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TITLE: What can explain the performance of Initial Coin Offerings?

AUTHOR(S)		SUPERVISOR:
		Peter Molnár
Candidate number:	Name:	
5081	Georgy Yuryev	
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What can explain the performance of Initial Coin Offerings?

Georgy Yuryev[1], Peter Molnár[1,2]

Abstract

I study features the most successful initial coin offerings (ICOs) have in common and analyze factors which can predict post-ICO token performance. I find that 79% of startups did have a working prototype, minimum viable product or open-source code available before the start of ICO campaign; 84% of ICOs had an active Reddit discussion channel at the moment of token sale and showed on average 93% increase in subscribers over the two weeks before ICO end date; 80% of startups did have core team members who worked together on the project more than one year before ICO event, with the average team age of 2.3 years; 81% of core teams did have previous work experience in startups or venture capital industry and 76% work fulltime on the startup project; 91% of startups did have a fixed number of tokens issued during ICO, i.e. hard cap token sale structure. I further document significant ICO underpricing of 200% average token return at the end of the first trading day with median value of 78%. Moreover, I provide evidence that 3-month subsequent token returns can be strongly predicted by ICO underpricing (first day token returns) along with fixed token issuance (hard cap) during the ICO.

Key words: Initial Coin Offering, Blockchain, Bitcoin, cryptocurrency, token

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[1] UiS Business School, University of Stavanger, Stavanger, Norway
[2] Faculty of Finance and Accounting, University of Economics, Prague, Czech Republic

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1. Introduction

Initial coin offerings (ICOs) as an innovative fundraising mechanism have become increasingly important topic of discussion in recent years. In 2017 startups raised $5.6B through ICO and surpassed early stage venture capital funding. Lack of perspective and explanation among investors has led to a highly speculative behavior of this market (FabricVentures & TokenData, 2018, p. 3). To fill the gaps in understanding the ICO phenomenon, this paper investigates which factors play the key role in the success of ICO and how various factors are related to the subsequent returns of a coin.

ICO can be defined as crowdfunding for blockchain-based projects. ICO is conducted by a company that has created a Blockchain related technology product or innovation and will distribute discounted tradable tokens in return for the investment prior to public exchange release of those tokens. The main difference between a coin and token is in their purpose. While a coin is considered as the mean of payment, token has a wider functionality (SingularDTV, 2017). The token itself has a value that depends on the adoption of its product or technology and the performance of the company.

Among the largest offerings in 2017, Filecoin raised $257M for developing a distributed data storage network; Tezos raised $231M to deploy a secure smart contract system; Sirin Labs raised about $158M to develop a first open source blockchain smartphone and all-in-one PC; The Bancor Protocol $153M for developing a standard that allows anyone to create liquid smart tokens; Status Network $108M for creating a browser, messenger and gateway to run on decentralized Ethereum technology. (Blockchainmob, 2017)

The year of 2017 was a turning point in the transformation of cryptocurrency market which was mainly dominated by Bitcoin before. While constituting around 85% of all cryptocurrency market capitalization since 2013, the share of Bitcoin in this market is constantly decreasing since the second quarter 2017 and is currently less than 50%, as of May 2018 (Coinmarketcap [a], 2018). This happens due to the increase in capital raised in initial coin offerings and the development of new tokens.

In recent years several studies have been made on cryptocurrency market and Bitcoin in particular. Bjordal & Opdahl (2017) found the evidence that including a portion of cryptocurrency in a

portfolio with traditional assets improves risk-adjusted return due to low historical correlation. Low correlation of Bitcoin with conventional assets is also documented by Bouri, Molnar, Azzi, Roubaud & Hagfors (2017) and Bouri, Jalkh, Molnar & Roubaud (2017). Wong, Saerbeck & Silva (2018) showed that Bitcoin and Litecoin can be useful as a hedge due to negative or zero correlations with other asset classes while Ripple shows traits of a diversifying investment. Using GARCH model, Cermak (2017) indicates that volatility of Bitcoin has been steadily decreasing since 2008 and will reach the volatility levels of fiat currencies in 2019-2020. Thies & Molnar (2018) document that distribution of Bitcoin returns and volatility keeps changing frequently. Hayes (2015) suggested three main drivers of cryptocurrency value, which are the difficulty in 'mining' for coins, the rate of unit production and the cryptologic algorithm employed.

While with help of digital token sales a number of innovative startups have successfully raised targeted funds, many of ICOs failed. While 435 startups out of 913 completed their token sales in 2017 and reported funding figures, the rest 478 projects either stated that they failed to reach soft capitalization (minimum amount of funding) or did not report the end result of token sale (FabricVentures & TokenData, 2018, p. 4). This implies that more than half of the token sales failed their ICO. Due to the lack of information about failed ICOs, this paper studies the most successful offerings in 2017 and addresses following questions. Firstly, which factors are the most significant when evaluating an ICO? Secondly, what do the most successful ICOs have in common? Thirdly, which quantitative variables can reliably predict the subsequent token returns?

In the first part, I study what the most successful ICOs have in common within the four valuation categories – product, community, team and token metrics. I find that 79% of startups did have a working prototype, minimum viable product (MVP) or open source code available prior the start of ICO campaign, in line with results of Adhami, Giudici & Martinazzi (2018). I further find that 84% did have an active discussion channel on Reddit forum during the ICO period and showed on average 93% increase in subscribers over the two weeks before ICO end date. I find that around 81% of startups did have team members who worked together on the project more than one year before the ICO date, with average team age of 2.3 years. I observe that 91% of startups did have a fixed number of tokens issued during an ICO, i.e. hard cap token sale structure.

