# ERASMUS UNIVERSITY ROTTERDAM
## Erasmus School of Economics

## Master Thesis Financial Economics


# INITIAL COIN OFFERINGS: UNDERPRICING AND LONG-TERM RETURNS

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**Abstract**

Initial coin offerings (ICOs) are an alternative and over the recent years increasingly popular way how companies can raise money by issuing new cryptocurrencies. Information quality and availability vary significantly among new issuances. In this work, I analyse a set of 245 ICOs appeared from 2013 until April 2018. The focus of this paper is to describe key determinants of the initial underpricing and the factors that influence the returns in an extended period of 120 days after the first day of trading. I find that the initial underpricing of newly issued tokens is significant and highly positive (average +4416% and median value +21%). In addition quality, number and availability of data about particular ICO have a positive impact on the returns in the initial period. At the same time initial and future distribution and composition of a new tokens issues have an effect on both, initial period and the extended period. Results suggest that investors are facing significant problems in valuation and due diligence process of new tokens issues, which might be affected by high information asymmetry between the issuing company and the investors.

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# 1    Introduction

The increasing number of newly issued tokens around the world is coming up with many questions related to economists and public authorities. Currently, there is barely any regulation for tokens issues, which corresponds with the fragile protection of investors. Information quality obtainable about new cryptocurrency projects is limited. There is still not a clear view if new tokens exchanged for fiat money represent a financial security or not. Generally, ICO represents a new creative way how to obtain funding for, in most cases, innovational project.

I analyse a sample of 245 ICOs appeared from 2013 until April 2018. A key objective of issuing new tokens is primarily related to the development of a new blockchain platform, disrupting financial sector (fintech) or issuance of new cryptocurrency. The participants can use the new tokens for purchases of products and services of the issuing company. In many cases, the only obtainable information about particular ICO is in the company's white paper. It is a document written with a focus on potential future investors. Moreover, some information might be biased or inaccurate.

The market for secondary transactions with cryptocurrencies is quite liquid, especially on the first day of actual trading. This leads to a highly positive average initial underpricing of 4416% (based on average price during the issuing period and first-day trading end price) and average return on the first day of trading in the amount of 2478%. In more extended periods we can observe a significant drop, in an average return, to 103% in 7 days period, but after some time the average return starts to recover to 745% in 120 days period linearly. Median results show a slightly different pattern; the first-day median return is 0. Later the returns go to negative numbers (ca -10% in 7 and 30 days period) and from 60 days period on start to positively increase to reach 20% average median return in 120 days period. These observations might suggest that investors are facing significant problems in adequately valuing new ICOs and after the new token reach critical period the return is mostly positive.

I validate Hypotheses concerning the initial underpricing; a calculation represents a percentage change over the issuing period. A base is the average issuing price in relation to the first-day end price. First of all the initial underpricing is positive. Information about a type of an algorithm and proof type in WP positively affects the initial underpricing. Further, I validate that the stability of future supply and fully pre-mined supply positively increase the initial

underpricing. On the other hand, if the issuing team is keeping a part of the new tokens the influence on the initial underpricing is negative. Corresponding to that more percentage share for the investors affect the initial underpricing in a positive way.

Secondly, I validate Hypotheses regarding the long-term return which I determine as 120 days period return, based on the first-day start price and 120 days end price. In contradiction to the effects on initial underpricing, if the issuing team and company keep majority (more than 50%) of newly issued tokens, the impact on the long-term return is positive. In addition, the size of the part that the issuing company and the team is keeping positively affect returns in the long term. Uncertainty about a part of a new tokens negatively affects the long-term return.

## 2 Theoretical background

Initial coin offerings (ICOs) are revolutionising how companies, in most cases startups, financing their projects at early stages. ICOs are in some characteristics comparable to traditional Initial public offerings (IPOs), Venture capital fundings (VCs) and Equity Crowdfunding. The similarity is observed in the fact that all ICOs, IPOs and VCs are meant to raise funds. IPO and VCs mean that the company is giving part of its share to the public in exchange for capital. Instead of selling equity, a company can sell tokens (investors receive new cryptocurrency with a potential possibility to change them to fiat currency), so the owners do not lose control over their companies. A token can be created and sold globally at barely any cost, and even small contributions can be accepted. Investors obtain the rights that are incorporated into the token and can trade this token on a very liquid market. (Adhami, S., Giudici, G., Martinazzi, S., 2017). So if the token gains in value, they can sell it at a profit. ICOs cumulative investment volume in June 2017 was higher than more traditional raising money through VCs investments. (Kotenko, A., Carlton, E., Lee, Ch., Ohan, M., 2017). The reason why companies prefer ICOs over VCs or IPOs could be their cost advantages and liquidity reasons.

### 2.1 IPO

We can observe significant differences between ICO and IPO. After participation in ICO investors receives new cryptocurrencies (in the form of a token), that can be exchanged for fiat money. On the other hand, after IPO investors receive shares of the company. Less strict regulation makes the process of ICO much faster and the preparation less demanding due to the fact there is no need for bankers, auditors and lawyers. Nowadays regulators such as the SEC (Securities exchange commission) and FCA (Financial conduct authority) release pieces of advice and warning posts to individual investors to be informed about the high risks of investing in ICOs. (Kotenko, A., 2017).

The fundamental aim of an IPO from investors perspective is to gain a profit from differences between capital invested and the final price of bought shares. IPOs are usually designed by investment banks which make a profit from buying the shares of the company at discounted prices and selling them to the public with added margin. (Koba, M., 2013).

If a company is planning to go public, it has to prepare a detailed financials (proved by an independent auditor) and include a document about firms plans, developments and potential risks. (Wasserman, E., 2017).

### 2.1.1 IPO initial underpricing

Companies are considering going public for several reasons. Listing a companies share on public markets creates an opportunity for current shareholders which are early investors, founders, employees to convert their parts of the company into cash at the time of the IPO or anytime after the initial listing. (Ritter, J. R., & Welch, I., 2002).

Chief financial officers state that publicly listed companies make acquisitions which are stock financed and also the fact that firms that are publicly traded indicate total value of the company in any given time. (Brau, J. C., & Fawcett, S. E., 2006).

Added value is observed by more faith in the publicly traded companies by investors, customers, suppliers, creditors. An important fact in consideration of going public is in which state of the lifecycle the company currently is. (Ritter, J. R., & Welch, I., 2002).

### 2.1.2 Information asymmetry

Investors have usually not the same amount and quality of information about the issuing company. Some investing parties could have some private information about for example management quality or some other important characteristics. (Benveniste, L. M., & Spindt, P. A., 1989). Also, the issuing company have very likely more precise information about the current state of their business than the outside parties (investors). (Benveniste, L. M., & Spindt, P. A., 1989). This could create a potential lemons problem (Akerlof, G., 1970), which suggest that the issuing firm has an initiative to over glorify the quality of an investment to potential investors (Booth, J. R., & Smith II, R. L., 1986).

### 2.2 Venture capital

Investing in venture capital consists of investments in growing, high potential business (usually start-ups). Investors are familiar with significant risks, so they expect higher than average profitability from their invested money. (Business dictionary., 2017).

Venture capital firms are considering investments into ICOs due to their profitability. Coin Desk posts a study in which they are estimating that venture capital firms invested circa EUR 1,5 b into blockchain startups. (Tian, C., 2017). Reasons, why VCs think about ICOs are growing profitability of the whole cryptocurrencies market and high liquidity of ICOs investments. Investors have to ability to withdraw quickly. (Kastelein, R., 2017).

## 2.3 Crowdfunding

An entirely new method, how to companies get funded from sponsors in exchange for obtaining something for return. Usually, it is a final product, service or some technology. (Investopedia, 2017). After product introduction on the crowdfunding platform, buyers know what exactly they receive after they fund a particular company and the product/service is prepared to enter the market. (Young, J., 2016).

## 2.4 ICO

A typical process of ICO starts with the launch of a document called White paper, which includes a description of a business idea, technical details and future outlook for the company. White paper accurately describes functions of the issued token and the process of creating a token. Important is to state the final number of issued tokens and under what conditions are potentially new tokens issued. Even though to estimate future growth opportunities of each business model is challenging. Some ICOs issuers launch even without proper white paper, which makes investments very risky and uncertain. (Adhami, S., 2017).

