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# AN EMPIRICAL INVESTIGATION OF ICO RETURNS

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I declare that I have compiled the paper independently and all works, important standpoints and data by other authors have been properly referenced and the same paper has not been previously presented for grading. The document length is 11798 words from the introduction to the end of conclusion.


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# ABSTRACT

Crypto currency and ICOs have recently gained more popularity, and they aim to enrich both companies and investors. On the other hand, our community has not yet accustomed fully with the new features brought by these phenomena. The purpose of this thesis is to study the profitability of crypto tokens three months after their initial coin offerings (ICOs). Given the abundant anecdotal evidence of fraud and uncertainty during ICOs, the author considers the following hypothesis: an average 3-month post ICO return is equal or less than zero. For the research, a quantitative method is used by utilizing historical data from two websites. With two data sources, the author uses simple formulas to study the results of 3-month post ICO returns for 191 ICOs. The results show that the average 3-months post ICO return is 489,8 % where the standard deviation of returns is 1110,4%. Thus, the hypothesis is not supported since the average returns are positive, however, highly volatile even for individual tokens. From the observations we can point out that tokens after their ICOs are fast-moving, highly volatile and risky, yet capable of giving returns up to several thousand percent.

# INTRODUCTION

Increasingly, people recognize the subjects of blockchain and crypto currencies nowadays. Blockchain is gaining recognition, and it is utilized in numerous different areas replacing old technology. The development and popularity of blockchain technology is reflected particularly in Bitcoin, which, by acting as a trailblazer introduced investors to digital currency trading. According to the data on Blockchain.com, Bitcoin has offered lucrative opportunities. If a curious investor had invested $ 5 in order to get one Bitcoin in 2011 and came back to look at the investment, these $ 5 would had changed to $ 9,000, which means a 179900% return on the investment. These affordable Bitcoin deals have been worthwhile to accept, but investors rarely caught up on insinuating or speculation when a new unknown currency was released to the market. Other crypto currencies have sought to follow the lead of Bitcoin, and many of them have succeeded on their way to active crypto markets. Crypto currencies have attracted attention both in terms of the increased number of new investors, and somewhat unclear investment processes. The function of crypto currencies to act as a monetary instrument has been utilized in a new phenomenon called Initial coin offering (ICO), which is similar to crowdfunding. Inspired by standard initial public offerings (IPO), companies can now raise money to their projects through ICOs by pre-selling units of their new crypto currencies. Unlike in IPOs, the buyer of new tokens does not benefit directly from the cash flows of the company, but instead, the value depends on holders' actions. Organizing ICOs has been a successful way to raise money for many companies. For instance, according to ICODATA, ICO of Ethereum succeeded to collect money of $ 18 million. We are already talking about large amounts of money, and the amounts collected by the ICOs are rising steadily. Because of the growing phenomenon of ICOs, they are also discussed dubiously as ICOs are considered risky investments because of possible scams and the lack of legislation. ICOs are therefore a timely topic, and their growing popularity creates questions about the profitability and returns.

The topic of this thesis is chosen for a several reasons. ICOs have gained a lot of popularity among companies and investors in forms of financing and investing. Despite that, it is not clear to make assumptions of crypto currencies' further development as the field is still young, meaning that our society has not had time to do enough conclusions based on research. Because of the fact that we have a lack of research results, many investment decisions of crypto currencies depend on speculation. Luckily at this point of time, there

have been arranged somewhat enough ICOs throughout the history for the purpose of analyzing their productivity based on public numerical data. Investments must ultimately be profitable for an investor, and this applies to investing through ICOs as well. Therefore, the returns shall be studied between different ICOs.

The first part of this thesis consists of background information of the matter. This part begins by explaining the open source code that allows blockchain technology. After blockchain technology and its potential, the thesis educates about the history of crypto currencies and their differences. From the main theme of the paper, ICOs, the author has chosen to write about their main features, formatting methods and legal aspects. After going through the theory, the second part of the paper, Methodology and research, begins by presenting data collected by the author and the sources for this data followed by the research questions and applied methods. At the end of the second part, the author has made calculations in order to be able to answer the research questions, and on that basis has produced results and conclusions. After the second part, it is possible to read the conclusion which gathers together the main findings and observations from the research itself. Finally, the reader will be able to read the sources which were classified in alphabetical order and examine the appendices through a link.

# 1. BACKGROUND

## 1.1. Crypto currency

To gain a better understanding of the subject, we go through the technology of what is behind crypto currencies and their characteristics. The first part of this chapter explains the link between blockchain and crypto currencies, and the second part reviews ICOs.

### 1.1.1. Technology of blockchain

The substructure of crypto currencies is a digital ledger called blockchain which is based on open source code. Everyone has access to specific open source codes which provides the user a possibility to customize it according to a person's own needs. Open source principles also include the freedom to use the open source program for any purpose and to copy and distribute both the original and the edited code version. Open source software is produced by collaboration, shared freely and used more often than we could imagine. For instance, every Firefox user can access the browser's code and to edit it for own purposes. (Venegas 2017, 2; Pickett 2018.) Open source software could be considered as a community good as it can be accessed by anyone anywhere. The open source code allows the digital currencies to be tracked, which is discussed in more detail later.

Blockchain technology allows the world's first decentralized and transparent database by allowing money to move directly from the transferor to the recipient without any third parties such as banks (Nakamoto 2008, 1-5). The name of the blockchain reflects the main idea of information blocks: All events are registered into blocks, and in the case of crypto currency it means all transactions and mining information ever made for that certain crypto currency (Chuen et al. 2017, 19). By combining these information blocks into chains, we get to form the whole history of one crypto currency.

"Blockchains can be configured to preserve the anonymity of its users, and if copies of the ledger are widely distributed, censuring the record is difficult" (Conley 2017, 1). By means of the open source code, these blocks can be viewed by anyone, but the information the blocks are holding cannot be changed afterward. Removing data from one location does not help because there are numerous copies of it around the world which is the result of decentralization. In addition, participants in creating or trading a certain crypto currency remain anonymous in general as their identities are hidden behind codes and links. An open source based blockchain would seem to

provide a potential solution to many of the developing countries' problems also. The blockchain could, for example, track international grants and ensure that they go to the right addresses. It also allows a transparent review of state finances and the creation of unadulterated documents.

The blockchain is decentralized to a large number of different computers, and the system would recognize mathematically if someone had an attempt to retract a particular block from the outset. The features which this decentralization allows such as increased capacity, better security, and faster settlement are features that need refining in traditional investment products. (Chuen et al. 2017, 17-18.) Therefore, the database can be maintained by unknown people all over the world, and the information that can be copied together cannot be changed later. For those in need of privacy in spending money, this high-level anonymity is a desired feature. In addition, many investors have been involved in the operation of crypto currencies because they may provide other benefits than other investment products. "For example, in the United States there are cases of paying salaries in Bitcoin, and in general more companies are paying employees in Bitcoin" (Bradbury 2014 in Iurina 2017, 13). Crypto currency could be considered superior to traditional investment products provided by banks, as the latter group has disadvantages which few are mentioned below (Harrod 2017, 16-17):

• "Traditional banking systems are susceptible to manipulation of figures. This means that the money in your account can be changed without your knowledge or permission.

• Banks which operate on fractional reserve banking aren't very reliable. In the case of national emergency, you might not be able to get your money when you need it.

• Inflation can reduce the value of your cash in the bank.

• You don't really know how the banking system operates. Transparency is a big issue.

• Banks have charges and fees for different transactions. This is especially bothersome for business owners.

• Different banks vary in their processes and procedures. Also, each bank can only hold the currency of their country and usually US currency. But keeping a foreign currency in the bank costs a lot more."

Crypto currencies are continually being created over time, and anyone willing to use their computers can join to create them. The concept of mining, as a matter of fact, reflects the activity of the blockchain and makes it possible in the first place.

For some crypto currencies, the creation of them is called mining, which happens by using the computing power to maintain the crypto currency network where a miner, who may be anyone willing, will solve mathematical algorithms with a computer-downloadable application. After solving these algorithms, the information is attached to the blockchain, and at the same time, the miner will verify the former information in the blockchain. (Stray 2017.) In addition, the miner receives a reward in crypto currency which the miner was extracting. Miners are therefore a necessary party to the existence of a crypto currency, where they verify recently appeared information, attach it to the blocks, and create more of the same crypto currency. In this case, the miners act as money mints, or as a central bank who create money and receive a reward in the form of this new crypto currency. (Vigna, Casey 2016, 54; Nakamoto 2008, 2-4; Norman 2017, 26; Bohr, Bashir 2014, 94.)

The mining process of crypto currency called Bitcoin, BTC, can proceed as long as possible until 21 million coins have been created. In fact, on January 13, 2018, it was announced that 80% of all Bitcoins were already mined. However, the creator of BTC, Satoshi Nakamoto, had an idea so that the extraction would not be so easy at the end. The reward for mining one BTC has always been halved every 210,000 blocks. At the same time, there was an intention to make the value of the coin rise. (Carrick 2016, 3; Zuckerman 2018; Bohr, Basir 2014, 94.) This means that mining BTC has become more difficult where regular computers are not enough anymore. Today mining BTC and Alt coins requires graphics processing units, GPUs, which means that to create BTC, one must invest in more advanced equipment (Bohr, Basir 2014, 94). The mining competition is fierce and creating BTC coins is more difficult than ever. Based on basic theories of economics, this leads to a situation where the demand for coins is greater than the supply, and in that case, the coin value is assumed to increase.

The blockchain technology could be illustrated as follows: Every user in creating a certain crypto currency has the same continuously updated common information "file" whenever they are participating in its creation. In marketplaces, buyers and sellers do not directly see this file full of code, but every single transaction is registered to this same worldwide data chain.

Instead of banks or other entities, bookkeeping is maintained by both the miners of the crypto currency and the owners at the same time. Miners are given data on the requested transactions and to make these transactions successful, miners once again solve mathematical puzzles and publish the transaction. The transaction cannot be canceled anymore because the information is

publicly available in the ledger, blockchain. (Harrod 2017, 39.) The process continues as if by itself in its ecosystem.

The blockchain technology is not just related to crypto currencies because the usefulness of blockchain technology has also been noted in energy trading and agriculture for instance. The revolutionary mode of operating has been introduced all over the world. Trafigura and Naxitis, two of the world's largest raw material brokers, took the technology as a tool for oil trading. In an attempt for technology to increase by exponential growth rate, the blockchain is really for many uses. To mention few, it is suitable for the maintenance of the land register for farmland and in ensuring the origin of the raw materials - which leads to a result that much is yet to come. Blockchain technology enables the retention, maintenance and rapid sharing of a wide range of information and which features many different industries have found to be more efficient and cheaper alternative to traditional systems. (Javier 2017.) In addition to code, it is possible to save and distribute files, text, and images in the blockchain.

