CHAPTER II

THEORETICAL BACKGROUND

2.1. Literature Review

In the literature review, researcher will try to explain the relevant theories used to explain the variables to be studied and as a basis for providing temporary answers to the formulation of the problem (hypothesis), and the preparation of research instruments. Researcher will explain theories that related to money, cryptocurrency, bitcoin, market indices, and signaling theory.

2.1.1. Money

In the beginning of its establishment, Satoshi Nakamoto was trying to build an electronic payment system based on cryptographic proof instead of trust. He wanted the people around the world use the same money that does not have inherent weaknesses of the trust-based model (Nakamoto, 2018). People has used money as a thing that could not be separated from the daily life. Researcher will explain the definition, function, and development of money.

2.1.1.1. Definition of Money

Based on Oxford Dictionary, money is a current medium of exchange in the form of coins and banknotes; coins and banknotes collectively. Money also is the assets, property, and resources owned by someone or something; wealth (Anon., 2019).

Money based on Nopirin (1998) is everything that can be bought/received to make payments for goods, services or debt.

According to Solikin and Suseno (2002), the definition of money is an object that can be exchanged for other objects, can be used to assess other objects, and we can save them. The researchers stated that it is very difficult or almost impossible to define money according to its physical form and characteristics because the physical form and characteristics of money vary so much, depending on the time and place of use. Thus, to simplify and simplify its understanding, money is seen as money that is in everyday life, which is seen from its use or function for humans. In other words, money is understood from what humans can do with the money. (Solikin & Suseno, 2002).

Based on the research of Seitz, E. (2017), money is neither an object with three or four functions, nor a mode of thought, as Spengler proposed. Money is a non-object based on human action, an interface of exchange and endless means as discussed in the research which suggested by Plato and Aristotle. In such a teleological approach to money's nature, quantity and materiality are properties (Seitz, 2017).

2.1.1.2. Function of Money

According to Solikin and Suseno (2002), money is a thing that has four main functions, they are: (1) money as medium of exchange. With money, someone can directly exchange the money with the goods they need to others who produce the goods; (2) money as store of value. People tend to collect and keep their wealth for future use. Although wealth can be stored in various forms (land, house, and other valuable

objects), it cannot be denied that money is an option to keep their wealth; (3) money as unit of account. With the existence of money, exchanging and valuing an item will be easier to do. Money also makes exchanging between two physically different items can also be done. (4) money as standard for deferred payment. The function of this money is related to lending and borrowing transactions. Money is one way to calculate the loan repayment amount. (Solikin & Suseno, 2002).

Based on an article from Bank of Canada in 2012 and similar to a book by von Mises, L. (1953), money has three main functions: Money is: (1) exchange tool. Without money, people have to exchange goods and services directly. Money simplifies commercial transactions; (2) unit of measurement. Money allows people to compare the value of many different types of goods and services. It became the standard for determining the prices of goods and services and the means for buying and selling them. It also makes it possible to compare prices from different period of time; (3) a store of value for future use. Money facilitates the accumulation of deposits, lending loans from those deposits to others. This money attribute makes it easier to enter into a contract—to pay in the future for goods or services received now.

2.1.1.3. Development of Money

The progress of money to become a payment system was not build in a day. The payment system has evolved over several centuries, in line with the changing nature and use of money as a means of payment. With the advancement of technology and there is more demand for more practical and inexpensive payment instruments.

Based on a journal of Pramono et al. (2006), it described the classification or type of money from the beginning of its discovery until now into five parts, they are:

a. Full-Bodied Money

Full-bodied money has a certain characteristic where its value as an item is equal to its value as money. The value equality is influenced by demand and supply. Metal coins are the first type of money that were used in the past. At first the coins were made of iron and copper. In line with the development of human civilization, people replaced iron and copper with silver and gold coins which were considered to provide more comfort in their use. In the modern era, the gold and silver which are used as money are issued by the government.