The second part of the thesis examines the determinants of post-ICO performance in 3-month time interval. I find that token return at the end of the first trading day strongly predicts the 3-month

subsequent return of the token. The observed ICO underpricing, i.e. first-day token return, is on average 200%, with median 78%. In addition, I confirm that initial coin offering with fixed structure of token issue (i.e. hard cap) are positively related to the 3-month subsequent return of the token.

The rest of the paper is organized as follows: Section 2 introduces Blockchain technology. Section 3 discusses the ICO phenomenon; Section 4 describes the data; Section 5 presents the analysis; Section 6 concludes.

2. Blockchain

Blockchain is a technology which decentralizes transactions and contract information by removing the need for the intermediary so that no single person or entity has control over the information in blockchain (Iansiti & Lakhani, 2017). This technology allows the information of a transaction to be stored on any computer that has a copy of the relevant Blockchain ledger. The transaction must be verified by multiple anonymous users globally who solve an encrypted algorithm. Trust is set not by the centralized institutions but by protocols, cryptography and computer code (Pilkington, 2015).

The information about transactions is permanently stored on the Blockchain and it is impossible to change it once it is linked to the Blockchain. Technically speaking, Blockchain is a set of protocols and encryption technologies for securely storing data in a distributed network (Evans, 2014).
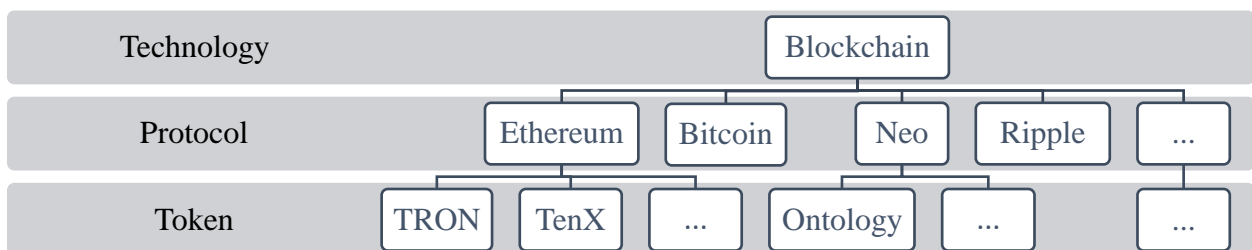

Figure 1. Relationship between Blockchain as the underlying technology, protocols and tokens.

In the world of digital tokens, protocols are based on Blockchain technology. One can view Blockchain as just an idea of decentralized way of transferring data, while in addition to this idea developers build the rules that the nodes will communicate by. In other words, every token is built

with a set of Blockchain rules (protocols). Protocol is defined as a set of communication rules and instructions that each node follows (Techterms, 2018).

One of the most famous non-Blockchain protocols which is used today is HTTP, or Hypertext Transfer Protocol, which is an application layer protocol that allows web-based applications to communicate and exchange data. The basic architecture of the Internet today is that the client is a device that makes the request while the server is the one who responds to it. For instance, when the user logs into Facebook, her browser is a client and it connects to the central Facebook server so that all communication process goes through the server owned by Facebook. However, with a decentralized social network, all the data (messages, photos, videos, payments etc.) will be exchanged directly between the users meaning that in the future there will be the need for completely different protocols. Instead of using HTTP and UDP (User Datagram Protocol) developers could reengineer the way communication happens on the internet, because it will be no longer a matter of contacting a server, but more of getting on the Blockchain. For example, Steemit online community introduced their decentralized social network with several benefits comparing to traditional social platforms. The company states that "*while most social media sites extract value for the benefit of their shareholders, Steemit believes that the users of the platform should receive the benefits and rewards for their attention and the contributions they make to the platform*" (Sandre, 2018). Users of Steemit earn digital money posting their own content which can be transferred to fiat currency and get instant access to the audience for what they write about. In addition, as the platform is built on Blockchain technology using Smart Token Media protocol (developed by Steemit), it is impossible for the third party to moderate or delete posts from the database, making the user the only owner of her data.

Protocol defines the coin which is the main digital asset of a network. The most popular protocol for generating tokens today is Ethereum platform. In January 2018 market share of Ethereum-based tokens constituted 91% of total token market capitalization (Trustnodes, 2018). Ethereum is an open-source blockchain-based distributed platform featuring smart contract functionality which was introduced by Vitalik Buterin in 2013. While Bitcoin is considered as a digital currency, the fundamental idea of Ethereum is to serve as a platform for building decentralized applications for various industries (Rosic [a], 2016). The programming language used in Ethereum is called Solidity, which is a high-level language with syntax similar to JavaScript. The code written using

Ethereum protocol will be executed in a decentralized manner on the Blockchain (Ethereumbuilders, 2015). With Ethereum a person or company can specify conditions under which another person or company will be paid with Ether (the underlying token) without external interference once the conditions are met. This is called smart contracts, which are defined as self-executing contracts with the terms of agreement between buyer and seller being directly written into lines of code (Rosic [b], 2016).

