

5-2019

# Is Bitcoin Reminiscent of Past Bubbles?

Jessica L. Leath

University of Tennessee at Chattanooga, [bdc394@mocs.utc.edu](mailto:bdc394@mocs.utc.edu)

Follow this and additional works at: <https://scholar.utc.edu/honors-theses>

Part of the [Finance and Financial Management Commons](#)

---

## Recommended Citation

Leath, Jessica L., "Is Bitcoin Reminiscent of Past Bubbles?" (2019). *Honors Theses*.

This Theses is brought to you for free and open access by the Student Research, Creative Works, and Publications at UTC Scholar. It has been accepted for inclusion in Honors Theses by an authorized administrator of UTC Scholar. For more information, please contact [scholar@utc.edu](mailto:scholar@utc.edu).

Is Bitcoin Reminiscent of Past Bubbles?  
Jessica Leath  
Departmental Honors Thesis  
The University of Tennessee at Chattanooga  
Finance Department

Examination Date: March 26, 2019

Dr. Hunter Holzhauser  
UC Foundation Assistant Professor of  
Finance  
Thesis Director

Dr. Christi Wann  
Professor of Finance  
Department Examiner

## ABSTRACT

Bitcoin, an open-source decentralized peer-to-peer payment system, has made an unprecedented rise to notoriety in the last decade. In 2018, Bitcoin reported its worst year in history with depreciation of more than 70% from its year opening price. Consequently, the narrative of a bubble that surrounded Bitcoin was amplified by this news. The purpose of this paper is to analyze the presence of a bubble within Bitcoin by comparing its price volatility and the psychological factors that influence its price formation to that of two historic bubbles, the Dotcom Bubble and the Tulip Mania.

## TABLE OF CONTENTS

INTRODUCTION.....	1
SECTION I: OVERVIEW OF CRYPTOCURRENCY AND BITCOIN.....	2
Defining Cryptocurrency.....	2
What is Bitcoin? .....	3
Technology Behind Bitcoin.....	5
SECTION II: POTENTIAL CAUSATIONS OF A BITCOIN BUBBLE.....	7
What is a bubble?.....	7
Potential Causations of a Bitcoin Bubble.....	9
Price Volatility.....	10
Altcoin Competition.....	17
SECTION III: COMPARATIVE ANALYSIS OF BITCOIN & PAST BUBBLES.....	22
Dotcom Bubble.....	22
Tulip Mania.....	27
SECTION IV: BLOCKCHAIN IN THE FUTURE.....	31
DISCUSSION & CONCLUDING REMARKS .....	34

## INTRODUCTION

Over the past decade the world has seen an explosive rise in the interest of cryptocurrencies. Although several have emerged in the last decade, there is one in particular which has created the most buzz throughout world markets, Bitcoin. Bitcoin was brought to life in 2008 through the distribution of a white paper titled “Bitcoin: A Peer-to-Peer Electronic Cash System” by the author Satoshi Nakamoto. Nakamoto’s identity has remained a mystery to this day, but the unidentified entity’s paper launched the beginning of what is regarded today as the most prevalent peer-to-peer decentralized monetary system.

In the beginning Bitcoin had a relatively slow start and did not begin to gain traction until news outlets began reporting on its valuation, which created a buzz and catapulted it to its current state. This media attention coupled with its fashionable, tech-savvy appeal led to its unrealistic price valuation and extreme volatility. The volatility and the psychological influences that have generated the instability of Bitcoin’s valuation are reasons economists have suggested this pioneering cryptocurrency displays similar characteristics of past bubbles. This paper analyzes Bitcoin in comparison to the Dotcom Bubble of the late 1990s and the Tulip Mania of the early 1600s in order to uncover the potential presence of a bubble.

## SECTION I: OVERVIEW OF CRYPTOCURRENCY AND BITCOIN

### DEFINING CRYPTOCURRENCY

Currency has been a fundamental element of civilization since 600 B.C. Over the course of time the accepted payment methods and the ways in which people complete payments have drastically evolved. In the last thirty years, the invention of the Internet and the considerable amounts of technological advancements that have been accomplished have helped shape the most recent and revolutionary of these changes, the creation of cryptocurrency. “Cryptocurrency is a digital or virtual currency that uses cryptography (application of encryption and decryption technology) for security” (Murthy, 2018). Due to its infancy and complexity cryptocurrency currently lacks a standard, formal definition.

