecosystem an experience in the research field no less than 1 year.

It was decided that defining expert's highest level of education will be important for emphasizing the trust to the reliability of assessment results.

In Figure 22 the percentage is shown of experts' highest education level. 85,7% percent of experts have Master' Degree as the highest level of education, 7,1% - University Degree and 7,1% Some doctorate level courses respectively.

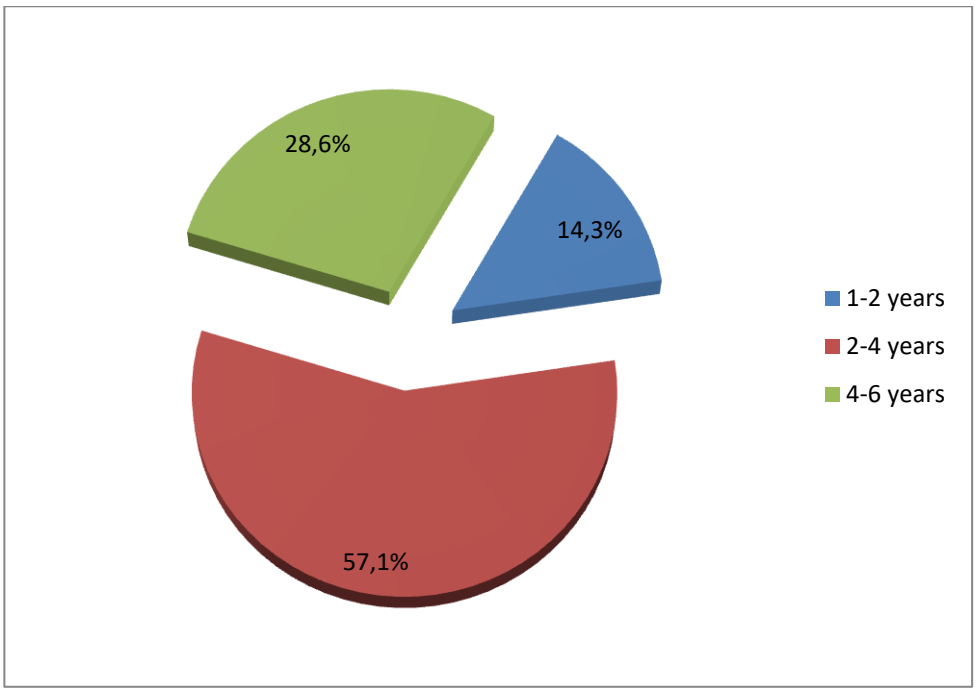


Source: developed by the author according to the experts assessment results

Figure 22. The highest level of experts' education

The selected experts were competent representatives of cryptocurrencies industry, considering the fact that the minimal experience of 1 year in the topic of cryptocurrencies was the second important selecting criteria (see Fig. 23).

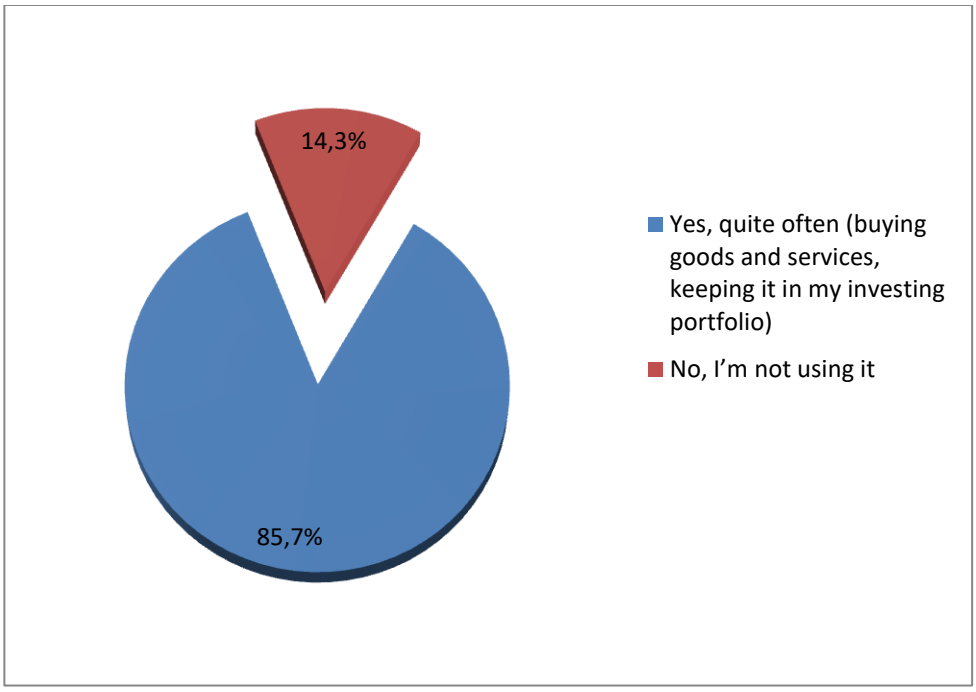
Figure 23 shows that 57,1% of experts have an experience in the researched topic 2-4 years; 4-6 years of experience were indicated by 28,6% and 1-2 years were indicated by 14,3% of respondents.



Source: developed by the author according to the experts assessment results

Figure 23. Experts' experience in the topic of cryptocurrencies

The majority of experts stated that they are using Bitcoin at a high frequency level (see Fig. 24). 85,7% of experts stated that they use Bitcoin quite often while buying goods and services and keeping it in their investment portfolio; 14,3% stated that they are not using it.



Source: developed by the author according to the experts assessment results

Figure 24. Do experts use Bitcoin?

The second part of the questionnaire was designed to define the significance of factors influencing Bitcoin price formatting. It was decided to not include the economic factor of *global*

economic and financial indicators in the questionnaire as long as there is no common scientific opinion regarding its role in Bitcoin price formation.

. The experts were given the factors influencing the price of Bitcoin with explanations, asking to rate the significance of each factor. The results are presented in systemized Table 6.

Table 6. Bitcoin price formatting factors mean values, P-values

№	Factor	Chronbach's Alpha = 0,643 Kendall's W[a] = 0,401	
		Mean value	P-value
1.	Investors attractiveness in form of search queries	3,86	0,005
2.	News	4,14	0,001
3.	The use of Bitcoin in exchange (Bitcoin economy)	4,43	0,001
4.	The velocity of Bitcoin circulation	3,29	0,336
5.	Energy efficiency (the Hash Rate)	2,57	0,082
6.	The size of mining network (network difficulty)	2,93	0,775
7.	Cyber-attacks	2,93	0,818

Source: developed by the author according to the experts assessment results

While introducing the results of the expert evaluation, the attention should be focused on interpretation of *Cronbach's alpha* coefficient calculated in SPSS program. The obtained result of *Cronbach alpha =0,643* is saying that questionnaire precisely reflects the researched object.

According to Remeikiene & Gaspareniene, (2017), if the mean value is equal to 3.5 and less, it is considered that the factor is not important. If the mean value is equal to 3.51 or more - the suggested statement is confirmed. As it may be seen from the Table 6, the answers are relevant, although experts' opinions` concurrence is weak (Kendall's W^a = 0,401). All of the factors marked by numbers 1, 2 and 3 gathered high score: investors attractiveness in form of search queries has a mean value of 3.86; News factor – 4,14, and the factor of use of Bitcoin in exchange (Bitcoin economy) – 4,43. The high P-values for these three factors are emphasizing their significance.

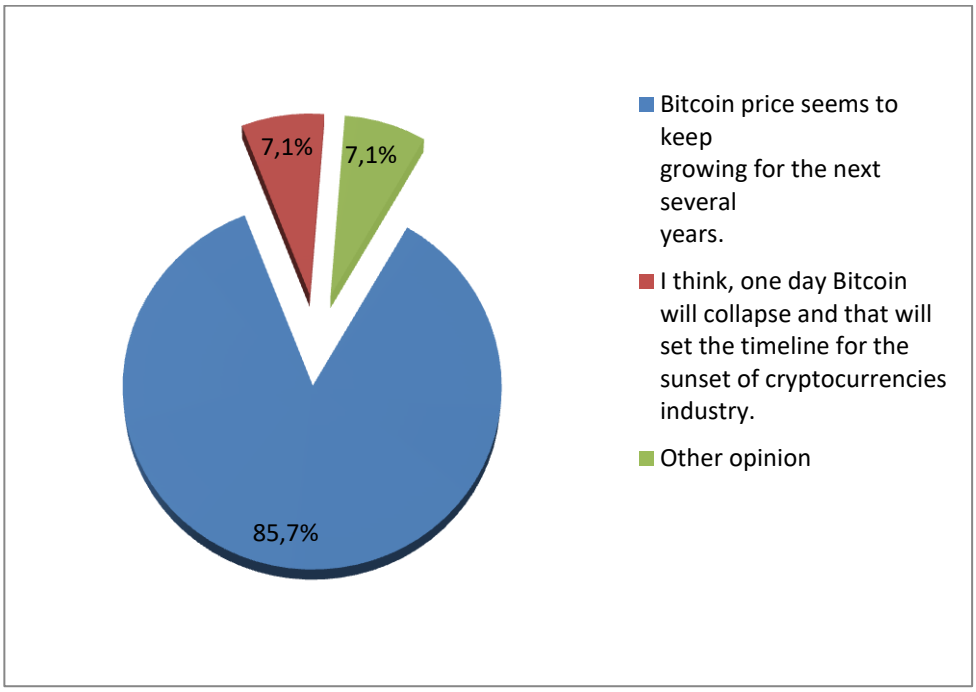
The rest of the factors marked by number 4, 5, 6 and 7 got both weak mean values and too low P-values.

It may be stated from gathered results that experts defined investors attractiveness in form of search queries, news (psychological factors) and the use of Bitcoin in exchange (Bitcoin economy) (economic factor) as the most significant in Bitcoin price formatting.

After the main question of the research, the experts were asked what they think about potential future of Bitcoin (see Fig. 25).

85,7% of experts believe that Bitcoin price seems to keep growing for the next several years; 7,1% think that one day Bitcoin will collapse and that will set the timeline for the sunset of cryptocurrencies industry and 7,1% (1 expert) has an alternative opinion that Bitcoin has a classical

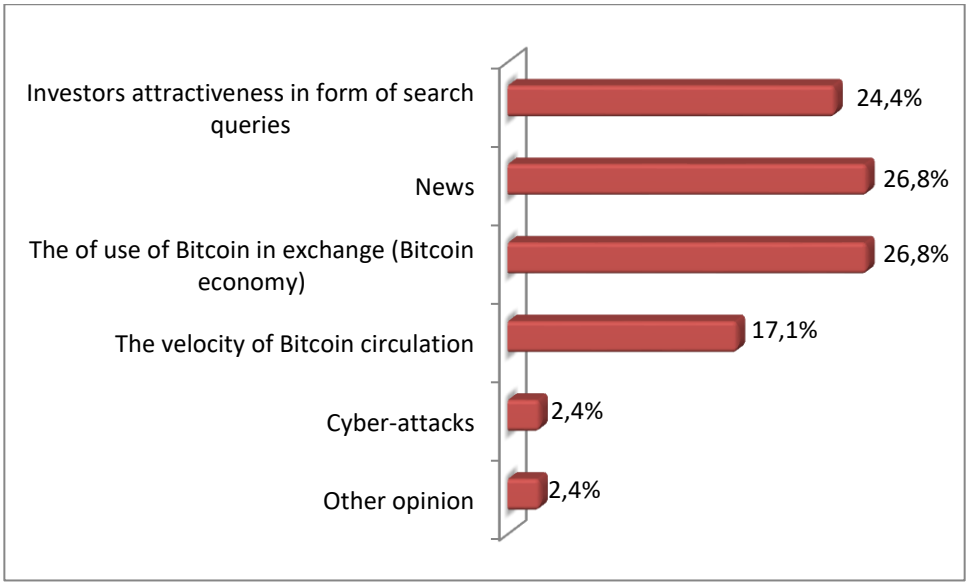
bubble pattern, that soon it will drop to 3000$ for 1 Bitcoin, but then the price will keep growing. In other words, 13/14 experts think positively about it.



Source: developed by the author according to the experts assessment results

Figure 25. The potential future of Bitcoin

In the next question experts were asked which factors they would check first among provided for expert evaluation before investing in it (see Fig.26).



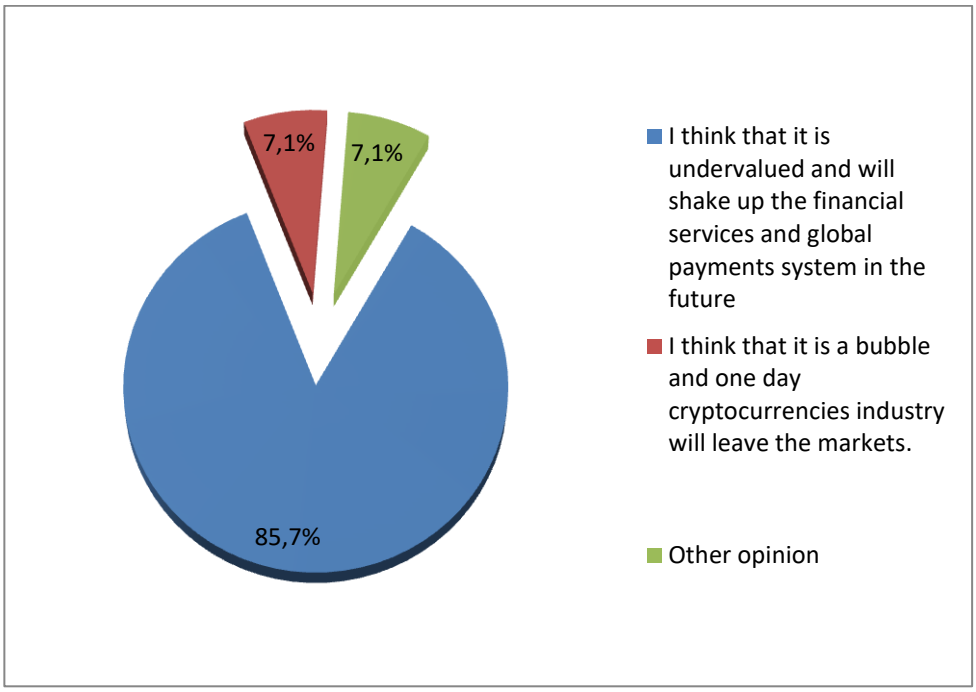
Source: developed by the author according to the experts assessment results

Figure 26. Prevailing factors to check before investing in Bitcoin

The figure illustrates the share of importance of each factor chosen. It may be seen that 24,4% goes the factor of investors attractiveness in form of search queries; the even share of 26,8% is being hold by the factor of news and the use of Bitcoin in exchange (Bitcoin economy); 17,1% goes to the

factor of velocity of bitcoin circulation; another even share of 2,4% goes to Cyber-attacks and alternative opinion of 1 expert, who would check first such components as: the most secure network, decentralized system, open source, transaction utility, programmable, borderless, digital form, no human inside, consensus based, etc., - which is, basically the general health of cryptocurrency ecosystem.