There are many industries which can be disrupted by introduction of smart contracts into business models. For instance, smart contracts can be applied in trade finance and accounting. Today it takes a lot of coordination and paperwork to manage the process of Letter of Credit issuance. Companies have to handle a lot of physical documents which can lead to the shipment delays. Both buyers and sellers will benefit from using smart contracts since this technology can mitigate risks and improve process efficiency (Dikusar, 2017). One of the several startups that develops a decentralized platform for accounting is Fizcal, which implemented a triple entry accounting approach. It states that "*instead of the old method of keeping separate records in localized ledgers, companies can write their transactions directly into a joint distributed register, creating an interlocking system of enduring accounting records*" (Fizcal, 2017).

Another example is the application of smart contracts in supply chain and logistics. Smart contracts allow businesses track product movement from the production plant to the store shelves. Internet of Things devices can transmit location data straight to a smart contract, which simplifies the tracking process. Such feature provides real-time visibility of an entire supply chain and improves the management process. Advanced tracking reduces risk of fraud and theft. In addition, customers could reliably find the origin of a product and its ingredients by checking the supply chain history using an app or a platform. Eximchain, a startup that successfully raised $20M during the ICO in March 2018 (Coindesk, 2018), has been developing a network where buyers and suppliers can automate contracting processes for small and medium-sized enterprises.

3. Initial Coin Offerings

Initial coin offering is considered as an alternative way for Blockchain related startups and projects to raise capital without going to venture capitalists and is viewed as combination of traditional crowdfunding mechanism (e.g. Kickstarter) and initial public offering (IPO). In general, it is difficult for newly started company to go public on the traditional exchange. In addition, only few

venture capital funds invest in Blockchain startups as most of these startups are in seed stages and it is usually difficult to assess their business model and market opportunities. Thus, token sale is being the only fundraising option for most of projects in this industry. In the next section, I review unique features of initial coin offerings and present challenges for this phenomenon.

3.1 Features of ICO

While companies going public need to register with the regulatory authority, issue IPO prospectus and follow standardized procedures prior IPO, ICOs are not restricted by any legal requirements in most of countries yet (Bitcoin Market Journal, 2017). The key document any ICO presents to investors is the White Paper. White Paper is the main document of a project, which typically looks like a business plan with a detailed description of the underlying technology and information about token sale. However, there is no standard of how this paper should look like. The startup doing an ICO doesn't need to have minimum earnings or positive track record as investors expect significant growth in future. Most companies have a conceptual framework presented in the White Paper and only some of them developed a working prototype or open source code. Considering this fact, the valuation of ICO is mainly based on future expectations rather than on the historical numbers, which makes investing in ICOs extremely risky. Costs for conducting an ICO are significantly lower than other types of financing. On average, a startup spends $60K to organize an ICO and between $50K and $1M to place the token on the cryptocurrency exchange depending on the size and liquidity of the trading platform (CryptoCrimson, 2018). In contrast, companies doing IPO pay on average an underwriter fee equal to 4–7% of gross proceeds plus an additional $4.2M of offering costs (PwC, 2017).

Unlike investing in the IPO or buying equity of a company through Venture Capital or Private Equity funds, purchasing digital tokens does not provide ownership rights in the company for investors. While the utility of holding a stock is in receiving dividends and having a vote in the shareholders meetings, tokens' utility is in the access to a certain platform or technology. This means that users purchasing tokens are doing it not only for speculative reasons, but maybe also because they want to be involved in the project and interact with the new platform (Martinez, 2017).

Initial coin offerings provide nearly immediate liquidity and potential exit options in comparison with alternative investments. On average, it takes two weeks after an ICO for a token to be placed on one of the cryptocurrency exchanges. In addition, there is a network effect being created by

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accessing users at a global level with large pool of investors. In contrast, venture capital funds and private equity firms exit times are five years on average. Besides that, traditional IPO issuance is a lengthy process with a lot of legal and compliance procedures, which usually takes from five to six months (PwC, 2017).

Initial coin offerings let individual investors participate in the funding of startups, unlike Venture Capital (VC) firms where there are many entry barriers, including minimum investment sum (around $1M for top-tier firm) and customer verification procedures (CNBC, 2014). In addition, since the token does not provide any rights of ownership, ICO is a non-dilutive way to raise funds for the startups, which let core team members save their control of the business and eliminate the agency problem in future.

3.2 Challenges for ICO

Despite several advantages over traditional financing mechanisms, initial coin offerings today experience serious challenges due to the immaturity of this phenomenon. One of the biggest problems in cryptocurrency space is fraud since there is no central regulating authority – investors are not protected against ICO scams. The biggest scam in ICO history recently happened in April 2018. Pincoin and iFan (operated by the same company from Vietnam) are believed to have stolen around $660M (Cointelegraph, 2018). The authorities started investigating the fraud when a number of investors launched protests near the company's office after the company refused to process cash withdrawals. Analysts from Satis Group conducted the research where they studied the quality of ICOs and found that almost 81% of ICOs are scams (Satis Group, 2018).

Another big issue for cryptocurrency space is the security risks during token sale and further trading on exchanges. To trade tokens and fiat money today users need to access one of the exchanges, which serves as an intermediary in transactions. In most cases, these exchanges are unregulated. One of the biggest hacks recently happened in Japan, where in January 2018 Coincheck crypto exchange reported that hackers stole $530M from its users (CNN, 2018).