The key feature of cryptocurrency is the distinctive use of a ‘distributed ledger,’ this allows cryptocurrency to be used in a decentralized system. The distributed ledger “eliminates all need of a central authority or intermediary to process, validate or authenticate transactions” (McLean, 2016). All transactions are validated through standard cryptographic techniques in order to verify the currency is available to be transferred to the receiving party. This application of a distributed ledger creates an anonymous circuit of transactions protected from any government interference or manipulation.

As a result of this sophisticated technology, cryptocurrencies have rapidly emerged within the last decade. A report published in 2017 from the Cambridge Centre for Alternative Finance, estimated that there were at least 3 million people actively using

cryptocurrency at the time of their research (Hileman & Rauchs, 2017). There are over 2,000 cryptocurrencies in existence today. Bitcoin, Litecoin, Ethereum, Ripple, Zcash, Monero, and Dash are all established cryptocurrencies on the current market. Although many attempts have been made towards producing an efficient and viable form of cryptocurrency, majority of them have been unsuccessful or have fallen short in comparison to the most prominent pioneer of the cryptocurrency market, Bitcoin.

### WHAT IS BITCOIN?

Bitcoin is defined as a “privately issued, decentralized, irredeemable asset designed as an electronic, encrypted, alternative to government-issued currencies” (England & Fratrick, 2018). Since its birth in 2009, Bitcoin has become a worldwide phenomenon. During the ten years of its existence, Bitcoin has received a plethora of positive and negative attention due to its significant price development and volatility. As a result, Bitcoin has been hailed as the first and most prominent cryptocurrency to utilize blockchain technology. As Dyhrberg states, the creation of Bitcoin has caused a disruption in monetary markets challenging participants to think differently about money (2015). With that being said, the classification of Bitcoin has been a highly debated topic. It is very difficult to categorize its function due to the wide variety of its users and applications. A multitude of arguments have been presented for the three possible classifications of Bitcoin as a currency, an investment, and a commodity.

The argument of whether Bitcoin is truly a currency corresponds directly to its ability to display the three functions of money. Economists have characterized money as an instrument that serves a medium of exchange, a unit of account, and a store of value.

There are differing opinions on whether Bitcoin serves all three of these functions. In order to provide some clarity on the subject the Financial Crimes Enforcement Network (FinCEN), a bureau of the US Department of the Treasury, defined ‘virtual currency’ “as a currency with the exception of some of the attributes, in particular the legal tender status requirement.” The FinCEN goes on to further explain that a ‘convertible virtual currency’ is defined as “a virtual currency that has either the equivalent value in real currency or acts as a substitute for a real currency” (Mandjee, 2015). These definitions formalized by the US Department of Treasury provide a better basis for the classification of Bitcoin as a currency in economic terms.

The belief that Bitcoin should be classified as an investment finds its evidence within the speculative behavior of Bitcoin. The price volatility of Bitcoin is at the center of this argument. Although, Bitcoin cannot conform to the Securities Exchange Act’s definition of a “security,” it has the potential to be classified as an “investment contract” (Mandjee, 2015). The Supreme Court defined investment contracts in *SEC v. W.J. Howey Co* stating it is (1) an investment of money; (2) in a common enterprise; (3) with an expectation of profits; (4) solely from the efforts of others (Gordon, 2011).

Parallel to the supporters of Bitcoin as an investment, the argument of Bitcoin as a commodity revolves around its price volatility as well. The similarities between gold and Bitcoin are used to support this argument. Their similarities include the facts that neither is overseen by the government, both have a finite supply and both of their prices fluctuate more than the prices of currencies (Mandjee, 2015). Because of the similarities gold and Bitcoin possess, Dryhberg suggests Bitcoin could be classified as something in between a currency and a commodity (Kjærland, Meland, Oust, & Øyen, 2018).



