INDONESIA CRYPTOCURRENCY EXCHANGE:

RISKS, REGULATIONS AND USERS PROTECTION

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Abstract

Indonesia is the world's fourth most populated country, the world's 10th largest economy in terms of purchasing power parity, however 80% of the population is unbanked. Indonesia can bring great benefit to the economy of the country by implementing digital revolution. The 2008 financial crisis has sparked global interest in an alternative, decentralized virtual currency system called 'Bitcoin', based on cryptographic principles and peer-to-peer technology for transaction management, offering innovative concepts for future financial systems. As the cryptocurrency market matured, cryptocurrency exchanges emerged to provide interfaces between existing cryptocurrency markets, traditional financial services and fiat currencies. However, these business activity of cryptocurrency exchanges present risks to consumers. As regulators around the world are eager to regulate cryptocurrency exchanges, Indonesia's regulators are also preparing to regulate cryptocurrency exchanges.

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1. Introduction

1.1 Background

Indonesia is the world's fourth most populated country, the world's 10th largest economy in terms of purchasing power parity, the largest economy in South East Asia and also the member of the G20[1]; however 80% of the population is unbanked[2] due to limited access of banks across the islands of Indonesia. This particular reason made Indonesia suitable for adoption of digital currency such as cryptocurrency[3] that only requires internet to access. Moreover, Indonesia's internet penetration is expected to gradually increase from 39.7% in 2017 to 49.89% in 2022.[4] Furthermore, McKinsey's research also found that Indonesia can realize profit of approximately US$150 billion annually in 2025 by adopting digitalization across key sectors such as manufacturing; retail; transport; mining; agriculture; telecom and media; healthcare; public sector and utilities; and financial[5]. In other words: a digital revolution in Indonesia can bring great benefit to the economy of the country.

In the past half century, the technological advances have provided great cost efficiencies to business and consumers such as 'cost savings in loan servicing due to management information systems and data processing automation'[6]. Moreover, financial technology (fintech) firms enable the world to leverage unused assets in the 'sharing economy'[7]. Globally, ecommerce has relied almost entirely on financial institutions to process electronic payments[8], as result consumers need to pay a certain amount of transaction cost for the provided services. In 2009, Satoshi Nakamoto

[1] 'The World Bank in Indonesia' (World Bank, 2018) <http://www.worldbank.org/en/country/indonesia/overview#1> accessed 23 August 2018.
[2] Sharon Lam, 'Indonesia Is Ripe For Cryptocurrency Disruption -- Could It Be Asia's Next Bitcoin Hub?' [2018] Forbes <https://www.forbes.com/sites/lamsharon/2017/11/01/indonesia-is-ripe-for-cryptocurrency-disruption-could-it-be-asias-next-bitcoin-hub/#6c23069a7309> accessed 23 August 2018..
[3] id
[4] https://www.statista.com/statistics/254460/internet-penetration-rate-in-indonesia/
[5] McKinsey Indonesia Office, 'Unlocking Indonesia'S Digital Opportunity' (McKinsey & Company 2016) <https://www.mckinsey.com/~/media/McKinsey/Locations/Asia/Indonesia/Our%20Insights/Unlocking%20Indonesias%20digital%20opportunity/Unlocking_Indonesias_digital_opportunity.ashx> accessed 23 August 2018.
[6] Lawrence J. Trautman, 'Is Disruptive Blockchain Technology The Future Of Financial Services?' (2016) <https://ssrn.com/abstract=2786186> accessed 23 August 2018.
[7] id
[8] Satoshi Nakamoto, 'Bitcoin: A Peer-To-Peer Electronic Cash System' (Bitcoin.org, 2018) <https://bitcoin.org/bitcoin.pdf> accessed 23 August 2018 (Bitcoin P2P)

published a white paper “Bitcoin: A peer-to-peer Electronic Cash System”, claiming that Bitcoin is the solution to improve payment efficiency by reducing transaction costs. Following the paper, Satoshi release the Genesis Block to the public which allows the public to run the hash algorithm on block transactions and store the result into the public ledger with Bitcoin as the reward, now known as ‘mining’ process[9]. The paper mapped a concept of ‘a completely new currency-not backed by any government or redeemable for any commodity, which could be moved anonymously across borders, absent the control of any government body’.[10] The structure of the network requires the public disclosure of every transaction so that they may be authenticated, whilst the identities of the parties to each transaction are kept anonymous. Bitcoin provides a cheap form of payment system and that possibility has brought public attention to cryptocurrency as an alternative payment system.[11]

Interest in Bitcoin has grown at an increasing pace in recent years, Coinmarketcap reported that there is more than 17 million of bitcoins in circulation by market capitalization of US$110 billion with one bitcoin being valued at US$6,406.93.[12] The innovation of bitcoin has spurred the creation of many new cryptocurrencies, known as altcoins, which use similar cryptographic techniques as bitcoin, but apply various algorithmic designs.[13] As of February 8, 2018, there are over 1,500 cryptocurrencies with a total market capitalization of US$400 billion, with bitcoin dominating one third of the market capitalization[14]. Besides Bitcoin, Ethereum is the second most traded cryptocurrency, with a market capitalization of US$30 million, and each Ethereum trading at a price of US$298.46[15]. The similarities between these cryptocurrencies lie in ‘the public ledger

[9] Brian Yahn, 'A Brief History of Bitcon – Hacker Noon' (Hacker Noon, 2018) <https://hackernoon.com/a-brief-history-of-bitcon-cf358da30bf0> accessed 23 August 2018.
[10] Jonathan B Turpin, 'Bitcoin: The Economic Case for a Global, Virtual Currency Operating in an Unexplored Legal Framework' (2014) 21 Indiana Journal of Global Legal Studies <https://www.repository.law.indiana.edu/cgi/viewcontent.cgi?article=1557&context=ijgls>.
[11] David Kuo Chen Lee., Handbook of Digital Currency: Bitcoin, Innovation, Financial Instruments, And Big Data (1st edn, Elsevier 2015). p. xxii (Handbook 2015)
[12] 'Cryptocurrency Market Capitalizations | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/> accessed 19 August 2018.
[13] Cryptocurrency: A new Investment Opportunity
[14] J.P. Morgan, 'Decrypting Cryptocurrencies: Technology, Applications and Challenges' (JP Morgan 2018) <https://forum.gipsyteam.ru/index.php?act=attach&type=post&id=566108> accessed 6 April 2018.
[1515] 'Cryptocurrency Market Capitalizations | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/> accessed 19 August 2018.

(known as 'blockchain') that is shared between network participants'[16] The emergence of cryptocurrency exchanges that facilitate conversion between cryptocurrency and fiat currency (such as Euro and Dollar), is one of the factors that initiate the extensive adoption of cryptocurrency[17].

Before the advent of cryptocurrency exchanges, cryptocurrency could only be acquired either by mining, or by informally trading cryptocurrency between other participants[18]. Due to the rise of cryptocurrency exchanges, people can easily acquire cryptocurrency over its Website[19]. Besides that, cryptocurrency exchanges also establish 'an accepted exchange rate' which consecutively creates a market price for cryptocurrency. As of August 19, 2018, Coinmarketcap reported that 205 cryptocurrency exchanges are operating worldwide. Currently, the most popular cryptocurrency exchange is Binance, with an average daily transaction of US$972,036,500[20]. In the recent years, the increase in market price of cryptocurrencies has made cryptocurrency exchanges, which handle and store large amounts of cryptocurrencies become popular target for criminals.

Many events have led to cryptocurrency exchanges losing their users funds, several of scenario were employed covering from outside server breaches to insider theft.[21] For instance, over 850,000 Bitcoins were stolen from Mt. Gox after the system was hacked in 2014 which leads the exchange to file for bankruptcy under the Japanese law[22]. At the time of the hack, Mt. Gox was the largest cryptocurrency exchange in the world that accounted for 70% of cryptocurrency transactions globally[23]. Recently, Coincheck, a Japanese cryptocurrency exchange confirmed

[16] Garrick Hileman and Michel Rauchs, '2017 Global Cryptocurrency Benchmarking Study' (Global 2017) <http://dx.doi.org/10.2139/ssrn.2965436> accessed 10 April 2018.
[17] Decker C and others, 'Making Bitcoin Exchanges Transparent' (Distributed Computing Group 2018) <https://www.tik.ee.ethz.ch/file/b89cb24ad2fa4e7ef01426d318c9b98b/decker2015making.pdf>
[18] Ibid
[19] Lee, 'Handbook 2015' (n 11) 560
[20] 'Binance Trade Volume and Market Listings | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/exchanges/binance/> accessed 19 August 2018.
[21] Hileman, 'Global 2017' (n 16) 38
[22] Jim Edwards, 'Hodlers' Complaining About The 'Special Moron' Handling The Mt Gox Sale Are Really Complaining About Bitcoin Itself' (Business Insider, 2018) <https://www.businessinsider.nl/bitcoin-hodlers-complain-mt-gox-bankruptcy-2018-3/?international=true&r=US> accessed 15 August 2018. (Mt Gox)
[23] Ibid

that over $524,000,000 worth of cryptocurrency were stolen.[24] In addition to these exchanges, many others have closed due to the security attacks and poor management. Security flaws and hacks have been a major concern for cryptocurrency exchanges and its users, with such thefts at times warding off potential investors. The peer-to-peer and decentralized nature of cryptocurrencies presents considerable challenges to the traditional legal and financial regulatory system. There is no central authority nor set of rules, nor any central record keeping system.[25] In case of any breach, the victim may not be able to produce acceptable legal evidences for recovery of the damages. Most regulatory systems focus on the point at which cryptocurrencies are exchanged with fiat currency, as transaction monitoring of wholly cryptocurrency based transactions are difficult. Among the reasons to have regulations, consumer protection might be one of the best. Indeed, consumers are usually the first victims because of their lack of sophistication and access to the information necessary to protect themselves[26].

Currently, 85% of all exchanges based in Asia-Pacific do not have a license, whereas 78% of North American-based exchanges hold a formal government license or authorization[27]. Even though these cryptocurrency exchanges are not licensed, it still needs to comply with regulation as is in the case of many China-based cryptocurrency exchanges[28]. The anonymity of cryptocurrency transactions also presents a money laundering risk. At present, the most active approach to legal and regulatory oversight of cryptocurrency exchange involves application of laws and rules governing the transmission of money[29]. These laws have primarily focus on the prevention of money laundering, legal requirements are designed to block money laundering. These has been ‘the most popular vehicles applied by government to monitor and influence

[24] Rob Wile, 'Inside the World’s Biggest Cryptocurrency Hack—And How the Scammers Pulled It Off' [2018] Time <http://time.com/money/5123018/coinchec-nem-hack-how-the-hackers-pulled-it-off/> accessed 10 March 2018.
[25] Ryan Middlemas, 'Allen & Overy: Bitcoin Theft: Regulatory Response to an Emerging Technology' (Allen & Overy: Investigations Insight Blog, 2018) <http://www.aoinvestigationsinsight.com/bitcoin-theft-regulatory-response-emerging-technology/> accessed 14 April 2018.
[26] Tara Mandjee, 'Bitcoin, Its Legal Classification and Its Regulatory Framework' (Digital Commons at Michigan State University College of Law, 2015) <http://digitalcommons.law.msu.edu/jbsl/vol15/iss2/4> p. 193 (Legal Classification)
[27] Hileman, ‘Global 2017’ (n 16) 36
[28] Ibid
[29] Sarah Jane Hughes and Stephen T. Middlebrook, 'Advancing a Framework for Regulating Cryptocurrency Payments Intermediaries' (2015) 32 Yale Journal on Regulation https://ssrn.com/abstract=2673762 504 (Advancing Framework)

cryptocurrency systems and transactions'[30]. These laws were likely to focus on 'registration, monitoring, and reporting requirements for all parties engaged in money transmission'[31].

With the rise of technologies in recent years, it is also a new world for the policymakers to regulate. According to Brito, regulation on technologies should also take into consideration the increasingly high cost of information control into their cost-benefit calculus[32]. Brito suggested that policymakers needs 'to discover and pursue strategies consistent with the new reality'[33] such as by 'legalizing and normalizing these activities, along with promoting education'[34]. In that sense, regulation to control technology should be the last resort for policymakers. In contrast, Hughes and Middlebrook stated that failure to regulate technology might cause market distortions and delay adoptions of technology, which is essential factor to finance 'the next generation of development'[35]. As regulators around the world are eager to regulate cryptocurrency exchanges, Indonesia's regulators are also preparing to regulate cryptocurrency exchanges.

1.2. Research Question

To address these issues, this thesis will try to answer the research question as follow:

1. To what extent should regulation address cryptocurrency exchanges risks to cryptocurrency exchange users and their concerns in Indonesia?

To help answer the main research question, these two sub-questions will be discussed and answered:

a) What are the risks when users engage with cryptocurrency exchange?
b) What are the concerns of cryptocurrency exchange users in Indonesia?

1.3 Research Methodology

This thesis examines a phenomenon largely overlooked in existing literature. In the second section, we will identify the development of technology in cryptocurrency, especially

[30] Jeffrey H Matsuura, Digital Currency: An International Legal and Regulatory Compliance Guide (Bentham Science 2016). 9 (Digital Currency)
[31] Ibid 9
[32] Jerry Brito, Houman B. Shadab and Andrea Castillo, 'Bitcoin Financial Regulation: Securities, Derivatives, Prediction Markets, & Gambling' (2014) XVI SSRN Electronic Journal https://ssrn.com/abstract=2423461 218 (Bitcoin Financial)
[33] Ibid 220
[34] Ibid 221
[35] Hughes, 'Advancing Framework' (n 27) 500

cryptocurrency exchanges. With the data collected from literature, we will identify the development of business models of cryptocurrency exchanges throughout the years. Further, we will identify the risks of cryptocurrency exchanges from online sources, books, papers, journals and other informative presentation materials.

In the fourth section, we examine the three countries that currently have regulations on cryptocurrency exchanges, that is: United States, Japan, and Singapore. We identify United States as the first country with regulation on cryptocurrency exchanges. Further, we identify Japan because of its regulation on cryptocurrency exchanges that enhance in the consumer protection aspects. We also identify Singapore as a country known for its light touch on fintech.

The fifth section will discuss the climate of regulating cryptocurrency exchanges in Indonesia. In the first sub-section, we will discuss cryptocurrency exchange development in Indonesia by using Indodax, a cryptocurrency exchange that accounted for 70% cryptocurrency transaction in Indonesia, as the model. Next, we provide the current regulatory approaches in Indonesia towards cryptocurrency exchange. The last sub-section will examined the current users concerns on cryptocurrency exchanges using data that we collected through a survey.

1.4 Contribution

This research intends to provide analysis in regards of regulating cryptocurrency exchanges. Most of transactions involving cryptocurrency took place on cryptocurrency exchanges. As the demand for cryptocurrency increases, consequently the number of cryptocurrency exchange users also increase in Indonesia. With this thesis, we aim to propose an approach for Indonesia regulators towards cryptocurrency exchanges, which might be applicable for other industries in the cryptocurrency market.

2. Current Development of Cryptocurrency Exchange

2.1 Cryptocurrency

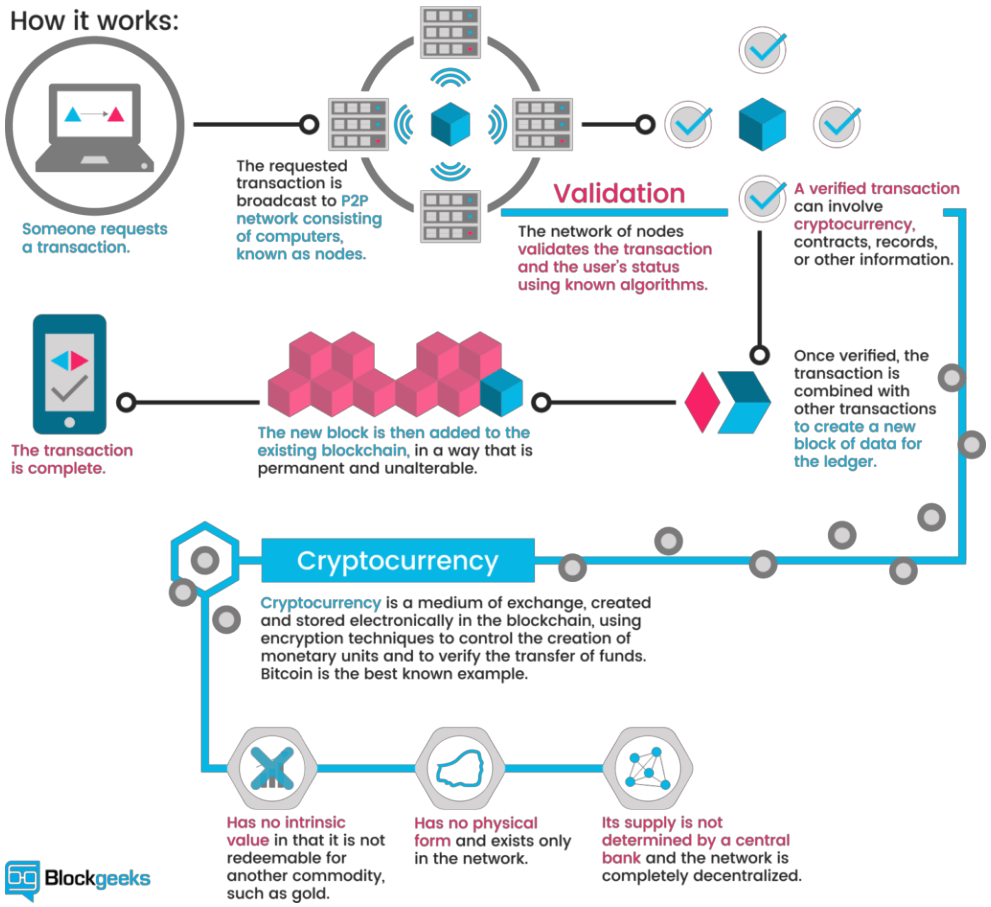
The global financial crisis in 2008 has provoked considerable interest in cryptocurrency. ‘As public trust in the current structure of the financial system crumbles, alternative concepts become more

relevant and introduce innovative concepts for future currency systems'[36]. The interest on cryptocurrency was revived when a white paper by Satoshi Nakamoto was circulated online in 2008. The paper introduced a digital currency that is widely known today as bitcoin[37]. Between its creation in 2009 and January 2018, Bitcoin has risen over 500,000,000% in value[38]. 'These innovations and the perceived investment potential'[39] have led to rapid and exponential creation of new cryptocurrencies, with 1,604 cryptocurrencies currently in existence[40]. Ranked by market capitalization, the top ten of these cryptocurrencies as of July 25, 2018 were: Bitcoin (US$140 billion); Ethereum (US$47 billion); Ripple (US$17 billion); Bitcoin Cash (US$14 billion); EOS (US$7,6 billion); Stellar (US$5,6 billion); Litecoin (US$4,9 billion); Cardano (US$4,3 billion); IOTA (US$2,7 billion); and Tether (US$2,5 billion)[41]. In general, bitcoin and these other cryptocurrencies share 'the similar cryptography[42] technology, but employ different algorithmic design'[43].