In the last question of second part experts were asked what they think about potential future of cryptocurrencies industry. The results of answer may be seen in Figure 27.



Source: developed by the author according to the experts assessment results

Figure 27. The potential future of cryptocurrencies industry

According to the illustration, 85,7% of experts think that that cryptocurrency industry is undervalued and will shake up the financial services and global payments system in the future; 7,1% think that it is a bubble and one day cryptocurrencies industry will leave the markets; 7,1% (1 expert) has an alternative opinion: "I think decentralized trustless monetary system in the long run will prevail over government issued money. Reason: it is not dependent on local economy, sound money, no censorship".

From expert assessment results obtained in this question it may be concluded that *investor should be a willing buyer of cryptocurrencies industry as it will keep developing and growing.*

It should be noted that during the Open lecture-discussion as of December 01 in Vilnius University delivered by one of the most influential present-day world economists, Nobel Prize laureate Robert J. Shiller: "Narrative Economics and Neuroeconomics" author had an opportunity to ask him several questions about cryptocurrencies (Shiller, 2017).

Author: *"Bitcoin is being widely discussed today in News. However, there are other coins popular by market capitalization going by. So, the question is what do you think about cryptocurrencies industry as a new economic paradigm? What do you think about the fact that during next 2 months the first cryptocurrencies Index just similar as S&P500 will be introduced to the exchanges? Would you invest in it?"*

Robert J. Shiller: *"I have not invested money in Bitcoin, I have to say and haven't heard about the news. So now we're getting the Index of cryptocurrencies prices?"*

Author: *"Index of Top 20 of them. It is based on Markowitz portfolio diversification theory."*

Robert J. Shiller: *"So, in other words they are going to sell you the Index and you can invest in it?"*

Author: *"Yes, you can invest in the Index."*

Robert J. Shiller: *"That's clever."*

Author: *"They are making rebalancing of investments every week and changing coins from less to more popular. So, what do you think about all of it?"*

Robert J. Shiller: *"Well, I'm not going to endorse any investments on the fly like that. That would be very hard to do variance-covariance matrix of these products that are just emerging, so it might not be stable. But that might be the minor consideration. It's interesting they have moved so fast and build an Index. There are changing happening in the investing world, we're becoming much more indexed. There is also a rise in so-called passive indexing. That's a sort of what this it, but in a certain product level. Indexing wasn't a big thing until the Great Depression. It took centuries for the first stock market Indexes to get attention. But now Bitcoin almost immediately produces.. I was impressed with the news of the other day that Chicago Stock Exchange is going to open up a futures market for Bitcoin. I have connections with CME and I expressed my doubts about that. Why do we need futures so fast in this thing? It's not really a thing. It has value, maybe. I don't mean to dismiss it; it might have value, because of things that are a little bit very hard to measure. It might be considered a medium of exchange that people like better, like credit cards replacement. Most of you don't spend money anymore, right? So, maybe, it will become important, but then again why not the other coin, there are hundreds of them. Maybe it will be the one that's going to prevail hasn't been started yet. This is what we call fundamental uncertainty and ambiguity. You can invest in it, but nobody can tell you whether it is right or wrong."*

Author: *"Thank you."*

Another interesting fact that was delivered during the lecture by professor is that those assets that are going viral, or, in other words, are being widely discussed in news, social networks, are being actively searched in search engines define the bullish trend of this asset (the price is increasing) (Shiller, 2017).

This lecture emphasizes the importance of two psychological factors: investors' attractiveness in form of search queries and news that got high mean and p values.

Summing up the results of the expert assessments and short interview with Nobel Prize laureate Robert J. Shiller, the following conclusions may be done:

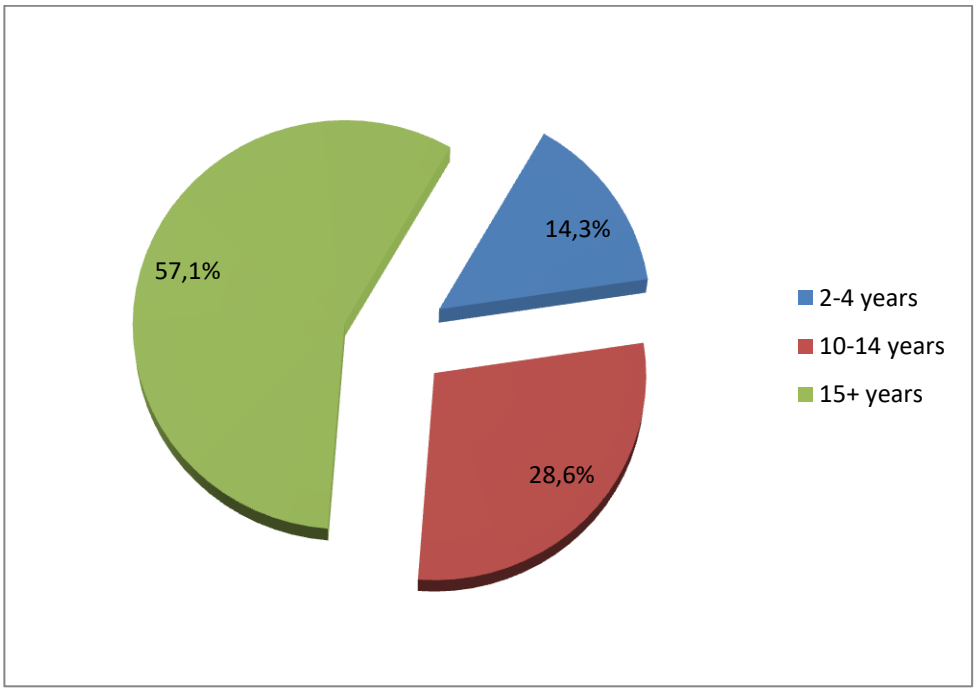
- The selected experts were competent representatives of cryptocurrencies industry and fit the selecting criteria. According to the their assessment results it may be stated that experts defined *investors attractiveness in form of search queries, news (psychological factors)* and *the use of Bitcoin in exchange (Bitcoin economy) (economic factor)* as the most significant in Bitcoin price formatting. The provided answers are relevant, although experts' opinions` concurrence is weak *(Kendall's W^a = 0,401).* The obtained result of *Cronbach alpha = 0,643* is confirming that questionnaire precisely reflects the researched object.
- The majority of experts thinks positively about Bitcoin and believes that Bitcoin price seems to keep growing for the next several years.
- Among the factors provided for expert evaluation respondents will check such prevailing of them before investing in Bitcoin as *the factor of investors attractiveness in form of search queries*, *the factor of news*, *the factor of the use of Bitcoin in exchange (Bitcoin economy)*, and *the factor of velocity of bitcoin circulation* (4 factors have 95% share of importance of all factors chosen). The less attention (5% share of importance of all factors chosen) was given to *cyber-attacks* and the *health of cryptocurrency ecosystem*.
- The majority of experts think that that cryptocurrency industry is undervalued and will shake up the financial services and global payments system in the future. Therefore, investor should be a willing buyer of cryptocurrencies industry as it will keep developing and growing.
- Cryptocurrencies are moving very fast in their development and might be useful, because may be considered a medium of exchange that people like better. They may also replace credit cards. However, the topic of cryptocurrencies has fundamental uncertainty and ambiguity and if somebody invested in it, nobody could tell him whether it is right or wrong.
- Those assets that are going viral, or, in other words, are being widely discussed in news, social networks, are being actively searched in search engines define the bullish trend of this asset. That emphasizes the importance of factor of investors' attractiveness in form of search queries and news.

3.2 Interview results

The first part of the questionnaire was designed to gather general information about the experts. The initial author idea was to interview the experts, who can objectively represent the financial markets. An interviewee should have at least 2 years of investing experience in financial markets and has current ROI (return of investments) above zero.

In Figure 28 it is shown what experience in the topic of financial markets interviewees have.

It may be seen that 57,1% of interviewees have an experience in the topic of 15+ years, 28,6% - 10-14 years, 14,3% - 2-4 years.

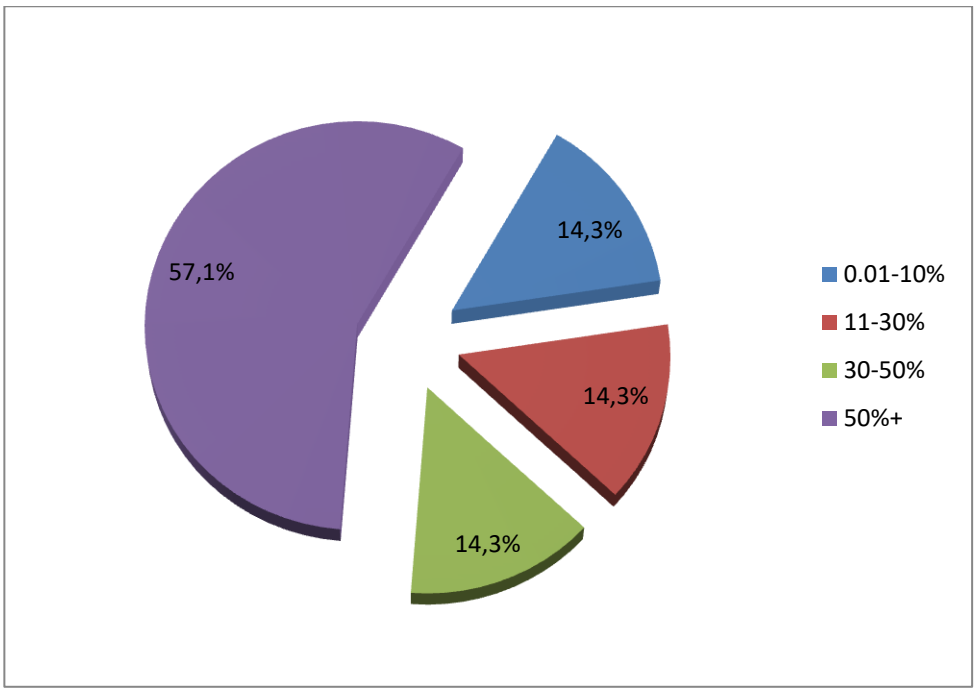


Source: developed by the author according to the Interviewees' assessment results

Figure 28. Interviewees' experience in the topic of cryptocurrencies

In the second question experts were asked to indicate their ROI range (see Fig. 29).

It may be seen that from Figure 29 that 57,1% of interviewees have a positive return of income at the rate of 50%+, 14,3% of them have ROI at the rate of 30-50%, another 14,3% of respondents have ROI at rate of 11-30% and the rest piece of 14,3% have a positive ROI of 0.01-10%.



Source: developed by the author according to the Interviewees' assessment results

Figure 29. Interviewees' experience in the topic of cryptocurrencies

The second part of the questionnaire was designed to get an accurate scheme for risk management and diversification of investment portfolio.

Before evaluating the provided answers of interviewees, it may be appropriate to note, that author had an internship as a Forex trader in Ukrsibbank (BNP Paribas Group) and was taught with basics of risk management and portfolio diversification as well. Therefore, in some cases, the logic of some terms was explained by author. While analyzing answers, in most cases they were mixed to provide the most objective.

To the first question *"Which seed capital do you consider to be appropriate for starting making investments/trades in financial markets?"* interviewees provided ambiguous answers: Expert A - any; Expert B - personal savings; Expert C - 10000$; Expert D - No seed capital, only proprietary capital in current environment in the financial markets, or leverage/margin provided by brokers; Expert E - 500.000$; Expert F - 10000$; Expert G -100.000 EUR.

As long as most people do not have starting capital bigger than 10.000$, nevertheless some professional traders believe it is an optimal number and usually use this capital to provide examples with trades, Dawson, (2017) also states that the size of starting capital defines the availabilities of mistakes, meaning the bigger capital one has to invest, the more mistakes he can make before losing the whole capital. For this question, it was decided that the best answer will be the mix of answers of Expert A, B and D - *any personal savings or leverage/margin provided by brokers*.

To the second question *"What is the limit (in percentage) of total capital that is appropriate to use at the time?"* interviewees provided such answers: Expert A - 100%; Expert B - 100%; Expert C - 100%; Expert D - 80%; Expert E - 50%; Expert F - 30%; Expert G -30%.

It was decided that the best answer for this question will be the mix of all answers -*it may be a range between 30-100%, depending on the risk acceptance of investor*.

To the third question *"Which part of your capital (in percentage) would you keep in one market/industry?"* interviewees provided such answers: Expert A - variable, can be 100%; Expert B - 100%; Expert C - 80%; Expert D - 20%; Expert E - 100%; Expert F - 30-35%; Expert G - 50%

It was decided that the best answer for this question will be the mix of all answers -*20-100%, depending on the market*.

To the fourth question *"How many instruments would you trade at the same time in one market?"* interviewees provided such answers: Expert A - up to 10; Expert B - 5-6; Expert C - 3-5; Expert D - 2-3; Expert E - 10; Expert F - 2-3; Expert G - 3.

This question was designed, in order to get basic rules about portfolio diversification among one market. For example, if investor works with forex market and want to invest in two classic pairs EUR/USD and USD/JPY there will not be portfolio diversification, as long as pairs have 1 common currency the USD. However, if investor replaces USD/JPY and adds GBP/NZD, he will get 2 instruments that do not have common currency, meaning they are not correlated with each other.

Hence, it was decided that the best answer for this question will be the mix of all answers - *from 2 to 10 instruments.*

To the fifth question *"What is the highest percentage of total capital loss that investor should take while making 1 trade?"* interviewees provided such answers: Expert A - 50% ; Expert B - 20%; Expert C - 10%; Expert D - up to 5 percent; Expert E - 5%; Expert F - 20%; Expert G - 25%.

It may be useful to understand what is staying behind each percentage of loss before investor will choose appropriate for him. If investor has a capital of 1000$ chooses 50% as an optimal percentage of loss per each trade, it means that if he makes mistaken investment decisions every single time, he will lose his capital on the 14^{th} trade. That may be counted in excel. On the other side, if he chooses 5% as an optimal percentage of loss per each trade, it means that if he makes mistaken investment decisions every single time, he will lose his capital on the 135^{th} trade. So, the percentage of total loss per trade should be chosen according to the mental ability of person to accept risk.

It was decided that the best answer for this question will be the answer of Expert D - *up to 5 percent.* Low risk acceptance allows keeping losses small and getting long-term experience of investing.

To the sixth question *"What is appropriate risk/reward ratio investor (or trader) should seek?"* interviewees provided such answers: Expert A - at least 1:2; Expert B - 1:1; Expert C - 1:3; Expert D - at least 1:2; Expert E - 1:1; Expert F - 1:2; Expert G - 1:3.

The risk/reward ratio mathematically means the following: if investor achieves 1:3 risk/reward ratio, it means that in order to turn back to the breakeven, he will need to make next investment decisions wrong for 3 times in a row. If he has 1:1 ratio as an optimal for each trade - 1 wrong decision will be enough. In other words, the higher risk/reward ratio one can achieve, the better long-run he will have. Some authors (Seiden, 2014) state that 1:3 risk/reward ratio is an optimal one.