Nowadays there are some legal uncertainties regarding ICOs. This technology is new, and regulators have not given a final official statement about them yet. It is unclear if ICOs should be categorised as security (like other financial instruments) or if they are more similar to some types of donations for early access to final product or service. Lack of regulations leads to potentially more risky behaviour from the side of token issuers. Potentially, less regulation could make ICOs more profitable and at the same time more bankruptcy like from an investor perspective than other funding alternatives. ICOs market is very liquid primarily because of easy access and uncomplicated transfer of tokens. Estimated values of tokens may be distorted from reality because investors do not have experience with a fair valuation. Corresponding to that, blockchain technology is entirely new, and there are still uncertainties about its usage (which sectors are most perspective) and future potential for profits and revenues. Because of

the uncertainties investors are making systematic errors in valuations of ICOs (mostly positive), this could lead to winner's curse phenomenon. (Sánchez, D., 2017).

A process of ICO starts with coordinators of the concrete ICO which determine the value of the cryptocurrency (token). The network at the particular moment justifies the value. The ICO participants determine costs through price change dynamics. Market supply and demand set these dynamics. The corresponding high volatility of the cryptocurrencies is the most significant risk for participated investors. Tokens creation is at the top of the protocols. Development of tokens is on separate technologies, e.g. market leader Ethereum (smart contracts), Openledger (independent ecosystem), Counterparty (based on Bitcoin protocol). (Kastelein, R., 2017). To design a prosperous ICO issuer have to take into account game theory, financial economics theory and aspects of the monetary theory. (Conley, J., 2017).

### 2.4.1 Reasons for issuing own tokens

There are several reasons why would a platform needs its own tokens. One of them is that token can in the future reward creators of the network without losing control after the launch of the platform. In addition, buyers of a particular token might fund development of the platform, because they potentially believe in long-term success and broad adoption of this specific network. Like stock certificates, token value creates a degree of commitment of a customer due to the value is fixed to a specific service or good with finite use. (Howell, S. T., Niessner, M., & Yermack, D., 2018).

In the process of an ICO, issuers specify the precise amount they are aiming to raise. If the target is not determined in fiat currency (dominantly in USD), then it is set in the same currency as the underlying technology. Usually, the amount is a cap, and the issuers may retain part of the offered tokens, and they are also, as the investors, exposed to volatility in the token value. Timeline of the ICO process is as follows (Catalini, C., & Gans, J. S., 2016):

### 2.4.2 ICO stage

• Issuer set quantity of the particular tokens; a minimum price for each new token; a share of tokens that the issuer is retaining; information if there is a contingency of the initial coin offer or whether the purchase of the new tokens is processed ex-ante. The issuers specify the number of tokens available in each period.

• The issuer is auctioning the tokens (second price auction or multi-unit English auction), and the agents then choose to purchase the issuing tokens or not.

• If the amount of total purchases passes the minimum set verge, the issuer proceeds with developing of the platform, otherwise are all of the contributions returned and the „venture" is not launching.

### 2.4.3 Market stage

• After the ICO stage period, the „venture" is established. Issuing company announce the product quality to all of the uninformed agents

• The issuers launch the platform on which the particular tokens are the only accepting medium of exchange

• Participants (buyers) trade tokens on a new marketplace and therefore are determining the exchange rate in every moment

• Profits and the payoffs are released

### 2.4.4 Distribution of the token holding

Two approaches can analyse the distribution. First is the analysis of the distribution of ownership of the token holding. Second is the distribution of demographics of traders or investors.

Sometimes is a significant part of the tokens owned by a small group of people, this is influencing and affecting the dynamics of the financial control of a particular project. Some countries with a relatively sizeable share in cryptocurrency investments have quite strictly regulated financial policies. The decision made by investors into the crypto tokens might not be entirely based on the expected growth of the particular projects (Yadav, M., 2017).

### 2.4.5 Information quality in a white paper

Since 2008 when the most famous cryptocurrency Bitcoin released its white paper, basically all of the new cryptocurrency projects publish their vision, roadmap and project core focus in the form of a white paper document (might be, in some cases, glorified). Issuing company writes a white paper, in most cases, with a focus on potential investors. Based on research, some parameters could help in the effectiveness of a particular white paper.

- A detailed explanation of a project and logical justification of the problem
- Financial roadmap with a focus on allocation of the token fund; sample balance sheet
- Understand the target users, especially their motivation and goals in participation to the project
- Information about technical risks and their unbiased presentation

## 3    Hypotheses development

To understand the dynamics of initial underpricing and returns of initial coin offerings, I collected information about 281 ICOs. Sample set contains ICOs that occurred from September 2013 to April 2018. Since there is no available sufficiency list of all ICOs, I use a combination of various internet sources, which monitor current and past ICOs[1] and issuing companies websites. To calculate particular initial underpricing, as an end price I use closing price on the first trading day (Lee, P., Taylor, S., Walter, T., 1996) and as a start price I use the average price of the initial coin offering period. Mainly due to a fact, that some issuers do not share start and end price of the initial period after the issuance of the particular token.

To make the initial return of particular tokens comparable to each other, I quote the initial return (IRi) in a relation of the first-day trading end price (PEi) to the average issuing price of a token (IAi) and multiply by 100 to obtain a proportional return.

$$IR_i = \frac{(PE_i - IA_i)}{IA_i} * 100$$

Consequently, to get a 120 days returns, I calculate the 120-days return (LRi) in a relation of 120-days end price (PEi) to the first-day trading start price (FSi) and multiply by 100 to acquire a proportional return.

$$LR_i = \frac{(PE_i - FS_i)}{FS_i} * 100$$

ICOs and corresponding tokens are a new thing. Investors do not have much experience with proper valuation so they may not be exact at an estimation of the value of the tokens. Initial coin offerings have revolutionised how organisations can finance projects at an early stage. The company can sell tokens instead of equity so that the owners do not lose control over their venture. A token can be created and sold globally at barely any cost, and even small contributions can be accepted. Investors gain the rights that are encoded into the tokens and can trade them on a very liquid market. Thus if the tokens gain in value, they can potentially sell them at a profit. If investors make systematic errors on the positive side, ICOs will benefit from something called the winner's curse.

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[1] www.coingecko.com; www.coinmarketcap.com; www.cryptocompare.com; www.icodrops.com; www.icowatchlist.com; www.tokenmarket.net; www.trackico.io

To test whether the mean initial underpricing is statistically significant > 0, I use a t-test with 244 degrees of freedom.

## 3.1   Hypothesis 0

H0: Underpricing of the Initial coin offerings > 0
H1: Underpricing of the Initial coin offerings <= 0

There is no evidence what are the critical determinants of higher positive returns of Initial coin offerings from an investor's perspective yet. It is essential to identify and understand these drivers. Information asymmetry is typically quite high for the ICOs. Investors have a limited amount of information, issuing document "white paper" can be inaccurate. Some of the proposing documents are more technical and detailed. A number of an issuers shares source code of the project (at least some parts). In a comparison of ICOs to IPOs, the information asymmetry is much higher for ICOs. Also, there is significantly less information that the investor can obtain about the issuing company of ICO.

Sharing information about a type of an algorithm and proof type in white paper could be explained, by investors, that the issuing company is transparent and therefore could increase the return in the initial period.

## 3.2   Hypothesis 1

H1: Quality, number and availability of data about particular ICOs have an impact on initial underpricing

Hypothesis 1 can be subdivided into followings:

H1A: Sharing information about a type of an algorithm in white paper positively affects the initial underpricing
H1B: Sharing information about a proof type in white paper positively affects the initial underpricing

In the beginning, Issuing company sets a rule what is going to happen with a supply of the tokens over time. The supply could increase, decrease or remain the same. Stability, concerning

that the supply remains unchanged, can be valuable for investors and thus the initial return can be possibly higher. The structure of a token sale could affect the initial return. Introduction of a bonus scheme can be a warning sign for investors. Issuing company, in this particular case, lure risk seeking early groups of investors. Keeping a part of the total, newly issued tokens, can give investors a signal that it is unpredictable, in the future, what exactly is going to happen with these coins. Impact on the initial underpricing can be thus negative. Corresponding to that, a high share of newly issued tokens going public (offered to investors) can be a sign that the issuing company genuinely believe in the future and adoption of this project as a currency for specific services or goods, not just a speculative investment.

## 3.3   Hypothesis 2

H2: Initial and future distribution and composition of new tokens influence initial underpricing of a concrete project

Hypothesis 2 can be subdivided into followings:

H2A: Stability of future supply and fully pre mined supply of particular tokens positively affects the initial underpricing

H2B: Incorporated bonus scheme in the pre-trading period negatively affects the initial underpricing

H2C: If the issuing team is keeping a part of the new tokens, the effect on initial underpricing is adverse; additionally more percentage of the newly issued tokens for investors affect the initial underpricing positively

In more extended periods of time can be the return of a concrete ICO influenced by other factors than during the issuing period. Alternatively, the same determinant can be explained differently by investors and can thus lead to the opposite effect. I set 120 days for an extended period, which lower the sample size from 245 ICOs to 184 new token issues.

