



# Bitcoin – a Currency or an Asset?

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## Summary

Cryptocurrencies is a part of the fast growing fintech market. Bitcoin is the first cryptocurrency, but also the currency with the largest market share. Bitcoin was created in 2009, by Satoshi Nakamoto, and have in the years since its release faced very volatile exchange rates. The purpose of Bitcoin is to create a currency that allows payments to be sent from one party to another without going through a financial institution. The volatile exchange rate, and Bitcoins attributes has raised the question of how to define Bitcoin. This thesis answers the research question: *Bitcoin – a Currency or an Asset?*

The thesis defines what is fiat currency, monetary theory and monetary value, in addition to the asset classes capital assets, consumable/transferable asset and store of value assets. Bitcoin's attributes are discussed in light of these definitions. Also included in the background are the governmental views on Bitcoin. Here the thesis focuses on how cryptocurrency is handled by legislators. In Japan cryptocurrencies are deemed legal tender, in the E.U. it is defined as currency, in the U.S. Bitcoin is defined as a commodity, while other cryptocurrencies is defined as securities, in China government has issued a ban on all cryptocurrency. The empirical part of this thesis is made up by time series regressions and rolling window regression using Bitcoin exchange rates, price of gold, OFRS financial stress index, S&P 500 and the federal funds rate as parameters.

Bitcoin is designed to function as a currency, but lack of acceptance in the economy causes problems for the users. The volatile exchange rate also causes problems as it makes Bitcoin worthless as a measurement of value, and also difficult to use Bitcoin for consumption. Findings from the time series regressions and the rolling window regressions indicate that the Bitcoin's exchange rate follows the asset market. When the S&P 500 increases and the OFR financial stress index is negative, indicating low stress in the financial market, the Bitcoin exchange rate increases. The exchange rate is also positively correlated with the price of gold. The empirical evidence, together with the theoretical framework leads to the conclusion that Bitcoin is an asset.

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# 1. Introduction

The recent years we have seen a big development, and innovation, in the financial service industry. This development is led by new, and innovative ways to meet consumer demands, using digital systems. Innovations such as per-to-per lending, crowdfunding, supply-chain finance and crypto currencies is a big part of what is now known as the fintech industry. The financial service market's traditional business models are now being challenged by the Fintech business model, which is more consumer sensitive. This development, and the rapid innovation cause big insecurities for many banks. Extremely fast innovation within the Fintech market leaves the commercial banks struggling to keep up with the industry. The fintech market is largely influenced by the many new cryptocurrencies in the market.

Since the release of the first cryptocurrency, Bitcoin, in 2009 consumers have shown big interest in using currency that is not regulated by official authorities. In the following years, several new cryptocurrencies were released. A new cryptocurrency can be created at any given time. In October 2019 there is approximately 2957 cryptocurrencies and counting. The total cryptocurrency market capitalization is 221 billion USD, around 85% of this is represented by the top ten cryptocurrencies. Bitcoin has, for the time being, by far the largest market share in the cryptocurrency market (Yahoo Finance, 2019). For this reason, my thesis focuses on Bitcoin.

Bitcoin is created to be an alternative to government issued currency, but the very volatile exchange rate of Bitcoin has made this difficult. The volatile exchange rate, and the behaviour in the market raises the questions about Bitcoin's classification as a currency. This thesis intends to determine whether Bitcoin is a currency or an asset. The research question is as follows;

## *Bitcoin - a Currency or an Asset?*

In the recent years is has been published many papers and articles about Bitcoin, from different angles. The question "is Bitcoin a currency or an asset" has been discussed in several of these papers.

Glaser et al. published in 2014 the article “Bitcoin – asset or currency? Revealing users’ hidden intentions”. In this article they use the exchange volume, network volume, as well as information on Wikipedia searches, GARCH model, and good- and bad news reports to determine if the users use Bitcoin as a currency or an asset. This article uses classical economic theory when defining both currency and asset, in order to determine which category Bitcoin falls under. One interpretation of the results is that exchange users buying Bitcoin for the first time are likely to keep these Bitcoins in their exchange wallet for speculation purposes and do not have the intention to use these acquired Bitcoins for paying goods or services. Furthermore, the interpretation that Bitcoin is used as asset is also supported by the fact that Bitcoin returns react on news events related to this digital currency. They also find indications that Bitcoin users are limited in their level of professionalism and objectivity, which is highlighted by their bias towards positive news. Thus, new users tend to trade Bitcoin on a speculative investment intention basis and have low intention to rely on the underlying network as means for paying goods or services (Glaser, Zimmermann, Haferkorn, Weber, & Siering, 2014). They note in their conclusion that their analysis is built on data from a single exchange, Mt. Gox, which at the time handled 80% of the exchange volume. This is a problem for the validity of their dataset, as it later has been discovered that Mt. Gox used bots to manipulate both trade volume and exchange rate (Gandal, Hamrick, Moore, & Oberman, 2018),

The article “Bitcoin, gold and the dollar, A GARCH volatility analysis” written by Dyhrberg was in 2016 published in Finance Research Letters. In this article the Bitcoin price is compared to the price of gold, exchange rate between USD and EUR, as well as the Financial times stock exchange 100 index (FTSE100) in an effort to find which parameters that effect the Bitcoin price. Also, this article uses the GARCH model to indicate how investors react to good and bad news. The article aims to define if Bitcoin’s attributes are more similar to gold or dollar. Dyhrberg finds that most aspects of Bitcoin are similar to gold as they react to similar variables in the GARCH model, possess similar hedging capabilities and react symmetrically to good and bad news. The overall result suggests that Bitcoin is somewhere in between a currency and a commodity due to its decentralized nature and limited market size (Dyhrberg, 2015).

Pagano et al. published in 2018 the article “Bitcoin and the demand for Money: Is Bitcoin more than just a speculative asset?” In this article Pagano et al makes an effort to determine the demand for Bitcoin as money. This is done using Keynes 1935 theory of money demand

as a framework. They separate the users of Bitcoin in three categories, transactional, precautionary and speculative. This article uses, among other parameters, the Financial Stress Index (FSI), trade volume, transaction volume, google trend “BTC Payment system” and different exchange rates to enlighten the research question. They find both evidences to support the fact that Bitcoin is used as a speculative asset, but also strong and consistent evidence that suggests Bitcoin is also used as a transactional currency. They argue that a link between transactional demand and trading demand of Bitcoin may exist due to a positive, self-reinforcing feedback loop. They also find some evidence that Bitcoin is used in a precautionary sense, possibly as a hedging instrument when financial markets are stressed or when fiat currencies experiencing high levels of inflation (Pagano & Sedunov, 2018).

In my thesis I combine the three approaches. I use, like Glaser et al. and Pagano et al., classical economic theory as a framework for this thesis. I will however not focus on the network, or the google and Wikipedia searches. I will, as Dyrberg, use parameters such as price of gold, and like Pagano et al. use the FSI when performing the statistical analysis. I have substituted the FTSE 100 with the S&P 500, as I focus on the US market in this thesis.