In the United States, the final decision on the official classification of Bitcoin has still not been reached. Although, in March 2014, the Internal Revenue Service (IRS) determined that Bitcoin should be treated as property for federal tax purposes, but this decision does not signify that Bitcoin will be regulated as a property in all respects or transactions. In other countries Bitcoin has received a variety of different classifications. Germany views Bitcoin as a “unit of account,” therefore it is recognized as private money, England considers Bitcoin “effectively” a currency (Litwack, 2015) and Canada treats Bitcoin as a commodity for tax purposes (Mandjee, 2015). The inability for countries, especially the United States, to come to a consensus on the classification of Bitcoin has allowed it to operate with relatively no official government or financial market oversight. Without regulation on Bitcoin, the US is susceptible to the loss of potential tax revenue, the inability to protect those using Bitcoin and the incapacity to prevent crimes committed through the use of Bitcoin (Litwack, 2015).

## TECHNOLOGY BEHIND BITCOIN

Bitcoin is held in wallets. A “wallet” is a mathematical address consisting of a very long sequence of numbers and letters; which compose a “public key” and “private key.” The wallet has no physical form. The transfer of Bitcoin to another user is done through the instructions the sender gives to Bitcoin software to send Bitcoin to the recipient’s public key. The private key is used in order for the recipient to access and spend the Bitcoin. Simply, the public key is used as an address for deposits and the private key is used to unlock the wallet for withdrawals. The security of the Bitcoin wallet relies on the privacy of the private key.

Once the transfer of Bitcoins has been made, it is recorded in the “blockchain.” In Satoshi Nakamoto’s white paper titled “Bitcoin: A Peer-to-Peer Electronic Cash System,” blockchain is described as “a chain of digital signatures.” The blockchain is a decentralized public ledger. Bitcoin is the largest implementation of blockchain technology to date. The blockchain records every transaction, beginning with the first-ever transaction of ten bitcoins that Satoshi Nakamoto sent to noted computer programmer and developer Hal Finney on January 12, 2009. Since the blockchain is public, edits can be made freely (Guzzetta, 2018).

This recorded data in the blockchain is stored in fixed structures called “blocks.” These blocks have two important parts, their header and their content. The header includes, metadata, like the unique block reference number, the time the block was created, and a link to the previous block. The content part of the block usually includes a validated list of Bitcoin and instruction statements, such as transactions made, amounts and addresses of parties who were sent the Bitcoin. When considering the latest block, it is possible to see the total history of all assets and the instructions of each transaction extending all the way to the first ever Bitcoin transaction, due to the linking of all the blocks to form a chain. This makes the data held in the blockchain verifiable and independently auditable (Grewal-Carr & Marshall, 2017).

## SECTION II: POTENTIAL CASUATIONS OF A BITCOIN BUBBLE

### WHAT IS A BUBBLE?

An economic bubble is defined by The National Association of Securities Dealers Automated Quotations (NASDAQ) as a “market phenomenon characterized by surges in asset prices to levels significantly above the fundamental value of that asset.” Such a phenomenon evokes widespread panic and mania to an economy once it finally reaches its breaking point and busts. Deciphering whether a bubble will grow until its sudden burst or if it will develop and then quickly deflate itself, is a difficult task considering majority of the time bubbles are not recognizable until they have already reached a point that initiates economic crisis.

Over the course of history bubbles have been presented when speculative assets are regarded as fashionable, and thus draw major attention from investors. Some of the most famous bubbles in history include the Dutch Tulip Mania in 1637, the British South Sea Bubble in 1720, the French Mississippi Bubble in 1720, the Wall Street Crash of 1929, the Dotcom Bubble in the late 1990's, and the most recent US Housing Bubble in 2008.