The pressure of demand and supply will ensure that the value of a metal as money is not much different from its value as a commodity. For example, if gold coins are considered more valuable as a commodity rather than its function as a medium of exchange, the gold coins will be lost from circulation as a medium of exchange and will be merged into a commodity (non-money purpose). Conversely, if gold is more valuable when it is used as money, then the role of gold as a commodity will decrease and then it will be used as gold coins. This will foster confidence in gold coins and ensure their acceptability as a medium of exchange.

b. Representative Full-Bodied Money

Representative Full-Bodied Money is a type of money which has no value as a good or thing. At first, the paper money issued by a private company known as a goldsmith which is basically a warehouse that receives recognition claims over a number of gold or silver. Because the paper money can be exchanged with a coin in a fixed amount, then the paper money itself becomes a means that can be accepted as a medium of exchange as metal coins. This type of money only represents a number of goods / metals, which is the value of metal as an item equal to its value as money.

c. Fiat Money or Credit Money

Nowadays, people need a type of payment instrument that is more efficient but can still be trusted. This is solved by the presence of credit money as a type of money whose value as money is greater than its value as goods. Even in some cases, the value as an item becomes insignificant like the paper money that we often see today.

The guarantee of this type of money is the public trust. The way to maintain the level of public trust is to control or limit the printing of money. The efforts to maintain the public trust are carried out by the central bank through maintaining the balance of the money supply in accordance with the needs of the economy.

d. Checking Account

An important innovation in the changing of payment process is the checks or checking accounts, which allows payments to be made through balance transfers at a

depository institution which is generally a bank. The use of checks allows people to transact in large quantities without having to carry a lot of physical money at once, and also reduce transportation costs in order to carry the money for transactions.

e. Electronic Payment

Electronic payments are payments that utilize information and communication technologies such as Integrated Circuit (IC), cryptography and communication networks. The many developed and well-known electronic payments today include phone banking, internet banking, credit cards and debit cards / ATMs. All such electronic payments, except credit cards, are always directly related to the accounts of bank customers who use them (Pramono, et al., 2006).

2.1.2. Cryptocurrency

Bitcoin is always identified as the biggest most popular cryptocurrency by people around the world. As the part of cryptocurrency, researcher will explain the definition and taxonomy of cryptocurrency.

2.1.2.1. Definition of Cryptocurrency

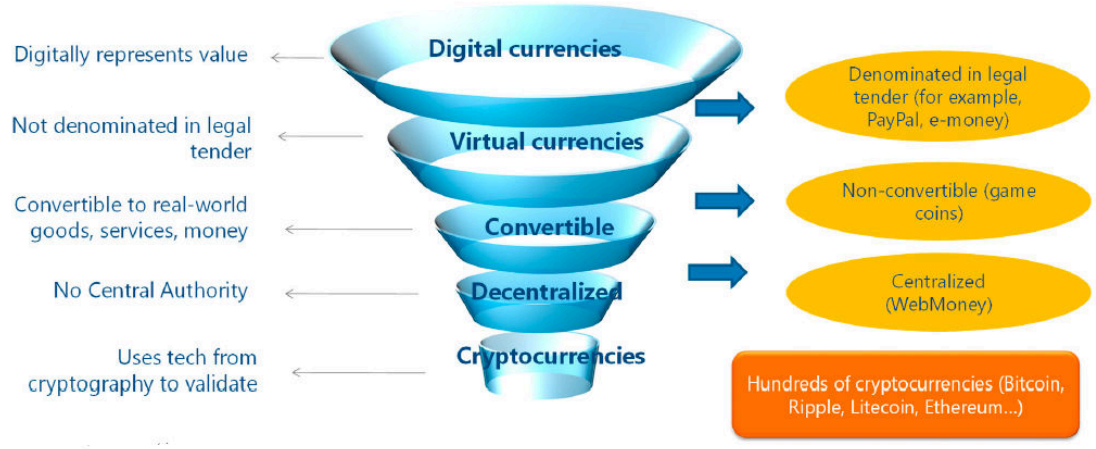
There are some definitions of cryptocurrency. Based on Meriam-Webster Dictionary, cryptocurrency is any form of currency that exists only in digital form, which usually does not have a publishing authority or central regulator but instead uses a decentralized system to record transactions and manage the issuance of new units, and which relies on cryptography to prevent fraudulent and fraudulent transactions.

Victor, A. O. (2017) described cryptocurrency as a digital asset designed to work as a medium of exchange uses cryptography to secure transactions and to control the creation of additional units of currency. Cryptocurrency is classified as part of digital currency and also classified as part of alternative currencies and virtual currencies (Victor, 2017).

A research by Dourado, E. (2014) explained that cryptocurrency is the name given to a system that uses cryptography to allow the secure transfer and exchange of digital tokens in a distributed and decentralized manner. These tokens can be traded at market rates for fiat currencies. This research concludes that Cryptocurrency is an impressive technical achievement, but it remains a monetary experiment. Even if cryptocurrencies survive, they may not fully displace fiat currencies (Dourado & Brito, 2014).