This thesis will add to the fast-growing literature regarding Bitcoin and its attributes. Combining these three approaches, as discussed above, this thesis will provide a slightly different approach the research question. This thesis focuses on how Bitcoin behaves in the market, not the user’s intentions like Glaser et al.’s paper. I also expect the dataset I use in this thesis to be more valid, as there is more available data resulting in the validity concerns regarding Mt. Gox to be smaller. Dyrberg’s paper focuses on Bitcoin compared to gold, but also the Bitcoin exchange rate in GBP and USD as well as the FTSE 100. This thesis focuses on the US market, for this reason the exchange rate in GDP is not relevant, nor is the FTSE 100, which is substituted with S&P500 here. In this thesis u use gold as a parameter, but as it is one of several parameters it is not emphasized as much as it is in Dahlberg’s paper. This thesis have similarities with Pagano’s paper, as both use a theoretical framework to answer the research question. Pagano et al.’s paper focuses on the demand for money, causing trade volume, transaction volume and google trend to be important parameters in their research. These parameters are not included in this thesis as they are not relevant for the research question. The combination of methods provides important information, and the framework to answer my research question, “Bitcoin - a Currency or an Asset?”

Results from the regressions on the Fed parameters suggests that bitcoin is a currency. Other findings from the regression shows that the Bitcoin exchange rate is influenced by both financial stress in the market, and also by how the S&P 500 is trading in the US stock exchanges. In addition to this, Bitcoin share some of the characteristics that fiat money has. Both hold no fundamental value, but fiat money is backed by government. The difference is that Bitcoin is in some instances difficult to use as a means of payment due to the volatile exchange rate, but also because it is not accepted as a means of payment by everyone in the economy. Lastly the volatile exchange rate makes Bitcoin useless as a valuation measure. It is also found that increased speculative pressure makes the currency less useful as a means of payment, reducing its value (Zimmerman, 2019).

## 2. Introduction to Bitcoin

In October 2009, Satoshi Nakamoto published the paper “Bitcoin: A Peer-to-Peer Electronic Cash System”. In January 2009 Bitcoin was first made available to the public (Bernard, 2017). Satoshi Nakamoto’s paper states that the purpose of Bitcoin is to create a currency that allows payments to be sent from one party to another without going through a financial institution. Nakamoto refers to the blockchain technology as a system for electronic transactions without relying on trust. Bitcoin was not the first cryptocurrency; it was the first cryptocurrency created to function as legal tender. Bitcoins forerunners were currencies developed as tokens, or currency to be used in online games. Satoshi Nakamoto is a pseudonym for one person, or a group of persons behind the first codes. There have been big efforts, from several different governments, to unveil the identity of Nakamoto. The identity is still unknown to the public.

### 2.1 How does it work?

In order to own Bitcoin, you need to download a digital wallet, or create an account on an online exchange. When purchasing Bitcoins, you trade money, in the currency you prefer, with Bitcoin in one of the many online exchanges. When you receive Bitcoins, you get a code in your digital wallet. You can purchase Bitcoins online, but also in real life by receiving the codes of the Bitcoins you have purchased. Bitcoin is built up as a peer to peer model. Money transfers between users are collected in what is known as block chains. The transactions that are not yet finished is collected in a block; the block contains a reference to the previous block thereby making a chain. The transactions are sorted by time, to avoid using the same Bitcoins in two transactions simultaneously.

In order to transfer these chains, and actually move the money from peer-to-peer, someone needs to make their computer capacity available in the network. This is known as mining. Miners are compensated by earning a given amount of Bitcoin as a block reward for their mining. Mining is therefore also how new money is generated in the Bitcoin economy. When a computer is mining it is solving difficult mathematical algorithms, proof of work, using a specialized computer program. Mining is trial and error, “trying to find the next piece of a puzzle”. The speed of the trials and errors for each miner is called a hash rate, i.e. the rate the

miner searchers for new puzzle pieces. The hash rate of each miner is determined by the mining software she uses.

The Bitcoin protocol is created to clear one block, on average, every 10 minutes. This is done by controlling the difficulty of the mathematical algorithms that the miners solve. The difficulty is reviewed every two weeks. This causes the number of miners to be insignificant to the speed of cleared blocks, and this in turn causes big fluctuations in the mining rewards. The restrictions of the speed blocks are cleared in also causes problems for users who wants to move their Bitcoins. When users make a transaction, it must first be verified by all the nodes available i.e. all the computers in the Bitcoin network. The transactions are then collected in a mempool (memory pool), while waiting to get picked up by a miner. There is also a restriction to the size of the blockchain, which causes the mempool to grow in periods when many users want to make transactions. When the mempool reaches its capacity, the nodes set up a minimal transaction fee threshold. The minimal transaction fee causes the users who offers a fee lower than the threshold to be excluded from the mempool. This also includes transactions that are already in the mempool. If the demand for transactions is high, there is a possibility that transactions that don't include transaction fee does not get picked up by miners, and therefore gets evicted from the mempool (Nakamoto, 2008).

In the Bitcoin protocol there is a finite amount of Bitcoins set to 21 million (Cheng, 2018). The block reward in Bitcoin's early days, was quite lucrative because you earned a relatively big share of the total amount of Bitcoins. The protocol, however, is made so that the block reward is halved whenever 210,000 Bitcoins is mined, approximately every 4<sup>th</sup> year. Therefore, in time, the amount of Bitcoins the miners receive converge asymptotically towards zero. This, in combination with the restrictions on clearing blocks, forces the consumers to include a fee to the miners in their transactions as an incentive to the miners to include their transactions in the block.

The cost of a Bitcoin transaction is influenced by the demand in the market. The supply of mining has up until now been constant, leaving only the demand for mining power to influence the cost. This makes it difficult to use Bitcoins as intended as it is not only the exchange rate that has big fluctuations, but also the transaction costs, as well as transaction time. As mentioned earlier, the goal when creating Bitcoin was that it would function as a currency along the lines of the already well-established fiat currencies. This has proven difficult since

the exchange rates has suffered big fluctuations, making it almost impossible for consumers to rely on Bitcoin as their main currency (Bovaird, 2017). The volatile exchange rate raises the question of whether Bitcoin should be defined as an asset or a currency.

## 2.2 Blockchain technology

The blockchain technology was first developed by Satoshi Nakamoto as an attribute to the Bitcoin technology. However, this clever new way of sharing information has shown to be useful in more ways than first intended. The blockchain technology distinguishes itself from other types of file sharing by being more secure. I will use an example of sharing a word document in order to explain how it works.

When using blockchain the document is not sent from one server to another server, like traditional documents. Instead it is uploaded on several servers simultaneously. The information in the blockchain is therefore more secure against hackers, because the information is not secured on one entity alone. On traditional documents it is only possible to make reviews, and changes at one entity. When you send someone a document, you have to wait for them to send it in return before you can continue reviewing the document. Using the blockchain technology the document is uploaded to several server simultaneously, making it possible to make changes from all servers in real time. The way traditional banks' technology work is similar to the example with the word document, changes can only be done on one entity, resulting in the bank having to lock the accounts in short periods to handle transactions. If banks were to adopt the blockchain technology this would not be necessary. Changes made in the account balance happens immediately, and on both accounts simultaneously.

The blockchain technology is as mentioned a more secure and faster way of sharing information. If fully adopted, it will enable banks to process payments more quickly and more accurately while reducing transaction processing costs and the requirement for exceptions. The traceability and the permanent record when blockchains backs up every asset or item of value that was traded provides assurance and authenticity all the way through the supply chain.

