Norwegian School of Economics

Bergen, Autumn, 2020

Cryptocurrency Entering Uncharted Territory

A combined deductive and inductive study into the mechanisms of institutional demand for cryptocurrencies and an examination of Bitcoin's safe haven capabilities

Anders Tveitan Ødegård & Tor Magne Volden

Supervisor: Nils Friewald

Master's thesis in Business Analysis and Performance Management and Financial Economics

NORWEGIAN SCHOOL OF ECONOMICS

Abstract

The objectives of this master's thesis are to uncover the drivers behind the recent increasing institutional demand for cryptocurrencies, and to examine whether Bitcoin is showing signs of establishing itself as a safe haven asset. To answer the research questions posed, a mixed methods research design was employed. The first research question led us to base our data collection on interviews with experts and actors within the industry. The second research question prompted quantitative analyses of the price performance of Bitcoin relative to the performance of indices indicative of the global equity market and the principal flight-to-safety asset, represented by the S&P 500, the MSCI World Index, and gold respectively. The performance of the assets and indices were analysed over a seven-year period, and individual sub-periods exhibiting signs of financial instability were determined using the VIX as an indicator of market unrest. Pearson correlation analyses were then conducted to measure the strength of the correlations, or lack thereof, between the returns of the assets and indices for the defined sub-periods.

Our findings suggest that the drivers behind the increasing institutional demand for cryptocurrencies are multifaceted and complex, and that they include factors both external and internal to the cryptocurrency industry. Moreover, our findings indicate that the returns of Bitcoin were uncorrelated with the returns of both indices and gold during the entire period examined. During the periods of market unrest, Bitcoin was uncorrelated with the indices in three individual periods. However, during the two most recent periods, 2020 as a whole and during the initial months of the COVID-19 pandemic, Bitcoin had a moderate to strong positive correlation with both indices.

On the basis of our findings, we conclude that the recent increasing institutional demand for cryptocurrencies can be attributed to expansionary monetary and fiscal policy, an increased focus on regulations, access to new markets through DeFi, and reduced volatility. We also conclude that Bitcoin is not currently establishing itself as a safe haven asset.

Keywords: Bitcoin, cryptocurrencies, S&P 500, safe haven, macroeconomic policy

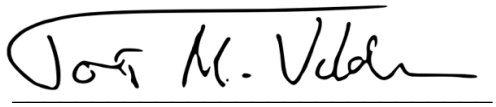
Preface and acknowledgements

Researching cryptocurrencies, a dynamic and perhaps controversial topic, has been very interesting. Prior to this research process, we had limited knowledge of the cryptocurrency industry. During this autumn, however, we have learnt a lot, and we have met a lot of resourceful and knowledgeable people. Examining this topic has been particularly fascinating because of the speed with which the industry changes. Several of the events discussed in this thesis occurred over the course of the four months we have spent developing our study. Furthermore, the process of writing a master's thesis in the midst of a global pandemic has in itself been interesting and at times challenging, and most of our cooperation was forced to take place online or over the telephone.

We wish to express our gratitude to everyone who in any way has contributed to the progress of our thesis. A special thanks goes to our supervisor Nils Friewald, who provided us with constructive and helpful feedback. We also wish to thank Torbjørn Bull Jenssen, Bendik Norheim Schei, Dr. Ulli Spankowski and James Bennett for new perspectives, relevant insights and encouraging words.

Bergen, 17.12.2020

Anders Tveitan Ødegård



Tor Magne Volden

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1. Introduction

In order to introduce our research, we will in the following identify some of the fundamental aspects of this master's thesis. We will begin by explaining the background for the chosen research area and topic. After this, we will present the research questions. Finally, we will announce the objectives of our research and our hypotheses, before the boundaries of our research are defined by clarifying which delimitations we have set for the thesis.

1.1 Background for chosen research topic

After the extreme surge in the price of various cryptocurrencies during the autumn of 2017, and the consecutive heavy downfall in the months following, many people believed that the concept was nothing but a temporary bubble and a fad. However, since the dramatic depreciation eventually floored out during the second part of 2018, the price of Bitcoin and other leading cryptocurrencies has been growing steadily. This, in conjunction with an increasing rate of adoption of virtual currencies over the last two years, suggests that cryptocurrencies are here to stay and that the market is gathering proponents.

An interesting trend emerging during these two last years, is the shift towards increased institutional demand. Institutions are now seeking exposure to the cryptocurrency market, either by offering cryptocurrency related services to their customers, or by allocating parts of their reserve assets into the cryptocurrency market, effectively substantiating cryptocurrency as an emerging investment asset class.

In September 2020, it was announced that the Vienna Stock Exchange had become the third stock exchange in the world to offer cryptocurrency ETPs to its customers (GlobeNewswire, 2020). The stock exchange thus followed in the footsteps of Deutsche Börse and SIX Swiss Exchange which both admitted Bitcoin and Ether ETPs to their markets during the previous two years.

A fortnight later, American BI company MicroStrategy completed the acquisition of 38.250 bitcoins, at an aggregate price of 425 million USD. The purchase was by the company itself characterized as a change of primary reserve asset. As a curiosity in this context, it needs to be mentioned that the Norwegian Government Pension Fund Global through its 1.51 % stock ownership in MicroStrategy now has an indirect ownership in Bitcoin.

A lot has happened in the world of cryptocurrencies since Bitcoin's whitepaper was published in 2008. Following the introduction of Bitcoin in the midst of the global financial crisis, numerous other digital coins have emerged, each representing its own use case or currency. Originally created as a peer-to-peer electronic cash system aiming at making financial institutions somewhat redundant (Nakamoto, S., 2008), Bitcoin and other cryptocurrencies have during recent years garnered the attention of professional investors and institutions seeking profits from alternative asset classes.

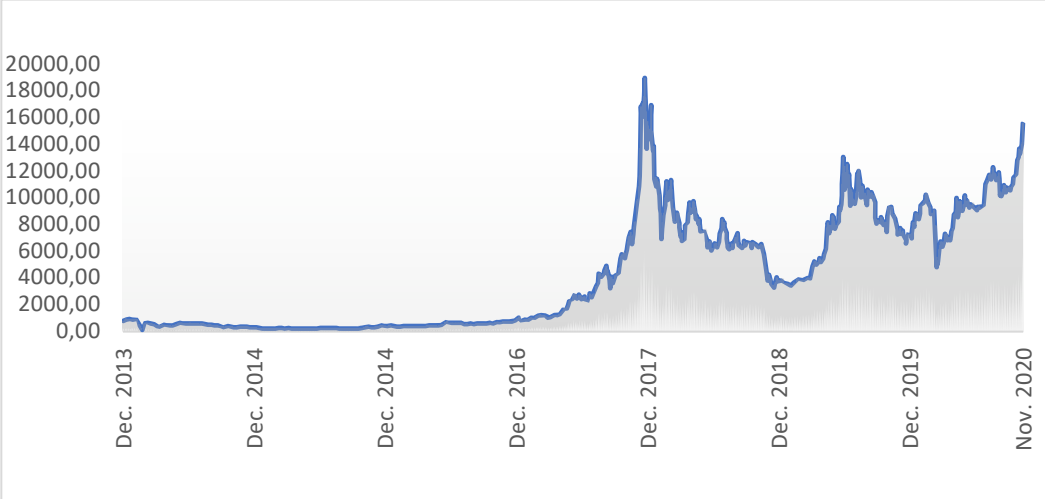

Figure 1: Bitcoin's price development during the last seven years (Data source: Investing.com)

As can be seen in figure 1, the appreciation of the price of one bitcoin over the last few years has been extreme. Furthermore, as the digital asset has matured, and especially after the Bitcoin price reached a bottom in December 2018, speculations have arisen among proponents of the digital asset that Bitcoin could potentially act as a hedge or even a safe haven asset. Proponents of this perspective have often cited Bitcoin's capacity as a store of value, its deflationary nature and its natural positioning on the side of traditional finance as reasons why the cryptocurrency could function as a safe haven asset.

1.2 Research questions

All of the aforementioned events and claims helped spark our interest in the subject and made us want to investigate the trends and price performance of cryptocurrencies further. Because the angle presented in the previous sub-chapter is bilateral in that we are interested in both

analysing the trend of institutions adopting cryptocurrencies and testing the relationships between Bitcoin and various traditional financial assets, we have constructed two research questions seeking to elucidate both angles.

RQ1) What are the drivers behind the increasing institutional demand for cryptocurrencies, and RQ2) is Bitcoin becoming a safe haven asset?

1.3 Research objectives and contribution

The purpose of the research questions is to develop an understanding as to *why* institutions are showing increased interest and adoption of cryptocurrencies, in addition to examine whether Bitcoin is showing signs of establishing itself as a safe haven asset

Our hope with this study is to find results and create a nuanced discussion that will help advance the knowledge on Bitcoin as an alternative investment. One of the reasons why we settled on this topic, was the perceived lack of literature and analysis of data on the matter, and we hope to contribute to the knowledge on Bitcoin's price performance relative to traditional asset classes. Bitcoin and other leading cryptocurrencies have outperformed traditional financial assets in terms of returns on investment over the last few years. However, as many people still view cryptocurrencies as an extremely volatile, speculative and risky asset class, we saw a need to delve into the performance of the asset class.

Furthermore, this study investigates Bitcoin in relation to traditional asset classes in periods of market unrest, however, the recession caused by the Coronavirus Crash provided an opportunity to examine the performance and capabilities of the digital asset during times of *extreme* market unrest for the very first time. Additionally, the stock market crash in itself and the recession that sprung from it once again highlighted the importance of keeping assets that are either negatively correlated or uncorrelated with the overall market as part of a diversified portfolio. In that sense, the economic crisis lay the foundation for a valid discussion of Bitcoin's potential safe haven capabilities. The stock market crash of 2020 thus contributes to the innovative aspect of our thesis, as it allows for an examination of Bitcoin's performance and correlation with other asset classes in a climate it had not previously experienced.

1.4 Hypotheses

On the basis of the objectives of RQ2, we have constructed both a null hypothesis and several alternative hypotheses. The hypotheses are as follows:

H0: *Bitcoin and the S&P 500/MSCI World Index are not uncorrelated or negatively correlated in times of market unrest.*

H1: *Bitcoin and the S&P 500/MSCI World Index are uncorrelated or negatively correlated in times of market unrest.*

Alternative hypotheses not directly connected to the null hypothesis:

H2: *Bitcoin and gold have a strong positive correlation in times of market unrest.*

H3: *Overall, during the entire period examined, Bitcoin and the S&P 500/MSCI World Index are uncorrelated or negatively correlated.*

1.5 Delimitations

This master's thesis will not concern itself with technical details of cryptocurrencies and/or the underlying technology, nor will it attempt to construct a pricing model for Bitcoin. Attempts have been made in the past at devising accurate and credible pricing models for Bitcoin, however, most of these have been heavily criticized and disregarded. Also, we are aware of the three-sided functionality of cryptocurrencies, namely as transaction system networks, means of exchange and investment objects.

Whether Bitcoin and other speculative cryptocurrencies originally intended to act as payment systems and digital currencies today ultimately should be considered currencies or investment assets is a complex debate. However, considering the purpose of this thesis, we will not endeavour into a long discussion of the sort.

Analysing the transaction data of Bitcoin, Baur, Hong and Lee (2017) find that Bitcoin at the time primarily was used as a speculative asset rather than as a medium of exchange. In an attempt to investigate Bitcoin's diversification abilities, Trautman and Dorman (2018) deduce that Bitcoin at the time was an alternative asset capable of operating successfully as a

diversifier because of its low correlation with the equity market. Furthermore, examining Bitcoin's potential as a portfolio diversifier, Guesmi, Saadi, Abid and Ftiti (2019) find that a hedging strategy comprised of gold, oil, equities and Bitcoin noticeably reduces the risk of a portfolio compared to a portfolio only consisting of gold, oil and equities. The researchers cite the high average return of cryptocurrencies and low correlation with traditional financial assets when they conclude that Bitcoin is an alternative investment asset. In a more recent paper, White, Marinakis, Islam and Walsh (2020) extend this research by comparing Bitcoin to a host of other categories. Their analysis leads to the conclusion that Bitcoin is an emerging asset class and not a currency nor a security.

In addition to the reference to Bitcoin as an alternative investment asset made by the papers above, there is also the fact that Bitcoin currently do not fulfill the requirements of a currency, illustrated in the table below:

Characteristics of a currency	Yes / No	
Fungible	Yes. 1 coin equals 1 coin.	✓
Durable	Yes. No physical wear and tear .	✓
Portable	Yes. Can be held on cell phone, borderless by nature.	✓
Uniform/stable	No. Value fluctuates a lot.	✗
Limited supply	Yes. 21 million coins.	✓
Acceptable	No. Not same status as fiat currencies.	✗
Divisible	Yes. 1 satoshi = 0,00000001 Bitcoin.	✓

Table 1: An overview of Bitcoin's characteristics with regards to the requirements of a currency.

In accordance with the previous literature listed above and the fact that speculative cryptocurrencies cannot be defined as *money* or *currency* with reference to the traditional characteristics of a currency, we will in this thesis consider Bitcoin as an alternative investment asset.

2. Cryptocurrencies and institutional demand

In order to be able to answer our first research question, we first need to examine the fundamentals of the matter. In this part of the thesis, we will begin by giving a brief overview of cryptocurrency as a concept, before we proceed with an exploration into the key aspects and historical price movements of Bitcoin. To conclude the chapter, an overview of recent events indicating increasing institutional demand for cryptocurrencies will be given.

2.1 What is a cryptocurrency?

Cryptocurrencies as a topic tends to divide people and create debate. Some people proclaim their enthusiasm for cryptocurrency and strongly believe that it will impact the world greatly, while others oppose it fiercely and predict that it has no part to play in the future. Keeping these contrasting views in mind, it is useful to define the concept from two perspectives.

CoinTelegraph (2020), one of the leading cryptocurrency oriented online newspapers defines cryptocurrencies as follows:

"a digital or virtual currency designed to work as a medium of exchange. It uses cryptography to secure and verify transactions as well as to control the creation of new units of a particular cryptocurrency. Essentially, cryptocurrencies are limited entries in a database that no one can change unless specific conditions are fulfilled".

The European Banking Authority (EBA, 2014) defines cryptocurrencies, or virtual currencies, with a slightly different focus:

"VCs (virtual currencies) are a digital representation of value that is neither issued by a central bank or public authority nor necessarily attached to a FC (fiat currency), but is accepted by natural or legal persons as a means of exchange and can be transferred, stored or traded electronically"

Generally acknowledged as the first cryptocurrency, Bitcoin's release in January 2009 lay the foundation for the numerous other cryptocurrencies that were to be created during the next decade. Created as a consequence of the founder's distrust in the established financial systems of the time, Bitcoin set out to create an entirely new peer-to-peer payment system (Nakamoto,

S., 2008). Some of the perceived weaknesses of the existing financial system outlined in Bitcoin's whitepaper are mediation costs which lead to higher transaction costs and discourage smaller transactions, double spending, a lack of non-reversibility of payments for non-reversible services, and general concerns over the reliance on financial institutions as third parties in transactions (Nakamoto, S., 2008).

The term *decentralized finance (DeFi)* has gained a lot of attention recently. Decentralization at its core relates to the fact that a blockchain, i.e. a distributed ledger recording all the transactions of a specific cryptocurrency, has no central authority. There is not one single point of failure due to the distributed ledger keeping records of transactions across the computers in the peer-to-peer network, or blockchain. Building on the permissionless and censorship free principles of blockchains, DeFi also aims at making financial services available to people and organizations who for various reasons are excluded from traditional financial services (Blenkinsop, 2019).

2.2 Bitcoin (BTC)

From its inception and until January 2017, the price of one bitcoin increased from having no value at all to 900 USD. After an exponential growth in 2017, the price of Bitcoin shortly reached a peak just below 20,000 USD in December 2017 before a dramatic plunge commenced and continued until December 2018. Since the bottom was reached in December 2018, the price of Bitcoin has increased by some 400 % (15.11.2020).

