

Business Venture Post ICO Period

by
RIANTIKA Teresa
52117603

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Certification Page

I, Teresa Riantika (Student ID 52117603) hereby declare that the contents of this Independent Final Report are original and true, and have not been submitted at any other university or educational institution for the award of degree or diploma. All the information derived from other published or unpublished sources has been cited and acknowledged appropriately.

RIANTIKA, Teresa

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Executive Summary

For the past decade, cryptocurrency market is the fastest growing industry, yet controversies exist on how this market is a bubble, that if it grows even bigger, a financial crisis might occur. At a glimpse, it reminds us of what happens with derivatives and financial crisis in 2008, how the key market player in the financial industry created such massive domino effects to the World Economy, allegedly, it required a comprehensive collaboration between financial institution giants, regulators and educators to be held responsible of what happened then.

At the same time, a pseudonymous called Nakamoto Satoshi created a peer-to-peer network electronic cash called Bitcoin. The idea was, in essence, to eliminate transaction costs by utilizing blockchain technology so that no intermediaries is needed regardless the amount of the transaction, who are the ones doing the transaction, or where the transaction takes place. In less than five years later, a unit of Bitcoin is valued for US\$113, and suddenly in 2017 its price rocketed to a mind-blowing US\$19,000 per unit. No one could predict how Bitcoin can be valued that much. Cryptocurrency became the new ‘it’ item in the financial industry. Despite of its original purpose to serve as an alternative to a fiat currency, Bitcoin was treated as new investment, or speculative asset.

Thanks to the ‘success’ of Bitcoin, many blockchain technology started up their own project, raising capital through a mechanism called ‘Initial Coin Offering’ (ICO). Early pioneer was Ethereum in 2014, who provided smart contract to developers to build their own decentralized application. In following years, many ventures tried to utilize this blockchain technology to create a business plan, in a form of whitepaper, to raise capital. Not only limited to IT industry, many carry other kind of business. Until present time, there are three main kind of tokens being offered, classified by how they are used; utility, payment and security tokens. 2017-2018 are the years when ICO projects are blooming, but at the same time, created another issue; customer protection issues. Investors can only rely on the whitepaper or business plan that the venture presented, without an established business that has already commenced. Buying the tokens also does not represent ownership of the business, thus profit sharing is not always an option. Arbitrating this rather vague business, comes scammer and fake ICOs, who ran away with the capital raised, leaving the investors penniless. On the other hand, since investors do not expect any profit sharing, they can only profitable with the capital gain. That being said, many of them are investing based on Fear on Missing Out (FOMO). They can withdraw their

money as soon as the ICO period ended and sell it on the secondary market, leaving the venture unable to continue their business.

As the impact of fake ICOs and scammers are getting worse, some countries chose to ban ICO completely, while others try to regulate ICO, or try to promote it. Regulation uncertainty in addition to customer protection issues affect cryptocurrency market as a whole. Negative impact of news related to ICO found to be giving adverse impact to cryptocurrency market.

Independent reports and journal articles related to ICO market are recently published. In numbers, most ICO projects were related to blockchain infrastructure. Different type of tokens interest different types of investors. This independent report aims to examine what kind of ICO projects has the ability to survive after ICO period end, as a going concern of a project is the high level of uncertainty. As a result, with average days of a project stays at the cryptocurrency market is 405 days, ICO projects with certain business type tends to survive longer than others. In addition, unlike how it was expected, token type does not affect whether a token stays longer in the market nor how investors are interested in an ICO project. Finally, market capitalization does not reflect on token performance in the market, agreeing to the views that say most investors has limited knowledge related to ICO project he/she invests in. This can also be seen from the figure that shows circulating supply has positive relationship to the hype score of investors; how likely they are to invest in a project, while circulating supply has negative relationship to whether or not a token stays longer in the market.

1. Introduction

1.1. Background of the study and problem discussion

Based on current market research, capital raised through an Initial Coin Offering (ICO) in 2018 is US\$11.6 billion. Starting from 2014, ICO market has been a vast growing market, yet is still ineffective and unregulated. Blockchain technology is deemed as a solution to intermediary fees.

Ethereum is a pioneer in ICO, starting its token offerings in 2014, it reached its highest price at US\$1,377.72 on January 14, 2018. Ethereum offers smart contracts that enables developers to build decentralized applications, which is a crucial development in blockchain technology. Following its success, more ICO projects were created, not only those who mainly focused on blockchain technology, but a whole range of business type such as business services (mostly supply chain management information system), social media and communication, until those that are considered illegal in some countries; marijuana trading, betting and casino.

By design, an ICO project is created to enable new business venture to actualize their business idea, without having to prepare a certain amount of money. Raising capital in public also means to build network of prospective supplier and customer base. What considered as a valid point of an ICO is how they can eliminate transaction costs while at the same time, capital can be raised without limitation on amount or who and even where the investors come from. Being able to utilize blockchain technology in that manner brings a distinctive value proposition that is unmatched by any existing technology. (Adhami, Giudici, & Martinazzi, 2018) empirical study on ICOs views ICO as significantly potential in funding “decentralized” cross-country teams of developers, favoring open innovation.

However, almost half of 2017 ICOs have already disappeared; some haven't managed to raise enough capital or ran away directly, but the majority disappeared quietly, with a further group stopped all form of communication, while others had negligible community size and therefore more likely to fail. This emphasize more important issue in ICO, about what happens after the launch.

1.2. Purpose of the study and research questions

As the area of study of ICO is still relatively new, there were only a few prior researches conducted. Some study showed that ICO projects with some traits tend to succeed in the capital raising, however, their going concern is still not studied yet. Other shows that an ICO project's average age is 120 days. These will be discussed in details in the Literature Review.

The purpose of this study is to add further knowledge and understanding related to how an ICO project can be beneficial for both venture and investor. This study will focus on searching what similar traits successful ICO projects share, differing them with the scam projects after ICO period is over.

The objectives of this report are to answer the following questions:

- Does certain type of business ventures affect market capitalization or liquidity?
- Does certain type of tokens affect market capitalization or liquidity?
- Does token supply affect market capitalization or liquidity?
- How ICO actually helps new business ventures in doing their businesses?

1.3. Scope of the study

This report study ICO projects from 2014 to 2018 that is still listed at the cryptocurrency exchange. Lists of ICO projects were extracted from ICO website aggregator, icodata.io, while lists of active cryptocurrency market were extracted from coinmarketcap.com. Both are regarded as reliable secondary sources for cryptocurrency market and are often used as database in prior researches.