As more capital is being involved in the cryptocurrency space, the legal and tax pressure from the governments is increasing. The fundamental issue right now – are these tokens security or not? If the company develops a token which is a security, then this company is subject to the security laws. During an ICO the company deals with fiat money, which requires to get a legal opinion and legal description of the sale. The goal of law firms that work with ICO is to ensure that the token being

sold is not a security. Business models of most of startups are focused on the cryptocurrency token being an intrinsic part of the platform. Any areas implying the cryptocurrency token acts like a security are removed – for example, investors do not have any voting rights, or dividend payouts. Many ICOs relabel themselves as "Token Sales", or "Token Generation Event" as participants buy the token but not the stake in the business behind this platform. These are the reasons why cryptocurrency space might need new regulation as token itself is not a traditional financial security, but more a technological item. There is no common consensus on what crypto-assets are, and countries disagree on how to classify them. Chinese government and South Korean authorities proclaimed a ban on all ICO activities in 2017, which negatively reflected on crypto currency market. In several countries like Russia, United Arab Emirates, Israel, Thailand, Japan, Switzerland authorities are working on creating a regulatory framework for token sales. ICOs are already allowed in a number of countries, including USA (heavily regulated), Australia, Gibraltar, Germany, Estonia, Lithuania, UK, Canada (Bitcoin Market Journal, 2017). The top five regions by capital raised via ICOs based on country of legal entity location are USA ($1.4B), Switzerland ($1.1B), Singapore ($418M), UK ($281M) and Japan ($238M) (FabricVentures & TokenData, 2018, p. 9).

Another issue related to ICOs is that team might spend too much time developing and promoting ICO rather than concentrating on the initial development of technology or product. Furthermore, token price performance may become the major concern for the team and can distract it from initial startup goals.

Even though participation in ICOs is supposedly open to all investors, this might not be true. In reality, some companies conduct a private token sale and set a high minimum investment sum. For instance, Telegram, a free cross-platform messaging app raised $1.7B in Q1 2018 during the first rounds of ICO from 94 investors (Khrennikov, 2018). The minimum contribution was starting from $1M and the token sale was open only to the limited pool of investors.

Blockchain as the ICOs underlying technology experiences significant issues. According to Vitalik Buterin, the creator of Ethereum, the current biggest problem of Blockchain technology is its scalability (Cryptovest, 2017). He introduced the "scalability trilemma" notion, which means that developers at current stage have to choose 2 things out of decentralization, security or scalability. As a result, current blockchain technology has slow performance compared to traditional databases.

For instance, PayPal is able to manage 193 transactions per second and Visa manages 1667 transactions per second, while Ethereum can process 20 transactions per second and Bitcoin does 7 transactions per second (Rosic [c], 2017). This means that Blockchain technology should be first effectively transformed and improved before being implemented into business processes. Projects developing solutions that will make Blockchain more usable and adapted could be more valuable for investors at this stage of Blockchain life cycle.

4. Data

This paper analyzes data obtained for ICOs that reached their soft cap, i.e. minimum amount of funds that startup needs for running business activities. The main issue in collecting information about the failed ICOs, those who didn't reach their soft cap due to several reasons (security flaw, legal issues, scam, poor marketing campaign) is the lack of data available for these companies. Founders try to delete any information about the failed ICO (including website, social media accounts, White Paper). Thus, I choose to focus on the analysis of successful projects. There were 913 ICOs in 2017, where 435 out of them were completed. These 435 decentralized token projects raised around $5.6b in 2017. The ten largest token sales raised around $1.4b which is 25% of total ICO funding in 2017 (FabricVentures & TokenData, 2018, p. 4).

The data used in this thesis are collected from tokendata.io, icodata.io, icodrops.com, icobench.com, coinmarketcap.com, finance.yahoo.com, redditmetrics.com, linkedin.com and White Papers of the analyzed startups. All data covers the period from 1st of January 2017 and 31st of December 2017. I collect the list of initial coin offerings from tokendata.io and further compare it with the data from icodata.io to get the most reliable information as there is no common database of past ICOs. I study ICOs that collected more than 10m USD to have sufficient information about token trading statistics. I end up with 160 ICOs on the list. I additionally check the initial fundraising sum at each ICOs social media or White Paper. Furthermore, I check coinmarketcap.com website whether the ICO has placed the token on the exchange in order to have corresponding quantitative data. Finally, I end up with the list of 140 most successful startups that did ICO in 2017 and have their tokens traded on the exchange. Projects in the dataset raised around $4.5b, or 80% of the total ICO funding in 2017.

I obtain the number of subscribers two weeks before the end date of ICO and the number of subscribers on the end date of ICO on each company's Reddit channel through redditmetrics.com

website. Icodrops.com, icobench.com, LinkedIn and company's White Paper are used to collect data on every startup, including relevant information about the Team, Product, ICO token price, ICO hard cap, ICO market cap. Coinmarketcap.com and finance.yahoo.com are used to collect Bitcoin price and token price on the first trading day and 3-month post-ICO price.

4.1 Pre-ICO Valuation

Firstly, I develop three categorical variables for analyzing product or technology developed by a company. I study whether the company has already developed a minimum viable product, working prototype or released the open-source code before the initial token sale. In addition, I examine what type of product a startup is working on and what is the purpose of the token issued by the startup. I obtain data about product or technology being developed from icodrops.com, icobench.com and each company's White Paper.