In effort to understand cryptocurrency, it requires to understand the Bitcoin functions which underlies these cryptocurrencies. 'Bitcoin is a revolutionary internet-wide payment system that does not rely on a central authority to secure and control its money supply'[44]. Instead, bitcoin relies on the principles of cryptography to validate transactions and govern the production of the currency itself'[45]. The cryptography techniques of bitcoin requires that each user be assigned two "keys," one private key that is kept secret like a password, and one public key that can be shared

[36] Florian Glaser and others, 'Bitcoin - Asset or Currency? Revealing Users' Hidden Intentions' ECIS 2014 (Tel Aviv) <https://ssrn.com/abstract=2425247> 1
[37] Nakamoto, 'Bitcoin P2P' (n 8) 1
[38] Edmund Mokhtarian and Alexander Lindgren, 'Rise of the Crypto Hedge Fund: Operational Issues and Best Practices for Emergent Investment Industry' [2018] Stanford Journal of Law, Business, and Finance, Forthcoming https://ssrn.com/abstract=3055979 (Crypto Hedge Fund)
[39] David Lee Kuo Chuen, Li Guo and Yu Wang, 'Cryptocurrency: A New Investment Opportunity?' (SSRN, 2018) <https://ssrn.com/abstract=2994097>. (Investment Opportunity)
[40] 'Cryptocurrency Market Capitalizations | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/> accessed 25 July 2018.
[41] Ibid
[42] Cryptography is the science of secure communication. It involves taking information and scrambling it in such a way that only the intended recipient can understand and use that information for its intended purpose. The process of scrambling the message is encryption, and unscrambling it is decryption, performed through complex mathematical techniques.(Cryptoassets p.14)
[43] Lee, 'Investment Opportunity' (n 36) 16
[44] Mandjee, 'Legal Classification' (n 24) 161
[45] Edward V Murphy, M. Maureen Murphy and Michael V Seitzinger, 'Bitcoin: Question, Answers, And Analysis of Legal Issues' (Congressional Research Service 2015) <https://fas.org/sgp/crs/misc/R43339.pdf> 1 (Bitcoin Report)

with the world similar to user's credential[46]. When a bitcoin is transferred, the sender creates a message called 'transaction' which contain the receiver's public key and signed with the sender's private key. The network then validate the transaction and record the new owner of the funds. The transaction is recorded, time-stamped, and displayed in one 'block' of the blockchain[47]. These process was made possible by 'miners', who is special users on the bitcoin network that contribute theirs computer's processing power to validate transactions in the network[48]. For that reason, miners are rewarded with newly created bitcoin[49]. To summarize, the Bitcoin technology uses cryptographic system in which each transaction using bitcoin is verified on the basis of group consensus and recorded on a distributed public ledger, known as blockchain.



[46] Jerry Brito and Andrea M Castillo, Bitcoin: A Primer for Policymakers (1st edn, Mercatus Center, George Mason University 2016). 2 (Bitcoin Primer)
[47] Ibid 5
[48] Murphy, "Bitcoin Report'(n 43) 2
[49] Ibid

Diagram 2.1 – Transaction Mechanism of Cryptocurrency[50]

The invention of Bitcoin has inspired the creation of other cryptocurrencies that are built on the open-source code[51] underpinning bitcoin. These other cryptocurrencies are 'essentially based on Bitcoin protocol with some distinctions'[52] and mostly known as 'alternative cryptocurrency'. Therefore, the application of these cryptocurrencies rely 'on the principle of cryptography to validate the transactions and generate the currency itself'[53]. Each of these new cryptocurrency operates its own blockchain, which records all transactions of the particular cryptocurrency. In October 2004, a new concept called 'sidechains' was introduced that allows bitcoin to be transferred between blockchain, and thereby facilitate the use of alternative cryptocurrency[54]. In addition, articles from Bank of England stated that indeed the key innovation of these cryptocurrencies is the blockchain, which allow cryptocurrencies to be used in a 'decentralized payment system'[55]. Thus, these cryptocurrencies rely on cryptography principles to maintain and distributed a ledger for recording ownership and value transfer (Halaburda & Sarvary, 2016)

Besides Bitcoin, Ethereum is also one of the widely accepted altcoins with the most innovative ideas. Currently, there are more than 101 million of ethereum circulating in the market with market capitalization of US$27 billion, with 13.49% dominance on the cryptocurrency market.[56] In contrast with bitcoin which is 'mostly used to send monetary value between people', ethereum 'could be used to send information between programs'[57].Ethereum 'extends the blockchain concept with a programming language', which enables users to build and distribute decentralized applications'[58]. In other words, 'developers could write programs, or applications, that would run

[50] 'What Is Cryptocurrency: Everything You Need to Know [Ultimate Guide]' (Blockgeeks, 2018) <https://blockgeeks.com/guides/what-is-cryptocurrency/> accessed 20 August 2018.
[51] The open-source nature of Bitcoin means that the source code is fully disclosed. This disclosure allows any software developer to examine the protocol and create their own versions of the software for testing or further development, and so far, no red flag has been raised as to the presence of Nakamoto or any other party with secret control. (Lee, 'Handbook 2015' (n 11) 15)
[52] Mandjee, 'Legal Classification' (n 24) 164
[53] Ibid 162
[54] Ibid 164
[55] Robleh Ali and others, 'The Economics of Digital Currencies' (Bank of England 2014) <https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/the-economics-of-digital-currencies.pdf?la=en&hash=E9E56A61A6D71A97DC8535FEF211CC08C0F59B30> 277
[56] 'Ethereum (ETH) Price, Charts, Market Cap, And Other Metrics | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/currencies/ethereum/> accessed 23 August 2018.
[57] Chris Burniske and Jack Tatar, Cryptoassets (1st edn, McGraw-Hill 2018) 55
[58] Lee, 'Handbook 2015' (n 11) 220

on top of this decentralized world computer[59]'. Thus, it supports various type of applications, such as 'prediction markets (Augur, Gnosis), banking services (Humaniq), investment or venture capital, (DAO Tokens), and web browsing (Mist)'[60]. Ethereum has its own tokens called ether, which can be used to build and distribute decentralized applications or pay for its usage[61]. In comparison to bitcoin that aimed to be a decentralized world currency, ethereum's goal was to serve as 'a decentralized world computer'[62].

Since the creation of bitcoin, there is on-going debates on whether cryptocurrencies are classified as money, security or commodity. Indeed, cryptocurrency shows certain features that allow it to function 'as a method of payment similar to a currency, and alternatively as a speculative investment or even otherwise'[63]. Traditionally, there are three functions of money such as (i) a store of value; (ii) a means of exchange; and (iii) a unit of account[64]. However, in practice, there are various kinds of cryptocurrencies that exceed the functions of traditional money. For instance, some cryptocurrencies like Ether and Neo, facilitate the automatic execution of contracts using computerized protocol, also known as smart contract[65]. Therefore, cryptocurrencies have exceed the functions of money by also functioning as tools to facilitate contract, to build internet-based applications, and also tools to raise funds[66].

Recently, many cryptocurrencies are issued as a method to raise funds for private entities or individuals, which is similar to private or public offering of stocks or other securities[67]. These newly-created cryptocurrency were offered by the developers to public in the form of an initial coin

[59] Burniske, 'Cryptoassets' (n 54) 55
[60] Mokhtarian, 'Crypto Hedge Funds' (n 36) 123
[61] Lee, 'Handbook 2015' (n 11) 553
[62] Burniske, 'Cryptoassets' 24
[63] Mandjee, 'Legal Classification' (n 24) 164
[64] European Central Bank, 'Virtual Currency Schemes' (European Central Bank 2012) <https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf>. 10
[65] Smart contract is 'a computerized transaction protocol that executes terms of a contract. The general objectives of smart contract design are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, and even enforcement), minimize exceptions both malicious and accidental, and minimize the need for trusted intermediaries. Related economic goals include lowering fraud loss, arbitrations and enforcement costs, and other transaction costs'. (Nick Szabo, Smart Contracts 1994)
[66] Mokhtarian, 'Crypto Hedge Funds' (n 36) 121
[67] Julie Verhage, Camila Russo and Lily Katz, 'What's An ICO? Like An IPO but with Digital Coins' (Bloomberg.com, 2017) <https://www.bloomberg.com/news/articles/2017-09-18/what-s-an-ico-like-an-ipo-but-with-digital-coins-quicktake-q-a> accessed 4 August 2018.

offering (ICO). These ICOs has caught the attention of regulators, for example the United States Securities and Exchange Commission (SEC) has recently issued guidance which categorized the cryptocurrencies issued in ICOs as securities based on the Howey test[68]. Additionally, SEC stated that 'securities law may apply to various activities, including distributed ledger technology, depending on the particular facts and circumstances, without regard to the form of the organization or technology used to effectuate a particular offer or sale'[69]. Instead of creating 'a one-size-fits-all solution'[70], SEC chose to regulate cryptocurrencies based on the particular functionally of each cryptocurrencies[71].

Arguably, cryptocurrency like bitcoin share some similarities with gold, such as (i) 'neither is overseen by a single government', and (ii) 'both have a finite supply' as the last bitcoin will be mined in 2040[72]. On March 6, 2018, a federal judge of the United States ruled that cryptocurrencies such as bitcoin are commodities, and therefore must be regulated by the US Commodity Futures Trading Commission (CFTC). Previously, the CFTC commissioner Bart Chilton stated that bitcoin would come under CFTC supervision as commodity for future delivery. Under US law, bitcoin can indeed fall under the category of commodity under the definition of 'useful articles of commerce' since it is 'traded online for goods and services or dollars'[73] The classification of cryptocurrency remains a controversial subject as there are many uses of cryptocurrency. Due to the various functions of cryptocurrency, it is difficult to apply only one classification on cryptocurrency as it would ignore the realities underlying the use of cryptocurrency.

2.2 Cryptocurrency Exchange

As the cryptocurrency market mature, a sizable cryptocurrency ecosystem emerged comprises diverse set of actors to build interface between public blockchain, traditional financial and various economic sectors that facilitate the use of cryptocurrency to mainstream users. These services

[68] Securities and Exchange Commission, 'Report of Investigation Pursuant To Section 21(A) Of The Securities Exchange Act Of 1934: The DAO' (Securities and Exchange Commission 2017).
[69] Ibid 10
[70] Mokhtarian, 'Crypto Hedge Funds' (n 36) 124
[71] Ibid 125
[72] Mandjee, 'Legal Classification' (n 24) 179
[73] Ibid

are essential as it adds significant value to the cryptocurrencies for being used in the broader economy. Cryptocurrency exchanges were one of the first services to emerge in cryptocurrency industry and establish a market price of cryptocurrency in 2010. Cryptocurrency exchange enables conversion of cryptocurrency into fiat currency or into another form of cryptocurrency, and *vice versa*[74]. Some exchanges are large operations geared towards institutions or fulltime traders, while others are offer simpler services better suited for less experienced traders and retail investors[75]. According to Coinmarketcap, there are currently 206 cryptocurrency exchanges in operation worldwide[76]. In Table 2.1, we include the average daily transaction volumes of 12 largest cryptocurrency exchanges based on CoinmarketCap.

Cryptocurrency exchanges are essential to the cryptocurrency economy by providing a marketplace for trading, liquidity and price discovery of cryptocurrency[77]. Currently, there are 15 million active traders in the cryptocurrency market, that number includes retail and sophisticated institutional investors[78]. A report produced by Cambridge University showed that the cryptocurrency exchanges sector has 'the highest number of operating entities'[79] and employs more people than other industry sectors in the cryptocurrency market such as wallets service provider, payment service provider and mining pools. Binance, a cryptocurrency exchange that started operation since July 2017 is currently the largest cryptocurrency exchange based on the average daily transaction volume of US$ 1 billion, and monthly transaction volume of 33 billion.[80] Binance's founder and CEO, Changpeng Zhao claimed that Binance made profit of US$7,500,000 in the first quarter and US$200,000,000 of profits was amounted in the second quarter.[81] In

[74] Lee, 'Handbook 2015' (n 11) 559
[75] Sarah Hansen, 'Guide to Top Cryptocurrency Exchanges' (Forbes.com, 2018) <https://www.forbes.com/sites/sarahhansen/2018/06/20/forbes-guide-to-cryptocurrency-exchanges/#2c47b8c52572> accessed 19 August 2018.
[76] '24 Hour Volume Rankings (Exchange) | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/exchanges/volume/24-hour/> accessed 24 August 2018.
[77] Hileman, 'Global 2017' (n 16) 30
[78] 'How Is Trading Cryptocurrency Different From Stocks And Forex Trading?' (Forbes.com, 2018) <https://www.forbes.com/sites/quora/2018/02/16/how-is-trading-cryptocurrency-different-from-stocks-and-forex-trading/> accessed 18 August 2018.
[79] Hileman, 'Global 2017' (n 16) 29
[80] 'Cryptocurrency Exchange Rankings | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/rankings/exchanges/> accessed 23 August 2018.
[81] Changpeng Zhao, 'Benefits of Crypto Part 1 - To Countries' <https://www.linkedin.com/pulse/benefits-crypto-part-1-countries-changpeng-zhao?trk=portfolio_article-card_title> accessed 23 August 2018.

addition, he stated that “any country that can attract Binance to open a branch in their location will receive a handsome tax income revenue”.[82]

In the past years, cryptocurrency exchange has grown from a simple exchange service provider into ‘more like a margin-taking balance sheet deploying broker-dealers’[83]. This is due to the increase of varieties in business models of cryptocurrency exchange. Currently, large cryptocurrency exchanges are often ‘set up by well-capitalized institution with the financial resources and track record to build the necessary infrastructure’[84]. Most of large cryptocurrency exchange allows trades on cryptocurrency derivatives, such as future contracts and spot contracts. Most of small exchanges have one or two cryptocurrencies listed on the exchange, while most of large exchanges allows trade to two or more cryptocurrencies[85] (Hileman & Rauchs, 2017).

Even though the blockchain has proven to be very secure, cryptocurrencies have been stolen by hacks from cryptocurrency exchanges (further discussion on 3.1 of this thesis). To avoid this, cryptocurrency exchanges can protect their funds by storing it offline in a cold wallet. This practice involves storing most of users’ deposits in the cold wallet and only small portion of the deposits is transferred to the hot wallet for daily transactions and payments purposes. Therefore, in case of security was breached then losses are limited only to the amount stored in the hot wallet.[86]

There are several important factors that influence the survival time of cryptocurrency exchanges such as transaction volume, security breach, compliance capabilities, backroom and settlement support, and financial strength[87]. Exchanges with high average daily transaction volume prove to be attractive to the liquidity-seeking traders, while it is more likely for exchange with lower transaction volume to shut down. However, it is to no surprise that exchange with higher transaction volume are likely to face security breach. Consequently, cryptocurrency exchanges

[82] ibid
[83] David Lee and Robert Deng, Handbook of Blockchain, Digital Finance, And Inclusion (1st edn, Academic Press 2017). 211 (Handbook 2017)
[84] Monetary Authority of Singapore, 'Consultation Paper On Review Of The Recognised Market Operators Regime' (Monetary Authority of Singapore 2018).
[85] Hileman, ‘Global 2017’ (n 16) 29
[86] World bank paper
[87] Lee, ‘Handbook 2015’ (n 11) 565

that suffered breach are more likely to lose its profits, decrease in cash flow and lose the confidence of its users before subsequently close[88]. Hundreds of cryptocurrency exchanges have emerged worldwide, however 45% closed down eventually with a median lifetime of only 381 days[89].