1.4. Outline of the report

The report is written as follows: second chapter explains prior research studies that has been conducted related to ICOs and how these studies build author analysis. Third chapter explains how the author gather and analyze the data from secondary sources which is reliable ICO listing, ICO rating and cryptocurrency exchanges market. Fourth chapter is the analysis derived from data processing through SPSS program, combining both quantitative and qualitative analysis based on current studies so far. Finally, in the last chapter, author make conclusion and suggest further study that can shorten the gap in the study of ICO.

2. Literature Review

2.1. Early development

Even though it is not entirely new, Bitcoin was a pioneer in cryptocurrency market. It was introduced by Satoshi Nakamoto in 2008, defined as a peer-to-peer electronic cash system. Electronic payments usually use third-party financial institutions as intermediary. However, in this payment system, there are some weaknesses; costs and payments arising from uncertainties of transactions' disputes. Paying over the internet requires mutual trust from both customers and sellers. Hence, a trusted third party is used to make sure transactions are done appropriately. Non-reversible transactions are not possible since the third party needs to mediate any dispute, if any, arising from fraudulent transactions, which increase transaction costs.

By using Bitcoin, Nakamoto suggest an alternative for cash payment system where online payment can be sent directly between related parties without having to go through third party financial institutions. Instead of relying on such mutual trust, Bitcoin payments are based on cryptographic proof. Transactions that are computationally impractical to reverse would protect sellers from fraud, and routine escrow mechanisms could easily be implemented to protect buyers (Nakamoto, 2008). Basically, Bitcoin relies on two fundamental technologies from cryptography: public private key cryptography to store and spend money; and cryptographic validation of transactions (Bohme, Christin, Edelman, & Moore, 2015).

To be categorized as a currency, it must serve as a medium of exchange, measured in unit of account and store values. Bitcoin fulfil these requirements as virtual currency, where its supply is limited to 21 million units. Nevertheless, by design, bitcoin do not have intrinsic value compared to fiat money. Its value is determined by demand-supply as results of amount and value of transactions, including its mining activities. Unlike its limited supply, demand for Bitcoins are more difficult to forecast. When the demand increases larger than its current supply that has not been mined, prices also go up. But what happened after all 21 million units been mined, there would be a definite deflationary effect. This is what makes users of Bitcoin are using them as a mean of investment rather than as medium of exchange (Baur, Hong, & Lee, 2018).

Bitcoin was not created through an ICO project, but it created the ICO market, which worth billions of dollars in just a few years, and is still growing. Many ventures with their ideas try to raise capital even though they have no actual ongoing business.

2.2. Definition of Initial Coin Offerings and its mechanism

2.2.1. Concept of ICO

Some definitions have been made regarding ICO, substantially, it is a mean of funding new business ventures through creation of new cryptocurrencies. (Fisch, 2018) further defined a differentiating feature of usage of Distributed Ledger Technology (DLT) which crowdfunding does not have. At a glance, ICO term is similar with Initial Public Offering (IPO) where companies raise their capital by issuing shares as equity funding. (Deloitte, 2018, p. 11) report described key differentiation between the three:

Table 2.1 Key criteria for differentiation of ICO, IPO and crowdfunding

		ICO	IPO	Crowdfunding
	Purpose (investor views)	Return on investment, ownership secondary	Return on investment and voting power	Realize idea, gain rewards and/or early access
Parties involved	Initiators	New business venture with business concept	Established business with proven assets	New business venture with concrete product
	Regulators	Currently unregulated, SEC started ICO audit	Regulated by financial authorities	Restrictions on investors allowed to take part in funding
	Investors	Supporters expecting return on investment	Institutional and private investors	Supporters expecting rewards and/or early access
Transac size	Transaction size	Small to medium size, strongly depending on	Medium to large size, depending on exchange	Small size, suitable for realizing idea or

		specific ICO	market	prototype
	Transferability and fees	High transferability with minimal transaction costs	High transferability, medium to high intermediary costs	Low transferability due to rewards and/or access, P2P platform fees might apply
	Risks	High, currently limited investor protection or legal obligation	Medium, depending on exchange market regulations	Medium, limited regulations, but ROI not key purpose

Source: Deloitte report, 2018

As elaborated in the definition and key differentiation to IPO and crowdfunding, ICO is expected to meet specific purposes that cannot be done by the two:

- Reducing costs of capital raising, avoiding intermediaries and payment agents, which means eliminating transaction costs
- Favor open source project development, enabling a built-in customer base, which led to positive network effects
- Allow funders to create a secondary market, which means higher liquidity. In addition to that, there are no limits on transaction amount nor where investors came from.

As many business ventures attempted to create their own cryptocurrency by ICO, there are also many types of token created, classified by its mean of usage. The main archetypes are payment tokens, security/asset tokens and utility tokens.

Payment tokens served as a mean of exchange, a unit of account or store of value, which has the same objective as fiat money. Users are expected to transact using the tokens via a DLT platform. Bitcoin is the most popular payment tokens as it is one of the pioneers, even though it was not created through an ICO. It has become one of the major cryptocurrencies, and often used as basis of ICO pricing. Most regulators, however, argue the functionality of a payment tokens. It could not be

treated as a fiat currency, as it is not issued nor backed by any central bank. Moreover, its value solely depends on how users place them.

Security tokens have similar traits that is found in financial instruments. It is created for investment purpose. [Deloitte, 2019] define security tokens as investment that provide ownership and entitlement to use an asset with profit distribution and voting rights. Of all kind of tokens, security tokens are the only type that is regulated by the governments, such as in US, if an ICO is categorized as investment in scope with the Howey tests, ventures need to register them under SEC. Meanwhile, EU has Financial Instrument Directive to regulate security tokens. Other than traditional debt or equity investments, security tokens also applicable for tangible assets such as property, art (music, paintings), and other assets. Due to regulation implication on security tokens, instead of ICO, security tokens can be offered through Security Tokens Offering (STO). For the purpose of this study, these security tokens that are offered through STO is out of scope.

Utility tokens served as specific tokens that users have to use to be able to access goods or services offered by the business venture. In other words, it served a functional advantage compared to the payment tokens. Most of ICO projects offered this kind of tokens. By design, utility tokens create intrinsic value for the company operation as they are used in value creation of their products. The intrinsic value of a token, thus, is present if the company has value.