As of November 2020, Bitcoin is still by far the biggest cryptocurrency by market capitalization with 66 % of the total market capitalization of all cryptocurrencies year to date (Rudden, 2020). However, this number has been in steady decline since 2015 when it held approximately 86 % of the total market capitalization. This is indicative of the growth observed in other cryptocurrencies during the last five years. Unlike most other major cryptocurrencies, the supply of Bitcoin is finite – there will be produced no more than 21 million bitcoins. In other words, a key difference between Bitcoin and fiat currencies is that while central banks can increase the supply of money indefinitely and thereby contribute to inflation of fiat currencies, the supply of Bitcoin becomes scarcer with time. By August 2020, about 18.5 million bitcoins had come into circulation. Critics who disregard Bitcoin as a potential global payment system often refer to the limited supply of the cryptocurrency as an important reason why Bitcoin will not be able to fill this role. In contrast, proponents of Bitcoin

as an investment object and as "*digital gold"* consistently highlight the scarcity of the coin as one of the main reasons behind its success as an investment asset. Nevertheless, bitcoins are divisible, with its smallest possible unit called a *satoshi* which equates to 0.00000001 bitcoin.

Important notice: Going forward, whenever the phrase *"the price of Bitcoin"* is used, we are referring to the price of one bitcoin relative to the price of the US dollar. Also, whenever the capitalized version of *Bitcoin* is mentioned, we refer to Bitcoin as a concept and/or an investment asset. When the lower-case version of *bitcoin* is used, this refers to it as a unit of account.

2.3 On Bitcoin and illicit activities

Considering the impression held by quite a few people that Bitcoin is something inherently criminal and that Bitcoin is primarily used in the context of illicit activities, we saw the need to address this misconception. Ms. Ria Bhutoria, the Director of Research at Fidelity Digital Assets, a sub-division of Fidelity Investments Inc., put this criticism into perspective in November 2020. According to Ms. Bhutoria, criticising Bitcoin for its use in illicit activities is equal to criticising cash for its use in criminal activities and criticising the internet for hosting the dark web and illegal marketplaces. She further elaborates that akin to cash or the internet, Bitcoin is neutral and that its properties may be valuable to both good and bad actors (Bhutoria, 2020). In addition to this, Ms. Bhutoria highlights the transparency of the Bitcoin blockchain and the intelligent solutions created by blockchain analytics companies to trace transactions as key characteristics of the Bitcoin blockchain that makes the network poorly suited for people and organizations with criminal motives.

Furthermore, blockchain analytics company Elliptic earlier this year reported that while 35 % of Bitcoin transactions could be linked with illicit activities in 2012, the percentage has decreased to less than 1 % during recent years (Khatri, 2020).

In the extension of this, there is also the statement made by Deputy Assistant Secretary of the Office of Terrorist Financing and Financial Crimes, Ms. Jennifer Fowler, in a hearing on Modernizing Anti-Money Laundering Laws (AML). In her testimony, Ms. Fowler stated that *"Although virtual currencies are used for illicit transactions, the volume is small compared to the volume of illicit activity through traditional financial services"* (Fowler, 2017).

2.4 Events illustrating the increasing institutional demand

Remark: When the term *institutional demand* is discussed in this thesis, we refer to institutions as "established organizations or corporations" (Merriam-Webster, 2020), e.g., corporations, banks, central banks, retail banks, investment banks, brokerage firms, (stock) exchanges etc.

The cryptocurrency ETP listings on **three European stock exchanges** and **MicroStrategy's** move to Bitcoin as the primary reserve asset mentioned in the introduction are not the only recent events illustrating a rise in the institutional demand for cryptocurrencies. Below, a brief overview of other noteworthy and recent events indicating an increasing institutional demand for cryptocurrencies is given.

As briefly remarked in *1.1 Research problem*, The Norwegian Oil Fund holds a position in MicroStrategy. Other global funds of considerable size also have stock ownership in this company. **BlackRock Inc**., the world's largest asset manager, has a 17 % ownership in MicroStrategy, while **Vanguard Group Inc**., also one of the largest investment groups globally, holds a 11 % ownership position in the company (Fintel, 2020).

In October 2020, American investment manager **Stone Ridge Asset Management** through their subsidiary New York Digital Investment Group (NYDIG), executed a purchase order of 10,000 bitcoins worth 115 million USD (Del Castillo, 2020). According to the same source, the creation of NYDIG was brought about due to growing personal investment in cryptocurrencies by the company's senior employees.

Also, in October 2020, it was reported that digital financial services company and cryptocurrency exchange operator **Diginex** had got their plans of listing on the Nasdaq approved by the SEC, thus effectively becoming the first publicly traded cryptocurrency exchange (Nasdaq, 2020a).

Later that same month, American online payment giant **PayPal** announced their venture into the cryptocurrency market. The company will launch a wallet service that will facilitate trading and holding of Bitcoin, Ether, Bitcoin Cash and Litecoin (Brookins, 2020). PayPal has always existed in the realms of online payments, but this venture marks a new focus area for the company. A strong and lasting price increase in the price of Bitcoin commenced concurrently with the release of these news. Towards the end of November 2020, it was reported that the company had been buying up 70 % of all newly mined bitcoins (Gogo, 2020).

Another company with plans of a public listing, is **Arcane Crypto,** Norway's leading cryptocurrency and blockchain company**.** The company is involved in both developing cryptocurrency payment technology, digital assets liquidity provision and institutional crypto-fiat exchange services, in addition to having their own research department. The company's main mission is to create a bridge between the digital economy and the traditional economy (Arcane, 2020). Arcane Crypto will be listed on the Swedish stock exchange Nasdaq First North in January 2021.

Indications of a softening in the relationship between actors in the cryptocurrency industry and traditional banking and finance have also surfaced. In September 2017, CEO of **JPMorgan Chase & Co**. Jamie Dimon heavily criticised Bitcoin and proponents of the virtual currency (Son, Levitt, & Louis, 2017). However, in May 2020, the investment bank signed two of the world's largest cryptocurrency exchanges Coinbase and Gemini as business clients (Harper, 2020). Furthermore, JPMorgan Chase & Co. in February of 2019 announced the launch of its own *stablecoin* cryptocurrency as a means of handling transactions to and from institutional clients, thereby becoming the first US bank to issue its own digital currency (Russon, 2019).

Other notable events are Square Inc's purchase of 4,709 bitcoins at an aggregate price of 50 million USD (October 2020), the launch of a VISA credit card that rewards customers in Bitcoin (December 2020), and the announcement of the S&P Dow Jones' plans to launch cryptocurrency indices in 2021 (December 2020).

Closing remarks on the institutional demand of cryptocurrencies

To illustrate the growing institutional demand graphically, a chart generated by the CME Group has been included below. The trading platform is the leading global derivatives marketplace (cmegroup.com). Figure 3 displays the total daily trading volume and the total open interest for Bitcoin futures from May 2019 until November 2020. The CME Bitcoin Futures chart gives a credible overview of institutional demand, as the trading platform is reserved exclusively for institutional investors. While it is important to emphasise that the chart displays the trading volume and open interest in futures contracts and not actual purchases of Bitcoin, the chart provides an illustration of how the institutional demand and interest in Bitcoin has increased during the last 1 ½ years.

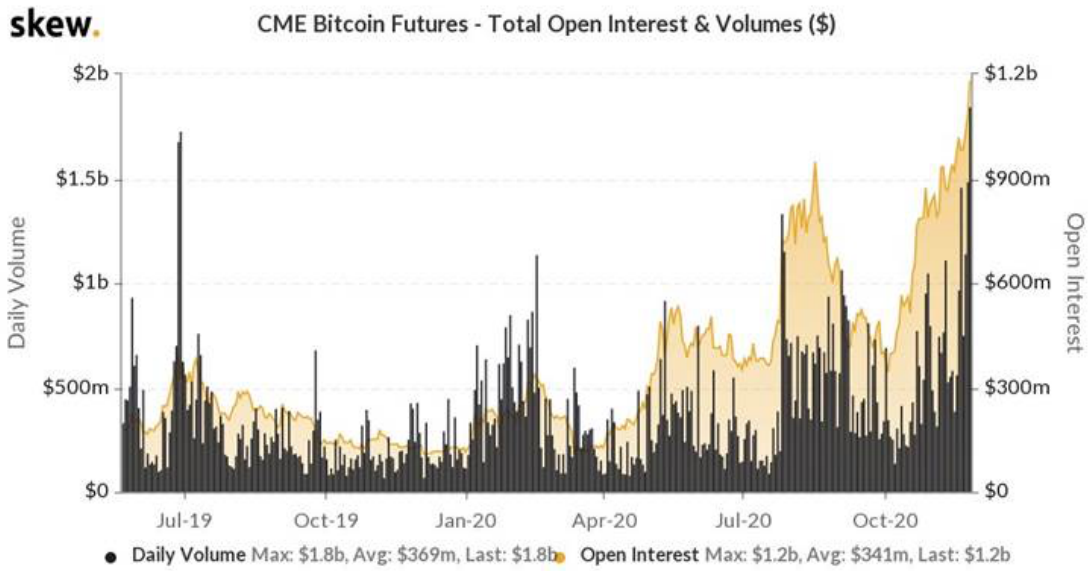

Figure 2: The CME Bitcoin Futures chart (Source: Skew.com). The black bars show the daily traded volume, and the yellow area marks the open interest. The CME Bitcoin futures reach an all-time high during Bitcoin's recent price surge in November 2020.

3. Literature review

In order to facilitate an insightful analysis and discussion of whether or not Bitcoin have the necessary attributes of a safe haven asset, we need to establish an understanding of some of the fundamental elements of the second research question. This section of the thesis therefore seeks to review four core topics, namely *safe haven assets, previous literature on Bitcoin´s safe haven capabilities, market unrest/financial instability* and *the CBOE VIX.* This extended focus on key aspects of the thesis will enable us to perform a more thorough analysis of the data in our second research question, and it will contribute to establish an appropriate foundation for the discussion of the associated results.

3.1 Literature review: Safe haven assets

The traditional, and perhaps most intuitive way of defining a safe haven asset, is *an asset or financial instrument intended to retain or increase in value during heavy falls in the market.* It can be considered an instrument of diversification, as a safe haven asset will retain its value or move in the opposite direction of the majority of assets in the market when the market experiences heavy drops (Chen, 2020a).

More formally, previous literature on the topic defines the term *safe haven asset* as an asset that is negatively correlated or uncorrelated with another asset or portfolio in certain periods only, e.g., in times of falling stock markets (Baur & McDermott, 2010; Reboredo, 2013). This means that in scenario of market unrest, a safe haven asset would be an asset or asset class moving in either the opposite direction or completely independently from the direction of the stock market.

The abovementioned papers also draw the distinction between a safe haven asset and a *hedge,* both remarking that while safe haven assets are uncorrelated or negatively correlated with another asset when *markets are in unrest*, a *hedge* must be uncorrelated or negatively correlated with the other asset on average (Baur and McDermott, 2010; Reboredo, 2013).

In a more recent research paper, Kopyl and Lee (2016) conducted a study aiming at analysing assets and commodities commonly regarded as having safe haven characteristics over a period of 50 years. The researchers examined the performance of government bonds, fiat currencies,

commodities and alternative assets in relation to the US equity market in times of market unrest. The results of this study show a negative correlation between the US equity market during market crisis and both US Treasuries and the Japanese yen, implying that these assets have safe haven capabilities.

Analysing data from both developed and developing economies, Baur and McDermott (2010) find support for their hypothesis that gold works as a safe haven asset in periods of market unrest. In essence, the results of their study indicate that gold operates as both a hedge and a safe haven for major European and American stock markets. In addition to classifying gold as a safe haven asset in several markets and during several periods, Baur and McDermott propose a distinction between weak and strong safe haven assets. According to the researchers, whereas a weak safe haven asset will protect investors to the extent that it does not move in tandem with other assets in response to negative market shocks, a strong safe haven asset will by moving against other assets during periods of market stress, reduce overall loss for investors.

Figure 3: A visual representation of the inverse relationship (strong negative correlation) between the price of gold (blue) and the S&P 500 (red) at several points in time during the last five years. The green boxes indicate incidents where gold was visibly negatively correlated with the index.

3.2 Literature review: Previous studies on Bitcoin's safe haven capabilities

Cryptocurrency is still a nascent and alternative asset class, and the amount of acknowledged literature on Bitcoin's safe haven capabilities is scarce. However, some studies have attempted to define the performance of the emerging asset relative to traditional assets, and a brief overview of some of these papers is given below.

Analysing data between 2011 and 2018, Stensås, Nygaard, Kyow & Sirimon (2018) investigate whether Bitcoin functioned as a diversifier, a hedge or a safe haven. The researchers find that Bitcoin acted as a hedge for investors in developing countries. They also find that Bitcoin acted as a safe haven asset for both US and non-US investors during three periods of financial instability, namely during the US election in 2016, the Brexit referendum in 2016 and during the burst of the Chinese market bubble in 2015. Examining the same overall period as Stensås et al. (2018), Smales (2019) finds that Bitcoin was uncorrelated with the indices and stocks included in the study. However, due to high volatility and lack of liquidity, the study concludes that Bitcoin at the time could not be characterized as a safe haven asset.

Both these papers investigate Bitcoin's price performance relative to other assets and indices during individual periods between 2011 and 2018. However, because of the paucity of market crisis periods in this period, none of the studies were able to investigate Bitcoin's safe haven capabilities during times of extreme market turmoil. Also, whereas Stensås et al. (2018) based their selection of periods on global events, Smales (2019) analysed the correlations coefficients between the assets during three sub-periods, 2011-13, 2014-16 and 2017-18 respectively. Furthermore, none of the papers feature a detailed, mathematical account of *how* periods of market unrest within their data sets were determined.

In a more recent research paper, Conlon, Corbet & McGee (2020) investigate the downside risk reduction properties of Bitcoin, Ether and Tether between April 2010 and April 2020. The researchers find that Bitcoin did not act as a safe haven asset for the majority of international equity markets during the periods examined, 2010 – 2020 and 2019 – 2020, respectively.

In summary, the decision not to isolate and analyse smaller periods exhibiting market unrest within the overall period examined, and the absence of a mathematically founded rationale behind the choice of periods to investigate, are two of the most evident weaknesses of these

previous studies. In addition, the inclusion of Bitcoin price data from before 2013 increases the probability that unreliable data from unreliable sources were allowed to interfere in the analyses.

3.3 Literature review: Market unrest/financial instability

In *3.1. Literature review: Safe haven assets*, we observed that terms like *financial instability*, *market unrest* and *markets in turmoil* in all three papers are mentioned in the context of safe haven assets. We found that what separates a *hedge* from a *safe haven asset* is the latter's capability of being negatively correlated or having no correlation at all with the other variable in times of financial instability. As a consequence, it is natural to continue with a literature review of what constitutes a situation of financial instability. A proper definition of this aspect is essential in order to determine the most purposeful and appropriate time intervals to examine later in this thesis.

As we have seen, research papers use different terminology when explaining the market conditions in which safe haven assets prove their negative correlation or lack of correlation with the other asset class(es) examined. Baur and McDermott (2009) refers to "times of falling stock markets", "times of financial stress or turmoil", Reboredo (2013) calls it "times of extreme market movements" and Kopyl and Lee refers to "market crisis". Because of the variety of terms used to express a certain market situation and due to the similarities in the time periods examined across the papers, it seems that the various terms generally refer to the same kind of market events. Kopyl and Lee (2016) investigate potential safe haven assets during financial crises, Baur and McDermott (2009) examine the performance of gold during crisis periods and Reboredo (2013) explores gold's safe haven properties in relation to the performance of the US dollar between 2000 and 2012, a period which featured both the Dot-com bubble, 9/11 and the financial crisis of 2007-2008 among other several other US and international market shocks. Henceforth, we will use the discussed papers' understanding of the conditional situation in the development of our own thesis. Thus, *"market unrest"*, *"market crisis"*, *"markets in turmoil"* and *"financial instability"* will all refer to the same kind of situation, namely situations characterized by rapid negative movements in the overall market.

However, while the terms discussed above are used in order to reference the same kind of situation, the meaning inferred when talking about *market unrest* remains relatively vague. In

order to be able to determine which time periods to investigate, clarifications as to *what constitutes a situation of market unrest* must be made.

Is there a consensus on *by how much* and *how quickly* a market must fall in order for economic research to categorize the fall as market unrest/financial instability?

Indeed, the existing literature does not seem to agree on a statistically exact percentage drop constituting a situation of market unrest or financial instability. Chen (2020b) defines a stock market *crash* as a rapid and often unanticipated drop in stock prices. He also remarks that there is no specific threshold for stock market crashes, but that an abrupt double-digit percentage drop of a stock index over a few days generally is considered to constitute a stock market crash.