Compliance capabilities also influence lifetime of cryptocurrency exchange. In effort to curb the criminal activities and provide more security to the network, most regulations require cryptocurrency exchanges to comply with anti-money laundering/ countering the financing of terrorism. Consequently, cryptocurrency exchanges are require to verify customer identity (Know-Your-Customer (KYC)), adopt record-keeping rules and repost suspicious activity (Suspicious Activity Reporting (SAR))[90] (Motsi-Omoijiade, 2018). Thus, cryptocurrency exchanges that operate in countries with greater emphasis on antimony laundering effort are more likely to shut down due to the compliance incapability (Bhaskar & Lee, 2015).

Conceptually, cryptocurrency exchange is similar to a traditional stock exchange since both share the same key function as a place to trade assets.[91] Currently, there are hundreds of cryptocurrency exchanges around the world that provide different kind of services and products. In general, cryptocurrency exchanges can be categorized into centralized and decentralized exchanges (Coindesk, 2018).

2.2.1 Centralized Cryptocurrency Exchange (CE)

A centralized cryptocurrency exchange is a cryptocurrency exchange that have a role of a middleman between buyers and sellers, by matching buy and sell orders through its internal and centralized system. Centralized exchanges provide simple interface for mainstream users that appeals to mainstream users. More than 99% of cryptocurrency transactions run through

[88] Lee, 'Handbook 2015' (n 11) 568
[89] Tyler Moore and Nicolas Christin, 'Beware the Middleman: Empirical Analysis of Bitcoin-Exchange Risk' [2013] Financial Cryptography and Data Security. 3 ('Beware Middleman')
[90] Lee, 'Handbook 2017' (n 79) 565
[91] Benjamin Robertson, Matthew Leising and Andrea Tan, 'New Crypto Exchanges Don't Want (To Hold) Your Money' (Bloomberg.com, 2018) <https://www.bloomberg.com/news/articles/2018-05-07/new-crypto-exchanges-don-t-want-to-hold-your-money-quicktake> accessed 23 August 2018.

centralized cryptocurrency exchange[92]. Centralized exchange are later classified into custodial and non-custodial exchanges.

Custodial Exchange

Most of cryptocurrency exchanges with high daily transaction volume are custodial exchanges, such as Coinbase, Bitfinex, Binance, Gemini etc. Currently, it is reported that 73% of centralized exchanges take custody of users' funds, while 23% allow users to control their own private key[93]. Essentially, custodial exchanges are cryptocurrency exchanges that take custody over users' funds[94]. Custodial exchange provide hosted wallet service on their platform and allow users to store funds in form of cryptocurrency or fiat currency with the exchange. Users can easily access their funds by authenticating a username and password, there is no need of securing a private key when users engage with custodial exchange. While all transactions of cryptocurrency are recorded in the blockchain, the same cannot be say for transactions that involve custodial exchange.

All transactions on the custodial exchange take place 'off the blockchain', meaning that 'transactions may not appear in the public ledger'[95]. In order for users' to perform transactions on the exchange, users are entails to deposit funds into the wallet provided by the particular exchange. Users of the exchange can buy, sell, or trade cryptocurrency with this wallet. All transactions that take place on custodial exchange are recorded on the exchange's order book, and not in the blockchain. Only transactions that involves deposit or withdrawal of the funds are recorded on the blockchain. Additionally, these transactions that are recorded on the blockchain as transactions of the particular exchange and cannot be identified by the users as the details of transactions only available in the exchange's database. Therefore, custodial exchanges manage users' assets through its internal ledger.

[92] Nathan Sexer, 'State of Decentralized Exchanges, 2018 – Consensys Media' (ConsenSys Media, 2018) <https://media.consensys.net/state-of-decentralized-exchanges-2018-276dad340c79> accessed 14 August 2018.
[93] Hileman, 'Global 2017' (n 16) 29
[94] Ibid 12
[95] Hughes, 'Advancing Framework' (n 27) 497

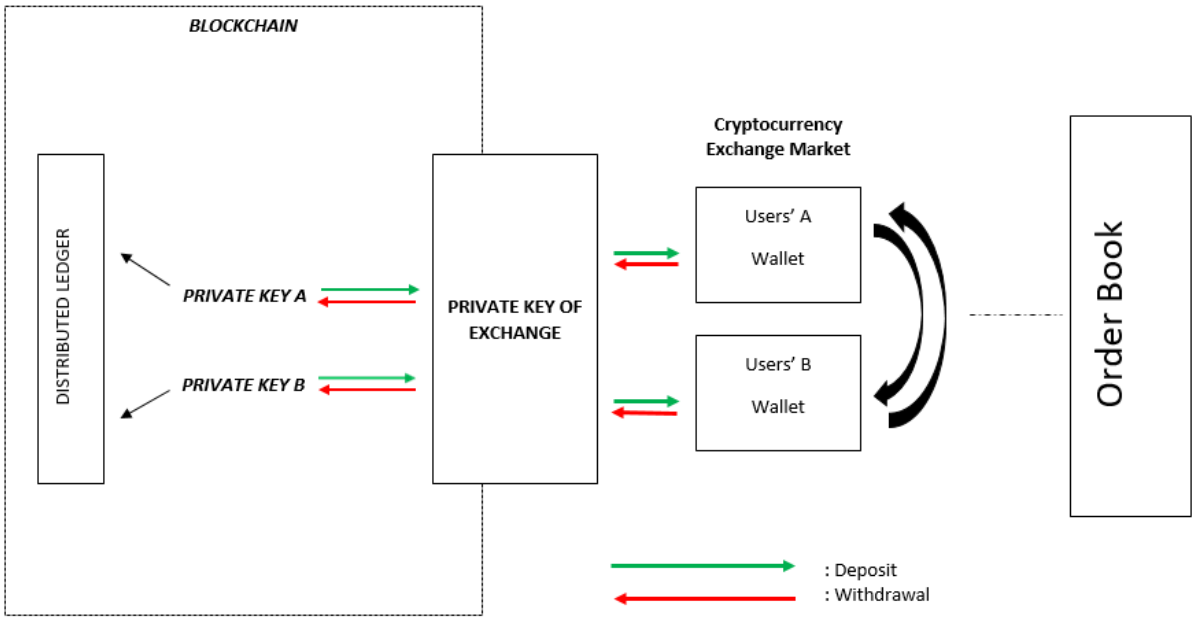


Diagram 2.2 – Centralized Custodial Exchange Mechanism[96]

Custodial exchanges provide simple interface for mainstream users, and for that reason custodial exchanges are widely used by many people. However, these custodial exchange aggregate so much value by holding both user's funds and personal details. It is worth noting that some of these custodial exchanges allows users to link their bank account with the exchange[97]. Due to that, hackers found it worthwhile to launch an attack on the exchange in attempt to gain profits. Especially now with the surge value of cryptocurrency, there have been increasing reports of hacks on cryptocurrency exchanges around the world. Consequently, these exchanges need to improve it security measure by safeguarding user's funds. In that attempt, cryptocurrency exchanges store most of their funds in cold storage, which is 'not accessible from the internet and therefore cannot be intercepted by cyber attacks'[98].

[96] Author
[97] Lee, 'Handbook 2017' (n 79) 560
[98] Pedro Franco, Understanding Bitcoin (1st edn, Wiley 2015). 42

Custodial exchanges hold most of their cryptocurrency funds in cold storage[99] and keep only a small fraction of their funds in online wallets to cover redemptions. 92% of custodial exchanges use cold-storage system to safeguard their funds, with an average of 87% of funds being stored in the cold storage[100]. In order for custodial exchange to perform real-time transaction, custodial exchanges have access to users' funds and manage users' assets through an internal ledger. Consequently, custodial exchanges "manage daily transfers and withdrawal request out of a much smaller pot of liquid cryptocurrencies that they control directly on users' behalf, depositing and receiving sums as and when users' liquidity is required, whilst supposedly parking the excess safely in storage"[101]. Some argue that this practice allows custodial exchange to partake in a form of fractional reserve banking and therefore should invoke fiduciary duties of the exchange[102]. Custodial exchanges act as custodian of cryptocurrency or cryptocurrency credentials belonging to their clients and may facilitate and clear transactions for users without updating the blockchain[103].

Non-Custodial Exchange

Non-custodial exchanges do not have custody of user's funds, by not allowing users to store cryptocurrency with the exchange[104]. Non-custodial exchange only matches order through an internal order book and charge fee for the service, without managing user's personal data and wallet. ShapeShift is one of the most popular non-custodial exchanges that are based in Switzerland. ShapeShift allows anyone to instantly convert one form of cryptocurrency into another without the need to register with the platform.

Services offered by centralized exchange fall into three categories; order-book service, brokerage services and trading platforms. Order-book exchange is a 'platform that use trading engine to

[99] "Cold storage is the cryptocurrency term for the offline bank vaulting the hard drives within which private keys are kept" (https://ftalphaville.ft.com/2016/08/03/2171799/time-to-reevaluate-blockchain-hype/)
[100] Hileman, 'Global 2017' (n 16)
[101] Izabella Kaminska, 'Time to Reevaluate Blockchain Hype' (Financial Times, 2016) <https://ftalphaville.ft.com/2016/08/03/2171799/time-to-reevaluate-blockchain-hype/#> accessed 13 August 2018.
[102] Lee, 'Handbook 2017' (n 79)
[103] Hughes, 'Advancing Framework' (n 27)
[104] Jacob Woods, 'Crypto Exchanges: Custodial vs. Non-Custodial vs. Decentralized' (Medium, 2018) <https://medium.com/@jacobrobertwoods/crypto-exchanges-custodial-vs-non-custodial-vs-decentralized-3d1d04cf205> accessed 14 August 2018.(Crypto Exchanges)

match buy and sell orders from users'[105]. Buy and sell orders are gathered in a centralized order book that runs through an order matching algorithm. Once an order is crossed, the appropriate amount of funds are credited and/or debited from users account. Order book exchange provide advance trading feature in their platform, similar to traditional stock exchanges. It also gives users opportunity to deploy strategies similar to the stock market. For example, users can transact their cryptocurrency at the price prevailing at a given moment or post limit orders, which instruct the exchange to buy or sell on behalf of the users in the future if the price becomes cheap enough or expensive enough. Example of exchanges that provide order-book service are Binance and Bitfinex.

In contrast, brokerage service only allows users to acquire and/or sell cryptocurrencies at the rate provided by the cryptocurrency exchange[106]. Example of cryptocurrency exchange with brokerage service is Coinbase. Brokerage services are the most widely offered service by small cryptocurrency exchange, with 42% small exchanges' activities fall under brokerage service[107]. In addition, trading platform is "a platform that provides a single interface for connecting to several other exchanges and/or offers leveraged trading and cryptocurrency derivatives"[108]. Most of large exchange provides trading platform service with order-book service.

Centralized exchanges are highly exposed to cybersecurity threats. Every centralized exchange has to maintain the transaction volume above a certain level in order to survive in the competitive market. However, at the same time, exchange with high transaction volumes are more attractive and worthwhile for hackers to attack. Notably one-third of centralized cryptocurrency exchanges have been hacked. In the first half of 2018, approximately US$1,1 billion worth of cryptocurrency was stolen[109]. The first biggest cryptocurrency exchange hacking occurred on 2014, Mt. Gox, a Japan cryptocurrency exchange lost approximately 850.000 bitcoins, with the current USD value of approximately US$5,4 billion[110]. During that time Mt. Gox was responsible of almost 70% of all cryptocurrency transaction in the market, consequently the incident has a high impact on cryptocurrency market.

[105] Hileman, 'Global 2017' (n 16) 12
[106] Ibid 30
[107] Ibid
[108] Ibid
[109] Edward, 'Mt Gox'(n 22)
[110] Ibid

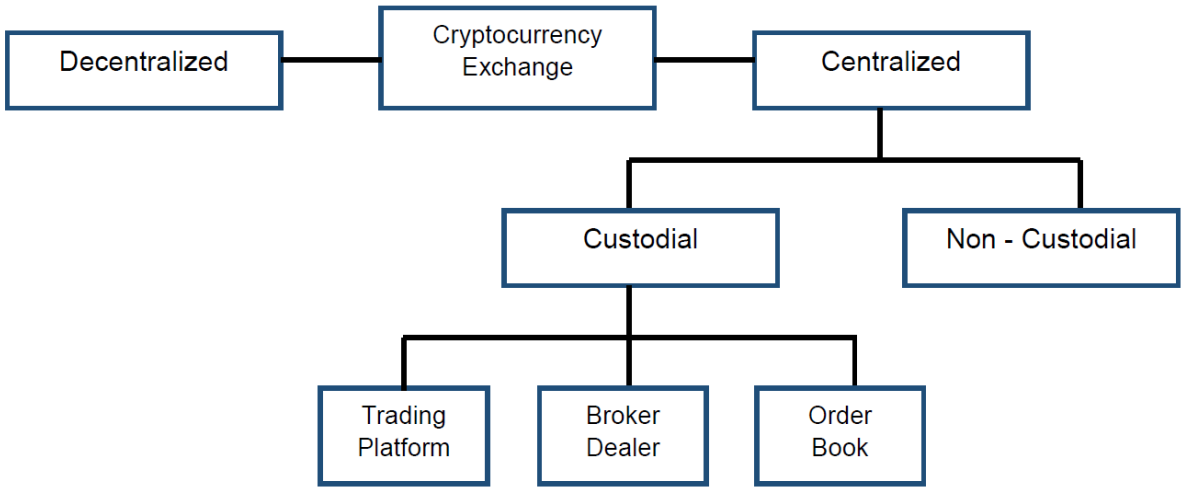


Diagram 2.3 Overview of Cryptocurrency Exchange Development[111]

2.2.2 Decentralized Cryptocurrency Exchange

In the past few years, the world has witnessed several high-profile hacks on centralized cryptocurrency exchanges around the world that lead the cryptocurrency exchanges to halt operation and eventually shutting down. Due to that, decentralized exchanges become more popular alternatives for trading cryptocurrencies by offering more security and transparency to users. Essentially, decentralized exchange do not take custody of users' funds and peer-to-peer transactions are available by automated process. In case of any attack or failure in the decentralized exchange's system, only a single user and their funds are affected.[112]

Decentralized cryptocurrency exchanges are "digital asset exchanges in which users have custody on their own assets"[113] without ever having to trust a centralized counterparty to manage and match orders. Conceptually, decentralized exchanges introduce a platform based on an independent system that runs on distributed ledger. All trades on decentralized exchange are

[111] Author
[112] http://bytemaster.github.io/article/2015/01/07/The-Worlds-First-Decentalized-Exchange/
[113] 'Decentralized Exchanges Are Not Above The Law - Decentralized Legal' (Decentralized Legal, 2018) <https://decentralizedlegal.com/dex/> accessed 10 August 2018.

"direct peer-to-peer transfer of value"[114]. Therefore, decentralized exchange does not hold customer's funds, information, and only serve as "a matching and routing layer for trade orders"[115]. Unlike centralized exchange that aggregate tremendous value in their system with holding user's funds and data, decentralized exchange do not store any valuable data of its users'. This practice of decentralized exchange provides users with more security and transparency than centralized cryptocurrency exchange.

Similar to non-custodial exchange, both exchanges do not require users to store or deposit funds with the exchange. The difference between non-custodial exchange and decentralized exchange is how transactions are recorded. In non-custodial exchange, all transaction are recorded in exchange's private database while all transactions on decentralized exchanges are recorded directly on the blockchain. Decentralized exchange provide more transparency and safety with the immutable digital seal of transactions on the blockchain[116]. Since decentralized exchange runs on a distributed ledger, all transaction on decentralized exchange have the same safety with transactions that took place on blockchain. Decentralized exchange is a new technology that facilitate cryptocurrency trading on the blockchain, by employing smart contracts to match and execute order[117].

When users engage with decentralized exchange, users are not require to send their funds to the exchange. Instead, users hold funds on their private key and 'tap into a public, peer-to-peer software network only to trade'[118]. Decentralized exchange was built as an incentive to solve the problem arise from centralized exchange, such as: hacks on cryptocurrency exchanges and exchange's lack of transparency. This feature of decentralized exchange make it impossible for hackers to steal their funds. However, decentralized exchange also pose a challenge to regulate. Unlike centralized exchanges that have an institution which maintain daily operations,

[114] ibid
[115] ibid
[116] Vince Tabora, 'What Decentralized Exchanges Can Do for Cryptocurrency Trading' (Decentralize Today, 2018) <https://decentralize.today/what-decentralized-exchanges-can-do-for-cryptocurrency-trading-9f2dc6ed31a> accessed 16 August 2018.
[117] Woods, 'Crypto Exchange' (n 104)
[118] Michaela Ross, 'Peer-To-Peer Crypto Exchanges Raise Regulatory Challenges' [2018] Bloomberg Law <https://www.bna.com/peertopeer-crypto-exchanges-n57982091554/> accessed 15 August 2018.

decentralized exchanges are automated programs. Therefore, if a suspicious transactions are detected on the cryptocurrency exchange, there is no one regulators can question.