### 1.1.2 The development of crypto currencies

We might say that all the money is based on the confidence that others also spend the same money in trading goods. With the money we use, one could not buy any goods if no one else considered this same money valuable. The value of money is based on its demand and supply, and currencies of different countries are also determined by their states' regulation. Fiat money is not worthy itself. Bank notes, for instance, are just pieces of paper which value is created by states and banks, and people are told that these pieces are worth something and that it should be believed. (Conley 2017, 3-7.)

We all know that money has a function which is a unit of account: we can measure the value of currencies, assets and any goods or services. "Money also has two functions: facilitate transaction flows (as a currency), and, store values (as an asset)" (Venegas 2017, 2). Compared to a traditional note which valuation is partly by government, laws, and regulations, values of the most crypto currencies are based only on people's belief that others believe in it. In addition, characteristics of crypto currency could be either more similar to regular currencies by meeting all definitions of money or some of them could be seen as financial products (Jabotinsky 2017, 4-5; Norman 2017, 27). Crypto currency could be considered as fiat money because they are not valuable as themselves and in addition, most of their values are not bound to anything physical. For continuity, investors must believe that crypto currencies have a future. To be able to call

crypto currency as money, it should meet three requirements or definitions of money, and that would need the support of consumers and businesses. (Vigna, Casey 2016, 309). It is not entirely clear where to classify these relatively new trading tools. Needless to say, crypto currency can be used to measure the value of other assets, and it can be traded. Their functionality to store values, however, may be questionable. One may want to reconsider their crypto currency holdings as long-term investments, because without reliable predictions of their value or trustworthy crypto markets, crypto currencies may not be suitable for long-term savings or investments in storing wealth. (Carrick 2016, 3.) The categorization of crypto currencies has also another point of view. They could also be considered as stocks because an investor is buying a part of technology which a company has provided. The investor may benefit if the business of the company is going well and other investors believe in the success of this company. (Heston 2018, 35.) Crypto currency types are discussed in more detail in chapter 1.1.3.

Virtual money began to be used as early as the 1990s when using Internet became more common, and its potential for fast worldwide money transactions incited online stores. Several websites and games created their own currencies which the users and players were able to buy. However, this purchased currency was centralized, and it could only be used within these communities to receive additional services or to develop a virtual game character. (Harrod 2017, 9; Chuen et al. 2017, 18.) The idea of decentralized digital money was utilized by a movement called Cypherpunk in the 1990's. The idea of the global digital currency, however, remained at the level of thought despite large efforts. We could say that their technology of public- and private key encryptions and codes to share data and make transactions were components of inspiration to what was going to happen next. (Vigna, Casey 2016, 53.) In 1998, Nick Szabo proposed an idea of a Bit Gold, a decentralized digital currency, which consistently would had consisted of bits which formed strings. Similarly, as in blockchain, the bits would had been merged into a public entity by an automated program. However, Bit Gold did not become a reality yet due to problematic compatibility problems between theory and technology. (Harrod 2017, 9; Lielacher, 2018.)

The most known and the first public and functioning crypto currency is Bitcoin which was created in 2008 by a party called Satoshi Nakamoto. Bitcoin, BTC, was created at the time of the financial crisis and therefore, was intended to be a new currency that banks or third parties could not control. It was a beginning of shifting investments and funding from centralized financial institutions to a decentralized system. (Iurina 2017, 12; Nakamoto 2018, 1; Vigna, Casey 2016, 16.) Due to the fact that belief in banks and regular investments faltered, the new options for the

traditional monetary system were certainly interesting for investors of any kind. Instead of human laws, BTC tries to offer its users mathematical based trust which could be actually very reliable, but in fact, it creates uncertainty for the users every day (Vigna, Casey 2016, 32). The existence of BTC and other crypto currencies rely on mathematical algorithms but the decision whether to sustain and support this currency is made by humans.

Crypto currency can be bought and traded on various exchange platforms and websites where one should also consider various transaction fees. For the purpose to storage crypto currency wealth, several websites offer a possibility to own virtual wallets which are often required in trading crypto currency. To start investing in crypto currencies, the investor is required to attach a bank account- or credit card information to the wallet. These service providers are continually updating their services, and crypto currencies can now be traded directly by using crypto wallets which enables fast and easy transactions. These wallets, however, may reveal the identity of the investor, which is contrary to the general nature of crypto currencies. The transactions can be made through P2P-Trading with another person using cash or PayPal, though such situations may be exciting, and it is essential to ensure the reliability of the other party. As digital currencies are becoming more popular, it is possible to find even ATMs which accept local cash in exchange for certain crypto currencies. (Heston 2018, 12-16; Harrod 2017, 27-30.) Therefore, there are three ways to sell and buy crypto currency: directly with another individual, at the exchange markets that are a crypto currency "stock" market or an intermediary company where the user has a wallet. The crypto currency market places are open around the clock also on weekends which is the reason that one can indeed participate in trading crypto currencies anytime. Contrary to earlier beliefs of some researchers that crypto currencies would experience their inflation, some crypto currencies have the opposite characteristics. Ether and Bitcoin have a deflationary model, as there is a fixed and finite supply which means that values of these coins cannot depreciate. (Wilcke in Venegas 2017, 5; Vigna, Casey 2016, 369; Norman 2017, 28.) As crypto currencies' values do not mostly derive from other assets, their values are not dependent on general inflation outside of the crypto world.

### 1.1.3. Crypto coin vs. crypto token

Crypto currency is understood as a concept of digital money, but in order to use the terms correctly, we need to separate a coin and a token from each other.
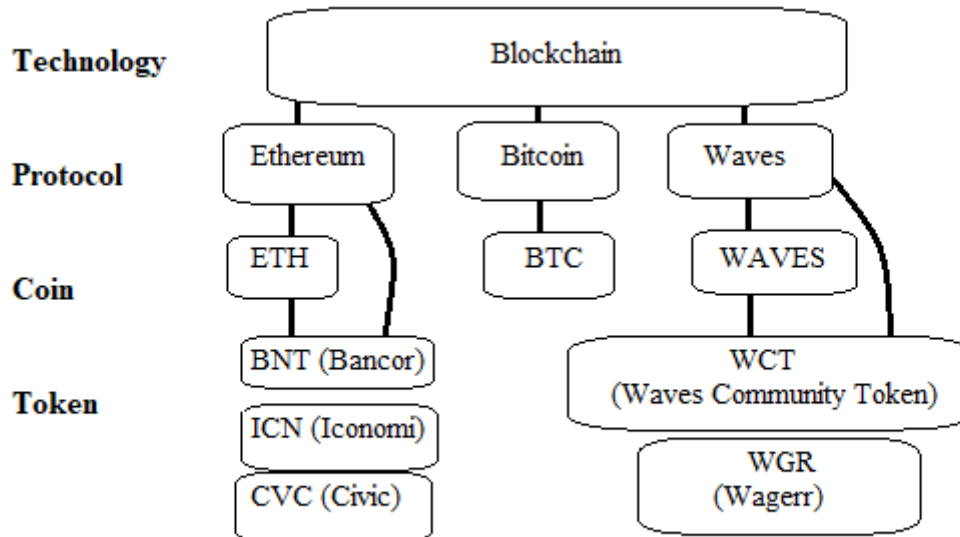


Figure 1.1. The structure of crypto currencies. (Sources: Masterthecrypto 2017; Lielacher 2017).

Figure 1.1. above demonstrates the difference between a token and a coin in general. In the first chapter of this paper, we considered blockchain and the open source code which are the main base, providing the existence of protocols used such as Ethereum, Bitcoin, and Waves. These protocols are using blockchain, but they differ from each other by using a specific own code. These protocols tend to have their own coins, such as Bitcoin has its BTC coin. BTC is a coin which could be assimilated to any traditional currency albeit its feasibility to become an official currency is still questioned. Crypto currencies are called Alt coins when they are any other crypto coins than Bitcoin, and all of them can be used as a mean of exchange in connection with various services and trading. They also have a currency value that can be expressed, for example, in relation to EUR or USD. A Crypto coin is a part of digital currency launched by a particular company, which acts as a unit of value for its own company. Coins are independent, and they are not linked or bound to any particular blockchain than their own. Coins often have only monetary value and no built-in functionality. (Masterthecrypto 2017.)

Table 1.1. Crypto currency types and their description

| Crypto currency types | Examples | Description |
|---|---|---|
| Coins and Alt coins | Bitcoin, Ethereum, Litecoin | In addition to trading in crypto currencies, they are also eligible for payments in some regular stores. |
| Utility Tokens | Siacoin, BAT, Storj | Units of services that can be purchased. (Used in ICOs) |
| Tokenized Securities | Trust Token, tZero | Value is linked to external asset (Used in ICOs) |
| Equity Tokens (Subcategory of Tokenized Securities) | OneGram, Goldmint | Represent ownership of an asset, stock or debt. (Used in ICOs) |
| Reward Tokens | Steem | Earned over a period of time from participating actively within the network or on the platform. |

Sources: Lielacher 2017; Wilmoth 2018.

Crypto currency includes a wide range of coins and tokens (MFSA 2017, 3). It is possible that most of us are more familiar with the term crypto coin.

We could say that tokens and coins are groups of digital currencies which are derived using a certain protocol. A token is different from a coin technically in a way that it is a crypto currency unit, based on another blockchain but it works only within a specific limited range of operating environment. For instance, BNT token does not mean the same thing as Ethereum-coin ETC, but its existence and code is based on Ethereum-protocol. *(Ibid.)*

As could be seen in Table 1., many available tokens in ICOs are usually Utility tokens, Tokenized securities or Equity tokens. For example, the owner of a Utility token may have access to a specific software functionality or the owner may be entitled to various discounts for that token issued company. This way Utility token also encourages the investor to use the organization's services or products. Tokenized securities or Security tokens are a group of crypto currency, and they represent ownership of an already existing tradable asset. In the case of Tokenized securities, the process requires securities laws and strict guidelines to which the organizer of tokens must obey. Equity tokens are a subcategory of Tokenized securities. The equity token corresponds practically to capital stock, and by owning these, one can be able to get

dividends in relation to the number of equity tokens held in the company. The trend for the future is that a large part of the tokens will be specifically Equity tokens. (Wilmoth 2018.) A person who has a lot to do with a company's activity and services or has been involved in developing the company's blockchain technology and crypto currency can earn reward tokens for participating. Steemit is an example of reward tokens. Steemit is a social media platform, where users may link their Facebook profiles, upload content such as pictures and text, and get a reward in Steem – currency if the uploaded content is good and it gets a lot of upvotes by other users. (Steem 2018; Lielacher 2017.) Dividing lines between different tokens are somewhat changeable as tokens can, despite classification, have some features that other tokens do not have, making every token unique. Tokens are very different, but generally, they can be described as digitized units which value the community defines.