2.1.2.2. Taxonomy of Virtual Currencies

According to the IMF (International Monetary Fund), digital currency is a representation of digital values. Then, virtual currency itself is a digital representation of a value issued by private developers with the determination of denominations in a separate unit. Virtual currencies can be stored, accessed and transacted electronically, and can be used for various transaction needs as long as all parties agree to use them. The concept of virtual currencies includes a broader range of "currencies", ranging from simple IOUs from issuers (such as Internet or cellular coupons and airline miles), IOUs that are supported by assets such as gold and "cryptocurrency" such as Bitcoin.



Source: Virtual Currencies and Beyond: Initial Considerations, 2016

Figure 2.1

Taxonomy of Virtual Currencies

Based on Figure 2.1, cryptocurrency is part of the virtual currency, where the virtual currency is included in the digital currency concept. In addition to virtual currency, there is also electronic money in digital currency. The difference between virtual currency and electronic money is the issuer, where the issuer of electronic money is regulated by the government and uses the country's currency (He, et al., 2016).

According to the European Central Bank (2012), based on its flow, virtual currency can be divided into three types, such as: closed (non-convertible), open with one flow direction, and convertible. Closed virtual currency commonly uses in the online games where the money cannot be directly used to buy goods and services in the real world. Even though the practice exists but is not legalized by the provider and usually results in sanctions in the form of closing accounts by administrators. Virtual currency that is open with one flow direction is like Facebook Credit, Nintendo Points,

whose usage is only limited to goods / services provided by the provider and circulation and regulations are regulated by the provider.

Then, convertible virtual currency is a virtual currency that can be used to buy goods and services in the real world and can also be exchanged for fiat currencies. Convertible virtual currency can be divided into two, which are centralized and decentralized. Centralized if it has the authority or central administrator who acts like a central bank in the banking world while decentralized is the opposite, when there is no central administrator that functions as an intermediary, the transaction that occurs is verified by the users of the virtual currency itself. An example of a virtual currency is Bitcoin, which is a virtual currency with the largest market capitalization (European Central Bank, 2012).

2.1.3. Bitcoin

Bitcoin became a phenomenon in financial market. Many researchers try to learn and explain deeper about it. Countries and governments around the world made new regulations that give limitations, boundaries, requirements of Bitcoin. As the main object of this research, the researcher will explain the definition, history, hard fork, and system of Bitcoin, also the ways to get Bitcoin.

2.1.3.1. Definition of Bitcoin

Bitcoin is one of the cryptographic virtual currency that is considered the father of cryptocurrency (Sovbetov, 2018). Bitcoin is the first decentralized peer-to-

peer blockchain network (a series of blocks arranged chronologically where each block has a list of transaction information) which is fully controlled by its users without any central authority or financial institution (Nakamoto, 2018).

Table 2.1

Comparison of Bitcoin with Conventional Currencies

Bitcoin	Conventional Currency
Using peer-to-peer technology and without a central authority or institution to oversee operations	Issued by the central bank as a form of its authority to manage national monetary policy
Bitcoin is designed to be a digital currency	Created in physical form
The amount of bitcoin produced is limited to 21 million	Can be issued without limit
Requires a high level of knowledge because it uses cryptocurrency technology	Does not require technology and deep understanding
Revenues are still limited, can only be used in certain stores	Can be used and accepted anywhere

Source: Danella et al, 2015

From the research of Danella, et al. (2015), we can compare between bitcoin and conventional currencies as shows at Table 2.1. In the end of the research, the researchers concluded that bitcoin can be a legal payment tool, especially in Indonesia, because bitcoin fulfills most of the terms of an object can be said to be a means of payment, such as: not easily broken, has a quality that tends to be the same, cannot be forged, easy to carry, and has a stable value (Danella, et al., 2015).

2.1.3.2. History of Bitcoin

Bitcoin has grown rapidly since it was created in 2009 by a mysterious individual or group under the pseudonym Satoshi Nakamoto, the bitcoin exchange rate jumped as many requests. Bitcoin emerged due to the results of the Great Recession and the financial crisis that occurred in 2008, bitcoin is a reaction to the financial revolution that has occurred over the past 20 years (Danella, et al., 2015).