On paper, decentralized exchange offer a perfect solution for the concern raised by centralized exchanges. However, there are downsides to the current state of decentralized exchanges such as complicated interface, limited functionality and low trading volume[119]. Centralized exchanges are popular and widely use due to its simple interface. For instance, users of centralized exchange do not need to manage its own private keys and can transact easily using username and password provided by the exchange. In contrast, decentralized exchange require users to manage its own private key and no account is provided by the exchange. Lack of simple user interface and user experience limit the adoption of decentralized exchange.

The limited functions on decentralized exchange is one shortcomings of decentralized exchanges. In comparison with centralized exchange, advance trading features are currently not available on decentralized cryptocurrency exchange. Additionally, decentralized exchanges have low transaction volume, due to its complicated interface and lack of trading features. These limitation make it hard for decentralized exchanges to compete with the existing well capitalized centralized exchanges. Currently there are hundreds of projects that works on decentralized cryptocurrency exchange, amongst other: Ox Protocol, Airswap and OmiseGo.

2.3 Conclusion

The 2008 financial crisis has sparked global interest in an alternative, decentralized virtual currency system called ‘Bitcoin’, based on cryptographic principles and peer-to-peer technology for transaction management, offering innovative concepts for future financial systems. The technology behind Bitcoin has sparked a number of alternative cryptocurrencies to be created, creating a global open market for cryptocurrencies. Indeed, the unique technological innovation that is shared between these cryptocurrencies is the blockchain that record ownership and value transfer.

[119] Phil Glazer, 'Decentralized Cryptocurrency Exchanges – Hacker Noon' (Hacker Noon, 2018) <https://hackernoon.com/decentralized-cryptocurrency-exchanges-93039613eeb7> accessed 11 August 2018.

new cryptocurrency exchanges have been created, providing interfaces between existing cryptocurrency markets, traditional financial services and fiat currencies. These cryptocurrency exchanges create marketplace for cryptocurrency to trade and thereby leads to price discovery of the particular cryptocurrency. Cryptocurrency exchanges are vary in terms of the services offered, employing different business models, and catering to different categories of consumers, ranging from retail investors, to institutional investors.

Exchanges operating in the cryptocurrency markets can be generally categorized into centralized exchanges or decentralized exchanges. Centralized exchanges act as a middleman between buyer and seller, providing services through an internal order book by matching sellers and buyers. In the case of a centralized custodial exchange, users are required to deposit funds inside the exchange in order to use its services. Custodial exchange at a minimum, perform three valuable functions; validation, security, and trust. First, cryptocurrency exchange needs to validate transactions by controlling and transferring the funds upon authorization of users. Second, cryptocurrency exchange implement security measures to protect users' funds against internal and external hacks. Third, cryptocurrency exchange generate trust by performing such validation and security functions.

Centralized non-custodial exchanges do not require deposits, but might require fees for their services. Decentralized exchanges are non-custodial exchanges where users do not have to rely on a trusting party in order to execute their orders. The order book is governed by smart contracts, transactions are made peer-to-peer and are automatically recorded on a public blockchain. The development of decentralized cryptocurrency exchange shows that technological solutions are still possible to answer problems raised by centralized cryptocurrency exchange.

3. Risks of Cryptocurrency Exchange to Users

The below section explores the risks posed by the use of cryptocurrency exchanges to its users. As we discussed in previous section, there is an increase in the diversity of business models of cryptocurrency exchanges in the last few years. Thus, the risks presented below are not applicable to every cryptocurrency exchanges, and depends on the type of the cryptocurrency exchange as well as their roles in facilitating the exchange.

3.1 Risk of Loss

Risk of loss is the most concerning risk when users engage with cryptocurrency exchanges. While cryptocurrency is secured with encryption technology, cryptocurrency exchanges are vulnerable to hack. As previously explained, custodial exchanges are responsible for securing users funds that are stored in their hosted wallet service. This practice in which custodial exchanges aggregate so much value, such as users' personal information, funds and transaction history, make exchange attractive target for hackers. Even more, the irreversible nature of cryptocurrency, makes it impossible to retrieve stolen funds.

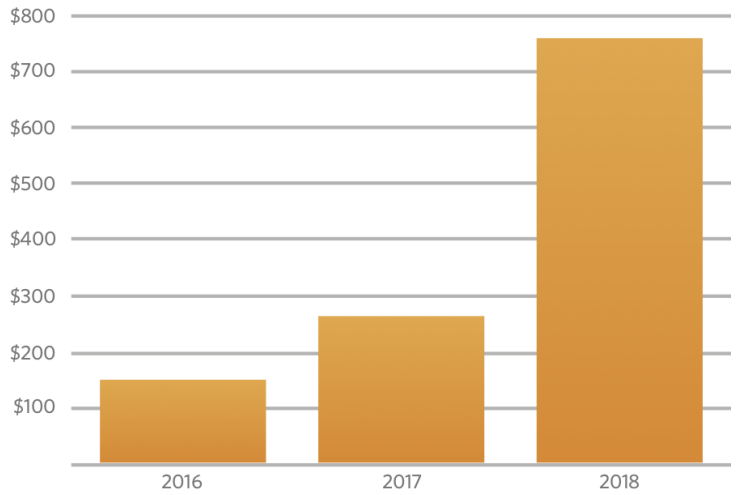


Diagram 3.1 – Amount of Cryptocurrency Stolen 2016-2018[120]

A report from U.S. based cybersecurity firm, CipherTrace, showed that a total of US$761 million worth of cryptocurrency was stolen from cryptocurrency exchange in the first six months of 2018,

[120] CipherTrace, 'Cryptocurrency Anti-Money Laundering Report - Q2 2018' (CipherTrace 2018) <https://info.ciphertrace.com/crypto-aml-report-q218> 4

while US$266 million worth of cryptocurrency was stolen in 2017[121]. In other words, the total amount of cryptocurrency stolen in the last six months have tripled since 2017. In addition, we provide list of reported attacks on cryptocurrency exchanges in the period of 2014 – 2018 with the estimation of loss made based on the exchange rate during the attack period. (Table3.1)

Loss in cryptocurrency exchange can be categorized into two; due to stolen users' credential that led to unauthorized transaction and large scale thefts of exchanges' private keys[122]. The first loss can occur due to negligence of users or cryptocurrency exchange. When hackers possessed users' account credential (i.e. username and password), they can conduct unauthorized transactions with that account. Moreover, if users' account is linked to the bank accounts then hackers can also gain access to the funds. For example on February 2017, Bithumb, a South Korean cryptocurrency exchange with average daily transaction volume of US$74 million[123] announced that personal data of 30,000 of its users were stolen[124]. Bithumb claimed that the data was stolen from an employee's personal computer. Following that, some of users reported to receive follow-up scam calls and texts in June that attempt to obtain theirs accounts' authentication codes.

Additionally, loss can also occurs due to large-scale theft of the exchanges' private key[125]. Rather than target an individual users, it makes more sense for hackers to attack the entire cryptocurrency exchange's stored cryptocurrencies. In attempt to do so, hackers breach the cryptocurrency exchange's security measures to steal private keys held by the cryptocurrency exchange. Most cases of loss in cryptocurrency exchange occurred due to this practice. In the case that attack left cryptocurrency exchange insolvent, users might walk away with nothing. Consequently, users suffer massive counterparty risk even when it is not users' fault that breach occurred.

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[121] Ibid

[122] Andrew Kang, 'Bitcoin's Growing Pains: Intermediation and the Need for an Effective Loss Allocation Mechanism' (2017) 6 Michigan Business & Entrepreneurial Law Review <https://repository.law.umich.edu/mbelr/vol6/iss2/4/> 278 (Bitcoin's Pains)

[123] 'Bithumb Trade Volume And Market Listings | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/exchanges/bithumb/> accessed 23 August 2018.

[124]

[125] Andrew Kang, 'Bitcoin's Growing Pains: Intermediation and the Need for an Effective Loss Allocation Mechanism' (2017) 6 Michigan Business & Entrepreneurial Law Review <https://repository.law.umich.edu/mbelr/vol6/iss2/4/>.

3.2 Fraud

In an unregulated market such as cryptocurrency, fraud is impossible to prevent. Fraud can also occur through “kitchen exchange”[126]. Kitchen exchange is a phenomenon of fake trading platform that has no direct access to the exchange market.[127] This is possible by creating an interface and stimulate an order-book which made up of an absolute fraud. Even more, in some case the fake trading platform can act as intermediary platform between users and real exchanges. Consequently, it creates delusional decision-making environment due to quotes and order book manipulation that will harm investors. Moreover, in worst cases, these kitchen exchanges might create withdrawal barriers for users who wish to withdraw their funds and leads users empty handed. In addition, Belgium authority has released list of 19 fraudulent cryptocurrency exchanges that involved in fraud.[128]

3.3 Lack of Transparency

In cryptocurrency market, trading volume of cryptocurrency exchange are important for users since it also indicates the liquidity and the reputation of the exchange. This serves as the main reason for exchanges to inflate the volume data of the exchange, since there is no method to verify the trading volume figures. Recently, a research shown that BitForex, a cryptocurrency exchange with an average daily transaction volume of US$284 million[129], is likely to pump its transaction volume. In a way, inflating the exchanges’ transaction volume can increase exchanges’ users and enable the exchange to charge higher listing price for cryptocurrency.

As explained before, users are entail to deposit funds into a wallet provided by the exchange before users can trade in the platform. In order to ensure constant and adequate liquidity to execute transactions in near real-time, exchanges have access to the private keys assigned to

[126] 'Crypto Exchange Ranks' (Cryptoexchangeranks.com, 2018) <https://cryptoexchangeranks.com/> accessed 18 August 2018.
[127] id
[128] 'Belgium Warns of 19 Probable Fraudulent Cryptocurrency Exchanges' (CryptoTicker, 2018) <https://cryptoticker.io/belgium-warns-of-19-probable-fraudulent-cryptocurrency-exchanges/> accessed 15 August 2018.
[129] Crypto Exchange Ranks, 'Is Making Fake 24/H Trading Volumes The Best Marketing Strategy For Crypto Exchanges? - Blog - CER' (Blog - CER, 2018) <https://blog.cryptoexchangeranks.com/industry-news/is-making-fake-24-h-trading-volumes-the-best-marketing-strategy-for-crypto-exchanges/> accessed 9 August 2018.

each customer. Exchanges usually hold most of their cryptocurrency funds in cold storage[130] and keep only a small fraction of their funds in online wallets to cover redemptions[131]. As a result, most of cryptocurrency exchanges manage daily transfers and withdrawal requests out of a much smaller pot of liquidity that they control directly on users' behalf, whilst supposedly parking the fund in cold-storage. However, since cryptocurrency exchanges are not subjected to any public audits or disclosures requirement, it is hard to know if the balances are really being segregated or reserved as claimed. In worst case, funds can be re-lent for other purposes without the knowledge of users[132].

3.4 Liquidity

Unlike regulated exchanges, cryptocurrency exchanges are not subjected to any capital adequacy requirement. Consequently, most of cryptocurrency exchanges are undercapitalized and not covered by insurance. In case of security breach on their system, most of cryptocurrency exchanges do not have enough financial strength to deal with mishaps.[133] A research conducted by Moore and Christin found that 18 of the 40 exchanges has ceased operation, with 5 exchanges failed to reimburse customers on closure, while 6 exchanges claim did and for the remaining 7 there is no data available.[134]

Moreover, the lack of liquidity in cryptocurrency market can also affect cryptocurrency exchange and its users. The growth in cryptocurrency exchange has boosted overall liquidity in the market, however most of cryptocurrency users are sitting tight on their cryptocurrency as the value rise and are unwilling to put their cryptocurrency in the market.[135] Liquidity issue can arise when all users simultaneously convert their cryptocurrency into fiat currency. Currently, there is no regulation to ensure that cryptocurrency exchanges have sufficient liquidity to withstand stressed liquidity scenario.

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[130] Private keys hold in cold storage are not accessible from the internet and therefore cannot be intercepted by cyber-attacks. A common cold storage technique is to print private keys on a piece of paper. (Understanding Bitcoin, pg. 42)
[131] Franco, 'Understanding Bitcoin' (n 78) 42
[132] https://ftalphaville.ft.com/2016/08/03/2171799/time-to-reevaluate-blockchain-hype/
[133] Lee, 'Handbook 2015' (n 11)
[134] Moore, 'Beware Middleman' (n 89) 3
[135] Adam Y, 'Problems with Crypto Exchanges – Hacker Noon' (Hacker Noon, 2018) <https://hackernoon.com/problems-with-crypto-exchanges-9251ff02786e> accessed 13 August 2018.

3.5 Conclusion

Through examination of literature, four commonly known categories of risks associated with cryptocurrency exchanges have been identified. The risk of loss happens when either individual users or exchanges are hacked or targeted in malicious attempts to gain private keys or other crucial account information. The risk of fraud occurs due to a lack of regulation in the cryptocurrency space, allowing malicious actors to engage in fraudulent activities such as operating 'kitchen exchanges'. A lack of transparency contributes to the risk of using cryptocurrency exchanges, as information on trading volume might be inflated, and financial track records are often manipulated and unaudited. Finally, cryptocurrency exchanges can face liquidity issues, as they aren't subject to capital adequacy requirements, leaving them open to the risk of being undercapitalized generally, and in scenarios of stressed liquidity demands.

4. Learning from United States, Japan and Singapore

Currently, there are no global regulations in regards to cryptocurrencies and/or cryptocurrency exchanges. Additionally, during the G20 summit on March 2018 that took place in Bueno Aires, the G20 finance ministers acknowledged cryptocurrencies as an asset class, which can deliver significant benefit to the financial system and general economy[136]. Following the summit, the finance ministers called on the Financial Action Task Force ("FATF") to implement global standards that apply to cryptocurrency, with respect to consumer and investor protection, along with market integrity, tax evasion, money laundering and terrorist financing. Further, on July 2018, the G20 agreed that cryptocurrencies do not pose any risk to the current global financial stability, and called the FATF to clarify on the global standards for cryptocurrencies by the October 2018[137].

In this section, we discuss the development of cryptocurrency exchange, regulation of cryptocurrency exchange and investor protection of the United States, Japan and Singapore. All of these three countries have a different approach when it comes to regulating cryptocurrency exchange. First, we discuss United States' regulators approach to cryptocurrency exchange in

[136] Financial Action Task Force, 'FATF Report To the G20 Finance Ministers and Central Bank Governors March 2018' (Financial Action Task Force 2018).
[137] Financial Action Task Force (FATF), 'FATF Report to the G20 Finance Ministers and Central Bank Governors July 2018' (FINANCIAL ACTION TASK FORCE 2018) <https://www.g20.org/sites/default/files/documentos_producidos/report_to_finance_ministers_and_central_bank_governors_fatf_july_2018_0.pdf>. 4

the early stage of cryptocurrency exchange. Then we will discuss the Japan's regulators approach to cryptocurrency exchange in response to major hacks that have attacked Japan cryptocurrency exchanges. Last, we discuss Singapore's regulators approach on cryptocurrency exchange as a country known for being a 'regional hub for technology start-ups and innovation'.

4.1 United States Regulation on Cryptocurrency Exchange

On March 18, 2013, the Financial Crimes Enforcement Network (FinCEN) of the United States Treasury Department issued a guidance (the "FinCEN Guidance") suggesting that cryptocurrency exchanges are qualified as 'money services business' (MSBs) under the Bank Secretary Act[138]. Consequently, cryptocurrency exchange needs to be register as MSB with FinCEN in each state in which they do business and similiary at the state level. Based on FinCEN Guidance, cryptocurrency exchange is referred to as an 'exchanger', 'a person engaged as a business in the exchange of virtual currency for real currency, funds, or other virtual currency'[139]. In addition, cryptocurrency exchanges must comply with "know your customer" rules, develop robust anti-money laundering programs and report suspicious activity.

At the state level, New York is the first state to propose a comprehensive regulation that requires businesses involving cryptocurrency to be licensed with the state. On June, 2015, the New York Department of Financial Service (NYDFS) introduced the regulation called "BitLicense"[140]. Under this regulation, cryptocurrency exchange is classified as 'virtual currency business activity'. According to the BitLicense, virtual currency business activity needs to fulfil the registration requirements such as maintaining sufficient capital throughout operations; maintain custody and protection of users' assets; and maintaining book and records keeping. Embedded in the license is compliance obligations that includes AML program requirement, cybersecurity program requirements, complaint processes, business continuity plan requirements, record keeping, and marketing and consumer protection[141]. Due to its stringent standards, only a handful of licenses

[138] The Financial Crimes Enforcement Network, 'Application of Fincen'S Regulations To Persons Administering, Exchanging, Or Using Virtual Currencies' (Department of the Treasury Financial Crimes Enforcement Network 2018).
[139] Ibid
[140] NEW YORK CODES, RULES AND REGULATIONS TITLE 23 2015.
[141] Ibid

have been issued. As of May 2018, the NYDFS has only issued five BitLicense to Circle, Ripple, Coinbase, BitFlyer and Genesis Global Trading[142].