Again, the abovementioned remarks were the author's attempt to define a *stock market crash*, which is generally perceived as the most severe type of negative market movement. To manifest the severity of a stock market crash, Chen (2020b) elevates the Wall St. Crash of 1929, Black Monday of 1987, the global financial crisis of 2007-08 and the Coronavirus Crash of 2020 as prime examples. However, due to the fact that neither Baur and McDermott (2010), Reboredo (2013) nor Kopyl and Lee (2016) make any explicit mention of the extremely negative movement of stock market *crashes* in their respective definitions of safe haven assets, we will as a consequence in this study allow for the inclusion of time periods which exhibit *less rapid and less severe negative price movements* than a stock market crash. More on this in *Determining time periods (Ch. 5.3.1)*. Due to the aforementioned considerations, it is especially important to be diligent in the process of analysing exactly which time periods should be allowed in our study, and this is the reason why we have decided to use the VIX in this selection process.

3.4 Literature review: The Volatility Index (VIX)

Volatility is an integral part of uncertainty and risk management, and in any credible attempt to analyse either the price development of cryptocurrencies in isolation or the price movements of cryptocurrencies in conjunction with other asset classes, volatility should therefore be addressed. As a consequence of both this and the considerations mentioned in the preceding subchapter, we have chosen to include the Chicago Board Options Exchange Volatility Index,

commonly known as the VIX, in our study. The VIX is a real-time index that expresses market sentiment and risk for a 30-day forward-looking period, and it is used by both private and institutional investors in order to get an overview of the levels of risk, fear and stress in the market (Kuepper, 2020a). The VIX is connected to the S&P 500 index options, and thereby gives a credible overview of the prevailing market sentiment due to this index' powerful influence on other indices and markets. Utilizing the VIX as a measure of market volatility, risk, fear and stress will help determine which periods can be characterized as times of market unrest/financial instability. In essence, if the option prices of the VIX shift upwards, this is an indication of increased uncertainty in the market. Vice versa, if the option prices shift downwards, this is indicative of a calmer market. This can be observed when comparing the VIX and the S&P 500. Spikes on the VIX usually corresponds with downfalls on the S&P 500.

Kopyl and Lee (2016) use the VIX as an indicator of periods with elevated market unrest, fear and volatility. In combination with the VIX, the researchers use the performance of the S&P 500 to validate which periods can be recognized as times of market unrest. Kopyl and Lee largely base their selection of periods on by how much individual observations of the VIX deviate from the average level of the index, calculated as an average of all months included in the study. The researchers use both standard deviation and percentiles (90 and 95) to justify which periods to include in their study.

Nevertheless, the VIX does not always accurately describe the level of market risk and uncertainty. Investigating the accuracy associated with using the VIX as a proxy of market risk, Kownatzki (2019) finds that the index has a tendency to overestimate the actual volatility of the market when the market is calm and normal, and to underestimate the market volatility during times of market unrest and crises. The implications of this aspect for this study will be addressed in *Ch. 5.3.1*.

4. Data

Owing to this thesis' two distinctive research questions and the need for a combined inductive and deductive approach, this thesis features both qualitative and quantitative data. This part of the thesis attempts to give an account of the data we have collected for both research questions. The data collected for the qualitative part of our thesis has mainly been collected through both written and oral correspondence with interviewees, and through other internet sources. The data for the quantitative part has generally been retrieved from web sites with access to reliable databases with comprehensive data on the historical price movements of the various assets examined. In addition to accounting for the data that has been collected, this section also includes special considerations when working with historical cryptocurrency data and different indices.

4.1 Qualitative data

The data collection and subsequent analysis of RQ1 can be considered rather interpretivist and inductive, and while researching this question we have relied on numerous sources. Depending on the type of source used to obtain the data, the qualitative data has been divided into ***primary*** and ***secondary data,*** each of which are described below.

4.1.1 Primary data

Most of the qualitative primary data we have collected and analysed has been obtained through the use of interviews and meetings with top executives of both domestic and international corporations. The interviews were all conducted using online video conferencing tools due to the ongoing pandemic. During the interviews we diligently took notes in order to later be able to transcribe and code the interview data, ensuring a clear, true and verifiable representation of the interviewees' perspectives. Below is a table containing the names and respective roles and companies of the interviewees.

Interviewee / Informant	Role / Company
Torbjørn Bull Jensen	Chief Executive Officer / Arcane Crypto, Norway
Bendik Norheim Schei	Head of research / Arcane Crypto, Norway
Dr. Ulli Spankowski	Chief Digital Officer / Börse Stuttgart, Germany
James Bennett	Chief Executive Officer / Bytetree, UK

Table 2: The interviewees in this study.

Our intentions with interviewing the people mentioned above, were to expand our knowledge on the topic, and to gather relevant data from people who through their company and position have extensive and updated knowledge on the issue of cryptocurrencies and institutional demand.

Particular reasons for contacting the listed people and organizations

Mr. Bull Jenssen at Arcane Crypto: Generally recognized as one of Norway's leading experts on cryptocurrencies. Arcane specializes in both the payment perspective and the investment perspective of cryptocurrencies, and they seek to lessen the gap between traditional finance and cryptocurrencies. We were made aware of Mr. Bull Jenssen's knowledge and competence through his occasional appearances in the media, and through his lecture on Bitcoin at NHH in September 2020.

Mr. Norheim Schei at Arcane Crypto: Being the Head of Research at Arcane Crypto, Mr. Norheim Schei leads the research on cryptocurrencies at Arcane Crypto.

Dr. Spankowski at Börse Stuttgart: Being the CDO of Börse Stuttgart, we wanted to interview Dr. Spankowski in order to gain insight into institutional demand for cryptocurrency products in general, and particularly the trend of traditional stock exchange's admittance of cryptocurrency products.

Mr. Bennett at Bytetree: CEO of a company specializing in blockchain and institutional-grade cryptocurrency data, Mr. Bennett has comprehensive knowledge on the institutional demand for cryptocurrencies. We also believed his background in traditional finance to be valuable in a discussion of this emerging market in relation to traditional finance.

During our research process, we contacted several other people working with either traditional finance or cryptocurrencies, but our inquiries and interview requests were left unanswered.

For interview guide, see *Appendix A.1.*

4.1.2 Secondary data

The use of secondary data sources has been central to the verification process of the claims and viewpoints suggested by the interviewees, see our remarks on *participant (interviewee) bias* in *5.2.1 Reliability and Validity.* Notable secondary data sources frequently used in this study are books, peer-reviewed research papers, finance and economics journals, news articles, press releases and company statements. In addition to acting as a means of evaluating the claims of our interviewees, the secondary data has been used where it has been deemed necessary throughout the paper. The use of secondary data sources is particularly prominent in *Ch. 2* and *6.1.* The purpose of this is the need for a nuanced presentation of certain aspects of cryptocurrencies and the proposed drivers of the increasing institutional demand.

4.2 Quantitative data

In contrast to the interpretivist and inductive approach used in RQ1, a positivist and deductive approach was employed when researching the second research question. Numerical data and statistics for the quantitative part in RQ2 has primarily been retrieved from web sites with access to reliable databases, meaning that the gathered data are *secondary data*. This section is intended to give an overview of the data collected for our quantitative analysis, and considerations that were taken into account when collecting the data will be explained.

4.2.1 Data and descriptive statistics

In the process of investigating RQ2, i.e. *"is Bitcoin becoming a safe haven asset?",* we have primarily been using existing quantitative data from numerous sources. Data gathered on the historical price movements of Bitcoin has been retrieved from Yahoo Finance. Historical price data for the VIX, the MSCI World Index, the S&P500, gold, Tesla, Facebook, Apple, Amazon, Netflix and Google (Alphabet) were gathered from Investing.com and Yahoo Finance, which are reliable stock market data websites. The data collected on Bitcoin, the MSCI World Index, the S&P 500 and Gold were sorted into a panel data set and can be defined as time-series variables. Time-series data sets consist of observations of a variable over a time period.

Organizing data sets consisting of both cryptocurrency price data and stock market data comes with one particularly evident implication. Whereas the trading hours of most equity markets globally are restricted to the working hours every weekday and closed every weekend and on certain holidays, the market for trading cryptocurrencies is always open. The difference in trading hours had obvious implications for the data collection and analysis, and the mismatch between stock market data and the data accumulated in the cryptocurrency market whenever the stock market is closed therefore needed consideration.

We decided that the most appropriate way to solve this problem would be to remove Bitcoin price data accumulated throughout the weekend and on holidays. By doing this, we were able to create matching data sets between Bitcoin, the indices and the individual stocks analysed in this study. Consequently, our data set consisted of 1728 *daily* observations for all variables between December 27th, 2013 and November 5th, 2020. Bitcoin price data from prior to this point in time is available on certain websites, however, going back further than this would allow for unreliable data from unreliable sources to interfere with our study. Although not considered a variable because of its status as a proxy in our study, the historical price movements of the VIX were also collected and analysed for reasons outlined in the next chapter.

Below is a table of descriptive statistics for the variables analysed in RQ2:

	Obs.	Mean	Std. Dev.	Min	Max
BTC	1728	4142.057	4174.637	111.6	18972.3
S&P 500	1728	2461.306	450.819	1741.9	3580.8
MSCI	1728	1920.662	240.277	1468.9	2494.1
GOLD	1728	1327.299	191.384	1051.7	2063.2
VIX	1728	16.886	7.832	9.1	82.7

Table 3: Table presenting the descriptive statistics for the absolute values of the key variables in the quantitative analyses.

Scatter plots illustrating the relationships between the absolute price values for each asset for the entire period examined are available in *Appendix A.2* and *A.3*.

Regarding the S&P 500 and the MSCI World Index, these are two of the most representative indices of the worldwide equity market. The MSCI World Index is a broad global equity index which includes the mid and large cap equity performance for 23 developed countries. The

index covers approximately 1600 global companies and includes most of the free flow-adjusted market cap in each country (msci.com, 2020). The S&P 500 index is a market cap-weighted index consisting of 500 of the largest publicly traded companies in the U.S.

As for why the performance of Bitcoin will be compared to both the S&P 500 and the MSCI World Index, this is because we want to illustrate that using the S&P 500 as an indicator of the global economy in a setting like this can be justified. In *Ch. 6 Results,* one can observe the similarities between the results of the correlation analyses of Bitcoin and each individual index. Put simply, the indices' corresponding results with regards to correlation coefficients defend the use of the S&P 500 as an indicator not only of the US economy, but also of the global economy. Furthermore, since the S&P 500 is the parent index of the VIX, we argue that the S&P 500 is the most purposeful index of the two to use when determining periods of elevated market unrest. To clarify, the S&P 500 and the MSCI World Index are both included in our study in order to be able to determine whether the correlation coefficients differ depending on which index is used.

Concerning the decision to prioritize Bitcoin as the sole cryptocurrency in the quantitative analyses

As, mentioned in the introduction to this thesis, Bitcoin is not the only cryptocurrency that has generated high returns during the recent years. Other notable cryptocurrencies that have experienced extreme growth in coin price since their introduction to the market are *Ether* (15,800 % increase since July 2015), *XRP* (4,200 % increase since August 2013), *Chainlink* (8,230 % increase since September 2017) and *Litecoin* (1,550 % increase since April 2013) (Data gathered from CoinMarketCap.com. All calculations are approximations).

Our decision to not include any of these other cryptocurrencies in our study is based on two specific concerns. Firstly, the number of people outside the cryptocurrency sphere who has any knowledge of either the use-cases or the price performance of these alternative coins is limited. Hence, an analysis and a discussion of cryptocurrencies that have not yet managed to reach the masses to the same degree as Bitcoin has, would have had a limited reach compared to an analysis of Bitcoin. It is important to remember that the market cap of the entire cryptocurrency industry is still very small compared to other financial assets. According to CoinMarketCap (2020a), the total market cap of the cryptocurrency industry is currently 535

Billion USD, just above the eight highest valued company in the world, Berkshire Hathaway, Inc. (TradingView, 2020).

Secondly, although Bitcoin's market cap relative to the total cryptocurrency industry through the years have decreased, Bitcoin still holds a dominant position over other cryptocurrencies, covering close to two thirds of the market cap of the entire industry. This causes the price movements of Bitcoin to be extremely decisive for the price movements of the rest of the market. Hence, including less established cryptocurrencies in this analysis would likely be futile, as the price movements of most other cryptocurrencies are not independent of Bitcoin's performance.

5. Methodology

In this section, we will give an overview of the methodology used in this thesis. Firstly, we will explain and give a justification for the research design employed in this study. Secondly, we will provide an elaboration on how the two primary research methods have been utilized in order to enable high-quality data collection and analysis. Thirdly, through the lens of quality criteria, the strengths and weaknesses of the research methods used will be assessed.

5.1 Research design

As a consequence of our choice to focalize our thesis around two connected, yet distinctive, research questions, the use of different methods for each question is required. RQ1 "*What are the drivers of the increasing institutional demand for cryptocurrencies?"* can be classified as a qualitative question, requiring an inductive data collection process and subsequent analysis. The classification of RQ1 as a qualitative question relates to how the available data regarding the subject still primarily is at a qualitative level. Hammarberg, Kirkman and de Lacey (2016) propose that qualitative methods be used to answer questions about experience, meaning and perspective, often from the standpoint of the participant, and that these data usually are not amenable to counting or measuring. This corresponds well with the nature of RQ1.

In contrast to RQ1, the second research question can be classified as having a quantitative nature due to the research purpose of examining the relationships between Bitcoin and traditional asset classes. This is also in accordance with our wish to contribute to broadening the literature on virtual currencies as an alternative investment class. The nature of RQ2 requires an extensive focus on statistical analysis of numerical data, thus a quantitative research design has been employed.

Furthermore, the research design of the thesis in its entirety is in accordance with a *sequential exploratory/explanatory mixed methods research design* (Saunders et al., 2016). The same source describes an *exploratory study* as a useful means of clarifying ones understanding of an issue, problem or phenomenon, which is in line with the purpose of RQ1. Conversely, RQ2 can be characterized as *explanatory*, as this investigation seeks to explain the relationships between variables (Saunders et al., 2016).

5.2 Qualitative method

Because the issue investigated in RQ1 is a recent and emerging phenomenon, there is little current data and structured knowledge on the topic. We therefore decided that a purposeful way to gain insight into RQ1 would be through interviews with people or organizations with extensive knowledge about the topic. We prepared a list of potential candidates we wanted to interview and contacted them via LinkedIn and e-mail.

In preparation for the interviews, we prepared a list of the questions we in advance believed to be of the greatest importance. Saunders et al. (2016) recommend using *semi-structured interviews* in cases where there are a lot of open ended and complex questions that need answering. This kind of interview, compared to a purely structured interview, would also be beneficial to us because it would allow for the interviewee to talk more freely about the aspects discussed and possibly also raise our attention to questions or vantage points previously unexplored by us. Notes were taken during all interviews, before the responses were coded and categorized in order to create a thorough overview of each participant's opinions. Subsequently, we sent each interviewee all sections of the thesis mentioning the interviewee's name and opinions, and we offered them the chance to clarify potential misunderstandings or errors.

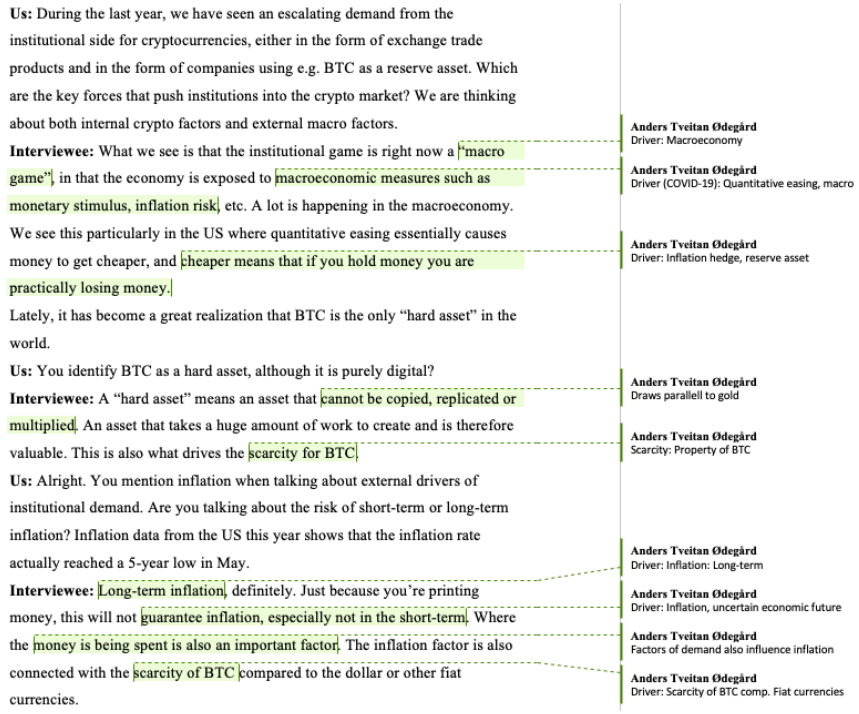

Figure 4: Excerpt from interview where statements have been coded and categorized into different groups.