After the initial "proof-of-concept" transaction, the first major users of bitcoin were the black market, such as Silk Road. During its 30-month existence, starting in February 2011, Silk Road exclusively accepted bitcoin as payment, making transactions of 9.9 million bitcoin, worth about USD 214 million. In March 2013, the temporary blockchain was split into two independent chains with different rules. The two blockchains operate simultaneously for six hours, each with its own version of the transaction history. Normal operations are restored when most networks are downgraded to version 0.7 of the bitcoin software. The US Financial Crime Enforcement Network (FinCEN) sets regulatory guidelines for "decentralized virtual currencies" such as bitcoin, classifying American bitcoin miners who sell their bitcoins generated as Money Service Business (MSBs), which are subject to registration or other legal obligations (Imam, 2018).

The price of Bitcoin is negatively affected by some hacking or theft from cryptocurrency exchanges, including theft from Coin checks in January 2018, Coinrail and Bithumb in June, and Bancor in July. During the first six months of 2018, $ 761

million worth of cryptocurrency was reported stolen from the exchange. Bitcoin prices are affected even though another cryptocurrency was stolen at Coinrail and Bancor because investors are worried about the safety of cryptocurrency exchanges (Imam, 2018).

2.1.3.3. Hard Fork of Bitcoin

Hard Fork is a fairly large update that must be made to a system, especially in cryptocurrencies. Bitcoin Hard Fork means this system changes within the scope of the Core Bitcoin system, and it is Bitcoin Classic for this case (Prastya, 2017). A fork occurs when developers of a given blockchain copy the source code and create a second one with the aim to change or add features. A hard fork is a change that is not compatible with previous versions of that blockchain, leading to a clear split in the blockchain, where some use the new version and some remain with the current. A soft fork on the other hand is a backward-compatible change. This means both new and current versions recognize new blocks, therefore no split is required (Falcon, 2018).

The number of Bitcoin users which kept growing raises hard fork. It occurred when there was a split between Classic Bitcoin (BTC) and the rise of Bitcoin Cash (BCH) on August 1, 2017. After Bitcoin Cash was released, it turned out that the entire crypto currency market, especially the Bitcoin Classic, experienced a rapid increase during August. The Hard Fork that happens to Bitcoin Cash has a good effect for Bitcoin Classic (BTC). Thus, the demand for Bitcoin Classic (BTC) is increasing and making prices rise rapidly (Prastya, 2017).

Hard Fork of Bitcoin Gold held on October 25, 2017 until the official release on November 1, 2017. This Hard Fork is almost the same as Bitcoin Cash, developers and miners agree to create new block provisions that will be used. Bitcoin Classic (BTC) will not be affected in this Hard Fork, but new Blockchain branches will be separated from the original block chain. The effect of this split is Bitcoin Classic (BTC) will continue to run on the same Blockchain (block chain) as before, while Bitcoin Gold (BTG) will have a new Blockchain path (Prastya, 2017).

2.1.3.4. System of Bitcoin

Bitcoin as the largest holder of market capitalization uses hash cash proof-of-work for its security in transactions. The smallest value of bitcoin, called satoshis is a number unit in multiples of 1×10^{-8}, 1×10^{-6} is called μBTC (microcoin), 1×10^{-3} is called mBTC (millicoin), and 1 is called BTC (Syamsiah, 2017).

In digital cryptography, the original text known as "plaintext" turns into an equivalent code called "ciphertext" through an encryption algorithm. The ciphertext is then decrypted at the end of receiving and returning to being a plaintext. This is a basic process carried out by computers during the transaction process in digital currency cryptographic systems (Kim, 2016).

Generally, banks record their financial transactions in one ledger. All these transactions are controlled by one financial institution. Bitcoin also has a ledger, called a blockchain, which records all transactions, but these transactions are not controlled by one party. These transactions are issued and managed by thousands of computers

that are operated by different people simultaneously. Blockchain allows payment transactions to occur and record them without using a ledger managed by a bank (Sukamulja & Sikora, 2018).

According to the journal of Syamsiah, N. O. (2017), there are several cryptographic techniques that build Bitcoin, they are: asymmetric cryptography, hash function, and hash cash as proof-of-work.

a. First is asymmetric cryptography, each Bitcoin is connected to the public key ECDSA (Elliptical Curve Digital Signature Algorithm). When Bitcoin is sent, a transaction message is created containing the recipient's public key, the number of coins, and the sender's signature (using the private key); to be subsequently published or broadcast to each user of the Bitcoin protocol, to check the validity of the owner, based on the sender's signature and the sender's balance value. The complete history of transactions is stored by all users, so that all are able to verify ownership of Bitcoin.
b. A hash function is a function that accepts an input string of any length and will return a message digest of a fixed length. The hash function has a one-way property, because the digest message has a fixed length and the input can have different lengths. The hash function is not exactly called the encryption process, because it doesn't have a key, even though the core message has no meaning.
c. Proof-of-work is a function or protocol that is expected to be able to fail denial of service or various excessive use of services such as spam by demanding that a

job be carried out by the user before using the service, usually resulting in processing time when the computer is done. The key to this function is asymmetry; the work is more difficult (but can be done) but is easily checked by the service provider (Syamsiah, 2017).