Keeping a majority of newly issued tokens within the company and a team decreases the risk of a potential hostile takeover of more than 50% by one investor, which destroys the decentralisation of the system. Initial distribution concerning that the company is distributing some part of new tokens to a group of „other" can be a sign of potential unpredictability of

future distribution of these tokens. This uncertainty can lead to an adverse effect in the extended period of returns. Keeping a part of newly issued tokens by the company and the team can be a signal that the team and company believe in the future success of a particular project. This message can thus lead to a higher positive return in an extended period.

### 3.4 Hypothesis 3

H3: Initial and future distribution and composition of new tokens influence returns in an extended period (120 days) of a concrete project

This hypothesis can be subdivided into followings:

H3A: Initially keeping more than 50% of new tokens with the team and company positively affects returns in an extended period

H3B: Other schemes of initial distribution negatively affect the returns in an extended period

H3C: Size of a part of newly issued tokens that the issuing company and team is keeping, positively affect the returns in extended period

## 4 Research design and data description

Figure 1 shows the sample number of initial coin offerings in each year from the sample period (January 2013 - April 2018). During the period from 2013 to 2015, issuing new cryptocurrencies was far from a mainstream source of funding new innovative projects, only 12 new companies issued tokens. In the year 2017, the boom and phenomenon of ICOs begin. The year 2017 was so far a record period with 174 new cryptocurrencies issued. From January until April 2018 companies issued 39 new coins. Assuming linear progress of issuing new tokens, in the year 2018 is going to be issued approximately 450 new coins. The year 2018 is likely going to set up the new record, in comparison to the previous year, 2017, there will be ca. 2.6 times more new token issues (under the linear trend assumption).

Figure 1. Time flows of Initial coin offerings
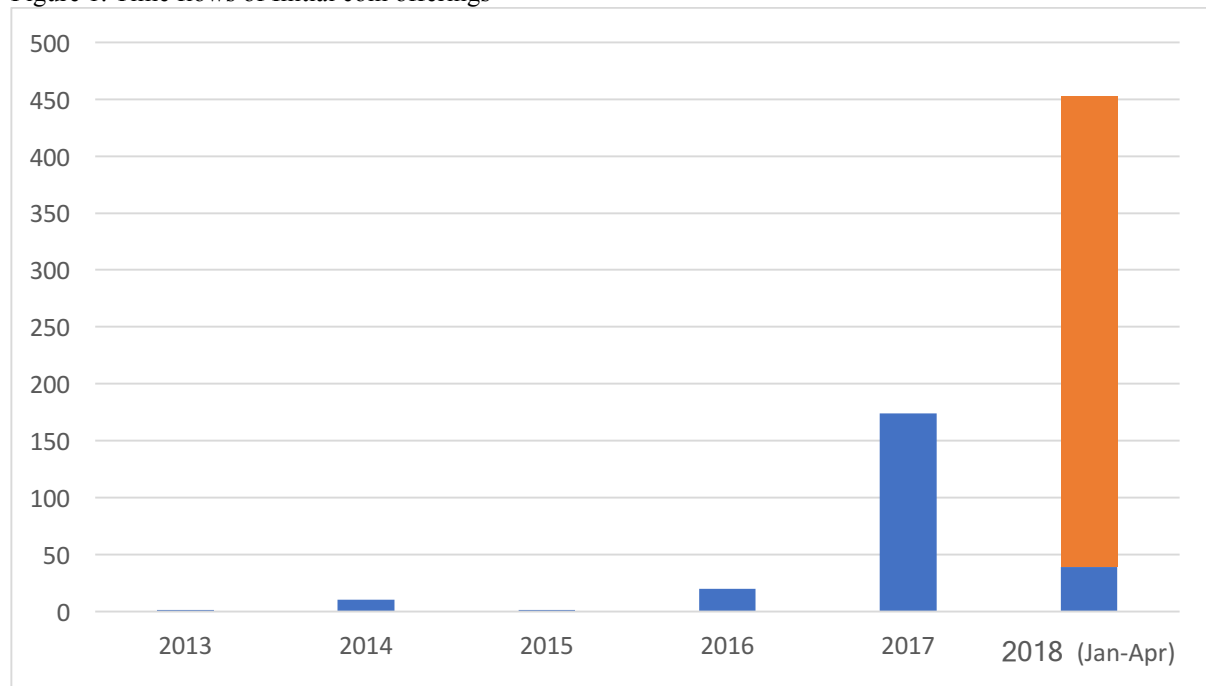


From the sample of 245 new coins offerings, the average length, in days, is 27, the median is 30. Relatively high number of ICOs, approximately 10%, took only one day (25 ICOs from the sample). Maximum length period was 113 days, and only two initial coin offerings took more than 100 days. The correlation coefficient between length in days and a total amount of raised money in US dollars is negative (-0.3), issuers with higher raising target are probably more experienced, and thus they know how to promote the ICO better and lure more potential investors in shorter periods of time. Moreover, this might suggests that issuers probably postpone the total ICO periods if they still not raised the full amount that they wanted.

Figure 2. Initial coin offerings length in days

| Variable | Mean | Median | Min | Max | Std. Dev. | Observations |
|---|---|---|---|---|---|---|
| ICO length days | 27 | 30 | 1 | 113 | 18.6 | 245 |

Over the sample years, the ICO length in days is relatively stable with no significant differences during the time. However, the trend of total length was slightly declining from 2014 to 2017. In the year 2018 (until April), there is an observable increase of approximately 51 % year over year.

Figure 3. Change in ICO length in days over the sample period (excluding the year 2015 due to small sample size, only one observation)

| Year | Mean | Observations |
|---|---|---|
| 2014 | 28.4 | 10 |
| 2016 | 26.2 | 20 |
| 2017 | 25.1 | 174 |
| 2018 | 35.1 | 39 |

Figure 4 shows that the spread of length of the initial coin offerings is widening over the years (2013-2018). However, at the same time, ICOs are not evenly spread between the day's length. Most of the ICO's (80%) durations are between 1 to 50 days.

Figure 4. Spread in lengths of Initial coin offerings over the sample period
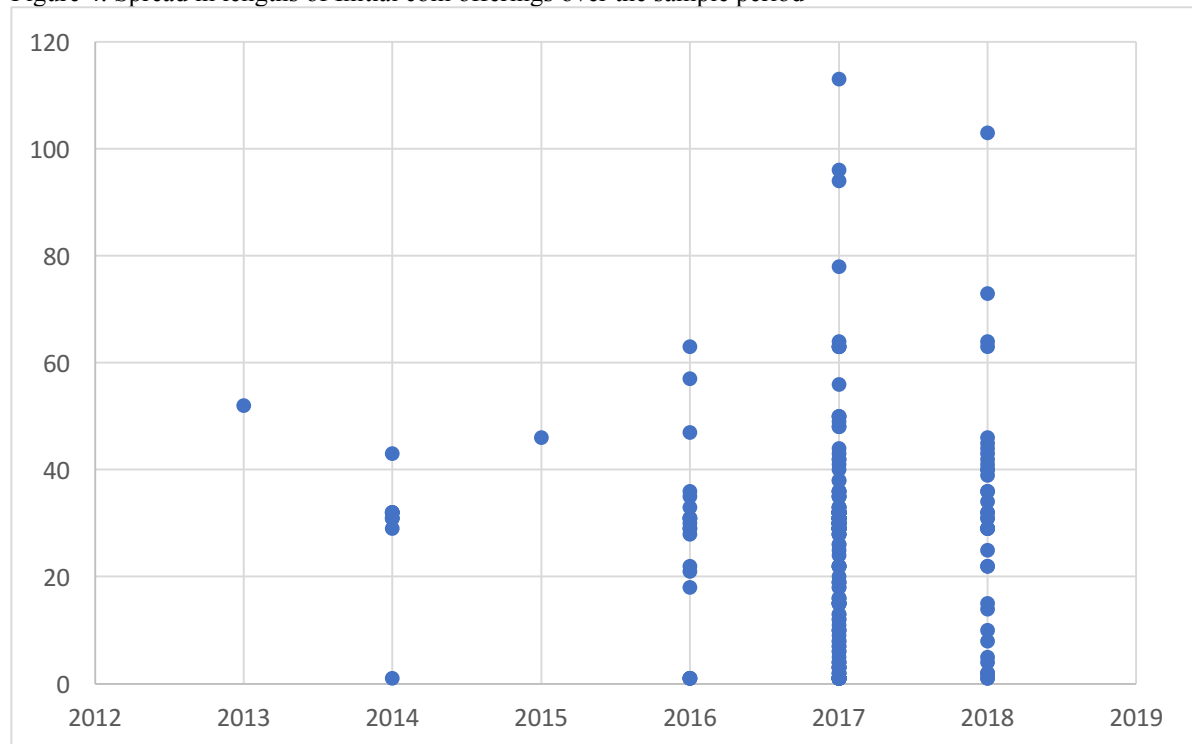
New token issuers raised on average 12,910,651 US dollars; the median is approximately half of the average amount (9,981,328 USD). Minimum amount raised was just 6,000 US dollars, 11 ICOs (4.3 %) from the sample obtained less than 100,000 US dollars in their initial offering. Highest amount raised was 153,000,000 US dollars. More than 10,000,000 US dollars raised 101 ICOs from the sample which accounts for approximately 40% of all sample ICOs. Only three new tokens (1.1 %) issues raised more than 100,000,000 US dollars. All of these large ICOs (obtained more than USD 100M) raised the money during the years 2017 to 2018. The year as an independent variable has a significant effect on the total money raised in US dollars on 1% level. This result is among expectations, as the ICOs are becoming more mainstream, more investors are considering and investing in them, and at the same time, even bigger more established companies are raising money via new token issues.

