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Cryptocurrencies: Their Current Validity and Future as Currency and as a Part of an Investment Strategy

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Cryptocurrencies: Their Current Validity and Future as Currency and as a Part of an Investment Strategy

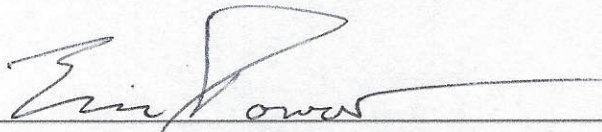
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Abstract

This paper examines the current and future prospects of cryptocurrencies with a focus on the most well-known and highest valued cryptocurrency, Bitcoin. Specifically, it will address how Bitcoin can be utilized as a currency and as part of an investment strategy and whether its utilization makes financial sense now and will in the future. The paper showcases the past behavior of Bitcoin, how the Bitcoin system functions, how Bitcoin acts as a currency, how Bitcoin can be used as an investment asset, and why it will continue to be employed as such in the future. This paper will show that using cryptocurrencies as a transaction method and holding them as a part of an investment strategy has the potential to gain in popularity and result in an increase in value of cryptocurrencies in the future.

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Overview of Bitcoin

History

The establishment of the first and most recognized cryptocurrency, Bitcoin, began with the publishing of a paper entitled: Bitcoin – A Peer to Peer Electronic Cash System on August 18, 2008 (Marr). This article was posted to a mailing list discussion surrounding cryptography by a user under the name Satoshi Nakamoto, describing in detail how the Bitcoin system functioned and would execute transactions (Marr). Adding to the initial mysterious nature, Satoshi Nakamoto was a username and the true identity of the founder of Bitcoin has never been disclosed publicly. On January 3, 2009, the Bitcoin network was established as Satoshi Nakamoto mined the 'genesis' block of Bitcoin, known as block number 0. With this act, the mining and blockchain aspects of Bitcoin began as well. Until 2010, only the mining operations were utilized until Bitcoin was traded for the first time when a user purchased two pizzas for 10,000 Bitcoins (Marr). Then in 2011, the first alternative cryptocurrencies were launched as Bitcoin's popularity reached new highs. This first batch of new cryptocurrencies included the likes of Namecoin and Litecoin and led to the current total of over 1,000 cryptocurrencies with new entries appearing at a frequent pace (Marr).

Since this time, Bitcoin has continued to grow its acceptance rate among merchants and has seen its value climb substantially throughout 2017 before falling to a steady holding level of around \$6,000-\$7,000 for one Bitcoin. Within Bitcoin's programming, there is a set number of possible Bitcoins that may be created. Out of the nearly 21 million possible Bitcoins that may be brought into its system, as of October 7, 2018, 17,311,963 Bitcoins are currently in existence and may be used and held within wallets, with more being created through the continued use

of the mining process. Presently, Bitcoin is still the most popular and receives the largest volume of transactions among the many created cryptocurrencies. With its current market capitalization of over \$100 billion, it is the most valuable and highest priced per unit cryptocurrency, as well.

The Transactional and Systemic Processes

Wallets

For a person to become a user in the Bitcoin system, the first step is the creation of their wallet. A wallet holds a user's private and public keys which grants access to Bitcoins stored in the wallet (Acheson). The Bitcoin address for the wallet is the public key and is an identifier consisting of 26-35 alphanumeric characters. This address is the interface to which the wallet accesses the Bitcoin system (Acheson). The private key consists of 64 alphanumeric characters and is similar to an account password.

Wallets come in many different variations. The types of wallets include online, software, mobile, hardware, and paper (Acheson). Online wallets are based in the cloud. They allow users to access their Bitcoins from any device and rely on the host's server for security measures. Software wallets are downloadable programs, such as Bitcoin Core, that are installed on a computer. Mobile wallets are apps that host the wallet on a smartphone or other mobile device. Hardware wallets are small devices that enact Bitcoin transactions when the user connects them to the internet and tend to be more secure than other wallets. Finally, paper wallets are simply pieces of paper that contain public and private keys printed on them and are most common for gifting someone an amount of Bitcoin (Acheson). Though they are called

wallets, these only contain the set-up information and must be inputted online to be able to access and use these wallets.

Exchanges

The main and most straightforward form for purchasing and selling Bitcoins comes in the form of exchanges. A Bitcoin exchange is an online experience similar to that of many stock trading platforms, where the program will buy and sell Bitcoin on your behalf upon request. Most exchanges will allow a user to create a wallet or utilize an existing wallet with the valid information (Acheson). Additionally, many exchanges enable users to operate in a manner similar to trading stocks, with the ability to submit limit, market, and stop orders (Acheson). Exchanges may have different policies relating to whether they require identification from users as some do require identification before depositing or withdrawing, while others do not require any identification (Pieters).

Exchanges' physical locations exist all around the world. Many exchanges are incorporated, have physical offices, and/or servers located in countries such as the United States, United Kingdom, Hong Kong, Netherlands, Finland, China, and Croatia, among others (Pieters). However, some exchanges choose to not disclose their locations which raises their degree of anonymity.

Exchanges make a profit through charging transaction fees. Typically, fees range somewhere between 0%-0.50% of the transaction (Pieters). However, transaction fees differ among the exchanges. While there may be small variances among exchanges, these amounts are held closely together due to the ease of moving and establishing new wallets. Consumers

have the ability to easily move and make new wallets among the different exchanges, so this competition keeps exchanges from charging extraordinarily higher transaction fees compared to their competitors. However, one factor may lead to certain premiums in higher transaction fees among certain exchanges. Exchanges that do not require identification tend to charge higher transaction fees than those that do require identification (Pieters). It is believed this is due to users who wish to remain anonymous being willing to pay a higher price to keep that level of anonymity (Pieters).

The Necessity and Growth of Blockchain

One of the main staying forces surrounding cryptocurrencies today is their reliance on a technology believed to be one with practical uses throughout the future. Blockchain technology is used by Bitcoin and many other cryptocurrencies as a manner to provide a record without the need for a centralized recording source. Without a centralized banking system, cryptocurrencies have to put forth a system in which users can feel that their currency is safe when they trade, buy, or sell using this form of money. The utilization of blockchain helps to fulfill those concerns by providing a method for bookkeeping.

One of the primary characteristics of Bitcoin and other cryptocurrencies is their status as a decentralized currency under no control from any government. Additionally, their decentralized nature corroborates that there is no regulating body of any kind able to exert control over the supply and processes of the currency (Chiu). Without the backing of any regulatory or banking system, these types of currencies must allow users to be sure of their holdings and to encourage transactions, necessitating having a way of showing when these

transactions occur. This sense of safety is vital to encourage the actual exchange of cryptocurrencies, as users must have confidence in the capital so that they may be convinced to utilize, purchase, and hold increments of the currencies.

To accomplish this necessity, cryptocurrencies employ the use of blockchain technology. A blockchain is a distributed database of records or public ledger of all transactions or digital events that have been executed and may be accessed among all participants (Crosby). The objective of blockchain technology is to ensure both parties that a digital event has actually happened and allow it to be seen by the public. The utilization of this technology is a vital component in the application of cryptocurrency networks. Blockchain provides cryptocurrencies with the tools necessary to provide the holders of this capital with a regulatory method of ensuring the truth of occurrences of transactions. This system safeguards users from being defrauded and allows for a sense of accountability that is imperative to assemble the foundations of a financial system.

In addition to the connection with cryptocurrencies, blockchain technology is being studied for possible uses in other fields (de Leon). With the digital nature and value blockchain technology provides, it may prove capable of improving security among other digital technologies, such as online shopping (de Leon). As a vital component for cryptocurrencies' stability and security, the growth of this technology may lead to greater awareness of the public which could affect how well cryptocurrencies get adopted by new users in the future.

Mining

The mining process of Bitcoin is both a necessary step in the verifying process and allows for the addition of new Bitcoins into circulation. Miners use computers to work to solve hash algorithms (Acheson). A hash algorithm turns a randomly large amount of data into a fixed length hash which can only be computed using that exact data (de Vries). Currently, computers on the Bitcoin network are performing around 26 quintillion calculations every second with the hopes of solving the current hash algorithms from the blocks that have been saved to the system, but not attached to the blockchain (de Vries).