Further action was taken by the United States Securities and Exchange Commission (SEC). On March 2018, SEC issued a public statement on 'potential unlawful online platforms for trading digital assets'[143]. In the statement, SEC stated that some of the cryptocurrency exchanges are trading products that meet the definition of security under the US federal securities law and therefore must register with SEC as a national securities exchange or alternative trading system ("ATS"), or broker-dealer. It also warned investors to only use registered cryptocurrency exchange when trading digital assets that constituted a security. In addition, SEC explained to investors that unregistered cryptocurrency exchanges was not under review of SEC and therefore do not meet SEC standards. SEC suggested investors tailored a list of questions for investors to ask when deciding to trade cryptocurrency. The list of questions as follow[144]:

a) 'Do you trade securities on this platform? If so, is the platform registered as a national securities exchange?
b) Does the platform operate as an ATS? If so, is the ATS registered as a broker-dealer and has it filed a Form ATS with the SEC?
c) Is there information in FINRA's BrokerCheck® about any individuals or firms operating the platform?
d) How does the platform select digital assets for trading?
e) Who can trade on the platform?
f) What are the trading protocols?
g) How are prices set on the platform?
h) Are platform users treated equally?
i) What are the platform's fees?
j) How does the platform safeguard users' trading and personally identifying information?
k) What are the platform's protections against cybersecurity threats, such as hacking or intrusions?
l) What other services does the platform provide? Is the platform registered with the SEC for these services?
m) Does the platform hold users' assets? If so, how are these assets safeguarded?'

The FinCEN Guidance emphasized on the need of licensing cryptocurrency exchanges as a money service business to prevent financial crimes, terrorist financing and money laundering.

[142] Robert Hackett, Jeff John Roberts and Jen Wieczner, 'Http://Fortune.Com' (Fortune, 2018) <http://fortune.com/2018/05/25/the-ledger-cryptocurrency-bitlicense/> accessed 11 August 2018.
[143] The U.S. Securities and Exchange Commission (SEC), 'Statement On Potentially Unlawful Online Platforms For Trading Digital Assets' (The US Securities and Exchange Commission 2018).
[144] Ibid

Consequently, cryptocurrency exchanges are required to verify user's identities and report suspicious activity amongst other things. However, this regulation was implemented in the early stage of cryptocurrency exchange development that have been dominated with the use of centralized cryptocurrency exchanges. Along with the development of decentralized cryptocurrency exchanges, there is increasing concern over classifying decentralized exchange as a money service business. As explained in the previous sections, there is no central operator that operates decentralized cryptocurrency exchange and transactions are automated by algorithm. Therefore, decentralized exchanges have no central authority that accepts and transmits funds or money, and to maintain regulatory compliances. In that sense, the current regulation on cryptocurrency exchange might not accommodate the increasing variations in business models used by cryptocurrency exchanges.

According to Vermeulen, there is a correlation between the levels of investment in fintech and the regulatory choice of the particular country[145]. More so, the regulatory environment does affect 'the willingness of companies to start operations in one jurisdiction. The research suggested that countries with proactive response towards Fintech are 'more attractive as a potential location for starting Fintech operation'[146]. In addition, previous research suggest that United States approach to regulate cryptocurrency and business related to it, 'have been primarily reactive to whatever crisis is in the news and the immediate costs associated with it'[147]. Arguably, the United States reactive approach towards cryptocurrency exchanges might decrease activity in the cryptocurrency exchange sector in the United States.

4.2 Japan Regulation on Cryptocurrency Exchange

According to CryptoCompare, Japan has the highest investment in cryptocurrencies, with the country's national currency, the Japanese Yen (JPY) accounting for 45.69% of the money invested in bitcoin worldwide[148]. In addition to that, approximately US$1 billion worth of

[145] Erik P. M. Vermeulen, Joseph A. McCahery and Mark Fenwick, 'Fintech and the Financing of Entrepreneurs: From Crowdfunding To Marketplace Lending' (SSRN, 2018) <https://ssrn.com/abstract=2967891>. 37 (Fintech Entrepreneurs)
[146] Ibid 34
[147] Hughes, 'Advancing Framework' (n 27)
[148] 'Bitcoin (BTC) - Live Bitcoin Price And Market Cap' (CryptoCompare, 2018) <https://www.cryptocompare.com/coins/btc/analysis/JPY> accessed 28 July 2018.

cryptocurrencies were stolen from Japan cryptocurrency exchanges in the past five years, resulting in losses for Japanese cryptocurrency exchange users. Due to that, the Japanese Financial Services Agency (FSA) was eager to establish a framework for cryptocurrency exchanges in a way that protects users of cryptocurrency. Consequently, in 2015, a working group was established within the FSA to give recommendation on 'sophistication of payment and settlement operations'[149]. The final recommendation of the working group was to introduce a registration system for cryptocurrency exchange business; to subject cryptocurrency exchanges with money laundering regulations; and to introduce a system that protects cryptocurrency users[150].

By March 2016, the Japanese Payment Services Act ("PSA") was amended and took effect on April 1, 2017. The amendments of PSA included a definition of virtual currencies, registration requirements for cryptocurrency exchange business; rules on cryptocurrency exchange operations; supervision and penalties for cryptocurrency exchange business; and provisions on a self-regulatory body of cryptocurrency exchange business[151]. The amendment PSA refers to cryptocurrency exchange as a 'virtual currency exchange services' and subject cryptocurrency exchange to capital and registration requirements. Besides that, cryptocurrency exchanges are obliged to properly manage and secure user's funds, to submit annual reports and to report suspicious transactions to the authorities. The registration of cryptocurrency exchange includes consultation and an application process which can take approximately six months to complete.[152]

Following the amendment, cryptocurrency exchanges that operate and engage with Japanese users need to be registered with the FSA. For cryptocurrency exchange to operate, it needs to meet the following requirements:[153] (i) operator must be 'stock company' or a 'foreign virtual

[149] 'Regulation of Cryptocurrency' (Loc.gov, 2018) <http://www.loc.gov/law/help/cryptocurrency/japan.php> accessed 16 August 2018.
[150] Ibid
[151] Yasutake Okano, 'Virtual Currencies: Issues Remain After Payment Services Act Amended' (Nomura Research Institute 2016) <https://www.nri.com/~/media/PDF/global/opinion/lakyara/2016/lkr2016243.pdf>. 2
[152] The length of time required for registration can vary, particularly according to the details of the virtual currency exchange service under application and the progress of establishing an operating framework.
[153] Masahiko Ishida, Edward Mears and Ryutaro Takeda, 'Japan Regulatory Update On Virtual Currency Business | Insights | DLA Piper Global Law Firm' (DLA Piper, 2018)

currency exchange service provider' and/or (ii) operator of foreign cryptocurrency exchange "must also be corporations that have representative in Japan"[154]. In other words, cryptocurrency exchange must be a joint-stock company (Kabushiki Kaisha) which is similar to 'a C-corporation in other jurisdiction' to fulfil the registration requirement. 'Foreign virtual currency exchange service provider' refer to foreign cryptocurrency exchanges. These foreign exchanges are required to 'have registration status equivalent to the registration status contained in the PSA'[155]. In addition. The foreign exchanges need to establish a representative office in Japan.

The requirements for registration also include a financial capital requirement of minimum amount of JPY10 million (equivalent to US$90,192) that is not in 'negative net assets'[156]. In addition, operator of cryptocurrency exchange must be 'equipped with systems for adequate operation and legal compliance, deemed necessary to operate a virtual currency exchange service appropriately and securely'. Among other requirements, this might be the most time-consuming requirement for cryptocurrency exchange operators. The FSA examined that operators are 'equipped with systems for adequate operation and legal compliance' during the registration screening process that takes between three or four months. Besides that, the amended PSA also includes requirements as follows[157]:

- "The provider must not use a trade name or company name that is identical to one used by any other virtual currency exchange service provider.
- The provider must not have had its registration in Japan as a virtual currency exchange service provider revoked or registration as a similar operator revoked based on provisions in a foreign law that is deemed equivalent of the Payment Services Act, in the past five years in either case.
- The provider must never have violated the Payment Services Act, the Law Controlling Contributions, Money Deposits and Interest or equivalent provisions of foreign laws, and never have been fined in Japan or penalized under foreign laws as a result, in the past five years.
- Other businesses operated by the provider must not harm the public interest.
- Directors of the provider must not include disqualified individuals."

<https://www.dlapiper.com/en/japan/insights/publications/2017/12/japan-regulatory-update-on-virtual-currency-business/> accessed 7 August 2018. (Japan Regulatory)

[154] Mai Ishikawa, 'Designing Virtual Currency Regulation in Japan: Lessons From The Mt Gox Case' (2017) 3 Journal of Financial Regulation.

[155] Ishida, 'Japan Regulatory' (n 153)

[156] Ibid

[157] Ibid

Following the registration, cryptocurrency exchange must subject to operation rule of the PSA, the relevant cabinet ordinances, and the administrative guidelines of the PSA. In light of protecting users, certain operation rules are imposed on cryptocurrency exchange such as[158] (i) 'measures for safely managing information'[159]; (ii) 'measures for ensuring the appropriate and secure conduct of business pertaining to outsourcing'[160]; (iii) 'provision of information to customers'[161]; (iv) 'obligations to segregate management of assets regarding cash or virtual currencies'[162]; and (v) 'measures pertaining to complaint processing measures and dispute resolution'[163]. Under the current regulatory regime, cryptocurrency exchanges are required to 'segregate users' assets from their own assets and undergo periodic compliance audits by a certified public accountant or audit corporations'.

Under the current regulation regime, registered cryptocurrency exchange needs to undergo supervision by the FSA. Cryptocurrency exchanges are required to maintain books and records of cryptocurrency transactions, and also need to submit annually business report to the FSA. Further, the FSA is 'authorized to order exchange businesses to submit reports and reference materials and to dispatch its officials to inspect the offices of an exchange business where necessary to secure the exchange business's proper conduct'[164]. Upon supervision, the FSA may issue an order for a cryptocurrency exchange to improve their business practice. Additionally, the FSA may revoke or suspend cryptocurrency exchange business in case that (i) cryptocurrency exchange has no longer meet one or more requirements for registration; (ii) the FSA found that cryptocurrency exchange applied for registration illegally; and (iii) cryptocurrency exchange business breach the PSA. Besides abovementioned requirements, cryptocurrency exchanges must comply with the Japan Act on Prevention of Transfer and Criminal Proceeds that includes

[158] Naoya Ariyoshi, Susumu Tanizawa and Hideki Katagiri, 'The Essential Points Of The Amendments To The Regulation On Virtual Currency Exchange Services - Finance And Banking - Japan' (Mondaq.com, 2018) <http://www.mondaq.com/x/554128/Financial+Services/The+Essential+Points+Of+The+Amendments+To+The+Regulation+On+Virtual+Currency+Exchange+Services> accessed 6 August 2018.
[159] Ibid
[160] Ibid
[161] Ibid
[162] Ibid
[163] Ibid
[164] Ibid

provision on (i) 'verification of identity of individuals opening new accounts', and (ii) 'reporting of suspicious transactions to the relevant authorities'.

Following the amendments on April 2017, the FSA has started to issue licenses on cryptocurrency exchanges business in Japan. As of March 2, 2018, the FSA has fully approved 16 cryptocurrency exchanges[165] namely; Money Partner, Quoine, Bitflyer, Bit Bank, SBI Virtual Currencies, GMO Coin, Bittrade, Btcbox, Bitpoint, Fisco Bitcoin Exchange, Zaif, Bit Arg Exchange Tokyo, FTT Corporation, FTT Corporation and Xtheta Corporation. In addition, the FSA also allowed for 16 'quasi' cryptocurrency exchanges to operate and conduct business while the application was still in process[166]. These 'quasi' cryptocurrency exchanges include Minnano Bitcoin, Payward Japan, Lemuria Bitcoin Exchange, Campfire Corporation, Tokyo Gateaway, Lastroots Corporation, Debit Eternal Link, FHSO Corporation, Raimu, Bit Station, Blue Dream Japan, Mr Exchange, Bmex Corporation, Bitexpress Corporation and Coincheck. Reportedly, there are over hundreds of firms currently waiting for approval from the FSA. As previously mentioned, the amended PSA also includes provisions on 'certified association for payment service providers' as a self-regulatory body of cryptocurrency exchange business. In that regards, on March 2, 2018, 16 registered cryptocurrency exchanges publicly announced its intention to form a self-regulatory body and aim to receive approval from the FSA under the PSA[167].

On January 2018, approximately ten months after the amended PSA took effect, a 'quasi' Japan cryptocurrency exchange namely Coincheck was hacked and approximately JPY58 billion (equivalent to US$532 million) worth of cryptocurrencies were stolen[168]. Following its on-site inspection on Coincheck, the FSA found that Coincheck's internal system had lack of security precautions. In light of Coincheck's incident, the FSA ordered all Japan cryptocurrency exchanges

[165] 'Japan'S 16 Licensed Cryptocurrency Exchanges Launch Self-Regulatory Body' (CCN, 2018) <https://www.ccn.com/japans-16-licensed-cryptocurrency-exchanges-launch-self-regulatory-body/> accessed 9 August 2018.
[166] '16 Government-Approved Crypto Exchanges Forming Self-Regulatory Body In Japan - Bitcoin News' (Bitcoin News, 2018) <https://news.bitcoin.com/government-approved-crypto-exchanges-self-regulatory-body-japan/> accessed 9 August 2018.
[167] Ibid
[168] Reuters Staff, 'The Coincheck Hack and The Issue With Crypto Assets On Centralized...' (Reuters.com, 2018) <https://www.reuters.com/article/us-japan-cryptocurrency-q-a/the-coincheck-hack-and-the-issue-with-crypto-assets-on-centralized-exchanges-idUSKBN1FI0K4> accessed 11 August 2018. (Coincheck Issue)

both registered and unregistered to give report to the FSA in regards of security protocols and resistance to hacking. On March 2018, the FSA issued a one-month business suspension order to two cryptocurrency exchanges, namely FSHO and Bit Station. Along with that, the FSA also issued a business improvement order to the following five cryptocurrency exchanges; Tech Bureau, GMO Coin, Mister Exchange, Bicrements and Coincheck[169].

In brief, the major theft on Japan cryptocurrency exchanges had led to stricter regulations on cryptocurrency exchanges in hope of protecting Japan's consumers. Unfortunately, even after the regulation was implemented almost a year ago, US$532 million worth of cryptocurrency was stolen from Coincheck. On the other hand, there are concerns that the new regulations on cryptocurrency exchange might serve as a barrier to entry for small startup businesses. In addition, five 'quasi' cryptocurrency exchanges in Japan have dropped their application for license due to high regulatory requirements[170]. In this sense, the current regulation is more welcoming to cryptocurrency exchanges that are set up by well-capitalized institutions which have a track record for building the necessary infrastructure and have more compliance capabilities. However, some believe that the strict regulatory standard might help to regain market confidence by nurturing healthy cryptocurrency exchange operator.[171]

4.3 Singapore Regulation on Cryptocurrency Exchange

Singapore is 'a rapidly growing regional hub for technology start-ups and innovation' and is well known for its 'market-leading regulatory practices and laws in relation to commercial matters'[172]. In relation to cryptocurrency, the Monetary Authority of Singapore (MAS) proves to follow the same approach.

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[169] Wolfie Zhao, 'Japan's Finance Watchdog Suspends Two Crypto Exchanges - Coindesk' (CoinDesk, 2018) <https://www.coindesk.com/japans-fsa-announces-suspension-of-two-crypto-exchanges/> accessed 5 August 2018.

[170] 'Cryptocurrency Exchanges Give up on Japan Licensing Efforts' (Business Insider, 2018) <https://www.businessinsider.com/ap-cryptocurrency-exchanges-give-up-on-japan-licensing-efforts-2018-3?international=true&r=US&IR=T> accessed 9 August 2018.

[171] Kazuaki Nagata, 'Small Cryptocurrency Exchanges Find the Going Hard under Greater Government Oversight | The Japan Times' (The Japan Times, 2018) <https://www.japantimes.co.jp/news/2018/04/10/business/small-cryptocurrency-exchanges-find-going-hard-greater-government-oversight/#.W3_BWegzaUl> accessed 14 August 2018.

[172] Lee, 'Handbook 2015' (n 11) 362

On August 1, 2017, MAS announced that digital tokens that constituted products regulated under the Securities and Futures Act (Cap. 289) ("SFA") and the Financial Advisers Act (Cap.110) ("FAA") (together refer to as "Singapore Securities Law") must comply with the applicable law[173]. Following that, on August 14, 2017, MAS issued guidance on the application of the Singapore Securities Law in regards to offers or issues of digital tokens in Singapore called A Guide to Digital Token Offerings ("MAS Guidance"). MAS Guidance includes explanation on digital tokens that constitute capital market products, offers of digital tokens that constitute securities, intermediaries that facilitate offers of digital tokens and extra-territoriality of the SFAA and FAA[174].