### 1.1.4. Statistical data of crypto currency performances

At the moment, there are 1823 different crypto currencies including alt coins and tokens (Investing 2018). Due to the fact that it has become easier to create own crypto currency, the number of them is growing quite steadily in tens in every week. In January 2018, it was calculated that the market capitalization of all combined crypto currencies in circulation was 707 billion USD where the market capitalization was calculated by multiplying the value of a crypto currency by the amount of that currency in circulation. (Martin 2018; Frankel 2018.)
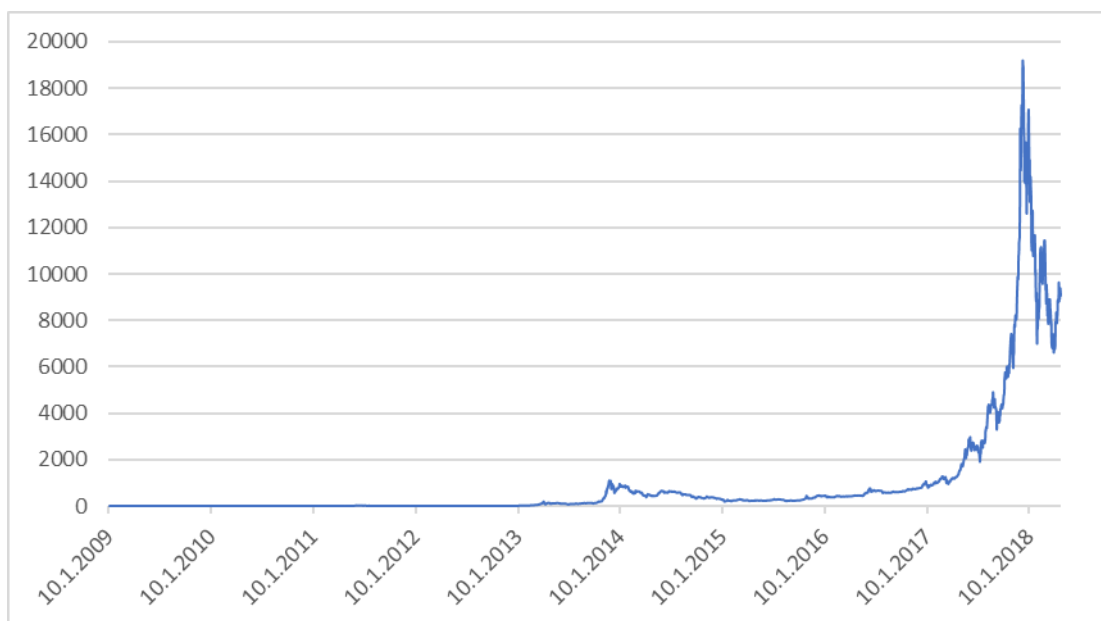


Figure 1.2. Bitcoin price from the beginning (Source: Bitcoin.com 2018).

The historical price development of Bitcoin had been calm at first, but later it had taken a swing and turned out to be still the most appreciated crypto currency in value (Investing 2018). In Figure 1.2. above is a demonstration of the frustrating but eventually explosively strong developing of the value for BTC from the very beginning to May 3, 2018. At this time, the price of BTC is relatively large compared to the past meaning that the fluctuation of the start is hard to distinguish in the figure. Bitcoin was very questionable amongst investors at the very beginning. Many investors, without taking into account the code protocols experts, were considering its success. "Initially, the idea of Bitcoin was not well-received by the public or mainstream media, but it gained traction within 3 years and then really took off in 2011 when several exchanges became well-organized" (Bohr, Bashir 2014 in Carrick 2016, 1). Prior to 2011, bitcoins were worth less than $ 1 per Bitcoin. More precisely, the value varied between a several tens of cents. In 2011 Bitcoin received more publicity and in spring 2011 the price was already in several dollars. The first time when BTC price started to rise rapidly was in the 2nd quarter of 2013, when the price first went over $ 100 and tried to reach the $ 200 -limit. The second time when the price of BTC exploded in a short time was on November 18, 2013, when the price was $ 504.52. At this time, the US Senate held a hearing on crypto currencies and their risks and opportunities. After promising comments, only ten days had passed till BTC price had risen to $ 1049.35. (Bitcoin.com 2018; Jeffries 2013.)

The timing for purchasing and selling crypto currency matters when we look at different time periods (Davila, 2018). BTC's value related to USD has risen by nearly 730 % in 2017. According to analyst Tom Lee, there is a simple explanation for the increase of BTC value, and he believes that Bitcoin will continue to grow in the future as well. Bitcoin has been criticized for not being based on any foundation, but the price is purely speculative. Part of the analysts see BTC in a rushing classical bubble mark. The price rises as investors react to the recent increase. Lee sees the development of the value of BTC differently. According to him, there is a meaningful and simple method for valuing it. This method is known as Metcalf's law which is explained that the value of BTC network is proportional to the square of the number of the network's users. A typical practical example of Metcalf's law is the market for fax machines. One fax machine is completely useless, but the value of each fax machine is the greater the number of faxes in the network because each user's potential for communication increases with the size of the network. (Silverstein 2017.)

Like many other investment products, such as shares, the value of tokens may also vary during the day. Figure 1.3. below describes the development of BTC price on March 31, 2018.
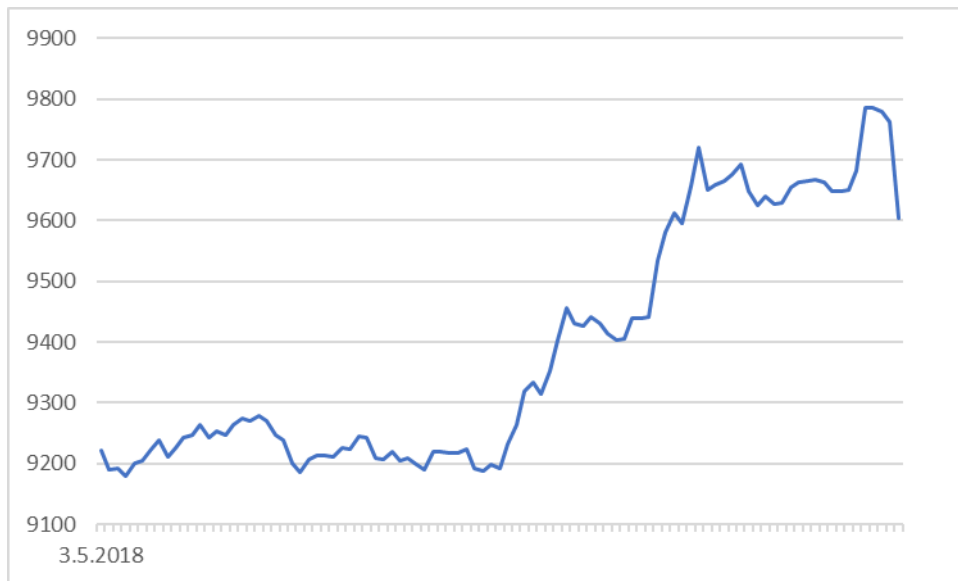


Figure 1.3. The fluctuation of the price of one Bitcoin in one day (Source: Cointelegraph 2018.)

BTC is depicted in USD dollars in the figure. What is exciting, is that the value of BTC has been very great in recent times so even a smaller change in value can be significant to investors. By exploring the figure above, the value of BTC during 3rd of March 2018 was at its lowest in the beginning of the day at 9178,47 USD, and at its highest at 9786,47 USD in the end of the day. The figure here shows that the volatility of BTC is indeed significant. Crypto currency markets are volatile, and the value varies not only from demand and supply but also from psychological and technical factors causing overreactions (Caporale, Plastun 2018, 2). A grand impression is also given by the media, news and discussion forums. By searching for information of crypto currencies, one cannot avoid coming across forums where investors are contemplating the success and the future of crypto currencies which they are holding or considering buying.

## 1.2. Initial Coin Offering, ICO

Initial Coin Offering, shortened to ICO, is a procedure such as IPO for raising money for companies' business activities. Start-up companies and already existing firms build up their own ICOs intending to introduce an organization's own crypto currency to investors before this crypto currency becomes available in all crypto markets. The units of crypto currency, tokens, are available in exchange for fiat currencies or other crypto currencies, usually Bitcoins. ICOs can be found on several online websites. (Chuen et al. 2017, 20; Aziz 2018; MFSA 2017, 2.)

"In a typical ICO, an entrepreneur raises capital by pre-selling a token which gives its owner the right to use the company's product or service once it is developed" (Li, Mann 2018, 2). After buying a token, an investor can receive in return promises of services or special rights from this company. Despite that, some tokens are developed almost exclusively for the purpose of raising money, and a new token is useful as itself to be sold and bought later. For example, Useless Ethereum Token, UET, was created without any purpose. The token was not linked to any projects or business activity, but still, ICO of UET managed to collect nearly 100,000 USD. At the moment, tokens do not allow the investor to benefit directly from cash-flows of the token creator company. (Chapin 2017, 320; Sánchez 2017, 3.) Many tokens distributed by ICOs is actually a potential opportunity for intrigued investors to expand their token portfolios. All in all, investors get early access to whatever the company is offering.

"ICO has become one of the most sought-after sources of revenue for projects that work based on blockchain technology" (Vorobyev A.V., 208). For some start-up companies, ICO is the only form of trying to raise money, and a company participating in ICO must think carefully about what information it gives itself and how to attract investors. As in the case of the first crypto currency Bitcoin, publishing a White Paper has been widely adopted in ICOs. White Paper can be considered as a company's business model, a plan and an advertisement about the company and the purpose of it to start raising money. An investor is therefore given access to know about the company and its services. A certain form of industry and means to exploit and develop blockchain are often the points that investors draw their attention and get interested in. There are countless ways to write the White Paper, and investors should read them carefully as some companies may be misleading with their promises. A comprehensive White Paper should list the company's overall information about their mission, strategic goals, partners and financial information. So that investors can draw their attention quickly to this particular ICO, the information should be also summarized in the beginning of the White Paper into an abstract. The company should also inform readers about the timetable and the process of their own ICO launch. From the point of view of the investor, it is imperative to investigate the share of tokens sold in ICO. In ICOs, tokens may be already mined and ready for trading, or there is a possibility that one can create more of a certain token later. Tokens in the ICO are equivalent to shares in IPOs. In a traditional model, an investor needs to consider how the company is valued: How much percentage is sold and at what price. (Chapin 2017, 804-899; Djeredjian 2018.)