Figure 5. Amount raised via ICOs in US dollars

| Variable | Mean | Median | Min | Max | Std. dev. | Observations |
|---|---|---|---|---|---|---|
| Raised in USD | 12,910,651 | 6,981,328 | 6,000 | 153,000,000 | 18,118,567 | 245 |

The funding target is sometimes difficult to calculate or estimate, mainly because the ICO price is usually defined in cryptocurrency. According to considerable volatility in cryptocurrencies prices, the exchange rate in US dollars can change a lot in a practically short period. The target, if specified, is mostly defined in US dollars ca 20% (51 cases) and ETH 14% (35 cases). Funding goal determined in bitcoin is only observable in only 3.5% of ICOs (9 cases). Rest of the defined targets 3.1% (8 cases) is mostly in some minor cryptocurrency, concretely DMT, DRT, LNC, NGC, OAX, SMT. Two funding goals were set in Swiss francs and euros.

Of all ICOs from the sample, 36% raised more or the same amount in total (any currency) that the issuers planned. Rest 64% raised less, or the funding target was not defined. New token issuers raised more money than planned more often over the recent years; this corresponds to the investment boom in ICOs nowadays.

Figure 6. Number of issuing tokens that achieved the funding target. % of the total in parentheses

| Variable | Observations |
|---|---|
| Achieved the target or raised more | 87 (36%) |
| Raised less than planned or not defined | 158 (64%) |
| Total nb of observations | 245 (100%) |

Over the years (Figure 7) new token issuers are on average raising more money (USD) in total for their particular projects. ICOs are becoming an alternative to more traditional ways of funding (e.g. venture capital or crowdfunding), mostly for startups.

Figure 7. Evolution of total money raised in USD over the sample period for particular projects
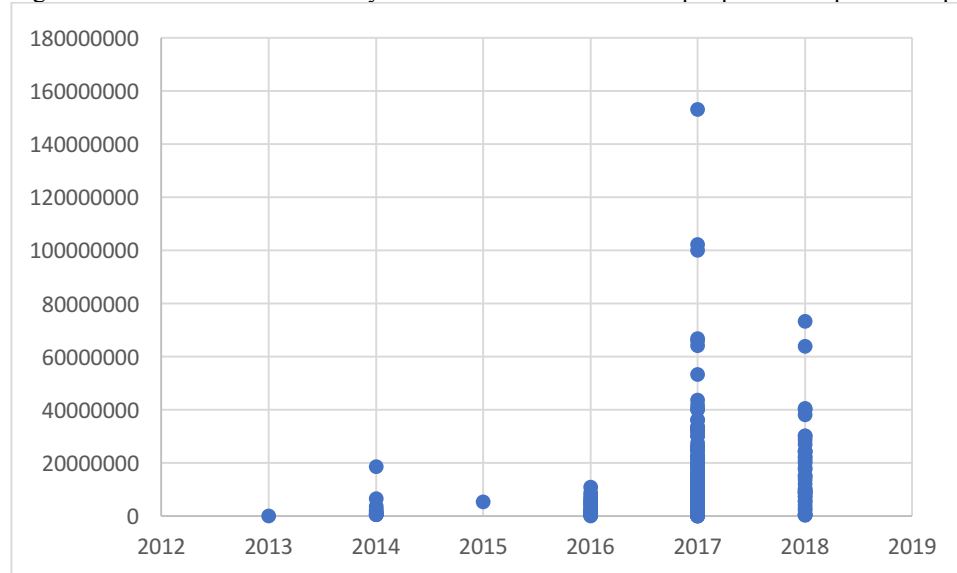


ICOs are generally not very transparent, which corresponds with a limited willingness of sharing information about particular ICO's jurisdiction, legal advisor (if any), legal form and security audit company (if any). From this concrete attributes, issuers are mostly sharing information about jurisdiction that is regulating the particular token sale; this holds true for 27% (66 cases) issuers from the sample. As a choice of jurisdiction, I often found countries such as Switzerland (19), Singapore (8), UK (6), Estonia (5), Cayman Island (4), USA (4), Gibraltar (4) and Hong Kong (3). Rest is spread between following countries: Australia, Austria, Canada, Germany, Israel, Jersey, Malta, Netherlands, Russia, Slovenian and South Africa. Issuers which are sharing information about token jurisdiction have slightly higher real chance of raising more money than initially planned. Even though, many of the highly successful tokens (defined by raising more money or subsequent returns for investors) absent the regulatory authority. Suggest that contributors (investors) are quite insensitive to the lack of protection from regulatory issues. ICOs issuers are mostly delegating information regarding eligibility to participate in particular ICO to the investors themselves (e.g. check if an investor from a particular country can invest into the ICO or not).

A known legal form of a particular ICO highly correlates with the ICO jurisdiction. Of ICOs which share information about jurisdiction, 78% established themselves as a recognised legal

form. From a sample, 24% (59 cases) of ICOs are established under a recognised legal form. Mostly is the legal form settled as LLC 34% (20 cases), Corporation 27% (16 cases) and Foundation 19% (11 cases). Rest is divided between forms of AG, BV, GmbH, LP, Non-profit, PTE and Sagl.

Some of the ICO issuers share information about their legal advisor, concretely 13% (32 cases) from a sample. Of which in 4 cases the legal advisor belongs to the Big 4 consultancies. Audit services requested just 8% (19 cases) of the sample ICOs.

Figure 8. Legal form, Jurisdiction, advisors and audit. % of the total in parentheses

| Variable | ICO Jurisdiction | ICO legal advisors | ICO legal form | ICO security audit company |
|---|---|---|---|---|
| Yes | 66 (27%) | 32 (13%) | 59 (24%) | 19 (8%) |
| No | 179 (73%) | 213 (87%) | 186 (76%) | 226 (92%) |

Similarly to initial public offerings, ICOs sometimes segment tokens into different offerings which target a specific audience (participants): project managers, community users, bounties (rewards for early contribution to particular ICO, the aim is to lure early adopters to invest and subsequently promote the initial offering).

Issuers split the ICO tokens into tokens per investors and token reserve split. Token reserve split in most cases divides into four parts: team, company, bonus and other. On average new token issuers offer 60% of particular tokens to investor and rest belong to the reserve. Of the sample ICOs, 6.3% (16 cases) of the total offer 100% of all new tokens to investors. On the other side are 2.8% (7 cases) of issuers which offer less than 10% of new tokens for investors to buy.