Hence, it was decided that the best answer for this question will be answers of Expert D and F – *at least 1:2.*

To the seventh question *"What is appropriate leverage that trader should use?"* interviewees provided such answers: Expert A – no leverage most of the time; Expert B - 1:10; Expert C - 1:100; Expert D - depends on the market, less volatile market, more leverage can be used. In general, not more than 1:10; Expert E - 1:25; Expert F - 1:20; Expert G - 1:100.

The concept of using leverage lays in ability to use the same capital for trading higher volumes of a certain instrument with increased risk. For example, if the price for 1 oil barrel is 50$ and investor has a capital of 1000$, without leverage he will be able to buy 1000/50 = 20 barrels. However, if he decides to use leverage, for example, 1:20 he would be able to buy 1000*20/50 = 400 barrels. Then, if the price falls to 48$ from 50$, in the first case investor will lose 20 barrels*2 = 40$ and will have a capital of 960$; in the second case investor will lose 400 barrels*2=800$ and will have a capital of 200$ available. On the other side, if price goes up to 52$, the first investor will earn 40$ and the second 800$ respectively. Hence, the use of leverage depends on the readiness of investor to accept risks. In fact, if investor have a rule to keep the losses small and fixed, he may use any leverage that fits that fixed risk.

Considering the fact that investor should keep the risk low, it was decided that the best answer for the question will be an answer of Expert D - *depends on the market, less volatile market, more leverage can be used. In general, no more than 1:10.*

To the eights question *"Do you use investment rebalancing of you current long-term positions? If yes, how many times per month?"* interviewees provided such answers: Expert A - no; Expert B – once per quarter; Expert C - no; Expert D - no; Expert E - once per month; Expert F - no; Expert G - no.

The concept of capital rebalancing lays in redistribution of the current profit among available in the investment portfolio assets according to their defined share in the whole portfolio. Investment rebalancing allows reducing risks of big losses due to possible collapse of one of the assets (Markowitz, 1952).

It might be appropriate to provide an example in for of table (see Table 7).

Table 7. Decreasing risks with diversification

Available capital	Instrument	Fixed Share	1st Capital distribution	%Growth in 1 month	2nd Capital distribution	Current share	Rebalan-cing
10000	Brent oil	20%	2000	50%	1000	9,90%	2020
	EUR/USD	20%	2000	115%	2300	22,77%	2020
	APPL	20%	2000	115%	2300	22,77%	2020
	US Corn Futures	20%	2000	105%	2100	20,79%	2020
	Nasdaq Futures	20%	2000	120%	2400	23,76%	2020
					10100	**100,00%**	

Source: created by author

In current example investor has distributed his investing capital of 10000$ between 5 instruments in his investment portfolio with fixed share of 20% for each: Brent oil, EUR/USD, APPL, US Corn Futures and Nasdaq Furures. In 1 month instruments changed their prices (%Growth is created randomly). It may be seen that due to oil decrease in price investor lost 1000$ of his capital which is 10%. However, because of the positive percentage growth of other instruments, the overall current result was positive (10100$). Then, having updated capital for trading, he made a rebalancing of his investment to the equal percentage again (see the last column “Rebalancing”).

This example was provided, in order to show how useful investment rebalancing may be. If Investor kept in his portfolio just Brent Oil, in 1 month he would lose 5000$, which is 50% of his capital.

It was decided that the best answer for this question will be the mix of answers of Expert B and E – *no later than 1 time per quarter, at least 1 time per month.*

To the ninth question *“What is appropriate percentage of yearly generated profit to reinvest for the next year of investments/trades?”* interviewees provided such answers: Expert A - 100%; Expert B - 60%; Expert C - 80%; Expert D - at least 50%; Expert E - 50%; Expert F - 70%; Expert G - 75%.

It was decided that the best answer for this question will be the mix of all answers – *from 50-100%.*

To the tenth question *“Which yearly ROI should investor be satisfied to achieve?”* interviewees provided such answers: Expert A - 10-20%; Expert B - 40%; Expert C - 20%; Expert D - Depends on the type of investment. If the goal is capital preservation, the return should be approximately 5%. If it is for capital growth, not less than 12%; Expert E - 25%; Expert F - 20%; Expert G - 30-35%.

It was decided that the most objective answer was provided by Expert D - *depends on the type of investment. If the goal is capital preservation, the return should be approximately 5%. For capital growth, not less than 12%.*

The third part of the questionnaire was dedicated to collecting interviewees' opinions about potential investments in cryptocurrency industry.

To the first question *"If you invested in cryptocurrencies industry, which percentage of total capital you would invest in it?"* interviewees provided such answers: Expert A - 0%; Expert B - 10%; Expert C - 30%; Expert D - the most risky part, 5-10%; Expert E - 100%; Expert F - 20%; Expert G - 15%.

Considering the fact that answer provided by Expert E is standing out of line and forcing the rules of portfolio diversification, it was decided that the best answer for this question will be the mix of all answers except of Expert E: *from 5-30%, depending on the risk investor is ready to take.*

To the second question *"If you invested in cryptocurrencies industry, how would you diversify your investment portfolio?"* interviewees provided such answers: Expert A - none; Expert B - BTC only; Expert C - BTC only; Expert D - I would choose a group of the most reliable cryptocurrencies in terms of technology and popularity; Expert E - Top-20 index (Crypto20); Expert F - group of 2 cryptocurrencies; Expert G - 10% - bitcoin; 25% - other cryptocurrencies.

As long as question was designed to get opinion about diversification, it was decided that answers of Expert A and B will not be submitted, because having 1 instrument in the market is not a portfolio diversification.

Hence, it was decided that the best answer for this question will be the mix of answers of all experts except of Expert A and B – *several instruments like a group of the most reliable cryptocurrencies in terms of technology and popularity; Top-20 index (Crypto20); no more than 10% of the capital should be invested in Bitcoin.*

To the third question *"If you invested in cryptocurrency industry, which leverage would you use for trading?"* interviewees provided such answers: Expert A - none; Expert B - none; Expert C - none; Expert D - None, the market is too volatile at the moment for leverage; Expert E - 1:25; Expert F - 1:5; Expert G - 1:10.

It was decided that the best answer for this question will be the mix of answers of all experts - *it is better not to use leverage at the moment, because the market is too volatile at the moment for leverage. However, if investor decides to use it, the leverage should be no more than 1:25.*

To the fourth question *"How would you diversify your invested capital in cryptocurrencies industry between conservative trading (e.g., buying fundamental cryptocurrencies that represent industry, investing in Cryptocurrency Conservative/Index Funds) and aggressive trading (e.g., trading with leverage, investing in ICOs and aggressive trading funds)?"* interviewees provided such answers:

Expert A - none; Expert B - 100/0%; Expert C - 100/0%; Expert D - 97/3%; Expert E - none; Expert F - 80/20; Expert G - 20/80

It was decided that the best answer for this question will be the mix of answers of all experts except of Expert A and E as long as they didn't provide answers - *it is better to be conservative while trading cryptocurrencies and use 80-100% of capital for conservative trading. However, if investor decided to be aggressive while trading cryptocurrencies, he should use no more than 80% for aggressive trading.*

Summing up the results of the interview assessments, the following conclusions may be done:

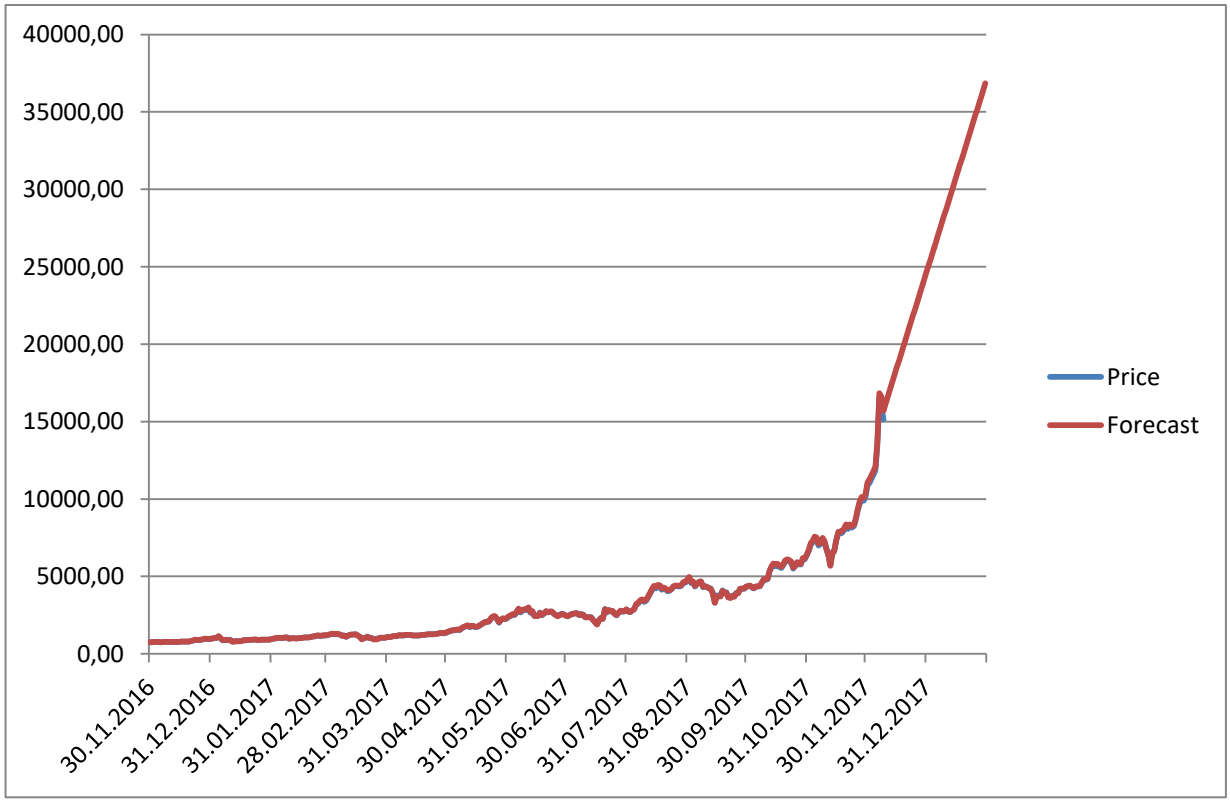
- Any personal savings or leverage/margin provided by brokers is appropriate for starting making investments/trades in financial markets.
- Depending on the risk acceptance of investor, 30-100% of total capital is appropriate limit to use at the time.
- Depending on the market, 20-100% part of capital is appropriate to keep in one market/industry.
- 2 to 10 is appropriate number of instruments to trade at the same time in one market.
- Up to 5 percent of total capital is appropriate loss that investor should take while making 1 trade.
- The appropriate risk/reward ratio investor (or trader) should seek is at least 1:2.
- In general, no more than 1:10 is appropriate leverage that trader should use. It depends on the market, less volatile market, more leverage can be used.
- Investor should make rebalancing no later than 1 time per quarter, at least 1 time per month.
- 50-100% is appropriate percentage of yearly generated profit to reinvest for the next year of investments/trades.
- Investor should be satisfied to achieve ROI of 5%, if his goal is capital preservation; not less than 12%, if the goal is capital growth.
- 5-30% of total capital is appropriate to invest in cryptocurrencies industry.
- If investor invested in cryptocurrencies industry, it would be appropriate to diversify his investment portfolio while investing in several instruments like a group of the most reliable cryptocurrencies in terms of technology and popularity; Top-20 index (Crypto20). No more than 10% of the capital should be invested in Bitcoin.
- If investor decides to use leverage while trading in cryptocurrencies, the leverage should be no more than 1:25.
- While investing in cryptocurrencies industry and diversifying capital between conservative and aggressive trading, it is better to be conservative while trading cryptocurrencies and use 80-100% of

capital for conservative trading. However, if investor decided to be aggressive while trading cryptocurrencies, he should use no more than 80% for aggressive trading.

3.3 Holt's Exponential Smoothing prognostication empirical results.

This method was used to make prognostication for Bitcoin price formation for December 2017 and January 2018.

The results are presented in Figure 30.



Source: created by author

Figure 30. The forecast of Bitcoin price formation for December 2017 and January 2018

It may be seen that both Bitcoin actual and forecasted prices are moving almost integrally. That's caused by the optimal matched Alpha and Beta smoothing values. The calculations are explained in the following text.

The first attempt to calculate Bitcoin forecasted price was done using Alpha and Beta smoothing coefficients 0.5 (for both). Smoothing coefficients were chosen randomly as the main goal of the first attempt was to get any SEE that had to help to find optimal smoothing coefficients. As a result (see Annex 13), the calculated SSE was 30052873,62. That wasn't the minimal numeric value among the whole table. Then, the minimal possible SSE value was found, 21519514,97 (marked with bold font in Annex 13). That SSE defined that optimal value for prognostication should be Alpha 0.9 and Beta 0.1.

Further, the new calculation was done with forecasts for December 2017 and January 2018 (see Annex 14).

Summing up the calculations, it may be stated that calculations are telling that as of December 31 the price of Bitcoin will be 24236,10$ per 1 Bitcoin; as of January 31 – 36839,41$. The results might have errors as long as corrections during the future Bitcoin price formation are not taken into account. It is impossible to do that without data about actual price. That's why it was decided to make short-term estimation. However, what we have is the fact that Bitcoin price is most likely to keep growing. That in addition to expert assessment results is telling us that we want to be buyers of Bitcoin.

4. CONSTRUCTING THE GUIDELINES FOR INVESTING IN CRYPTOCURRENCIES INDUSTRY

Considering the fact that cryptocurrencies are based on a new perspective technology called "blockchain" that may be accepted as a new form of technological revolution, that is being implemented to the businesses of different sectors; the fact that expert assessment foresees the further acceptance of cryptocurrencies industry and its growing popularity; the fact that increasing interest in Bitcoin and other cryptocurrencies from regular investors, big companies and even governments is raising the size of economy of cryptocurrencies industry, it may be suggested that the whole industry of cryptocurrencies (those, which fundamentally represent the industry) will keep growing. Such state of affairs makes potential investors willing buyers of the industry. Therefore, the question appears: "how to invest in cryptocurrencies industry?"

4.1 Investing guidelines for conservative investing.

This subpart is designed to provide the guidelines for investors, who want to be conservative while investing in cryptocurrencies industry or, in other words, want to keep risks low. The guidelines are based on the data, gathered in the first, third part of Master thesis and cryptocurrencies industry review.

The concept of conservative investing lays in fundamental approach: such type of market participants is making long-term investments in whatever they consider to be global, and that has trend.

For example, somebody may believe that prices of shares of several U.S. companies related to IT sector will keep growing for several next years, because they are producing the most willing products comparing to other industries and have potential to expand their production. In this case, investor will buy the shares of these companies, because they are fundamentally good.