When a miner completes an algorithm, they are rewarded with some amount of Bitcoin for their work. Bitcoin's protocol has the mining reward amount set per block mined. Originally, miners received 50 Bitcoins per mined block, with the current rate at 12.5 Bitcoins per mined block (Houy). The protocol calls for the mining reward to be halved every 210,000 blocks mined which will gradually slow the number of new Bitcoins units entering circulation (Houy). Additionally, miners are compensated with a transaction fee that is included within a block. However, these fees are set by the users who are participating in the transactions and typically only comprise around 0.4% of miners' total rewards (Houy).

Ensuring Transactions are Valid

Every transaction in a public ledger may be verified by consensus of a majority of participants in the system, and once entered, that information cannot be deleted (Crosby). In the Bitcoin system, every proposed transaction is sent out to the over 6,000 nodes within the entire system (Acheson). Nodes are computers and are located in many various places around

the world. Every proposed transaction is sent to every single node in the Bitcoin network where the node works to verify that the spender owns the currency and has a sufficient amount to complete the transaction (Crosby). If the nodes verify this information, the order status remains pending as miners take control of the next step in the process.

Simultaneously, these pending transactions are being grouped together to form a block (Crosby). These blocks consist of the pending transactions, public keys, and version numbers (Acheson). A new block is saved to the system at least once every 10 minutes and may contain up to 1 megabyte of data.

As previously stated, miners work to solve hash algorithms to attach new blocks to the existing blockchain. To guard against double-spending, blocks are time stamped and must be linked into the blockchain to allow transactions to occur. Pending blocks will only be verified if miners can solve the hash algorithm output that corresponds with the input data of the pending transactions comprising the block (Crosby). Bitcoin's protocol sets a target maximum value for the next output for a hash algorithm and if the pending block's output is less than that specified number then the block is accepted by the network (Dhillon). In this process, miners try to solve the hash algorithm by getting the output to begin with the correct number of zeroes as this entails a decreasing number (Dhillon). When a miner correctly completes the hash algorithm of the pending block, that block is attached to the chain. It is finally at this point that a transaction is enabled to occur and becomes the newest block in the blockchain.

Bitcoin as Currency

As Bitcoin was originally devised as a currency, the cryptocurrency performs the major functions that are required by a currency system to ensure usability. These characteristics include durability, transportability, non-counterfeit ability, and divisibility (Grill). Due to the distinct characteristics of Bitcoin being a cryptocurrency, the currency did succeed with durability due to its longevity, transportability due to its online network allowing access worldwide, and non-counterfeit ability due to its verification method concerning its blockchain and mining processes. The next step for the cryptocurrency was to increase its usage both for the consumer and the businesses and merchants that may interact with current and future consumers so that there may be more reasons for people to become users within this system. Additionally, possible users would have to feel that the cryptocurrency system would be able to overcome any concerns or differences that Bitcoin had in regard to fiat currencies that currently dominate the global financial system.

Divisibility

To allow for transactional values at many prices, Bitcoin has the ability to be divisible down to the hundredth of a millionth Bitcoin or 0.00000001 BTC (Grill). This unit is called the Satoshi after the username of the founder of the cryptocurrency. With the total possible number of Bitcoins at nearly 21 million, once that number is met there would be 2 quadrillion units available. Currently, it is projected that this will occur in 2140 (Grill).

Bitcoin's Growing Transactional Acceptance as Currency

Over time, Bitcoin has gradually gained acceptance by merchants and businesses. The number of payment methods has expanded and the willingness among merchants to accept Bitcoin has grown. In response to this development, consumer spending on Bitcoin has increased substantially. In 2013, consumers spent on average \$9.8 million a month in Bitcoin on merchant services (Nova). This average increased to more than \$190.2 million a month in 2017 (Nova). The increase in the monthly value of Bitcoins spent on merchant services shows that both consumers and merchants are becoming more accepting of transacting in the cryptocurrency. In turn, this works to continue growing the likelihood that both merchants and consumers will look to transact in Bitcoins as the cryptocurrency will be more widely accepted by merchants making consumers more likely to use it and vice versa. In response to these growing transactional amounts, major companies accepting cryptocurrencies for payment includes Microsoft, PayPal, Subway, Expedia, and Overstock (Nasdaq).

Deflationary Currency

Besides the decentralized and online nature of Bitcoin, another aspect that differentiates the cryptocurrency from the many fiat currencies around the world is that Bitcoin is a deflationary currency, whereas the fiat currencies, those backed by the government that printed them, are inflationary. These fiat currencies, such as the US dollar, will, in most normal years, experience some percentage of inflation. For example, the Federal Reserve aims to have a 2% inflation rate for the United States dollar. Many economists argue that some inflation keeps the economy healthy by providing an incentive for people to invest and not store their

money, while also providing incentive for people to borrow. The incentive to borrow comes from the cost of the debt shrinking over time. Additionally, it is thought that a growing economy needs to be able to have a larger supply of money to facilitate the expansion.

Bitcoin is a deflationary currency due to it having a maximum number of units. Once the last Bitcoin is mined, there will be no ability to add any more coins into circulation. This prevents Bitcoin from evolving into a mode of perpetual inflation that has been a staple for fiat currencies, who have the ability to continually add more to their supply. Due mainly to the lack of incentive for people to borrow with a deflationary currency, economists struggle to see how Bitcoin is able to supplant the norms of financial and economic policy that dominate the globe today (Jeftovic).

Further Concern for the Bitcoin's Currency Aspects

Bitcoin faces additional concerns in its acceptance as a currency through its current classification by the Internal Revenue Service. Presently, the IRS classifies Bitcoin as an asset due to it not being issued by a sovereign nation (Nova). This implies that when a transaction occurs, it would be considered a taxable event. Therefore, when Bitcoin or any other cryptocurrency is used in a transaction, paying capital gains taxes would be necessary (Nova). This implication severely limits the possibility that users would continue to utilize cryptocurrencies as currency as paying capital gains taxes would keep these transactions from producing economic sense. Looking towards the future, cryptocurrencies will need to lose the asset classification from the Internal Revenue Service to be able to provide users with a

currency without economic negativities so that they will be encouraged to use the cryptocurrency as the name implies.

Bitcoin as an Investment Asset

Throughout the existence of Bitcoin, the cryptocurrency has generated discussion among its holders and professionals in the finance world as to whether it is more appropriate to utilize Bitcoin as a currency or as an investment. Generally, despite the increasing amounts of Bitcoin transactions and acceptance among merchants, most users have derided Bitcoin as an investment and employed similar strategies to that of holding stocks and other investment assets to that of their handling of the cryptocurrency. This user sentiment, along with views held by financial regulatory bodies such as the Securities Exchange Commission and the Internal Revenue Service, which has classified cryptocurrencies as an asset and requires capital gains taxes to be paid upon a transaction, has led to a greater usage of Bitcoin as an asset for investment purposes.

Deflationary Asset

One of the issues discussed that Bitcoin has had to overcome as a currency is its aspect as a deflationary asset. Due to Bitcoin having a maximum number of possible units, people have been more likely to view the cryptocurrency in a similar light to commodities such as gold and silver. Though the price of commodities fluctuates over time, investors will hold these assets for the long term because, due to their limited amount, over time the assets should gain in value as there is less of the commodity entering the market. Therefore, a deflationary asset would

provide incentive for owners to hold their assets and allow their value to rise over time as the supply of that commodity decreases. Due to Bitcoin conforming to this classification, many users have opted and will continue to view Bitcoin in this light as part of their investment strategy.

ETF Potential

As cryptocurrency investment has grown over the years, many potential investors have sought an investment form that has become popular in financial markets, an exchange-traded fund, to encompass the cryptocurrency market. An exchange-traded fund is an investment fund that holds assets, usually stocks, bonds, or commodities, and is traded on an exchange similar to an individual stock (Rooney). Many companies have sensed the wants of these investors and have been racing to become the first to launch a Securities and Exchange Commission approved exchange-traded fund.

While there have been previous applications to launch a Bitcoin specific exchange-traded fund, Bitwise, a San Francisco-based asset manager, has filed the first application with the Securities Exchange Commission that would track multiple cryptocurrencies (Rooney). Their proposed exchange-trade fund would include Bitcoin along with 9 other cryptocurrencies. The firm stated their application stemmed from their investors yearning to utilize the index strategy and having a belief that the value of public blockchain would raise the overall value of cryptocurrencies in the future (Rooney).