Even though society and lawmakers have come to take control of crypto currencies, ICOs have had time to develop themselves with the power and cooperation of the blockchain community

(Brand 2017, 259). ICOs want to emphasize transparency and communality in order to give everyone the opportunity to make a contribution and participate in exciting series of events by bringing a new crypto currency to market. As a matter of fact, ICOs have genetic roots of crowdfunding, or they have at least common factors as in both cases a new project or an early-stage company is introduced to public. At the same time, it is possible to advertise the mission of the new organization and get the feedback about demand and the process of having ICO. (Sánchez 2017, 3.)

The first ICO was held in 2013 by a start-up company called Mastercoin (MSC) which coins were created by using the Bitcoin blockchain. For one month, funding for the development project was announced in Bitcointalk- discussion forum, whereby one BTC was equal to 100 Mastercoins, followed by an inducement of a 10% increase in value weekly. This encouraged investors to eventually join 5120 BTC raised project. The project raised around 500,000 USD, which was a prominent sum at the time, but no one hardly knew that the whole Bitcoin sum would have been worthwhile saving as its value at current Bitcoin prices would be around 35,000,000 USD. (Gilson 2013; Buterin 2013.) Subsequently, the word for a new type of financing began to spread, and 16 new ICOs were organized in 2014. In 2014, we saw different ICOs from success stories to direct scams. One of the success stories of 2014, Ethereum, succeeded to collect a record of $ 18 million and it is now the second largest crypto currency by its trading volume. ICO was still a completely new concept in the market where regulatory and clear procedures were missing, which is the reason why it was difficult to distinguish the scams in honest terms from the real projects. The uncertainty caused by the scams could also appear in ICOs arranged in 2015, when the amount of funds collected through them started to fall. In 2016, however, the popularity of ICOs started to rise fast, and during that year, 69 start-up companies funded their projects where funding totaled $ 103 million. ICOs have raised an estimated $ 6.4 billion from the beginning by the end of 2017. (Galka 2017; Tokentops 2018; Icodata 2018.)
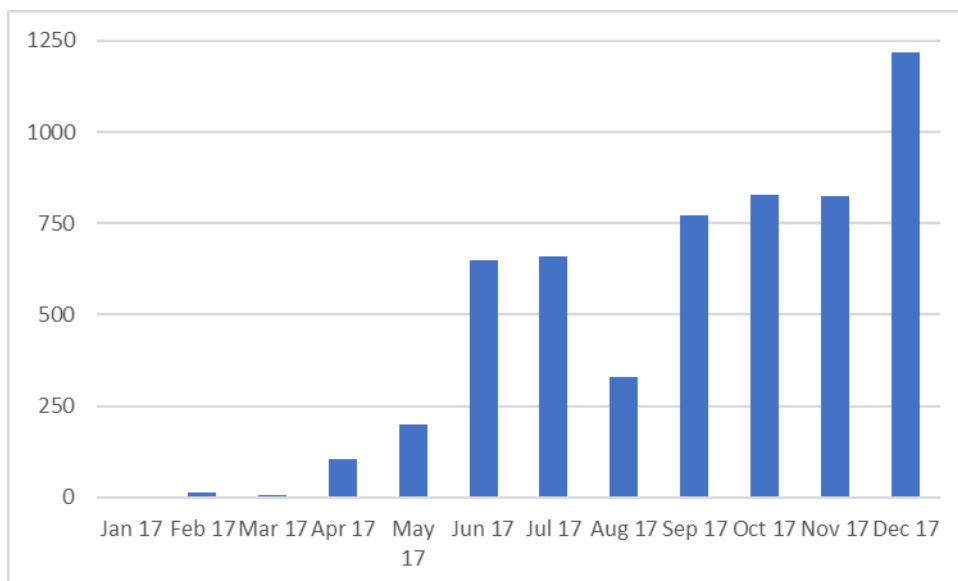
Figure 1.4. USD Raised by ICOs in 2017 (Source: BusinessInsiderUK 2018).

From the Figure 2, we could deduce that ICOs have increased their popularity among companies by the end of 2017. However, the size of branches is not necessarily due to only reputation, but it is actually the result of many different elements, including the way the company performs its ICO. From the size of the branches in the figure, we cannot infer immediately the number of ICOs or the number of ICOs that succeeded in an expected way. However, now we know that ICOs are continuously created, and the amount is growing every week. In 2017, the amount which companies have raised through ICOs per month has increased from 2 million USD to over 1 billion USD. USD raised by ICOs seems to be in the growth direction.

### 1.2.1. Different ways of arranging ICO and determining the sale price

The token sale price is an important factor when it comes to returns. Due to the small, almost non-existent regulation, ICOs differ from each other as there is no absolutely correct way to arrange ICO. It also means that organizing ICO does not require vast resources from the company either. The selling price, and - time vary by different new tokens, and it is almost impossible to find a coin offering with precisely the same characteristics as another. However, we have a possibility to distribute ICOs roughly to eight different types in terms of determining the sale price of a token (Djeredjian 2018):

1) Uncapped with a fixed rate;

2) Soft Caps;

3) Hard Caps;

4) Hidden Caps;

5) Dutch auction;

6) Reverse Dutch Auction;

7) Collect and Return;

8) Dynamic Ceiling.

In order for the investor to obtain the best possible result, shall the participator take into account, inter alia, the purpose of the enterprise for raising the money, dates, durations and exchange rates. If an investor is not familiar with the crypto currency which would be used to buy another crypto currency, it could be difficult to estimate the price of that investment. Exchange rates may vary between different ICO market platforms. It is good to be careful in the diversifying group of ICOs. Reading the White paper and discussing with other investors via online forums are nearly a supposition, the things that the investor is expected to do in order to make proper decisions about the token ownership. In addition, before investing in ICOs, it is good to know the meaning and purpose of different caps. Hard Cap refers to a cut-off point where enough money or capital is raised to end the funding, while soft cap is merely a line where the minimum wanted amount of capital has been raised, and after this, the situation sometimes leads to a limited time to continue trading in uncapped ICOs with a fixed rate. Early investors of a certain ICO may get more holdings at the same price than the others because of the non-existence of a cap and usually a decreasing rate for exchange. On the other hand, information may also be hidden from investors, or it will only be released closer to the end in the case of Hidden caps. (Djeredjian 2018; Coinstaker 2018.) Although organizing ICOs may not require major effort or resources, it does not mean that an investor should not get to know about the potential investment.

Also familiar with IPOs, a Dutch Auction works on the principle that the price starts from the highest and gradually decreases. The initial price is determined by the price suggestions made by investors in the beginning who are also expressing their willingness to pay a higher price for tokens. Buyers may want to wait as long as possible before their bids as the price of a token falls all the time but, in this case, however, it does not really matter as investors buy these new tokens

at the same final price in the end. The price of the token also reduces in a reversed Dutch auction although the ICO has an agreed cap in it. For Reverse Dutch Auction we have limited quantity of tokens. The proportion of tokens which buyers will get, depend on the length of the sale. In the arrangement of collect and return, the fixed amount of funding exists. However, after ICO, any bid exceeding the requested limit may be accepted, which, if necessary, will be returned if there is nothing to sell anymore. Dynamic ceiling is a great mixture of all these previously mentioned ways to proceed an ICO. If the collection of the funding for some reason is canceled, all the funds collected by that date have to be returned to investors. (Djeredjian 2018; Watts 2017.)

### 1.2.2. Regulations of crypto currency and ICOs

"Since ICOs do not fit neatly into existing securities or consumer-protection laws, regulators are concerned of ICOs presenting new opportunities for loopholes exploitations or even fraud" (Li, Mann 2018, 2). Every investment always involves a particular risk, and ICOs are not an exception in this manner. There always lies the risk that the entire amount invested could be lost, and therefore, the investor should assess carefully how much he or she wants to be involved in financing a new company and a crypto currency. Financial Action Task Force, FATF, has determined that despite the ambiguous state of the virtual currency in legislation, the virtual currency can measure value and can be traded with other payment options (Kadyrov, Prokhorov 2018, 384). The debate on whether or not to accept the use and trade of crypto currencies seem to be largely due to the facts that it is about investing in currency which value is usually not linked in anything physical and this trading is done mostly anonymously. This is in contrast to the recent reforms of the MiFID - regulation and the unstable situation of terrorism and its financing.

The following adverse features can be mentioned, for example, in crypto currencies and their use (Bauer 2017 in Kadyrov 2018, 390):

• financing of terrorist organizations;

• penetration into information systems with unlawful purposes;

• unauthorized use of identification data;

• creation of viruses-extortionists (cryptolockers);

• drug trafficking, illegal trafficking in arms and people;

• blackmail;

• kidnapping;

• bribery of voters.

Financial experts such as Kenneth Rogoff has pointed out that Bitcoin is used for money laundering, but it is, in fact, a bad idea for a criminal as the transaction information can be visible to everyone (Buntinx 2018). This does not, however, prevent financing illegalities through crypto currencies due to advanced averting of tracking computers and crypto currency transactions. Transfers are made so often and at a fast pace that tracing the criminal is almost impossible. (Vorobyev 2018, 209.) Even though anyone could track others' crypto currency wallets, and possibly identify the owner, there is a way to be anonymous. These so called "mixing services" can wash the owner's crypto currencies and hide the original source (Norman 2017, 28).

From the list above, we can extrapolate the fact that crypto currencies as new trading components bring a lot of concerns with them. The concerns of many nations and a security-seeking society about crypto currencies may be in that way appropriate. On the other hand, some countries have come to think about solutions to preserve crypto currency as such or as modified to fit in current economy. Crypto currencies have many aspects related to even the security of society. Due to its blockchain technology and its decentralized management, no central bank, government or other entity can block or control the use of crypto currency or cause them to generate inflation by generating more. Even though crypto currencies and ICOs are the ones of their own fate, they have been very controversial in the eyes of the law.