The same is fair for cryptocurrencies industry. The first and third part of Master Thesis is telling us that this industry is fundamentally perspective and have high chances to keep growing.

Knowing that, conservative investor will try to find fundamentally reliable cryptocurrencies.

There are several among 1250+ that fundamentally represent the industry. There may be several ways to define them: to define those several coins that are still afloat after their early appearance on the market; to check coin's market capitalization – the higher it is, the bigger demand for this cryptocurrency and the bigger size of economy it has.

If we chose the first approach, we will find out that Bitcoin, launched in 2009; Ethereum, launched in 2014; Ripple, launched in 2012; Litecoin, launched in 2011; Dash, launched in 2011;

NEM, launched in 2015; Monero, launched in 2014; Ethereum classic, launched in 2015 are still afloat and most of them increased their value in tens or even hundreds times. Besides, they are all in TOP 20 cryptocurrencies by market capitalization.

If we choose the second approach, we will find out that as of December 08, 2017 their neighbors by market capitalization (TOP 20 cryptocurrencies) according to coinmarketcap.com are Bitcoin Cash, IOTA, Bitcoin Gold, Cardano, Stellar Lumens, NEO, EOS, BitConnect, Lisk, Populous, Qtum and Zcash.

Having found the most attractive among cryptocurrencies, the next question appears what investor should do with them.

Primer industry review in combination with interview empirical results may provide investor with the next investment decisions.

1. **Buy Bitcoin and hold.** Bitcoin has shown unprecedented growth since its appearance and there is still high probability that it will keep growing. The investments should not exceed 10% of total capital. The easiest way to do this, is to buy it with credit card, using Lykke wallet (available for IOS and Android). There are no commissions while buying Bitcoin. The App is available for all European countries.

2. **Buy the industry.** Top 5-20 cryptocurrencies might be bought, using investment rebalancing no later than 1 time per quarter, at least 1 time per month.

In the following example (see Table 8) it is supposed that investor has top-10 coins in his portfolio and is making rebalancing every month.

Table 8. Investing in TOP 10 cryptocurrencies using portfolio diversification

Available capital	Instrument	Fixed Share	1st Capital distribution	%Growth in 1 month	2nd Capital distribution	Current share	Rebalan-cing
1000	Bitcoin	10%	100	130%	130	11,46%	113,4
	Ethereum	10%	100	117%	117	10,32%	113,4
	Bitcoin Cash	10%	100	127%	127	11,20%	113,4
	IOTA	10%	100	128%	128	11,29%	113,4
	Ripple	10%	100	91%	91	8,02%	113,4
	Litecoin	10%	100	114%	114	10,05%	113,4
	Dash	10%	100	95%	95	8,38%	113,4
	Bitcoin Gold	10%	100	112%	112	9,88%	113,4
	Monero	10%	100	116%	116	10,23%	113,4
	Cardano	10%	100	104%	104	9,17%	113,4
					1134	**100,00%**	

Source: created by author

In this example investor decided to invest 33% of his capital (1000$) in TOP 10 cryptocurrencies by market capitalization. The percentage growth in 1 month was chosen randomly, however, investor may get an idea on how his portfolio would look. Investor may differentiate the share of investments in each coin according to his perception of each cryptocurrency. As long as the whole industry is growing these days, it may be supposed that the overall growth of the capital will be optimistic. All investor has to do is to make investment rebalancing and decide, which part of the income he will reinvest and consume at the end of the year. However, it would be better for him, if he reinvests at least 50% of the yearly profit.

There are several exchanges, where investor can buy cryptocurrencies: Poloniex, Bittrex, Kraken, Bitfinex and others.

Another interesting way to buy industry may be buying TOP 20 cryptocurrency Index called "Crypto20" (crypto20.com). This is autonomous Index that is investing in TOP 20 cryptocurrencies according to their market capitalization, using investment rebalancing every week. The work of Index is based on Markowitz portfolio diversification mentioned in the Chapter 3 of the research. The idea is to buy tokens, which is an equivalent to classic shares that will represent the share of investor in the whole index. Once investor buys it, he may relax, as long as he does not have to do anything further. The Index is investing automatically and once the TOP 20 coins is growing, the Index fund is growing too, which leads to increase in Net Asset Value of token. At the beginning of Index working, investor was able to buy 1 token for 1.1$. As of 8th, December 2017, 8 p.m. the token NAV was 1.30$, which means that investor had at momentum 0.20 (the growth in cents)/1.10 (starting price of token) *100% = 18.2% of ROI. This is a good result, considering the fact that Index is working fully less than 1 month. Assuming that the growth of token price would be fixed for each month, in one year the ROI will be 0.20*12/1.10*100% = 218.2%. This percent says that investor will double his invested capital. This result is much better comparing to all the ROI interviewees provided in the questionnaire.

3. **Buy cheap cryptocurrencies and wait.** Another way to invest in cryptocurrencies industry is to buy several cheap coins with the expectation that some of it will rocket its price just like Bitcoin, Ethereum, Litecoin and others.

For example, investor may invest 20$ in Ripple coin. As of December 08 its price according to coinmarketcap.com was 0.248311. Assume it has a price of 0.25$ to make calculable example. For 20$ investor may buy 80 Ripples. If the price of Ripple will rocket to 100$, just like Litecoin did, investor will get 80 Ripples*100$ = 8000$. Then the ROI will be 8000$/20$ = 400 times or 40000%. Sound optimistic. That's real.

For this tactic, investor might invest in Ripple, Cordano, IOTA, NEM and EOS.

4. **Invest in cloud mining.** The idea of this strategy lays in investing in companies that are accumulating money for buying special equipment to mine Bitcoin or other cryptocurrencies. Investor

signs a contract with the company that confirms that he will get a fixed amount of money every day as the return of his investments.

For example, if investor invested 1000$ of his money in Genesis Mining company for mining Bitcoin with the contract of 2 years, he would get on his account balance 5$ every day. That means that using this service, his investment will pay off in 1000$/5$ = 200 days. As long as he concluded contract for 2 years, his net profit at the end of the contract will be 365*2-200*5$ = 2500$, which is 150% ROI.

This strategy is safe, because investor doesn't mine Bitcoin by himself, which helps him to avoid any legal issues.

There are several services investor may use: Genesis Mining, bitpower.io, HashFlare and NiceHash.

Summing up provided guidelines for conservative investing, a conclusion may be done:

There are 4 strategies proposed that investor may use for conservative investing in cryptocurrencies:

- **Buy Bitcoin and hold:** Bitcoin has shown unprecedented growth since its appearance and there is still high probability that it will keep growing.
- **Buy the industry:** fundamentally representative cryptocurrencies that are in TOP 20 by market capitalization may be included in investments portfolio. Investor can buy TOP 5-20 manually and make investment rebalancing no later than 1 time per quarter, at least 1 time per month or buy the autonomous Index called Crypto20.
- **Buy cheap cryptocurrencies and wait:** in case cheap coins rocket investor can get ROI more than 40000%.
- **Invest in cloud mining:** Investor put money in company that mine cryptocurrencies, and confirms that investor will get a fixed amount of money every day as the return of his investments. This strategy is safe, because investor doesn't mine Bitcoin by himself, which helps him to avoid any legal issues.

4.2 Investing guidelines for aggressive investing.

This subchapter is designed for investors that are seeking for higher profit being ready to accept high risks. The guidelines are based on the data gathered in the first, third part of Master thesis and cryptocurrencies industry review.

The concept of aggressive investing lays in speculative approach: such type of market participants usually makes short-term investments that have speculative nature.

Unlike the conservative investor, aggressive is primarily thinking about what he can buy low and sell high (or vice versa). That means that such type of investor will not focus his attention on fundamental coins only, he can go beyond them.

There are several strategies aggressive investor may use:

1. **Trading with leverage.** The concept of leverage was discussed in Chapter 3. This instrument allows increasing trading volumes, which opens an opportunity to earn more, if investor is right, or lose more if investor is wrong. As it was stated by the experts in interview, it is better not to use leverage for trading cryptocurrencies, because the market is too volatile at the moment for leverage. However, if investor decides to use it, the leverage should be no more than 1:25.

Here is the case how investor may use it. Assume that Bitcoin price is falling after the bad news, however, investor is sure that soon price will grow again, because Google Trend is showing spike of interest to Bitcoin. Investor thinks that Bitcoin price will fall from 15000$ to 8000$, which means that 8000$ is the price he wants to buy Bitcoin for. Investor has 1000$ for trade, which means he can buy only 1/8 of Bitcoin. However, he is so sure the price will go up from this point that he decided to use leverage 1:20 for his trade. In other words, now he has 20000$ to invest and he can buy 20000$/8000$ = 2.5 BTC. So he did. After he bought Bitcoins, the price rallied up to 10000$ and he decided to close his position. His profit in this case would be: 2.5 BTC*10000$ - 2.5BTC*8000$ = 5000$. In this case his ROI would be 5000$/1000$ (real capital)*100% = 500%. That was a good trade in sense of profit. However, it was bad in sense of risk management: when investor bought 2.5 BTC, each dollar of the Bitcoin price movement made +2.5$ if price goes upper than 8000$ or -2.5$, if the price goes lower. It means that if the price continued to drop to 7600$, investor would lose all his money (7600$*2.5 – 8000$*2.5 =-1000$). According to professional opinion, provided by interviewees in Chapter 3, investor in this case was seeking to risk/reward ratio 1:5, where 1 is invested capital of 1000$ and 5 is potential outcome of 5000$; however, he was ready to lose 100% of his capital, whereas it should be no more than 5% or 50$ of the capital. That leads to conclusion that he could not use the leverage in this particular case.

This case was provided in order to show what may happen to investor, if he has no plan for the trade and is not following rules. Investor always should remember that losses have to be small. There is no place for emotions like greed or fear. Only systematically made decisions will lead to positive long-run while trading markets, especially too volatile like cryptocurrencies. Hence, it may be proposed not to use this type of strategy, if investor is the beginner.

2. **Investing in ICO.** ICO (Initial Coin Offering) is another strategy that aggressive investor may use. ICO is just like IPO (Initial Public Offering) provides investors with digital assets called “tokens” that represent his share in the whole investment pie. ICO is used by start-ups to accumulate money, in order to implement the product to the market.

On the Figure 31 there is an example of the most profitable ICO of all the time.

	NAME	CHANGE (%)	ICO DATE	ICO PRICE	CURR. PRICE
	NXT Buy Instantly	+4255114%	09/28/13	$ 0.000	$ 0.715
	IOTA	+1034333%	11/25/15	$ 0.000	$ 4.495
	Ethereum Buy Instantly	+147835%	07/22/14	$ 0.311	$ 460.699
	Stratis Buy Instantly	+118880%	06/20/16	$ 0.007	$ 8.653
	Neo	+111424%	10/01/15	$ 0.032	$ 35.465

Source: https://icostats.com/roi-since-ico. Seen on: 8th, December 2017

Figure 31. ROI since ICO

It may be seen from the illustration that in case of the first ICO in the list, NXT, investor could get 42551$ from 1$ of investments, if he invested money on the first day of ICO, 9th September, 2013.

Hence, investing in ICOs may be a good idea, but how to choose the right one?

For example, Crypto20 Index had an ICO. The start-up idea was to create the first autonomous Index of TOP 20 cryptocurrencies. This project solved the problem of constructing the representative investment portfolio, using effective investment rebalancing. Owning 1 token means investor has put money for the whole industry. That's easy and that's attractive. That's why this project was succeeded. It got a massive demand for it.

Today there are thousands of ICOs and while choosing several of those to invest investor should analyze them from the perspective of public and corporate demand for it, and reliability of the team, who is in charge.

If investor put money in the right ICO just for 1 time, he may get inconceivable ROI.

There are several websites, where investor can track the coming ICOs: icohotlist.com, icoalert.com, and icotracker.net.

3. Investing in aggressive trading funds. If investor is feeling that his personal investment decisions could be better, he may invest his money in so called trading funds. The idea is that people, who are trading in such funds, usually, do their job better than average investor. Hence, there will be a win-win situation, when investor put his money in the fund: the fund will use this money for trading to preserve their own capital; at the end of the contract investor will get his return of investments stated in contract.

For example, the fund called United Traders suggest potential investor to invest 5000$ in the fund and get a yearly ROI of 1000%. If investor considers this or another fund to be attractive because of the team, commissions and offered ROI, he may take a risk and put investments.

Summing up provided guidelines for aggressive investing, such conclusions may be done:

There are 3 strategies proposed that investor may use for aggressive investing in cryptocurrencies aggressively:

- **Trading with leverage:** this strategy allows increasing trading volumes, which opens an opportunity to earn more, if investor is right, or lose more if investor is wrong. It is recommended not to use this type of strategy, if investor is the beginner.
- **Investing in ICO:** ICO is used by start-ups to accumulate money, in order to implement the product to the market. If investor put money in the right ICO just for 1 time, he may get inconceivable ROI.
- **Investing in aggressive trading funds:** If investor is feeling that his personal investment decisions could be better, he may invest his money in so called trading funds. The fund will use this money for trading to preserve their own capital; at the end of the contract investor will get his return of investments stated in contract.

The example of investment portfolio when investor is 80% conservative and 20% aggressive may be seen in Table 9.

Table 9. Visualizing the investment portfolio of cryptocurrencies investor

Conservative investing	**The fundamental representatives of cryptocurrencies industry**			**Total capital**
				10000$
80%	**Instrument**	**Share**	**Capital distribution**	
	Bitcoin	10%	1000$	
	TOP 2-11 (manual tracking)	15%	1500$	
	Crypto20	30%	3000$	
	Cheap coins	15%	1500$	
	Cloud mining	10%	1000$	
Aggressive investing	**Supposed to have speculative nature**			
20%	**Instrument**	**Share**	**Capital distribution**	
	Trading with leverage	10%	1000$	
	Investing in ICO	6%	600$	
	Aggressive trading funds	4%	400$	

Source: created by author

CONCLUSIONS AND RECCOMENDATIONS

Conclusions:

1. Cryptocurrency is a virtual system that functions like a medium of exchange that is being produced and stored electronically in the blockchain, using encryption techniques to control the creation of monetary units and to verify the transfer of funds. The appearance of cryptocurrencies solved two issues: the problem of trust and double-spending. The cryptocurrency history is ambiguous: despite the fact it has a criminal past, publicity, realizing that, boosted its acceptance of Bitcoin. Today there are more than 1250 cryptocurrencies. All of them are not functioning as traditional money.
2. There are 3 groups of factors that influence the price of Bitcoin: factors from psychological perspective that include investors' attractiveness in form of search queries and news; factors from economic perspective that include Bitcoin use in exchange (Bitcoin economy), its velocity in circulation and global economic and financial indicators, which has controversial opinions; factors from technological perspective that include the Hash Rate (or energy efficiency), the size of mining network (or its difficulty) and cyber-attacks.
3. The most significant factors in Bitcoin price formatting are attractiveness in form of search queries, news and the use of Bitcoin in exchange (Bitcoin economy). According to expert assessment results Bitcoin price seems to keep growing for the next several years. Besides, cryptocurrency industry is undervalued today: it is moving very fast in its development and will shake up the financial services and global payments system in the future. Those cryptocurrencies that are going viral, or, in other words, are being widely discussed in news, social networks, are being actively searched in search engines define their bullish trend.
4. Interviewee's assessment results shew that there is strict set of rules that investor should follow in order to be succeeded while investing in cryptocurrencies industry. Despite the fact that cryptocurrencies may provide inconceivable return of investments, they are too volatile today. Hence, it is better to be conservative while investing in it. If investor decides to use aggressive investment approach, he should have appropriate experience. It is very important for investor to have diversified portfolio.
5. There were 4 strategies proposed that investor may use for conservative investing in cryptocurrencies: Buy Bitcoin and hold: Bitcoin has shown unprecedented growth since its appearance and there is still high probability that it will keep growing; Buy the industry: fundamentally representative cryptocurrencies that are in TOP 20 by market capitalization may be included in investments portfolio; Buy cheap cryptocurrencies and wait: in case

cheap coins rocket investor can get inconceivable ROI; Invest in cloud mining: Investor put money in company that mine cryptocurrencies and gets instead a fixed amount of money every day as the return of his investments.