5.2.1 Reliability and Validity

According to Saunders et al. (2016, p. 202), *reliability,* or *dependability,* is a measure of replication. A study can be considered as reliable if another researcher would achieve the same results had the same research design been employed. Reliability then relates to *how* one measures the issue or phenomenon examined. As mentioned above, the qualitative data collection of the first research question relies on two types of sources. Large parts of the data were collected through the use of semi-structured interviews. However, in order to verify the claims and ideas put forward by the interviewees, we were conscientious about finding substantiating support for their opinions in secondary sources.

With regards to the reliability aspect of using semi-structured interviews as a means of collecting data to answer a complex question with little to none existing established theory or literature, we have attempted to ensure the reliability of the study by publishing both the names of the interviewees and our interview guide (*Appendix A.1).* However, Saunders et al. (2016, p. 398) propose that in-depth or semi-structured interviews are not necessarily intended to be repeatable since they reflect reality at the time they were collected, in a situation which may be subject to change. The assumption behind this type of research is that the circumstances to be explored are complex and dynamic. The value of using in-depth or semi-structured interviews is derived from the flexibility that you may use to explore the complexity of the topic. Therefore, an attempt to ensure that qualitative, non-standardised research could be replicated by other researchers would not be realistic or feasible without undermining the strength of this type of research.

This is not to say that we exempt ourselves from the responsibility of ensuring a reliable study; it is merely an explanation as to why replication of qualitative studies finds itself in a grey area and consequently dwells with fundamental uncertainty. Regardless, an obvious threat to qualitative studies featuring interviews is that of participant (interviewee) bias. When interviewing someone who either have self-interest or feels strongly about a subject, we were aware of the implications this entails. People have various biases depending on their approach to a subject, and we believe that the validation or disproval of claims and ideas using secondary sources has been imperative to the reliability of our research, and we consider it to be one of the strengths of this study.

Measurement validity concerns itself with whether the measures used to research the matter are appropriate for the intended purpose. This form of validity is generally more applicable in quantitative research, and according to Saunders et al. (2016) judging the quality of qualitative studies in light of measurement validity can be difficult. However, considering the exploratory purpose of the study, we believe this study's use of interviews and secondary sources (e.g., company press releases) to be a valid means of assessing the phenomenon being studied, and that the qualitative methods used to a large extent measure what they are intended to.

Internal validity, or credibility, refers to the accuracy in the analysis of the results and the proposed relationships. This translates to ensuring that the representations of research participants' socially constructed realities actually match what the participants intended (Saunders et al., 2016). We ensured this by establishing rapport with the interviewees early in the process, and this enabled the possibility of asking the interviewees for clarifications or elaborations whenever inconsistencies or unclarities in their statements were found. We gave the interviewees a thorough description of both our research problem, context and purpose, and this established an understanding of what exactly was being researched. Being two students writing this thesis together also enabled a continuous internal discussion of interview data, results and findings which helped strengthen the credibility of our study. Furthermore, by engaging in *participant validation*, i.e. the process of permitting the interviewees to comment on and correct sections of the text featuring their name and opinions in order to validate the statements (Saunders et al., 2016), we ensured the accuracy of the analysis of the interview data and the relationships proposed.

External validity, or transferability or generalizability, relates to the potential generalization of findings. A study has high transferability or generalizability if a full description of the research questions, design, findings and interpretations is provided, in order to let the reader of the study judge to what extent the study is transferable or generalizable to other settings or problems he/she may be interested in researching (Saunders et al., 2016). Again, our interview guide is available in *Appendix A.1*. The overall context of thesis is established in *Ch. 1* and *Ch. 2.*, while the research design and the justification for it has been described in detail earlier in this chapter. Findings from both the interviews and the secondary data sources and the respective interpretations of these are referenced in *Ch. 6*. *Results and Findings*. By taking these measures, external validity of the qualitative part of the thesis should be ensured.

5.2.2 Ethical considerations

Permissions to mention by name and to express individual statements made were granted by all interviewees. Bryman and Bell (2007) emphasise key aspects of ethical considerations in qualitative studies; adequate levels of confidentiality if requested, protection of privacy, and honesty and transparency of communication. Saunders et al. (2016) highlight that participants have the right to withdraw from the study at any stage should they wish to do so, that the participants should participate on the basis of informed consent. We consistently abided by all these ethical considerations during the entirety of the research process.

5.3 Quantitative method

In processing and analysing data related to RQ2 *"Is Bitcoin becoming a safe haven asset?"* we have mainly relied on Stata/SE 16.0 and Excel. More specifically, these programs were used to analyse the correlations coefficients between the variables in our study. The following section of the thesis serves as an overview of the quantitative methods and measures used in order to answer RQ2. First, the reasoning behind our selected time periods in which we investigate the correlations between the assets will be presented. Second, a description of the Pearson correlation coefficient along with an assessment of the reliability and validity of the quantitative analysis will be given.

5.3.1 Determining time periods

Drawing on the literature review on safe haven assets, a safe haven asset must be either negatively correlated or uncorrelated *only in times of market stress/financial instability.* Seeing as our primary purpose is to investigate the safe haven capabilities of Bitcoin, we will therefore center our analysis on periods within the seven-year period (Dec. 2013 – Nov. 2020) which exhibit the characteristics of market unrest/financial instability. In this process, we have used both the S&P 500 and the CBOE VIX as indicators of market unrest.

Optimally, considering that this ultimately is an investigation into Bitcoin's price performance relative to indices and the principal flight-to-safety asset gold during market unrest, the amount of available Bitcoin price movement data would be larger. Bitcoin is a nascent asset, and the number of periods where the market can be characterized as being in a state of unrest is

therefore limited. Between 2013 and 2020, the stock market fell by similar percentages as in previous large-scale stock market crashes only on two occasions: October 2018 – January 2019 and February 2020 – March 2020. To summarize, Bitcoin's raw status as an alternative investment asset combined with the paucity of stock market crashes in the available time period thus led us to also include smaller stock market downfalls in our investigation.

If we were to only rely on the S&P 500 in determining periods of market unrest, identifying local vertices and consecutive downfalls would be purposeful. However, using the VIX in the selection process, adds another dimension in that this index has a flat trend line. A stock market index does not share the same characteristics as the VIX, because market indices tend to either increase or decrease over time.

Consequently, observations in which the VIX exits its mean range of the average value plus one standard deviation will therefore be of importance in determining which periods to include. In accordance with Kopyl and Lee's (2016) selection of periods using the VIX, the average values and the standard deviations of the VIX for the entire period examined have been calculated.

	Obs.	Mean	Std. Dev.	Min	Max
VIX	1728	16.886	7.832	9.1	82.7

Table 4: Descriptive statistics for the VIX between December 27, 2013 - November 05, 2020.

Between December 27th, 2013 and November 5th, 2020, we find that that the VIX had an average value of 16.886 and a standard deviation of 7.832. The standard deviation added to the mean gives a value of 24.718.

In the table below, descriptive statistics for the VIX have been separated into the respective years. As can be observed in the table, 2020 displays extraordinary VIX values, both in terms of mean, standard deviation and maximum values when compared to the other years in this study.

	Obs.	Mean	Std. Dev.	Min	Max
VIX_2020	215	30.411	13.033	12.10	82.69
VIX_2019	252	15.388	2.610	11.54	25.45
VIX_2018	251	16.640	5.090	9.15	37.32
VIX_2017	251	11.090	1.356	9.14	16.04
VIX_2016	252	15.826	3.972	11.27	28.14
VIX_2015	252	16.674	4.335	11.95	40.74
VIX_2014	252	14.176	2.636	10.32	26.25
VIX_2013	3	13.247	0.686	12.46	13.72

Table 5: Descriptive statistics for the VIX, grouped into separate years.

With extreme levels observed particularly between February and April 2020 and the consistent high values throughout the year, the observations in 2020 increase the mean value and standard deviation of the VIX for the entire period. As a consequence, December 2013 – December 2019 and January 2020 – November 2020 will be examined separately. These are termed ***period 1*** and ***period 2*** respectively. Consequently, the unusually high VIX values of 2020 do not interfere in determining periods of market unrest in period 1.

Period 1

In period 1, December 27th, 2013 – December 31st, 2019 we have defined periods of market unrest/financial instability as when the market, using VIX as a proxy, deviates with more than one standard deviation from its average value. Both periods exhibiting elevated market unrest within period 1, as well as period 1 in its entirety will be analysed.

	Obs.	Mean	Std. Dev.	Min	Max
VIX	1513	14.964	4.040	9.14	40.74

Table 6: Descriptive statistics for the VIX for period 1, December 27th, 2013 – December 31st, 2019.

In *Appendix A.4* summary statistics for Bitcoin and the S&P 500 and scatter plots depicting the relationship between the assets with absolute price values for period 1 are presented to show the behavioural nature of these data.

During this period the VIX had a mean value of 14.964 and a standard deviation of 4.040. A *normal and calm* market in our research is thus defined as having a VIX value of no more than 19.004. A VIX value one standard deviation above the average equals a 26.997 % increase in

VIX value. In other words, a VIX value above 19.004 in our research signals an uncertain and volatile market sentiment. Because we consider deviations in the VIX value to be relative to the mean VIX value, we characterize prolonged spikes above +26.997 % as periods of market unrest. To identify the periods where the VIX spikes above 26.997 % from the mean value, we used Stata.

Overall, we find 40 individual periods where the VIX spikes above the 19.004 mark, but a minority of these have a sufficient number of observations above the normal VIX range. Most of these periods have just one or a few observations where the VIX value is above normal values. 37 of these 40 periods thus cannot be considered to be periods of market unrest as they do not consist of enough observations. Hence, our focus is on periods with both high relative VIX values *and* a satisfying number of observations, as this will assist in achieving more consistent and valid results. Using the average value of the VIX plus one standard deviation to determine points where the VIX exits its normal and calm range has proved purposeful in this study, as all prolonged spikes above the normal range have corresponded with significant drops on the S&P 500.

In our case, how we perform the sampling is relevant as we are defining our selected periods based on the mean plus one standard deviation of the VIX. We have determined that 30 observations or more is a sufficient number of observations. Below, the VIX defined sub-periods for period 1 are presented:

- **Period 1.1**: August 20th, 2015 – October 7th, 2015
  34 observations.
  S&P 500 fall within the VIX-defined period: - 8.26 %
  Real S&P 500 fall from vertex (17.08.2015) to bottom (25.08.2015): - 11.17 %
- **Period 1.2**: January 4th, 2016 – March 1st, 2016.
  40 observations.
  S&P 500 fall within the VIX-defined period: - 9.30 %
  Real S&P 500 fall from vertex (29.12.2015) to bottom (11.02.2016): - 11.99 %
- **Period 1.3**: October 10th, 2018 – January 11th, 2019.
  64 observations.
  S&P 500 fall within the VIX-defined period: - 16.45 %
  Real S&P 500 fall from vertex (03.10.2018) to bottom (24.12.2018): - 19.63 %

As can be observed in *Appendix A.7*, the spikes above the level of average VIX value plus one standard deviation between October 10th, 2018 – January 11th, 2018 are occasionally and briefly interrupted by observations exhibiting normal VIX values. The period consequently is comprised of five sub-periods with high VIX values. However, due to concurrent large downfall on the S&P 500, we find it appropriate to include this period as well, as this is the largest percentage drop on the S&P 500 after the Coronavirus Crash.

The reason why a distinction has been made between the *real S&P 500 fall* and the *S&P fall within the VIX-defined period*, has to do with the VIX being an indicator of the sentiment on the S&P 500, and the observed tendency of the VIX to underestimate the actual market volatility in times of market unrest (Kownatzki, 2019). Because of this tendency, real percentage drops on the S&P 500 has been used to verify whether or not the individual periods examined can be defined as periods of market unrest. During the entire period examined, whenever the S&P 500 fell, the VIX usually took some time to react. Put simply, the VIX reacts to the S&P 500 and not vice versa. Also, whereas the individual real S&P 500 falls have been measured from a vertex before a heavy fall until a bottom was reached, the S&P falls within the VIX-defined periods have been calculated using only observations from within the VIX-defined period, hence these falls display a lower percentage drop than the real S&P 500 falls.

In *Appendix A.5* and *A.6* summary statistics for Bitcoin and the S&P 500 and scatter plots depicting the relationship between the assets with absolute price values for periods 1.1-1.3 are presented.

Period 2

Period 2, January 2nd, 2020 – November 5th, 2020, consist of 215 observations and has an average VIX value of 30.411. This implies that the period as a whole can be defined as exhibiting market unrest/financial instability, as values above 20 generally marks elevated levels of market unrest and values above 30 is an indicator of high market volatility (Kuepper, 2020a; Williams, 2013). Also, an average VIX value of 30.411 throughout 2020 is a 103 % increase from the mean for the preceding six years, thus illustrating the high degree of volatility and market unrest observed this year compared to the other years examined.

In addition to analysing the entire year of 2020 as a prolonged period of market unrest, a decision was made to investigate the period between February 27th and May 8th separately. The reasoning behind this was to be able to explicitly examine the correlations between Bitcoin and the other variables during the heavy market fall from February to March, and in the successive weeks after the downfall. The dates February 27th and May 8th marks the days where the VIX initially enters and exits the volatility range above 30 respectively.

- **Period 2.0:** January 2nd, 2020 – November 5th, 2020.
  215 observations.
- **Period 2.1:** February 27th, 2020 – May 8th, 2020.
  51 observations.
  S&P 500 fall within the VIX-defined period: - 28.52 %
  Real S&P 500 fall from vertex (19.02.2020) to bottom (23.03.2020): - 33.92 %

In *Appendix A.8* and *A.9* summary statistics for Bitcoin and the S&P 500 and scatter plots depicting the relationship between the assets with absolute price values for period 2 and 2.1 are presented.

Generally, larger sample sizes would give more significant results. However, due to the explicit purpose of RQ2 of researching Bitcoin's safe haven capabilities, the use of smaller samples is a direct consequence of the definition of a safe haven asset itself. Using larger sample sizes would contradict our current method of defining periods of market unrest using the VIX's average plus one standard deviation. For example, defining market unrest as average VIX value + 0.5 standard deviation would lead to increased sample sizes, but it would also increase the probability of including periods less representable of a market in unrest. The average value plus one standard deviation is a commonly used method of classifying values within a normal range. The validity of this method is strengthened by the correspondence in percentage fall on both the VIX and the S&P 500 in our thesis, which was elaborated earlier in this chapter. By using the average value of the VIX plus one standard deviation, the respective downfalls on the indices match almost perfectly, only differing by a few days.

5.3.2 Pearson product-moment correlation coefficient

This sub-chapter is intended to outline some of the considerations that need to be taken into account when using the Pearson correlation coefficient as a measure of the strength of the relationships between variables. The Pearson correlation coefficient is one of the most widely used methods of correlation analysis.

This method measures how close the observed values lay around a regression line, i.e. the strength of the linear relationship between the variables, and therefore indicates the direction of the statistical association between two variables. Testing hypotheses through the Pearson correlation coefficient and performing significance tests of the individual coefficients, ultimately reveal whether a coefficient is significantly different from zero. The definition of a strong, moderate, weak, negligible or non-existent correlation primarily depends on the type of study, the number of observations, the significance level and the degrees of freedom. Because of the formulation of our null hypothesis and our research objective of examining Bitcoin's safe haven capabilities, this study is concerned with finding either a lack of correlation or a negative correlation between Bitcoin and the S&P500/MSCI World Index. This has implications for the consequent interpretation of the correlation coefficients. The different significance levels will be marked with *, ** or ***, making a distinction between the 10 %, 5 % and 1 % significance levels. Whereas a significant coefficient of 0.910*** means that the coefficient with a 99 % certainty is different from zero and is the real coefficient value, an unsignificant coefficient of 0.018 indicates that the relationship between the variables is not significantly different from zero at any significance level. The level of uncertainty varies depending on whether or not the data satisfy the assumptions of the method. The assumptions of the Pearson correlation are listed below:

Common mistakes when investigating the correlation coefficients between the returns of different variables, are to misinterpret correlation as causation and to predict future performance using correlations based on historical data. Sachs, Tan & Tiong (2014) argue that historical correlations may dramatically and long-lastingly change under unexpected new market conditions, and that the predictive power of a correlation coefficient thus is limited. The researchers conclude that conventional measures of correlation only explain parts of the relationship between the returns of two variables.