2.1.3.5. Ways to Get Bitcoin

Based on Syamsiah, N. O. (2017), the mechanism that occurs in transactions using Bitcoin is four types, namely: Mining, Exchange, Commerce, and Investment:

a. Mining is the mechanism system that guarantees the value of Bitcoin is a complicated mathematical calculation carried out by all users using special software and hardware. In return for participation in the mechanism system, each user will get a reward in the form of Bitcoin.

b. Exchange can be done by buying and selling Bitcoin, transferring Bitcoin to others, making deposits in the form of Bitcoin, and making deposits in conventional currency. Besides through exchangers, it can also be through a vending machine. Vending machines are like ATMs, serving exchange of Bitcoin with conventional currencies.

c. Merchants are providers of goods and services who are willing to be paid with Bitcoin. Bitcoin and other virtual currencies, actually created for trading purposes. Here, providers of goods or services can make transactions with buyers who pay with Bitcoin.

d. Bitcoin, like conventional currencies, can also be used by people as investment instruments. Now people see Bitcoin more as an investment or speculation tool than any other function.

Almost similar with the mechanisms above, Sukamulja (2018) stated that there are three ways to get bitcoin, they are: mining, bitcoin trade exchange, and faucet. Faucet explained as a way to get bitcoin, where several websites share bitcoins for free, but the users must fulfill several requirements to get those free bitcoins. For example, they should download new applications, play games or watch advertisements to get the bitcoins for free (Sukamulja & Sikora, 2018).

2.1.3.6. Bitcoin Wallet

Bitcoin Wallet is a software program where Bitcoin is stored. Bitcoin is not stored anywhere; there is a private key (secret number) for each Bitcoin address that is stored in the Bitcoin wallet of the person who has a balance. The Bitcoin Wallet facilitates the sending and receiving of Bitcoin and grants ownership of Bitcoin balances to users. Bitcoin wallets come in various forms; desktop, mobile, web, and hardware are the four main types of wallet (Frankenfield, 2018).

Wallet holds bitcoin balance. It stores the user's Bitcoin address and private key to access the Bitcoin blockchain. When people make payments, the wallet uses keys for digital transactions that prove ownership of coins in the network, known as "unused transactions" (UXTO) (Anon., 2018).

2.1.4. Market Indices

Market indexes are hypothetical portfolios of investment ownership that represent financial market segments. The calculation of the index value comes from the underlying ownership price. Some indexes have values based on market capitalization weights, revenue weights, floating weights, and fundamental weights. Weighting is a method for adjusting the individual impact of an item in an index (Young, 2019).

There are a lot of major stock indices in the world, like FTSE 100 in United Kingdom, Shanghai Composite in China, Nikkei 225 in Japan, KOSPI in Japan, and IDX Composite in our country, Indonesia. In order to get more accurate calculation and result, researcher decided to use major stock index in United States of America. There are 3 major stock indices in USA that are often used in many researches, they are Dow Jones Industrial Average, NASDAQ Composite, and S&P 500.

2.1.5. Signaling Theory

Signaling theory is useful for describing behavior when two parties, can be between individuals or organizations, have access to different information. Usually, one party, the sender, must choose whether and how to communicate (or signal) that information, and the other party, the recipient, must choose how to interpret the signal. As such, signaling theory holds a prominent position in a variety of management literature, including strategic management, entrepreneurship, and human resource management. (Connelly, et al., 2011).

Stiglitz (2002) said that for more than a century, the formal economic model of the decision-making process was based on perfect information assumptions, where information asymmetry that occurred was ignored. Apart from information imperfections, economists largely assume that markets with small information imperfections will behave the same as markets with perfect information (Stiglitz, 2002).

First, Michael Spence in 1973 introduced the signaling theory that examined signaling that occurred in the labor market. Signaling theory provides a unique, practical, and empirically tested perspective on the problem of social selection under conditions of imperfect information. In this study, he seeks to provide clarity on the abundance of concepts that penetrate theories; describe the signals, signals, and receivers that management scholars have explored when they use theory; and making a road map for how the scientific community can advance theory. The fact that researchers in fields such as anthropology, economics, and marketing continue to use signaling theory to explain the phenomenon of selection in their own scientific discipline is convincing. The researchers hope that a review of signaling theories in the management literature will lead researchers to broaden and expand the use of their theories when studying the various choices of eclectic problems that occur within and between organizations (Spence, 1973).