Although identifying economic bubbles presents inherent complexities, the American economist Hyman P. Minsky was able to condense the developments of financial crises into a five-stage model, commonly referred to as Minsky's Model. The five stages are defined as: displacement, boom, euphoria, profit taking, and panic (Cassidy, 2008). Displacement occurs when investors get excited about a new paradigm—such as the creation of new technology (e.g. Internet and cryptocurrencies), a

war or a sudden change in economic policies. The boom stage indicates a slow rise in prices that begins to intensify as more and more people enter the market. This is followed by the euphoria stage as rationality is completely dismissed and prices skyrocket. During this phase price valuations reach extreme, inconceivable levels, which results to movement towards the profit taking phase. During the profit taking stage, market participants take notice of the warning signs and begin selling their portions in order to secure their profits. The panic stage occurs when prices plunge at the same rate that they had soared during the euphoria phase. At this point investors want to sell their holdings at any price in an attempt to hedge their losses. Supply begins to overwhelm demand, which prompts dramatic reductions in price. The end of the panic stage results as economic crisis that has substantial impacts on its immediate participants and in some cases the country or world as a whole. The importance of identifying a bubble within a market or economy is reinforced in Minsky's pattern, which presents the idea that a boom ultimately sows the seeds of a bust.

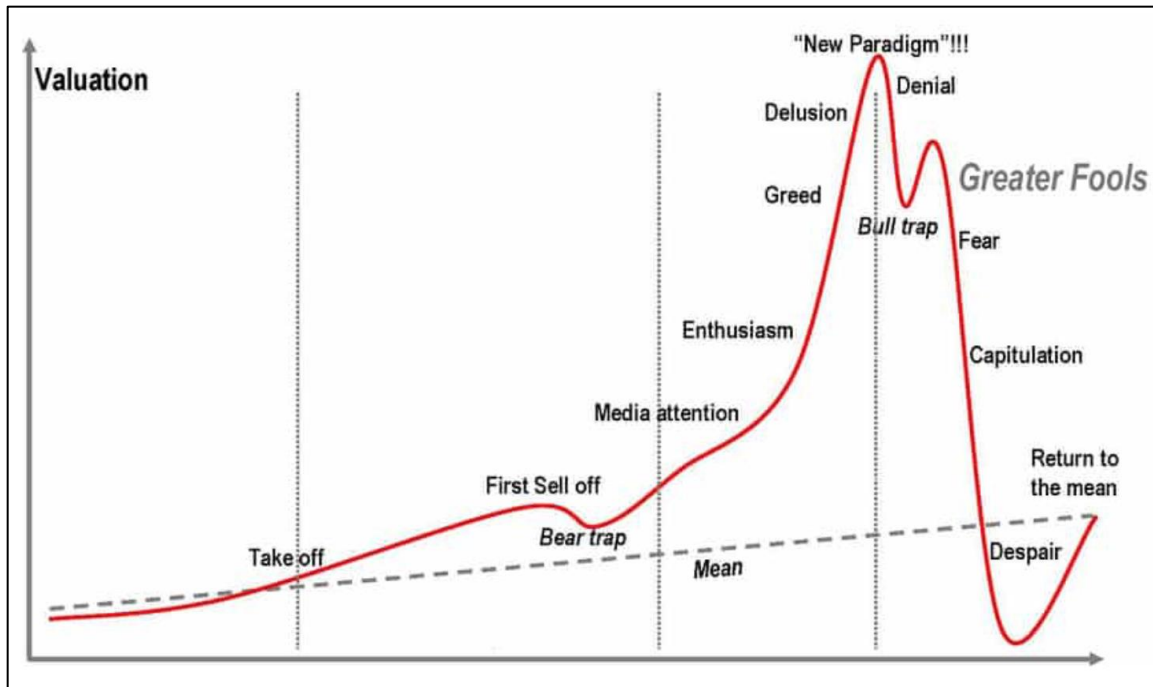


Figure 1. Model of a Bubble Graph. Adapted from “Bitcoin Bubble Graph Compared to Dotcom Crash,” by P. Kallas, 2018, April 12, *FixWillpower*. Retrieved November 11, 2018, from <https://fixwillpower.com/blog/bitcoin-bubble-crash/>. Copyright 2018 by FixWillpower.