Using returns instead of absolute price levels in a correlation analysis, adjusts the weight of the first few observations in each period to the same level as the rest of the observations and transforms the price changes of the different variables into the same unit. If large changes are observed in the beginning of a period, the period risks being overly weighted in the direction of these first observations. Also, using absolute price levels would be irrational considering the difference in value between the assets, as can be seen when comparing the absolute changes of the variables: A hypothetical price fall of Bitcoin from 10,000 to 9,000 USD, would constitute a 10 % reduction in value. If the S&P fell by the same absolute amount from 3,000 to 2,000 USD, this would constitute a drop 33.33 %.

In order to verify the results of the correlation analyses using daily percentage returns, calculations were also performed using log returns. These analyses generated close to identical results, and no inconsistencies were found.

After removing Bitcoin price observations generated every weekend and on holidays, the data sets were matched in Excel, before both the daily percentage returns and log returns were manually transferred to Stata. The data were then prepared for analysis and consequently calculations were performed. The results from the correlation analyses, where the daily percentage returns of all assets have been used, are displayed in *Ch. 6.* In determining the strength of the correlations between the different assets, the following correlation coefficient scale will be used:

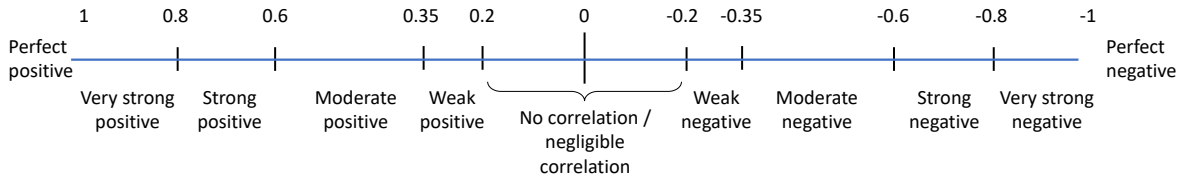

Figure 5: The correlation coefficient scale that will be used to interpret the strength of the correlations between the assets.

5.3.3 Reliability and validity

Reliability in terms of qualitative studies was covered previously in the chapter; however, the reliability of our quantitative analyses demands a separate assessment. The positivist and quantitative nature of RQ2 simplify the process of ensuring the quality of our analysis and

discussion. Reliability of research is concerned with consistency and replication of findings. Because we in this chapter and in *Ch. 4* have outlined *which* data we have collected, *how* we have processed the data and *why* we intend to interpret the findings the way we do, we believe our research to be reliable. In addition to this, all the data we have collected are from reliable sources accessible to the public.

As an investigation of an asset's safe haven capabilities naturally infers a discussion of its relationships, in the form of correlations with other assets, the use of correlation analysis is justified. Furthermore, because being a safe haven asset entails being negatively correlated or uncorrelated with the other asset or index *only in a very specific period of time*, this necessitates sampling the entire period examined into shorter periods. The most evident drawback of this is that the results will be more uncertain when analysing periods with fewer observations. However, and as stated in *Ch. 5.3.1,* this sampling has been necessary in order to specifically examine the price performance of Bitcoin during market unrest. We therefore believe the methods used to be purposeful for the problem examined, hence our research has a relatively high *measurement validity*. We also believe the requirements of *internal validity* to be met, as our interpretation of results and relationships is in line with the established methods and coefficient scale associated with correlation analysis. Our correlation analysis does not claim to infer any causal relationships between the variables either, as will be explained in the next sub-chapter.

Regarding *external validity,* we do in our research clarify that we examine Bitcoin's safe haven capabilities relative to the performance the S&P 500 and the MSCI World Index, which function as indicators of the global economy. Additionally, all the data used are real-world historical data. However, even though the indices used are very indicative of the worldwide economy, there is no guarantee that we would have obtained the same results had we also used other indices or other time periods. Also, considering the short time Bitcoin has been in the market, and consequently the relatively short period of time examined in this thesis, it is difficult to claim that the results can be generalized. Saunders et al. (2016) say about cases like this that in order to infer statistical generalizability of the results, it is necessary to replicate the study in other contexts. With time, as Bitcoin matures as an asset and the economy inevitably encounters new periods of market unrest, it will be possible to conclude whether the results of our study can be generalized.

5.3.4 Causality

A well-known objective in economics and other sciences is that of establishing causal relationships. The economist's goal is to infer that one variable has a *causal* effect on another variable and we do know that findings are rarely convincing if one cannot show such evidence (Wooldridge, 2020). In this study, however, we are not examining the effects of one variable on another. Rather, since we are investigating the strength of the relationships between several variables, we do not expect to discuss determination coefficients and the explanatory power of a change in one variable. A discovery of any degree of correlation will not infer a causal relationship per se, rather it will serve as an indicator of the extent to which two variables are statistically related.

6. Results and findings

This section will present the results and findings of both our research questions. We will first present the qualitative findings of RQ1 *"What are the drivers behind the increasing institutional demand for cryptocurrencies?"*, before we continue with a presentation of the quantitative results for RQ2 *"Is Bitcoin becoming a safe haven asset?"*.

6.1 Results for RQ1

In the process of discussing the different drivers of the institutional demand for cryptocurrencies, both primary data from interviews and secondary data obtained through other sources are referenced in this section. Due to a large part of the institutional demand emerging this last year, several of the proposed drivers are directly linked to the economic effects of the COVID-19 pandemic.

6.1.1 Driver no. 1: The consequences of expansionary monetary and fiscal policy

This driver is comprised of the effects of monetary and fiscal policy measures imposed by central banks and governments – particularly during the COVID-19 crisis of 2020. Quantitative easing, inflation, zero interest-rate policy and the Austrian business cycle theory will be covered in this sub-chapter.

6.1.1.1 Quantitative easing and inflation

> *"If something is by design going to depreciate 2 % per year through inflation, why own it?" (Tudor Jones & Giorgianni, 2020).*

It might not seem intuitive at first how inflation, a traditional economic measure intended to stimulate growth in an economy, can contribute to the increasing institutional demand of cryptocurrencies. However, both Mr. Bull Jenssen, Mr. Norheim Schei and Mr. Bennett, along with several of the institutions that have decided to place parts of their reserves into Bitcoin, cite inflationary concerns as part of the rationale.

While inflation generally is viewed as a natural and integral part of most economies and used as a means of promoting economic growth, the measure effectively decreases the purchasing

power of the currency in a given economy. As private consumers directly suffer from this mismatch, increased minimal wages are often used to counter the effects of this imbalance, thereby creating a state of wage push inflation.

Another term that needs to be addressed when discussing inflation, and in the process of understanding how inflation could cause an increasing institutional demand for alternative assets such as Bitcoin, is the concept of *quantitative easing.* This emergency measure has been in frequent use by central banks across the world as a consequence of the effects of the Coronavirus on the economy, and it can broadly be defined as a monetary policy where central banks through purchasing government bonds and long-term securities from the open market seek to increase the supply of money (Scott, 2020). With regards to inflation, the fundamental aspect of this monetary policy is that of increased supply of money. It is also important to note that this kind of monetary policy is implemented when the interest rates have already been lowered to rates close or equal to zero, i.e. as a last resort when an economy is experiencing a crisis.

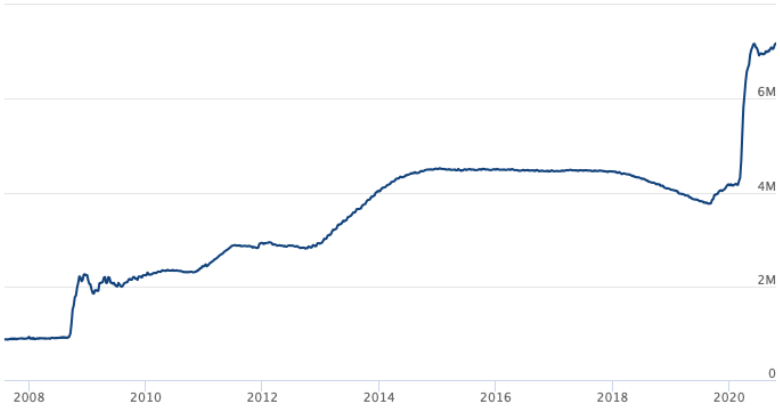

Figure 6: A graph showing the trend of the balance sheet of the Federal Reserve (FED) in the US. The graph shows the total assets of the FED between 2008 and present day. As a consequence of measures implemented during the pandemic, the FED's balance sheet increased by approximately 87 % from 3,8 Trillion USD to 7,1 Trillion USD (Source: Federalreserve.gov).

As can be seen in figure 9, the FED has injected an enormous amount of money into the US economy since the beginning of 2020. In spite of this, according to data from TradingEconomics.com, inflation in the US reached a 5-year-low of 0.1 % in May of this year, before slowly rising to its current level of 1.2 %. Regardless of this, expansionary monetary policy in the form of unprecedented levels of quantitative easing is no guarantee for future inflation. CEO of Bytetree, Mr. James Bennett, stated during our interview that the fear of depreciating fiat currencies was a long-term aspect, and that he did not expect inflation to

escalate concurrently with the ongoing recession. In addition to this, Mr. Bennett put an emphasis on the gravity of the drop on the demand-side during the Coronavirus pandemic, which is currently alleviated to some extent by the prevailing monetary policy of quantitative easing imposed by central banks. In his rationale for an increased future inflation, Mr. Bennett also cites concerns over the huge spending by governments in the form of fiscal policy measures. Governments all over the world have this year targeted the demand-side implications of the pandemic with structural levers ranging from tax reliefs to stimulus checks to increased wage subsidies (IMF, 2020), and Mr. Bennett argues that the interaction between fiscal policies and quantitative easing observed throughout the world has the power to depreciate the value of fiat currencies in the future.

Inflation data from the previous decade supports the fear of a potential rise in inflation. Similar to the behaviour of the inflation rate during this year's market crash, the inflation rate in the US decreased both during the global financial crisis of 2007-08 and during the extreme oil price fall towards the end of 2014 (Trading Economics, n.d.). Both of these relatively sudden drops in inflation rate were followed by an increasing inflation rate in the successive months and years, rising from -2.1 % in July 2009 to 3.9 % in September 2011, and from -0.2% in April 2015 to 2,7 % in February 2017.

Contrary to the target inflation levels of fiat currencies regulated by governments, Bitcoin has no governing body that routinely adjusts its supply of coins. Individuals and institutions emphasising Bitcoin's capabilities as an appreciating store of value and as a hedge against inflating fiat currencies, often refer to Bitcoin's *deflationary nature.* We briefly introduced this concept in *2.2.1 Bitcoin (BTC)*, and there are two essential aspects to it. The first one being that the algorithm which is responsible for producing new bitcoins allows for the creation of no more than 21 million coins, i.e. Bitcoin's intrinsic value is tied to *scarcity,* and the second one being the inverse relationship between the number of existing bitcoins and the production rate of new bitcoins. The *fixed supply rate* of new bitcoins declines with the number of units already in circulation.

Both the CEO and the Head of research at Arcane Crypto, Mr. Bull Jenssen and Mr. Norheim Schei, along with already mentioned James Bennett of Bytetree, hold the contrasting inflationary characteristics of fiat currencies and Bitcoin as one of the key reasons behind the

increasing institutional demand. In essence, the interviewees believe that institutional investors that have ventured into the cryptocurrency market have done so partly because of an expectation that Bitcoin will hold as a hedge for future inflation.

In May 2020, highly acclaimed American hedge fund manager Paul Tudor Jones revealed that he had allocated parts of his 5,8 billion USD fortune into Bitcoin as a hedge against inflation (Schatzker, 2020). Along with this announcement, Tudor Jones authored a market outlook titled *"The Great Monetary Inflation"*. In the paper, he discusses probable short-term and long-term consequences of the extreme monetary and fiscal spending by central banks and governments propelled by the ongoing recession. Drawing parallels to the increase in gold price during the second half of the 1970's, a period featuring high inflation rates, and discussing the probability of an increase in inflation rates in the near future, Tudor Jones predicts the best performing asset over the course of the next ten years to be Bitcoin (Jones & Giorgianni, 2020).

Previously in this thesis, MicroStrategy's change of primary reserve asset from cash to Bitcoin was introduced. This was accompanied by a press release from top executives of the company who outlined the rationale behind the decision. CEO Michael Saylor points out several macroeconomic factors, such as financial stimulus by governments and quantitative easing, and he expresses concerns that these will have a significant depreciating effect on both the purchasing power of fiat currencies and the real value of other conventional assets types in the long run (Business Wire, 2020). He also states that the company believes Bitcoin to be a dependable store of value and that the asset has a greater long-term appreciation potential than cash reserves. In summary, the company to a large extent explain their change of primary reserve asset by concerns over central bank and government policies which have the capacity to diminish the purchasing power of fiat currencies.

To sum up, quantitative easing and fiscal policy and their side effects have the ability to contribute to a decrease of the purchasing power of fiat currencies over time. The fact that quantitative easing or other forms of expansionary monetary policy is not part of Bitcoin's characteristics, makes individuals and institutions believe that Bitcoin can act as a hedge against planned and unplanned annual depreciation of fiat currencies.

6.1.1.2 Zero interest-rate policy

Another controversial monetary policy introduced by central banks this year, is the zero interest-rate policy. A lowering of the key interest rate is considered an expansionary macroeconomic policy often targeted at stimulating economic growth, countering a steep fall in the demand for goods and services, and offsetting the negative consequences of an economic crisis in general. This was one of the most frequently discussed factors during the interviews.

It is important to clarify that the effects of a zero interest-rate policy have implications for both institutional as well as individual demand.

The central bank of Norway lowered the key interest rate to 0 % in May 2020, as a means of stimulating the activity in the economy (Norges Bank, 2020). The US also responded to the economic crisis by lowering the federal funds rate to between 0-0,25 % (Knueven, 2020). The lowering of the Norwegian key interest rate came after a period of two years of fractional increases of the interest rate. A product of the zero interest-rate policy is the reduced interest rates for borrowers, and consequently, a low or non-existent interest rate incentivises spending while discouraging saving. However, this type of expansionary monetary policy also has other consequences, both for individuals and institutions.

Mr. Bull Jenssen suggests that the recent increasing demand for and interest in cryptocurrency partly can be attributed to low interest rates, in that lenders now generate less interest than before on their bank deposits. Whereas a bank client previously could rely on generating a fair and stable interest on their bank deposits, most banks have as a consequence of the lowered key interest rate adjusted their interest rates accordingly. In our interview, Bull Jenssen argues that this mechanism has led individuals and institutions with available savings or reserve assets to reconsider leaving their assets in a bank account. Because a zero interest-rate policy and quantitative easing are similar macroeconomic forces in that both are related to a weakening of the value of fiat currencies (bank deposits generate little or no interest, and money printing contributes to a weakening of the purchasing power of each unit of currency), some of the observed arguments mentioned below apply to both drivers.

In MicroStrategy's rationale for adopting Bitcoin as their primary reserve asset, there are indications that a lowering of interest rates has been decisive for the choice. The company states that holding Bitcoin is likely to help the company earn higher returns and to help

preserve the value of their capital in the long term compared to holding cash (Business Wire, 2020).

Another company to publicly announce a shift to Bitcoin as primary reserve asset is American company Snappa. The company CEO, Christopher Gimmer, rationalize the reallocation of 50 % of the company's reserve assets into Bitcoin over concerns that unprecedented levels of quantitative easing in combination with fiscal stimulus forms a foundation for currency debasement. Gimmer also explicitly highlights that the lowering of the company's high interest rate to 0.45 % when adjusted for the current inflation rate directly will decrease the purchasing power of company's Canadian and US dollar reserves (Gimmer, 2020).

In essence, the statements above made by the top executives in MicroStrategy and Snappa all signal that general macroeconomic factors were decisive in the decision to change reserve asset. Summed up, the choice of adopting Bitcoin as the primary reserve asset can be attributed to wanting to limit the company's exposure to value depreciation of fiat currencies as a consequence of both lowered interest rates and inflation.

Due to Bitcoin's recent price performance, MicroStrategy's 425 million USD (including fees) investment into 38,250 bitcoins in August 2020 is as of mid-November 2020 worth approximately 612 million USD. We have on multiple occasions contacted MicroStrategy for an interview or a comment, but they have not responded to our inquiries.