European securities and Market Authority (ESMA) issued a policy statement on 13 November 2017 which stated the following: "Firms involved in ICOs must give careful consideration as to whether their activities constitute regulated activities. If their activities constitute a regulated activity, firms have to comply with the relevant legislation, and any failure to comply with the applicable rules would constitute a breach. Where the coins or tokens qualify as financial instruments, it is likely that the firms involved in ICOs conduct regulated investment activities, such as placing, dealing in or advising on financial instruments or managing or marketing collective investment schemes." (ESMA50-157-828 in MFSA 2017, 7.) European banks are sceptical towards crypto currencies in general. For example, Nordic banking group Nordea announced in January 2018, that all their employees are forbidden to trade with crypto currencies

because such actions may support terrorism and money laundering which is entirely against the banks' values. (Schwartzkopff 2018.)

All crypto currencies do not precisely meet the criteria to be financial products which means that currently crypto currencies are not protected by the law nor cannot be controlled by financial supervision in Europe. For example, Malta Financial Services Authority (MFSA) proposes a legislative framework specially for virtual currencies, and the debate continues with other institutions and possibly new laws and regulations are expected soon in Europe.  (MFSA 2017,7-8, 19.)

In the United States of America, discussion of classifying crypto currencies and categorizing them is on-going. United States Securities and Exchange Commission, SEC, does not approve exchange-traded products to include any crypto currencies. SEC announced on February 28th, 2018 that many ICOs might have breached securities laws, and the issue requires the evaluation of ICOs and the tokens they disseminate. However, the state of Arizona is considering BTC and other crypto currencies recognized by the state to act as means of payment for the payment of taxes. Though, the proposal is still only in the draft stage. Crypto currencies and their functions are evaluated and categorized in accordance with the general principles. (Glazer 2018.) New regulative actions are likely to be put into practice in 2018-2020, which will change ICOs for the companies involved and for investors around the globe (Chohan 2017, 5).

The Asian region has taken a stricter grip on cryptographic currencies. In China, many regulators banned all ICOs, and the ICO funding collectors were prohibited from storing their collected funding under penalty (Chohan 2017, 3). News from China is somewhat controversial. At the end of January 2018, China considered abolishing the ban, but later it became known that China is going to block every internet site which is even related to crypto currencies or ICOs. To justify such actions, China indicated the desire to protect citizens' funds from fraud. In Japan, regulators are mainly discussing the legislation for crypto currency platforms. In January, the Japanese platform Coincheck became a victim of hacking, which resulted in a loss of $500 million worth of funds. The recent news from South Korea has told that tax evasion is the reason why trading in crypto currencies should be banned. It later became apparent, however, that South Korea implies that crypto currencies should be regulated rather than prohibited completely. (Glazer 2018.)

Crypto currencies and ICOs are a global phenomenon, and everyone, in principle, can take part in it anywhere. Companies having ICOs are now required to follow the rules if their tokens also

have something to do with physical assets, securities, and debt. "Utility token creators usually refer to these crowdsales as token generation events (TGEs) or token distribution events (TGEs) to avoid the appearance that they are engaging in a securities offering" (*Ibid*). New regulations are therefore being welcomed with divergent opinions. Since blockchain and crypto currencies were originally designed to function without the need for a third party, it may be that new regulations and financial supervision are not obstacles for investors because the expanding community is always trying to find loopholes and new possibilities to continue trading crypto currencies in a way that it used to. However, with more strict regulations to secure investors' wealth and control the markets, these actions may lure more traditional investors to invest in crypto currencies as investors can feel relief for their crypto investments because their variation of value or even existence are not based on mere speculation anymore.

# 2. METHODOLOGY

## 2.1 Data

The study was conducted using quantitative methods. For the research tools, internet sites were the source for numerical data, and Excel was used to compile data, calculate solutions by chosen formulas and to create figures. For this study paper, information of several ICOs has been collected using data provided by two online webpages: Tokendata.io and Coinmarketcap.com.

The first step of the survey data collection phase was done by taking into consideration all on-record ICOs which were completed, in other words, were able to reach their goals by raising the successful amount of money in their own terms. Also, these ICOs had to be completed at a time when the token values could be possibly calculated at least three months forward. After some ICOs, it can take few days or even a month before a token can be found in open markets. In order to get enough ICOs for benchmarking and research, the time interval had to be small enough. Many of ICOs were completed at the end of 2017, which means that a one-year interval, for example, would had been too long period because data from these tokens does not yet exist. The research focuses on one-week prices three months after the completion of ICOs. From the first website (Tokendata.io), author collected all these ICOs' basic information: a name of the company which created its token, a token identification tag, the date of ICO completion, a selling price of a token, and an amount which ICO had collected in US Dollars. In order to maintain the uniformity and comparability of these ICOs, a part of them were cut off from the research mainly due to lack of available information.

Eventually, there were 191 different completed ICOs which data could be applied to the research in total. At the next step of the survey, the values of each ICO tokens were manually searched and attached to the data from Coinmarketcap.com. These values were all historical high, low and closing prices after the completion of each ICO.

Since the survey data, calculations, and spreadsheets collected in the survey are extensive, the author decided to combine these appendices into one file that is publicly viewable online in Google Drive. The following link guides the reader directly to the Google Drive folder and the file named *Appendices for ICO returns*: https://drive.google.com/open?id=1dLgZZ496pO-PPfJEEHvzrtgD3mjz94g8

The website address is also found in the references.

## 2.2. Hypothesis and research methods

For an investor, ICO may be a suspicious investment opportunity. This is due to so far almost non-existent legislation, fraud, and generally unclear future of a token if there is not enough effort to maintain it. These factors can lead to an unexpected decline in the value of a token and the loss of the investment. Because the popularity of ICOs is so great, but their riskiness is also emphasized, this thesis considers the number of ICOs which are in practical terms profitable. The author also assumes that since everyone can theoretically easily create ICOs without large resources, these many tokens might no longer be appreciated in the future despite their possible finite supply, and the value would fall below the selling price. The time period before tokens entered the open market, was approximately one month. Due to previous literature, we might want to wait as long as possible to give tokens some time to settle down and develop their values. On the other hand, in order to include enough tokens on the research, the author decided to look at the returns after two months from the time the tokens came to the open market.

For these reasons, the author has prepared the following hypothesis:

H1: an average 3-month post-ICO return is equal or less than zero

For calculations, author used basic formulas.

Formula 1. Average return

$$\bar{x} = \frac{\sum x_i}{n},$$

where $x_i$ is a 3-months return for a particular ICO

$$x_i = \frac{p_2}{p_1} - 1$$

where $p_1$ is a token sale price at ICO, and $p_2$ is a token price in 3 months.

ICO returns are also calculated in alternative way (smoothed 3-months post ICO returns):

$$x_i = \frac{\overline{p_2}}{p_1} - 1$$

where $p_1$ is a token sale price at ICO, and $\overline{p_2}$ is a one-week-average token price in 3 months.

The purpose of this study is to examine the values and returns for 191 tokens after the completion of their ICOs. There are two ways to calculate the return of ICOs. The first one is called the 3-months post ICO return which is calculated by choosing close prices of a token three months from the token's ICO divided by its ICO sale price – 1. Because we assume that token prices are volatile, we also compute the other return called the smoothed 3-months post ICO return which is calculated in the same way, but we use an average close price for a week after three months after a token's ICO in the numerator. The calculation is based on a scenario where the investor has invested in ICO and returns to look at this investment three months after the end of the ICO. Since the study examines many numbers, it is concluded that calculations also require standard deviation to see how much the numbers vary on both sides of their averages. In addition, the study calculates the intraday volatility for each token. Using these previous formulas, we can determine the variations in daily prices and therefore, the returns.

In addition, the author calculates standard deviation of 3-months post ICO returns and intraday volatility of tokens to depict a detailed picture of crypto tokens volatility.

Formula 2. Standard Deviation of returns

$$\sigma \text{ (population)} = \sqrt{\frac{\sum_{1=i}^{n}(x_i - mean)^2}{n}}$$

Formula 3. Intraday volatility

$$\text{Intraday volatility} = \frac{Price_{High}}{Price_{Low}} - 1$$

# 3. EMPIRICAL RESULTS

## 3.1. Average returns

The problem of the research is to be solved by calculating the return percentages for all tokens in for different periods of time.
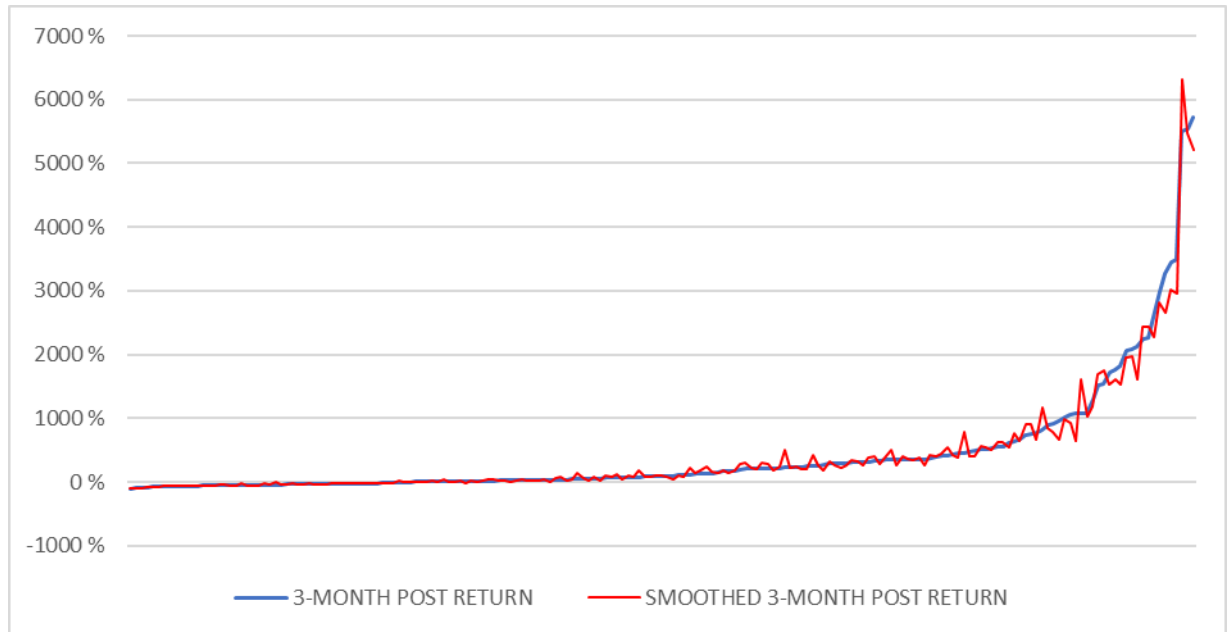