2.2.2. ICO mechanism

ICO is done before any startups do their operation. To attract future investors and or customers, they usually publish whitepaper which describes what the project is about, how many tokens are planned to be issued, how much it is, budget planning on the proceeds, who the developer team, roadmap of project, etc. Until present time, there are no rules that direct the templates of whitepapers, nor audit conducted to give assurance to their prospective investors.

An ICO is deemed as successful if they can manage to fulfill targeted

cap or minimum funding goal. (Adhami, Giudici, & Martinazzi, 2018, p. 73) found that 81% of ICO deals during 2014-August 2017 are deemed as successful, which the success was determined by availability of these followings:

- Set of codes for the blockchain projects, which has a highly positive and strong relationship to success of an ICO, and also reflect that most investors are tech literate.
- Presale initiatives, also gives highly positive and strong relationship to success of ICO. Although not proven, many investors move fast in fear of missing out (FOMO) and for the issuers, testing the market with targeted, smaller token sale is a valuable strategy.
- Additional benefit or bonus scheme, which is marginally significant. As ICO does not gives any kind of ownership towards their investors, gain that can be enjoyed by investors is capital gains when they sold their tokens or bonus scheme that is given by the issuers when the project is successful.

In this study, availability of a whitepaper does not affect the probability of successful ICO, since the contents of ICO are varied in contents and length, while there is no certification or bind contract implied in it, which makes it less valuable.

However, according to [Howell, Niessner, Yermack, 2018], success of an ICO can be determined when issuers reduce information asymmetry to their investors, where whitepaper can be the medium of information, specifically when it contains:

- Budget of use of proceeds. Investors can see how much of capital raised during ICO will be used in development of projects.
- Team with entrepreneur experience. In a decentralized network with blockchain operations are anonymous, disclosure of developer teams can give investors feeling of safety and credibility for issuers.
- Vesting periods for tokens held by issuers, which represents the presence of profit motive for developer team to finish their

projects, which then led to investors feeling safer that the project will not be abandoned when the ICO is over.

In addition, when the projects involved utility function of the token, it gives more liquidity on the tokens being traded as market mechanism moves according to its supply and demand.

After ICO period ended, the token will be listed at a crypto-exchange, enables prospective investors or user to trade their tokens. Based on a study by (Benedetti & Kostovetsky, 2018, p. 6), survival rate for startups after 120 days from ICO period end date is 44.2%, using Twitter activity as proximity of token liquidity. That imply that more than half of ICO projects ended up vanishing, raising customer protection issue.

2.3. Valuation of tokens based on each type; payment, utility and security

Since ICO projects consisted of a broad range of business type, it results in different type of tokens offered. As discussed before, even Bitcoin, that is created as an alternative payment options, are currently treated not as alternative of fiat currency but an investment. Tokens are not created equal, and through its development, tokens are not merely a medium of exchange but some of their characteristics are similar to existing traditional assets. Currently, there are three major kinds of token; utility, payment and security (or asset) tokens. Adapting ‘substance over form’ principle in how to treat an ICO, valuation of ICO differs in what kind of token being offered.

2.3.1. Payment tokens

Payment tokens are created as mean of exchange, with the purpose of eliminating intermediary costs. There are few studies trying to capture on how to value cryptocurrency, mainly on Bitcoin. Instead of medium of exchange, some argue that Bitcoin is a speculative asset. As an asset, Bitcoin shows similar characteristics with gold. Both can have intrinsic value if its users are rational. Moreover, Bitcoin and gold has the same limitation on their supply and are costly to extract. None of them are controlled by a government, in fact they are ‘mined’ by independent companies. If Bitcoin is used for investment purpose, volatility of Bitcoin should have some similarities with other investments in the

market; such as government bonds and stocks or reacts symmetrically to what happens in the market.

[Dhyrberg, 2016] analyzed that Bitcoin is like a hybrid between gold and dollar. Bitcoin react to similar variables in the GARCH model, and possess similar hedging capabilities and at the same time, like a currency, it reacts significantly to federal funds rate. [Baur, Hong, Lee, 2018] analyzed return properties on Bitcoin between July 2010-June 2015. It is shown that one third of Bitcoin are held for investment purpose, where its returns are uncorrelated with all major asset classes in normal and extreme times. This means even though its price volatility is really high, it will not affect other assets and vice versa. Due to its limited market size and how it is still largely unregulated, Bitcoin can combine some of the advantages of both commodities and currencies in the financial markets. Only when the cryptocurrencies market grows even larger in global scale, it can influence the value of fiat currency and even changing relevance of monetary policy.

While there are debates whether Bitcoin has bubble effects and the ability to stay in the long terms, apparently more investors are attracted to capture yields from this investment. As a relatively new investment asset and currency, it is expected to find such volatility and the market is inefficient. [Kristoufek, 2015] used wavelet methodology to see what the main drivers for the price formation of Bitcoin is. Firstly, like a currency, Bitcoin price is formed in accordance to quantity theory of money, where its trade volume, money supply and price level play major roles. Second, in technical point of view, more Bitcoin users are interested to be miners as its price is increasing. This trend, however, will diminish over time as hash rates and difficulty level increases. Third, investors' interest in Bitcoin. Basically, due to its popularity as reported in many medias, many people actually try to invest in Bitcoin, hence raise its demand and increases its prices. This relationship is most evident in the long run.

Asset prices show the relationship between volume and returns. Studies about this relationship has been covered in variety of equities such as

bonds, commodities, and future rates. Bitcoin market, however is still unexplored. Since it went online in 2009, however, Bitcoin price movement rise and fall sharply until present time. In some cases, there can be seen that its price movement is associated with high transaction volumes.

[Balcilar, Bouri, Gupta, Roubaud, 2017] examined data from December 2011 – April 2016 and found that Bitcoin returns and volume are non-normally distributed. Volume can predict returns when the market is functioning around the normal mode. But when the market is in bullish or bearish condition, volume became irrelevant information to predict its volatility. Under these circumstances, predicting future results is appropriate by using past values. Hence, technical analysis can still be used to gain information regarding Bitcoin price movement.