Secondly, I study how many people were involved in the community of a particular company two weeks before the end of ICO and at the date of ICO event using Reddit Metrics tool, which is found on redditmetrics.com website. This timeframe is chosen due to the big variation in ICO periods among the observed companies – some of them finished their ICO within several minutes while others were raising funds during one month. It is not possible to observe the historical data on subscribers of other social platforms. However, Reddit forum is one of the most popular internet platforms for discussion Blockchain related projects (Reddit, 2018).

Thirdly, I introduce five categorical variables that provide the snapshot of the team of each startup. I study how many people are involved in the project; how much time team members worked together before the token sale (measured in years); whether the core team has experience working in startups or venture capital funds; whether the core team works full time on the project and how many advisors are involved in the business. I mainly obtain the data from Linkedin.com and each company's White Paper. In some cases, I use icobench.com due to lack of information in the company's White Paper.

Fourthly, I consider token metrics of a particular startup, where I study ICO market capitalization, i.e. how much funds a startup plans to raise. In addition, I study what is the token price measured in USD and whether the ICO has a hard cap. I obtain the data from icodrops.com, icobench.com and company's White Paper.

I present the summary of factors in the table below.

Table 1. Pre-ICO valuation factors.

PRE-ICO VALUATION	
Factors	**Components**
1. Product	1. Does the company already have a minimum viable product / working prototype / open-source code before an ICO?
	2. What is the type of the project the company is working on? (Blockchain/Protocol, Cryptocurrency, Platform, Hardware)
	3. What is the role of the token? (Currency, Utility or Security token)
2. Community	1. Did the company have an active Reddit channel prior ICO?
	2. What is the growth rate of subscribers during 2 weeks before the end date of ICO?
3. Team	1. How long does the team work together?
	2. How many team members work in the company?
	3. Did the core team of the company work in startups/VC industry before?
	4. Does the core team work full time for the ICO project?
	5. How many advisors does this ICO have?
4. Token Metrics	1. What is the token price?
	2. What is ICO market cap?
	3. Does the company have a hard-cap?

4.2 Post-ICO Performance

The data on each token and Bitcoin prices is collected from coinmarketcap.com and finance.yahoo.com correspondingly. First, I obtain the ICO price of each token ($token\_price_0$) and Bitcoin price (btc_price_0) on the same date (the last day of token sale). Secondly, I collect the price of each token three months after the end of ICO ($token\_price_{3m}$). I further download the price of Bitcoin on the same date (btc_price_{3m}). Bitcoin returns is considered as a benchmark for cryptocurrency market returns. Thus, $Excess\_return_{3m}$ measures how much an investor is better

off by investing in the token and selling it on the first trading day rather than following this strategy with Bitcoin on the corresponding dates. I study token returns adjusted for Bitcoin prices in order to exclude the effect of Bitcoin price movements on the tokens as cryptocurrency market tends to carry strong correlation between the coins (Sifrdata, 2018). Token excess return three months after the end of ICO is the dependent variable in my research. In the next sections, I describe several explanatory variables.

I compute the excess returns of the token three months after the last day of ICO with the following formula:

$$Excess\_return_{3m} \; = \; \log\left(\frac{token\_price_{3m}}{token\_price_0}\right) - log\left(\frac{btc\_price_{3m}}{btc\_price_0}\right) \qquad (1)$$

Price of each token at the end of the first trading day is denoted as $token\_price_{1d}$, which is usually two weeks after token sale is finished (this timeframe varies from one day to two months); the price of Bitcoin on the same date is labelled as btc_price_{1d}. I compute the excess returns of the token on the first trading day with the following formula:

$$Excess\_return_{1d} \; = \; \log\left(\frac{token\_price_{1d}}{token\_price_0}\right) - log\left(\frac{btc\_price_{1d}}{btc\_price_0}\right) \qquad (2)$$

Dummy variable *hard_cap* indicates whether there is a hard cap during the token sale, i.e. whether the ICO has a fixed maximum number of tokens being issued. All token sales observed in the dataset reached their soft cap, or minimum fundraising goal. However, some of the startups didn't reach their hard cap, i.e. the maximum fundraising goal. I find it relevant to study whether this factor influence the sentiment of investors and causes any impact on the 3-month excess return of a token. I introduce a dummy variable *ico_success,* which reflects whether the startup reached the maximum goal, i.e the hard cap.

I introduce four dummy variables by classifying ICO projects into: Platform – startups developing a blockchain platform mainly for individuals; Blockchain – startups developing a solution (code) or protocol for Blockchain optimization mainly addressed to developers; Cryptocurrency – startups developing a coin for payments; Manufacturing – startups developing hardware devices.

The descriptive statistics for the data studied in the second part of this research are presented in the Table 2 and Table 3. The correlation matrix for this data is presented in the Table 4.

Table 2. Descriptive statistics for continuous variable, measured in 100%.

	N	Mean	Median	Max	Min	Std.Dev.	Skewness	Kurtosis
1st day token return	140	2.00	0.78	29.69	-0.92	4.11	3.78	18.04
3-month token return	131*	2.58	0.71	42.92	-0.91	6.39	4.65	24.98

* At the time of the research there is no statistics for 3 months subsequent returns for 9 companies in the dataset

Table 3. Descriptive statistics for categorical variables.