6.1.1.3 Austrian business cycle theory (ABCT)

The description of the effects of the interaction between quantitative easing and lowering of interest rates on an economy in crisis observed during our interviews and in our secondary data, has clear resemblances with the Austrian School of Economic thought's perceived workings of expansionary monetary policy. Although disregarded by most economists who prefer theory grounded in empirical data and statistics, the Austrian business cycle theory may still offer relevant insights, especially considering the present state of economies worldwide. In simplified terms, the ABCT proposes an interplay where a lowering of the interest rates leads to increased spending because borrowing money becomes cheaper. This in turn causes wasteful investments financed with money that has just been issued to the market, which over time are believed to depreciate the value of assets. Additionally, according to ABCT, a mismatch arises between the supply-side and the demand-side when a firm invests too heavily

in factors of production because of advantageous interest rates on bank loans, and consumers' preferences changes because of increased inflation (Rothbard, 1963).

6.1.2 Driver no. 2: Increased focus on regulations and bridging the gap to traditional finance

Bitcoin and other cryptocurrencies have undoubtedly suffered from and been criticised for the lack of legitimacy and credibility associated with it. Our findings from the interviews and from the secondary data sources suggest that this to a large extent can be attributed to cryptocurrencies not being embraced or recognized by traditional finance, and a lack of an appropriate regulatory framework – until now.

Dr. Spankowski considers the aspect of regulations as being of massive relevance to the research question. In our interview, he suggested that an increased focus on the regulatory side of cryptocurrencies would be important in increasing the legitimacy of virtual currencies. In fact, Dr. Spankowski was adamant that *bringing cryptocurrencies closer to the regulated space by the financial authorities* is the primary driver of the institutional adoption.

In July 2020, the European Financial Reporting Advisory Group, released a discussion paper titled *Accounting for Crypto-Assets (Liabilities).* The paper primarily evaluates accounting aspects of cryptocurrencies; however, the paper also discusses potential contributors to the increasing institutional demand of this asset class. According to the paper, there is a consensus that continued increasing institutional demand would be dependent on improvements to regulations and oversight requirements, and other mechanisms of trust-building that diminish abuses (EFRAG, 2020). In other words, the paper by EFRAG is in accordance with Dr. Spankowski's remarks on the importance of bringing cryptocurrencies closer to the regulated space.

Until now, the lack of regulations and oversight in the cryptocurrency sphere has been a cornerstone in the argumentation used by critics of the emerging market. Opponents argue that governments' failure to establish comprehensive legal frameworks and regulations in the cryptocurrency industry has contributed to the use of cryptocurrencies in illicit activities. With this as the backdrop, Dr. Spankowski emphasises that the wish of both several actors within the cryptocurrency community and authorities to implement regulations and legal frameworks

has a great role to play in the continued institutional demand for cryptocurrencies. Implementing appropriate regulations is likely to be beneficial for both governments, individuals and institutional investors.

Furthermore, we suggest the aspect of *bringing cryptocurrencies closer to the regulated space* be split into two different perspectives, because events contributing to pushing cryptocurrency towards the regulated space have come from two different sides. The first perspective relates to how financial authorities directly impose regulations and contribute to establishing regulatory frameworks for the industry, while the second perspective relates to how either the cryptocurrency industry itself or traditional finance attempts to bridge the gap between the two markets. An example of the first perspective is the definition of cryptocurrencies as capital assets and the consequent inclusion of capital gains from buying and selling cryptocurrencies in the Taxation Act of Norway. The second perspective is exemplified by the admittance of cryptocurrencies ETPs in the regulated stock market or the listing of cryptocurrency and blockchain companies on stock exchanges.

As an example of the first perspective, Dr. Spankowski highlights the importance of the 5th Anti-Money Laundering Directive (AML5) by the EU which came into effect in January 2020. Fearful of the effects of a lack of transparency in the overall cryptocurrency economy, the EU with this directive imposed stricter regulations on KYC and identification of people and organizations that participate in the market. Effects of the directive were restricting anonymous and non-verified transactions to not exceed 50 GBP per user, compulsory reporting of suspicious activity to the financial intelligence units and consecutive cease and desists orders for individuals or organizations whose operations are not in compliance with the regulations (European Commission, 2018). Dr. Spankowski asserts that financial regulations like the AML5, will help strengthen the legitimacy of the industry, and thus contribute to the mass adoption of cryptocurrencies.

Mr. Norheim Schei agrees that for a continued growth in institutional demand to be realized, appropriate regulations will be important in strengthening the legitimacy and credibility of cryptocurrency trading. Whereas Dr. Spankowski refers to the first perspective by suggesting the AML5 as a contributor in bridging the gap between the cryptocurrency market and traditional finance, Mr. Norheim Schei illustrates the second perspective by referring to CME Group’s inclusion of Bitcoin futures on their derivatives platform. Originally a marketplace

for derivatives of traditional financial assets, the CME Group has seen an increasing interest from institutional investors seeking exposure to the cryptocurrency industry, and Mr. Norheim Schei suggests that the inclusion of BTC futures on regulated and reliable platforms with a more mainstream market infrastructure like the CME platform strengthens the legitimacy of cryptocurrency products among institutional investors.

6.1.3 Driver no. 3: The idea of decentralized finance (DeFi) and massive, unexplored markets

This sub-chapter will outline an additional driver that was not extensively discussed during the interviews but highlighted by one of the interviewees.

The concept of DeFi was introduced in *Ch. 2.1.* It is a movement that has sprung from cryptocurrency and blockchain technology during recent years. The movement has been accelerated by the creation of new cryptocurrencies and applications aiming at offering financial services to people or organizations who for various reasons are excluded from traditional financial services. The majority of DeFi initiatives currently takes place on the Ethereum blockchain. Also, the different concepts and technologies within DeFi are still in their infancy, and consequently there is a lot of risk associated with directly investing in these projects.

The inclusion of individuals or businesses all over the world who have struggled to access financial services, e.g., loans, digital payments, microfinancing or online betting, opens up a massive and previously unexplored market for actors within the cryptocurrency industry to exploit. In addition, Mr. Bull Jenssen underlines the need for a simplification of the cash flow in cross-border payments both in order to support the growth in digital services, and to give individuals and organizations a higher degree of control over their personal finances. Mr. Bull Jenssen states that cryptocurrency technology has the ability to facilitate both the offering of financial services to people "off the grid" and a simplification of cross-border payments. This view is supported by then Managing Director of the IMF, Christine Lagarde, who in November 2018 stated that digital currency offers great promise in terms of financial inclusion because of its ability to reach individuals and businesses in remote and marginalized areas, and that traditional banks are not rushing to serve these populations (Lagarde, 2018).

Square Inc. and previously mentioned PayPal are two global financial services and payment companies that have recently launched ventures into the cryptocurrency industry, both by direct purchases of Bitcoin as an investment asset, and by expanding their financial services to storing and trading of cryptocurrencies. Square Inc's purchase of Bitcoin was accompanied by an investment whitepaper where the company stated their view of Bitcoin as an instrument of global economic empowerment and as a means for individuals worldwide to participate in a global monetary system (Square Inc., 2020a). Although the company did not explicitly claim their cryptocurrency interest to be a result of their wish to target these massive, unexplored markets, the statement can be considered to be in accordance with the CFO of the company's remarks that the investment corresponds with their plans of creating a more inclusive future (Square Inc., 2020b).

A press release announcing PayPal's expansion into the cryptocurrency market indicates that the company shares Square Inc's aims of creating a more inclusive future for financial services. CEO Dan Schulman highlights that the shift to digital currencies leads to advantages in terms of financial inclusion and access (PayPal, 2020). A probable side-effect of PayPal's inclusion of cryptocurrencies on its platform, is increased legitimacy and credibility of Bitcoin and other cryptocurrencies through PayPal's position as a legitimate payment provider. Another is the simplified first introduction to cryptocurrency trading for hundreds of millions of individuals and institutions who already have a PayPal account.

6.1.4 Driver no. 4: Reduced volatility

Another aspect of Bitcoin that was frequently brought up during our interviews was Bitcoin's volatility in relation to the volatility of popular technology stocks. Consequently, we decided to investigate this further.

Volatility is a term often associated with the price of cryptocurrencies. This is due to the extreme price fluctuations historically seen in this asset class compared to other assets. Volatility as a statistical measure is concerned with measuring the dispersion of returns of an asset, i.e. it tells us by how much the price of an asset swings around its mean (Kuepper, 2020b). However, there are also stocks in the traditional financial market which when observing their price movements seem to also exhibit high levels of volatility. Technology stocks such as the FAANGs (Facebook, Apple, Amazon, Netflix and Google) and Tesla were some of the best performing stocks of the last decade. An investment into these stocks around

late December of 2013 would have generated a profit of *600 %*, *531 %*, *723 %*, *880 %*, *217 %* and *1,300 %* respectively. In comparison, a purchase of Bitcoin at this point in time would have given a ROI of *1,830 %* as of November 2020. In a recent study conducted by Business Insider, Amazon was ranked first, Apple third, Tesla fourth and Facebook seventh when several hundred investors were asked to name the stocks they were likely to hold on a long-term basis (Winck, 2020).

In the following, we will examine the volatility of the previously mentioned technology stocks compared to that of Bitcoin. The analyses will be performed using two time periods: Dec. 27, 2013 – Nov. 05, 2020, and Dec. 14, 2018 – Nov. 05, 2020. Using daily percentage returns, volatility will be measured in terms of standard deviation relative to mean asset price and in terms of beta.

Method no. 1: Volatility in terms of standard deviation

Period 1: December 27, 2013 – November 05, 2020

	Mean	Std. Dev.	Std. Dev. / mean
Tesla	75,63	76,82	102%
Facebook	142,55	54,17	38%
Apple	42,76	22,17	52%
Amazon	1183,69	775,21	65%
Netflix	209,47	137,44	66%
Google	925,75	304,9	33%
Bitcoin	4142,06	4174,64	101%
S&P 500	2461,31	450,82	18%

Table 7: The results of volatility calculations using standard deviations for the first period.

Interpretation: Being the asset with the highest mean price, Bitcoin shows the highest volatility in terms of standard deviation in isolation. However, the standard deviations are relative to the price of the asset observed. The S&P 500 has the lowest relative standard deviation at 18 %. Bitcoin and Tesla stand out as having the highest standard deviations relative to their mean price at 102 % and 101 %. This implies that even though Bitcoin had an ROI of roughly 1830 % and Tesla had an ROI of 1300 % in this period, Tesla stocks was the slightly more volatile asset of the two. Apple, Amazon and Netflix all display similar levels

of volatility. Google and Facebook were the two individual stocks with the lowest standard deviations.

Period 2: December 14, 2018 – November 05, 2020

	Mean	Std. Dev.	Std. Dev. / mean
Tesla	138,49	124,79	90%
Facebook	201,02	36,95	18%
Apple	69,02	24,35	35%
Amazon	2143,97	554,81	26%
Netflix	375,8	75,71	20%
Google	1293,59	167,92	13%
Bitcoin	8293,48	2631,82	32%
S&P 500	3006,33	259,16	9%

Table 8: The results of the volatility calculations using standard deviations for the second period.

Interpretation: The standard deviation as a percentage of the mean decreased for all assets observed. However, while Tesla's standard deviation remains high at 90 % of its mean price, Bitcoin's relative standard deviation decreased from 101 % to 32 %. In terms of standard deviation, Bitcoin thus shows a lower volatility than both Apple and Tesla in this period.

Method no. 2: Volatility in terms of beta

Using beta values is another way of determining the volatility of an asset. By adding the performance of a benchmark, commonly an index that represents the market, beta adds another dimension to volatility. *"A beta coefficient can measure the volatility of an individual stock compared to the systematic risk of the entire market"* (Kenton, n.d.).

In order to find the beta value of all the different assets, the absolute values where converted into daily percentage returns before the calculations were performed.

The S&P 500 and the NASDAQ Composite index served as benchmark indices in the following calculations.

I) Beta using the S&P 500 index as a benchmark

Period no. 1: December 27, 2013 – November 05, 2020

	Covariance w/S&P 500	Variances	Beta
Tesla	0,01651%	0,11549%	*1,297*
Facebook	0,01423%	0,04205%	*1,118*
Apple	0,01472%	0,03263%	*1,157*
Amazon	0,01263%	0,03886%	*0,993*
Netflix	0,01340%	0,07184%	*1,053*
Google	0,01358%	0,02753%	*1,068*
Bitcoin	0,00659%	0,91531%	*0,518*
S&P 500	-	0,01272%	-

Table 9: Beta calculations for period 1, using the S&P 500 as benchmark.

Interpretation: Tesla had the highest beta value for the entire period investigated. All the technology stocks, except Amazon, had a beta greater than 1.0. Because a beta calculation is performed using both data from individual assets and a benchmark, the beta value indicates the volatility of the asset examined in relation to the benchmark, in this case the S&P 500. Tesla's beta of 1.297 means that this stock theoretically is 29.7 % more volatile than the overall market. Bitcoin, on the other hand, has a rather low beta value. This in theory indicates that the volatility of this asset is lower than the market.

Period no. 2: December 14, 2018 – November 05, 2020

	Covariance w/S&P 500	Variances	Beta
Tesla	0,03667%	0,21333%	*1,275*
Facebook	0,02998%	0,06188%	*1,043*
Apple	0,03402%	0,05989%	*1,183*
Amazon	0,02304%	0,04413%	*0,801*
Netflix	0,02271%	0,06995%	*0,790*
Google	0,02837%	0,04334%	*0,987*
Bitcoin	0,02004%	0,20852%	*0,697*
S&P 500	-	0,02875%	-

Table 10: Beta calculations for period 2, using the S&P 500 as benchmark.

Interpretation: In this period, all of the assets except Apple and Bitcoin have a lower beta than in the overall period in the previous calculations. In other words, the volatility of the majority of the assets has decreased, while the volatility of Apple and Bitcoin has increased. In spite of this development, Bitcoin still has the lowest volatility in terms of beta in this period.

II) Beta using the NASDAQ Composite index as a benchmark

Although the S&P 500 is one of the most influential and indicative indices of the overall global economy, performing calculations using the NASDAQ Composite index may also be valuable, especially when the companies analysed all belong to the technology sector. Whereas the S&P 500 consists of companies from a variety of industries, the NASDAQ Composite is a technology-heavy index with companies from the technology sector accounting for 49.71 % of the index' weight (Nasdaq, 2020b).

	Period 1: Dec. 27, 2013 – Nov. 05, 2020		**Period 2:** Dec. 14, 2018 - Nov. 05, 2020	
	Covariance w/Nasdaq Comp.	Beta	Covariance w/Nasdaq Comp.	Beta
Tesla	0,02137%	*1,344*	0,04527%	*1,397*
Facebook	0,01809%	*1,138*	0,03495%	*1,079*
Apple	0,01779%	*1,119*	0,03854%	*1,189*
Amazon	0,01691%	*1,064*	0,02917%	*0,900*
Netflix	0,01809%	*1,138*	0,02918%	*0,900*
Google	0,01652%	*1,039*	0,03183%	*0,982*
Bitcoin	0,00739%	*0,465*	0,02147%	*0,662*

Table 11: Beta calculations for both periods, using the NASDAQ Composite as benchmark.

Interpretation: The beta values of Tesla, Apple and Bitcoin all increase from the first period to the second. Using this index as the benchmark, Bitcoin still displays the lowest beta value of all the assets considered.

Closing remarks and conclusion:

Our findings regarding Bitcoin's volatility in terms of standard deviation compared to major US stocks were to a large extent confirmed in November 2020 by American investment management firm VanEck. Their recent research shows that Bitcoin displayed a lower volatility than 112 and 145 stocks listed on the S&P 500 respectively during the past 90 days and year-to-date (Nasdaq, 2020c).

To sum up, when using standard deviation relative to the mean price in an attempt to quantify Bitcoin's risk and volatility, our results indicate that Bitcoin has become less volatile over the last two years. The calculations also indicate that Bitcoin has become a less volatile asset than both Tesla and Apple, two of the most popular individual stocks to keep in a long-term portfolio. However, the analyses also indicate that the alternative asset is still more volatile than the rest of the technology companies analysed.

Bitcoin's low beta value, in itself and compared to the other assets, also gives indications of a rather low volatility. Although the beta value increases from the first to the second period examined, Bitcoin displays the lowest beta value of all the assets examined when using both the S&P 500 and Nasdaq Composite as benchmarks.

Nevertheless, both methods of calculating volatility come with certain drawbacks. Firstly, in our analysis of standard deviation and beta values, we rely on historical price data, meaning that the results of the analyses indicate how volatile the assets have been in the past. Historical performance is no guarantee for future performance, hence using beta values and standard deviations based on historical data to predict future price movement has limited value and purpose. Additionally, the use of standard deviation in a volatility analysis makes no distinction between negative and positive deviations from the mean price. To predict the future price fluctuations of an asset, i.e. *implied volatility*, one could perform calculations using option pricing models. However, calculations of this sort fall outside the boundaries of this thesis.