2.3.2. Security tokens

As there are underlying assets backing the tokens offered, valuation of security tokens, specifically for those that are backed by traditional debt or equity investments or financial assets can be valued in similar manner. [Pazos, 2019] designed a valuation method for security tokens by forecasting its future cash-flow using DCF model. Similar to classic valuation of companies using DCF model, determining discount rates for security tokens venture is really challenging as there is a lack of a closed-form expression of discount rates for start-up firms. In addition, accuracy of venture valuation will also lie in the measurement of the Serviceable Obtainable Market, as their prospective revenue.

2.3.3. Utility tokens

[Cong, Li, Wang, 2018] develop a dynamic pricing model for utility tokens. A project can be an attractive investment when venture expect future technology or productivity progress, token price then will appreciate and thus creating a ripple effect where more agents are joining the platform. Tokens capitalize future growth and speeds up user adoption. In other words, dynamic pricing of tokens crucially depends on platform productivity, endogenous user adoption and user heterogeneity.

As mentioned before, utility tokens are native cryptocurrencies created as medium of exchange for platform users. [Cong, Li, Wang, 2018] described the phenomenon as a monetary embedding, where the creation of native tokens will enable the use of standard unit of account for platform users from around the world, while eliminating transaction costs and mitigating risks of mismatched asset-liability. In addition, it also enables issuer to control market supply of the tokens, creating a certain degree of scarcity, shaping the price of tokens in the future.

2.4. Opposing views of ICO

By design, issuers are not bind by any obligation to finish their projects, which gives rooms for scammers to create fake ICOs. That is one of the main reasons why regulators feel the urge to formulate regulations to protect investors. Issuer startups market their business using whitepaper and might disclose information regarding project development, however, after ICO, there are no requirement for them to actually go with the plan. While if they really succeeded on their business and gaining profit, they can keep all the money for themselves.

On the other hand, real ICO projects also often suffers by investor behaviors, where most of them are pursuing more of their own interest, thus, high rate of sell-off in short-term. Investors do not have any rights nor obligation towards issuer operation after ICO period. There might be some terms regarding vesting period, however, they can withdraw their money whenever they want by selling these tokens to secondary market.

Some argue that ICO is short-lived. Blockchain technology does not change fundamental economics, and all tokens are not created equal. Tokens with intrinsic utility will increase in value, while those whose purpose is to extract value from a business will lose their value. (Forbes, 2018) state that there are clearly speculative profits to be made in buying tokens at or before ICO and selling them before the company begins operations and real-world economics take effect, but in the long run, the value of almost all of these tokens will be driven to zero.

Others find that bearish market actually helps growth of ICOs. Companies

holding ICOs have become more aware whether their tokens are held in the wrong hands, since doing so limits the long-term value of their tokens. The introduction of larger lockup periods has tied up investors in the tokens for a longer period of time, with the average being just over three months. (Forbes, 2018). Increasing difficulty in producing the same returns as before means that only the best ventures are joining. Today's market automatically eliminates the poor performing ICOs, but provides worthy ones with more and better resources.

Since the start of ICO in 2014 until present time, governments around the world are still in the process of formulating appropriate rules and regulations to protect both investors and issuers. Most were supporting, but since there are a lot of fraud or theft cases incurring significant amount of losses, some turned their back towards ICO, such as China, India and South Korea, who are banning ICOs, while US and EU are issuing some regulations related to ICOs (PwC, 2018).

Figure 2.1 Treatment of ICO worldwide



(source: pwc.ch)

[Zetzsche, Buckley, Arner, Fohr, 2017] described ICO as a bubble, as a scam as it raises difficulty for regulators to take action. Based on many cases of disappearing ICOs, customer protection issue is crucial, however due to its borderless nature, only in some cases that regulators can resolve. While there are

serious tech innovators that actually pursue advantage of blockchain technology, rather than completely banning ICO, [Zetzsche, Buckley, Arner, Fohr, 2017] recommended regulators to solve the key issue, which is information asymmetry.

2.5. Current ICO market condition

Based on (icorating, 2017) and (icobench, 2018) reports on ICO market 2017-2018, total funds raised by industries is dominated by blockchain infrastructure, followed by financial industry, including exchange and wallets, banking and payments.

From its first initiation in 2014, ICOs are growing both in terms of number and capitalization. Based on (icorating, 2017, p. 6), total amount raised by ICOs in 2017 reached US\$6.18 billion, generating median ROI of 116.63%. Not only independent business venture, but established large companies are actually attempted to enter ICO market by creating a separate venture that is not consolidated to their business, mainly due to the legal status of ICO. These companies include Kik, Telegram, Kodak, etc.

Implication of regulatory uncertainty is directly related to the growth of ICOs and cryptocurrencies market as a whole. As ICOs token pricing is heavily related to major cryptocurrencies, which also determined by market demand, any negative news related to ban or new limitations of ICOs reflected directly in token price depreciation. On the other side, news related to opportunities in ICO investments can give positive impact to prices.

Many analysts agree that price trend on ETH, is highly affected by ICO. One of the main reasons is that ETH provide smart contracts which many startups develop their ICO on. Matching the price against capital raised, there seem to be positive relationship in 2017. Number of ICOs boosted significantly in 2017, which affected price of BTC and ETH positively in Q4 2017. However, starting from 2018 both faced downturn until present time. Many believes this is due to ban of ICO in China and other countries such as South Korea, in addition to no-ICO-ads policy by the giants such as Facebook, Google and Amazon.

Meanwhile, in terms of number and capital raised, ICO is growing exponentially in 2018, marking the highest point in May in terms of number, and June in terms

of capital raised, where \$4.0 billion was contributed by ICO of EOS and \$1.7 billion by Telegram. Excluding EOS, Telegram and Petro, capital raised in 2018 is lower than in 2017, relative to number of ICO (2017: US\$15.4 million/project, 2018: US\$10.1million/project). ICO market and cryptocurrency market were going in the same direction as they are connected to each other. In addition to regulatory uncertainty, one of the reasons of bearish market of cryptocurrency is the fact that a lot of ICO-funded startups cashing out their ether, fearing that the bear market is going to extend further than many people had initially expected. Moreover, (icobench, 2018, p. 15) report stated that the top 10 ICOs by funds raised have negative ROI and/or not listed on exchanges.

3. Methodology

The analysis of the data is using combined qualitative and quantitative approach. As previously mentioned, currently there are limitation on ICO study, as none of fundamental economics nor finance theories that can be fully applied to value an ICO project. Qualitative analysis will be based on available literature on ICO study and current news and events in the cryptocurrency market. The quantitative analysis will be done using statistical methods.