6. There were 3 strategies proposed that investor may use for aggressive investing in cryptocurrencies aggressively: Trading with leverage: this strategy allows increasing trading volumes, which opens an opportunity to earn more, if investor is right, or lose more if investor is wrong. It is recommended not to use this type of strategy, if investor is the beginner; Investing in ICO: ICO is used by start-ups to accumulate money, in order to implement the product to the market. If investor put money in the right ICO just for 1 time, he may get inconceivable ROI; Investing in aggressive trading funds: If investor is feeling that his personal investment decisions could be better, he may invest his money in so called trading funds.

Recommendations:

1. It is very important to understand what is staying behind the blockchain as the technology which all cryptocurrencies are based on. Getting familiar with it will help to realize the value of technology as long as its appearance solved the problem of trust and double-spending. The more governments, companies and people will accept it, the bigger influence blockchain will have on E-payments services and investing world.
2. It might be useful to get familiar with peculiarities of at least TOP 10 cryptocurrencies by market capitalization. That will help to understand which problems there were created to solve and which perspective they have in sense of demand for them. Once investor gets familiar with fundamental representatives of the industry, he will be able to create reliable investment portfolio.
3. It might be useful to analyze 3 factors identified in this research as the most significant in Bitcoin price formatting simultaneously. That will help to increase the chance of making the right investment decisions. Considering the fact that all cryptocurrencies have the same ecosystem, these 3 factors may be used for analysis of all of them.
4. Before investing in cryptocurrencies industry, it will be useful to get familiar with basic risk-management and portfolio diversification rules. That will help to keep losses small. Besides, it might be useful for potential investor to get familiar with the basics of fundamental analysis of the markets and non-conventional technical analysis.
5. If investor is beginner, it might be useful for him to start with prevailing conservative investing approach. Such start will help to feel what cryptocurrencies are about. Once he gets some experience and profit, he can add some aggressive investment strategies in his

investment portfolio. Having diversified portfolio is a question of survival while investing in cryptocurrencies industry.

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Andriienko O. Identification of the factors influencing the price of Bitcoin / Master‘s Work in Electronic Business Management. Supervisor doc. dr. R. Remeikienė – Vilnius: Mykolas Romeris University, Faculty of Economics and Business, 2017.

ANNOTATION

Master Thesis is dedicated to identification of the factors influencing the price of Bitcoin. The research highlights the concept of cryptocurrencies, factors that influence the price of Bitcoin and provides the solution which identified factors have the biggest impact in Bitcoin price formation. In the first section analyzes theoretical aspects of the factors influencing the price of cryptocurrencies: the concept and origins of cryptocurrencies, their types, peculiarities and factors influencing the price of Bitcoin. In the second section the methodology of the identification of the factors influencing the price of cryptocurrencies was presented: expert evaluation method, method of interview and Holt’s Exponential Smoothing prognostication method. In the third section the factors influencing the price of Bitcoin were evaluated according to expert assessment; basic rules of risk-management and portfolio diversification were gathered according to interview gathered data; prognostication for Bitcoin price formation was provided. After the theoretical, methodological and empirical part the guidelines for investing in cryptocurrencies industry were proposed in the fourth section.

Key words: Bitcoin, cryptocurrency, cryptocurrencies industry, blockchain, investing, factors influencing the price of Bitcoin.

Andriienko O. Veiksnių, lemiančių bitkoino kainą, identifikavimas / Elektroninio verslo valdymo magistro darbas. Vadovė doc. dr. R. Remeikienė – Vilnius: Mykolo Romerio Universitetas, Ekonomikos ir verslo fakultetas, 2017.

ANOTACIJA

Magistrinio darbo tikslu siekiama identifikavus veiksnius, lemiančius bitkoino kainos svyravimus, pateikti investavimo į bitkoiną ar kitas kriptovaliutas, rekomendacijas.

Teorinėje pirmoje darbo dalyje apibrėžiama kriptovaliutų samprata, jų kilmė ir rūšys, veiksniai, lemiantys bitkoino kainą.

Antroje metodologinėje dalyje pristatomi metodai ir empirinio tyrimo loginė eiga bitkoino kainos svyravimus lemiantiems veiksniams identifikuoti: ekspertinis vertinimas, interviu ir Holto eksponentinio išlyginimo prognozavimo metodas.

Trečioje empirinėje dalyje remiantis ekspertinio vertinimo rezultatais identifikuojami bitkoino kainą lemiantys veiksniai; interviu metodo pagalba suformuojamos rizikos valdymo ir portfelio diversifikavimo pagrindinės taisyklės bei atliekamas bitkoino kainos lygio prognozavimas.

Darbo pabaigoje pateikiamos investavimo į kriptovaliutų pramonę gairės.

Raktiniai žodžiai: bitkoinas, kriptovaliutos, kriptovaliutų pramonė, „blockchain“ technologija, investavimas veiksniai, lemiantys bitkoino kainą.

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SUMMARY

Master Thesis is dedicated to identification of the factors influencing the price of Bitcoin. The topic of the research is relevant and significant as long as the unique nature of cryptocurrencies opens a range of opportunities for financial market investors and ignoring digital currencies features may lead to the missing of the existing opportunity. Hence, knowing the factors influencing the price of Bitcoin may help them to make right investment decisions.

The aim of scientific research lays in identification the most valuable factors in Bitcoin price formatting among the defined in primer scientific literature review and to propose the guidelines of investment decisions in Bitcoin and other cryptocurrencies.

Master Thesis consists of 4 parts.

The task of the first part was to analyse theoretical aspects of the factors influencing the price of cryptocurrencies. Methodological framework is based on theoretical descriptive, comparative, analytical methods. These methods are applied to the analysis of the theoretical literature on the concept and origins of cryptocurrencies, their types, peculiarities and factors influencing the price of Bitcoin.

The task of the second was to present methodology of the identification of the factors influencing the price of cryptocurrencies (the example of Bitcoin). Three methods were described in this part: expert evaluation, interview and prognostication. The main aim of expert evaluation method was to find out how do experts evaluate existing factors of Bitcoin price formatting. Their assessment helped to define the most significant factors in Bitcoin price formatting. The aim of semi-structured interview with representatives of financial markets was to get scheme for basic rules of risk management and portfolio diversification. Their answers helped to construct the investing guidelines in the fourth part of the research. The aim of prognostication method was to analyze existing statistical data of Bitcoin price and make short-term prognostication of Bitcoin price.

The task of the third par was to evaluate the factors influencing the price of Bitcoin.empirical results were presented and structured.

The task of the fourth part was to propose investing guidelines in cryptocurrencies industry. The guidelines were proposed based on the gathered data from the first and third part of master thesis.

Andriienko O. Veiksnių, lemiančių bitkoino kainą, identifikavimas / Elektroninio verslo valdymo magistro darbas. Vadovė doc. dr. R. Remeikienė – Vilnius: Mykolo Romerio Universitetas, Ekonomikos ir verslo fakultetas, 2017.

SANTRAUKA

Magistrinio darbo tikslas - identifikavus veiksnius, lemiančius bitkoino kainos svyravimus, pateikti investavimo į bitkoiną ar kitas kriptovaliutas, rekomendacijas. Tyrimo tema yra itin aktuali ir svarbi šiuolaikinėmis rinkos sąlygomis, nes unikali kriptovaliutų prigimtis suteikia daugybę galimybių finansų rinkų investuotojams, o skaitmeninės valiutos bruožų ignoravimas gali privesti prie tokių galimybių praradimo. Vadinasi, veiksnių, veikiančių bitkoino kainą žinojimas, gali padėti jiems priimti teisingus investavimo sprendimus.

Mokslinio tyrimo tikslu siekiama atlikus mokslinės literatūros analizę identifikuoti labiausią įtaką bitkoino kainos formavimui turinčius veiksnius ir pasiūlyti investavimo sprendimų gaires į bitkoinus ar kitas kriptovaliutas.

Magistrinį darbą sudaro 4 dalys.

Pirmoje dalyje analizuojami teoriniai veiksnių, veikiančių kriptovaliutų kainas, aspektai. Metodologija yra parengiama remiantis teoriniais tyrimais, palyginamaisiais ir analitiniais metodais. Šie metodai yra atrenkami po teorinių tyrimų apie kriptovaliutų sampratas ir kilmę, tipus, jų bruožus ir bitkoino kainą lemiančius veiksnius.

Siekiant išspręsti antrąjį uždavinį buvo pristatyta veiksnių, veikiančių kriptovaliutų (bitkoino atvejis) kainos svyravimus, metodologija. Trys metodai buvo aprašyti šioje dalyje: ekspertinis vertinimas, interviu ir prognozavimas. Pagrindinis ekspertinio vertinimo tikslas – nustatyti, kaip ekspertai vertina egzistuojančius veiksnius, veikiančius bitkoino kainos svyravimus. Jų įvertinimas padėjo apibrėžti reikšmingiausius bitkoino kainą veikiančius veiksnius. Pusiau struktūrinio interviu su finansų rinkų atstovais tikslas – gauti informacijos apie pagrindines rizikos valdymo ir portfelio diversifikavimo taisykles. Jų atsakymai padėjo suformuoti investavimo sprendimų gaires, kurios pateikiamos ketvirtojoje darbo dalyje. Prognozavimo metodo tikslas – išanalizuoti egzistuojančius bitkoino kainos statistinius duomenis ir atlikti trumpalaikį bitkoino kainos prognozavimą.

Trečiosios dalies tikslu siekiama įvertinti veiksnius, veikiančius bitkoino kainos svyravimus. Šioje dalyje pristatomi empiriniai rezultatai.

Ketvirtojoje dalyje suformuojami investavimo sprendimai į kriptovaliutų pramonę. Gairės pateikiamos atsižvelgiant į surinktus duomenis iš pirmos ir trečios tyrimų dalių.

LIST OF ANNEXES

Annex 1. Bitcoin logo

Annex 2. Ethereum logo

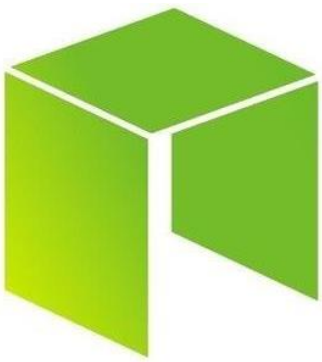
Annex 3. Bitcoin Cash logo

Annex 4. Ripple logo

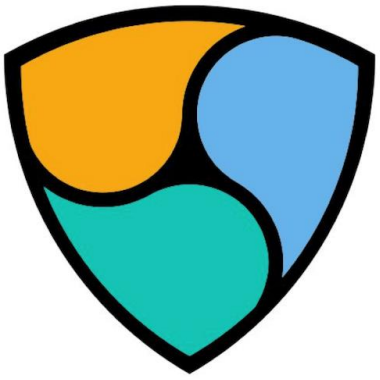
Annex 5. Litecoin logo

Annex 6. Dash logo

Annex 7. NEO logo



Annex 8. NEM logo



Annex 9. Monero logo

Annex 10. Ethereum Classic logo

Annex 11. The questionnaire for expert evaluation

Dear Expert,

I am a Master Degree student from Lithuanian Mykolas Romeris University. Currently I'm writing a Master Thesis: "Identification of the Factors Influencing the Price of Bitcoin" and would like to kindly ask you to answer the questions, which would help to identify prevailing factors for Bitcoin price formation and the potential future of cryptocurrencies industry. Your provided information will be used in scientific researches and analyzed generally. *Your participation in the research is very important. The results will be provided for you upon the request.*

Could you please complete online questionnaire consisting of 7 questions by following provided link: https://pollmill.com/f/identification-of-the-factors-influencing-the-price-of-bitcoin-e68urs7.fullpage

If you know some competent expert, who could complete this questionnaire, please, share with him the link of the survey or send his contacts to the following address: **andriienko.oleksandr@gmail.com**

Thank you in advance!

Kind Regards,

Oleksandr Andriienko

Part I. General information about the expert:

1. What is your highest level of education?

a) University Degree

b) Master's Degree

c) Some doctorate level courses

d) Doctorate Degree

e) Other, (please indicate)_____

2. What is your current experience in the topic of cryptocurrencies?

a) 1-2 years

b) 2-4 years

c) 4-6 years

d) 6 years and more.

3. Do you use Bitcoin in business life?

a) Yes, quite often (buying goods and services, keeping it in my investing portfolio)

b) Yes, but rarely

d) No, I'm not using it

Part II. Factors that influence Bitcoin price formation

1. **Could you please choose, in your opinion, the most valuable factor for Bitcoin price formation?** Please evaluate the importance of statements/definitions, provided bellow. A scale of five is used for the evaluation: where 1 point - totally disagree with the statement, and 5 points – totally agree with the statement. Different statements can be evaluated with the same amount of points.

№	Factor	Totally disagree	Disagree	Do not have an opinion	Agree	Totally agree
1	Search queries	1	2	3	4	5
2	News	1	2	3	4	5
3	The use of Bitcoin in exchange (Bitcoin economy)	1	2	3	4	5
4	The velocity of Bitcoin circulation	1	2	3	4	5
5	Energy efficiency (the Hash Rate)	1	2	3	4	5
6	The size of mining network (network its difficulty)	1	2	3	4	5
7	Cyber-attacks	1	2	3	4	5

Explanation of factors:

1) **Search queries.** According to Kristoufek (2013), the frequency of searches related to the virtual currency (can be analyzed with Google Trends or Wikipedia) is a good measure of investors' interest in the currency and may serve as an early indicator of Bitcoin price changes.
2) **News.** According to Grullon et al., (2004); Barber & Odean, (2008), the majority of investors are buying only those assets that have recently caught their attention. The more investors are feeling confident in their ability to identify an instrument worth of investment, the more they are interested about the asset and its industry.
3) **The use of Bitcoin in exchange (Bitcoin economy).** According to Kancs et al., (2015) the size of Bitcoin economy is represented by the total number of unique Bitcoin transactions per day (number of transactions), and the number of unique Bitcoin addresses used per day (number of addresses). The more demand for Bitcoin economy is in form of increased number of transactions and addresses used, the more Bitcoin price is and vice versa.
4) **The velocity of Bitcoin in circulation.** According to Bouoiyour & Selmi, (2015) the velocity determines at which frequency one unit of Bitcoin is being exchanged for goods and services.