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Figure 3.1. Difference between return calculations

Based on previous research and literature, we assume that the token values are volatile. This can also be proven in the figure 3.1. above. The blue line represents 3-months post ICO return, and the red one, in turn, represents smoothed 3-months post ICO return. The x-axis represents all 191 ICOs from the smallest return to the biggest. We continue using these two return calculations in next analyses to see that the token value changes during a week and because we want to take it into account as well. The author will focus on discussing daily volatility in more detail at the end of this chapter. Since we have now proved that the token values have characteristics of fluctuating, we will take a look at the distribution of profits more closely between different ICOs in figures 3.2., 3.3. and 3.4.
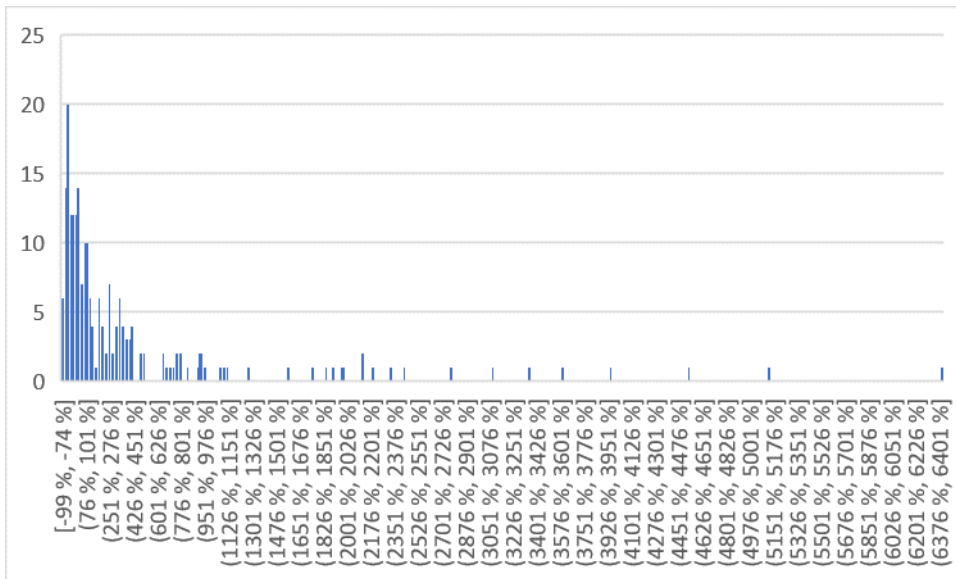
Figure 3.2. Distribution of tokens based on 3-months post ICO return (one month)

The y-axis of figure 3.2. indicates the relative frequency of days, and the x-axis the range of return percentages. The histogram above has the return percentages for each token 3-months after their ICOs for 30 days. The histogram does not tell us which tokens had received positive and/or negative results, but we can have the overview of which kind of returns tokens gave. In 30 days, returns varied between -99% and 6401%. Most of the daily returns resulted between -74% to 76%, which is a wide range. Over 500% daily returns seemed to be somewhat less common on the basis of this histogram, but there were still many of them. The average return for all ICO tokens from 30 days was 489,8 % where the standard deviation was 1110,4%.

Because we assume that the price of a token can change a lot during the month, and we want to take the investor's point of view perhaps selling any of these tokens exactly three months after ICO, we will focus on the changes that will take place during a shorter time period.
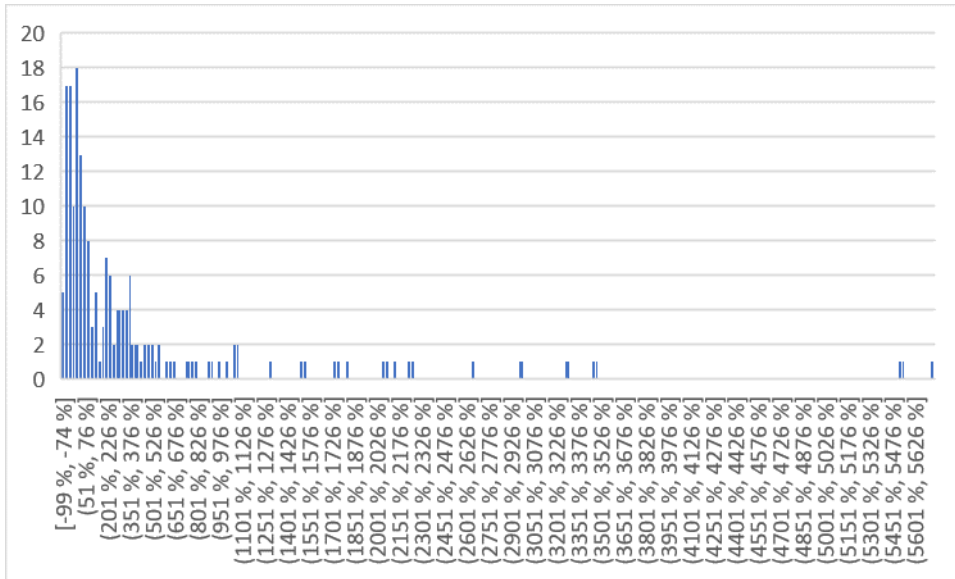
Figure 3.3. Distribution of tokens based on 3-months post ICO return (one day)

Figure 3.2. and Figure 3.3. are histograms, and they show all 191 tokens' locations based on their returns. The purpose of these figures is to obtain an overall view of the yield of all tokens at the same time. The difference in histograms is that the figure 3.2. shows the 3-months post ICO returns (1 day), and the figure 3.3. smoothed returns (1 week). The Y-axis represents the relative frequency of days, and the x-axis return rate. Since the smallest number is -99% and the largest is 5626%, the range of different returns is also wide. Between -99% and 76%, there is a large cluster of tokens. The number of days would seem to slightly decrease as the return rate increases. However, some tokens are placed in a haphazard way between the minimum and maximum return percentages. According to Appendix 1., the 3-months post ICO return was 434,1 %, and the standard deviation was 903,0%, meaning that the returns varied a lot. The most successful token by the 3-months post ICO return was ICON, ICX, which ICO was completed in the third quarter of 2017, and it resulted 5730%. For an investor, 3-month post ICO return for one week would be a more realistic measure to include the change in value during days nearby. For that reason, the author presents one-week results in the figure 3.4.
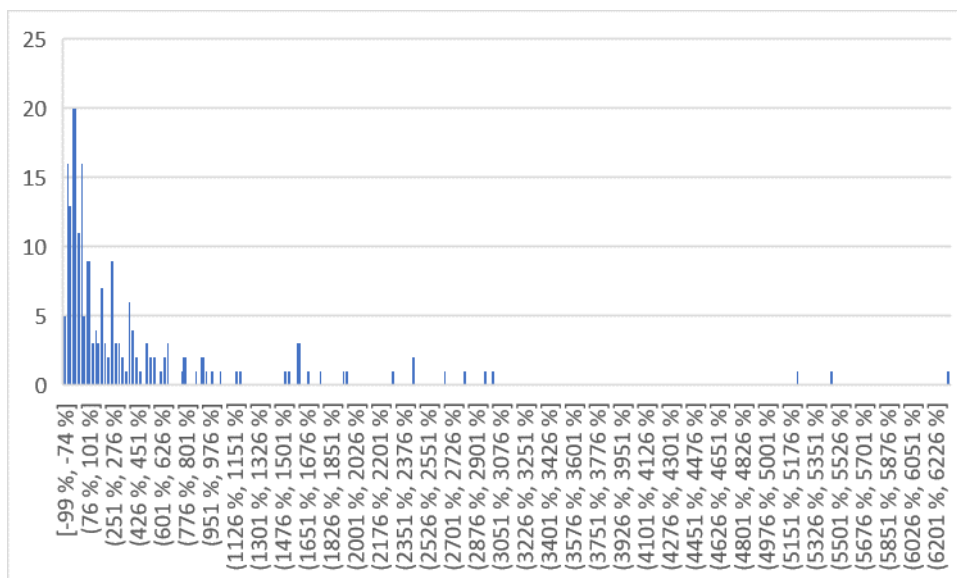
Figure 3.4. Distribution of tokens based on smoothed 3-months post ICO return (one week)

When we switch to look the results with smoothened returns, we see that tokens with a return of several thousand percent have changed their places. Since smoothed returns take into account seven different prices for each token, there are expected changes in the results. Daily returns could have gone up to 6226%, though these results were isolated cases. Returns were most probably about -99% to 101%. According to Appendix 1., the smoothed 3-months post ICO return of all 191 ICOs was 438,9%, and the standard deviation was 930,1%. On the basis of the smoothed 3-months post ICO return, the best return was given by Etheroll, DICE, at 6308%. of return. Nimic token, NET, which ICO was completed in July 2017, had the worst performance due to both its 3-months post ICO return and the smoothed 3-months post ICO return of -99,5%.

Still, it is not easy to tell big differences between these figures with a human eye. A more detailed approach is taken in the following table 3.1.

Table 3.1. Token return categories

| 3-months post ICO return (%) | Frequency, f | f (%) | Smoothed 3-month post ICO return (%) | Frequency, f | f (%) |
|---|---|---|---|---|---|
| -100 > -50 | 22 | 12 % | -100 > -50 | 21 | 11 % |
| -50 > 0 | 27 | 14 % | -50 > 0 | 33 | 17 % |
| 0 - 50 | 30 | 16 % | 0 – 50 | 27 | 14 % |
| 50 - 100 | 19 | 10 % | 50 – 100 | 15 | 8 % |
| 100 - 150 | 8 | 4 % | 100 – 150 | 8 | 4 % |
| 150 - 200 | 4 | 2 % | 150 – 200 | 8 | 4 % |
| 200 - 250 | 13 | 7 % | 200 – 250 | 5 | 3 % |
| 250 - 300 | 6 | 3 % | 250 – 300 | 11 | 6 % |
| 300 - 350 | 8 | 4 % | 300 – 350 | 5 | 3 % |
| 350 - 400 | 8 | 4 % | 350 – 400 | 7 | 4 % |
| 400 - 450 | 3 | 2 % | 400 – 450 | 6 | 3 % |
| 450 - 500 | 4 | 2 % | 450 – 500 | 1 | 1 % |
| 500 > | 39 | 20 % | 500 > | 44 | 23 % |
| All | 191 | 100 | All | 191 | 100 |

Source: Author's calculations based on data from Appendix 1.