	1 (Yes)	0 (No)
ICOs with hard cap	127	13
ICOs reached the hard cap	92	48
Platform	97	43
Blockchain	32	108
Cryptocurrency	7	133
Manufacturing	4	136

Table 4. Correlation table for variables.

	excess_return$_{3m}$	excess_return$_{1d}$	hard_cap	ico_success	platform	blockchain	cryptocurrency	manufacturing
excess_return$_{3m}$	1							
excess_return$_{1d}$	0.58	1						
hard_cap	0.19	0.03	1					
ico_success	0.08	0.23	0.26	1				
platform	-0.25	-0.24	0.03	-0.17	1			
blockchain	0.24	0.24	-0.02	0.17	-0.82	1		
cryptocurrency	0.07	0.10	0.07	0.16	-0.34	-0.12	1	
manufacturing	0.01	-0.05	-0.10	-0.15	-0.27	-0.10	-0.04	1

5. Analysis and Results

I first study the key components of ICO success within four valuation categories – Product, Community, Team and Token Metrics in order to identify common patterns among the most successful ICOs in 2017. Secondly, I concentrate on the post-ICO performance of the observed startups in order to study the determinants of subsequent three months returns. I formulate four research hypotheses.

H1: Token return at the end of the first trading day predicts 3-month subsequent return of the token.

H2: Initial coin offerings with fixed structure of token issue experience higher 3-month subsequent token returns than ICOs without the hard cap.

H3: Initial coin offerings which successfully raised the maximum targeted sum experience higher 3-month subsequent token returns than ICOs that did not reach the hard cap.

H4: ICO companies that develop a protocol or technological solution for Blockchain experience higher 3-month subsequent token returns than companies developing other types of products.

5.1 Pre-ICO Valuation

Product

Valuation of a product developed by a startup company is a complex task done by experienced venture capitalists. When analyzing product or technology angel investors pay close attention to the feasibility of idea implementation. Thus, having a clear prototype or minimum viable product (MVP) should increase chances of financing. According to Audretsch, Bönte & Mahagaonkar (2012), ventures with patents or patent applications and prototypes are more likely to obtain equity finance from potential investors.

Product or technology developed by a company doing ICO must be Blockchain-related and use the underlying token in the ecosystem. In other words, customers should have clear incentives to use this token in order to access the developed product or technology. I study whether the startups from the dataset used in this research did have a working prototype, MVP or open source code before their token sale. I find that 111 projects out of 140 did have a proof of concept in the form of prototype, MVP or open source code. This fact comes in line with the results of study done by Adhami, Giudici & Martinazzi, (2018), who state that the probability of ICO success is higher if the source code for blockchain project is available.

I further find that the majority of startups (97 out of 140) develop a Platform with underlying blockchain technology, while 32 companies work on developing a technology or a protocol for the Blockchain effectivization. The rest of startups develop a cryptocurrency (7 companies) and manufacture a physical product (4 companies). Moreover, I use this variable in the econometric model presented in the second part of this work, where I study post-ICO performance.

The majority of observed companies issue the utility type of token (128 out of 140 projects). These tokens perform a specific action in an ecosystem run by the issuing startup and are generally built on top of an existing platforms such as Ethereum. This is the largest class of tokens now being built in the cryptocurrency space (Cepka, 2017).

Community

The result of any crowdfunding campaign depends on the participation of the investors, thus it is important to measure the hype around the token sale. This implies checking company's social media, i.e. the sentiment around the company and the number of subscribers before an ICO. The most common media are Company's social accounts (Telegram channel, Slack channel, Twitter page, Facebook, Linkedin, Medium). In addition, community forums are the good indicator of investors' engagement (Bitcointalk, Reddit, Github, Steemit). I use Reddit Metrics tool to extract the past data about subscribers' growth two weeks before the end date of ICO. Reddit is a social news website and discussion forum. As cryptocurrencies are representations of value or assets within a network, its viability is not based on generating revenue, but rather directly depends on the participation of the community (user, miners, developers). I find that 117 companies (84% of companies) did have an active Reddit channel at the moment of token generation event and on average 93% increase in subscribers over the 2 weeks before ICO end date. On average the observed startups had 321 active subscribers on the end date of ICO and 166 active subscribers 2 weeks before that.

Team

According to the Stein (2018), Blockchain-related jobs are the second-fastest growing in today's labor market with 14 job openings for every one Blockchain developer. The core team behind any business at early stages is one of the most influential factors for further business development and one of the key factors analyzed by venture capitalists. While novice VCs tend to focus on the qualifications of individual team members, experienced VCs focus more on team cohesion (Franke,

Gruber, Harhoff & Henkel, 2008). Founding team experience enhances both new venture survival and sales, but effects are non-linear, and vary with venture age. (Delmar & Shane, 2006). Following these findings, I look at the time period a team has spent together working on a project. I find that 111 out of 140 of reviewed ICOs did have team members who worked together on the project more than 1 year before the ICO date. The average time period the core team spent working together is 2.3 years. As many ICOs turn to be scams, this factor can play a significant role in valuation of token sale. If the team is quickly set up together, then the ICO might have a higher chance being a money grab.

I further find that the average number of team members is 14, while the median value is 10. In addition, companies from the dataset had 5 advisors on average at the moment of ICO. I also find that 103 ICOs (74% of companies) did have an international team prior the token sale. Team members from different countries can bring broader work experience and could attract attention of investors from different regions.