Secondly, exactly which market Bitcoin operates in, is in itself unclear. The choice of using the S&P 500 and Nasdaq Composite as benchmark indices was primarily based on the traits of the technology companies, and not Bitcoin. The choice of deeming the respective indices as appropriate in an analysis of technology stocks is justified by the size of the companies and the fact that all the technology stocks are included in either both or one of the indices. Furthermore, Bitcoin being an alternative investment with no underlying company or operational performance causes difficulties when attempting to make a valid assessment of Bitcoin's volatility relative to that of the technology companies which produce tangible products and services. With that being said, we believe this analysis to have value in the discussion of whether or not the volatility of Bitcoin has been reduced over the years, and

whether its volatility can be compared to the volatility of comparable and highly demanded high-risk stocks in the traditional financial markets.

6.1.5 Conclusion

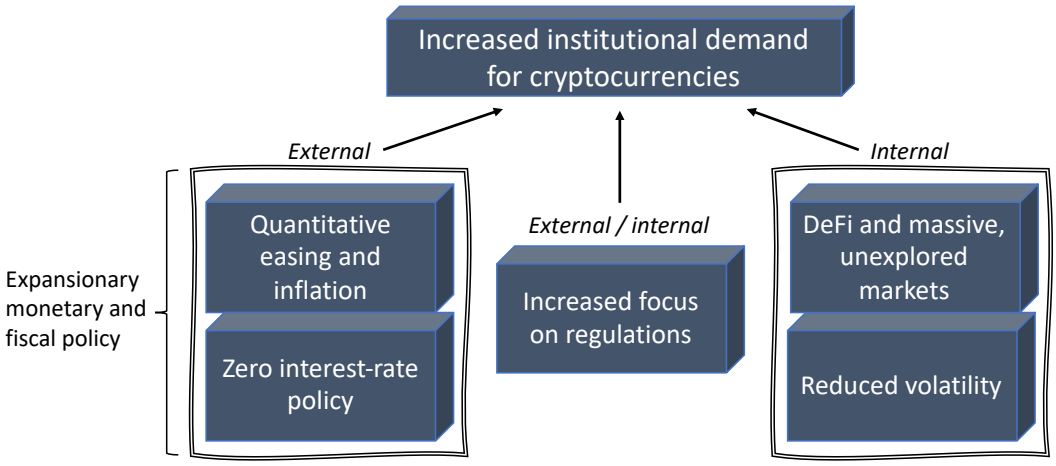

Figure 7: The proposed constituents of the increasing institutional demand of cryptocurrencies.

Figure 7 sums up the findings related to RQ1 graphically. The results will be further explained in the next section of the thesis.

6.2 Results for RQ2

This section presents the results of the correlation analyses between Bitcoin, the S&P 500, the MSCI World Index and gold that will be used in testing the hypotheses formulated in the introduction of this thesis.

Along with the presentation of the results for each period investigated, a brief interpretation of the results will be given.

6.2.1 Results for P0

Below are the calculated Pearson correlation coefficients between Bitcoin, the S&P 500, the MSCI World Index and gold for the period December 27th, 2013 – November 5th, 2020. Calculated using 1,728 observations.

	BTC	S&P 500	MSCI	Gold
BTC	1.000			
S&P 500	0.061**	1.000		
	(0.011)			
MSCI	0.056**	0.953***	1.000	
	(0.020)	(0.000)		
Gold	0.017	-0.046*	-0.005	1.000
	(0.485)	(0.055)	(0.836)	

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Correlation matrix for P0

Interpretation:

Bitcoin has a negligible positive correlation and for all purposes it is uncorrelated with both the S&P 500, the MSCI World Index and gold.

Gold is uncorrelated with Bitcoin and the two indices.

6.2.2 Results for P1

Below are the calculated correlation coefficients between for the period December 27th, 2013 – December 31st, 2019. Calculated using 1,513 observations.

	BTC	S&P 500	MSCI	Gold
BTC	1.000			
S&P 500	0.001	1.000		
	(0.979)			
MSCI	-0.011	0.924***	1.000	
	(0.661)	(0.000)		
Gold	-0.013	-0.170***	-0.129***	1.000
	(0.606)	(0.000)	(0.000)	

*** p<0.01, ** p<0.05, * p<0.1

Table 13: Correlation matrix for P1.

Interpretation:

Bitcoin is uncorrelated with the S&P 500, the MSCI World Index and gold.

Gold has a negligible negative correlation with the S&P 500 and the MSCI World Index and for all purposes it is uncorrelated with both indices.

6.2.3 Results for P1.1

Below are the calculated correlation coefficients for the period August 20th, 2015 – October 7th, 2015. Calculated using 34 observations.

	BTC	S&P 500	MSCI	Gold
BTC	1.000			
S&P 500	0.293*	1.000		
	(0.093)			
MSCI	0.324*	0.946***	1.000	
	(0.062)	(0.000)		
Gold	0.149	-0.091	-0.084	1.000
	(0.400)	(0.608)	(0.635)	

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Correlation matrix for P1.1.

Interpretation:

At the 10 % significance level, Bitcoin has a weak positive correlation with both the S&P 500 and the MSCI World Index.

Bitcoin has a negligible positive correlation with gold and for all purposes they are uncorrelated. Gold is uncorrelated with both indices.

6.2.4 Results for P1.2

Below are the calculated correlation coefficients for the period January 4th, 2016 – March 1st, 2016. Calculated using 40 observations.

	BTC	S&P 500	MSCI	Gold
BTC	1.000			
S&P 500	0.090	1.000		
	(0.581)			
MSCI	0.063	0.929***	1.000	
	(0.698)	(0.000)		
Gold	-0.095	-0.541***	-0.525***	1.000
	(0.558)	(0.000)	(0.001)	

*** p<0.01, ** p<0.05, * p<0.1

Table 15: Correlation matrix for P1.2.

Interpretation:

Bitcoin has a negligible positive correlation with the S&P 500 and the MSCI World Index and a negligible negative correlation with gold. For all purposes, these coefficients are uncorrelated.

Gold has a moderate negative correlation with both indices.

6.2.5 Results for P1.3

Below are the calculated correlation coefficients for the period October 10th, 2018 – January 11th, 2019. Calculated using 64 observations.

	BTC	S&P 500	MCSI	Gold
BTC	1.000			
S&P 500	-0.019	1.000		
	(0.881)			
MSCI	0.038	0.959***	1.000	
	(0.767)	(0.000)		
Gold	0.162	-0.290**	-0.273**	1.000
	(0.201)	(0.020)	(0.029)	

*** p<0.01, ** p<0.05, * p<0.1

Table 16: Correlation matrix for P1.3.

Interpretation:

Bitcoin has a negligible negative correlation with the S&P 500, and negligible positive correlation with the MSCI World Index and gold. For all purposes, these coefficients are uncorrelated. Gold has a weak negative correlation with both indices.

6.2.6 Results for P2

Below are the calculated correlation coefficients for the period January 2nd, 2020 – November 5th, 2020. Calculated using 215 observations.

	BTC	S&P 500	MSCI	Gold
BTC	1.000			
S&P 500	0.480***	1.000		
	(0.000)			
MSCI	0.504***	0.978***	1.000	
	(0.000)	(0.000)		
Gold	0.330***	0.152**	0.198***	1.000
	(0.000)	(0.025)	(0.004)	

*** p<0.01, ** p<0.05, * p<0.1

Table 17: Correlation matrix for P2.

Interpretation:

Bitcoin has a moderate positive correlation with both the S&P 500 and the MSCI World index. Bitcoin has a weak positive correlation with gold. Gold has a negligible positive correlation with both indices, and for all purposes it is uncorrelated with both indices.

6.2.7 Results for P2.1

Below are the calculated correlation coefficients for the period February 27th, 2020 – May 8th, 2020. Calculated using 51 observations.

	BTC	S&P 500	MSCI	Gold
BTC	1.000			
S&P 500	0.578***	1.000		
	(0.000)			
MSCI	0.613***	0.982***	1.000	
	(0.000)	(0.000)		
Gold	0.274*	0.193	0.265*	1.000
	(0.052)	(0.175)	(0.060)	

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 18: Correlation matrix for P2.1.

Interpretation:

Bitcoin has a positive moderate correlation with the S&P 500, and a strong positive correlation with the MSCI World Index.

At the 10 % significance level, Bitcoin has a weak positive correlation with gold.

Gold is uncorrelated with both indices.

7. Discussion

This last section of the thesis will discuss the main findings outlined in the previous chapter, and the implications of our study. An account of the limitations of the study along with recommendations and suggestions for future research will also be given. Although this section of the thesis primarily will discuss the empirical findings of RQ2, a brief discussion and conclusion of RQ1 is also included.

7.1 Discussion of results and implications

RQ1 of this thesis, *"What are the drivers behind the increasing institutional demand for cryptocurrencies"* led to an investigation into institutional adoption of and demand for cryptocurrencies. Our primary data gathered from interviews with key people within the industry and data gathered from secondary sources suggest that the drivers of the recent increasing institutional demand for cryptocurrencies to a large extent are multifaceted and complex. Some of the proposed drivers are related to external macroeconomic forces influencing the institutional demand from the outside, while others are internal in the sense that they relate to internal properties of the cryptocurrency industry. In summary, according to the data collected and analysed in this thesis, the primary drivers of institutional demand for cryptocurrencies are expansionary monetary and fiscal policy, an increased focus on regulations, access to new markets through decentralized finance, and reduced volatility.

With RQ2, we sought to expand the existing empirical research on Bitcoin's capabilities as a safe haven asset, both during periods of market unrest previously left unexamined, and during the stock market crash facilitated by the pandemic of 2020. A discussion of the results linked to the relevant hypothesis will now be given. Below, our null hypothesis and alternative hypotheses are presented once again:

H0: *Bitcoin and the S&P 500/MSCI World Index are not uncorrelated or negatively correlated in times of market unrest.*

H1: *Bitcoin and the S&P 500/MSCI World Index are uncorrelated or negatively correlated in times of market unrest.*

Alternative hypotheses not directly connected to the null hypothesis:

H2: *Bitcoin and gold have a strong positive correlation in times of market unrest.*

H3: *Overall, during the entire period examined, Bitcoin and the S&P 500/MSCI World Index are uncorrelated or negatively correlated.*

Important clarification: Our hypotheses can be considered reversed compared to typical correlation analyses. In a typical correlation analysis, the researcher constructs a null hypothesis as $r = 0$ and an alternative hypothesis as $r \neq 0$, as this is the more logical way of constructing a null and alternative hypothesis when trying to establish a relationship between two variables. In this study, however, we are interested in discovering periods where the correlation between Bitcoin and the S&P 500/MSCI World Index was in fact equal to zero ($r = 0$), meaning that there is no linear relationship between the assets. For instance, a correlation coefficient between Bitcoin and the S&P 500 of 0.001 (P1) not significant at any level, means that the correlation coefficient is not significantly different from zero; thus, confirming that Bitcoin during the period was uncorrelated with the S&P 500.

H0 and **H1**: For the null hypothesis and the primary alternative hypothesis, the results from P1.1-1.3, P2 and P2.1 are the relevant calculations to discuss. The results for P1.1-1.3 vary slightly and have high standard errors, indicating that the calculated coefficients are not significantly different from zero. This suggests that H1 be accepted for these periods of market unrest. In other words, Bitcoin was uncorrelated with the indices during these periods. For P2 and P2.1, which are the most recent periods of market unrest, we find that Bitcoin had a moderate positive correlation with the S&P 500/MSCI World Index, and the low standard errors suggest that the coefficients are significantly different from zero. We therefore reject the alternative hypothesis H1 on the basis of the most recent results in P2 and P2.1.

Although Bitcoin was uncorrelated with the indices in several of the sub-periods (P1.1-1-3), our alternative hypothesis does not hold because Bitcoin was not uncorrelated with the indices during the most recent and most severe market downfall investigated in this thesis. *H1 is therefore rejected in favor of H0.*

H2: For this hypothesis, the results from P1.1-1.3, P2 and P2.1 are the relevant calculations to discuss. Bitcoin did not show a significant positive correlation with gold in any of the sub-

periods except for P2. In P2, Bitcoin had a weak positive correlation with gold, hence H2 is rejected.

H3: For this hypothesis, the results from P0 are the relevant calculations to discuss. In this period Bitcoin was uncorrelated with the S&P 500/MSCI World Index. The results are significant at 5 %, meaning that there is a 95 % probability that the relationship was not equal to exactly zero. However, the coefficients of 0.061 and 0.056 with the S&P 500 and the MSCI World Index respectively imply a negligible correlation, thus the relationship is considered to be uncorrelated. Overall, between December 2013 and November 2020, the returns of Bitcoin were uncorrelated with the returns of the S&P 500 and the MSCI World Index, and H3 is therefore accepted.

In summary, Bitcoin was uncorrelated with the indices during three periods of market unrest. However, due to the moderate to strong correlations with the S&P 500/MSCI World Index observed in 2020 as a whole and during the initial market crash in February and March, we cannot claim that Bitcoin has been uncorrelated with the S&P500/MSCI World Index during all periods of market unrest. The analysis also indicates that Bitcoin during the entire period examined was uncorrelated with the indices.

The rejection of H1 and consequent acceptance of the null hypothesis, means that we have not found significant evidence of Bitcoin acting as a safe haven asset in times of market unrest in spite of the lack of correlation found in P1.1-1.3. The significant results discovered for 2020 as a whole (P2) and during the Coronavirus Crash (P2.1) indicate the exact opposite of what was predicted in H1 - Bitcoin had a moderate to strong correlation with the overall equity market in both periods. This is in line with Conlon et al. (2020) who found that Bitcoin did not act as a safe haven asset during the COVID-19 crisis.

On the other hand, the coefficients from P1.1-1.3 indicate that our results to a limited extent are in line with the research of Stensås et al. (2018), who found that Bitcoin functioned as both a hedge and a safe haven asset during three periods of market unrest. However, it is important to emphasize that these researcher's definition of market unrest is not in accordance with our

mathematically founded method of determining periods of market unrest. Thus, there is a difference between the individual periods examined across the studies.

In the extension of this, we do not find it purposeful to discuss our correlation coefficients in light of the correlation analyses conducted by Smales (2019), as the time periods examined in that study do not correspond with periods of elevated market unrest.

As for gold, our findings suggest that gold operated as a safe haven asset to a greater extent than Bitcoin. In some of the sub-periods, gold acted as a strong safe haven asset, being negatively correlated with the indices (P1.2 and P1.3). In other periods of elevated market unrest, it acted as a weak safe haven asset (P1.1, P2 and P2.1). These findings are in line with Baur and McDermott (2010) who found evidence of gold operating as a safe haven.

As previously mentioned in *Ch. 5.3.4 Causality*, a discovery of any degree of correlation will not infer a causal relationship. Therefore, we do not claim to have found causality between the returns of the assets, and we cannot predict the future performance of Bitcoin as a safe haven asset on the basis of the correlation analyses performed using historical price data.

As mentioned in the introduction, it has been speculated that Bitcoin could function as a safe haven asset to the same degree as gold. Proponents of this belief have often referred to Bitcoin as *digital gold* and claimed that Bitcoin shares several of the properties of gold. Our results and previous literature on the topic, suggest that this theory still cannot be either approved or dismissed. Nevertheless, this study provides new insight into the relationship between Bitcoin and two prominent and influential indices, as this study tests the strength of the correlation between Bitcoin and the indices during periods previously unexamined. As for now, one cannot conclude that Bitcoin have the capabilities of a safe haven asset, as the results for the two periods examined in 2020 indicate that Bitcoin and the equity market were moderately to strongly correlated in these periods.

We propose that Bitcoin is still at an early stage of maturation and adoption, and that the general perception and attributes of Bitcoin as an alternative investment need to mature in order for it to potentially become a safe haven asset in the future. While we have observed a decrease in the volatility, improved infrastructure for trading cryptocurrencies, and a trend of institutions recognizing Bitcoin as a legitimate investment asset, we agree with Smales' (2019) rationale that the current high volatility and relative illiquidity of the asset do not support defining Bitcoin as a safe haven asset as of this point in time.

7.2 Limitations and recommendations for future research

In spite of our study's use of indices representative of the global economy, it could be that Bitcoin has more prominent safe haven capabilities if tested against other specific indices or currencies. Future studies need to be conducted in order to determine both the direction and the strength of the relationships between Bitcoin and other indices or assets. As the asset matures, it is also possible that Bitcoin over time develops safe haven capabilities when compared with either the S&P 500 or the MSCI World Index or other individual indices, and future research is needed in order to generalize the findings of this thesis.