Figure 9. Token for investors

| Variable | Mean | Median | Min | Max | Std. dev. | Observations |
|---|---|---|---|---|---|---|
| % of tokens for investors | 59.73 | 60 | 1.92 | 100 | 24.62 | 245 |

On average, most of the token reserve split is consequently put into issuing company fund, 18% of all new tokens. Company fund is set up by 69% of issuers (169 cases). The second most significant portion split the issuers into the team, 11% of the total, from the sample 71% (175 cases) of issuers give a portion of new tokens to the team (in most cases developers, founders and advisors). Issuers put on average 7% of all new tokens into a part called bounties (33% of all new tokens), these are the new tokens which company give to early contributors

(investors) to reward them for their investments. The amount of these bonuses usually depends on a time frame (if a participant is investing early, then gets more tokens as a bonus) or capacity of the particular ICO (after reaching some point concerning raised money, the bonus is proportionally lower). Rest of the tokens, on average 2% of all new tokens is a part of a group named other, this is in most cases some foundation (e. g. mining purposes) or merely a part of tokens with unsure purpose.

Figure 10. Token reserve split. % of the total in parentheses

| Variable | Team | Company | Bonus | Other |
|---|---|---|---|---|
| Yes | 175 (71%) | 169 (69%) | 81 (33%) | 90 (37%) |
| No | 70 (29%) | 76 (31%) | 164 (67%) | 155 (63%) |
| Average in % | 11.75 | 18.35 | 7.58 | 2.59 |
| Median in % | 10 | 10 | 0 | 0 |
| St. Deviation in % | 11.83 | 23.99 | 14.69 | 5.98 |
| Nb of observation | 245 | 245 | 245 | 245 |

The most favoured blockchain based platform which is chosen by the issuers as an underlying technology for the projects is the Ethereum (79% of the sample, 194 cases). The reason why Ethereum is highly prefered over more tradition bitcoin (used as underlying technology in only 3%, 8 cases) is the fact that Ethereum was from the very beginning developed with the purpose to hold itself the complex Turing complete smart contracts. The second most prefered underlying technology is the issuer's new blockchain platform (8%, 21 cases), followed by a platform called Waves (6%, 15 cases). In other cases are adopted minor technologies, namely NXT, BTS and XEM, holding together 2% (7 cases) of the sample. The popularity of bitcoin platform is significantly decreasing over the years. Nowadays the issuers develop somewhat new blockchain technologies or using relatively new Waves.

Figure 11. Type of blockchain as an underlying platform. % of the total in parentheses

| Variable | ETH | New blockchain | Waves | BTC | NXT | BTS | XEM | Observations |
|---|---|---|---|---|---|---|---|---|
| Nb of ICOs in each group | 194 (79.2%) | 21 (8.6%) | 15 (6.1%) | 8 (3.3%) | 4 (1.6%) | 2 (0.8%) | 1 (0.4%) | 245 |

Currencies in which initial investors participate in the ICOs can be divided into two groups: fiat currencies and cryptocurrencies. Of the total sample, 57% of ICOs received initial investments in one of the two main fiat currencies, concretely US dollar (56%, 127 cases) which leads as an overall "start price" currency and euro with 1% (2 cases). Cryptocurrencies are responsible for the rest of 44% (106 cases). ETH is the leading cryptocurrency and at the

same time the one with a second highest share of the sample with 38% (92 cases), followed by BTC with 6% (14 cases). The dominance of preference for raising money in fiat currencies can be the stability and low volatility in comparison to cryptocurrencies. Especially for ICOs with a longer initial period, this could significantly influence the absolute value of raised „equity".

Figure 12. ICOs start price. % of the total in parentheses

| Variable | USD | ETH | BTC | EUR |
|---|---|---|---|---|
| Startprice currency | 137 (56%) | 92 (38%) | 14 (6%) | 2 (1%) |

White papers, in most cases, share information about the total token supply. The average total token supply for a sample is ca. 2,1 billion tokens. Just 2% (5 cases) of new tokens have a maximum supply lower than one million coins. Token DTR With 375 billion supply of tokens is a token with the highest total supply, followed by project FUN, which is ca. 20 times smaller. Approximately 19% (47 cases) of the projects from a sample have a total token supply higher than 1 billion of coins.

Figure 13. Total token supply

| Variable | Mean | Median | Min | Max | Std. dev. | Observations |
|---|---|---|---|---|---|---|
| Token supply | 2,137,032,632 | 100,000,000 | 102,620 | 375,000,000,000 | 23,985,895,194 | 245 |

After the ICO period, issuers could increase, decrease or remain unchanged the supply of the particular tokens. Companies share this information in their white papers in 86% (210 cases) of the sample ICOs. For the rest 14% this information is not obtainable, or the issuer has not decided, in issuing period, about the future of the total supply of particular token in a future. Majority of sample ICOs (65%, 159 cases) plan to remain unchanged the supply of total tokens, followed by 16% (39 cases) ICOs which decide to increase the supply and 5% (12 cases) of new tokens issuers which decrease the supply of tokens in the future.

Figure 14. Change in the supply of tokens after ICO. % of the total in parentheses

| Variable | | Remains unchanged | Increases | Decreases | N/A | Observations |
|---|---|---|---|---|---|---|
| Change in supply of tokens after ICO | | 159 (65%) | 39 (16%) | 12 (5%) | 35 (14%) | 245 |

Fully pre-mined tokens are the tokens that are all mined before the actual token trading. The community accepts the concept of pre-mining quite well. However, some people think of pre-mining as something that is not acceptable at all. Many cryptocurrencies, including even the major one (Ethereum, Cosmos) have some part of all token supply pre-mined before the release. A problem could arise when more than 50% of all tokens is pre-mined before the official launch or if one authority holds a significant amount of pre-mined tokens. The decentralisation of the system is thus destroyed. Of the sample, 11% (26 cases) of the ICOs are fully pre-mined, the rest 89% (219) is not fully pre-mined, more detailed information is unfortunately not obtainable.

Figure 15. Pre-mined tokens. % of the total in parentheses

| Variable | Not fully premined | Fully premined | Observations |
|---|---|---|---|
| Nb of tokens | 219 (89%) | 26 (11%) | 245 |

From the collected sample of 245, it was manageable to obtain white papers for just approximately 130 ICOs. Reason for this relatively small portion of the sample is that after the initial period of ICO, the issuers usually delete the information regarding the concrete ICO from their website and corresponding to that they also exclude the white paper. For the sample with white papers, the average file size of the whitepaper is ca. 3 MB with on average ca. 31 pages.

Figure 16. White papers statistics

| Variable | White paper size | White paper nb of pages |
|---|---|---|
| Average | 3,423,623 | 31 |
| Median | 1,533,645 | 27 |
| St. Deviation | 4,645,739 | 21 |
| Nb of observations | 127 | 130 |

From the sample collection, white paper contains information about a type of an algorithm in just 11% (27 cases) of the sample ICOs. Rest (89%, 218 cases) do not share this information at all, or it is not easy to obtain the type of an algorithm from other sources, for example, some developers website (e.g. Github).

Figure 17. Type of an algorithm in a white paper. % of the total in parentheses

| Variable | Not sharing type of an algorithm in a white paper | Sharing type of an algorithm in a white paper | Nb of observations |
|---|---|---|---|
| Nb of ICOs | 218 (89%) | 27 (11%) | 245 |

Willingness to share a proof type in a white paper is significantly correlated with sharing a type of an algorithm. The correlation coefficient is 0.74. At the same time, issuers share a proof type in more cases than the type of an algorithm. Of the sample, 17% (42) of issuers share the proof type in a white paper. Rest does not share information about the proof type at all or information is not readily obtainable from the particular white paper.

Figure 18. Share of a proof type in a white paper. % of the total in parentheses

| Variable | Not sharing of a proof type in a white paper | Sharing of proof type in a white paper | Observations |
|---|---|---|---|
| Nb of ICOs | 203 (83%) | 42 (17%) | 245 |

## 5 Empirical results and analysis

### 5.1 Initial underpricing

Calculation of initial underpricing is based on percentage change in the average price of the particular token during the ICO period and close price of the first day of trading. I choose the average price during ICO as a base price, because the price during the ICO period could change a lot in value and at the same time, some issuers do not share the start and end price. However, there is on average no significant difference between the ICO start and end price.

Initial underpricing of ICOs is on average 4416%, and the median is 21%. Calculations with a base value of ICO start price shows slightly higher initial underpricing, which corresponds with expectation, due to higher bonuses and higher risks corresponding with very early investments (average 4421% and median 24%). Initial underpricing based on ICOs end price is lower than both calculations mentioned above, with average 4421% and median 20%.