I find that core teams of 113 companies (81% of companies) from the dataset did have previous experience working in startups or VC industry. Founders who worked in startups are familiar with typical problems that arise during the early stages of business development which in theory will increase chances of success in future. What is more, I find that the core teams of 106 companies (76% of companies) from the dataset work fulltime on the project, which is an important sign that founders fully invest their time in startup management.

Token Metrics

While market capitalization is a popular metric for traditional securities, it has unique implications in cryptocurrency market. On average, coins with small market capitalization tend to have larger variation in returns when news regarding this company are released, or "whale investors" (large buyers) take positions. Following this, investors who hold tokens with small market caps are at risk of being crushed by larger traders.

Hard cap will determine the total fixed quantity of tokens being issued during an ICO. Token sales with hard cap is expected to bring more value to investors due to scarcity of the coin as compared to no-cap token sales, where supply is not fixed. Bancor Protocol, a decentralized liquidity network, raised $150m in uncapped ICO within three hours and resulted in no percentage gain for investors.

The first day return of the token was -23%, while 3-month subsequent return was -40% (Coinmarketcap [b], 2018)

Often if the token sale is uncapped, it can mean that the team doesn't have precise budget spending plan. In addition, raising too much funds could result in the loss of motivation among the team and will lead to the ineffective work environment. Uncapped token sale could lead to uncertainty and dilution in valuation of the token. If the token is considered as a permission to use the network, then each additional token would lower the value of all outstanding tokens. However, uncapped ICO gives a fair right to participate in an ICO for every investor without paying high gas fees (i.e. transaction fees). When ICO has a limited number of tokens being issued and the hype around the token sale is high, there is a high chance that investors will be ready to pay high gas fees in order to execute transaction and get this token in exchange for Ether. Gas fee is the execution fee for every operation made in Ethereum network and is adjustable according to investors' preferences. In other words, transactions executed with high gas fees will be served faster (Coleman, 2016).

I find that 127 startups (91% of companies) did have a fixed number of tokens issued with the average token price of $0.82, while median token price was $0.16. I further study whether the fixed number of tokens being issued influence the post-ICO performance in the second part of the thesis.

5.2 Post-ICO Performance

In this section I present and analyze the results of post-ICO return prediction model, which is specified as follows.

$$Excess\_return_{3m}$$
$$= \alpha + \beta_1 Excess\_return_{1d} + \beta_2 hard\_cap + \beta_3 ico\_success \qquad (3)$$
$$+ \beta_4 platform + \beta_5 blockchain + \beta_6 cryptocurrency + \varepsilon_t$$

The dependent variable used is the token excess returns 3 months after the end date of token sale. The explanatory variables include token excess returns at the end of the first trading day, the availability of the hard cap on token sale, the success of ICO in reaching the hard cap and the type of ICO project. The results of the model are summarized in Table 5.

Table 5. Predictive models for 3-month post-ICO performance. Regression results of model (1), tested with the inclusion of different variables. Values in parentheses are standard errors. One star indicates significance at the 5% level, two stars indicate significance at the 1% level and three stars imply significance at 0.1% level. R^2 is included on the final line of each model.

	Dependent variable: excess_return$_{3m}$			
	(1)	(2)	(3)	(4)
excess_return$_{1d}$	0.719***	0.712***	0.741***	0.703***
	(0.0889)	(0.0872)	(0.0891)	(0.0918)
hard_cap		0.716*	0.830**	0.878**
		(0.289)	(0.298)	(0.298)
ico_success			-0.270	-0.315
			(0.184)	(0.188)
platform				-0.386
				(0.488)
blockchain				0.0198
				(0.516)
cryptocurrency				-0.175
				(0.627)
_cons	-0.184	-0.831**	-0.774**	-0.497
	(0.0940)	(0.277)	(0.279)	(0.520)
R^2	0.336	0.367	0.377	0.398

The correlation Table 4 in Data section shows no values equal to or above 0.7. The tolerance values are greater than 0.1 and the VIF values are smaller than 10. These indicators suggest that there is no concern of multicollinearity among the dependent variables.