## POTENTIAL CAUSATIONS OF THE BITCOIN BUBBLE

Bitcoin, being the most well-known cryptocurrency in the world, has attracted a substantial amount of both positive and negative coverage over the ten years of its existence. These mixed reviews have resulted in two major opinion groups, one that champions its long-term success and sustainability, and another that warns of its inevitable failure and collapse. The latter group believes Bitcoin is destined to become the next speculative bubble. Among this group are many highly regarded academics and successful business analysts. One of which is Nouriel Roubini, the economist who has been credited with predicting the 2008 global financial crisis. He has labeled Bitcoin as the “mother of all bubbles” (Monaghan, 2018). Another notable name who has a similar belief about Bitcoin’s speculative future is Microsoft’s co-founder Bill Gates, who

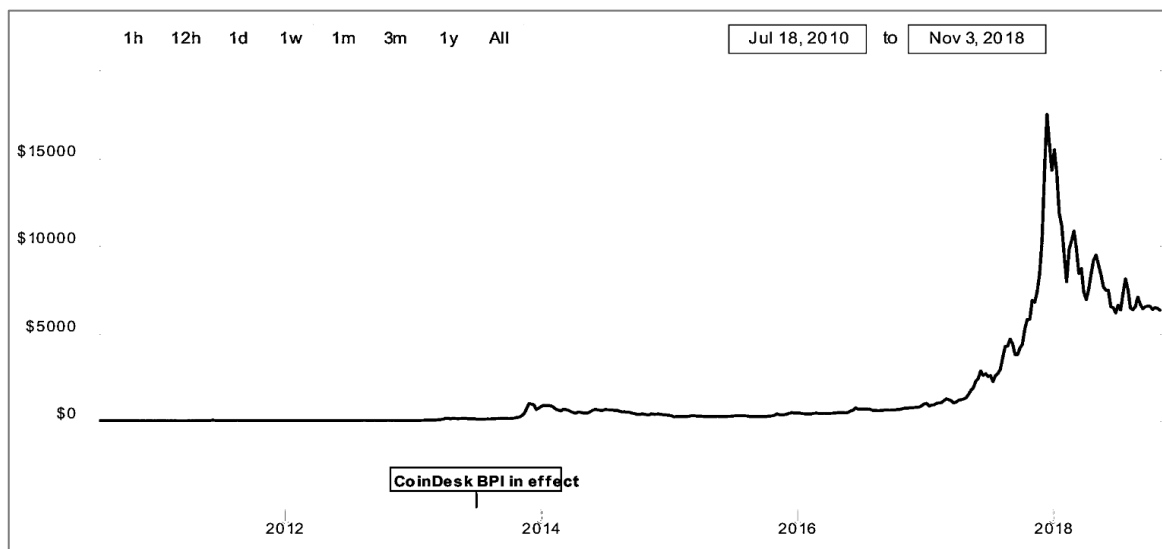
believes Bitcoin is a “kind of a pure ‘greater fool theory’ type of investment” (Cheng, 2018).

There are several reasons to believe a bubble is a plausible outcome for such an innovative digital asset. The price volatility that has manifested during its short existence, along with its behavioral driven market, and the exponential growth of competing cryptocurrencies are three major factors that could ultimately bury Bitcoin in its own grave. These factors will be discussed in more details throughout the following sections.

## PRICE VOLATILITY

The price volatility of Bitcoin spanning its ten-year history has been explosive and extremely unstable. According to coindesk.com, Bitcoin is operating at a market cap of \$111 billion and is selling for \$6,357.78 at the time of this writing; however, this value changes frequently and at drastic rates in the matter of minutes. According to data retrieved in February 2018, on average, Bitcoin fluctuates five times as much as NASDAQ, six times as much as the S&P 500, and over one-hundred times as much as the U.S. housing market (Galka, 2018). This volatility and instability have rose suspicions as to the longevity of the cryptocurrency and whether it can sustain such fluctuations over time. As shown in Figure 2, Bitcoin’s price has endured a sequence of substantial fluctuations since its entry onto the market in July 2010. To further illustrate the fluctuations Bitcoin’s price has endured most recently, on November 3, 2018, as shown on the graph, Bitcoin was selling for \$6,357.78 and by March 25, 2019 Bitcoin’s

closing price was \$3,910. This displays the magnitude of Bitcoins price volatility in a short time frame.