However, the Securities and Exchange Commission has yet to approve any cryptocurrency exchange-traded fund. Back in August 2018, the Securities and Exchange

Commission rejected the applications of 9 separate Bitcoin-based exchange-traded fund (Minkoff). The reasoning given by the financial regulatory body was that there were not enough protections against fraud and market manipulation, the same reasoning used in past rejections (Minkoff).

Possible Price Manipulation

An immense concern regarding the future safety of cryptocurrency investment centers around the possible price manipulation that can occur among cryptocurrencies. A study conducted by the University of Texas explored how the cryptocurrency Tether may have been used to manipulate the price of Bitcoin when it spiked to nearly \$20,000 a coin throughout 2017 (Holt). The study analyzed the publicly available blockchain transaction records and found that a pattern developed where Tether was being used to buy Bitcoin, usually following a price drop in Bitcoin's value (Holt). Adding a greater amount of evidence, exchanges that accepted Tether experienced a much quicker price jump for Bitcoin than those that did not (Holt). The discovered pattern ended when Bitfinex stopped issuing new Tether in 2018.

Exchanges have incentive to manipulate prices because of different revenue increasing processes. Through manipulating the price of cryptocurrencies, exchanges can raise revenue through liquidations of current cryptocurrencies, increasing the popularity of their derivative markets, and through increasing margin trading (Holt). An increase in price will lead to more investors buying the cryptos from the exchanges, a greater amount of derivative trading on the exchanges, and with many investors setting long and short bets with margin, the exchanges gain revenue through loaning funds for trading to investors.

The study held enough evidence to suggest that the exchange Bitfinex, which created and sold Tether while also being an exchange for other cryptocurrencies, used Tether to drive up demand and prices for Bitcoin (Holt). The company executives denied any wrongdoing but have been subpoenaed by the US Commodity Future Trading Commission (Holt).

Bitcoin's Past Performance and Correlation Among Other Assets

Located in Figure 1 of the Appendix, Bitcoin's value over the past 5 years from July 1, 2013 to July 1, 2018 has been used to calculate its correlation to a major stock index, commodities, fiat currencies from around the world, and other cryptocurrencies. From the calculations performed, Bitcoin has shown very little correlation among the S&P 500 index and incurred a 60-month beta of 0.0069 (Figure 3). Additionally, this sentiment continued when Bitcoin was compared to commodities, including gold, silver, and oil. Gold and silver both had very small negative correlations along with 60-month betas of -0.0129 and -0.0182, respectively, with Bitcoin (Figure 3). Meanwhile, oil had little positive correlation with Bitcoin and had a 60-month beta of nearly 0 at 0.0005 (Figure 3).

Furthermore, Bitcoin's value was compared with fiat currencies around the world including the US dollar, Iranian rial, Russian ruble, Colombian peso, Peru sol, Mexican peso, Nicaraguan córdoba, and Honduran Lempira (Figure 2). These currencies were selected based of their currency standing in global financial markets, the facing of sanctions by the governments, and by countries which were seen as corrupt by their respective citizens. Once again, Bitcoin showed very little correlation as correlations hovered around 0 at barely positive or negative amounts (Figure 4).

Lastly, Bitcoin was compared with cryptocurrencies including Ethereum, Litecoin, Monero, Dash, and Unobtanium due to their high market capitalizations within the cryptocurrency market and having been in existence for at least a 24-month period (Figure 5). These calculations showed that while not perfectly correlated, cryptocurrencies were much more correlated to Bitcoin than that of the other assets used (Figure 6). The largest issue with this set of calculations stem from the relatively young age of cryptocurrencies as many had not been around for the full 5-year period. These cryptocurrencies had to be compared on shorter time frames and need to be reexamined when more data is available in the future. Overall, these results led to a conclusion that cryptocurrencies tend to move within relative unison with each other, especially to that of other financial assets.

The Future of Bitcoin

The future of Bitcoin is predicated on the cryptocurrency remaining perceived as having value by users and investors around the world. To continue to be utilized as a currency, Bitcoin must bring transactional value to users that is different from the fiat currencies that reign supreme in financial markets. As an investment asset, Bitcoin must present current and possible new investors with reasoning to hold the cryptocurrency. Building off of this one Bitcoin system, the currency and investment aspects will affect the perceived value of the other and could work to increase or decrease this value. Most importantly, users and investors, alike, will need to continue find inherent value in Bitcoin or otherwise the system will prove worthless.

The Inherent Value of Bitcoin

Within the world of economics, something is considered to have value if it has both scarcity and utility (Bearman). With the way that the Bitcoin system was designed, scarcity is achieved. Additionally, the cryptocurrency has built its utility to rely on the same aspects as that of fiat currencies.

Bitcoin achieves scarcity through the limiting of the total possible number of Bitcoin. As previously discussed, Bitcoin is deflationary in having a maximum number of units and, once that is achieved, no mechanism for the addition of new units. Unlike fiat currencies, there is not an unlimited amount of currency that may go into circulation. Furthermore, Bitcoin's protocols ensure a greater stability of supply and guard against the occurrence of any large addition of Bitcoin units into circulation. Unlike an asset like gold, which is thought to have intrinsic value, the stable payout of Bitcoin through the mining process ensures that units are entered into circulation at a nearly constant rate (Bearman). Whereas the physical mining of gold may result in differing amounts of the metal entering the market place.

While Bitcoin may differ in having utility as compared to a metal such as gold, the cryptocurrency can achieve the same utility as that of fiat currencies: trust. Bitcoin has been criticized for not having intrinsic value, but the vast value of fiat currencies does not come in the form of intrinsic value. Much of the value of a fiat currency, such as the US dollar, comes from the trust of the people using the currency. A \$100 bill costs a few cents in materials to make but is valued at \$100 due to having the backing of the US government and people trusting in the US financial system (Bearman). Furthermore, many economists believe that Bitcoin's utility stems from its potential in becoming a more efficient commodity than any currently

available. Economists point to the decentralized nature, the ease of divisibility, and the open source nature of Bitcoin blockchain to support the potential for greater efficiency (Bearman).

Bitcoin has a developed system that ensures that the cryptocurrency maintains scarcity. However, to ensure the feasibility of its value throughout the future it must continue to gain trust among new users and the population at large. As Bitcoin becomes more widely accepted by merchants and consumers alike, this trust will continue to grow and will increase its inherent value.

The Future of Bitcoin as Currency

As Bitcoin continues to garner acceptance among businesses, merchants, and consumers, the rate at which it is used as a currency will continue to increase. The trends in transactional data support a greater value of Bitcoin being traded every month on merchant services. Additionally, large corporations are opening the possibility for consumers to purchase their products in cryptocurrencies and are supporting partnerships to spur development of widespread cryptocurrency acceptance in online payments. With the trust exhibited by major companies and their push for widespread adoption of cryptocurrency payments, the value of Bitcoin used for merchant transactions will increase and the trust that people have in the Bitcoin system will increase, as well. This gain in trust will make it more likely that new users will begin to partake in the system further pushing merchants to accept cryptocurrencies as a payment method.

Conjointly, a further gain in trust in Bitcoin as a currency, along with increasing application of technology in place around the world, will make it more feasible for international

users to join in the use of Bitcoin as a currency. People around the world who lack trust in their government and its financial systems or who are looking to maneuver around sanctions or bad governmental relations will seek another method for payment. As cryptocurrencies gain further relevance, the number of these individuals seeking to become users of Bitcoin and other cryptocurrencies will continue to increase.

The Intersection of Bitcoin as a Currency and Investment Asset

Thus far, the currency and investment aspects of Bitcoin have been viewed separately, but there is an effect from one aspect to the other. Bitcoin's acceptance as a currency will be indicative on how it is valued as an asset. Solely as an asset, Bitcoin does not garner value or have a use. The investment value is built upon Bitcoin's currency aspect. Therefore, for Bitcoin to continue to be utilized as an investment, the system will need to continue to be a functioning currency and, in its best interests, one that is continuing to grow. Currently, the growth in Bitcoin's usage as a currency would support its continued valuation as an investment asset.

The Future of Bitcoin as an Investment Asset

Thus far, Bitcoin has been proven to be uncorrelated with any commodity, stock index, or currency. The only classification that has observed correlation is that of Bitcoin with other cryptocurrencies. This makes sense due to Bitcoin having the highest market capitalization of any cryptocurrencies and its recognition as the most widely known cryptocurrency. However, Bitcoin has proven to be a truly uncorrelated asset.