3.1. Data collection

Since one of the features of ICO project is its limitless transaction beyond borders where anyone in the world can participate, in addition of ease in creating one, there are no global database yet available that list every ICO project. However, there are some ICO data aggregator website that provide detailed data regarding each of ICO project. As such, sample selected for this study is a compiled data from those ICO data aggregator websites.

First, we use icodata.io as the basis of ICO project list from 2014 – December 31, 2018. Second, we match those data to coinmarketcap.com, which lists all the active tokens until present time. Data taken from this website include end date of ICO, market capitalization of the token and circulating supply as at December 31, 2018. Both icodata and coinmarketcap is a comparatively comprehensive and often used as secondary sources by most of the studies related to ICO.

In addition to icodata and coinmarketcap, we use deadcoins.com that list inactive tokens or the ones that are delisted from the cryptocurrency market, and icorating.com, an ICO rating that provides analysis on risk of an ICO project. We use the feature of ‘hype score’ rating, where icorating assess social media activity as well as potential investors reception towards respective ICO projects.

3.2. Variable selection

3.2.1. Independent variable

There are three independent variables used in this quantitative approach; business type, token type and circulating supply.

- Business type: One of the main purpose business venture create

ICO projects is to gain competitive advantage by utilizing blockchain technology. As of present time, there are various business venture with a range of business type trying to gain capital through ICO. However, half of them vanished not long after ICO period is over. There are arguments that certain business type is more likely to succeed because blockchain technology is substantial to their products. In this report, business type is classified into 12 categories:

- Blockchain infrastructure
- Exchange and wallets
- Social media and communication
- Business services
- Computing and data storage
- Financial services
- Gaming and VR
- Trading
- Investment
- Banking and payment
- Betting and casino
- Marketing

- Token type: As previously discussed, different type of ICO tokens may have different valuation. Asset, utility and payment token has different range of usage, and also attracts different investors.
- Circulating supply: Every type of ICO tokens is basically used as a currency. Thus, its price might follow quantity theory of money where trade volume, token supply and price level are significant.

3.2.2. **Dependent variable**

There are three dependent variables used in this quantitative approach; hype score, number of days in cryptocurrency exchange and market capitalization of the token.

- Hype score: represents level of interests from potential investor. As mentioned earlier, the data is taken from icorating.com, where they provide analysis and assessment towards an ICO project, ranging from low to very high. The hype score is calculated based on the number of users on project pages on social media (bitcointalk, twitter, telegram) and other social activity metrics. Social media activity is one of proxy of tokens' liquidity, considering on how most of the potential investors are investing their money based on Fear of Missing Out (FOMO).

- Number of days in cryptocurrency exchange: is calculated from the end date of ICO to cut-off date of December 31, 2018. The number of days in the cryptocurrency exchange also represents liquidity of the token being listed in the market, as well as its going concern. Due to data limitation for number of days in cryptocurrency for delisted coins, the number of days in cryptocurrency exchange is classified into three ordinal categories; above average, below average and delisted.
- Market capitalization: is taken from coinmarketcap.com, calculated by multiplying circulating supply and token price as at December 31, 2018. It is expected that market capitalization can represent financial performance of the active tokens, as how a company's share price represents value of the business.

3.3. Quantitative method

Statistical method is used to analyze whether or not these independent and dependent variables relate to each other. There were 1,872 ICO projects listed on icodata.io from 2014 to December 2018. We then cross referenced these tokens with the ones being actively traded from coinmarketcap.com, and gathered 530 samples, while 63 delisted tokens were cross referenced to deadcoins.com. Due to unavailability of the data, from 530 active tokens, there were 291 tokens rated at icorating.com for their hype score.

Statistical methods were selected in accordance to what kind of data each dependent and independent variable are, and whether or not they fulfil assumptions needed for each test. Below are summarized statistical tests run for each data:

Table 3.1 Summary Quantitative Analysis

Dependent	Independent	Sample size	Method
Hype score (ordinal)	business type (nominal)	291	kruskal-wallis
	token type (nominal)	291	kruskal-wallis
	circulating supply (scale)	291	spearman
Market capitalization	business type (nominal)	530	anova
	token type (nominal)	530	anova

(scale)	circulating supply (scale)	530	pearson
Number of days in exchange (ordinal)	business type (nominal)	593	kruskal-wallis
	token type (nominal)	593	kruskal-wallis
	Circulating supply (scale)	593	spearman

Source: author

Kruskal-wallis test is a non-parametric test that can be used to determine whether or not statistically significant differences between two or more groups, where the independent variable consists of two or more categorical groups, while the dependent variable is measured on ordinal or continuous level. Thus, to seek any significant differences in hype score and number of days in exchange in regards to business type and token type, Kruskal-wallis test is applied.

Spearman rank-order correlation is also a non-parametric test to determine any association between two variables that are measured on ordinal, interval or ratio scales. Thus, to seek any association with the circulating supply, which is interval/ratio data, Spearman correlation is applied.

One-way Analysis of Variance (ANOVA) is used to determine whether or not there are statistically significant differences between the means of two different groups. This is applied to a condition where the dependent variable is measured in interval or ratio level, whereas independent variable consists of two or more categorical, independent groups. Thus, for dependent variable of market capitalization, which is a continuous data, and independent variables of business type and token type, ANOVA is applied.

Pearson correlation coefficient measures the strength and direction of association between two variables that is measured in interval scale. Since both dependent and independent variable of market capitalization and circulating supply are scale data, Pearson correlation is applied.

4. Data analysis

4.1. Correlations in token's liquidity

From 530 samples, we calculated how many days the tokens were active in the market from end of ICO date to December 31, 2018. Longest token stayed for 1,595 days, while the shortest was 30 days, with average of 405 days. In addition, there were 63 delisted tokens. Thus, we categorize number of days in cryptocurrency exchange in ordinal level; above average, below average and inactive.

Table 4.1 and table 4.2 below shows results from SPSS. Using Kruskal-wallis test, it is found that there are significant differences between twelve groups of business type and number of days in cryptocurrency market, where $X^2(2) = 30.138$, $p = 0.02$. Mean rank for each business type is ranging from 189.78 – 353.80. This implies that certain business type has longer period of staying in the cryptocurrency market than other type.