Beside guidance on the application of securities laws to Initial Coin Offerings (ICO), the MAS Guidance also address how laws and regulations applied by MAS to intermediaries who[175]: (i) operates a primary ICO launch platform, (ii) offer financial advice in regards of digital tokens, and (iii) operate trading platform that involves digital tokens. These intermediaries need to comply with the Singapore Securities Law if the digital tokens are constituted as capital market product[176]. Specifically, cryptocurrency exchanges that trades digital token which constitute capital market product may establish or operate a market and must be approved or recognized by the MAS under the SFA. The MAS Guidance also explain that the requirements of SFA may also apply to intermediaries who operates trading platform outside Singapore. Besides the requirement of SFA, these intermediaries will be required to make policies, procedures and controls to address money laundering and terrorism financing risks. Intermediaries will be required to conduct customer due diligence, monitor transactions, perform screening, report suspicious transactions and keep adequate control.

In order for cryptocurrency exchange to trade digital token which constitute capital market product, it needs to be approved as an Approved Exchange or recognized as a Recognized Market

[173] The Monetary Authority of Singapore, 'MAS Clarifies Regulatory Position On The Offer Of Digital Tokens In Singapore' (2017) <http://www.mas.gov.sg/News-and-Publications/Media-Releases/2017/MAS-clarifies-regulatory-position-on-the-offer-of-digital-tokens-in-Singapore.aspx> accessed 6 August 2018.
[174] The Monetary Authority of Singapore, 'Guide to Digital Token Offerings' (The Monetary Authority of Singapore 2017). 2
[175] Ibid 5
[176] under section 2(1) of the SFA, "capital markets products" means any securities, futures contracts, contracts or arrangements for the purposes of foreign exchange trading, contracts or arrangements for the purposes of leveraged foreign exchange trading, and such other products as the Authority may prescribe as capital markets products https://sso.agc.gov.sg/Act/SFA2001

Operator ("RMO"). Approved Exchanges are required to comply with more legal requirements than the RMOs. Approved Exchange and RMO are determined by several factors such as, whether or not the market is systemically-important and public interest. As of 1 April 2018, the MAS have not yet approved or recognized any cryptocurrency exchange in Singapore as exchanges or recognized market operators ("RMO")[177].

On May 24, 2018, the MAS warned eight cryptocurrency exchanges in Singapore not to facilitate trading in cryptocurrency that constituted capital market products without MAS' authorization.[178] MAS further explained that cryptocurrency exchanges must immediately cease trades of such cryptocurrency until cryptocurrency exchange obtain approval either as approved exchange or RMO. Additionally, Mr Lee Boon Ngiap, the assistant manager director (Capital Markets) of MAS said[179]:

> "The number of digital token exchanges and digital token offerings in Singapore has been increasing. We do not see a need to restrict them if they are bona fide businesses. But if any digital token exchange, issuer or intermediary breaches our securities laws, MAS will take firm action. The public should be aware that there is no regulatory safeguard if they choose to trade on unregulated digital token exchanges or invest in digital tokens that fall outside the remit of MAS' rules."

Earlier before the warning, on May 22, 2018, the MAS issued a consultation paper proposing changes on the current RMO regime, from a single tier to three separate tiers[180]. According to MAS, the three separate tiers of RMO would better match regulatory requirements to the risks posed by different types of cryptocurrency exchanges and lower the cost of entry for players that do not pose systemic wide risks. As result, the MAS expand the current RMO regime from a single tier to three separate tiers. Cryptocurrency exchanges that are currently authorized as RMO, will be re-classified under Tier 2 RMO. The Tier 1 RMO aimed at cryptocurrency exchange with limited

[177] Li Fei QUEK and others, 'Regulating Cryptocurrency Exchanges In Singapore' (CNPlaw 2018) <https://www.cnplaw.com/regulating-cryptocurrency-exchanges-in-singapore/> accessed 13 August 2018.
[178] The Monetary Authority of Singapore, 'MAS Warns Digital Token Exchanges And ICO Issuer' (2018) <http://www.mas.gov.sg/News-and-Publications/Media-Releases/2018/MAS-warns-Digital-Token-Exchanges-and-ICO-Issuer.aspx> accessed 13 August 2018.
[179] Ibid
[180] Monetary Authority of Singapore, 'Consultation Paper On Review Of The Recognised Market Operators Regime' (Monetary Authority of Singapore 2018). 3

access to Singapore-based retail investors while the Tier 3 RMO aimed at cryptocurrency exchange with significantly smaller scale of business compared to more established operators.

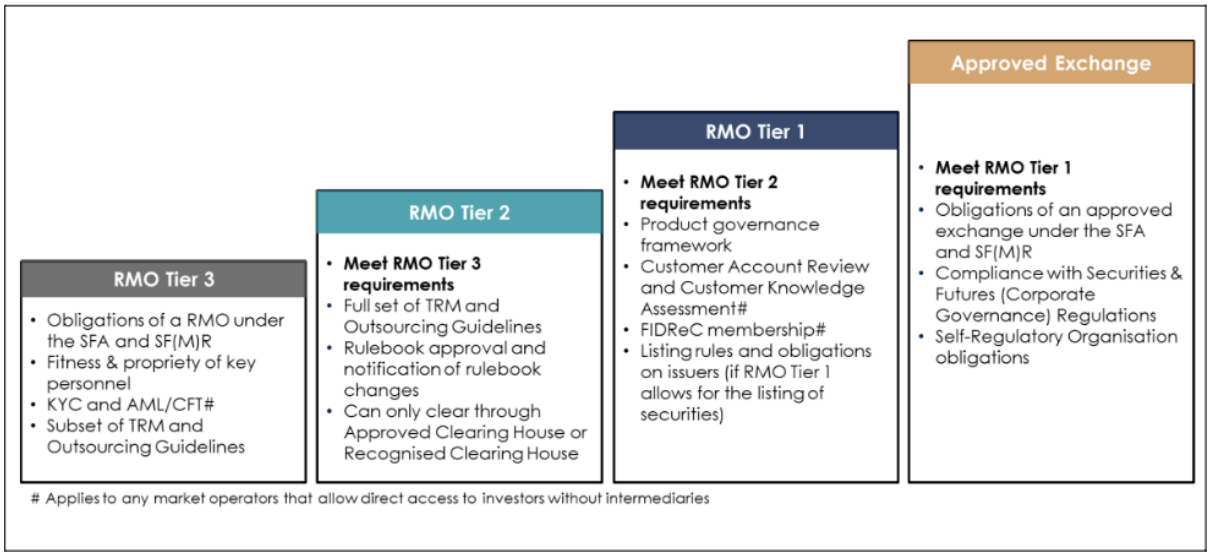


Diagram 4.1 – Changes on Requirement for RMO System[181]

The Tier 3 RMO aimed at cryptocurrency exchanges that are smaller in scale of business compared to more established cryptocurrency exchanges and are targeting the non-retail market (i.e. banks and fund managers)[182]. This category could also include new entrants without an established track record and cryptocurrency exchanges that have reached the end of their 'sandbox tenure' but whom have not developed any business to meet the requirement of current RMO regime. Consequently, the MAS proposed to establish a simplified set of requirements for RMO Tier 3 as follows[183]: (i) reduce capital requirements[184], (ii) simplify set of requirement on technological risk management and outsourcing; and (iii) Tier 3 RMO is allowed to engage overseas clearing house to provide central clearing services. Additionally, the MAS also proposes to streamline the RMO Tier 3 application process, which only requires applicants to self-certify compliance against a checklist of requirement prepared by the MAS. The review by MAS should take up to four weeks under this approach.

[181] Ibid 13
[182] Ibid 7
[183] Ibid
[184] The base capital requirement for a Tier 3 RMO will be S$50,000, instead of S$500,000 that is imposed on Tier 2 RMOs. The ongoing capital requirement for a Tier 3 RMO will also be set at three months of working expenses, instead of six months of operating expenses for Tier 2 RMOs.

In addition, due to the likelihood of Tier 3 RMO being applied by operators with less established track record or experimental business models, the MAS proposes two safeguards to limit the reach and impact to the market in case of failure. First, Tier 3 RMO is not allowed to provide direct access to any individual unless the individual is a Capital Market Service License ("CMSL") holder. Second, the MAS restrict the maximum volume of business for Tier 3 RMO as follows[185]: '(a) maximum of S$10 million in revenue per annum; or (b) S$10 billion in securities traded by value annually; or (c) 10 million derivative contracts traded annually'. A Tier 3 RMO that is reaching any of these limits will be expected to prepare for transit to be a Tier 2 RMO, where it will subject to full range of requirements that are currently enforce on RMOs.

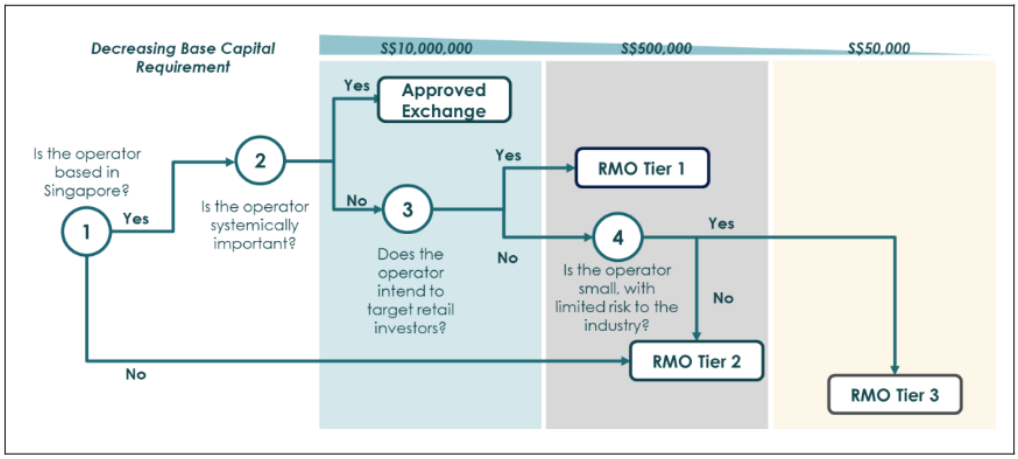


Diagram 4.2 – Overview of Changes to the RMO System[186]

Under the current regulatory regime, only AEs are allowed by the MAS to target retail investors. Hence, the MAS propose to create the RMO Tier 1 that allows cryptocurrency exchanges some access to retail investors[187]. On the other hand, the MAS also recognize that interaction with retail investors can lead to 'negative societal outcome'[188] in the event of failure. The MAS also explained that the systemic risk posed between Tier 1 RMO and Tier 2 RMO has no significant differences. Due to that, Tier 1 RMO has the same 'prudential requirements' (i.e. base and ongoing capital requirements) with Tier 2 RMO. Thus, Tier 1 RMO needs to implement additional conduct safeguards that address retail investor protection.

[185] Ibid
[186] Ibid 14
[187] Ibid 10
[188] Ibid

Given that Tier 1 RMO interface directly with retail investors, Tier 1 RMO needs to comply with additional requirements. Additional requirements are aimed to limit the potential risks of failure faced by retail investors. These requirements include[189]: (i) product governance framework, (ii) restriction to collect or hold retail investors' cash or collateral; (iii) clearing, settlement and custody services can only be performed by MAS-regulated entity; and (iv) transaction transparency through publication of bids, offers, price, volume and date of last transaction offered to retail investors.

According to the consultation paper, Tier 1 RMOs are allowed to list securities for trading on their platform. In the case that such securities are not listed on other exchanges, these Tier 1 RMOs have to ensure that such securities have met regulatory requirements. The regulatory requirements include prospectus requirements, continuing obligations, and change of control transactions. Securities' issuers that intend to be listed in Tier 1 RMO platform needs to provide prospectus or offering documents and financial statements with accounting standards to Tier 1 RMO.

Further, the MAS proposed caps on the level of participation by retail investors on Tier 1 RMO in hope to minimize impact of failure. The MAS propose that a maximum of S$4 million of investments from retail investors can be raised by securities' issuer on Tier 1 RMO platform, and a maximum of S$200 million of investments from retail investors on a Tier 1 RMO[190]. These caps are only applicable to Singapore resident retail investors. Tier 1 RMO that reached the limit are expected to transit to become an AE.

The MAS hopes that by introducing the two additional tiers for market operators, it will better adjust 'regulatory requirements' and 'supervisory intensity' based on the 'systemic importance and 'target clientele'[191]. In the proposed scheme, 'market operators' need to step up the regulatory tiers as the business grow, where they will be subject to higher regulatory requirements and supervisory intensity. The MAS also clarified that the proposals only applies to Singapore entities, and foreign cryptocurrency exchanges can only apply under RMO Tier 2.

[189] Ibid 12
[190] Ibid 13
[191] Ibid 14

As previously mentioned, countries with proactive responses that involves regulatory guidance or regulatory experimentation are more attractive for fintech companies to establish their business[192]. Singapore response towards cryptocurrency exchange arguably is proactive, with the issuance of guidance and dialogue between regulators, and innovators through the consultation paper. These response might led to increasing cryptocurrency exchange operations in the country.

4.4 Conclusion

The first wave of cryptocurrency regulation in the United States, focuses on licensing cryptocurrency exchange as a money service business. Subsequently, cryptocurrency exchanges need to conform to Anti-Money Laundering (AML) and countering the Financing of Terrorism (CFT) requirements mainly consisting of customer identity verification, record-keeping rules and suspicious activity report. Then, the second wave of cryptocurrency regulation in the United States came from financial regulators that expressed concerns on cryptocurrency exchange operating an unregulated market. Additionally, the SEC issued a set list of question for investors to consider before trading using unregistered cryptocurrency exchange.

In the background of a major heist on Japan cryptocurrency exchanges, the regulation on cryptocurrency exchange in Japan was proposed by the financial authority. Consequently, the regulations are highly concentrated on consumer protection aspects. Under the new regulation, cryptocurrency exchanges need to meet a certain financial capital requirement in order to be registered and operate in Japan. Apart from registration, there are three key points of operational rules for cryptocurrency exchange to comply, such as: protective measures for service users; segregated management of money and cryptocurrency deposits; and information technology system risk management. There are concerns that such strict regulations implemented by Japan might serve as a barrier to entry for startup cryptocurrency exchanges. In other perspective, the strict regulatory standards might pose as a way to regain confidence in the market and ‘nurture healthy exchange operator’.

[192] Vermeulen, ‘Fintech Entrepreneurs’ (n 145) 29

Singapore has always been known as a region hub for technology startups and innovators; and the neighboring country of Indonesia. In respect to cryptocurrency exchange, the Singapore's financial authority requires cryptocurrency exchange to be registered as market operator if the respected cryptocurrency exchange listed products which constituted securities under Singapore securities law. In comparison with United States and Japan regulators, the Singapore financial authority issued a consultation paper to propose changes on decreasing base capital requirements for cryptocurrency exchanges. In the consultation paper, Singapore regulatory took into account the innovation of cryptocurrency exchange that lead to increasing varieties of cryptocurrency exchange's business models. It also acknowledges that different types of cryptocurrency exchange present different scale of risks and, therefore, the regulation requirements and supervision intensity should be adjusted accordance to the risks.

5. Regulating Cryptocurrency Exchange in Indonesia

This section analyzed the development of cryptocurrency exchange, regulatory approach to cryptocurrency exchange and cryptocurrency exchange users in Indonesia. First, we will discuss the development of cryptocurrency exchange in Indonesia by using Indodax, an Indonesia cryptocurrency exchange that is accountable for 70% of cryptocurrency trades in Indonesia as a sample. Further, we will discuss the current regulatory approach in regards of cryptocurrency exchange in Indonesia. In the last section we will provide survey analysis of cryptocurrency exchange users in Indonesia.

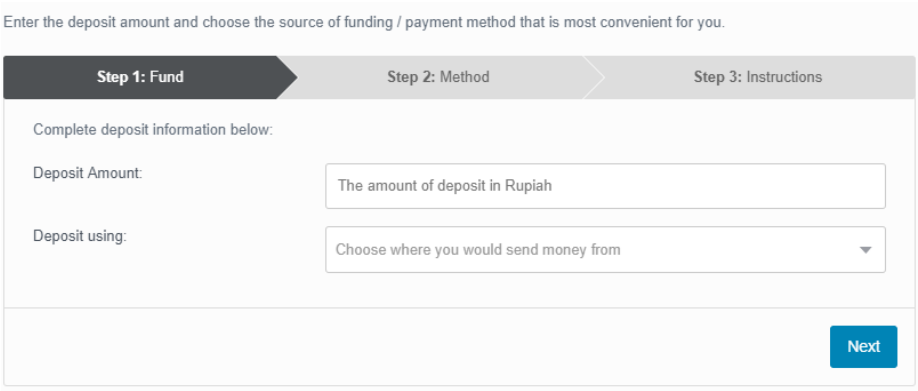
5.1 Cryptocurrency Exchange Development in Indonesia

Indonesia Digital Asset Exchange ("Indodax"), currently is the largest Indonesia cryptocurrency exchange by average daily transaction volume of US$10 million[193]. When it was first founded in 2013, Indodax was not a cryptocurrency exchange. It was previously known as bitcoin.co.id, a bitcoin enthusiast community platform (similar to reddit.com). In 2014, Indodax starts to facilitate exchange of Indonesia's currency ("Rupiah") and bitcoin on their platform. By March 2018, the Chief Executive Officer of Indodax, Oscar Darmawan reported that there are currently 1.14 million

[193] 'Indodax Trade Volume And Market Listings | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/exchanges/indodax/> accessed 24 June 2018.

members trading on the platform. In comparison, data from Indonesia Central Securities Depository shows that Indonesia Stock Exchange (IDX) has only 1.18 million registered participants[194]. The number of users of cryptocurrency exchange is expected to surpass number of investors of IDX by the end of this year.