Standard deviations and beta values were used to calculate the volatility of Bitcoin in relation to technology stocks earlier in this thesis. As mentioned, volatility calculations based on past performance gives an overview of historical actual volatility, and not implied volatility. Future studies should attempt to construct valid and reliable pricing models in order to predict the future price movements and volatility of cryptocurrencies.

Regarding the concerns over the illiquidity of Bitcoin put forward by Smales' (2019), future research is needed to investigate how Bitcoin's investment attributes changes as efforts are made to improve the infrastructure on which Bitcoin and other cryptocurrencies are traded. The relative illiquidity of Bitcoin is inherently tied to its scarcity and to some degree the transaction costs imposed by different actors within the industry, and future studies should attempt to incorporate the liquidity of the cryptocurrency market compared to the traditional financial markets. In the extension of this, we do not specifically test the effects of different weights of Bitcoin in a diversified portfolio, hence it would also be interesting to investigate the real effects of keeping Bitcoin in a diversified portfolio.

7.3 Conclusion

Our two main objectives with this study were to discover the drivers behind the increasing institutional demand for cryptocurrencies, and to quantitatively examine Bitcoin's capabilities as a safe haven asset.

By relating the findings of RQ1 to unfavorable perceptions of Bitcoin and cryptocurrencies, and by discovering aspects of this nascent asset and its macroeconomic surroundings enticing

institutions to explore it, this study contributes to broadening the literature on Bitcoin as an emerging alternative investment. With the investigation initiated by RQ1, a multifaceted rationale for the recent increasing demand for cryptocurrencies has been proposed, and a backdrop for the shift in perception of cryptocurrencies by corporations and institutional investors has been constructed. The explanatory purpose of RQ2 prompted an analysis of Bitcoin's performance relative to other assets in times of market unrest, and a quantitative overview of Bitcoin's past and current safe haven capabilities has been established.

Essentially, the two parallel investigations conducted in this study demonstrate *why* institutions are beginning to recognize cryptocurrencies, and *how* this emerging alternative investment relates to traditional financial assets.

On the day this thesis was completed, December 16th, 2020, the price of Bitcoin finally broke the 20,000 USD barrier and set a new all-time high of 21,380 USD.

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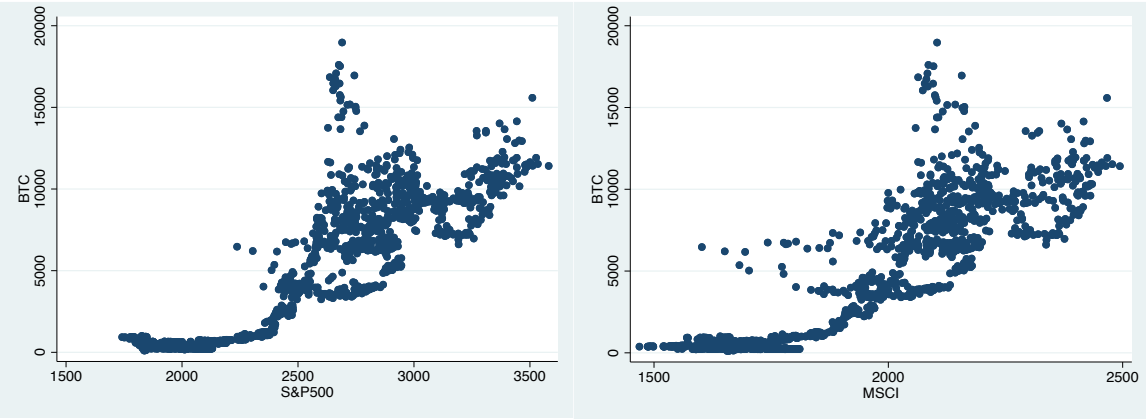
Appendix

Appendix A.1: Interview guide

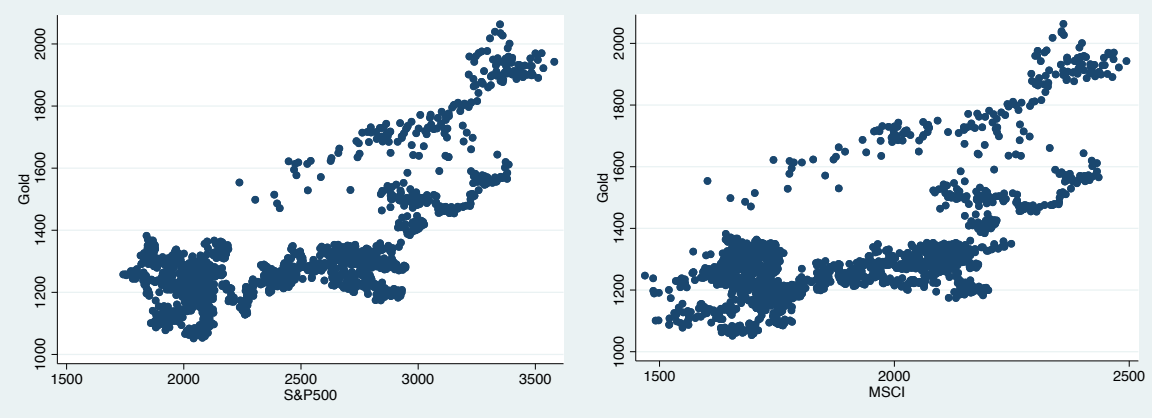
- Which factors do you see that makes cryptocurrencies attractive to institutional investors?
- Which internal forces and external forces are contributing to the increasing demand, and why?
- Which events or signs to you consider to be most indicative of institutional demand and adoption?
- Which factors help drive the price of cryptocurrencies?
- How has the cryptocurrency market changed since you first got involved in it?
- Which platform(s) do you use when analysing the institutional demand for cryptocurrencies?
- What will be the consequence of cryptocurrency products' entry into regulated stock exchanges?
- Do you see cryptocurrencies mainly as peer-to-peer payment systems/payment networks, or as assets?
- Has the speculative nature and volatility of cryptocurrencies, and the emergence of regulated markets listing cryptocurrency products hurt their chances of becoming the payment systems of the future?
- What will the shift of Bitcoin going from being traded mostly by individual private traders to being traded and invested in by institutions mean for the future?
- Why are *you* in the cryptocurrency industry?

Appendix A.2



Scatter plot of Bitcoin and S&P 500's absolute level values for the period December 27th, 2013 – November 5th, 2020 to the left and scatter plot of Bitcoin and the MSCI World Index' absolute level values for the period December 27th, 2013 – November 5th, 2020 to the right.

Appendix A.3

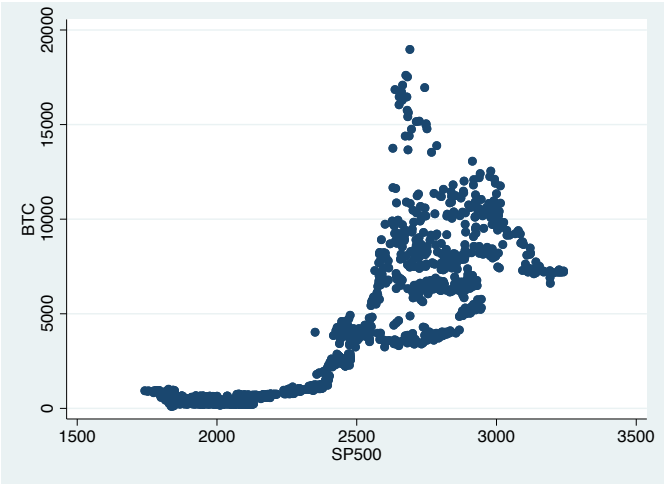


Scatter plot of gold and the S&P 500's absolute level values for the period December 27th, 2013 – November 5th, 2020 to the left and scatter plot of gold and the MSCI World Index' absolute level values for the period December 27th, 2013 – November 5th, 2020 to the right.

Appendix A.4

Variable	Obs	Mean	Std. Dev.	Min	Max
BTC	1,513	3367.259	3820.587	111.6	18972.3
MSCI	1,513	1876.195	210.3985	1468.9	2364.9
SP500	1,513	2364.615	381.5088	1741.89	3240.02
GOLD	1,513	1266.076	92.8539	1051.74	1552.6

Summary statistics of all assets for period 1.



Scatter plot of Bitcoin and the S&P 500's absolute level values for period 1.

Appendix A.5

Variable	Obs	Mean	Std. Dev.	Min	Max
BTC	34	232.3853	7.00775	211.4	246.1
SP500	34	1950.797	36.7669	1867.61	2035.73
MSCI	34	1619.244	30.91747	1550.43	1697.25
GOLD	34	1130.799	14.79069	1105.4	1161.05

Summary statistics of all assets for period 1.1.

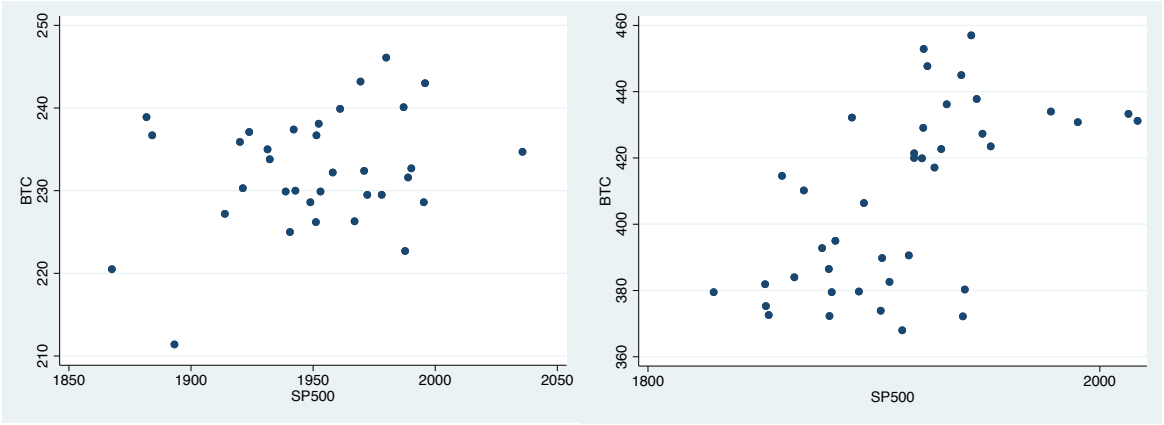
Variable	Obs	Mean	Std. Dev.	Min	Max
BTC	40	407.67	26.8455	368	457
SP500	40	1913.002	42.63598	1829.08	2016.71
MSCI	40	1540.79	35.28156	1468.9	1630.89
GOLD	40	1153.34	59.71079	1074.7	1246.89

Summary statistics of all assets for period 1.2.

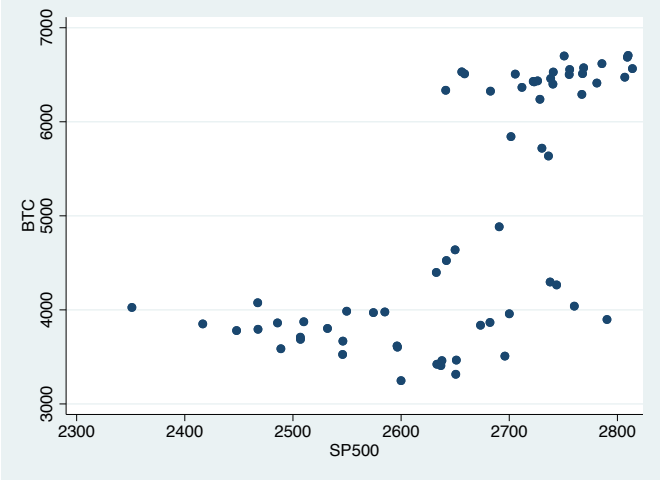
Variable	Obs	Mean	Std. Dev.	Min	Max
BTC	64	4970.592	1314.492	3247.8	6705.3
SP500	64	2657.793	110.2194	2351.1	2813.89
MSCI	64	1985.651	72.10686	1802.95	2091.21
GOLD	64	1239.359	25.50483	1194.78	1293.99

Summary statistics of all assets for period 1.3.

Appendix A.6



Scatter plot of Bitcoin and the S&P 500's absolute level values for period 1.1 to the left and period 1.2 to the right.



Scatter plot of Bitcoin and the S&P 500's absolute level values for period 1.3

Appendix A.7

Sub-periods defined by VIX

Red = period of market unrest/financial instability with continuous days out of range.
Orange = period of market unrest/financial instability with mostly continuous days out of range.

Start date	End date	Obs.
03.02.2014	05.02.2014	3
10.10.2014	17.10.2014	6
11.12.2014	17.12.2014	7
31.12.2014	07.01.2015	5
12.01.2015	20.01.2015	7
28.01.2015	02.01.2015	1
08.07.1015	09.07.2015	2
20.08.2015	07.10.2015	34
13.11.2015	13.11.2015	1
09.10.2015	15.10.2015	5
18.12.2015	18.12.2015	1
04.01.2016	01.03.2016	40
13.06.2016	27.06.2016	11
22.06.2016	22.06.2016	1
24.06.2016	27.06.2016	2
02.11.2016	04.11.2016	3
05.02.2018	21.02.2018	13
28.02.2018	02.03.2018	3
19.03.2018	19.03.2018	1
22.03.2018	04.04.2018	10
06.04.2018	11.04.2018	4
10.10.2018	15.10.2018	4
18.10.2018	06.11.2018	14
12.11.2018	15.11.2018	4
19.11.2018	23.11.2018	5
27.11.2018	27.11.2018	1
04.12.2018	11.01.2019	26
14.01.2019	14.01.2019	1
16.01.2019	16.01.2019	1
22.01.2019	23.01.2019	2
29.01.2019	29.01.2019	1
07.05.2019	09.05.2019	3
13.05.2019	13.05.2019	1
05.08.2019	07.08.2019	3
12.08.2019	12.08.2019	1
14.08.2019	15.08.2019	2
23.08.2019	28.08.2019	4
03.09.2019	03.09.2019	1
02.10.2019	03.10.2019	2
08.10.2019	08.10.2019	1

Appendix A.8

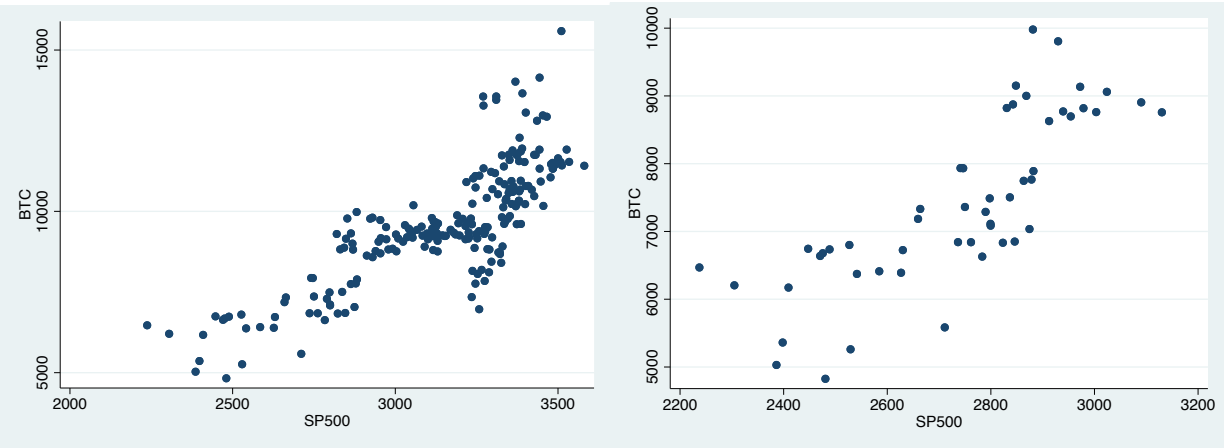
Variable	Obs	Mean	Std. Dev.	Min	Max
BTC	215	9594.472	1843.131	4826	15587.1
MSCI	215	2233.579	201.9555	1602.11	2494.1
SP500	215	3141.74	283.778	2237.4	3580.84
GOLD	215	1758.138	147.2547	1471	2063.19

Summary statistics of all assets for period 2.

Variable	Obs	Mean	Std. Dev.	Min	Max
BTC	51	7416.531	1251.227	4826	9979.8
SP500	51	2735.067	210.341	2237.4	3130.12
MSCI	51	1943.7	151.9415	1602.11	2243.09
GOLD	51	1644.643	69.38909	1471	1731.58

Summary statistics of all assets for period 2.1.

Appendix A.9



Scatter plot of Bitcoin and the S&P 500's absolute level values for period 2 to the left and period 2.1 to the right.