Figure 19. Initial underpricing of ICOs

| | Mean | Median | Max | Min | Std. dev. | Observations |
|---|---|---|---|---|---|---|
| ICO start price in USD per token | 7.51 | 0.16 | 1069.51 | 0.00 | 74.07 | 245 |
| ICO end price in USD per token | 6.74 | 0.18 | 825.02 | 0.00 | 60.32 | 245 |
| ICO average price in USD per token | 6.69 | 0.17 | 852.18 | 0.00 | 61.63 | 245 |
| Open price 1st day in USD per token | 85.70 | 0.25 | 13551.85 | 0.00 | 899.74 | 245 |
| Close price 1st day in USD per token | 3.87 | 0.23 | 392.85 | 0.00 | 27.07 | 245 |
| Initial underpricing based on ICO average | 4416% | 21% | 833233% | -99.997% | 535.26 | 245 |
| Initial underpricing based on ICO start price | 4421% | 24% | 833233% | -99.997% | 535.25 | 245 |
| Initial underpricing based on ICO end price | 4414% | 20% | 833233% | -99.997% | 535.26 | 245 |

Figure 20 shows the distribution of initial underpricing of ICO from the sample of 245 new tokens. The graph demonstrates that the sample dataset is not normally distributed. Relatively high percentage of the ICOs, approximately 12%, lost between 90%-100% of their value during the ICO period. The part with a second largest share (8%) is underpriced by 100%-200%. Three new tokens lead to initial underpricing of more than 20,000%, with a record value of 833,233%.

Figure 20. Distribution of initial underpricing (in %)
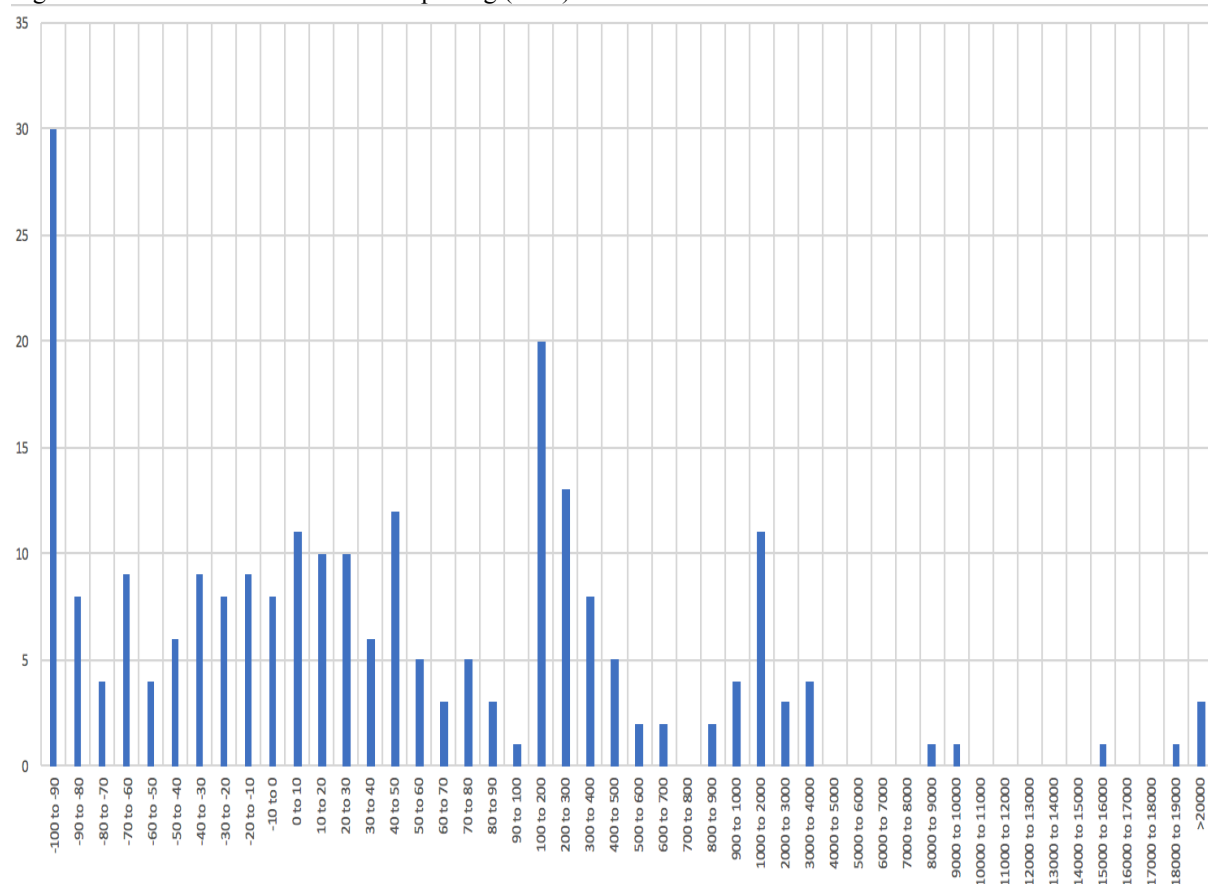


To determine whether the sample ICOs' initial underpricing (respectively overpricing) is statistically significant, I perform one sample t-test, with the null hypothesis, H0: underpricing (mean) = 0. On a 10% level of confidence, I reject this null hypothesis and accept (on 10% level of confidence) the alternative hypothesis Ha: underpricing (mean) > 0. ICOs are thus initially underpriced; this corresponds with the high volatility of the prices of particular ICOs, high information asymmetry and high risk.

Figure 21. Initial underpricing one sample t-test

| Variable | Observations | Mean | Std. Err. | Std. Dev. | 95% Conf. Interval | |
|---|---|---|---|---|---|---|
| Underavg | 245 | 4415 | 3426 | 53635 | -2333 | 11165 |

mean = mean(underavg)                   t = 1.2887
Ho: mean = 0                            degrees of freedom = 244

Ha: mean < 0      Ha: mean != 0      Ha: mean > 0
Pr(T < t) = 0.9006      Pr(|T| > |t|) = 0.1987      Pr(T > t) = 0.0994

## 5.2 Returns after the initial period

Table 22 shows that average returns are positive for all calculated time periods, concretely first, seven, thirty, sixty, ninety and one hundred and twenty days returns. Base value for calculations is first-day trading start price in relation to the end price of the particular day for that above mentioned time frames. However median values are neutral or negative for periods until 60-days return (included). From 90-days to 120-days the median values are positive. Part of a possible explanation might be that in periods close to the first-day underpricing just a few new tokens have a positive return and at the same time the return is very high. In more extended periods the returns of ICOs, included in the sample, are mostly positive, but this might distort the lower number of sample size (the riskiest ICOs do not „survive" for the more extended periods).

Figure 22. Average returns of ICOs in a diferent time periods

| | Mean | Median | Max | Min | Std. Dev. | Number of observations |
|---|---|---|---|---|---|---|
| 1-day return of new tokens | 2478% | 0 | 599900% | -99.9% | 38247 | 245 |
| 7-day return of new tokens | 103% | -11% | 11182% | -99.8% | 906 | 243 |
| 30-day return of new tokens | 114% | -12% | 9361% | -99% | 712 | 238 |
| 60-day return of new tokens | 410% | -8% | 45915% | -99.8% | 3276 | 226 |
| 90-day return of new tokens | 454% | 12% | 36292% | -99.8% | 2777 | 213 |
| 120-day return of new tokens | 749% | 22% | 73484% | -99.8% | 5526 | 183 |

## 5.3 Correlation of returns with main cryptocurrencies

Correlation matrixes (Figures 23 and 24) describes correlations between the ICO sample and two main cryptocurrencies, namely Bitcoin and Ethereum. If I include from the sample only new tokens based on BTC as an underlying technology (8 cases) and BTC change in prices during the particular ICOs periods, there is a significant positive correlation. In a short period, the correlation is low, because investors might consider more other factors than the evolution of the underlying cryptocurrency as a driver of a price. In more extended periods the correlation is about 0.5, which is quite high since BTC was not primarily built as a technology for establishing new tokens and using BTC technology as an underlying platform.

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Figure 23. Correlation matrix of BTC cryptocurrency to BTC based new tokens (*). Nb of observations in parentheses

|  | 7-days return* | 30-days return* | 60-days return* | 90-days return* | 120-days return* |
|---|---|---|---|---|---|
| BTC 7-days return | 0.06 (8) |  |  |  |  |
| BTC 30-days return |  | 0.59 (8) |  |  |  |
| BTC 60-days return |  |  | 0.55 (8) |  |  |
| BTC 90-days return |  |  |  | 0.5 (8) |  |
| BTC 120-days return |  |  |  |  | 0.43 (8) |

On the other hand ETH primarily goal was to develop a platform for developing new cryptocurrencies. Correlation of ETH as a cryptocurrency and new ICOs based on Ethereum platform (170-106 cases, depends on period) is not significant, because investors might not put their money into new ICO because of a perspective of ETH, but instead, they believe in the future of the particular new token project.