For better observing, the author has categorized the tokens into returns classes, which are listed in an order from the smallest to largest, and they are split by 50% intervals. The groups can be seen in table 3.1. above, where we use two previously described return calculation methods again as well. Tokens with a return of more than 500% were classified as their own group as the author did not see it appropriate to create more categories because of the fragmented distribution of tokens with over 500% returns. In addition, at this point, we are striving to already look at the details of volatility caused by one week. For 3-month post ICO return method, we see that out of 191 ICOs, there were 49 tokens which prices had declined under the original sale price. For smoothed 3- month post ICO return, there were 54 tokens resulting in loss which was more than in the first calculation method.

For 3-months post ICO return, 25,65% of all tokens resulted in loss, and 20,90% of tokens had returns over 500%. Due to smoothened 3-months ICO return, there were 27,75% of tokens resulting in loss and 23,04% tokens with returns over 500%. In proportion, these two groups

could, in this case, be considered as outliers in this range where both sets have approximately the same number of tokens. The remaining tokens constituted the majority, with a return percentage ranging from 0% to 500%. The largest share of this majority was in the category where the return was from 0% to 50% for both returns calculation methods. The following calculations are based on data of Appendix 1. For 3-months post ICO return, the average of negative and positive results were -44,7% and 611,3% in the same order. For smoothed returns, these values were -40,0% and 621,7%. The averages of positive returns are far smaller than the averages of all data returns. The return categories can be seen as illustrated in figure 3.4.
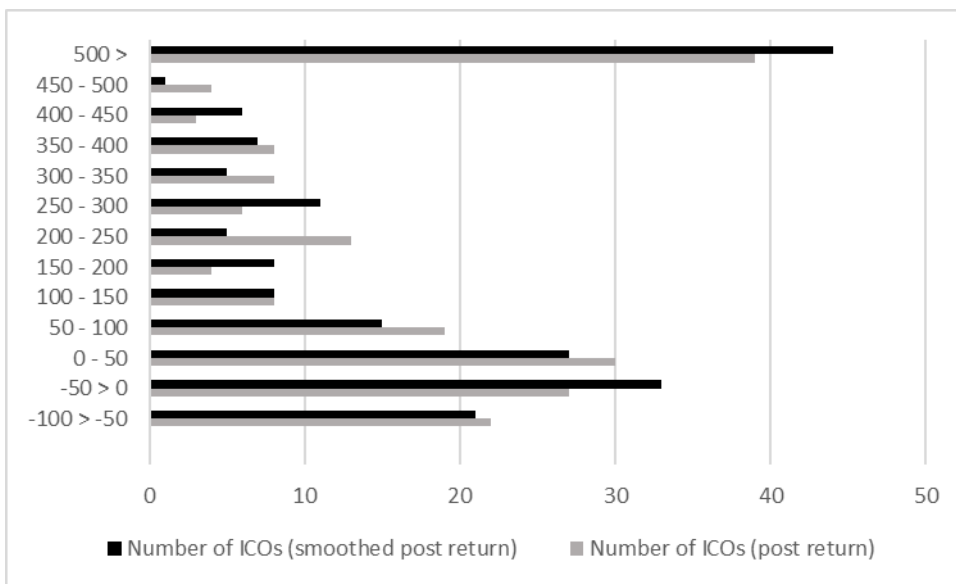


Figure 3.5. Token return categories graphically

The data from table 3.1. was computed into a graph where we can see the same data but as illustrated. Here in figure 3.4. the y-axis shows the return groups and the x-axis number of ICO tokens. Colours black and grey mean the 3-months post ICO return and the smoothed 3-months post ICO return, respectively. Even though the returns of the majority of tokens were 0 % >500 %, the large returns were definitely large, and they affected the average returns vastly.

## 3.2. Returns per quarter

The author also drew up the distribution of the tokens on time basis. In this section, the thought is a scenario in which an investor, for example, is excited to invest in a number of ICOs during a certain period. The investor will return to investigate the situation of these investments after three months.
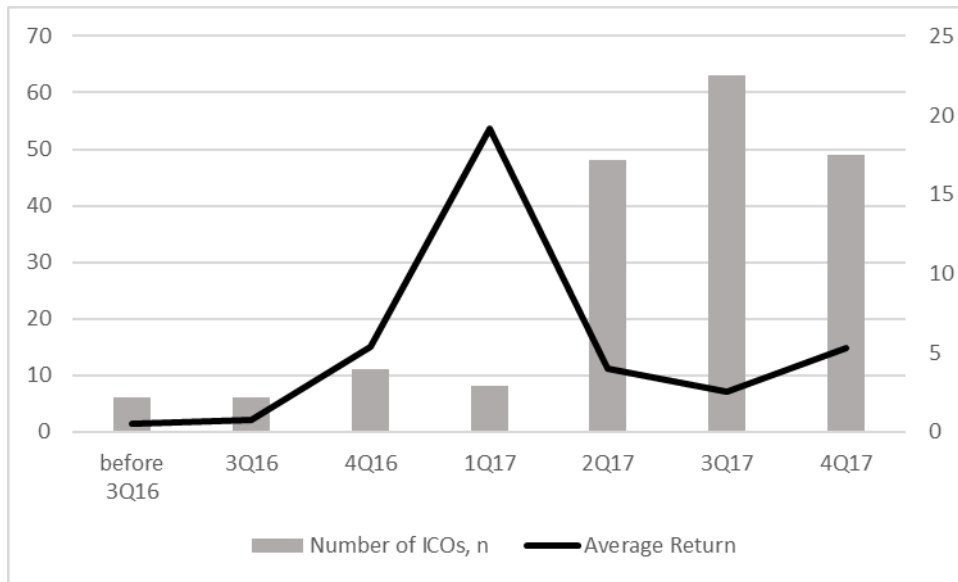


Figure 3.6. Average return from ICOs per quarter

Here the smoothed 3-months post ICO return is enough in order to illustrate more realistic returns per quarter and there is no need for the non-smoothed return calculation. The left y-axis illustrates the number of ICOs, and the right one illustrates the return rate. The x-axis consists of tokens distributed to the quarters when each token's ICO was completed. Out of 191 ICOs, there were six ICOs which were completed before April 1$^{st}$, 2016, six in the third quarter of 2016, 11 in the fourth quarter of 2016, 8 in the first quarter of 2017, 48 in the second quarter of 2017, 63 in the third quarter of 2017 and 49 in the last quarter of 2017. The average smoothed 3-months post ICO return for these ICOs were corresponding 52,5%, 75,0%, 540,7%, 1913,5%, 395,8%, 255,6% and 526,4 %.

The standard deviation for these quarterly returns were 109%, 157%, 776%, 2196%, 731%, 880% and 655%, respectively.

If an investor invested in as many ICOs as possible during any quarter, the investor would have most likely gained quite a good profit. There were following amounts of tokens that generated negative returns, in accordance with the order shown in the figure: 33%, 33%, 0%, 18%, 18,8%, 49% and 16%, where.the average for these was 27,8%. For each period, at least over a half of the

tokens' returns were positive. Here we should take into account how many ICOs were completed during these quarters also. Comparing these results to percentages presented below the table 2.1., the percentage for negative-return for all 191 tokens based on 3-months post ICO return, was quite similar to results for quarters. The first quarter of 2017 included eight ICOs which all resulted in positive returns. It is interesting to see that ICOs completed in the first quarter of 2017 were the most profitable in total compared to other quarters. This quarter also had the second least of ICO tokens. We take a closer look at the tokens which ICOs were completed in the 1st quarter of 2017 in table 3.2.

Table 3.2. Distribution of 1st Quarter / 2017 ICO returns

| TOKEN | TOKEN TAG | USD RAISED | SALE PRICE | 3-MONTH POST ICO PRICE | 3-MONTH POST ICO AVERAGE PRICE | 3-MONTH POST ICO RETURN | 3-MONTH POST ICO SMOOTHED RETURN |
|---|---|---|---|---|---|---|---|
| Wings | WINGS | 2074 | 0,028 | 6 % | 8 % | 128 % | 177 % |
| Tokes | TKS | 81 | 0,125 | 83 % | 90 % | 563 % | 621 % |
| Spectrecoin | XSPEC | 15 | 0,001 | 2 % | 2 % | 1511 % | 1686 % |
| ChronoBank | TIME | 5400 | 7,604 | 1070 % | 1158 % | 41 % | 52 % |
| Melonport | MLN | 2900 | 5,8 | 2945 % | 3207 % | 408 % | 453 % |
| Procommerce | PROC | 77 | 0,027 | 19 % | 17 % | 615 % | 540 % |
| Etheroll | DICE | 304 | 0,068 | 381 % | 436 % | 5503 % | 6308 % |
| Augmentors | DTB | 1070 | 0,015 | 85 % | 84 % | 5545 % | 5472 % |

Source: Author's calculations based on data from Appendix 1

Since there were only eight completed ICOs during the 1st quarter of 2017, one could think that the most profitable token of all ICOs, Etheroll, DICE, would radically raise the average. In fact, as Table 2.1. shows, all the tokens performed well. Without the best performed DICE, the average returns would still be over 1000%. The 1st quarter of 2017 was, in fact, the only quarter which included ICOs with only positive returns. Investors who invested in ICOs in the 1st quarter of 2017 were sure to receive a return on their investment when we evaluate returns afterwards.