## 3. Background

### 3.1 Money

Fiat money is a currency that is established as legal tender by government regulations. Fiat money does not hold indistinct value in themselves. The value of money is influenced by a combination of supply and demand, as well as the stability of the government that issued the money. Before fiat money was invented commodity money was used. This form of money holds a value on its own, compared to fiat money which gets its value from credit in the economy. Fiat money was first used in China 1000 ad, before it spread to other countries around the world. The use of fiat money became common in the 20<sup>th</sup> century, when the Nixon administration passed a law that made U.S. dollar independent of the value of gold, stopping the use of gold standard in the U.S. economy. Today most countries use fiat money.

Fiat money can be defined as paper-based money, that can be used as a means of payment. The one big difference, compared to commodity money, is that it cannot be redeemed or converted. One of the advantages of fiat money, in comparison to commodity money is that government gets more control over the economy by having the possibility to control how much money is printed. The opportunity to print more money is also one of the drawbacks of fiat money, if this possibility is not used responsibly it can result in hyperinflation in the economy. Fiat money sets high standards for government, they have to be alert to counterfeiting, and act responsible in regard to money supply, for fiat money to be trusted by the public, which is a prerequisite for the success of fiat money (CFI, 2019).

A common misunderstanding that occurs when people talk about Bitcoin is that it is not real, because you cannot physically touch it. It is not possible to hold Bitcoin in your physical wallet; it has to be held in an online account, or the digital wallet created by Satoshi Nakamoto. They also argue that Bitcoin has no fundamental value. Fiat currencies have, like Bitcoin, no fundamental value in itself. The fiat currencies are made out of paper and metal, and the money and our bank accounts are digital, the same way Bitcoin is digital. The big difference is that fiat currencies are controlled, and backed, by government. The use of these currencies is based on that public trusting the governments monetary policies. In most countries this is a matter of course, and the currency is regarded as safe for the countries'

public, and also by global public and institutions. However, fiat currencies will, as Bitcoin, face big difficulties if the public do not trust the currency. Lack of trust of fiat currencies have in the past culminated in bank runs. The public's fear of insolvency in the banking sector acts as a self-fulfilling prophecy, because when the bank run starts the banks become insolvent, and if the run is not stopped, they may go bankrupt.

## 3.2 Monetary Theory

Money is designed to have three main purposes. First, money should present an opportunity to store value over time. This gives the public the ability to differentiate between consumption and saving. When storing the value, money can be saved for later use. Money should also have the function of a measuring unit for value. This measuring unit gives the public a way to compare the price of different services and goods. Lastly money is means of payment. Money must be accessible for everyone in the economy. It must also be able to be diversified, i.e. it must be possible to fragment it down in smaller units. Money have to be accepted by everyone in the economy, movable and uniform, they have to be the same both in appearance, and the consumption power they give (Steigum, 2018).

Bitcoin does not have all these the characteristics. First it can be argued Bitcoin can be used as a way to store values over time. The exchange rate is as mentioned earlier volatile, but nevertheless it allows consumers to store value over time. Second Bitcoin is not a good measuring unit of value. The volatile exchange rate makes it near impossible to compare prices of different services and goods. Lastly Bitcoin's use as a means of payment can be defined as limited, as it is not accepted by everyone in the economy. One can also argue that it is not accessible to everyone in the economy, because of the entry barrier of needing access to a computer or a smart phone.

### 3.3 Demand for money

Keynes argued in his 1935 publication the demand for money could be explained with the help of the general liquidity model, which separates the motive for money demand into three categories; transactional, precautionary and speculative. The first motive for money demand is the transactional motive. This can be considered to be a rational demand, as the public needs a method of collecting income, and paying for consumption. This demand however is largely influenced by the activity in the economy, high activity yields high demand, and contrary low activity yields low demand. The second demand Keynes formulated is precautionary demand. This demand arises for the liquidity to handle unexpected events such as loss of income, or to cover big expenses. The precautionary demand can be used as a way to smoothen households' consumption, this is done by saving a buffer which grows in good times and is used in harder times. Lastly there is a demand for money to be used for speculative purposes. The motive is to save up excess funds, that can be used for promising investment opportunities (Pagano & Sedunov, 2018).

Pagano et al. finds in their paper results that indicates that there is a demand for Bitcoin for transactional purposes. Glaser et al. finds evidence to the opposite, that Bitcoin is used for speculative purposes. There are validity concerns regarding this paper, making Pagano et al.'s findings more creditable. Pagano et al. also finds evidence that there also is demand for Bitcoin with precautionary and speculative motives.

### 3.4 Government control

Governments have three ways of controlling the money supply through different actions executed by the central bank.

#### *The reserve ratio*

The reserve ratio is the rate a government decides that commercial banks are required to hold against deposits. This ratio specifies the share of deposits the banks are required to hold on to, and lend out, or invest. This ratio consequently determines how much the banks can lend out to the public. A reduction in the reserve ratio will allow the banks to lend out more money to the public, resulting in more money in the economy. An increased reserve ratio will have the opposite effect (CFI, 2019).

### *Federal discount rate*

The federal discount rate is the rate that the central bank offers to commercial banks who want to borrow funds from the central bank. The discount rate indirectly sets the rate banks offer the public. The savings, or increased expenses experienced by the banks are passed along to their customers. When the federal discount rate is increased households use a larger percentage of their income on loans, resulting in a decrease in savings and other consumption. This is, in effect a way to slow down the economy, by giving the public less money to use. When the rate decreases households have more money available, making them able to increase their savings and consumption. This is used as a tool to boost the economy in times of recession, or after a crisis (CFI, 2019). This way of using the federal discount rate is a part of the counter-cyclical policy that Keynes was a strong advocate for.

### *Open market operations*

Open market operations, OMO, is a way for the central bank to affect the quantity of money in circulation. If the central bank wants to increase the quantity of money in circulation, it purchases securities from commercial banks and institutions. The commercial bank's assets is then freed up, which in turn gives the banks more money to loan out to the public. The opposite is done when the goal is to decrease the quantity of money in circulation. These open market operations are used as a means to reach the targeted federal fund rate. The federal funds rate is the average overnight rate that major financial institutions use when lending and borrowing funds amongst themselves (CFI, 2019).

Under special conditions, like especially difficult economic circumstances, the central banks can use a program of quantitative easing. This program was used by many central banks in the period following the financial crisis in 2008. When using quantitative easing the central bank create more money and uses these to buy assets and bonds. This causes the banks' reserves to increase and gives the banks incentives to lend out more money. Another effect is that the long-term interest rates to drop and hence encourages investments. A problem with quantitative easing is that it can cause high inflation rates, as much money is poured into the economy. If the quantitative easing has no effect other than increased inflation the economy can go into a state of stagflation. Another problem that can occur as a result of quantitative easing is devaluation of the currency. This will also cause big problems in the economy,

leaving export businesses with a big competitive disadvantage, and raising prices in all import consumption (Joyce & Spaltro, 2014).

## 3.5 Assets

An asset can be defined as an attribute that holds future economic value. These attributes can be intangible assets such as people within a company, software and goodwill, or tangible asset such as property and inventory. In this thesis I will use the framework used by Robert J. Greer in the paper “What is an Asset class anyways?” (1997). In this framework assets are separated into three main classes, Capital assets, consumable/transformable assets and store of value asset. There are however not clear lines between the asset classes.