Figure 24. Correlation matrix of ETH cryptocurrency to ETH based new tokens (*). Nb of observations in parentheses

|  | 7-days return* | 30-days return* | 60-days return* | 90-days return* | 120-days return* |
|---|---|---|---|---|---|
| ETH 7-days return | -0.009 (170) |  |  |  |  |
| ETH 30-days return |  | 0.02 (163) |  |  |  |
| ETH 60-days return |  |  | -0.09 (149) |  |  |
| ETH 90-days return |  |  |  | 0.06 (132) |  |
| ETH 120-days return |  |  |  |  | 0.01 (106) |

Correlation of portfolio which consists of BTC and ETH (same weight) to the data sample (164-236 cases, depending on a time frame) is not significant probably for the same reasons as the explanation mentioned above of the ETH projects.

Figure 25. Correlation matrix of a portfolio of BTC and ETH cryptocurrency to new tokens (*). Nb of observations in parentheses

|  | 7-days return* | 30-days return* | 60-days return* | 90-days return* | 120-days return* |
|---|---|---|---|---|---|
| BTC/ETH avg 7-days return | 0.02 (236) |  |  |  |  |
| BTC/ETH avg 30-days return |  | 0.01 (229) |  |  |  |
| BTC/ETH avg 60-days return |  |  | -0.1 (210) |  |  |
| BTC/ETH avg 90-days return |  |  |  | 0.01 (192) |  |
| BTC/ETH avg 120-days return |  |  |  |  | 0.09 (164) |

## 5.4 Initial underpricing regression model

I estimate a regression model, where the dependent variable is initial underpricing, I quote the initial return (IRi) in the relation of first-day trading end price (PEi) to the average issuing price

of a token (IAi) and multiply by 100 to obtain a proportional return. Pertaining to Hypothesis 1 (H1), I introduce two dummy variables, Algo_share and ProofType_WP. Algo_share take the value of 1 if the sample ICO share information about a type of algorithm used for the specific project in a white paper. ProofType_WP is taking the value of 1 if the white paper contains information about the proof type of concrete ICO. Referring to Hypothesis 2 (H2), six variables have been created of which five are dummy variables: Fuly_premined (taking value of 1 if the token is fully pre-mined), Supply_incr (taking value of 1 if the supply of the token increases in the future), Team_scheme (taking value 1 if the issuing team is keeping a part of newly issued tokens), Supply_unchanged (taking value of 1 if the supply of the token remains unchanged in the future), Bonus_scheme (taking value 1 if there is any bonus incentive in terms of free tokens to the investors) and one dependent variable Tok_per_inv (taking value from 0 to 100, depends how many % of newly issued tokens are offered to investors). Among the control variables, Year takes value from 2013 to 2018, to capture if there is any market momentum.

### 5.4.1 Monovariate statistics

Table 26 presents the monovariate statistics for the main variables of my initial underpricing analysis.

Figure 26. Regression variables monovariate statistics

| Variable | Observations | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Fully_premined | 245 | 0.1061224 | 0.3086248 | 0 | 1 |
| Algo_share | 245 | 0.1102041 | 0.313785 | 0 | 1 |
| Supply_incr | 245 | 0.1591837 | 0.3665962 | 0 | 1 |
| Team_scheme | 245 | 0.7142857 | 0.4526787 | 0 | 1 |
| Supply_unchanged | 245 | 0.6489796 | 0.4782664 | 0 | 1 |
| Bonus_scheme | 245 | 0.3673469 | 0.483069 | 0 | 1 |
| Tok_per_inv | 245 | 59.72984 | 24.621 | 1.92 | 100 |
| ProofType_WP | 245 | 0.1714286 | 0.3776545 | 0 | 1 |
| Year | 245 | 2016.931 | 0.8293302 | 2013 | 2018 |

### 5.4.2 Correlation matrix of variables

Table 27 presents the correlation matrix for the variables of the analysis. Relatively high correlation is observable between proof type in WP and type of algorithm in WP, this is among the expectations due to its fundamental similarity. Additionally, it suggests that if the issuing company is transparent, it mostly share information regarding both of these variables. A

negative correlation of -0.59 between changes in supply is also part of the expectations due to a fact that there are only three possible states of what is planned to happen to the supply in a future, namely the supply remains the same, increases or decreases over the time. In other cases, I find no relevant issue of multicollinearity among the presented covariates.

Figure 27. Correlation matrix

|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Fully_premined (1) | 1.00 | | | | | | | | |
| Algo_share (2) | 0.13 | 1.00 | | | | | | | |
| Supply_incr (3) | 0.10 | 0.49 | 1.00 | | | | | | |
| Team_scheme (4) | -0.02 | 0.08 | -0.07 | 1.00 | | | | | |
| Supply_unchanged (5) | 0.03 | -0.31 | -0.59 | -0.09 | 1.00 | | | | |
| Bonus_scheme (6) | -0.07 | 0.03 | -0.12 | 0.29 | 0.12 | 1.00 | | | |
| Tok_per_inv (7) | 0.09 | 0.05 | 0.01 | -0.04 | -0.08 | 0.09 | 1.00 | | |
| ProofType_WP (8) | 0.09 | 0.74 | 0.48 | 0.05 | -0.35 | -0.05 | 0.08 | 1.00 | |
| Year (9) | -0.37 | -0.35 | -0.34 | 0.13 | 0.11 | 0.14 | -0.11 | -0.35 | 1.00 |

### 5.4.3   Regression model based on initial underpricing

Table 28 represents the results of the estimations of the three regression models. All of them rely on 245 observations.

In model 1, I find that the coefficient Algo_share is positive and highly significant (p value < 1%), which confirms the Hypothesis H1A. At the same time, I find a very significant effect (p value < 1%) for the Fully_premined (positive) and Supply_incr (negative) variables, which goes to corroborate H2A. The coefficient of Team_scheme is negative and significant at 95%, partly confirming Hypothesis H2C.

In model two, three new variables are introduced, namely Supply_unchanged, Bonus_scheme and Tok_per_inv. The coefficient of Supply_unchanged is significant at 95% and positive, which in addition to variable Supply_incr, confirms Hypothesis H2A. The coefficient of Bonus_scheme is not statistically different from zero, although it is negative, I can not confirm Hypothesis H2B. The variable Tok_per_inv is significant at 90% confidence level and positive, it confirms Hypothesis H2C with a smaller effect that the variable Team_scheme.

In model 3 variable ProofType_WP and control variable Year are introduced. I experience an increase in the pseudo R2, which is expected due to lower initial underpricing in a recent period over the first years of the sample period. Variable ProofType_WP is positive and significant at 95%, confirming Hypothesis H1B.

Figure 28. Regression results. Standard errors in parentheses. *, **, *** = significantly different from zero at the 90%, 95%, 99% levels

| Variable | (1) | (2) | (3) |
|---|---|---|---|
| Fully_premined | 32647*** | | 18517* |
| | (10673) | | (11190) |
| Algo_share | 48218*** | 42333*** | |
| | (12065) | (11198) | |
| Supply_incr | -28571*** | | -31039*** |
| | (10281) | | (10198) |
| Team_scheme | -14639** | | |
| | (7284) | | |
| Supply_unchanged | | 17194** | |
| | | (7420) | |
| Bonus_scheme | | -10764 | |
| | | (6987) | |
| Tok_per_inv | | 253* | |
| | | (136) | |
| ProofType_WP | | | 20980** |
| | | | (9961) |
| Year | | | -19039*** |
| | | | (4523) |
| Constant | 10642* | -22594** | 38400000*** |
| | (6432) | (10518) | (9124385) |
| N | 245 | 245 | 245 |
| R2 | 0.11 | 0.08 | 0.14 |

## 5.5 Long-term returns regression model

I estimated the second regression model, where the dependent variable is long-term return, which I set up as 120 days change in price of particular tokens. I quote the long-term return (LRi) in a relation of 120 day trading end price (PLi) to the first day trading start price (PSi) and multiply the result by 100 to obtain a proportional return. Referring to Hypothesis 3 (H3), I introduce 9 variables of which 4 are dummy variable. Concretely Raised_USD (taking value from 0 to 8, depending on amount of USD raised during the ICO period), Bonus_% (value from 0 to 100, which captures part of newly issued tokens kept for bonus schemes), Days (value 0 to 113, number of days of the whole ICO process), Team_% (value from 0 to 100, which captures part of newly issued tokens kept by the issuing team), Company_% (value from 0 to 100, which captures part of newly issued tokens kept by the issuing company). Dummy variables are namely Team&Comp_majority (value 1 if team together with company is keeping majority, more than 50%, of newly issued tokens), Other_scheme (value 1 if there is an uncertainty about part of the newly issued tokens), Start_Crypto (value 1 if the money raised in ICO is determined in cryptocurrency), Start_Fiat (value 1 if the money raised in ICO are determined in fiat currency). Pertaining to the Hypothesis 3, concretely to sub Hypothesis H3A

I include dummy variable Team&Comp_majority, which take the value of 1 if the Team together with the company is initially keep more than 50% of newly issued tokens. Referring to sub-hypothesis H3B I include dummy variable Other_scheme, taking value 1 if there are any uncertainties about the distribution of a part of a newly issued tokens. Relating to Hypothesis H3C, I include 2 new variables Team_% and Company_% (both taking value from 0 to 100, depending on how many percent of newly issued tokens are kept within the issuing team, respectively the issuing company).