Table 4.1 Descriptive statistics for business type

	N	Mean	Std. Deviation	Minimum	Maximum
liquidity	593	1.26	.639	0	2
business_type	593	4.01	3.295	0	11

Table 4.2 Kruskal-Wallis test results and statistics for business type

		Ranks	
	business_type	N	Mean Rank
liquidity	Blockchain infrastructure	94	317.38
	Exchange & Wallets	72	339.14
	Social media & communication	78	293.12
	Business services	60	285.57
	Computing & data storage	66	287.95
	Financial services	52	274.93
	Gaming & VR	29	329.84
	Trading	28	353.80
	Investment	25	291.52

Banking & payment	43	255.93
Betting & Casino	19	299.08
Marketing	27	189.78
Total	593	

Test Statistics ^{a,b}	
liquidity	
Kruskal-Wallis H	30.138
df	11
Asymp. Sig.	.002

a. Kruskal Wallis Test

b. Grouping Variable: business_type

(Icorating, 2017) found that in 2017, the top 5 industries with the highest sum of funds raised are banking and payments; blockchain infrastructure; business services; computing and data storage; and exchange and wallets. In 2018, highest sum of funds raised are blockchain infrastructure, including platform and smart contract, followed by business services, banking and payment (Icobench, 2018). This implies that investors are more attracted to ICO projects that are more related to development of blockchain technology and the ones that act as currency, where they can enjoy the ease of transacting without limit and intermediaries fee.

For token type, however, there are no significant differences with the number of days in cryptocurrency market, where $X^2(2) = 0.593$, $p = 0.743$. Mean rank for utility, payment and security token is 291.64, 301.35, and 280.19, respectively. Since $p > 0.05$, it indicates that there are no association between the two variables.

Table 4.3 Descriptive statistics for token type

	N	Mean	Std. Deviation	Minimum	Maximum
liquidity	593	1.26	.639	0	2
token_type	585	.30	.556	0	2

Table 4.4 Kruskal-Wallis test results and statistics for token type

		Ranks	
	token_type	N	Mean Rank
liquidity	Utility	440	291.64
	Payment	116	301.35
	asset	29	280.19
	Total	585	

Test Statistics^{a,b}

liquidity	
Kruskal-Wallis H	.593
df	2
Asymp. Sig.	.743

a. Kruskal Wallis Test

b. Grouping Variable: token_type

Initially, token type is expected to have significant results. Prior studies showed that valuation of each type of token can be predicted. (Cong, Li, & Wang, 2018) provide a dynamic pricing model for utility tokens, (Balcilar, Bouri, Gupta, & Roubaud, 2017) state that technical analysis can be used to predict Bitcoin (payment tokens) movement under normal market mode, and (Pazos, 2019) use DCF model to predict value of security tokens. No significance found between token type and number of days in the cryptocurrency market indicates that even though each token type valued differently, investors decision making is not based on how the token perform in the market. This will be more apparent in the next section of market capitalization.

Using Spearman's correlation, it is found that there is a negative relationship between circulating supply and number of days in the cryptocurrency market, as seen in the Table 4.5, where $r = -0.262$, $p = 0.000$

Table 4.5 Spearman correlation test results for circulating supply

		liquidity	Circulatingsupply
Spearman's rho	liquidity	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	593
	circulatingsupply	Correlation Coefficient	-.262**
		Sig. (2-tailed)	.000
		N	497

** . Correlation is significant at the 0.01 level (2-tailed).

(Baur, Hong, & Lee, 2018) stated that Bitcoin is a hybrid between commodity money and fiat currency, that it was used as a speculative asset even though its purpose and characteristics were designed as a fiat currency. As (Nakamoto, 2008) created, Bitcoin supply was limited to 21 million units, which can be mined. ICO tokens, were also created with limited supply, that some of them can be mined, some cannot. The mechanism is the similar with Bitcoin, token's pricing is shaped by the demand and supply. When all tokens' supplies are circulating in the market, there will be deflationary effects.

The figure shows that increasing circulating supply might implies maturity of the token, that is when circulating supply approaching the total supply of tokens, price can only go down. In accordance, investors behavior is expected to withdraw their tokens before the price took a fall, which in the end, its value equals zero.

4.2. No significance found in the market capitalization

Using ANOVA and Pearson correlation to seek relationship between market capitalization with business type, token type and circulating supply, we found no significance with any of the independent variables. Please refer to Appendix 1-6 for SPSS results.

Market capitalization is calculated by multiplying circulating supply to current price. No significance found between market capitalization and any of the independent variables might suggest that market capitalization does not represent how tokens are valued in the market.

Compared to the stock market, share prices is the perceived value of (prospective) investors on how much the company actually value. Discounted cash flows, price-to-earnings ratio or other financial ratio are used to determine how a company is under or over-valued. There is a fundamental valuation to predict share prices of these listed companies.

Token pricing, however, does not based on project development forecast or nature of the business or type of token itself. As investors can profit by capital gain, most of decision making were based on hype of the token. (EY, 2017) study shows that ICO valuation is based on FOMO that leads on extreme token volatility in post-ICO trading. Irregular return pattern can be found in most of the tokens after ICO period.

Information asymmetry is the most important issue in pricing these tokens. Hype-based valuation of the token had started since the beginning of ICO project announced. As mentioned before, (Howell, Niessner, & Yermack, Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales, 2018) stated that ICO projects that can minimize information asymmetry would have higher chance to succeed in raising capital. Whitepapers containing team with entrepreneur experience is one of the important factors. At the same time, these lists of teams with widely-known venture capitalists created the hype for ICO. Unfortunately, there has been found on many cases that teams listed in ICO projects are fake; by using someone's identity without consent or just randomly using pictures from internet. For example, Benebit, a platform using blockchain token system to unify customer loyalty programs, are found to be scam, where photos of teams appeared to be stolen from a UK school with boys. These fake founders able to took US\$2-4 million.

In the quantitative analysis, we used hype-score from icorating.com as a proxy for prospective future demand. This hype-score assessment is derived from social media activity. Needless to say, social media also has important role in creating hype for ICO; words of mouth from influencers, create bigger hype in the market. Social media is also the medium for these ICO projects to communicate with its investors, any updates regarding their progress will be shared to public using these platforms. While it is one of the main source of

information, at the same time, it created bigger information asymmetry in the market since the developers cannot control every information that has been circulating among users.