### *Capital assets*

Capital assets can be defined as ongoing source of value. Capital assets are assets that yields economic value, just by holding the assets. Within this asset class it is possible to divide the assets further, equities, bonds or income-producing real estate. Using equity as an example, these assets give future economic value by its expected future dividends. Considering real estate, only income-producing real estate can be defined as a capital asset as it yields economic value, contrary to regular real estate that stores, not yields value by being owned.

### *Consumable/Transformable assets*

This asset class includes the asset which can be consumed, or transformed, but does not yield ongoing value in itself. This asset class consists of physical commodities. These commodities, such as corn, or energy products cannot, like capital assets, be valued using a present value analysis. The reason for this is that the commodity itself are not capital in nature, and therefore must be valued based on the supply and demand in their particular market.

### *Store of value assets*

This third asset class contains asset that does not yield income, nor can it be consumed or transformed into something else. This asset class is purely for storing value. There are different categories within this asset class. Some may use art as a store of value, while others choose currency.

There are, however, many assets that fits in to several of these classes. Gold is an example of an asset that is difficult to determine where it belongs in this framework. Gold can be used as a store of value because the price value of gold has traditionally been stable. However, it can also be classified as a consumable/transformable asset, as it can be transformed from a gold bar, to a necklace, and perhaps increase its value. It does however not yield ongoing value, hence it cannot be defined as a capital asset. Bitcoin does not yield ongoing value, nor can it be transformed. It can however be used as a store of value. The historical exchange rate has proven Bitcoin to be a lucrative investment.

### 3.6 Governmental views on Bitcoin

Ever since government in different countries became aware of crypto currencies there has been a big debate on how to deal with this new phenomenon. Legislators across the world have chosen different approaches toward the new currencies. For the time being, there exist no global regulations (Rooney, 2018). This thesis does not go into detail on how different governments have chosen to define the virtual currencies but focuses on decisions from the biggest economies.

#### *The European Union*

In 2015 EU top court decided that Bitcoin is not exempt from VAT i.e. it is to be considered a currency (Hedqvist, 2015). In 2016 the European commission proposed a legislation that had the purpose of bringing virtual currencies under the scope of the Anti-Money Laundering Directive. This meaning that users of virtual currencies would be under the same legislation as users of governmental issued currencies, also implying that one is required to do due diligence in order prevent, detect and report money laundering and terrorist financing. The proposal was approved in committee 29. January 2018 (The Law Library of Congress, 2018). This legislation was important because previous event has shown us that Bitcoin has been and is still being used in relation to criminal- and terrorist activities (Malik, 2018).

## *China*

In 2018 when the governor of People's Bank of China, Zhou Xiaochuan, stepped down, he stated that "Chinese regulators are not recognizing virtual currencies such as Bitcoin as a tool for retail payments like paper bills, coins, or credit cards. The banking system is not accepting any existing virtual currencies or providing relevant services". Prior to his statement the People's Bank of China had conducted a three year long study of digital currencies, and setup an institute of Digital Money within the bank. Chinese authorities also stated in 2017 that "initial coin offering financing that raises so-called 'virtual currencies' such as Bitcoin and Ethereum through the irregular sale and circulation of tokens is essentially public financing without approval, which is illegal" (The Law Library of Congress, 2018).

Despite the ban issued by Chinese government, China wants to be one of the frontrunners in the blockchain technology. The government wants to develop a crypto currency of its own. This currency will however not be decentralized, and the main goal with this currency is that it will provide more control over the financial system. This cryptocurrency will also provide the government with more information about its users, making it easier for the government to monitor the public, and crack down on criminal activity (Bloomberg News, 2018).

## *USA*

In March of 2018 the Financial Crimes Enforcement Network, FinCEN, a bureau of the Treasury Department stated that "virtual currency does not have legal tender status in any jurisdiction". The legality of crypto currency exchanges differs between the states. The U.S. market is the second largest Bitcoin market, and handles approximately 26 percent of Bitcoin volume (Rooney, 2018). The U.S. regulators differ in their definition of Bitcoin and other cryptocurrencies. The Securities and Exchange Commission has implied that they consider cryptocurrency to be a security, and wants to apply security laws to cryptocurrency exchanges, and digital wallets. The Commodity Futures Trading Commission considers Bitcoin to be a commodity. Lastly the IRS defined cryptocurrency as property in 2014 and stated that "for federal tax purposes, virtual currency is treated as property. General tax principles applicable to property transactions apply to transactions using virtual currency" (IRS, 2014).

## *Japan*

Japan distinguishes itself from the other countries. As of April 2017, it deemed Bitcoin to be legal tender. Almost half of the of the cryptocurrencies being traded every day is traded in Japanese Yen (Rooney, 2018). As a result of cryptocurrencies being legal, the exchanges are being regulated by The Payment Services act, which was amended in June 2016, and took effect 1. of April 2017. This act defines cryptocurrencies as “property value that can be used as payment for the purchase or rental of goods or provision of services by unspecified persons, that can be purchased from or sold to unspecified persons, and that is transferable via an electronic data processing system; or property value that can be mutually exchangeable for the above property value with unspecified persons and is transferable via an electronic data processing system” (The Law Library of Congress, 2018).

The act states that only business operators registered with a competent local Finance Bureau are allowed to operate in Japan. The exchanges must have a contract with a designated dispute resolution center with expertise in cryptocurrency exchanges. The exchange business must keep accounting records of its cryptocurrency transactions and verify the identity of users opening accounts. The exchanges are also required to alert authorities if they detect suspicious trades. The exchanges also deliver reports to The Financial Services Agency, FSA, annually. This helps the government control the cryptocurrency market, and also provides more security for the public. If the FSA finds security breaches, or problems regarding any of the exchanges they can retract the exchange’s authorization to operate in Japan, until they improve their security problems. Japanese authorities regard income from cryptocurrency as miscellaneous income, and not as capital gain. It is added to other income, when taxable income is calculated.

## **4. Methodology**

### **4.1 Research approach**

This thesis aims to answer the research question “Bitcoin – a Currency or an Asset?” I approach this question using economic theory to define what an asset is, what is money and what is fiat currency. I collect raw data from several sources to perform regressions. The findings from the regressions, together with the economic theory is the foundation of the discussion on whether Bitcoin is a currency or an asset.

The research design makes up the framework for the data collection and data analysis in order to answer the research question and meet research objectives providing reasoned justification choice of data sources, collection methods and analysis techniques (Saunders, Lewis, & Thornhill, 2016). This thesis uses a quantitative research design. The reason for this is that the nature of the research question calls for extensive use of numeric data. I use statistical techniques to examine the relations between different variables, which is one of the characteristics of a quantitative research design.

#### **4.1.1 Time horizon**

I use a timeline starting in August 2010 and ending in October 2019. The reason for choosing this period is that this is the period where there is possible to collect trustworthy data on Bitcoin exchange rates from one source. There is only a small part of Bitcoin’s history that is not represented in the collected data. This period is also one I regard as with little impact as Bitcoin was still new, and had in this period very few users, and a small transaction volume. As the scope restrictions are relatively small, I do not expect it to have any influence on the quality of the research.