As part of building a portfolio strategy, adding a cryptocurrency, such as Bitcoin, would provide added diversification among a portfolio. Though 2017 and 2018 saw a large increase and then a subsequent large decrease in the value of Bitcoin, the cryptocurrency has seen stability throughout the latter half of 2018. This period of stability has occurred during a time that has seen an immense level of volatility among US financial and stock markets, as well as foreign stock markets. This level of stability during an otherwise volatile market adds credence that Bitcoin can provide investors with added diversification as its value is not correlated to the prevailing market at large.

Ultimately, investors have found value in Bitcoin and have shown a notable amount of support for holding it long term. Many investors have seen the benefit of the cryptocurrency adding diversification, while others are speculative upon the future value of Bitcoin as the number of added units decrease and the possibility that blockchain technology gains traction in other technological functions. Accordingly, with the trends that Bitcoin adoption will continue to increase as a currency, it stands to reason that more users will add Bitcoin as a part of an investment strategy which, along with the decreasing number of new units available, should lead to an increase in its value in the future.

The Incentive to Continue Mining Bitcoin after the Last Mining Reward

With the last new unit of Bitcoin expected to be mined around the year 2140, there has to be some financial incentive for miners to continue the mining process after this event. As previously stated, users involved in a transaction can attach a transaction fee which is visible to miners. With the current incentive for mining still being the relatively large reward of Bitcoins,

transaction fees are typically very small. However, this will be unsustainable upon the termination of Bitcoin rewards for mining. Currently, transaction fees comprise less than 1% of the total rewards for miners, but have been put into place to provide for this incentive mechanism in the absence of new Bitcoin rewards (Houy).

With mining a necessity for the security of the Bitcoin system, the protocol must address concerns regarding the long-term sustainability of transaction fee size warranting enough incentive to continue mining new blocks. Many have worried that due to the decentralized market and no constraint on the maximum block size, that transaction fees will not grow to a level necessary to incentivize the continuation of a mining market large enough to support a fully operational system (Houy). This is due to mining providing a social value, the security component of the system, in addition to the private value utilized by users of the system. Therefore, some have argued that the protocol needs to address these inefficiencies through providing mechanisms to warrant larger transaction fees in the future.

The two primary methods to raise transaction fees include imposing a fixed transaction fee that is high enough to provide incentive to mine or setting a maximum block size. Imposing a fixed transaction fee will allow miners to achieve stability in the expectance of their revenue generation through a tax-like mechanism (Houy). Alternatively, setting a maximum block size would provide miners with a form of monopoly rent and provide for the increasement of transaction fee size to reflect the added social value (Houy). In either of the cases, the rise of the fee size would allow stability for incentives for miners to continue the mining process which allows the system to maintain security and provide reassurance for the long-term outlook of its future.

The Future of Other Cryptocurrencies

While the main focus has been on Bitcoin, due to its position among cryptocurrencies, other cryptocurrencies are likely to correspond to movements with the Bitcoin's acceptance and value. The acceptance of Bitcoin by a merchant makes the process easier to expand to accept other cryptocurrencies. This makes other cryptocurrencies more likely to expand with Bitcoin through its expansion of acceptance. Additionally, cryptocurrencies' values, as a whole, tend to be mostly correlated with each other as a group. Subsequently, as Bitcoin increases in value so do other cryptocurrencies, generally. These dynamics have led cryptocurrencies to act somewhat as a group much in the way stocks are subdivided into sectors. Therefore, cryptocurrencies' future success hinge, much like Bitcoin, on their acceptance as currency and as an asset. With Bitcoin the de facto leader, other cryptocurrencies benefit from Bitcoin acceptance expansion and an increase in its value. As Bitcoin continues to grow, so will other cryptocurrencies.

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Appendix

Figure 1 – Bitcoin & Commodity Monthly Prices

Date	Bitcoin	S&P 500 Index	Gold	Silver	Oil
7/1/18	6,347.86	2,759.82	1,249.90	16.16	73.62
6/1/18	7,518.24	2,718.37	1,294.80	16.42	65.81
5/1/18	9,067.71	2,705.27	1,303.80	16.04	67.25
4/1/18	6,816.74	2,648.05	1,327.00	16.38	64.91
3/1/18	10,907.59	2,640.87	1,302.90	16.20	60.99
2/1/18	9,052.58	2,713.83	1,344.30	17.18	65.80
1/1/18	13,412.44	2,823.81	1,308.70	17.07	60.24
12/1/17	10,859.56	2,673.61	1,278.80	16.30	58.36
11/1/17	6,750.17	2,584.84	1,274.10	17.13	54.30
10/1/17	4,394.64	2,575.26	1,275.00	16.64	51.64
9/1/17	4,950.72	2,519.36	1,324.50	17.72	47.29
8/1/17	2,735.59	2,471.65	1,272.60	16.73	49.16
7/1/17	2,460.20	2,470.30	1,236.00	16.60	46.28
6/1/17	2,452.18	2,423.41	1,267.00	17.24	48.36
5/1/17	1,402.08	2,411.80	1,253.30	16.78	48.84
4/1/17	1,089.51	2,384.20	1,247.50	18.28	50.69
3/1/17	1,230.02	2,362.72	1,248.90	18.44	53.83
2/1/17	987.35	2,363.64	1,205.60	17.42	53.88
1/1/17	997.69	2,278.87	1,151.00	15.99	54.09
12/1/16	753.25	2,238.83	1,166.90	16.43	51.06
11/1/16	729.27	2,198.81	1,286.40	18.39	46.67
10/1/16	613.93	2,126.15	1,313.50	19.23	48.04
9/1/16	571.69	2,168.27	1,312.20	18.86	43.16
8/1/16	607.37	2,170.95	1,351.40	20.47	40.06
7/1/16	676.52	2,173.60	1,336.70	19.54	48.99
6/1/16	536.42	2,098.86	1,211.90	15.91	49.01
5/1/16	453.04	2,096.95	1,292.10	17.88	45.90
4/1/16	417.01	2,065.30	1,222.20	15.05	36.79
3/1/16	433.64	2,059.74	1,230.30	14.73	34.40
2/1/16	371.25	1,932.23	1,127.90	14.33	31.62
1/1/16	434.46	1,940.24	1,063.40	13.84	37.60
12/1/15	362.73	2,043.94	1,063.80	14.06	41.85
11/1/15	325.08	2,080.41	1,137.90	15.51	46.43
10/1/15	237.57	2,079.36	1,114.20	14.51	44.74
9/1/15	227.35	1,920.03	1,138.70	14.61	45.41
8/1/15	280.04	1,972.18	1,095.50	14.76	46.86
7/1/15	257.66	2,103.84	1,169.00	15.55	56.96
6/1/15	223.31	2,063.11	1,188.30	16.66	60.20
5/1/15	232.12	2,107.39	1,174.50	16.11	59.15
4/1/15	246.55	2,085.51	1,208.10	17.04	50.09
3/1/15	258.74	2,067.89	1,214.30	16.62	49.45
2/1/15	226.40	2,104.50	1,284.10	17.17	47.59
1/1/15	313.92	1,994.99	1,186.80	15.81	54.56
12/1/14	378.64	2,058.90	1,218.00	16.65	69.00
11/1/14	325.39	2,067.56	1,166.40	16.11	80.59
10/1/14	381.33	2,018.05	1,214.60	17.21	90.73
9/1/14	474.13	1,972.29	1,287.40	19.50	95.83
8/1/14	595.08	2,003.37	1,293.60	20.33	97.88
7/1/14	635.59	1,930.67	1,326.40	21.07	105.34
6/1/14	629.02	1,960.23	1,250.00	18.75	102.92
5/1/14	456.27	1,923.57	1,283.10	18.99	99.42
4/1/14	478.72	1,883.95	1,279.60	19.75	99.74
3/1/14	563.74	1,872.34	1,335.90	21.39	103.00
2/1/14	853.02	1,859.45	1,242.40	19.11	97.40
1/1/14	770.47	1,782.59	1,205.40	19.54	98.70
12/1/13	946.92	1,848.36	1,251.50	19.94	92.71
11/1/13	198.51	1,805.81	1,313.10	21.80	94.61
10/1/13	125.49	1,756.54	1,286.00	21.12	102.04
9/1/13	128.26	1,681.55	1,380.40	23.35	105.91
8/1/13	96.42	1,632.97	1,311.00	19.62	107.89
7/1/13	76.08	1,685.73	1,255.90	19.56	97.99