Connelly et al. (2011) encourage the expansion of the use of signaling theory to other fields. Studies that have been carried out extend the use of signaling theory to the world of cryptocurrency. The application of the theory will be similar to the

application in which the manager's decision works as a signal to outsiders. In the case of Bitcoin, there are no organizations with insiders and outsiders. Other parties, such as the government sending signals about Bitcoin, will function as insiders, and investors who interpret these signals will become outsiders.

2.2. Previous Research

Previous research as a main reference for writing this research is from International Journal of Economics and Financial Issues which was written by Frode Kjærland, Maria Meland, Are Oust, and Vilde Øyen in 2018, the title of the research is "How can Bitcoin Price Fluctuations be Explained?". In the study the authors stated that the study shows that it is difficult to find the drivers behind the price. However, some variables may help understand the underlying forces behind the price fluctuations (Kjærland, et al., 2018). The research concluded that the volume of Bitcoin has a significant, negative relationship with Bitcoin's price; interest in Bitcoin and the price fluctuations are tightly connected, as there is a significant, positive relationship between Google search and Bitcoin's price; and the political incidents and statements (shocks) are drivers of the price.

Another research about Bitcoin also has done by Sukmawati Sukamulja and Cornelia Olivia Sikora in 2018. The title of the research is "The New Era of Financial Innovation: The Determinants of Bitcoin's Price". The DJIA stock exchange index, demand for bitcoin, and the price of gold have significant negative effect in the long

term & short term. Bitcoin offers are not significant in the long run, but are significant in the short term (Sukamulja & Sikora, 2018).

A research was conducted by Ladislav Kristoufek in 2015 about "What are The Main Drivers of The Bitcoin Price? Evidence from Wavelet Coherence Analysis". The result of the research are the money supply and price level play a role in the price of Bitcoin in the long run; the increase in Bitcoin prices motivates users to become miners; Bitcoin prices are driven by investor interest in crypto currencies; and Bitcoin does not appear to be a safe haven investment (Kristoufek, 2015).

Dennis van Wijk did a research about "What Can be Expected from The Bitcoin?" in 2013. The research concluded that the Dow Jones stock index, the Euro-Dollar exchange rate & WTI oil prices have a significant influence on the value of Bitcoin in the long run; and the development of global finance can drive the price of Bitcoin in the long run (Wijk, 2013).

According to Junpeng Wang, Yubo Xue, and Minghao Liu in the research of "An Analysis of Bitcoin Price Based on VEC Model" in 2016, in the short run, oil price and trading volume little influence on bitcoin price. Stock price index relatively larger impact; while in the long run, stock price index and oil price negative effect on bitcoin price, while daily trading volume positive (Wang, et al., 2016).

A journal entitled "Can Volume Predict Bitcoin Returns and Volatility? A Quantiles-Based Approach" by Mehmet Balcilar, Elie Bouri, Rangan Gupta, and David Roubaud in 2017 concluded thatvVolume predicts returns over the quantile range of

0.25 to 0.75; and there is no evidence of predictability emanating from volume for volatility of bitcoin returns (Balcilar, et al., 2017).

Another research about "Analysis on the influence factors of Bitcoin's price based on VEC model" by Yechen Zhu, David Dickinson, and Jianjun Li in 2017 concluded CPI, DJIA, FFR and USDI do have a long-term negative influence on Bitcoin price; the gold price has no influence on Bitcoin's price in the long run; and in the short run causality, CPI, GP, and USID to BTC. USDI have the strongest influence. (Zhu, et al., 2017)

To be able to support this research, the researcher will explain them briefly, included the journal title, the researchers, the research methodology, and the result of the research.