**Figure 2. Bitcoin's (USD) price from 07.19.10 to 11.03.18. Coindesk.com. Retrieved November 3, 2018, from <https://www.coindesk.com/price/>.**

Bitcoin's dominant and pioneering attitude combined with the extreme interest in this innovative cryptocurrency has gained the attention and price speculation of consumers around the world. Priced at just \$0.06 per coin when it hit the market on July 19, 2010, Bitcoin had a slow start and took a few years to gain the momentum and mainstream appeal it has today. The world began hearing of Bitcoin in 2011 when Silk Road, a dark web marketplace that is notoriously known for illegal drug sales, adopted Bitcoin as its currency. In 2013, with the help of the media coverage it was receiving Bitcoin became well known and started expanding as new Bitcoin companies were being created. At this time large businesses such as Overstock and Baidu agreed to accept Bitcoin as a form of payment.

In late 2013, Bitcoin saw its first of many hyperinflation incidents. Being valued at \$100 per coin a month prior; Bitcoin's price soared to \$1,000 over the course of a

month. This price was halved in value during the four months following as a result of the Chinese government banning the use of Bitcoin. The spike in price drew major media attention and gave rise to its unprecedented popularity. In 2014 Mt. Gox, the largest cryptocurrency exchange in the world, collapsed after a major hack resulting in the loss of 850,000 Bitcoin. The hack caused many Bitcoin users to distrust the system and ultimately led to a decrease in prices.

Over the period of 2015 and 2016 over \$1 billion dollars was invested into Bitcoin and blockchain start-ups. This massive influx of capital and interest laid the foundation for what would translate to Bitcoin's biggest success in 2017. Prices increased from about \$1,000 to almost \$20,000 per coin in the matter of a few months. The massive price increase grabbed the attention of mainstream financial institutions and governmental agencies. Exchange operators CBOE and CME launched Bitcoin futures in December of 2017. This period of euphoria for Bitcoin came to a halt at the end of the year with prices dropping from \$20,000 to \$10,000 per coin. The surge of prices was driven by the enormous amounts of investors who bought Bitcoin in order to reap the short-term returns. This decline continued into early 2018, until prices started to stabilize around \$7,000 a coin. Bitcoin's price has remained in the \$6,000 to \$7,000 range since June (Williams-Grut, 2018).

The history of Bitcoin's price volatility provides a considerable indication to the presence of an ever-growing bubble. Many influential economists have warned of Bitcoin's price fluctuations and volatility as a sure sign of the impending bubble that is destined to bust in the near future. A proponent of this camp is Stephen Roach, a Yale University senior fellow and former Asia chairman and chief economist at Morgan



Stanley, who is described as one of Wall Street's most influential economist. In an interview in December of 2017 he stated "this is a dangerous speculative bubble by any shadow or stretch of the imagination" adding "I've never seen a chart of a security where the price really has a vertical pattern to it. And Bitcoin is the most vertical of any pattern I've ever seen in my career" (Murphy, 2017). This unusual pricing pattern is the most referenced reason for the forecast of a Bitcoin bubble, and these volatile movements have been correlated to many different elements, which will be detailed in the following sections.

#### IMPACT OF SOCIAL FACTORS ON PRICE VOLATILITY

The cryptocurrency phenomenon has been hailed as the most significant behavioral event since the emergence of behavioral science and its application to financial markets. According to Rick Lehman Professor of Behavioral Finance at UC Berkley, "Bitcoin may be as pure a behaviorally driven market the world will ever see" (2017). The demand and supply of Bitcoin is driven by the speculative behavior of its investors. Since there are no interest rates associated with cryptocurrencies, a profit is only made when the price changes. Considering the users of Bitcoin are setting its price, the worth of Bitcoin is solely determined by the price someone else will take for it. This allows several different social factors to have a huge impact on the price volatility Bitcoin has displayed over time.

Speculation is a main driving factor of the price of Bitcoin. In relation to past bubbles the riding cause is commonly associated to investors' enthusiasm and overconfidence in certain speculative assets, which often can cloud their judgment. The price-to-price feedback theory is a great example of how Bitcoin's price volatility has

evolved. As described by Robert Shiller, the price-to-price feedback theory states when speculative prices increase and create successes for its investors, it attracts mainstream attention that promotes word-of-mouth enthusiasm and lays the foundation for the expectation of further price increases. This in turn increases the demand for the asset and creates another wave of price increases. This sequence of events, left uninterrupted will go on for several more rounds until it produces a speculative bubble, where high expectations for more price increases results in extremely high current prices. These prices are not sustainable and only result because of the expectation for continuous growing prices, which causes the bubble to burst and the prices fall dramatically over time. The feedback loop can produce a negative bubble as well. This occurs when the price falls and causes a continuous decrease in prices over time, promoting negative word-of-mouth, until the market reaches its bottom level (2003).