According to quantity theory, the price of Bitcoin falls with the decreasing of velocity and units of Bitcoin in circulation and vice versa. Kancs et al., (2015)

5) **Energy efficiency (the Hash Rate).** According to Hayes, (2017) the hash rate is measurement unit of the processing power of the Bitcoin network. Additional hashing power added to the global mining network has a tendency to increase the mining difficulty, which is positively reflected in the price.
6) **The size of mining network (network difficulty).** According to Hayes, (2017); Kristoufek (2015), the Bitcoin network difficulty measures of how difficult it is to find a new block compared to the easiest it can ever be. Due to technological progress mining efficiency increases. In turn, it lowers the cost of production and force miners to leave the market. That leads to negative effect of pulling Bitcoin price down.
7) **Cyber-attacks**. According to Ciaian et al., (2016); Moore & Christin, (2013); Yermack (2015) Cyber-attacks have a power to lead Bitcoin to its collapse. Being a digital currency, Bitcoin is more pregnable to cyber-attacks comparing to fiat money. Users of Bitcoin network are forced to keep their digital currency savings in "digital wallets" that are vulnerable to hackers-predators. Besides, Bitcoin exchanges may be shut down by cyber-attacks.

2. What is your opinion about potential future of Bitcoin?

a) Bitcoin price seems to keep growing for the next several years.

b) I think, one day Bitcoin will collapse and that will set the timeline for the sunset of cryptocurrencies industry.

c) I think, one day Bitcoin will collapse and once it is gone, its money supply will be distributed among nearest competitors by market capitalization like Ethereum, Bitcoin Cash, Ripple, Litecoin and others cryptocurrencies.

d) Other, (please indicate)_____

3. If you invested in Bitcoin, which factors among provided for expert evaluation you would check first to make investment decisions in Bitcoin? (You can choose more than one option).

a) Investors' attractiveness in form of search queries

b) News

c) The use of Bitcoin in exchange (Bitcoin economy)

d) The velocity of Bitcoin circulation

e) Energy efficiency (the Hash Rate)

f) The size of mining network (network difficulty)

g) Cyber-attacks

h) All of them

i) Other, (please indicate)_____

4. What is your opinion about potential future of cryptocurrencies industry?

a) I think that it is undervalued and will shake up the financial services and global payments system in the future.

b) I think that it is a bubble and one day cryptocurrencies industry will leave the markets.

c) Other, (please indicate)_____

Thank you very much for your time and your answers!

Annex 12. The questionnaire for semi-structured interview

Dear Expert,

I am a Master Degree student from Lithuanian Mykolas Romeris University. Currently I'm writing a Master Thesis: "Identification of the Factors Influencing the Price of Bitcoin" and would like to kindly ask you to fill online questionnaire. The questions are dedicated to the basics of risk-management and portfolio diversification. Your answers will help to construct the guidelines for investing in cryptocurrencies. Your provided information will be used in scientific researches and analyzed generally. *Your participation in the research is very important. The results will be provided for you upon the request.*

Could you please complete online questionnaire consisting of 16 questions by following provided link:

https://pollmill.com/f/basics-of-risk-management-and-portfolio-diversificaton-ynj881d.fullpage

If you know some competent expert, who could complete this questionnaire, please, share with him the link of the survey or send his contacts to the following address: **andriienko.oleksandr@gmail.com**

Thank you in advance!
Kind Regards,
Oleksandr Andriienko

Part I. General information about the expert:

1. What is your current experience in the topic of investments?

a) 2-4 years
b) 5-9 years
c) 10-15 years
d) 15+ years

2. Could you, please, select a range, where is your yearly ROI allocated?

a) 0.01-10%
b) 11-30%
d) 30-50%
e) 50%+

Part II. Basic rules of risk management and portfolio diversification:

1. Which seed capital do you consider to be appropriate for starting making investments/trades in financial markets?

2. What is the limit (in percentage) of total capital that is appropriate to use at the time? *For example, if you own a capital of 10.000$ and have a rule to use only halve of it for all existing trades, then your limit would be 50%.*

3. Which part of your capital (in percentage) would you keep in one market/industry?

4. How many instruments would you trade at the same time in one market?

5. What is the highest percentage of total capital loss that investor should take while making 1 trade?

6. What is appropriate risk/reward ratio investor (or trader) should seek?

7. What is appropriate leverage that trader should use? *(1:100, 1:50, other options)?*

8. Do you use investment rebalancing of you current long-term positions? If yes, how many times per month?

9. What is appropriate percentage of yearly generated profit to reinvest for the next year of investments/trades?

10. Which yearly ROI should investor be satisfied to achieve?

Part III. Interviewees' opinion about potential investments in cryptocurrency industry:

1. If you invested in cryptocurrencies industry, which percentage of total capital you would invest in it?

2. If you invested in cryptocurrencies industry, how would you diversify your investment portfolio? *Would you invest in Bitcoin only or a group of top-5, top-10, top-X cryptocurrencies? Would you invest in Cryptocurrency Index Funds, aggressive trading funds, ICOs? Maybe, other options?*

3. If you invested in cryptocurrency industry, which leverage would you use for trading?

4. How would you diversify your invested capital in cryptocurrencies industry between conservative trading (e.g., buying fundamental cryptocurrencies that represent industry, investing in Cryptocurrency Conservative/Index Funds) and aggressive trading (e.g., trading with leverage, investing in ICOs and aggressive trading funds)? *Please, provide your answer with percentage ratio X%/Y%, where X - is conservative trading, Y - is aggressive trading. For example, 60%/40%.*

Thank you very much for your time and your answers

Annex 13. Finding optimal smoothing values

		Beta								
SSE =	30052873,62	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9
Alpha	0,1	102047321,4	74542198,08	59454883,46	54299075,93	53614648,16	57136852,86	64173299,33	72663965,16	79275934,22
	0,2	52494594,56	43663443,94	42755260,05	44611490,47	46133689,01	46402741,73	46093805,85	45992508,06	46469547,01
	0,3	38291877,94	35047804,81	35205305,9	35731762,73	36183573,32	36813664,78	37657343,35	38536071,66	39284710,29
	0,4	31573537,05	30188906,48	30580461,64	31284506,7	32131076,84	33054418,01	33966775,08	34832546	35667527,08
	0,5	27703213,23	27289566,63	28012697,47	28987671,89	30052873,62	31141252,49	32225217,65	33309046,34	34408285,58
	0,6	25263539	25471720,49	26460240,59	27619374,6	28818568,28	30008704,2	31168801,96	32285805,53	33339389,15
	0,7	23612592,85	24225612,5	25374941,86	26610597,7	27824015,07	28968141,24	30012874,09	30931669,67	31699612,46
	0,8	22419368	23280256,3	24492864,69	25711206,58	26845443,73	27856933,94	28726947,63	29452171,83	30047651,18
	0,9	**21519514,97**	22522834,69	23741101,93	24908550,73	25963954,03	26896893,11	27725342,63	28491735,33	29260467,69

Annex 14. Forecasts of Bitcoin price formation

Alpha = 0.9; Beta = 0.1

Date	Period	Price	A_t	T_t	Forecast	Error	$Error^2$
30.11.2016	1	742,69	742,69	0,725			
01.12.2016	2	752,24	751,36	1,51925	743,42	8,82	77,88
02.12.2016	3	772,43	770,47	3,2790425	752,88	19,55	382,33
03.12.2016	4	764,33	765,27	2,43090793	773,75	-9,42	88,81
04.12.2016	5	764,81	765,10	2,17051275	767,70	-2,89	8,37
05.12.2016	6	754,63	755,89	1,03292709	767,27	-12,64	159,77
06.12.2016	7	756,62	756,65	1,00530508	756,93	-0,31	0,09
07.12.2016	8	766,11	765,26	1,76616543	757,66	8,45	71,47
08.12.2016	9	769,72	769,45	2,00819657	767,03	2,69	7,23
09.12.2016	10	770,02	770,16	1,878662	771,46	-1,44	2,07
10.12.2016	11	773,40	773,26	2,00082896	772,04	1,36	1,84
11.12.2016	12	768,30	769,00	1,37397105	775,27	-6,97	48,51
12.12.2016	13	777,00	776,34	1,97062786	770,37	6,63	43,95
13.12.2016	14	778,49	778,47	1,98703704	778,31	0,18	0,03
14.12.2016	15	774,89	775,45	1,48584462	780,46	-5,57	31,01
15.12.2016	16	776,75	776,77	1,46939936	776,93	-0,18	0,03
16.12.2016	17	781,56	781,23	1,76840889	778,24	3,32	11,04
17.12.2016	18	788,70	788,13	2,28175305	783,00	5,70	32,53
18.12.2016	19	788,40	788,60	2,10072969	790,41	-2,01	4,05
19.12.2016	20	789,52	789,64	1,99436168	790,70	-1,18	1,40
20.12.2016	21	793,09	792,94	2,12553233	791,63	1,46	2,12
21.12.2016	22	824,21	821,30	4,74815148	795,07	29,14	849,15
22.12.2016	23	860,59	857,14	7,85727977	826,04	34,55	1193,42
23.12.2016	24	901,31	897,68	11,1258374	864,99	36,32	1318,95
24.12.2016	25	891,61	893,33	9,57836781	908,80	-17,19	295,64
25.12.2016	26	886,90	888,50	8,13766775	902,91	-16,01	256,25
26.12.2016	27	897,33	897,26	8,19990765	896,64	0,69	0,48
27.12.2016	28	930,37	927,88	10,4417399	905,46	24,91	620,47
28.12.2016	29	967,48	964,56	13,0660666	938,32	29,16	850,26
29.12.2016	30	963,38	964,81	11,7835533	977,63	-14,25	203,07
30.12.2016	31	952,15	954,59	9,58408213	976,59	-24,44	597,24
31.12.2016	32	959,87	960,30	9,19636762	964,18	-4,31	18,56
01.01.2017	33	997,72	994,90	11,7364231	969,50	28,22	796,53
02.01.2017	34	1015,97	1015,04	12,5766506	1006,63	9,34	87,16
03.01.2017	35	1023,14	1023,59	12,1740748	1027,61	-4,47	20,01
04.01.2017	36	1126,76	1117,66	20,3639504	1035,76	91,00	8280,75
05.01.2017	37	994,67	1009,01	7,46208247	1138,02	-143,35	20550,39
06.01.2017	38	883,09	896,43	-4,5418917	1016,47	-133,38	17789,56
07.01.2017	39	896,83	896,34	-4,0969189	891,89	4,94	24,44
08.01.2017	40	908,14	906,55	-2,6657989	892,24	15,90	252,85
09.01.2017	41	894,18	895,15	-3,539165	903,88	-9,70	94,17
10.01.2017	42	906,05	904,61	-2,2396768	891,61	14,44	208,48
11.01.2017	43	785,22	796,93	-12,782857	902,37	-117,15	13723,29
12.01.2017	44	803,37	801,45	-11,053218	784,15	19,22	369,34
13.01.2017	45	826,29	822,70	-7,8226644	790,39	35,90	1288,45
14.01.2017	46	817,91	817,61	-7,5497693	814,88	3,03	9,19
15.01.2017	47	822,20	820,99	-6,4569005	810,06	12,14	147,45

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16.01.2017	48	830,50	828,90	-5,0194926	814,53	15,97	255,08
17.01.2017	49	903,84	895,84	2,17660253	823,88	79,96	6393,06
18.01.2017	50	874,99	877,29	0,10381782	898,02	-23,03	530,42
19.01.2017	51	895,79	893,95	1,75919574	877,40	18,39	338,31
20.01.2017	52	893,62	893,83	1,57110592	895,71	-2,09	4,37
21.01.2017	53	920,44	917,94	3,8246974	895,40	25,04	627,00
22.01.2017	54	918,60	918,92	3,54023378	921,76	-3,16	9,99
23.01.2017	55	922,07	922,11	3,50546638	922,46	-0,39	0,15
24.01.2017	56	890,32	893,85	0,32899767	925,61	-35,29	1245,67
25.01.2017	57	893,04	893,15	0,22654101	894,18	-1,14	1,30
26.01.2017	58	915,95	913,69	2,25780665	893,38	22,57	509,39
27.01.2017	59	919,27	918,94	2,55653062	915,95	3,32	11,02
28.01.2017	60	920,31	920,43	2,44991526	921,49	-1,18	1,40
29.01.2017	61	915,93	916,62	1,82456135	922,88	-6,95	48,28
30.01.2017	62	921,17	920,90	2,06941544	918,45	2,72	7,40
31.01.2017	63	964,70	960,53	5,82535345	922,97	41,73	1741,61
01.02.2017	64	979,70	978,37	7,02666545	966,35	13,35	178,17
02.02.2017	65	1007,61	1005,39	9,02629675	985,39	22,22	493,65
03.02.2017	66	1013,02	1013,16	8,90079318	1014,41	-1,39	1,94
04.02.2017	67	1030,99	1030,10	9,70447143	1022,06	8,93	79,74
05.02.2017	68	1014,83	1017,33	7,45703683	1039,80	-24,97	623,58
06.02.2017	69	1024,01	1024,09	7,38736006	1024,78	-0,77	0,60
07.02.2017	70	1050,11	1048,25	9,06452997	1031,47	18,64	347,27
08.02.2017	71	1052,37	1052,86	8,61983927	1057,31	-4,94	24,41
09.02.2017	72	976,10	984,64	0,93528466	1061,48	-85,38	7290,42
10.02.2017	73	999,10	997,75	2,15265358	985,57	13,53	182,96
11.02.2017	74	1008,84	1007,95	2,95725165	999,90	8,94	79,92
12.02.2017	75	1000,60	1001,63	2,02995881	1010,90	-10,30	106,16
13.02.2017	76	999,87	1000,25	1,68883323	1003,66	-3,79	14,37
14.02.2017	77	1011,78	1010,80	2,57462568	1001,94	9,84	96,87
15.02.2017	78	1012,32	1012,43	2,48008862	1013,37	-1,05	1,10
16.02.2017	79	1035,20	1033,17	4,30662694	1014,91	20,29	411,88
17.02.2017	80	1055,53	1053,72	5,93138434	1037,48	18,05	325,91
18.02.2017	81	1056,63	1056,93	5,65903549	1059,66	-3,03	9,16
19.02.2017	82	1052,77	1053,75	4,77508741	1062,59	-9,82	96,46
20.02.2017	83	1084,75	1082,13	7,13513474	1058,53	26,22	687,63
21.02.2017	84	1123,78	1120,33	10,2416773	1089,26	34,52	1191,43
22.02.2017	85	1123,22	1123,95	9,58018064	1130,57	-7,35	54,02
23.02.2017	86	1172,01	1168,16	13,0429147	1133,54	38,47	1480,31
24.02.2017	87	1174,86	1175,49	12,4718258	1181,21	-6,35	40,26
25.02.2017	88	1150,60	1154,34	9,10885259	1187,97	-37,37	1396,25
26.02.2017	89	1175,04	1173,88	10,1523585	1163,45	11,59	134,43
27.02.2017	90	1190,75	1190,08	10,7568969	1184,03	6,72	45,12
28.02.2017	91	1187,56	1188,89	9,56212997	1200,84	-13,28	176,23
01.03.2017	92	1222,49	1220,09	11,7257616	1198,45	24,04	577,94
02.03.2017	93	1259,41	1256,65	14,2096062	1231,81	27,60	761,66
03.03.2017	94	1285,40	1283,95	15,5182261	1270,86	14,54	211,42
04.03.2017	95	1267,02	1270,26	12,5982477	1299,46	-32,44	1052,63
05.03.2017	96	1270,93	1272,12	11,5243076	1282,86	-11,93	142,39
06.03.2017	97	1275,19	1276,04	10,7631259	1283,65	-8,46	71,53
07.03.2017	98	1238,44	1243,28	6,41082642	1286,80	-48,36	2338,58