Figure 2 – Bitcoin & Fiat Currencies Monthly Prices

Date	Bitcoin	Dollar Index (DXY)	Iranian Rial (IRR)	Russian Ruble (RUB)	Colombian Peso (COP)	Peru Sol (PEN)	Mexican Peso (MXN)	Nicaraguan Córdoba (NIO)	Honduran Lempira (HNL) (Inv.)
7/1/18	6,347.86	94.58	0.000023	0.01594	0.000342	0.3052	0.05048		24.0300
6/1/18	7,518.24	93.98	0.000024	0.01610	0.000349	0.3057	0.05015	0.03165	23.9000
5/1/18	9,067.71	92.45	0.000024	0.01570	0.000356	0.3075	0.05280	0.03205	23.6500
4/1/18	6,816.74	90.01	0.000026	0.01740	0.000358	0.3099	0.05480	0.03210	23.6695
3/1/18	10,907.59	90.32	0.000027	0.01760	0.000347	0.3066	0.05310	0.03190	23.6200
2/1/18	9,052.58	88.67	0.000027	0.01790	0.000358	0.3114	0.05450	0.03195	23.6200
1/1/18	13,412.44	92.17	0.000028	0.01730	0.000336	0.3089	0.05090	0.03245	23.6015
12/1/17	10,859.56	92.89	0.000028	0.01700	0.000334	0.3091	0.05370	0.03245	23.5500
11/1/17	6,750.17	94.81	0.000029	0.01720	0.000326	0.3062	0.05245	0.03310	23.6680
10/1/17	4,394.64	93.11	0.000030	0.01730	0.000340	0.3055	0.05485	0.03300	23.5500
9/1/17	4,950.72	92.81	0.000030	0.01740	0.000341	0.3090	0.05615	0.03355	23.4050
8/1/17	2,735.59	93.04	0.000031	0.01660	0.000336	0.3089	0.05590	0.03350	23.4500
7/1/17	2,460.20	95.64	0.000031	0.01690	0.000329	0.3070	0.05490	0.03340	23.3060
6/1/17	2,452.18	97.20	0.000031	0.01770	0.000343	0.3056	0.05360	0.03360	23.5290
5/1/17	1,402.08	99.15	0.000031	0.01750	0.000340	0.3083	0.05340	0.03380	23.5195
4/1/17	1,089.51	100.56	0.000031	0.01780	0.000348	0.3080	0.05360	0.03360	23.3775
3/1/17	1,230.02	101.77	0.000031	0.01720	0.000342	0.3068	0.05050	0.03400	23.5400
2/1/17	987.35	99.75	0.000031	0.01660	0.000343	0.3058	0.04830	0.03400	23.6100
1/1/17	997.69	102.78	0.000031	0.01630	0.000333	0.2968	0.04820	0.03400	23.3590
12/1/16	753.25	100.95	0.000031	0.01560	0.000325	0.2926	0.04810	0.03430	22.9620
11/1/16	729.27	97.73	0.000031	0.01580	0.000335	0.2973	0.05210	0.03410	22.4680
10/1/16	613.93	95.42	0.000032	0.01600	0.000347	0.2954	0.05180	0.03440	22.6755
9/1/16	571.69	95.65	0.000033	0.01520	0.000340	0.2946	0.05330	0.03440	22.8035
8/1/16	607.37	95.78	0.000032	0.01490	0.000300	0.2983	0.05300	0.03460	22.6130
7/1/16	676.52	95.64	0.000033	0.01570	0.000300	0.3042	0.05450	0.03520	22.7500
6/1/16	536.42	95.42	0.000033	0.01490	0.000300	0.2968	0.05400	0.03470	22.5000
5/1/16	453.04	93.08	0.000033	0.01530	0.000300	0.3028	0.05810	0.03480	22.4970
4/1/16	417.01	94.61	0.000033	0.01480	0.000300	0.2990	0.05770	0.03550	22.5500
3/1/16	433.64	98.34	0.000033	0.01360	0.000300	0.2844	0.05580	0.03520	22.6450
2/1/16	371.25	99.04	0.000033	0.01290	0.000300	0.2871	0.05480	0.03660	22.3585
1/1/16	434.46	98.69	0.000034	0.01370	0.000300	0.2933	0.05820	0.03600	22.1890
12/1/15	362.73	99.84	0.000033	0.01500	0.000300	0.2966	0.06050	0.03560	21.6415
11/1/15	325.08	96.84	0.000033	0.01570	0.000300	0.3049	0.06080	0.03690	21.9890
10/1/15	237.57	96.10	0.000033	0.01530	0.000300	0.3093	0.05910	0.03650	21.8165
9/1/15	227.35	95.38	0.000033	0.01510	0.000300	0.3075	0.05890	0.03710	21.6645
8/1/15	280.04	97.19	0.000034	0.01570	0.000300	0.3138	0.06180	0.03700	21.9520
7/1/15	257.66	96.27	0.000034	0.01790	0.000300	0.3147	0.06340	0.03740	21.7740
6/1/15	223.31	97.43	0.000035	0.01860	0.000400	0.3167	0.06460	0.03760	21.9005
5/1/15	232.12	95.21	0.000035	0.01930	0.000400	0.3195	0.06420	0.03770	21.8465
4/1/15	246.55	98.12	0.000036	0.01740	0.000400	0.3230	0.06600	0.03760	21.3455
3/1/15	258.74	95.48	0.000036	0.01590	0.000400	0.3233	0.06660	0.03760	20.9915
2/1/15	226.40	94.67	0.000036	0.01460	0.000400	0.3265	0.06730	0.03770	21.0870
1/1/15	313.92	90.35	0.000037	0.01720	0.000400	0.3345	0.06780	0.03780	21.1190
12/1/14	378.64	87.98	0.000037	0.01950	0.000400	0.3410	0.07150	0.03760	21.1990
11/1/14	325.39	86.92	0.000037	0.02290	0.000500	0.3419	0.07350	0.03760	21.3475
10/1/14	381.33	85.91	0.000037	0.02520	0.000500	0.3456	0.07430	0.03840	21.0110
9/1/14	474.13	82.74	0.000038	0.02680	0.000500	0.3506	0.07630	0.03810	21.0435
8/1/14	595.08	81.30	0.000038	0.02800	0.000500	0.3574	0.07590	0.03850	20.8695
7/1/14	635.59	79.82	0.000039	0.02910	0.000500	0.3576	0.07730	0.03850	20.9755
6/1/14	629.02	80.40	0.000039	0.02850	0.000500	0.3552	0.07740	0.03870	20.6625
5/1/14	456.27	79.52	0.000039	0.02810	0.000500	0.3561	0.07670	0.03890	19.0220
4/1/14	478.72	80.09	0.000039	0.02850	0.000500	0.3561	0.07660	0.03900	19.2135
3/1/14	563.74	79.78	0.000040	0.02740	0.000500	0.3564	0.07500	0.03940	19.5390
2/1/14	853.02	81.25	0.000040	0.02820	0.000500	0.3538	0.07380	0.03960	19.9955
1/1/14	770.47	80.13	0.000040	0.03040	0.000500	0.3576	0.07670	0.03940	20.3050
12/1/13	946.92	80.68	0.000040	0.03010	0.000500	0.3572	0.07570	0.03940	20.5450
11/1/13	198.51	80.72	0.000040	0.03080	0.000500	0.3603	0.07660	0.03990	20.4200
10/1/13	125.49	80.14	0.000040	0.03100	0.000500	0.3596	0.07600	0.04020	20.4805
9/1/13	128.26	82.12	0.000081	0.02999	0.000500	0.3563	0.07500	0.03950	20.4505
8/1/13	96.42	82.34	0.000081	0.03020	0.000500	0.3580	0.07790	0.04000	20.4415
7/1/13	76.08	83.05	0.000081	0.03030	0.000500	0.3594	0.07720	0.04030	20.2315