## 3.3. Volatility

Here we are going to study the importance of daily volatility of tokens. Intraday volatility calculations are found in Appendix 2. which was created by using data from appendices which included all tokens' daily highest and lowest prices.
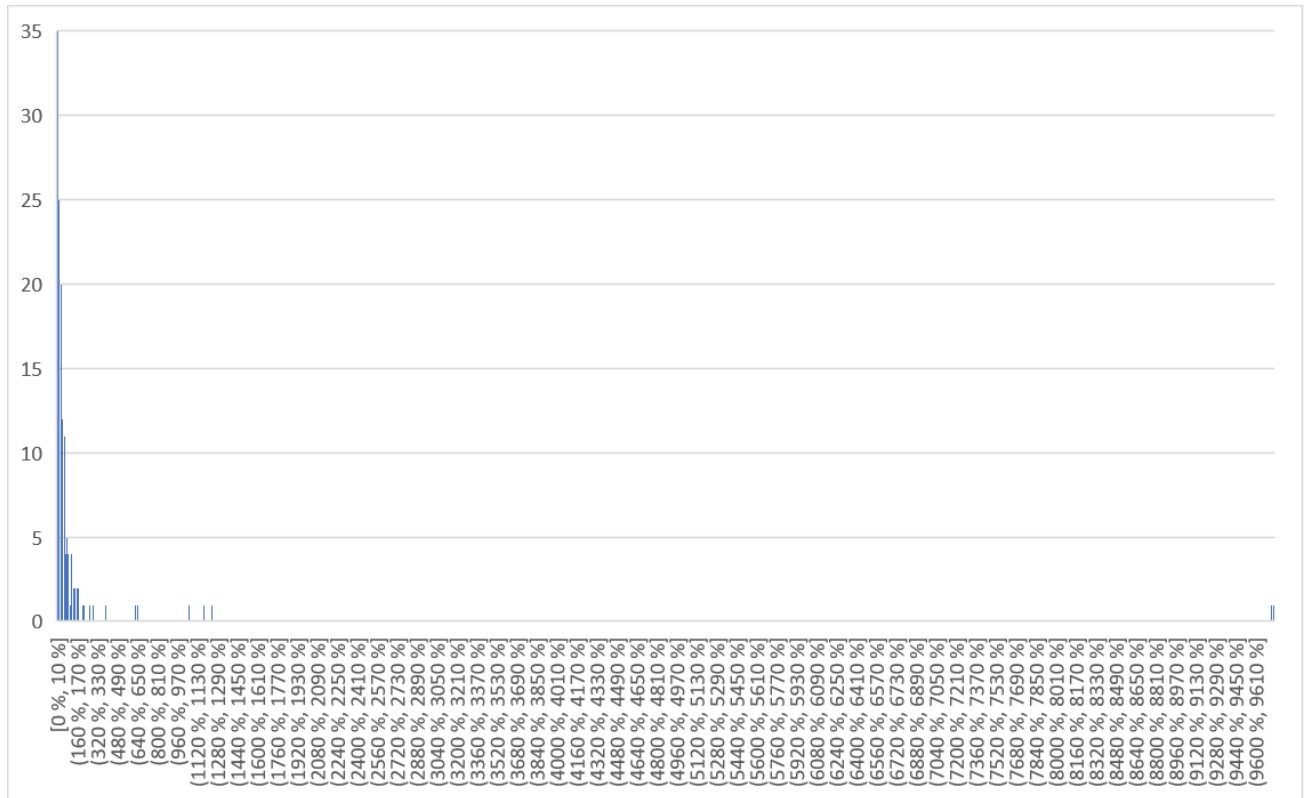


Figure 3.7. Intraday volatilities of all tokens for 90 days after going in the secondary market

The y-axis of figure 3.6. indicates the relative frequency of days, and the x-axis the range of volatility percentages. The figure includes all tokens' daily volatilities from 90 days since the day when token appeared in the secondary market. Amongst all tokens, the intraday volatility was often between 0 to 50% for one day. There were also many days with intraday volatility ranging from 50% to even 170%. In fact, there were prominent differences in intraday volatilities between different days.

Over 1000% daily volatilities were clearly exceptional. There may have been an error in the original data for the day prices, or for a few tokens something critical might have happened, allowing the price to change notably. One of the reasons for sudden changes may be, for example, that some crypto currencies have fewer owners, and when one of the owners sells or buys a bit more, this is reflected in the price and hence in volatility as a major change. However, we can conclude that ICO tokens are more volatile than, for instance, average traditional shares

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and stocks as the average mean of all ICO's average intraday volatilities was 39,9%, and the average of standard deviations of all intraday volatilities was 76%.

Table 3.3. Distribution of tokens' volatilities per period

| Period | Average volatility | Number of tokens, n |
|---|---:|---:|
| before 3Q16 | 47,2 % | 6 |
| 3Q16 | 29,3 % | 6 |
| 4Q16 | 58,2 % | 11 |
| 1Q17 | 251,4 % | 8 |
| 2Q17 | 8258,1 % | 48 |
| 3Q17 | 42,8 % | 63 |
| 4Q17 | 34,0 % | 49 |

Source: Author's calculations based on data from Appendix 2

When we look at the table 3.3., we will notice two extraordinary periods with high average volatilities. In this case, we got a range of 29,3% - 8258,1% which does not seem realistic. The reason for the second and third quarters of 2017 values for being notably large, was due to three tokens. In the 1st quarter of 2017, Etheroll token had an average volatility of 1768%. In the second quarter, there were Ethbits and Veritaseum, which average volatilities were 199790% and 3495798%. The reason for these numbers were that each of these three tokens had just a few days when the intraday volatility rose incredibly high for unknown reasons in this study. Because it was just a few days of exceptional volatilities, the writer felt it important to look at the results without these three tokens, which the results are shown in the following table.

Table 3.4. Distribution of tokens' volatilities per period, adjusted

| Period | Average volatility | Number of tokens, n |
|---|---:|---:|
| before 3Q16 | 47 % | 6 |
| 3Q16 | 29 % | 6 |
| 4Q16 | 58 % | 11 |
| 1Q17 | 35 % | 7 |
| 2Q17 | 38 % | 46 |
| 3Q17 | 43 % | 63 |
| 4Q17 | 34 % | 49 |

Source: Author's calculations based on data from Appendix 2

The author removed Etheroll, Ethbits, and Veritaseum from the calculations because they had an adverse effect on the average. These three tokens are a good example of how extraordinary changes affect the average, so we need to get to know them better. As a result of this, the average volatilities tend to look more realistic and quite the same size. The average volatility for the periods mentioned in the table 3.4. are 47%, 29%, 58%, 35%, 38%, 43% and 34%. The price of the day has thus fluctuated averagely by almost the same amount in different days for different period ICO tokens.

# CONCLUSION

The purpose of the study was to find out if the average 3-months post ICO return for tokens was negative or equal to zero. The research hypothesis was built for the following reasons. ICOs are criticized for their riskiness because regulations or the highest institutions do not control their progress. This has led to possible fraud attempts and questionable investment cases. Also, it is possible that the tokens sold in ICOs may not be able to produce large profits because there are constantly more ICOs generated, and anyone can organize their own ICOs. The time horizon of the hypothesis, 3 months, was chosen due to the fact that it took approximately one month before these ICO tokens entered the secondary market. Additionally, these crypto currencies were given the time to develop on the market, but not too long because there would not had been enough research data. These ICO tokens were allowed to develop on the secondary market for 2 months before they were examined by using the chosen formulas. The investigation was started by proving if the ICO tokens were volatile. In the study, tokens' returns were calculated for three different time intervals, which two were used in further studies. For the results of the tokens, the averages were calculated, and it was decided to categorize the tokens based on the size of their returns. Tokens were also divided into seven quarters based on their ICOs' completion date, which we calculated average returns. The purpose of this part was to examine whether the timing of the investment would had been relevant to these tokens' returns. The study also utilized raw data with the highest and lowest daily prices for tokens. From this, we were able to calculate intraday volatility for 90 days, as we were trying to get information about changes in the value of a mediocre token. After that, also the intraday volatility results were divided by the dates of tokens' ICO completions.

For all 191 ICOs, the average 3-months after ICO return and for 30 days was 489,8 % where the standard deviation was 1110,4%. The 3-months post ICO return (1 day), and the smoothed 3-months post ICO return (1 week) were 434,1 %, and 438,9% % in the same order. The standard deviation for these were 903,0% and 930,1%. Understandably, the results smoothed the more the greater was the number of comparable days. However, the results were higher than assumed. The most successful token was Etheroll, DICE, which ICO was completed in February 2017. DICE resulted 6308% of smoothed 3-months post ICO return. Nimic token, NET, which ICO ended in July 2017, had the worst performance as its 3-months post ICO return was -99,5%.

The average return of tokens was positive, but the time of measurement is of great importance. The average returns were actually split so that about 27,8% of the ICO tokens had negative

returns. Approximately 21,5% of the tokens, on the other hand, had averagely generated over 500% of return. These outliers were interesting to note, especially from the study's main hypothesis' point of view. The main averages could had been smaller if these high yield tokens were not taken into account. Clearly deviating values strongly affected the averages. Based on the calculations, 51,5% of the tokens had produced something between 0-500% on average. Among these majority group tokens, approximately 30% had an average return from the range between 0% and 50%.

The division of the tokens into their quarters also produced interesting results. In the first quarter of 2017, all the tokens had produced positive results that were, on top of that, remarkably high. There may had been some trend going on at the time, or the tokens had been simply fortunate or otherwise popular. The relationship between the negative and positive producing tokens of other quarters could be possibly seen as a pattern. Approximately 27,8% of the tokens were negative in terms of return, and the quarterly results for the calculation method were close to the average. This might be a general relationship between negative and positive returns when looking at large groups of tokens.

Intraday volatility really gave a big scale of numbers. Several tokens may had been a bit extraordinary for some days, but some tokens simply had more varied high and low prices during the days. Intraday volatility was also calculated by quarters. In these cases, the average 90-day intraday volatility was 29% -58%. The average intraday volatility was 39,9% overall, but its standard deviation was 76%.

After all, according to smoothed 3-months post ICO return, 72,2% of all ICOs gave positive returns. Although crypto currency and ICOs are controversial in the sense that the investment is not always safe, it can be said from this study that most of the tokens were positively profitable three months after their completed ICOs. Because crypto currencies are not directly linked to the market changes we are accustomed to such as inflation, this study also proves that it is difficult to find common correlation between time periods and the variability of token values. Inflation or other economic events will not affect crypto currencies unless they concern the companies which created their own tokens. Each crypto currency is its own independent product, and investors cannot assume that the value of any crypto currency would change if it happened to another. The study focused on examining returns only on the basis of numbers, and it did not intend to speculate much on the causal consequences.

Interesting things came up in the research. For example, the average intraday volatility of all tokens was correct and realistic, but in reality, the daily volatility was often around 10% for many tokens. It is not necessarily relevant for a potential investor to display only average returns of tokens if he or she wishes to get an accurate picture of it. However, average calculations with standard deviations gave us hints about the type of a token as an investment product. We can point out that tokens after their ICOs are highly volatile and risky, but they have a full capability of making its investors rich even in a short time as three months. One considering ICOs as investment opportunities shall study the area of ICOs and at least try the best to exclude chances of scam and ICOs with questionable or missing information of plans and goals. Overall, ICOs that had completed had also been more likely to be positively profitable and therefore worth investing in. Behind the numbers, however, there are things that should be clarified before starting to risk money.

For the further research, the following studies could explore the causes of changes in ICO token values and hence their possible effect on other tokens. This information might enable more valuable return estimation methods for tokens, which could make investors and perhaps even regulators more confident about trading crypto currencies.

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