## 4.2 Data

In this thesis I analyse the data using the statistical software STATA. This software is used to estimate econometric models. These models include data extracted both from the Bitcoin exchange, and also from US government issued sites. Above I have reviewed two of the parameters I use when estimating the regressions in STATA. In addition to a linear regression, I also perform a rolling window regression.

The numeric data on Bitcoin is collected from Investing.com. This site provides data on exchange rate in USD and exchange volume in Bitcoin. The data presented at Investing.com is not provided by exchanges, but by market makers. For this reason, the reported exchange rate can differ from what is offered on different exchanges. The numeric data is available in several different currencies. I choose to use USD in my thesis. I also use data on the federal funds rate, the financial stress index and the S&P 500. These data are accessible from online sources.

### 4.2.1 Variables

#### *Financial Stress Index, FSI*

In this thesis I use the Office of Financial Research Stress Index as one of the parameters for regression. The OFR Financial Stress Index (OFR FSI) is a daily market-based snapshot of stress in global financial markets. It is constructed from 33 financial market variables, such as yield spreads, valuation measures, and interest rates. The value of the OFR FSI on a given day is the weighted average level of each variable observed in the market on that day, relative to its history. The index is zero when this average is zero, suggesting that stress is at normal levels. The index is calculated after each U.S. trading day (Office of financial research, 2019). This index is useful because it can be used in regressions, to show if there is correlation between the FSI and the Bitcoin exchange rate.

## *S&P 500*

The S&P 500 is another parameter that I use when estimating the regressions. The S&P 500 is widely regarded as the best single gauge of large-cap U.S. equities and serves as the foundation for a wide range of investment products. The index includes 500 leading companies and captures approximately 80% coverage of available market capitalization (Bloomberg, 2019). The reason for including the S&P 500 is that it gives information on the financial market. Using this as one of the independent variables in the regressions, with the Bitcoin exchange rate as dependent variable, gives useful information to help answer the research question.

### **4.2.2 Validity**

One of the main problems regarding the data is that it is provided from the Bitcoin exchanges. This makes it difficult to validate, due to the anonymity of the users. In the past a big exchange has disappeared overnight, including the Bitcoins and data (Levine, 2017). In the recent years evidence have been found implying that some of the price-, and trade booms on the Bitcoin exchanges can be attributed to the work of price manipulating robots. Throughout most of 2013 there were two active bots named Willy and Markus on the Mt. Gox exchange. These two bots acquired 600,000 Bitcoins during the short time they were active. Mt. Gox CEO, Mark Karpelès, admitted during his trial in Japan, that the Willy bot was operated by Mt. Gox (Gandal, Hamrick, Moore, & Oberman, 2018). It is only possible to document usage of bots in 2013, this gives however no guaranty that this is the only time the price, and transactions have been manipulated.

Despite concerns regarding the data extraction, the Bitcoin exchanges are the only possible source for finding this data. The data collected from the exchanges is raw data, meaning it is not collected, or created with any specific purpose in mind. This is an advantage which helps eliminate many possible sources of error concerning the data. Data regarding the Bitcoin exchange rate, and volume is collected from investing.com, which delivers daily data. Data on some other parameters are only available on trading days, causing the used data to be only from trading days.

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I keep the validation concerns discussed above in mind when analysing the result from the regressions. Apart from data from Bitcoin exchanges, the dataset also consists of data from official US sources. I therefore consider this data to be valid. Another validation issue in this thesis is the difficulty to validate the sources delivering news about the Bitcoin community. As the users are mostly anonymous, many of the news stories comes from underground forums, and sites specialised on Bitcoin news. It is difficult to determine the validity of these news, as the sites are often small, and not acknowledged as big news sites. It is therefore especially important to bear this in mind when siting these sources and using them further in the analysis. However, these sites are the ones with the most knowledge about the Bitcoin market. As a precaution it is useful to search for several sources, and also evaluate the sources with a critical mindset before using them.

### 4.2.3 Dickey-Fuller test

Before using the collected data, I run a Dickey-Fuller test on the different variables to test if they are stationary or has unit root. This test is designed to tell if the auto-regressive model has a unit root or that it follows a random walk. A unit root is a function of processes that develops as time passes, this can cause problems, such as statistical interference.

AR (1) - process

$$y_t = \rho y_{t-1} + u_t$$

Test for unit root

$$\nabla y_t = \delta y_{t-1} + u_t$$

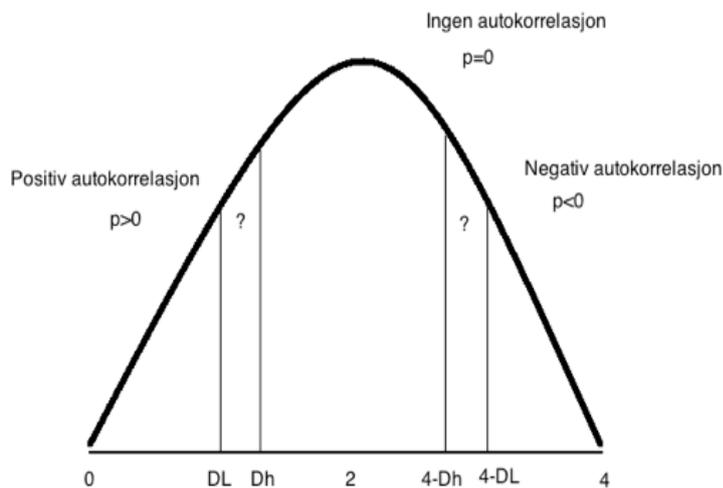
A unit root is present if  $p=1$ , meaning the model is not stationary. It is also possible to test for a unit root with drift, and deterministic time trend. When the  $\tau$ -value is larger than critical value, we find the regression to be non-stationary. The ambition thus is to have a  $\tau$ -value that is smaller than the critical value.

#### 4.2.4 Durbin-Watson test

I also performed a Durbin-Watson test on the regression made with the time series data. The Durbin-Watson test is developed to test for the presence of autocorrelation, a relation between values that is separated by different time lags in residuals for prediction errors from a regression analysis. The Durbin-Watson test is developed as a test of the residuals of OLS, Ordinary Least Squares.

$$d = \frac{\sum_{t=2}^T (e_t - e_{t-1})^2}{\sum_{t=1}^T e_t^2}$$

The value of  $d$  will be between 0 and 4. In the event of  $d = 2$ , there is no autocorrelation. If the value is between 0 and 2, the value indicates that there is autocorrelation between the variables. Precisely at what value autocorrelation occurs is difficult to determine, however, if the value is between 0 and 1, there is a high probability that autocorrelation is present in the time series data. To test if there exist positive autocorrelation that is significant at  $\alpha$ , the  $d$ -value is compared with the critical values  $d_{L,\alpha}$ , and  $d_{h,\alpha}$ .



## 4.2.5 Exogenous Bitcoin market shocks

### *Rise and fall of Silk Road*

Silk Road is best described as the dark web's version of eBay. Designed by Ross Ulbricht, Silk Road got its name from the historical trade route that connected Europe and east Asia. It was launched in February 2011. Silk Road was designed with the intention of creating a free marketplace for products and services, outside the scope of government. This made Silk Road infamous for its supply of drugs, and services such as sex workers and hitmen.