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08.03.2017	99	1157,39	1166,62	-1,8958779	1249,69	-92,30	8518,68
09.03.2017	100	1192,46	1189,69	0,60038067	1164,72	27,74	769,30
10.03.2017	101	1098,61	1107,78	-7,6505277	1190,29	-91,68	8404,63
11.03.2017	102	1179,15	1171,25	-0,5384711	1100,13	79,02	6244,61
12.03.2017	103	1227,49	1221,81	4,57179698	1170,71	56,78	3224,05
13.03.2017	104	1239,81	1238,47	5,78016206	1226,38	13,43	180,26
14.03.2017	105	1245,37	1245,26	5,88118398	1244,25	1,12	1,26
15.03.2017	106	1257,39	1256,76	6,44377962	1251,14	6,25	39,08
16.03.2017	107	1180,94	1189,17	-0,960401	1263,21	-82,27	6768,13
17.03.2017	108	1091,17	1100,87	-9,693683	1188,21	-97,04	9416,08
18.03.2017	109	952,23	966,12	-22,19918	1091,18	-138,95	19307,09
19.03.2017	110	1029,80	1021,21	-14,470503	943,93	85,87	7374,38
20.03.2017	111	1049,08	1044,85	-10,66009	1006,74	42,34	1792,50
21.03.2017	112	1118,63	1110,19	-3,0601408	1034,19	84,44	7130,77
22.03.2017	113	1028,72	1036,56	-10,116633	1107,13	-78,41	6147,42
23.03.2017	114	1038,78	1037,55	-9,0063855	1026,44	12,34	152,18
24.03.2017	115	941,91	950,57	-16,803086	1028,54	-86,63	7504,76
25.03.2017	116	959,34	956,78	-14,501778	933,77	25,57	653,83
26.03.2017	117	956,78	955,33	-13,196887	942,28	14,50	210,21
27.03.2017	118	1037,22	1027,71	-4,6390785	942,13	95,09	9041,49
28.03.2017	119	1046,12	1043,82	-2,5647806	1023,07	23,05	531,20
29.03.2017	120	1040,57	1040,64	-2,6260205	1041,25	-0,68	0,46
30.03.2017	121	1037,90	1037,91	-2,6361027	1038,01	-0,11	0,01
31.03.2017	122	1079,54	1075,11	1,34773835	1035,28	44,26	1959,38
01.04.2017	123	1086,92	1085,87	2,289026	1076,46	10,46	109,39
02.04.2017	124	1099,16	1098,06	3,27874243	1088,16	11,00	120,93
03.04.2017	125	1141,81	1137,76	6,92112725	1101,34	40,47	1637,90
04.04.2017	126	1141,60	1141,91	6,64356428	1144,68	-3,08	9,51
05.04.2017	127	1133,07	1134,62	5,2501872	1148,55	-15,48	239,69
06.04.2017	128	1196,30	1190,66	10,3290326	1139,87	56,43	3184,53
07.04.2017	129	1190,45	1191,50	9,38080425	1200,99	-10,54	111,00
08.04.2017	130	1181,14	1183,11	7,60380903	1200,88	-19,74	389,84
09.04.2017	131	1208,80	1206,99	9,23116669	1190,72	18,08	326,95
10.04.2017	132	1207,74	1208,59	8,46769746	1216,22	-8,48	71,96
11.04.2017	133	1226,61	1225,65	9,32755776	1217,06	9,55	91,28
12.04.2017	134	1218,92	1220,53	7,88196359	1234,98	-16,06	257,99
13.04.2017	135	1180,02	1184,86	3,52702745	1228,41	-48,39	2341,42
14.04.2017	136	1185,26	1185,57	3,24570137	1188,39	-3,13	9,77
15.04.2017	137	1184,88	1185,27	2,89125564	1188,82	-3,94	15,51
16.04.2017	138	1186,92	1187,04	2,77919806	1188,17	-1,25	1,55
17.04.2017	139	1205,63	1204,05	4,20176447	1189,82	15,81	249,84
18.04.2017	140	1216,18	1215,39	4,91536231	1208,25	7,93	62,87
19.04.2017	141	1217,93	1218,17	4,70183949	1220,30	-2,37	5,63
20.04.2017	142	1241,68	1239,80	6,39482165	1222,87	18,81	353,85
21.04.2017	143	1258,36	1257,14	7,48978592	1246,19	12,17	148,02
22.04.2017	144	1261,31	1261,64	7,19070161	1264,63	-3,32	11,04
23.04.2017	145	1257,98	1259,07	6,21393004	1268,83	-10,85	117,79
24.04.2017	146	1262,90	1263,14	5,99979918	1265,28	-2,38	5,66
25.04.2017	147	1279,41	1278,38	6,92430416	1269,14	10,27	105,52
26.04.2017	148	1309,10	1306,72	9,06566729	1285,31	23,79	566,10
27.04.2017	149	1345,35	1342,39	11,7263935	1315,79	29,56	874,01

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28.04.2017	150	1331,29	1333,57	9,67169075	1354,12	-22,83	521,21
29.04.2017	151	1334,97	1335,80	8,9269683	1343,24	-8,27	68,47
30.04.2017	152	1353,00	1352,17	9,67176891	1344,72	8,28	68,48
01.05.2017	153	1417,17	1411,64	14,6510898	1361,84	55,33	3060,94
02.05.2017	154	1452,07	1449,49	16,9714238	1426,29	25,78	664,69
03.05.2017	155	1507,57	1503,46	20,671029	1466,46	41,11	1689,76
04.05.2017	156	1508,29	1509,87	19,245397	1524,13	-15,84	250,92
05.05.2017	157	1533,33	1532,91	19,624348	1529,12	4,21	17,73
06.05.2017	158	1560,41	1559,62	20,3332518	1552,53	7,88	62,04
07.05.2017	159	1535,86	1540,27	16,3646495	1579,96	-44,10	1944,42
08.05.2017	160	1640,61	1632,21	23,9224708	1556,63	83,98	7051,93
09.05.2017	161	1721,28	1714,77	29,7855306	1656,13	65,15	4243,89
10.05.2017	162	1762,88	1761,05	31,4351388	1744,55	18,33	335,95
11.05.2017	163	1820,99	1818,14	34,0008371	1792,48	28,51	812,69
12.05.2017	164	1720,47	1733,64	22,1505316	1852,14	-131,67	17337,01
13.05.2017	165	1771,92	1770,31	23,6024532	1755,79	16,13	260,26
14.05.2017	166	1776,31	1778,07	22,0185246	1793,91	-17,60	309,73
15.05.2017	167	1723,12	1730,82	15,0913645	1800,09	-76,97	5924,14
16.05.2017	168	1739,03	1739,72	14,4723257	1745,91	-6,88	47,31
17.05.2017	169	1807,48	1802,15	19,2684125	1754,19	53,29	2839,81
18.05.2017	170	1899,08	1891,31	26,2578641	1821,42	77,66	6031,16
19.05.2017	171	1961,52	1957,13	30,2132015	1917,57	43,95	1931,44
20.05.2017	172	2052,90	2046,34	36,1137471	1987,34	65,56	4298,33
21.05.2017	173	2046,53	2050,12	32,8802644	2082,46	-35,93	1290,79
22.05.2017	174	2090,66	2089,89	33,5693923	2083,00	7,66	58,63
23.05.2017	175	2287,71	2271,29	48,3515598	2123,46	164,25	26976,85
24.05.2017	176	2379,19	2373,23	53,7113362	2319,64	59,55	3546,57
25.05.2017	177	2387,20	2391,17	50,1341936	2426,95	-39,75	1579,75
26.05.2017	178	2211,97	2234,90	29,4937019	2441,31	-229,34	52596,28
27.05.2017	179	2014,05	2039,08	6,96241954	2264,40	-250,35	62673,91
28.05.2017	180	2192,98	2178,29	20,1863735	2046,05	146,93	21589,25
29.05.2017	181	2275,93	2268,18	27,1574953	2198,47	77,46	5999,57
30.05.2017	182	2239,20	2244,81	22,1047329	2295,34	-56,14	3151,90
31.05.2017	183	2285,93	2284,03	23,8157307	2266,92	19,01	361,42
01.06.2017	184	2399,24	2390,10	32,0413147	2307,84	91,40	8353,12
02.06.2017	185	2446,14	2443,74	34,2011548	2422,14	24,00	575,91
03.06.2017	186	2525,76	2520,98	38,5048349	2477,94	47,82	2286,62
04.06.2017	187	2516,17	2520,50	34,6066678	2559,48	-43,31	1876,01
05.06.2017	188	2698,31	2683,99	47,4948509	2555,11	143,20	20506,82
06.06.2017	189	2883,31	2868,13	61,1591327	2731,48	151,83	23050,94
07.06.2017	190	2664,92	2691,36	37,3661389	2929,29	-264,37	69889,70
08.06.2017	191	2792,99	2786,56	43,150187	2728,72	64,27	4130,27
09.06.2017	192	2827,49	2827,71	42,950075	2829,71	-2,22	4,94
10.06.2017	193	2845,37	2847,90	40,6737571	2870,66	-25,29	639,71
11.06.2017	194	2961,82	2954,50	47,2659871	2888,57	73,25	5365,12
12.06.2017	195	2657,67	2692,08	16,2977713	3001,76	-344,09	118398,81
13.06.2017	196	2748,18	2744,20	19,8800503	2708,38	39,80	1584,29
14.06.2017	197	2447,04	2478,74	-8,6535263	2764,08	-317,04	100514,20
15.06.2017	198	2442,48	2445,24	-11,138467	2470,09	-27,61	762,34
16.06.2017	199	2464,95	2461,87	-8,3621987	2434,10	30,85	951,56
17.06.2017	200	2665,92	2644,68	10,755326	2453,50	212,42	45120,96

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18.06.2017	201	2507,38	2522,19	-2,5695009	2655,43	-148,05	21919,88
19.06.2017	202	2617,21	2607,45	6,21397153	2519,62	97,59	9524,62
20.06.2017	203	2754,97	2740,84	18,9314613	2613,66	141,31	19967,23
21.06.2017	204	2671,04	2679,91	10,9456788	2759,77	-88,73	7873,18
22.06.2017	205	2727,28	2723,64	14,2235894	2690,86	36,42	1326,51
23.06.2017	206	2710,41	2713,16	11,7529575	2737,86	-27,45	753,58
24.06.2017	207	2589,16	2602,73	-0,4643719	2724,91	-135,75	18427,55
25.06.2017	208	2512,36	2521,35	-8,5563114	2602,27	-89,91	8083,89
26.06.2017	209	2436,45	2444,08	-15,427337	2512,79	-76,34	5828,52
27.06.2017	210	2517,90	2508,98	-7,3954795	2428,66	89,24	7964,29
28.06.2017	211	2585,34	2576,96	0,1428994	2501,58	83,76	7015,70
29.06.2017	212	2544,41	2547,68	-2,7998236	2577,11	-32,70	1069,09
30.06.2017	213	2477,64	2484,36	-8,8514118	2544,88	-67,24	4521,20
01.07.2017	214	2434,07	2438,21	-12,581244	2475,51	-41,44	1717,49
02.07.2017	215	2501,19	2493,63	-5,7811148	2425,63	75,56	5708,86
03.07.2017	216	2561,22	2553,88	0,82189838	2487,85	73,37	5382,69
04.07.2017	217	2599,72	2595,22	4,87322884	2554,71	45,01	2026,33
05.07.2017	218	2619,18	2617,27	6,59117129	2600,09	19,09	364,36
06.07.2017	219	2609,96	2611,35	5,33996012	2623,86	-13,90	193,28
07.07.2017	220	2491,20	2503,75	-5,9541574	2616,69	-125,49	15747,79
08.07.2017	221	2562,13	2555,70	-0,163995	2497,79	64,34	4139,01
09.07.2017	222	2536,23	2538,16	-1,9012192	2555,53	-19,30	372,59
10.07.2017	223	2366,17	2383,18	-17,209232	2536,26	-170,09	28930,28
11.07.2017	224	2369,86	2369,47	-16,859102	2365,97	3,89	15,13
12.07.2017	225	2385,74	2382,43	-13,87757	2352,61	33,13	1097,47
13.07.2017	226	2354,78	2356,16	-15,116836	2368,55	-13,77	189,60
14.07.2017	227	2190,94	2205,95	-28,625847	2341,04	-150,10	22530,05
15.07.2017	228	2058,99	2070,82	-39,275922	2177,32	-118,33	14002,97
16.07.2017	229	1931,21	1941,24	-48,306296	2031,55	-100,34	10067,61
17.07.2017	230	2176,62	2148,25	-22,774867	1892,94	283,68	80475,79
18.07.2017	231	2320,12	2300,66	-5,2569862	2125,48	194,64	37885,94
19.07.2017	232	2264,76	2267,82	-8,0144693	2295,40	-30,64	938,73
20.07.2017	233	2898,18	2834,34	49,4388846	2259,81	638,37	407517,02
21.07.2017	234	2682,19	2702,35	31,2956204	2883,78	-201,59	40639,26
22.07.2017	235	2807,60	2800,20	37,9515881	2733,64	73,96	5469,37
23.07.2017	236	2725,54	2736,80	27,816142	2838,16	-112,62	12682,38
24.07.2017	237	2751,82	2753,10	26,6643446	2764,62	-12,80	163,78
25.07.2017	238	2560,99	2582,87	6,97467382	2779,76	-218,77	47862,12
26.07.2017	239	2495,02	2504,50	-1,5593139	2589,84	-94,82	8991,23
27.07.2017	240	2647,62	2633,15	11,4616256	2502,94	144,68	20931,46
28.07.2017	241	2781,63	2767,93	23,7930732	2644,61	137,02	18773,41
29.07.2017	242	2722,51	2729,43	17,5640414	2791,72	-69,21	4790,23
30.07.2017	243	2745,95	2746,05	17,4699745	2747,00	-1,05	1,09
31.07.2017	244	2866,43	2856,14	26,7314701	2763,52	102,91	10589,54
01.08.2017	245	2710,41	2727,66	11,2099873	2882,87	-172,46	29742,77
02.08.2017	246	2693,63	2698,15	7,13874021	2738,87	-45,24	2046,30
03.08.2017	247	2794,11	2785,23	15,1323289	2705,29	88,82	7888,58
04.08.2017	248	2873,85	2866,50	21,7463781	2800,36	73,49	5400,70
05.08.2017	249	3218,11	3185,12	51,434009	2888,25	329,86	108809,31
06.08.2017	250	3252,56	3250,96	52,8742113	3236,56	16,00	256,07
07.08.2017	251	3407,22	3396,88	62,1789525	3303,83	103,39	10688,67