Table 2.2

Summary of Previous Research

	Journal Title	Researcher(s)	Methodology	Result
1.	How can Bitcoin Price Fluctuations be Explained?	Frode Kjærland, Maria Meland, Are Oust, Vilde Øyen (2018)	Dependent variable: • Bitcoin prices Independent variables: • Bitcoin Volume • Google Search for Google Trends • S&P GSCI Gold Spot for gold prices • S&P 500 Low Volatility index for volatility	• The volume of Bitcoin has a significant, negative relationship with Bitcoin's price. • Interest in Bitcoin and the price fluctuations are tightly connected, as there is a significant, positive relationship between Google

	Journal Title	Researcher(s)	Methodology	Result
			• Crude Oil spot for oil prices • Hash rate • S&P 500 index for stock • Negative political incidents • Positive political incidents Time series data. The research method is Autoregressive Distributed Lag Models (ARDL).	search and Bitcoin's price. • The political incidents and statements (shocks) are drivers of the price.
2.	The New Era of Financial Innovation: The Determinants of Bitcoin's Price	Sukmawati Sukamulja, Cornelia Olivia Sikora (2018)	Dependent variable: • Bitcoin prices Independent variables: • The Dow Jones Industrial Average (DJIA) stock exchange index • Bitcoin requests from, quandl.com total number of wallet users • Bitcoin offers from, existing total Bitcoin • Gold price Time series data. The research method is Vector Error Correction Model (VECM)	• The DJIA stock exchange index has a significant negative effect in the long term & short term. • Demand for bitcoin has a significant negative effect in the long term & short term. • Bitcoin offers are not significant in the long run, but are significant in the short term. • Requests & offers negatively affect prices

	Journal Title	Researcher(s)	Methodology	Result
				• The price of gold has a significant negative effect in the long term & short term.
3.	What are The Main Drivers of The Bitcoin Price? Evidence from Wavelet Coherence Analysis	Ladislav Kristoufek (2015)	Dependent variable: • Bitcoin prices Independent variables: • US Dollar & Chinese Yuan exchange rate index • Bitcoin word search in Google Trends • Total Bitcoin allocated, number of transactions excluding transactions, estimated output volume, trading volume, transaction volume & hash level. • Financial Stress Index (FSI) to control all types of financial pressure • Gold price Time series data from September 14, 2011 - February 28, 2014. Analytical method	• The money supply and price level play a role in the price of Bitcoin in the long run • The increase in Bitcoin prices motivates users to become miners. • Bitcoin prices are driven by investor interest in crypto currencies. • Bitcoin does not appear to be a safe haven investment. • Even though the USD & CNY market is closely related, there is no clear evidence that the Chinese market is affecting the USD market.

	Journal Title	Researcher(s)	Methodology	Result
4.	What Can be Expected from The Bitcoin?	Dennis van Wijk (2013)	Dependent variable: • Bitcoin value Independent variables, global macro financial development: • Bitcoin to US Dollar, Euro and Yen exchange rates • Dow Jones stock exchange index, FTSE 100, & Nikkei 225 • Brent oil price, West Texas Intermediate (WTI), & CMCI Time series data from 19 July 2010 - 13 June 2013. Method of Error Correction Mechanism (ECM) model analysis	• The Dow Jones stock index, the Euro-Dollar exchange rate & WTI oil prices have a significant influence on the value of Bitcoin in the long run. • The value of the Dow Jones stock index also significantly affects Bitcoin value in the short term. • The development of global finance can drive the price of Bitcoin in the long run.
5.	An Analysis of Bitcoin Price Based on VEC Model	Junpeng Wang, Yubo Xue, Minghao Liu (2016)	Dependent variable: • Bitcoin prices Independent variables: • Oil Price • Trading volume • Stock price Time series data from January 2011 to April 2016 VEC Model	• Short run: oil price and trading volume little influence on bitcoin price. Stock price index relatively larger impact. • Long run: stock price index and oil price negative effect on bitcoin price, while daily trading volume positive.

	Journal Title	Researcher(s)	Methodology	Result
6.	Can Volume Predict Bitcoin Returns and Volatility? A Quantiles-Based Approach	Mehmet Balcilar, Elie Bouri, Rangan Gupta, David Roubaud (2017)	Dependent variable: • Bitcoin prices Independent variables: • Bitcoin returns • Trading volume Time series data from 19 December 2011 to 25 April 2016 VAR Model	• Volume predicts returns over the quantile range of 0.25 to 0.75. • No evidence of predictability emanating from volume for volatility of bitcoin returns.
7.	Analysis on the influence factors of Bitcoin's price based on VEC model	Yechen Zhu, David Dickinson, Jianjun Li (2017)	Dependent variable: • Bitcoin prices Independent variables: • Consumer Price Index • Dow Jones Industrial Average • US Dollar Index • Effective Federal Funds Rate • Gold Fixing Price 3:00 P.M. (London time) in London Bullion Market Time series data from September 2011 to March 2016 VEC Model	• CPI, DJIA, FFR and USDI do have a long-term negative influence on Bitcoin price. • The Bitcoin market behave similar to gold as a financial asset from a certain extend. But gold price has no influence on Bitcoin's price in the long run. • In the short run causality, CPI, GP, and USID to BTC. USDI have the strongest influence.