Inspection of the standardized coefficients shows that the first day excess return of the token and the hard cap token sale have a significant positive impact on 3-month post-ICO subsequent returns in all the models. The R^2 of the multivariate regression is 0.398, which means that the model can explain almost 40% of the variation in the 3-month post-ICO token excess returns. However, only token excess returns at the end of the first trading day and the availability of hard cap during ICO have significant contribution in the model. In fact, token excess returns at the end of the first trading day make the most significant contribution to the model explaining 33.6% of variance in the dependent variable.
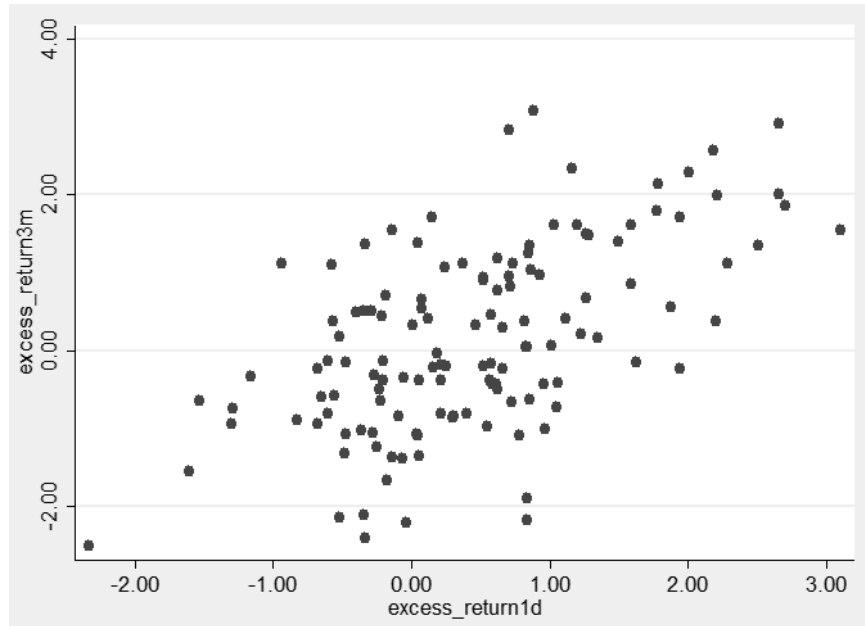
Figure 2. Relationship between 3-month token excess returns and 1st day token excess returns.

Through the regression model I find that the coefficient of *excess_return1d* is positive and significant at 0.1%, confirming my hypothesis H1. I include scatter plot, which illustrates that the relationship between the dependent variable (3-month token excess returns) and the strongest explanatory variable (1st day token excess returns) can be observed even in the raw data.

Startups from the dataset carry underpricing which results in 200% return on the first trading day on average, while the median value is 78%. It is noticeably higher compared to underpricing phenomenon during the initial public offering, where the average first day return for 2001-2016 period is 14% (Ritter, 2017). However, some of the tokens start trading lower than the ICO selling price. In the dataset used in this research there are 41 tokens that showed negative returns at the end of first trading day.

Hard_cap variable predicts 3-month post-ICO returns. ICO investors might consider tokens with fixed supply being more valuable than uncapped token issuances. The coefficient for *ico_success* is not statistically different from zero. Thus, there is no significant relation between the success of ICO in reaching the hard cap and 3-month post-ICO token excess returns. There is no significant relationship between type of product the startup develops and 3-month post-ICO token excess returns. I finally conclude that first day excess token returns and the hard cap during an ICO predict 3-month subsequent token returns.

6. Conclusion

Initial coin offering can be defined as an online fundraising mechanism through which a blockchain startup company raises funds by issuing tokens which are being sold to the public. Once the startup successfully closes ICO, investors get a cryptographic token. The underlying value of token is determined by the value of the economy, or ecosystem that's being created by this startup. However, it is usually the expectation about the value of future ecosystem that drives the price of the token.

Initial coin offerings as the alternative way to raise funds have become tremendously popular throughout 2017. Being in the very early stage of development this phenomenon lacks valuation methods while its performance is not thoroughly studied. This paper investigates which factors characterize the most successful ICOs and analyzes which variables are useful in predicting post-ICO performance.

Firstly, I analyze 140 most successful ICOs and find that factors which characterize them include Product, Community, Team and Token Metrics. I find that 79% of startups did have a working prototype, minimum viable product (MVP) or open source code available prior the start of ICO campaign, which in investors beliefs will positively influence the survival of a startup and comes in line with the research done by Adhami, Giudici & Martinazzi (2018). I find that 84% of successful ICOs had active Reddit channel at the moment of token generation event and on average 93% increase in subscribers over the two weeks before ICO end date. I find that around 80% of reviewed ICOs did have team members who worked together on the project more than one year before the ICO date, and the average team age is 2.3 years. I also find that core teams of 113 companies (81% of companies) from the dataset did have previous experience working in startups or VC industry and core teams of 106 companies (76% of companies) work fulltime on the start-up project. 127 startups (91% of companies) did have a fixed number of tokens issued, i.e. hard cap on token sale, which could make token more valuable in future as demand rises while supply stays fixed.

Secondly, I evaluate which quantitative factors explain subsequent returns of a token. The analysis of post-ICO performance showed that successful ICOs, which further place their tokens on the exchanges tend to carry significant underpricing, with median value of 78% and average value of 200%. The high failure rate of ICOs can explain this pattern – around 52% of all token sales either

failed to raise funds or turned to be a scam in the past year, leaving investors more optimistic about startups that eventually reported the success of ICO.

Furthermore, I find that 3-month subsequent returns of a token can be strongly predicted by ICO underpricing along with the availability of fixed token issuance during the ICO. In addition, the linear relationship between 3-month token subsequent returns and token returns at the end of the first trading day becomes more statistically significant when post-ICO performance and ICO underpricing are adjusted to Bitcoin returns. This can indicate that returns of tokens can be partly explained by returns of Bitcoin during the same period and is consistent with Sift Data on cryptocurrency correlations (Sifr, 2018).

Throughout the work with the thesis, I have encountered several alternative phenomena to investigate for further research. The first topic would be to study post-ICO performance considering a longer period using time series analysis. The second approach is to investigate the fundamental value of Blockchain startups and compare it to current market prices of their tokens. Thirdly, one can study the investors' sentiments among several social platforms prior ICO using natural language processing (NLP) algorithms in order to examine whether this factor has significant impact on ICO performance.

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