4.3. Correlation between hype score and circulating supply

Using Kruskal-wallis to seek any association between hype score and business type, results seen on Table 4.6 and Table 4.7 show that both has no significance, where $X^2(2) = 12.544$, $p = 0.324$. Mean rank ranging from 113.88 – 188.63.

Table 4.6 Descriptive statistics for hype score and business type

	N	Mean	Std. Deviation	Minimum	Maximum
hype_score	291	1.33	.749	0	3
business_type	291	3.63	3.078	0	11

Table 4.7 Kruskal-Wallis Test result for hype score and business type

		Ranks	
business_type		N	Mean Rank
hype_score	Blockchain infrastructure	54	149.05
	Exchange & wallets	36	136.08
	Social media & communication	38	125.88
	Business services	27	139.63
	Computing & data storage	43	162.55
	Financial services	19	161.55
	Gaming & VR	16	134.03
	Trading	16	136.25
	Investment	15	172.63
	Banking & payment	11	144.73
	Betting & casino	8	113.88
	Marketing	8	188.63
	Total	291	

Test Statistics^{a,b}

hype_score	
Kruskal-Wallis H	12.544
df	11

Asymp. Sig.	.324
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a. Kruskal Wallis Test

b. Grouping Variable: business_type

Alike business type, no significance found between hype score and token type. As seen in Table 4.8 and Table 4.9, Kruskal-wallis test results shows $X^2(2) = 1.708$, $p = 0.426$. Mean rank for utility, payment and security token is 144.48, 135.14 and 162.79, respectively.

Table 4.8 Descriptive statistics for hype score and token type

	N	Mean	Std. Deviation	Minimum	Maximum
hype_score	291	1.33	.749	0	3
token_type	287	.29	.569	0	2

Table 4.9 Kruskal-Wallis Test results for hype score and token type

Ranks			
	token_type	N	Mean Rank
hype_score	utility	222	144.48
	payment	48	135.14
	asset	17	162.79
	Total	287	

Test Statistics^{a,b}

hype_score	
Kruskal-Wallis H	1.708
df	2
Asymp. Sig.	.426

a. Kruskal Wallis Test

b. Grouping Variable: token_type

There was no significance found between hype score and business type nor token type. Circulating supply, however as seen in Table 4.10, indicates a positive relationship with hype score, where $r = 0.127$, $p = 0.033$. This support the view

that decision making process of most investors are still heavily based on FOMO. Hype score represents potential demand of tokens. The positive relationship between hype score and circulating supply implies that investors are more attracted to the widely known ICO projects, rather than performing fundamental valuation on how the ICO projects future development, or how far they have achieved from what was stated in their whitepaper.

Table 4.10 Spearman correlation test results for hype score and circulating supply

			hype_score	circulating_supply
Spearman's rho	hype_score	Correlation Coefficient	1.000	.127*
		Sig. (2-tailed)	.	.033
		N	291	282
	circulating_supply	Correlation Coefficient	.127*	1.000
		Sig. (2-tailed)	.033	.
		N	282	282

*. Correlation is significant at the 0.05 level (2-tailed).

5. Conclusion and future research

Based on the results on quantitative and qualitative analysis, we found a few points to be noted related to ICO projects. First, as ICO market has already expand to a range of business type, there is an association found between whether a project stays in the cryptocurrency market and what kind of business the ICO projects bring. We categorized 12 kind of business type and found that the mean differences between each business type is significant. Appropriate use of blockchain technology offers a distinctive value proposition for any business, in regards with eliminating transaction cost and ability to raise capital without limit and borders. This finding implies that not any business type can do so with ICO. Those related to blockchain infrastructure or fulfilling its original purpose as alternative fiat currency seemed value more or not as risky as the ones claiming innovating a brand-new industry, in the perspective of investors.

In the problem statement, we discussed that information asymmetry is one of the main reasons of why there are so many failed ICO, both that are not reaching its funding goals and those that are surviving in period of below average. On the other side, there are investors that are less knowledgeable and based their investing decision on the hype. This then leads to the second point, circulating supply has relationship with hype score and negative relationship with number of days in the cryptocurrency market. Hype score represent investors' enthusiasm towards particular ICO, assessed by social media activity, which should represent potential demand of token. Positive relationship with circulating supply implies that tokens with higher circulating supply are more in demand rather than those that are lower. But the fact that circulating supply has negative relationship with actual days or period of token staying in the cryptocurrency market signals that there are many more investors that decide their investing decisions on fear of missing out.

Finally, all the points above lead to how current valuation of tokens are not reflected in their pricing in the market. Market capitalization shows no significance with any of the independent variables. There have been quite a few studies trying to develop a valuation model for each of the token type. However, current condition shows that cryptocurrency is still an unpredictable market. All in all, it requires collaboration between venture, investors and regulators to capture the value proposition of blockchain technology due to its ability to increasing transparency while minimizing transaction costs, thus developing an efficient financial tool.

This report shows that as of present time, ICO market is still highly inefficient, where investors' decision making is rather based on FOMO instead of fundamental valuation, thus token price volatility does not represent its performance nor value of the project.

In the near future, it is expected that this condition will change. With bearish market eliminating poor performing and fake or scams ICOs, more business venture will compete to pursue the value proposition of blockchain technology, making more effort in minimalizing the information asymmetry between them and their platform users.

New development on tokenization is also taking place. Security tokens offerings, for example, are created to mitigate customers protection issues. Regulations towards ICO are still being processed in many countries. Since there are a lot of variables changing, more study is required to cover valuation of ICO projects post ICO period, what affects them and how investors behavior changes when certain variables changing.