Besides Indodax, there is two other cryptocurrency exchange that provide pairings to Rupiah such as Triv and Luno. However, almost 70% of cryptocurrency transactions[195] in Indonesia took place at Indodax platform that is managed by PT Indodax Nasional Indonesia, a registered limited liability company with office in Kuta, Bali. As of August 8, 2018, there is 31 cryptocurrencies[196] listed to trade with available fiat pairings to Indonesia's currency ("Rupiah"). Indodax provides service for users to buy, sell and trade cryptocurrency with Rupiah, it also includes a wallet for users to store cryptocurrency and Rupiah on its platform. Next, we examined the terms and conditions of Indodax that includes provision in regards of registration process; changes in users' data; Indodax's scope of trading activity; transaction procedure; transaction fee; refusal and postponement of transaction; cancellation of transaction; suspicious transaction; withdrawal limit; service cooperation; statement and guarantee; responsibilities; risk; prohibition; secrecy; negligence; blocking and freezing of account; intellectual property rights; security; force majeure; notification; dispute resolution; and domicile of the exchange[197].



194 Fathiya Dahrul and Harry Suhartono, 'Indonesian Bitcoin Investors Set To Outnumber Stock Participants' (Bloomberg.com, 2018) <https://www.bloomberg.com/news/articles/2018-03-14/indonesian-bitcoin-investors-set-to-outnumber-stock-participants> accessed 10 August 2018.
195 Ibid
196 'Indodax Trade Volume And Market Listings | Coinmarketcap' (Coinmarketcap.com, 2018) <https://coinmarketcap.com/exchanges/indodax/> accessed 24 June 2018.
197 'Terms And Conditions – Informasi Dan Petunjuk Indodax.Com' (Help.indodax.com, 2018) <https://help.indodax.com/en_US/ketentuan-dan-persyaratan-indodaxcom/> accessed 6 August 2018.

Diagram 5.1 – Rupiah Deposit in Indodax[198]

In order for users to perform transaction on Indodax, users need to be registered by providing personal identification documents, email and telephone number. Interestingly, Indodax allows offline registration, meaning that users who wish to register and open an account on Indodax can register at Indodax's office. After registration, users are given username and password to access their account where users can store and trade cryptocurrency. Before users can perform any transactions, users need to deposit funds into the hosted wallet service. Indodax allows deposit in fiat currency (Rupiah) as well as other cryptocurrencies. Unlike most cryptocurrency exchanges, Indodax also provide offline deposits and withdrawal method for fiat currency (Rupiah) deposits and withdrawals in their headquarter office. Offline deposit is limited to IDR450,000,000 (approximately US$30,889) and offline withdrawal is limited to IDR500,000,000 (approximately US$34,321)[199].

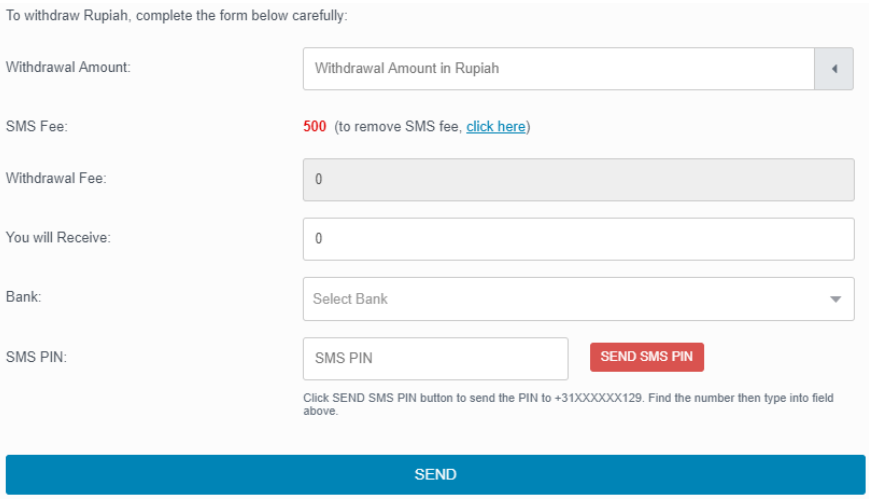


Diagram 5.2 – Rupiah Withdrawal Indodax[200]

The scope of trading activity allowed on the Indodax's platform as stipulated on its terms and conditions is as follow[201]s:

1. 'Bitcoin buying using Rupiah
2. Bitcoin trading using Rupiah
3. Money deposit in Rupiah

198 Ibid
199 Ibid
200 Ibid
201 Ibid

4. Withdrawal in Rupiah
5. Deposit in any form of digital asset
6. Barter trading among digital asset in among users in the Website
7. Sending digital asset to another member in the Website, or other digital asset user out of Website
8. Doing production and transfer service of Indodax.com that can be disbursed to rupiah balance in another Indodax.com account'

Indodax provide a brokerage and order-book service in its platform, that allows users to buy, sell and trade cryptocurrencies. Unlike most exchanges that only allows deposits in form of cryptocurrencies, Indodax allows deposit in fiat currency (Rupiah) as well as other cryptocurrencies[202]. Besides matching sells and buys orders, Indodax also manage users' funds both in form of cryptocurrency and fiat rupiah. In that sense, Indodax is acting as a financial institution managing customers' funds both in form of cryptocurrency and Rupiah.

For the provided service, Indodax charged several fees to users such as withdrawal fees, deposit fees and trading fees. Indodax charged no fees for cryptocurrency deposits, and charged 0.3% of transactions for the trading fee[203]. On other hand, withdrawal fee is vary depending on the mining fee of the particular cryptocurrency. Besides providing simple interface that enhance users' interaction on the platform, Indodax also provide a customer support service center to assist users in terms of transactions problems, changes in users' data, technical support and general information related. In addition, Indodax states that it complies with Indonesia Law on Prevention of Banking Crime, Indonesia Law on Anti-Corruption and Prevention of Money Laundering and therefore monitor users' account in order to prevent financial crime[204].

The terms and conditions also provide provision in regards of dispute resolution and the applicable law. As mentioned in terms and condition, the Indonesia laws apply and disputes will be resolved at the District Court of West Jakarta[205]. Additionally, we found that the cryptocurrency exchanges do not provide any information to users in regards of the product offered and how funds are managed by the exchange. As of our analysis, the terms and conditions of Indodax

[202] Ibid
[203] Ibid
[204] Ibid
[205] Ibid

merely consist of technical information, but lack of provision in terms of product information and funds management.

5.2 Current Regulatory Approach

In February 2014, Indonesia's central bank (Bank Indonesia) issued a statement that outlined the illegal nature of using cryptocurrency as either a payment instrument or currency. The press release is as follow[206]:

> "In view of the Act No. 7 Year 2012 concerning Currency and Act No. 23 Year 1999 which has been amended several times, the latest with Act No. 6 Year 2009, Bank Indonesia states that Bitcoin and other virtual currency are not currency or legal payment instrument in Indonesia.
>
> The society is encouraged to be careful toward Bitcoin and other virtual currency. All risks related to the ownership/use of Bitcoin should be borne by the owner/user of the Bitcoin and other virtual currency."

Bank of Indonesia Regulation No. 19/12/PBI/2017 on Implementation of Financial Technology ("IFT") states that financial technology provider are banned to use cryptocurrency as a payment system. However, the regulation is silent in regards of cryptocurrency trading[207]. Recently, the Trade Ministry's Commodities Futures Trading Supervisory Boards (Bappebti) announced that a framework of cryptocurrency exchange was being prepared[208]. In that effort, Bappebti involves Bank Indonesia, the Financial Services Authority ("OJK"), and the Taxation Directorate General, the Financial Transaction Reports and Analysis Centre as well as the counterterrorism unit of the National Police. The framewok will rule on several issues such as cryptocurrency exchange business, taxation and prevention of money laundry as well as terrorism financing. According to his statement, the regulation is hope to also introduce measures to prevent the loss of funds due to embezzlement or hacking often found in cryptocurrency exchange platforms[209]. In that effort,

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[206] Bank Indonesia, 'Statement of Bank Indonesia Related to Bitcoin and Other Virtual Currency' (2018) <https://www.bi.go.id/en/ruang-media/siaran-pers/Pages/SP_160614.aspx> accessed 7 August 2018.
[207] Deloitte, 'New Financial Services Authority (OJK) & Banking Regulations' (Deloitte 2017) <https://www2.deloitte.com/content/dam/Deloitte/id/Documents/audit/id-aud-ojk-banking-regulations-dec2017.pdf>.
[208] 'Cryptocurrencies Decided As Future Trading Commodity' (The Jakarta Post, 2018) <http://www.thejakartapost.com/news/2018/06/04/cryptocurrencies-decided-as-future-trading-commodity.html> accessed 8 August 2018.
[209] Ibid

the official also called on existing cryptocurrency exchange platform such as Indodax and other representative of crypto-community to submit proposals in regards of the product specification such as the type of cryptocurrencies and trading procedures including trading hours and dispute settlement mechanism[210].

In the regulated market, the financial regulation system highly focus on regulating intermediaries that are "uniquely positioned to disrupt misconduct"[211]. For example, banks are positioned as tax-withholding agents in effort to prevent tax evasion and regulation on securities exchange to protect investors[212]. By regulating the cryptocurrency exchange, regulators have the ability to use intermediaries as regulatory agents. However, it is also important to equip consumers with information about the safety of websites, and how to secure their own personal data. Regulators can intervene by raising awareness of the consumers, for example consumers should check the availability of dispute resolutions and/or refunds provision before using the service.

5.3 Survey: Cryptocurrency Users Response

In this paper, we conduct a survey of cryptocurrency users' response in Indonesia regarding their concerns on using cryptocurrency exchange. The target respondents in our survey are cryptocurrency users in Indonesia. We have inquired 58 cryptocurrency users. The survey was made and distributed using Qualtrics®, an online survey application. We used an anonymous link provided by Qualtrics® and circulate the link online at https://forumbitcoin.co.id, an Indonesia's bitcoin enthusiast forum. The survey was distributed for three weeks, in the period of May 9th, 2018 to May 24th, 2018. To prevent the risk of a strategic and biased answer, the survey was conducted anonymously and respondents are not required to disclose their identity. More importantly, the survey was taken voluntary and the result would be treated in a confidential manner.

The survey analysis is divided into two sections. In the first section, we collected information on the character of respondents. We asked how users obtain their cryptocurrency in order to understand the importance of intermediation in the cryptocurrency market. Furthermore, we asked

[210] Ibid
[211] Lee, 'Handbook 2017' (n 79) 214
[212] Ibid

the amount of cryptocurrency owned by cryptocurrency users to understand the stage of cryptocurrency market in Indonesia. Following that, we asked the percentage amount stored at cryptocurrency exchange in order to understand the popularity of cryptocurrency exchange among cryptocurrency users. Moreover, the second section will discuss users' concerns when engaging with cryptocurrency exchange and what would lessen these concerns.

Characteristics of the Respondents

This section provide information on cryptocurrency users that responded to our survey (total 58 responses). We first examined the characteristics of cryptocurrency users based on how they obtain cryptocurrency, the USD value of cryptocurrency they owned, and the percentage amount of cryptocurrency stored in cryptocurrency exchange. Second, we examined the level of knowledge of users in respect of trading both in traditional market and cryptocurrency market. In the last section, we examined the concerns of users when engage with cryptocurrency exchange and what could lessen those concerns. The data source for information in this section is the answered survey.

	%	Count
Mining	17.24%	10
Initial Coin Offering	3.45%	2
Cryptocurrency Exchange	65.52%	38
Payments	5.17%	3
Others	8.62%	5
Total	100%	58

Table 5.1 – Means of Obtaining Cryptocurrency

Table 5.1 shows that 65.52% of the cryptocurrency users responding to this survey acquired cryptocurrency from cryptocurrency exchange, 17.24% acquired cryptocurrency through mining, 5.17% acquired cryptocurrency through payment, 3.45% acquired cryptocurrency through ICO and 8.62% acquired through "others" with 1 acquired from airdrop, 1 acquired through ICO and cryptocurrency exchange, 1 acquired from trading, 1 acquired from mining and cryptocurrency exchange, 1 acquired through mining, ICO and cryptocurrency exchange. This data shows that cryptocurrency exchange is the most popular way to obtain cryptocurrency and essential to

provide access into the cryptocurrency market. It also shows the significance of intermediation in the cryptocurrency market.

Value of Cryptocurrency	%	Count
Less than US$300	46.55%	27
US$300 – US$800	18.97%	11
US$800 – US$2,000	15.52%	9
More than US$2,000	18.97%	11
Total	100%	58

Table 5.2 – USD Value of Owned Cryptocurrency

The table 5.2 shows that 46.55% of cryptocurrency users that respond to the survey own less than US$300 worth of cryptocurrency, 18.97% own between US$300 to US$800 worth of cryptocurrency, 15.52% of users own between US$800 to US$ 2,000 worth of cryptocurrency, and 18.97% of users own more than US$2,000 worth of cryptocurrency. It shows that most of the respondents are retail investors, additionally it also shows that cryptocurrency market is still a nascent market.

Percentage amount stored at cryptocurrency exchange	%	Count
100%	39.66%	23
75 – 99%	18.97%	11
50 – 75%	5.17%	3
Less than 50%	22.41%	13
None	13.79%	8
Total	100%	58

Table 5.3 – Percentage Amount of Cryptocurrency Stored With Cryptocurrency Exchange

Table 5.3 shows that 39.66% of cryptocurrency users that respond to the survey have stored 100% of their cryptocurrency in a cryptocurrency exchange, 22.41% stored less than 50% of their cryptocurrency in a cryptocurrency exchange, 18.97% of users stored between 75% to 99% of their cryptocurrency in an exchange, 5.17% of users stored between 50% to 75% of their cryptocurrency in an exchange, and 13.70% of cryptocurrency users do not stored their cryptocurrency with any cryptocurrency exchanges. It shows that most of cryptocurrency users

stored their cryptocurrency with cryptocurrency exchanges. In other words, cryptocurrency exchange are important to this market.

Concerns of Users When Engaging With Cryptocurrency Exchange and Possible Measures to Lessen These Concerns

Concerns in using cryptocurrency exchange	1		2		3		4		5		Total
Lack of Transparency	17.78%	8	8.89%	4	28.89%	13	33.33%	15	11.11%	5	45
Liquidity/ bankruptcy	8.89%	4	24.44%	11	24.44%	11	24.44%	11	17.78%	8	45
Fraud	33.33%	15	26.67%	12	15.56%	7	13.33%	6	11.11%	5	45
Cyber-attack	31.11%	14	22.22%	10	17.78%	8	13.33%	6	15.56%	7	45
Regulatory uncertainty	15.56%	7	15.56%	7	15.56%	7	6.67%	3	16.67%	21	45

Table 5.8 – Concerns of Users

Table 5.8 shows that 33.33% of users' greatest concerns is fraud, while cyber-attack is the second greatest concern of 31.11% of the users. Then follows with lack of transparency and regulatory uncertainty with users concern of 17.178% and 15.56%. The less concern of the users is liquidity or bankruptcy of cryptocurrency exchange. This shows that most of users concern relates to the organizational and operational aspect of cryptocurrency exchange.

	Question	1		2		3		4		5		6		Total
1	Insurance for lost funds in case of cyberattack at cryptocurrency exchange	25%	10	20%	8	25%	10	12.5%	5	7.5%	3	10%	4	40
2	Regulations on cryptocurrency exchanges	27.5%	11	10%	4	7.5%	3	12.5%	5	12.5%	5	30%	12	40
3	Audit report of cryptocurrency exchange by a trustworthy financial institution	27.5%	11	17.5%	7	20%	8	7.5%	3	17.5%	7	10%	4	40
4	Improved cyber security standard by exchanges	27.5%	11	22.5%	9	12.5%	5	25%	10	7.5%	3	5%	2	40
5	More transparency and disclosure of cryptocurrency exchanges	10%	4	22.5%	9	22.5%	9	15%	6	25%	10	5%	2	40
6	A self-regulatory body for cryptocurrency exchanges	5%	2	10%	4	10%	4	22.50%	9	22.5%	9	30%	12	40

Table 5.9 – What would lessen those concerns?