Figure 3 – Bitcoin & Commodity Monthly Returns, Correlations, & Betas

Firm/Commodity	Bitcoin	S&P 500 Index	Gold	Silver	Oil
36 Month Beta		0.0146	-0.0129	-0.0182	0.0011
60 Month Beta		0.0069	-0.0065	-0.0093	0.0005
7/1/18	-15.57%	1.52%	-3.47%	-1.58%	11.87%
6/1/18	-17.09%	0.48%	-0.69%	2.37%	-2.14%
5/1/18	33.02%	2.16%	-1.75%	-2.08%	3.60%
4/1/18	-37.50%	0.27%	1.85%	1.11%	6.43%
3/1/18	20.49%	-2.69%	-3.08%	-5.70%	-7.31%
2/1/18	-32.51%	-3.89%	2.72%	0.64%	9.23%
1/1/18	23.51%	5.62%	2.34%	4.72%	3.22%
12/1/17	60.88%	3.43%	0.37%	-4.85%	7.48%
11/1/17	53.60%	0.37%	-0.07%	2.94%	5.15%
10/1/17	-11.23%	2.22%	-3.74%	-6.09%	9.20%
9/1/17	80.97%	1.93%	4.08%	5.92%	-3.80%
8/1/17	11.19%	0.05%	2.96%	0.78%	6.22%
7/1/17	0.33%	1.93%	-2.45%	-3.71%	-4.30%
6/1/17	74.90%	0.48%	1.09%	2.74%	-0.98%
5/1/17	28.69%	1.16%	0.46%	-8.21%	-3.65%
4/1/17	-11.42%	0.91%	-0.11%	-0.87%	-5.83%
3/1/17	24.58%	-0.04%	3.59%	5.86%	-0.09%
2/1/17	-1.04%	3.72%	4.74%	8.94%	-0.39%
1/1/17	32.45%	1.79%	-1.36%	-2.68%	5.93%
12/1/16	3.29%	1.82%	-9.29%	-10.66%	9.41%
11/1/16	18.79%	3.42%	-2.06%	-4.37%	-2.85%
10/1/16	7.39%	-1.94%	0.10%	1.96%	11.31%
9/1/16	-5.87%	-0.12%	-2.90%	-7.87%	7.74%
8/1/16	-10.22%	-0.12%	1.10%	4.76%	-18.23%
7/1/16	26.12%	3.56%	10.30%	22.82%	-0.04%
6/1/16	18.40%	0.09%	-6.21%	-11.02%	6.78%
5/1/16	8.64%	1.53%	5.72%	18.80%	24.76%
4/1/16	-3.83%	0.27%	-0.66%	2.17%	6.95%
3/1/16	16.81%	6.60%	9.08%	2.79%	8.79%
2/1/16	-14.55%	-0.41%	6.07%	3.54%	-15.90%
1/1/16	19.78%	-5.07%	-0.04%	-1.56%	-10.16%
12/1/15	11.58%	-1.75%	-6.51%	-9.35%	-9.86%
11/1/15	36.84%	0.05%	2.13%	6.89%	3.78%
10/1/15	4.50%	8.30%	-2.15%	-0.68%	-1.48%
9/1/15	-18.82%	-2.64%	3.94%	-1.02%	-3.09%
8/1/15	8.69%	-6.26%	-6.29%	-5.08%	-17.73%
7/1/15	15.38%	1.97%	-1.62%	-6.66%	-5.38%
6/1/15	-3.80%	-2.10%	1.17%	3.41%	1.78%
5/1/15	-5.85%	1.05%	-2.78%	-5.46%	18.09%
4/1/15	-4.71%	0.85%	-0.51%	2.53%	1.29%
3/1/15	14.28%	-1.74%	-5.44%	-3.20%	3.91%
2/1/15	-27.88%	5.49%	8.20%	8.60%	-12.77%
1/1/15	-17.09%	-3.10%	-2.56%	-5.05%	-20.93%
12/1/14	16.36%	-0.42%	4.42%	3.35%	-14.38%
11/1/14	-14.67%	2.45%	-3.97%	-6.39%	-11.18%
10/1/14	-19.57%	2.32%	-5.65%	-11.74%	-5.32%
9/1/14	-20.32%	-1.55%	-0.48%	-4.08%	-2.09%
8/1/14	-6.37%	3.77%	-2.47%	-3.51%	-7.08%
7/1/14	1.04%	-1.51%	6.11%	12.37%	2.35%
6/1/14	37.86%	1.91%	-2.58%	-1.26%	3.52%
5/1/14	-4.69%	2.10%	0.27%	-3.85%	-0.32%
4/1/14	-15.08%	0.62%	-4.21%	-7.67%	-3.17%
3/1/14	-33.91%	0.69%	7.53%	11.93%	5.75%
2/1/14	10.71%	4.31%	3.07%	-2.20%	-1.32%
1/1/14	-18.63%	-3.56%	-3.68%	-2.01%	6.46%
12/1/13	377.01%	2.36%	-4.69%	-8.53%	-2.01%
11/1/13	58.19%	2.80%	2.11%	3.22%	-7.28%
10/1/13	-2.16%	4.46%	-6.84%	-9.55%	-3.65%
9/1/13	33.02%	2.97%	5.29%	19.01%	-1.84%
8/1/13	26.74%	-3.13%	4.39%	0.31%	10.10%
Correlation with Bitcoin		0.1344	-0.0823	-0.0689	0.0034
36 Month Std. Dev.	27.07%	2.94%	4.23%	7.14%	8.98%
60 Month Std. Dev.	54.13%	2.78%	4.28%	7.28%	8.77%