References

- Adhami, S., Giudici, G., & Martinazzi, S. (2018). Why do businesses go crypto? An empirical analysis of initial coin offerings. *Journal of Economics and Business*.
- Balcilar, M., Bouri, E., Gupta, R., & Roubaud, D. (2017). Can volume predict Bitcoin returns and volatility? A quantiles-based approach. *Economic Modelling*.
- Baur, D. G., Hong, K., & Lee, A. D. (2018). Bitcoin: Medium of exchange or speculative assets? *Journal of International Financial Markets, Institution & Money*.
- Benedetti, H., & Kostovetsky, L. (2018). Digital Tulips? Returns to Investors in Initial Coin Offerings.
- Bohme, R., Christin, N., Edelman, B., & Moore, T. (2015). Bitcoin: Economics, Technology, and Governance. *The Journal of Economic Perspectives, Vol. 29, No. 2 (Spring 2015)*, 213-238.
- Cong, L. W., Li, Y., & Wang, N. (2018). Tokenomics: Dynamic Adoption and Valuation.
- Deloitte. (2018). *ICOs – The New IPOs? How to Fund Innovation in the Crypto Age*. Deloitte.
- Deloitte. (2019). *Are Token Assets the Securities of Tomorrow?* Deloitte.
- Dhyrberg, A. H. (2016). Bitcoin, gold and the dollar –A GARCH volatility analysis. *Finance Research Letter*, 85-92.
- EY. (2017). *EY Research: initial coin offerings (ICOs)*.
- Fisch, C. (2018). Initial coin offerings (ICOs) to finance new ventures. *Journal of Business Venturing*.
- Forbes. (2018, March 29). *Why A Crypto Bear Market Would Only Bring The Best ICOs*. Retrieved from Forbes: <https://www.forbes.com/sites/naeemaslam/2018/03/29/why-crypto-bear-market-would-only-bring-the-best-icos/#483a69ad31d2>
- Forbes. (2018, January 9). *Why Your ICO Investment Is Going To Zero*. Retrieved from Forbes: <https://www.forbes.com/sites/tromero/2018/01/09/why-your-ico-investment-is-going-to-zero/#36ad39d53922>
- Howell, S. T., Niessner, M., & Yermack, D. (2018). Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales. *Review of Financial Studies*.
- icobench. (2018). *ICO Market Analysis 2018*. icobench.
- icorating. (2017). *ICOrating Annual Report 2017*. icorating.
- Kristoufek, L. (2015). What Are the Main Drivers of the Bitcoin Price? Evidence from Wavelet Coherence Analysis. *PLoS ONE*.
- Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System*. Retrieved from

www.bitcoin.org: www.bitcoin.org

Pazos, J. (2019). Valuation Method of Equity-based Security Token Offerings (STO) for Start-Up Companies. *The JBBA*.

PwC. (2018). *Initial coin offerings - Legal Frameworks and regulation for ICOs*. Retrieved from PwC Switzerland: <https://www.pwc.ch/en/industry-sectors/financial-services/fs-regulations/ico.html>

Zetsche, D. A., Buckley, R. P., Arner, D. W., & Fohr, L. (2017). THE ICO GOLD RUSH: IT'S A SCAM, IT'S A BUBBLE, IT'S A SUPER CHALLENGE FOR REGULATORS. *University of Luxembourg Law Working Paper No. 11/2017*.

Appendix

1. Descriptive statistics for market capitalization and business type

	N	Mean	Std. Deviation	Std. Error
Blockchain infrastructure	81	269068325.2469	1640718153.5474	182302017.06083
Exchange & Wallets	60	31143018.2500	111431824.96541	14385786.74428
Social media & communication	65	5720179.6769	14393034.77414	1785236.24814
Business services	54	9805731.0370	33832053.97616	4603959.39955
Computing & data storage	59	9329225.2712	19601920.30371	2551952.65747
Financial services	41	3656142.8537	7014852.74031	1095535.94155
Gaming & VR	25	8935021.5600	15604511.60895	3120902.32179
Trading	25	5927576.8000	10870716.72856	2174143.34571
Investment	21	10014256.9048	12922450.48471	2819909.88145
Banking & payment	33	8358446.1212	13330585.01295	2320556.99157
Betting & Casino	12	5432871.5000	7486434.57428	2161147.50837
Marketing	20	1741782.3000	3504717.56832	783678.67247
Total	496	52867915.1673	667821137.23280	29986054.26314

	95% Confidence Interval for Mean		Minimum	Maximum
	Lower Bound	Upper Bound		
Blockchain infrastructure	-93724250.5267	631860901.0205	52779.00	1.46E+10
Exchange & Wallets	2357125.4645	59928911.0355	21.00	7.84E+8
Social media & communication	2153760.2840	9286599.0698	4367.00	8.84E+7
Business services	571357.9088	19040104.1653	77537.00	2.34E+8
Computing & data storage	4220937.0180	14437513.5244	188835.00	1.05E+8
Financial services	1441982.1230	5870303.5843	10486.00	3.65E+7
Gaming & VR	2493795.7471	15376247.3729	36152.00	5.13E+7
Trading	1440365.4760	10414788.1240	27464.00	4.38E+7
Investment	4132027.9675	15896485.8421	428983.00	4.91E+7
Banking & payment	3631626.2097	13085266.0327	26521.00	7.30E+7
Betting & Casino	676217.9053	10189525.0947	21628.00	2.44E+7
Marketing	101523.9876	3382040.6124	7123.00	1.49E+7
Total	-6047724.4552	111783554.7899	21.00	1.46E+10

2. ANOVA test result – market capitalization and business type

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	45567867318858 92600.000	11	41425333926235 3860.000	.927	.514
Within Groups	21620582357889 3780000.000	484	44670624706383 0140.000		
Total	22076261031077 9670000.000	495			

3. Descriptive statistics for market capitalization and token type

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound
utility	372	64041115.7769	769740653.81849	39909193.77400	-14435476.9045
payment	93	23041415.7957	90265926.87095	9360140.58452	4451368.6560
asset	23	8148351.8261	13696807.86791	2855981.86703	2225407.9496
Total	488	53593358.2582	673259261.86077	30477014.77630	-6289315.8715

	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
utility	142517708.4583	4367.00	1.46E+10
payment	41631462.9354	21.00	7.84E+8
asset	14071295.7025	158640.00	4.91E+7
Total	113476032.3879	21.00	1.46E+10

4. ANOVA test results for market capitalization and token type

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17491478555364 5472.000	2	87457392776822 736.000	.192	.825
Within Groups	22057148761724 2040000.000	485	45478657240668 4610.000		
Total	22074640240279 5700000.000	487			

5. Descriptive statistics for market capitalization and circulating supply

	Mean	Std. Deviation	N
market_cap	52762090.3903	667151762.14239	497
circulating_supply	4004458372.7867	38400264576.380	497
		64	

6. Pearson correlation test results for market capitalization and circulating supply

		market_cap	circulating_supply
market_cap	Pearson Correlation	1	.005
	Sig. (2-tailed)		.905
	N	497	497
circulating_supply	Pearson Correlation	.005	1
	Sig. (2-tailed)	.905	
	N	497	497