The consumers in Silk Road was anonymous because the site was located in the deep web. In order to access the deep web, one have to use a browser named Tor. This browser makes your searches and actions on the deep web untraceable. This, in combination with the use of Bitcoins, made it easy for suppliers to market their services. In June 2011 Adrian Chen, a reporter from Gawker, posted an article about Silk Road which lead to a big increase in the popularity, and number of users on the site (Bilton, 2017). It is claimed that the mention in the article, made the Bitcoin's exchange rate almost double from \$18 to \$30 (Norrie & Moses, 2011). At its peak Silk Road reportedly had 957 079 user accounts. Over the course of its lifespan, two years, approximately 9,5 million Bitcoins changed hands between vendors and customers (Fung, 2013).

Because of the nature of Silk Road, and the use of Bitcoin in connection to the site, governments all over the world worked hard to find the person behind the site and shut it down. Silk Road was shut down by FBI in October 2013, and Ulbricht was arrested. A Silk Road 2.0 was then launched, but it too was shut down. Ulbricht was later sentenced to life in prison, without the possibility of parole (Williams-Grut, 2018). The shutdown of Silk Road had an impact on Bitcoin exchange rate. Many of Bitcoin's users used it as a way of buying or selling illegal product and services. The government initially seized 29 665 Bitcoins from different accounts on Silk Road. Later it became known that they seized additional 144 336 Bitcoins from Ulbricht's account (U.S. Attorney's Office, 2013). This resulted in insecurity in the Bitcoin market, because one of the most used arguments in favor of Bitcoin, and other crypto currencies is that it is anonymous, and that the money cannot be seized by the government.

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## *The hack of Mt. Gox*

Mt. Gox, an acronym for magic the gathering online exchange, was at its height by far the biggest Bitcoin exchange. In 2014 it was said to handle approximately 80% of Bitcoin transactions worldwide (Glaser, Zimmermann, Haferkorn, Weber, & Siering, 2014). The exchange was based out of Tokyo, Japan. The exchange was launched in 2010, by programmer Jed McCaleb. As the exchange grew, McCaleb decided to sell the company to Mark Karpelès.

Mt. Gox suffered its first hacker attack in June 2011. In the attack 2000 Bitcoin was transferred at an artificially low price, while approximately 650 Bitcoins was bought by costumers at this low price. The hack did not cause users to lose big values. The small losses made it possible for Mt. Gox to rebuild its reputation and grow further. Even though many former employees, and business partners warned about lack of security and organization within the exchange, Mt. Gox continued to grow. On the 07. of February 2014 Mt. Gox stopped all Bitcoins withdrawals, 24. of February all trades were suspended, and the exchange went offline. Finally, 28. of February Mt. Gox filed for bankruptcy in Japan, and two weeks later in the U.S.

At first it seemed like the exchange was subject to a large attack by hackers, and that all value were lost overnight. However, investigation showed that the attack may have started as early as 2011, and that the exchange had in the time period 2011-2013 already been technically insolvent. It is reported that approximately 650 000 Bitcoins is still not accounted for after the big hack. Some claim that the amount is far less, and that Mt. Gox CEO manipulated the number to make the exchange seem bigger than it was in reality. (Norry, 2018).

In the time since Mt. Gox filed for bankruptcy the costumers who lost their money have gathered and filed a large, ongoing lawsuit towards Mt. Gox in Japan, led by prosecutor Nobuaki Kobayashi. One of the things that makes this case special is that even though Mt. Gox have filed for bankruptcy, it is still solvent. According to Japanese laws, any surplus in such cases belongs to the shareholders. Karpelès owns 88% of the company. In the ongoing lawsuit Kobayashi set the value of one Bitcoin to its 2014 value \$483, which made many of the complainants dissatisfied because the value has grown significantly since 2014. However, there is still a risk that the exchange rate will yet again plummet to a value lower than \$483 (Jeffries, 2018). The shutdown of Mt. Gox sent shivers through the Bitcoin market. There is no guaranty that the attack on Mt. Gox was an isolated event, and this resulted in uncertainty

in the market. Many users became afraid of losing their Bitcoins. The disappearance of Mt. Gox also gave Bitcoin a big setback in liquidity. Another effect of the disappearance of Mt. Gox had on the market was a big drop followed by malaise in the Bitcoin exchange rate.

## 5. Econometrics

I write this thesis to answer the research question Bitcoin – a currency or an asset? Satoshi Nakamoto stated in his paper that Bitcoin was created as an alternative currency. I use four hypotheses as a tool to answer this research question.

*H1: Significant and negative Fed coefficients indicates that Bitcoin is an asset.*

If the fed coefficients are negative it is an indication that higher fed rate results in lower Bitcoin exchange rate. This assumption is made using supply demand theory, if consumers were to prefer commercial banks when they give higher returns on savings, it would lead to a higher supply of Bitcoin, and consequently a lower price. If the fed coefficient is negative there is a preference for consumers to move their money from Bitcoin to commercial banks. If the hypothesis is kept it indicates that Bitcoin is an asset used to store value.

*H2: Significant and positive Gold coefficients indicates that Bitcoin is an asset.*

If the gold coefficient is positive it tells us that if the price of gold increases, the Bitcoin exchange rate will increase as well. If the hypothesis is kept it shows that the Bitcoin exchange rate follows the price development of other assets such as gold, indicating that Bitcoin also is an asset.

*H3: Significant and negative OFR FSI coefficients indicates that Bitcoin is an asset.*

If the OFR FSI coefficients are negative the Bitcoin price is connected to the stress cycles in the market. This means that in periods with low stress, and a negative OFR FSI the Bitcoin exchange rate is increasing, and in periods with high stress and positive OFR FSI the Bitcoin exchange rate decreases. If the hypothesis is kept the results denote that Bitcoin is used as an asset, as its exchange rate is largely influenced by the financial stress in the market.

*H4: Significant and positive S&P 500 coefficients indicates that Bitcoin is an asset.*

If the S&P 500 coefficients is positive it tells us that if the value of the stocks included in the S&P 500 increases, so will the Bitcoin exchange rate. This is also an indicator that the Bitcoin exchange rate is connected to the stock market, and should be defined as an asset.

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## 5.1 Regressions

I use linear regressions and rolling window regression to determine if I should keep or discard the four hypothesises. I run the Dickey-Fuller test on the Bitcoin price and find the  $\tau$ -value to be larger than the critical value at all levels. I run a new test, this time using the natural logarithm to the Bitcoin price. This time the value is stationary, consequently I decide to use the natural logarithm to the Bitcoin price as the dependent variable in the regressions. The rest of the variables have  $\tau$ -values lower than the critical level, making them stationary at all levels. I run the following regression;

$$\text{Ln (BTC price)} = \beta_0 + \beta_1 \text{Fed} + \beta_2 \text{Gold Price} + \beta_3 \text{S\&P 500} + \beta_4 \text{OFRFSI} + \varepsilon$$

To view the effect of the exogenous shocks on the time series, I run three regressions, first I run a regression including all data in the timeseries. Secondly a regression with time horizon 16.08.10 - 13.02.13. Lastly a regression for the time period is 03.03.14 – 11.11.19. The left out period includes the bots trading on Mt. Gox, the shutdown of silk road, and also the disappearance of Mt. Gox. I also perform a rolling window regression. This is a regression performed in a loop, with a sample from the original full-size sample. In this thesis the loop is set to be approximately a year. The sample period is set to 260, as the dataset only contains information on trading days. The findings from the rolling window regression is presented graphically.