Source: Compiled from listed journals

2.3. Hypotheses of the Research

Based on the theoretical background and previous researches, the researcher can summarize the hypotheses for this research. There are 5 hypotheses in this research with 1 dependent variable (the price of bitcoin) and 5 independent variables (the volume of bitcoin. the stock exchange index, the total of bitcoin wallet users, the price of gold, and the price of oil).

2.3.1. The Effect of the Volume of Bitcoin on the Price of Bitcoin

The volume–return relationship is often used as one of the variables to describe the dependent of the researches, like equities, commodities, interest rates, currency futures, and real estate (Balcilar, et al., 2017). Kjærland et al. (2018) found that the volume of Bitcoin has a significant negative relationship with the price of Bitcoin.

According to Balcilar et al. (2017), the trading volume predicts returns over the quantile range of 0.25 to 0.75, but there is no evidence of predictability emanating from volume for volatility of bitcoin returns. Wang et al. (2016) in the research concluded that the daily trading volume positively little influence on bitcoin price.

H_1 : the volume of Bitcoin negatively influences the price of Bitcoin

2.3.2. The Effect of the Stock Exchange Index on the Price of Bitcoin

There is a lot of literature on economic growth and determinants. Recent developments in growth theory are mainly theoretical although significant progress has

also been made in empirical growth. Among the determinants of economic growth, the development of the stock market is increasingly becoming an important factor to have an impact on it (Petros, 2017).

Van Wijk (2013) stated Dow Jones Index significantly affect Bitcoin in the short run. According to Wang et al. (2016), stock price index negatively effects on the price of bitcoin in the long run. The research of Sukamulja & Sikora (2018) found that the DJIA stock exchange index has significant negative effect in the long term and short term.

H_2 : the stock exchange index negatively influences bitcoin's price fluctuations

2.3.3. The Effect of the Total of Bitcoin Wallet Users on the Price of Bitcoin

As mentioned in the beginning, Bitcoin became a phenomenon, especially in financial market. Many new users opened their new account in different platforms. There are many popular investing sites which accommodate the transaction Bitcoin around the world, like BitStamp.net, Bitfinex.com, and Binance. Besides that, there is Indodax which is one of the biggest cryptocurrency exchange market in Indonesia. There are many reasons that make Bitcoin interesting whether as a commodity or a payment medium.

Kristoufek (2015) found that the rising price of bitcoin motivates users to become miners. Bitcoin is driven by investor interest; during the explosion price episode, interest pushes prices further, and during a rapid decline, it pushes them further

down. Sukamulja & Sikora (2018) also found that demand for bitcoin which is represented by total wallet users has a significant negative effect in the long term and short term.

H_3 : the total of bitcoin wallet users negatively influences the price of Bitcoin

2.3.4. The Effect of the Price of Gold on the Price of Bitcoin

Gold is a common commodity where people buy and sell in order to invest, reproduce, or other reasons. Many economists generally compare bitcoin with gold because they have a lot in common. Gold has some intrinsic value but most likely does not justify the current market value. Bitcoin and gold get most of its value from the fact that they are rare and expensive to extract. None of them have nationality or are controlled by the government.

Sukamulja & Sikora (2018) found that the price of gold has a significant negative effect in the long term and short term. Zhu et al. (2017) also found that the gold price negatively influences bitcoin's price.

H_4 : the price of gold negatively influences the price of Bitcoin

2.3.5. The Effect of the Price of Oil on the Price of Bitcoin

Oil can be used as one the measured indicators to compare with bitcoin. The indicators can consist of macroeconomic measures (GDP per capita, unemployment, etc) or financial indicators like oil prices. There are some measurements concerning oil prices that often used by researchers in their researches, namely the Brent oil price, the West Texas Intermediate (WTI) oil price, and the UBS Bloomberg Constant Maturity Commodity Index (CMCI).

WTI oil price significantly affect Bitcoin in the long run and most influencing variables related to the U.S (Wijk, 2013). Wang et al. (2016) found that oil price has little negative influence on the price of bitcoin. The research by Kjærland et al. (2018) found that last week's changes in the oil price may impact the Bitcoin price

H_5 : the price of oil negatively influences the price of Bitcoin