Table 5.9 shows that regulation on cryptocurrency exchanges, audit report on cryptocurrency exchange by trustworthy financial institution, and improved cyber security standards by

cryptocurrency exchange are the most chosen between respondents with each choice being favored by 27.5% of respondents. The other 25% of users chose insurance for lost funds in case of cyberattack would lessen those concerns, while 10% of respondents choose more transparency and disclosure by cryptocurrency exchange would lessen those concerns. The rest of respondents chose a self-regulatory body for cryptocurrency exchange would lessen those concerns.

5.4 Conclusion

The bitcoin.co.id, previously starts as Indonesia's bitcoin enthusiast forum has transform into Indodax, a leading cryptocurrency exchange in Indonesia with more than a million of users from Indonesia. Indodax provides broker service by enabling conversion of Rupiah to cryptocurrency and vice versa, as well as trading service that allows users to trade between cryptocurrencies. In comparison to other cryptocurrency exchanges, Indodax provides service both in online and offline manners. In addition, Indodax is a centralized custodial exchange by its nature and therefore manage users' funds both in form of cryptocurrency and Rupiah. These activity of cryptocurrency exchange requires trust from users to the exchange, in order to secure and store their funds. As examined in the terms and conditions, Indodax includes provision in regards of dispute resolution. However, it lacks of provision in regards of products disclosure information, and how orders are executed on the platform.

As of now, there is no regulation or guidelines in regards of cryptocurrency exchange operation. However, official of Indonesia commodities market regulator has indicated that the government is preparing a comprehensive regulatory framework on cryptocurrency exchanges. In addition, the government is now requesting local cryptocurrency exchanges to hand in a regulatory proposal.

Users' survey showed that cryptocurrency exchange is popular amongst cryptocurrency users to store their funds. Moreover, it also showed that most of users have no experience in working, trading and investing on a traditional exchange such as stock exchange; but have reasonable knowledge on cryptocurrency exchange. Next, concerns on using cryptocurrency exchange are dominated with fraud of cryptocurrency exchange. When users were asked what would lessen the concern, most of users choose regulations on cryptocurrency exchange, financial statement

of cryptocurrency exchange from certified audit institution and increase cyber-security standards of cryptocurrency exchange.

6. Conclusion

This thesis discusses the technology advancement in cryptocurrency exchange industry, which have an essential role in providing entrance to the cryptocurrency market. In the early stages, the cryptocurrency exchange industry is dominated with centralized cryptocurrency exchange that provide simple exchange services. However, these centralized exchange operates off-chain and therefore, do not have the same security measures of a blockchain. With the increasing value of cryptocurrency and the weakness of centralized cryptocurrency exchanges, hackers found it worthwhile to launch an attack on the exchange. Consistently, there are reports on multiples cyber-attacks on cryptocurrency exchanges around the world. Besides the risk of loss, there are several risks of cryptocurrency exchanges to the users, that mainly caused by the unregulated nature of the exchange. In this thesis, we have identified four consumer-centric risks of cryptocurrency exchange such as risk of loss, fraud, lack of transparency and liquidity risk.

The development of more innovative services built on this technology is still rapidly being carried out, especially by developing the use of the blockchain to offer various services, such as the decentralized cryptocurrency exchange. Decentralized cryptocurrency exchanges, in a way, minimize the risk of loss and lack of transparency incurred by users of centralized exchanges using the blockchain technology. The development of decentralized cryptocurrency exchange shows that technological solutions are still possible to answer problems raised by centralized cryptocurrency exchange such as loss funds due to cyber-attack, and transparency problem.

Further, we are not alone to suggest that these operation of cryptocurrency exchanges present risks to the users. Regulatory around the world are considering to regulate cryptocurrency exchanges, including United States, Japan, and Singapore. United States is the first one to regulate cryptocurrency exchange, in result cryptocurrency exchanges need to be register as a money service business and needs to comply with the Bank Security Act. Recently, the US SEC also release statement in regards of cryptocurrency exchanges and rule that some of cryptocurrency exchanges might fall under the federal securities law and need to register with the

SEC. Then, SEC also provides information in regards of risks which unregistered cryptocurrency exchanges might present to the users.

In comparison, Japan's regulation on cryptocurrency exchanges are highly motivated for protecting its users by subjecting cryptocurrency exchanges with stricter regulations. Under the current regulation, cryptocurrency exchanges need to be registered and supervised by the financial authorities. More, it also includes provision on rules for cryptocurrency exchanges operation such as obligation to segregate funds; to manage information; to ensure appropriate and secure conduct of business; to provide information to users, and to provide measure in case of complaints and dispute resolution. In result, small startups exchanges with weaker compliance capabilities have revoke their license applications.

In Singapore, regulations on cryptocurrency exchanges was established in late 2017 with the issuance of MAS Guidance. According to the guidance, cryptocurrency exchanges might fall under the securities law and needs to be registered with the authority. Few months after the guidance was issued, Singapore's financial authority released a consultation paper in regards of the current regulation regime for cryptocurrency exchange. The consultation paper proposed changes to lower the entry barrier for cryptocurrency exchange businesses. The paper emphasized that different types of activity of cryptocurrency exchanges present different scale of risks and in that sense, the regulatory requirements and supervision intensity needs to be adjusted accordingly.

The cryptocurrency exchange industry in Indonesia has been led by Indodax, a centralized cryptocurrency exchange that accounted for 70% of cryptocurrency transactions in Indonesia. As mentioned before, the number of Indodax users are expected to surpass the number of registered investors in Indonesia stock exchange. Hence, as of the writing, there is no regulation or guidelines on cryptocurrency exchanges. Nevertheless, government official revealed that a guidelines for cryptocurrency exchanges is currently being prepared. On other hand, our surveys found that most of users concerns when engage with cryptocurrency exchange relates to fraud and cyber-attack. However, only 27.5% agrees that regulation on cryptocurrency exchanges would lessen those concerns.

In conclusion, most of the consumer-centric risks of cryptocurrency exchange were due to the unregulated nature of the industry. Due to that, regulators around the world are eager to regulate cryptocurrency exchange. On the other hand, the innovators also attempt to solve these problem such as transparency and hacks by developing another type of cryptocurrency exchange that is known today as decentralized cryptocurrency exchange. Recently, Indonesia's regulators have pointed out their intention to regulate cryptocurrency exchange. Among the reasons to have regulations, consumer protection might be one of the best since consumers are usually the first victims due to the lack of sophistication and or access to the necessary information. More importantly, our analysis of Indodax's terms and conditions showed that Indodax do not provide sufficient information from the standpoint of investment-decision making. Currently, Indonesia is still at the early stage of cryptocurrency exchange development. It can be argued that protecting cryptocurrency exchange users do not necessary means regulating cryptocurrency exchanges. Arguably, educating users with the risks pose by cryptocurrency exchanges as well as raising awareness of users can also protect users from the risks of cryptocurrency exchange. However, the impact of educating users on cryptocurrency exchange risks are not discussed in this study, and would require further research.

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Appendix

Introduction

Survey on Cryptocurrency Exchange Users in Indonesia

Dear Survey Participants,
My name is Windy Kosim, I am a master student of International Business Law at Tilburg University. This survey is part of a research project that aims to improve our understanding of cryptocurrency exchange. By completing this survey, you will help us identify legal risks associated with the use of cryptocurrency exchanges, particularly in Indonesia. This survey should take approximately 5 minutes.

All data obtained will be kept anonymously and will not be distributed or shared to any third party. Only aggregate data will be made public. Moreover, we will not link the survey responses to any other data.

Should there be any question regarding the survey, please contact Windy Kosim

Thank you very much in advance for your participation.

1. Have you ever owned cryptocurrency?
a. Yes
b. No, I will never own cryptocurrency
c. No, but I will consider it in the future
Condition: B is selected. Skip to the end.
C is selected. Skip to 6

2. In case you have ever owned cryptocurrency, how do you obtain your cryptocurrency?
a. Mining
b. As a mean of payments for goods and services
c. Initial Coin Offering (ICO)
d. A web-based cryptocurrency exchange
e. Others, please specify...

3. How much cryptocurrency do you own in US Dollars?
a. less than US$300
b. US$300 - US$800
c. US$800 - US$2000
d. more than US$2000

4. What is the percentage amount of your cryptocurrency stored in the cryptocurrency exchange?
a. 100%
b. 75% - 99%
c. 50% - 75%
d. Less than 50%
e. None

5. How many cryptocurrency exchanges have you ever used?
a. Only 1
b. 2 - 5
c. 5 - 10
d. More than 10

6. How do you rate your knowledge of cryptocurrency exchanges?
a. Extensive knowledge
b. Reasonable knowledge
c. Limited knowledge
d. No knowledge at all

7. How do you rate your knowledge of stock exchanges?
a. Extensive knowledge
b. Reasonable knowledge
c. Limited knowledge
d. No knowledge at all

8. Have you ever have experienced working, trading or investing in stock exchanges?
a. Yes
b. No

9. Please select your preferred types of cryptocurrency exchange
a. Traditional trading cryptocurrency exchange (ie. Binance or INDODAX)
b. Broker cryptocurrency exchange (ie. Coinbase or Shapeshift)
c. P2P/ direct trading platform (ie. LocalCoin)
d. Decentralized cryptocurrency exchange (ie. EtherDelta or IDEX)
e. I do not have any preference

10. How important are the following factors when you engage with cryptocurrency exchange?

Not at all important	Slightly important	Moderately important	Very Important	Extremely Important	I don't know

a. Terms and Conditions

b. Transaction fee

c. Transaction volume

d. Jurisdiction

e. Compliance to regulation (ie. KYC/AML)

f. Exchange rate

g. Security (ie. 2FA authentication)

h. Reputation (ie. history of security breach)

i. Provided service

11. What are your greatest concern when trading in cryptocurrency exchange? (Rank the following risks in order of concern, 1 being the most concerned risk),
_____Lack of transparency
_____Liquidity
_____Fraud
_____Cyber-attack
_____Regulatory risk/ uncertainty

11. What would lessen your concern to the above mentioned risks? (Rank the following solutions based on preference, 1 being the most preferred solutions)
_____Insurance for lost funds in case of a cyberattack in the cryptocurrency exchange
_____Regulations on cryptocurrency exchanges
_____Higher liquidity of cryptocurrency exchanges
_____Improved cyber security standard by exchanges
_____More transparency and disclosure of cryptocurrency exchange
_____A self-regulatory body for cryptocurrency exchanges

***

Table 2.1

Average Daily Transaction of 12 Largest Cryptocurrency Exchange

					Fees		
Rank	Exchange	Country	Currency	Average Daily Transaction Volume (per. July 28, 2018)	Transaction	Deposit	Withdrawal
1	EXX	Hongkong	-	US$1,002,812,275	0.1%	-	-
2	Binance	Hongkong	-	US$1,177,617,687	0.1%	-	
3	OKEx	Hongkong	-	US$1,106,028,902	0.2%	-	0.1%
4	Huobi	Singapore	-	US$580,828,657	0.2%	-	-
5	ZB	China	-	US$504,701,366	0.2%	-	-
6	Upbit	South Korea	KRW	US$450,016,512	0.05%-0.25%	-	-
7	Bithumb	South Korea	KRW	US$417,343,187	0.15%	-	-
8	Bitfinex	United States	USD	US$357,224,596	0.02%-0.2%	-	-
9	HitBTC	Hongkong	-	US$287,371,442	0.1%	-	-
10	LBank	Hongkong	USD, CNY	US$208,680,192	0.1%	-	-
11	Bibox	China	-	US$207,534,640	0.1%	-	-
12	CoinEx	Unknown	-	US$ 169,170,691	0.1%	-	-

Table 3.1
List of Cryptocurrency Exchange Hacks from 2014 - 2018

Year	Cryptocurrency Exchange	Country	Circumstances	Period	Amount Stolen	USD Equivalent (at the time of loss)
2018	Bithumb[1]	South Korea	Exchange's hot wallets were breached by hackers	20 June	Unknown. Bithumb has not release any information in this regard	USD$32 million
	Coinrail [2]	South Korea	Exchange's hot wallets were breached by hackers	10 June	1,927 ether, 2,6 billion NPXS, 93 million ATX and 831 million DENT coins	US$40 million
	Bitgrail[3]	Italy	Exchange's hot wallets were breached by hackers	8 February	17 million Nano coins	US$187 million
	Coincheck[4]	Japan	Exchange's hot wallets were breached by hackers. Coincheck admitted to store majority of customer wallet in cold wallets.	26 January	500 million NEM coins	US$500 million
	Youbit[5]	South Korea	Security breached on the exchange's system. South Korea investigators are investigating on North Korea's involvement in the hack.	4 April, 19 December	4000 bitcoins were stolen in the first attack. 17% of total assets were stolen in the second attack	

[1] https://www.bloomberg.com/news/articles/2018-06-20/cryptocurrencies-fall-as-korean-exchange-says-coins-were-stolen
[2] https://www.coindesk.com/coinrail-exchange-hacked-loses-possibly-40-million-in-cryptos/
[3] https://cointelegraph.com/news/its-impossible-to-refund-the-stolen-amount-interview-with-bitgrails-francesco-firano
[4] http://fortune.com/2018/01/31/coincheck-hack-how/
[5]https://www.coindesk.com/south-korean-bitcoin-exchange-declare-bankruptcy-hack/

2017					leading it to file for bankruptcy.	
	Bithumb[6]	South Korea	Bithumb employee's personal computers was hacked and 30,000 users' personal and trading information data were leaked.	February	30,000 users' personal and trading information were leaked	-
2016	Bitfinex[7]	Hong Kong	Security breached	August	119,756 bitcoins	US$65 million
	Gatecoin[8]	Hong Kong	Exchange's hot wallets were breached by hackers	May 9 – 11,2018	185,000 ethers and 250 bitcoins	US$2.14 million
	Shapeshift[9]	Switzerland	Exchange's security was breached due to an inside job. Shapeshift claimed an employee sold key security data to hacker.	March 14, April 7& 9	Total amount of 469 bitcoins, 5,800 Ethereum, and 1,900 Litecoin	US$230,000
2015	BTER	China	BTER claimed that hack occurred on its cold wallet.	February 15	7,170 bitcoins	US$1.75 million
	Bitstamp[10]	Luxembourg	Exchange's hot wallets were breached by hackers, after employee's computer was infiltrated.	January	19,000 bitcoins	US$5.2 million
	796Exchange[11]	China	Exchange's wallets were not attacked. Hackers manipulate the exchange's system, so users deposit funds were routed to hackers' address.	January	1,000 bitcoins	US$230,000
	BTER[12]	China	Exchange's hot wallets were breached by hackers, eventually BTER was able	August 15	51,670,000 NXT	US$1.65 million

[6] https://www.bbc.com/news/technology-40506609
[7] https://www.bloomberg.com/news/articles/2016-08-03/bitcoin-plunges-after-hackers-breach-h-k-exchange-steal-coins
[8] https://www.coindesk.com/gatecoin-2-million-bitcoin-ether-security-breach/
[9] https://www.coindesk.com/digital-currency-exchange-shapeshift-says-lost-230k-3-separate-hacks/
[10] https://www.coindesk.com/unconfirmed-report-5-million-bitstamp-bitcoin-exchange/
[11] https://cointelegraph.com/news/chinese-exchange-suffers-1000-btc-loss-in-uncertain-service-compromise
[12] https://www.coindesk.com/bter-nxt-bitcoin-exchange-hack/

			to track the hacker and negotiate for a partial return of the stolen funds.			
	KipCoin[13]	China	Kipcoin claimed exchange's wallets were breached by hackers	18 February	3,000 bitcoins	US$690,000
	MintPal[14]	London	Mintpal claimed it was hacked on an announcement before suddenly disappear. Further investigation found that Mintpal owner was selling the stolen cryptocurrency through LocalBitcoins platform.	October	3,700 bitcoins	US$1.3 million
2014	Cryptsy[15]	United States	January 2016, Cryptsy claimed for bankruptcy and revealed that it was previously hacked on 2014.	July	13,000 bitcoins and 300,000 litecoins	US$9.5 million
	Poloniex[16]	United States	A vulnerability in Poloniex's coding led to attack on their system	March	12.3% of Poloniex's bitcoin supply at that time	US$64,000
	Cryptorush	United States	Cryptorush claimed that incident caused by a bug with an altcoin called BlackCoin. The bug released an unannounced fork that allow BlackCoin users to withdraw more funds than they actually owned.	March	950 bitcoins and 2500 litecoins	US$570,000
	Mt. Gox[17]	Japan	A leaked Mt. Gox document reported that hackers had been skimming money from the exchange for years without being detected.	June 2011-2014	850,000 bitcoins	US$480 million

[13] https://www.newsbtc.com/2015/02/19/chinese-bitcoin-exchange-kipcoin-shuts-claims-losing-3000-btc-hackers/
[14] https://nulltx.com/mintpal-scam-artist-ryan-kennedy-charged-with-fraud-and-money-laundering/
[15] https://www.coindesk.com/cryptsy-bankruptcy-millions-bitcoin-stolen/
[16] https://www.coindesk.com/poloniex-loses-12-3-bitcoins-latest-bitcoin-exchange-hack/
[17] https://www.wired.com/2014/03/bitcoin-exchange/