## 5.5.1 Monovariate statistics

Table 29 presents the monovariate statistics for the main variables of my long-term returns analysis.

Figure 29. Regression variables monovariate statistics

| Variable | Observations | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Team&Comp_majority | 245 | 0.05 | 0.22 | 0 | 1 |
| Other_scheme | 245 | 0.69 | 0.46 | 0 | 1 |
| Raised_USD | 245 | 12900000 | 18100000 | 6000 | 200000000 |
| Bonus_% | 245 | 2.59 | 5.98 | 0 | 40 |
| Start_Crypto | 245 | 0.43 | 0.50 | 0 | 1 |
| Days | 245 | 27.24 | 18.61 | 1 | 113 |
| Team_% | 245 | 11.75 | 11.83 | 0 | 80 |
| Start_Fiat | 245 | 0.57 | 0.50 | 0 | 1 |
| Company_% | 245 | 7.58 | 14.69 | 0 | 95 |

## 5.5.2 Correlation matrix of variables

Table 30 represents a correlation matrix for the variables of the analysis of long-term returns. I find no relevant issue of multicollinearity among the covariates.

Figure 30. Correlation matrix

|  | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| Team&Comp_majority (1) | 1.00 | | | | | | | | |
| Other_scheme (2) | -0.04 | 1.00 | | | | | | | |
| Raised_USD (3) | -0.05 | 0.09 | 1.00 | | | | | | |
| Bonus_% (4) | -0.03 | -0.11 | -0.01 | 1.00 | | | | | |
| Start_Crypto (5) | -0.06 | 0.07 | -0.02 | 0.05 | 1.00 | | | | |
| Days (6) | 0.03 | -0.12 | -0.30 | 0.00 | 0.02 | 1.00 | | | |
| Team_% (7) | 0.19 | -0.07 | 0.05 | -0.02 | -0.02 | 0.01 | 1.00 | | |
| Start_Fiat (8) | 0.06 | -0.07 | 0.02 | -0.05 | -1.00 | -0.02 | 0.02 | 1.00 | |
| Company_% (9) | 0.60 | -0.13 | 0.06 | 0.10 | 0.00 | -0.07 | -0.09 | 0.00 | 1.00 |

### 5.5.3   Results of the long-term return regression model

Results of the estimations of the two regression models are expressed in table 31. Both of the models rely on 184 observations.

In model 1, five variables are introduced. Namely Team&Comp_majority, Other_scheme, Raised_USD, Bonus_% and Start_Crypto. The coefficient of Team&Comp_majority is positive and significant on 95% confidence level, confirms Hypothesis H3A. The variable Other_scheme is significant at 90% confidence level and negative, confirms Hypothesis H3B. Control variable Raised_USD is 0 and significant on 90% confidence level. In addition, variable Start_Crypto is significant at 90% which suggest some kind of momentum of ICOs raising sources in cryptocurrencies.

In model 2, four new variables are introduced. Team_% is slightly positive and significant at 90% confidence level and together with variable Company_% significant at 95% and also positive confirms Hypothesis H3C. Variable Start_FIAT is not significant, but the negative coefficient is in line with the variable Start_Crypto from model 1.

Figure 31. Regression results. Standard errors in parentheses. *, **, *** = significantly different from zero at the 90%, 95%, 99% levels

| Variable | (1) | (2) |
|---|---|---|
| Team&Comp_majority | 6233*** | |
| | (1580) | |
| Other_scheme | -1414* | |
| | (846) | |
| Raised_USD | .00004* | |
| | (.00002) | |
| Bonus_% | -65 | |
| | (72) | |
| Start_Crypto | 1554* | |
| | (798) | |
| Days | | -26 |
| | | (20) |
| Team_% | | 59* |
| | | (32) |
| Start_Fiat | | -1150 |
| | | (817) |
| Company_% | | 59** |
| | | (26) |
| Constant | 347 | 1068 |
| | (817) | (927) |
| N | 183 | 183 |
| R2 | 0.12 | 0.06 |

# 6    Conclusion

Based on analyses of a sample of 245 ICOs which appeared from 2013 until April 2018, I found that the initial returns of this data set are not normally distributed. At the same time, the initial underpricing is significant (average +4416% and median value +21%). Calculation of returns based on periods after the initial offering shows that the average return drops significantly but remains highly positive, even in 120 days period after the initial offer of new tokens, which is the most prolonged period included in this analysis. These observations suggest that the information asymmetry between the issuers and investors is potentially high. I find no significant correlation between the ICOs and portfolio of two main cryptocurrencies, namely Bitcoin and Ethereum. Which suggest that investors are primarily investing in new tokens because of the projects themselves not because of the potential return sentiment of the main cryptocurrencies.

My regression analysis of initial underpricing reveals that quality, number and availability of data about particular ICO have an impact on initial underpricing. Concretely sharing information about a proof type of particular coin and note about the type of algorithm positively and significantly influence the initial underpricing. Besides that, initial underpricing is influenced by the initial and future distribution of the tokens of a concrete project. Investors value stability and predictability of new tokens and thus fully pre-mined tokens show higher and positive underpricing which is in line with a positive coefficient of a constant (unchanged) supply of particular tokens in the future. Investors explain an increasing number of tokens as a dilution of current tokens and the impact on initial underpricing is significant and negative. If the issuing team is keeping at least some part of the newly issued tokens, the impact on initial underpricing is significant and positive. However, this holds true to some part because more percentage of the newly issued tokens for public investors is positive and significant. On the other hand, if issuance is supported by a bonus scheme which primary task is to lure more investors, the impact on the initial underpricing is negative but not significant. The negative and significant coefficient of a variable year suggest that tokens are becoming over the years less underpriced, this could be because of more experience of investors in a valuation of new tokens or because of a more saturated market.

For an extended period, I define 120 days return based on the first-day trading price. I test a hypothesis that initial and future distribution and composition of new tokens influence returns

in an extended period of a concrete project. Results suggest that investors value predictability of the supply; if the issuing company is not concrete what is the plan with a part of the newly issued tokens, investors explain it as a potential warn sign and the return is negative and significant. Keeping a majority of newly issued tokens within the company and a team decreases the risk of a potential hostile takeover of more than 50% by one investor, which destroys the decentralisation of the system. Investors positively and significantly value elimination of this risk. In addition, more percentage kept by the company and the issuing team has a positive impact on the long-term returns. Amount raised in US dollars is slightly positive and significant. Which suggest that sizable initial offerings are less risky for investors. Corresponding to that there is a negative impact of a longer initial offering period (concerning days of particular ICO) on the extended returns. However, I do not find this coefficient significant. Raising money in any cryptocurrency positively affect the returns in extended periods.

The cryptocurrency market is highly volatile especially because of a shortage of appropriate due diligence process in investing in new tokens issues. Investors have to learn and find a proper way how to evaluate this new innovative method of raising capital. Due to a lack of that investors could face a significant market drop soon. Research regarding ICOs is still in the early stage. Especially questions related to the potential regulation of the ICOs market should be answered. Corresponding to that implementation of protection of investors against widespread frauds on this market is a relevant topic. Additional research question could answer: What are the real advantages and disadvantages for the issuing company if the firm decides to raise money through ICO (in comparison to other alternatives). Why is the initial underpricing so much higher than is typical for IPOs? Do ICOs increase effectiveness of raising capital over its alternatives? What is the impact of banning new ICOs by governments? Do the issuers move to the countries where the regulation is weaker or do the firms raise money via different methods, more traditional ones?

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