I run the Durbin-Watson test for all regressions, it shows results in d-values below 1. This indicates that there likely is autocorrelation in the time series in all the regressions. For all the variables in this regression the p-value is 0, or close to 0, this means that the observations are not likely to be random. This we can also see from the t-value, which is high for all variables. Also, the value of adjusted R-squared are high, indicating that the variables fits the model.

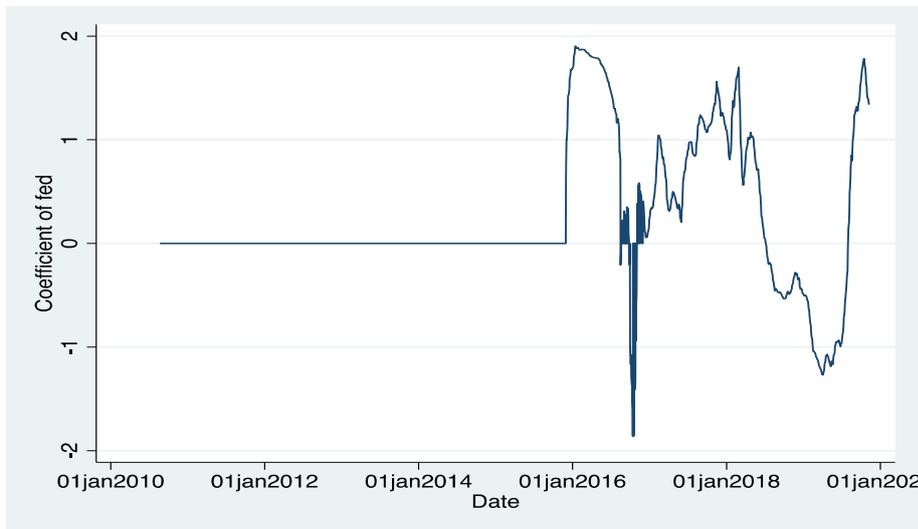
## 5.2 Results from regressions

16.08.10 – 11.11.19	Coefficient	Std. Err.	t-value	p-value
Fed	-1,5312	0,0596	-25,67	0,000
Gold	0,0018	0,0002	11,58	0,000
OFR FSI	- 0,0772	0,0125	-6,18	0,000
S&P 500	0,0070	0,0001	67,33	0,000

16.08.10 – 13.02.13	Coefficient	Std. Err.	t-value	p-value
Fed	-	-	-	-
Gold	0,0058	0,0006	16,52	0,000
OFR FSI	0,1020	0,0311	3,28	0,001
S&P 500	0,0079	0,0007	10,32	0,000

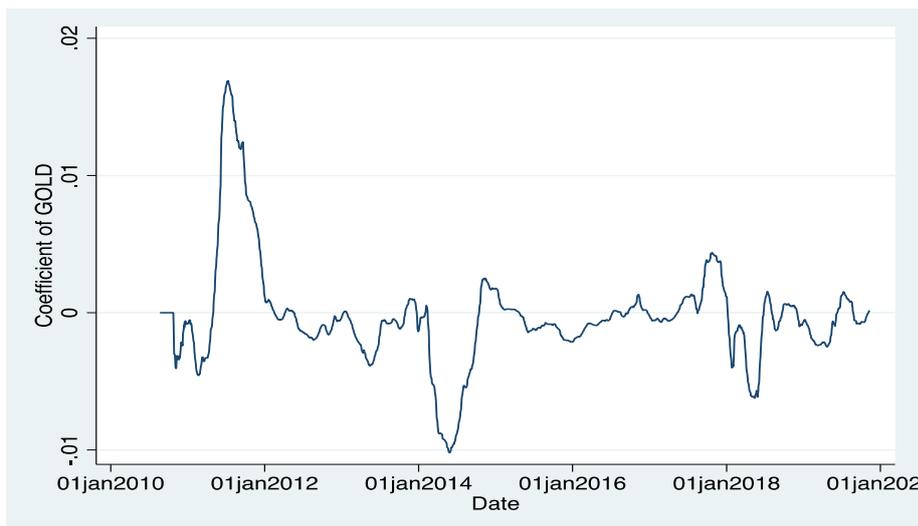
03.03.14 – 11.11.19	Coefficient	Std. Err.	t-value	p-value
Fed	1,3367	0,0176	75,75	0,000
Gold	0,0017	0,0002	10,61	0,000
OFR FSI	-0,1946	0,0098	-19,81	0,000
S&P 500	-2,90e-06	2,50e-08	-11,60	0,000

*H<sub>1</sub>: Significant and negative Fed coefficients indicates that Bitcoin is an asset.*



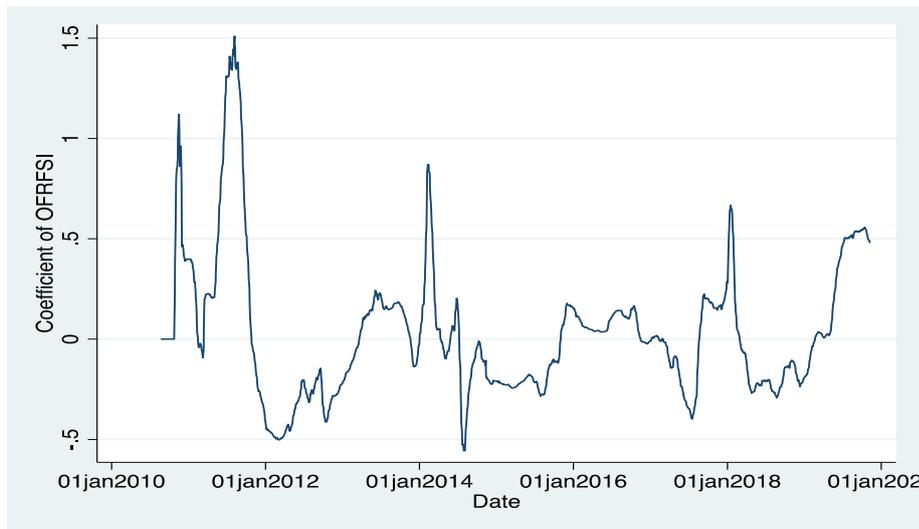
When performing the regression for the whole time period the fed coefficient is negative. The fed coefficient for the first period cannot be omitted because of collinearity. As is apparent in the graph, the coefficient is very volatile. In the last time period the coefficient is positive. The results are significant for both regressions. Because of the collinearity in the first period H<sub>1</sub> is discarded as the coefficient is positive in the last period. This suggests that Bitcoin is a currency.