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08.08.2017	252	3457,37	3457,54	62,0268209	3459,06	-1,69	2,86
09.08.2017	253	3357,32	3373,54	47,4246939	3519,57	-162,25	26323,72
10.08.2017	254	3424,40	3424,06	47,7334587	3420,97	3,43	11,77
11.08.2017	255	3632,50	3616,43	62,1973239	3471,79	160,71	25827,58
12.08.2017	256	3852,80	3835,38	77,8729513	3678,63	174,17	30336,46
13.08.2017	257	4125,54	4104,31	96,9785484	3913,26	212,28	45064,67
14.08.2017	258	4282,99	4274,82	104,331539	4201,29	81,70	6674,87
15.08.2017	259	4217,02	4233,23	89,7396993	4379,15	-162,13	26286,64
16.08.2017	260	4360,87	4357,08	93,1504424	4322,97	37,90	1436,19
17.08.2017	261	4328,72	4340,87	82,2144769	4450,23	-121,51	14764,86
18.08.2017	262	4130,44	4159,70	55,8763774	4423,09	-292,65	85641,42
19.08.2017	263	4222,66	4221,95	56,5134935	4215,58	7,08	50,11
20.08.2017	264	4157,95	4170,00	45,6670907	4278,47	-120,52	14524,01
21.08.2017	265	4043,72	4060,91	30,1917123	4215,67	-171,95	29566,34
22.08.2017	266	4082,18	4083,07	29,3883203	4091,11	-8,93	79,68
23.08.2017	267	4174,95	4168,70	35,0123323	4112,46	62,49	3904,88
24.08.2017	268	4340,31	4326,65	47,3060236	4203,71	136,60	18658,62
25.08.2017	269	4363,05	4364,14	46,3244506	4373,96	-10,91	118,95
26.08.2017	270	4360,51	4365,51	41,8284927	4410,47	-49,96	2495,51
27.08.2017	271	4354,30	4359,60	37,0554326	4407,33	-53,03	2812,61
28.08.2017	272	4391,67	4392,17	36,6064377	4396,66	-4,99	24,89
29.08.2017	273	4607,98	4590,06	52,7348588	4428,78	179,20	32114,32
30.08.2017	274	4594,98	4599,76	48,4315636	4642,79	-47,81	2286,22
31.08.2017	275	4748,25	4738,24	57,4366934	4648,19	100,06	10011,40
01.09.2017	276	4911,74	4900,13	67,8820039	4795,68	116,06	13469,69
02.09.2017	277	4580,38	4619,14	32,9947546	4968,02	-387,64	150261,75
03.09.2017	278	4648,15	4648,55	32,6358018	4652,14	-3,99	15,91
04.09.2017	279	4344,09	4377,80	2,29728434	4681,18	-337,09	113632,80
05.09.2017	280	4488,72	4477,86	12,073377	4380,10	108,62	11799,01
06.09.2017	281	4641,82	4626,63	25,7433823	4489,93	151,89	23070,25
07.09.2017	282	4654,65	4654,42	25,9481785	4652,37	2,28	5,18
08.09.2017	283	4310,75	4347,71	-7,317678	4680,37	-369,62	136619,41
09.09.2017	284	4375,55	4372,03	-4,1536726	4340,39	35,16	1235,92
10.09.2017	285	4329,95	4333,74	-7,5674415	4367,88	-37,93	1438,74
11.09.2017	286	4248,09	4255,90	-14,595149	4326,18	-78,09	6097,37
12.09.2017	287	4219,03	4221,26	-16,599756	4241,30	-22,27	496,11
13.09.2017	288	3961,27	3985,61	-38,504639	4204,66	-243,39	59237,52
14.09.2017	289	3319,62	3382,37	-94,97821	3947,10	-627,48	393736,32
15.09.2017	290	3774,26	3725,57	-51,159928	3287,39	486,87	237042,20
16.09.2017	291	3763,62	3754,70	-43,131306	3674,41	89,21	7957,87
17.09.2017	292	3746,06	3742,61	-40,027026	3711,57	34,49	1189,70
18.09.2017	293	4093,31	4054,24	-4,861666	3702,58	390,73	152666,98
19.09.2017	294	3943,41	3954,01	-14,39858	4049,38	-105,97	11228,73
20.09.2017	295	3977,56	3973,76	-10,982899	3939,61	37,95	1440,35
21.09.2017	296	3658,89	3689,28	-38,33317	3962,78	-303,89	92350,29
22.09.2017	297	3637,50	3638,84	-39,543312	3650,95	-13,45	180,80
23.09.2017	298	3776,38	3758,67	-23,606228	3599,30	177,08	31356,87
24.09.2017	299	3703,04	3706,24	-26,488559	3735,07	-32,03	1025,66
25.09.2017	300	3942,55	3916,27	-2,836922	3679,75	262,80	69061,72
26.09.2017	301	3910,30	3910,61	-3,1189353	3913,43	-3,13	9,82
27.09.2017	302	4202,55	4173,04	23,4360676	3907,49	295,06	87057,80

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28.09.2017	303	4201,98	4201,43	23,9310218	4196,48	5,50	30,24
29.09.2017	304	4193,57	4196,75	21,0698252	4225,36	-31,79	1010,67
30.09.2017	305	4335,36	4323,61	31,6485213	4217,82	117,54	13815,90
01.10.2017	306	4360,72	4360,17	32,140424	4355,25	5,47	29,87
02.10.2017	307	4386,88	4387,42	31,6513761	4392,31	-5,43	29,53
03.10.2017	308	4293,30	4305,88	20,3316475	4419,07	-125,77	15819,29
04.10.2017	309	4225,17	4235,27	11,2381263	4326,21	-101,04	10208,90
05.10.2017	310	4338,85	4329,62	19,5485429	4246,51	92,34	8526,30
06.10.2017	311	4345,60	4345,96	19,2277157	4349,16	-3,56	12,71
07.10.2017	312	4376,19	4375,09	20,2182385	4365,18	11,01	121,13
08.10.2017	313	4602,28	4581,58	38,8457493	4395,31	206,97	42837,55
09.10.2017	314	4777,96	4762,21	53,023583	4620,43	157,53	24816,17
10.10.2017	315	4782,28	4785,58	50,0580439	4815,23	-32,95	1085,73
11.10.2017	316	4819,48	4821,10	48,604266	4835,63	-16,15	260,92
12.10.2017	317	5325,13	5279,59	89,5930043	4869,70	455,43	207416,87
13.10.2017	318	5563,80	5544,34	107,108808	5369,18	194,62	37876,96
14.10.2017	319	5739,43	5730,63	115,027295	5651,45	87,98	7741,04
15.10.2017	320	5647,31	5667,14	97,1758876	5845,66	-198,35	39342,32
16.10.2017	321	5711,20	5716,51	92,3950169	5764,32	-53,12	2821,82
17.10.2017	322	5603,71	5624,23	73,9272783	5808,91	-205,20	42105,85
18.10.2017	323	5546,17	5561,37	60,2484494	5698,16	-151,99	23100,04
19.10.2017	324	5727,63	5717,03	69,7896061	5621,62	106,01	11238,72
20.10.2017	325	5979,45	5960,19	87,1264572	5786,82	192,63	37106,96
21.10.2017	326	6020,37	6023,06	84,7015612	6047,31	-26,94	725,94
22.10.2017	327	5983,18	5995,64	73,488831	6107,77	-124,59	15521,64
23.10.2017	328	5876,07	5895,38	56,1136632	6069,13	-193,06	37271,17
24.10.2017	329	5505,82	5550,39	16,0034168	5951,49	-445,67	198621,22
25.10.2017	330	5669,62	5659,30	25,2940846	5566,39	103,23	10656,36
26.10.2017	331	5893,13	5872,28	44,0625838	5684,59	208,54	43488,46
27.10.2017	332	5772,50	5786,88	31,1171012	5916,34	-143,84	20689,57
28.10.2017	333	5776,69	5780,82	27,3991138	5818,00	-41,31	1706,60
29.10.2017	334	6155,43	6120,71	58,6479948	5808,22	347,21	120554,64
30.10.2017	335	6105,87	6113,22	52,0341634	6179,36	-73,49	5400,34
31.10.2017	336	6388,64	6366,30	72,1390055	6165,25	223,39	49901,81
01.11.2017	337	6665,30	6642,61	92,5563793	6438,44	226,86	51465,33
02.11.2017	338	7068,02	7034,74	122,512842	6735,17	332,85	110788,85
03.11.2017	339	7197,72	7193,67	126,155333	7157,25	40,47	1637,99
04.11.2017	340	7437,54	7425,77	136,749402	7319,83	117,71	13856,09
05.11.2017	341	7377,01	7395,56	120,053843	7562,52	-185,51	34412,56
06.11.2017	342	6989,07	7041,72	72,664661	7515,62	-526,55	277251,18
07.11.2017	343	7092,12	7094,35	70,6604233	7114,39	-22,27	495,92
08.11.2017	344	7415,87	7390,78	93,2380615	7165,01	250,86	62932,07
09.11.2017	345	7158,03	7190,63	63,8987998	7484,02	-325,99	106270,65
10.11.2017	346	6719,39	6772,90	15,7363816	7254,53	-535,14	286372,66
11.11.2017	347	6362,85	6405,43	-22,584735	6788,64	-425,79	181297,28
12.11.2017	348	5716,30	5782,95	-82,57372	6382,84	-666,54	444281,28
13.11.2017	349	6550,22	6465,24	-6,0881838	5700,38	849,84	722226,82
14.11.2017	350	6635,41	6617,78	9,77540636	6459,15	176,26	31068,33
15.11.2017	351	7301,42	7234,03	70,4228788	6627,56	673,86	454088,38
16.11.2017	352	7815,00	7763,95	116,371767	7304,46	510,54	260654,36
17.11.2017	353	7786,88	7796,22	107,962397	7880,32	-93,44	8730,56

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18.11.2017	354	7817,14	7825,84	100,12824	7904,19	-87,05	7577,03
19.11.2017	355	8007,65	7999,48	107,47919	7925,97	81,68	6671,16
20.11.2017	356	8255,59	8240,73	120,85575	8106,96	148,63	22090,44
21.11.2017	357	8060,00	8090,16	93,71329	8361,58	-301,58	90952,25
22.11.2017	358	8268,03	8259,61	101,28755	8183,87	84,16	7082,64
23.11.2017	359	8149,00	8170,19	82,21640	8360,90	-211,90	44902,33
24.11.2017	360	8250,97	8251,11	82,08711	8252,41	-1,44	2,06
25.11.2017	361	8707,40	8669,98	115,76504	8333,20	374,20	140025,07
26.11.2017	362	9284,00	9234,17	160,60798	8785,75	498,25	248257,93
27.11.2017	363	9718,29	9685,94	189,72365	9394,78	323,51	104657,11
28.11.2017	364	9952,50	9944,82	196,63899	9875,66	76,84	5903,94
29.11.2017	365	9879,32	9905,53	173,04682	10141,46	-262,14	68714,91
30.11.2017	366	10147,00	10140,16	179,20459	10078,58	68,42	4681,25
01.12.2017	367	10884,00	10827,54	230,02195	10319,36	564,63738	318815,371
02.12.2017	368	11071,00	11069,66	231,23171	11057,56	13,4417884	180,681675
03.12.2017	369	11333,00	11329,79	234,12183	11300,89	32,1124683	1031,21062
04.12.2017	370	11585,00	11582,89	236,01988	11563,91	21,0894141	444,763388
05.12.2017	371	11878,00	11872,09	241,33790	11818,91	59,0890614	3491,51718
06.12.2017	372	13541,00	13398,24	369,81929	12113,43	1427,57101	2037958,99
07.12.2017	373	16502,00	16228,61	615,87369	13768,06	2733,93781	7474415,97
08.12.2017	374	16007,00	16090,75	540,50050	16844,48	-837,47991	701372,597
09.12.2017	375	15143,00	15291,82	406,55813	16631,25	-1488,2485	2214883,56
10.12.2017	376				15698,38		
11.12.2017	377				16104,94		
12.12.2017	378				16511,50		
13.12.2017	379				16918,06		
14.12.2017	380				17324,62		
15.12.2017	381				17731,17		
16.12.2017	382				18137,73		
17.12.2017	383				18544,29		
18.12.2017	384				18950,85		
19.12.2017	385				19357,41		
20.12.2017	386				19763,96		
21.12.2017	387				20170,52		
22.12.2017	388				20577,08		
23.12.2017	389				20983,64		
24.12.2017	390				21390,20		
25.12.2017	391				21796,75		
26.12.2017	392				22203,31		
27.12.2017	393				22609,87		
28.12.2017	394				23016,43		
29.12.2017	395				23422,99		
30.12.2017	396				23829,55		
31.12.2017	397				24236,10		
01.01.2018	398				24642,66		
02.01.2018	399				25049,22		
03.01.2018	400				25455,78		
04.01.2018	401				25862,34		
05.01.2018	402				26268,89		
06.01.2018	403				26675,45		
07.01.2018	404				27082,01		

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08.01.2018	405				27488,57		
09.01.2018	406				27895,13		
10.01.2018	407				28301,69		
11.01.2018	408				28708,24		
12.01.2018	409				29114,80		
13.01.2018	410				29521,36		
14.01.2018	411				29927,92		
15.01.2018	412				30334,48		
16.01.2018	413				30741,03		
17.01.2018	414				31147,59		
18.01.2018	415				31554,15		
19.01.2018	416				31960,71		
20.01.2018	417				32367,27		
21.01.2018	418				32773,82		
22.01.2018	419				33180,38		
23.01.2018	420				33586,94		
24.01.2018	421				33993,50		
25.01.2018	422				34400,06		
26.01.2018	423				34806,62		
27.01.2018	424				35213,17		
28.01.2018	425				35619,73		
29.01.2018	426				36026,29		
30.01.2018	427				36432,85		
31.01.2018	428				36839,41		