Figure 4 – Bitcoin & Fiat Currencies Monthly Returns, Correlations, & Betas

Firm/Commodity	Bitcoin	Dollar Index (DXY)	Iranian Rial (IRR)	Russian Ruble (RUB)	Colombian Peso (COP)	Peru Sol (PEN)	Mexican Peso (MXN)	Nicaraguan Córdoba (NIO)	Honduran Lempira (HNL)
36 Month Beta		-0.0016	0.0046	0.0076	-0.0048	-0.0005	-0.0052	-0.0048	0.0036
60 Month Beta		-0.0008	0.0072	0.0046	-0.0037	-0.0002	-0.0022	-0.0021	0.0029
7/1/18	-15.57%	0.64%	-4.17%	-0.99%	-2.01%	-0.16%	0.66%	0.25%	0.54%
6/1/18	-17.09%	1.65%	0.00%	2.55%	-1.97%	-0.59%	-5.02%	-1.25%	1.06%
5/1/18	33.02%	2.71%	-7.69%	-9.77%	-0.56%	-0.77%	-3.65%	-0.16%	-0.08%
4/1/18	-37.50%	-0.34%	-3.70%	-1.14%	3.17%	1.08%	3.20%	0.63%	0.21%
3/1/18	20.49%	1.86%	0.00%	-1.68%	-3.07%	-1.54%	-2.57%	-0.16%	0.00%
2/1/18	-32.51%	-3.80%	-3.57%	3.47%	6.55%	0.81%	7.07%	-1.54%	0.08%
1/1/18	23.51%	-0.78%	0.00%	1.76%	0.60%	-0.06%	-5.21%	0.00%	0.22%
12/1/17	60.88%	-2.03%	-3.45%	-1.16%	2.45%	0.95%	2.38%	-1.96%	-0.50%
11/1/17	53.60%	1.83%	-3.33%	-0.58%	-4.12%	0.23%	-4.38%	0.30%	0.50%
10/1/17	-11.23%	0.32%	0.00%	-0.57%	-0.29%	-1.13%	-2.32%	-1.64%	0.62%
9/1/17	80.97%	-0.25%	-3.23%	4.82%	1.49%	0.03%	0.45%	0.15%	-0.19%
8/1/17	11.19%	-2.72%	0.00%	-1.78%	2.13%	0.62%	1.82%	0.30%	0.62%
7/1/17	0.33%	-1.60%	0.00%	-4.52%	-4.08%	0.46%	2.43%	-0.60%	-0.95%
6/1/17	74.90%	-1.97%	0.00%	1.14%	0.88%	-0.88%	0.37%	-0.59%	0.04%
5/1/17	28.69%	-1.40%	0.00%	-1.69%	-2.30%	0.10%	-0.37%	0.60%	0.61%
4/1/17	-11.42%	-1.19%	0.00%	3.49%	1.75%	0.39%	6.14%	-1.18%	-0.69%
3/1/17	24.58%	2.03%	0.00%	3.61%	-0.29%	0.33%	4.55%	0.00%	-0.30%
2/1/17	-1.04%	-2.95%	0.00%	1.84%	3.00%	3.03%	0.21%	0.00%	1.07%
1/1/17	32.45%	1.81%	0.00%	4.49%	2.46%	1.44%	0.21%	-0.87%	1.73%
12/1/16	3.29%	3.29%	0.00%	-1.27%	-2.99%	-1.58%	-7.68%	0.59%	2.20%
11/1/16	18.79%	2.42%	-3.12%	-1.25%	-3.46%	0.64%	0.58%	-0.87%	-0.92%
10/1/16	7.39%	-0.24%	-3.03%	5.26%	2.06%	0.27%	-2.81%	0.00%	-0.56%
9/1/16	-5.87%	-0.14%	3.13%	2.01%	13.33%	-1.24%	0.57%	-0.58%	0.84%
8/1/16	-10.22%	0.15%	-3.03%	-5.10%	0.00%	-1.94%	-2.75%	-1.70%	-0.60%
7/1/16	26.12%	0.23%	0.00%	5.37%	0.00%	2.49%	0.93%	1.44%	1.11%
6/1/16	18.40%	2.51%	0.00%	-2.61%	0.00%	-1.98%	-7.06%	-0.29%	0.01%
5/1/16	8.64%	-1.62%	0.00%	3.38%	0.00%	1.27%	0.69%	-1.97%	-0.24%
4/1/16	-3.83%	-3.79%	0.00%	8.82%	0.00%	5.13%	3.41%	0.85%	-0.42%
3/1/16	16.81%	-0.71%	0.00%	5.43%	0.00%	-0.94%	1.82%	-3.83%	1.28%
2/1/16	-14.55%	0.35%	-2.94%	-5.84%	0.00%	-2.11%	-5.84%	1.67%	0.76%
1/1/16	19.78%	-1.15%	3.03%	-8.67%	0.00%	-1.11%	-3.80%	1.12%	2.53%
12/1/15	11.58%	3.10%	0.00%	-4.46%	0.00%	-2.72%	-0.49%	-3.52%	-1.58%
11/1/15	36.84%	0.77%	0.00%	2.61%	0.00%	-1.42%	2.88%	1.10%	0.79%
10/1/15	4.50%	0.75%	0.00%	1.32%	0.00%	0.59%	0.34%	-1.62%	0.70%
9/1/15	-18.82%	-1.86%	-2.94%	-3.82%	0.00%	-2.01%	-4.69%	0.27%	-1.31%
8/1/15	8.69%	0.96%	0.00%	-12.29%	0.00%	-0.29%	-2.52%	-1.07%	0.82%
7/1/15	15.38%	-1.19%	-2.86%	-3.76%	-25.00%	-0.63%	-1.86%	-0.53%	-0.58%
6/1/15	-3.80%	2.33%	0.00%	-3.63%	0.00%	-0.88%	0.62%	-0.27%	0.25%
5/1/15	-5.85%	-2.97%	-2.78%	10.92%	0.00%	-1.08%	-2.73%	0.27%	2.35%
4/1/15	-4.71%	2.76%	0.00%	9.43%	0.00%	-0.09%	-0.90%	0.00%	1.69%
3/1/15	14.28%	0.86%	0.00%	8.90%	0.00%	-0.98%	-1.04%	-0.27%	-0.45%
2/1/15	-27.88%	4.78%	-2.70%	-15.12%	0.00%	-2.39%	-0.74%	-0.26%	-0.15%
1/1/15	-17.09%	2.69%	0.00%	-11.79%	0.00%	-1.91%	-5.17%	0.53%	-0.38%
12/1/14	16.36%	1.22%	0.00%	-14.85%	-20.00%	-0.26%	-2.72%	0.00%	-0.70%
11/1/14	-14.67%	1.18%	0.00%	-9.13%	0.00%	-1.07%	-1.08%	-2.08%	1.60%
10/1/14	-19.57%	3.83%	-2.63%	-5.97%	0.00%	-1.43%	-2.62%	0.79%	-0.15%
9/1/14	-20.32%	1.77%	0.00%	-4.29%	0.00%	-1.90%	0.53%	-1.04%	0.83%
8/1/14	-6.37%	1.85%	-2.56%	-3.78%	0.00%	-0.06%	-1.81%	0.00%	-0.51%
7/1/14	1.04%	-0.72%	0.00%	2.11%	0.00%	0.68%	-0.13%	-0.52%	1.51%
6/1/14	37.86%	1.11%	0.00%	1.42%	0.00%	-0.25%	0.91%	-0.51%	8.62%
5/1/14	-4.69%	-0.71%	0.00%	-1.40%	0.00%	0.00%	0.13%	-0.26%	-1.00%
4/1/14	-15.08%	0.39%	-2.50%	4.01%	0.00%	-0.08%	2.13%	-1.02%	-1.67%
3/1/14	-33.91%	-1.81%	0.00%	-2.84%	0.00%	0.73%	1.63%	-0.51%	-2.28%
2/1/14	10.71%	1.40%	0.00%	-7.24%	0.00%	-1.06%	-3.78%	0.51%	-1.52%
1/1/14	-18.63%	-0.68%	0.00%	1.00%	0.00%	0.11%	1.32%	0.00%	-1.17%
12/1/13	377.01%	-0.05%	0.00%	-2.27%	0.00%	-0.86%	-1.17%	-1.25%	0.61%
11/1/13	58.19%	0.72%	0.00%	-0.65%	0.00%	0.19%	0.79%	-0.75%	-0.30%
10/1/13	-2.16%	-2.41%	-50.62%	3.37%	0.00%	0.93%	1.33%	1.77%	0.15%
9/1/13	33.02%	-0.27%	0.00%	-0.70%	0.00%	-0.47%	-3.72%	-1.25%	0.04%
8/1/13	26.74%	-0.85%	0.00%	-0.33%	0.00%	-0.39%	0.91%	-0.74%	1.04%
Correlation with Bitcoin		-0.0229	0.0581	0.0446	-0.0415	-0.0081	-0.0395	-0.1032	0.1060
36 Month Std. Dev.	27.07%	1.91%	2.14%	4.60%	3.11%	1.58%	3.57%	1.25%	0.91%
60 Month Std. Dev.	54.13%	1.92%	6.67%	5.60%	4.79%	1.35%	3.01%	1.08%	1.49%

Figure 5 – Bitcoin & Other Major Cryptocurrencies Monthly Prices

Cryptocurrency	Bitcoin	Ethereum	Litecoin	Monero	Dash	Unobtanium
7/1/18	6,347.86	453.92	80.24	129.77	235.70	161.79
6/1/18	7,518.24	580.04	119.92	157.54	315.35	136.11
5/1/18	9,067.71	673.61	148.49	240.26	478.90	134.82
4/1/18	6,816.74	379.61	115.22	175.51	291.53	129.72
3/1/18	10,907.59	872.20	209.75	314.04	617.53	169.71
2/1/18	9,052.58	1,036.79	142.30	240.96	617.04	115.86
1/1/18	13,412.44	772.64	229.03	358.99	1,053.98	80.89
12/1/17	10,859.56	466.54	99.00	190.94	797.53	79.30
11/1/17	6,750.17	291.69	53.18	85.72	271.56	54.56
10/1/17	4,394.64	302.34	54.54	93.22	315.80	122.70
9/1/17	4,950.72	387.74	86.04	141.20	393.35	96.41
8/1/17	2,735.59	226.77	43.04	44.15	184.75	41.45
7/1/17	2,460.20	274.60	38.99	40.96	165.71	41.06
6/1/17	2,452.18	222.24	28.80	43.70	136.08	19.61
5/1/17	1,402.08	76.30	15.92	22.77	88.12	11.48
4/1/17	1,089.51	50.70	6.88	21.50	68.60	7.87
3/1/17	1,230.02	17.35	3.80	12.33	42.54	2.44
2/1/17	987.35	10.73	4.08	13.27	16.03	1.11
1/1/17	997.69	8.17	4.51	13.97	11.23	1.68
12/1/16	753.25	8.45	3.91	8.58	8.74	1.89
11/1/16	729.27	10.77	4.09	4.71	9.04	2.25
10/1/16	613.93	13.17	3.85	7.36	11.71	1.32
9/1/16	571.69	11.99	3.83	8.00	11.45	1.26
8/1/16	607.37	10.94	3.86	1.70	9.90	1.16
7/1/16	676.52	12.20	4.26	1.66	7.24	2.44
6/1/16	536.42	14.00	4.74	0.87	8.26	1.93
5/1/16	453.04	8.85	3.71	0.89	6.79	2.00
4/1/16	417.01	11.66	3.24	1.46	7.07	3.07
3/1/16	433.64	7.65	3.43	0.82	3.90	1.80
2/1/16	371.25	2.21	3.08	0.50	4.12	1.23
1/1/16	434.46	0.95	3.51	0.47	3.38	1.76
12/1/15	362.73	0.87	3.43	0.38	2.08	1.50
11/1/15	325.08	1.06	3.96	0.40	2.66	1.53
10/1/15	237.57	0.69	3.00	0.39	2.29	1.33
9/1/15	227.35	1.35	2.82	0.46	2.54	1.60
8/1/15	280.04		4.15	0.59	3.61	2.42
7/1/15	257.66		3.92	0.50	2.82	2.57
6/1/15	223.31		1.62	0.45	2.65	2.71
5/1/15	232.12		1.41	0.50	2.74	2.19
4/1/15	246.55		1.66	1.01	3.83	3.00
3/1/15	258.74		1.89	0.43	3.33	3.80
2/1/15	226.40		1.80	0.30	1.88	2.88
1/1/15	313.92		2.70	0.47	1.94	1.90
12/1/14	378.64		3.58	0.47	2.37	2.71
11/1/14	325.39		3.57	0.59	1.67	2.49
10/1/14	381.33		4.43	1.20	2.46	2.23
9/1/14	474.13		4.71	2.04	2.27	1.86
8/1/14	595.08		7.70	2.67	5.64	3.14
7/1/14	635.59		7.79	2.35	7.90	2.39
6/1/14	629.02		11.14	1.74	12.93	2.82
5/1/14	456.27		11.10		1.52	2.32
4/1/14	478.72		13.13		0.72	3.01
3/1/14	563.74		13.65		0.94	5.93
2/1/14	853.02		22.47			4.07
1/1/14	770.47		24.62			6.48
12/1/13	946.92		34.74			
11/1/13	198.51		2.45			
10/1/13	125.49		2.42			
9/1/13	128.26		2.58			
8/1/13	96.42		2.91			
7/1/13	76.08		2.95			