*H<sub>2</sub>: Significant and positive Gold coefficients indicates that Bitcoin is an asset.*



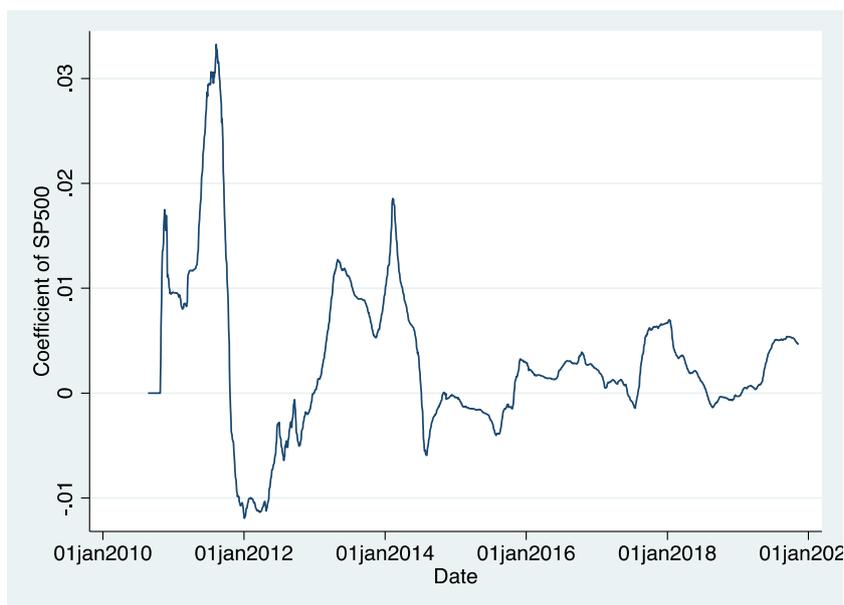
As is apparent for the graph, the gold coefficient was very volatile in the first period. The gold coefficient is positive in all three regressions. The p-values are zero for all regressions, and the t-value is high for all regressions, making the findings significant. For this reason H<sub>2</sub> is kept.

*H<sub>3</sub>: Significant and negative OFR FSI coefficients indicates that Bitcoin is an asset.*



The OFR FSI coefficient is also very volatile in the first period. The coefficient is positive in the regression for the first period, and negative in both the regression for the last period and the regression for the whole time period. The coefficient has the lowest t- value in the first period. For this reason I choose to keep the hypothesis.

*H<sub>4</sub>: Significant and positive S&P 500 coefficients indicates that Bitcoin is an asset.*



The S&P 500 coefficient is positive for the first period, and also for the whole period. It is negative for the last period, however the coefficient in this period is small  $-2,90e-06$ . The t- values for the first and the last period is similar,  $-11,6$  and  $10,32$ , and for the whole period the t-value is  $67,33$ , for this reason H<sub>4</sub> is kept.

## 5.3 Discussion

Findings from the regressions tells us that consumers do not prefer to move their money to commercial banks in the event of an increased fed rate. This indicates that Bitcoin is not used as a store of value asset. For some consumers the Bitcoin exchanges, and the digital wallets are an alternative to commercial banks. This is also what Pagano et al. found in their research, this arguments for Bitcoin being a currency.

Bitcoin's exchange rate is positively correlated to the price of gold. This finding tells us that high gold prices also gives high Bitcoin prices, and opposite. This is also what Dyhrberg found in her research. This is an indication that Bitcoin is an asset, as it follows the price of gold, which can be defined as an asset. The variable S&P 500 has a small, positive effect on the Bitcoin exchange rate. This tells us that in times of economic growth, there is a larger demand for Bitcoins, resulting in a higher exchange rate. The t-value of this variable is very high, indicating that this finding is not coincidental. This finding also indicates that Bitcoin is an asset.

The OFR FSI parameter has a negative coefficient. As explained earlier, when there is little stress in the financial markets the OFR FSI is negative. The negative coefficient therefore indicates that stress in the financial markets drives the Bitcoin price down, and absence of stress drives the price up. The Bitcoin exchange rate is counter cyclic to the stress index. This result tells us, like coefficient from S&P 500 that in times of economic growth consumers are more motivated to invest in Bitcoins. This is also an indicator that Bitcoin is an asset, used for speculative purposes.

Bitcoin is acknowledged as a legal tender in Japan, and also treated as a currency by the European Union. This is despite the fact that Bitcoin is missing some of the important properties of money. Bitcoin is not accepted by everyone in the economy, and its function as a means of payment hence is poor. As mentioned earlier the Bitcoin exchange rate has been historically very volatile, which also contributes to difficulty using it as a means of payment. In addition to this, the volatile exchange rate makes Bitcoin useless as a measuring unit for value.

The U.S. have chosen differently when defining the legal status of Bitcoin. U.S. authorities have classified Bitcoin as a commodity, while tax authorities defines Bitcoin as property, in addition to this all other cryptocurrency is classified as securities. The U.S. authorities clearly state that cryptocurrencies are not valid currencies. Chinese authorities has have set in place even stricter laws against cryptocurrency, and have issued a ban on all cryptocurrencies. At the same time the Chinese government puts much effort into developing their own cryptocurrency.

In addition to problems with volatile exchange rate, and low acceptance of Bitcoin as a means of payment Bitcoin also suffer from transactional problems. As mentioned earlier the Blockchain technology is a safe and fast way of sharing information. The problem arises because of restrictions on the number of transactions in a block, and the rate the blocks are cleared. In periods with many transactions it is necessary to include a mining reward as an incentive for miner to pick up the transaction. If the reward is too small, the user risks that the transaction is never made as it is dropped from the mempool. Suppose further that trading is costly and households can observe the price posted by the market maker before choosing their actions, households may be incentivized to pay low rewards and allow speculators priority (Zimmerman, 2019). Also incidents in the past, like the hack and trading bots on Mt. Gox also questions the security, and transparency of the online exchanges.

## 6. Conclusion

Cryptocurrencies are a fast-growing market, Bitcoin was the first cryptocurrency, and holds the largest market share. Bitcoin is a decentralized currency, differentiating it from fiat money. It is a system of electronic transactions that is not controlled by anyone and does not rely on trust in the market. Bitcoin uses an innovative proof-of-work, and blockchain technology to transfer the Bitcoins between peers. Bitcoin's attributes, and volatile exchange rate raises the question Bitcoin – a currency or an asset?

Bitcoin does not fulfil all the purposes of money. Bitcoin is difficult to use to measure value, due to the volatile exchange rate. In addition to this it can also be difficult to use as a means of payment, because few businesses accept Bitcoin as a method of payment. Lastly in a global perspective, Bitcoin is not accessible to everyone in the economy, due to entrance barriers. Despite this, cryptocurrencies are deemed a legal tender in Japan, one of the countries where Bitcoin is very popular, and it is also regarded as a currency by the European Union. In the U.S. however Bitcoin is classified as a commodity, while other cryptocurrencies are classified as securities. In China the government have issued a ban on all cryptocurrencies, at the same time the government is working in issuing their own cryptocurrency.

Findings from regressions shows that Bitcoin has coinciding trend with the asset market. In times when the S&P 500 is growing, and the OFR FSI is negative, indicating low stress levels in the financial markets, and high returns on the U.S. stock exchanges the Bitcoin exchange rate increases. This can be interpreted as Bitcoin being a speculative asset, that follows the asset market. The Bitcoin exchange rate also follows the gold price, another indication that bitcoin should be considered an asset. At the same time the empirical results from regressions regarding the Fed rate coefficient indicates that Bitcoin is a currency.

The empirical results from regressions causes only one hypothesis to be discarded. The empirical result can therefore be interpreted in favour of Bitcoin being classified as an asset. As mentioned earlier, Bitcoin is not an asset that yields ongoing value, and it cannot be transformed into something else. For this reason Bitcoin must be classified as a store of value asset.

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