Figure 6 – Bitcoin & Other Major Cryptocurrencies Monthly Returns, Correlations, & Betas

Firm/Commodity	Bitcoin	Ethereum	Litecoin	Monero	Dash	Unobtanium
24 Month Beta*		0.5810	1.5454	1.0827	1.0617	0.4344
36 Month Beta		-	1.5306	1.0725	1.0778	1.1685
60 Month Beta		-	2.9679	-	-	-
7/1/18	-15.57%	-21.74%	-33.09%	-17.63%	-25.26%	18.87%
6/1/18	-17.09%	-13.89%	-19.24%	-34.43%	-34.15%	0.96%
5/1/18	33.02%	77.45%	28.88%	36.89%	64.27%	3.93%
4/1/18	-37.50%	-56.48%	-45.07%	-44.11%	-52.79%	-23.56%
3/1/18	20.49%	-15.87%	47.40%	30.33%	0.08%	46.48%
2/1/18	-32.51%	34.19%	-37.87%	-32.88%	-41.46%	43.23%
1/1/18	23.51%	65.61%	131.34%	88.01%	32.16%	2.01%
12/1/17	60.88%	59.94%	86.16%	122.75%	193.68%	45.34%
11/1/17	53.60%	-3.52%	-2.49%	-8.05%	-14.01%	-55.53%
10/1/17	-11.23%	-22.03%	-36.61%	-33.98%	-19.72%	27.27%
9/1/17	80.97%	70.98%	99.91%	219.82%	112.91%	132.59%
8/1/17	11.19%	-17.42%	10.39%	7.79%	11.49%	0.95%
7/1/17	0.33%	23.56%	35.38%	-6.27%	21.77%	109.38%
6/1/17	74.90%	191.27%	80.90%	91.92%	54.43%	70.82%
5/1/17	28.69%	50.49%	131.40%	5.91%	28.45%	45.87%
4/1/17	-11.42%	192.22%	81.05%	74.37%	61.26%	222.54%
3/1/17	24.58%	61.70%	-6.86%	-7.08%	165.38%	119.82%
2/1/17	-1.04%	31.33%	-9.53%	-5.01%	42.74%	-33.93%
1/1/17	32.45%	-3.31%	15.35%	62.82%	28.49%	-11.11%
12/1/16	3.29%	-21.54%	-4.40%	82.17%	-3.32%	-16.00%
11/1/16	18.79%	-18.22%	6.23%	-36.01%	-22.80%	70.45%
10/1/16	7.39%	9.84%	0.52%	-8.00%	2.27%	4.76%
9/1/16	-5.87%	9.60%	-0.78%	370.59%	15.66%	8.62%
8/1/16	-10.22%	-10.33%	-9.39%	2.41%	36.74%	-52.46%
7/1/16	26.12%	-12.86%	-10.13%	90.80%	-12.35%	26.42%
6/1/16	18.40%	58.19%	27.76%	-2.25%	21.65%	-3.50%
5/1/16	8.64%	-24.10%	14.51%	-39.04%	-3.96%	-34.85%
4/1/16	-3.83%	52.42%	-5.54%	78.05%	81.28%	70.56%
3/1/16	16.81%	246.15%	11.36%	64.00%	-5.34%	46.34%
2/1/16	-14.55%	132.63%	-12.25%	6.38%	21.89%	-30.11%
1/1/16	19.78%	9.20%	2.33%	23.68%	62.50%	17.33%
12/1/15	11.58%	-17.92%	-13.38%	-5.00%	-21.80%	-1.96%
11/1/15	36.84%	53.62%	32.00%	2.56%	16.16%	15.04%
10/1/15	4.50%	-48.89%	6.38%	-15.22%	-9.84%	-16.88%
9/1/15	-18.82%	-	-32.05%	-22.03%	-29.64%	-33.88%
8/1/15	8.69%	-	5.87%	18.00%	28.01%	-5.84%
7/1/15	15.38%	-	141.98%	11.11%	6.42%	-5.17%
6/1/15	-3.80%	-	14.89%	-10.00%	-3.28%	23.74%
5/1/15	-5.85%	-	-15.06%	-50.50%	-28.46%	-27.00%
4/1/15	-4.71%	-	-12.17%	134.88%	15.02%	-21.05%
3/1/15	14.28%	-	5.00%	43.33%	77.13%	31.94%
2/1/15	-27.88%	-	-33.33%	-36.17%	-3.09%	51.58%
1/1/15	-17.09%	-	-24.58%	0.00%	-18.14%	-29.89%
12/1/14	16.36%	-	0.28%	-20.34%	41.92%	8.84%
11/1/14	-14.67%	-	-19.41%	-50.83%	-32.11%	11.66%
10/1/14	-19.57%	-	-5.94%	-41.18%	8.37%	19.89%
9/1/14	-20.32%	-	-38.83%	-23.60%	-59.75%	-40.76%
8/1/14	-6.37%	-	-1.16%	13.62%	-28.61%	31.38%
7/1/14	1.04%	-	-30.07%	35.06%	-38.90%	-15.25%
6/1/14	37.86%	-	0.36%	-	750.66%	21.55%
5/1/14	-4.69%	-	-15.46%	-	111.11%	-22.92%
4/1/14	-15.08%	-	-3.81%	-	-23.40%	-49.24%
3/1/14	-33.91%	-	-39.25%	-	-	45.70%
2/1/14	10.71%	-	-8.73%	-	-	-37.19%
1/1/14	-18.63%	-	-29.13%	-	-	-
12/1/13	377.01%	-	1317.96%	-	-	-
11/1/13	58.19%	-	1.24%	-	-	-
10/1/13	-2.16%	-	-6.20%	-	-	-
9/1/13	33.02%	-	-11.34%	-	-	-
8/1/13	26.74%	-	-1.36%	-	-	-
Correlation with Bitcoin		0.2937	0.9215	0.3606	0.5495	0.2118
24 Month Std. Dev.	31.38%	62.07%	52.62%	94.22%	60.62%	64.37%
36 Month Std. Dev.	27.07%	-	44.96%	80.51%	53.09%	56.96%
60 Month Std. Dev.	54.13%	-	174.35%	-	-	-

* Some cryptos have not been in existence long enough to calculate a 36 month and/or 60 month period.

*Correlation is calculated from the amount of time that crypto has been functional.