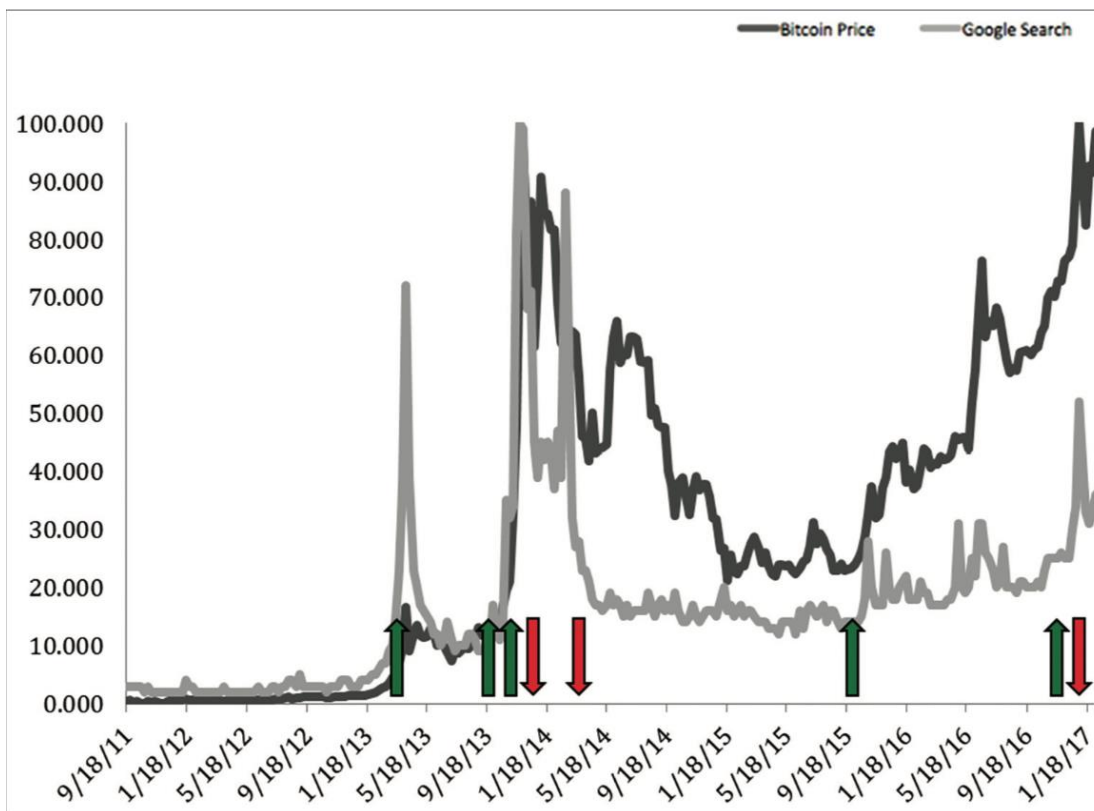
The positive price-to-price feedback loop described above effectively describes how social factors have contributed to the price formation of Bitcoin since its existence. Positive feedback loops are the fuel to the development of speculative bubbles, creating the instability that results in a major crash. This positive feedback loop can be associated to peers, experts, companies, countries, governments, and media outlets around the world that have been instrumental in the development of the extreme price movements Bitcoin has had and continues to experience.

## IMPACT OF MEDIA ON PRICE VOLATILITY

The popularity of Bitcoin is directly correlated to the media coverage it has experienced over the last ten years. Many studies have suggested the media has had the biggest impact on Bitcoin's popularity and the price volatility that has ensued as a result. Whether it is positive or negative media, there have been several studies linking the impact it has had on the price and overall interest from the public. One of these includes a study executed by Kjaerkand et al., which indicates a correlation between Bitcoin's level of interest and price fluctuations. As shown in Figure 3, the study compared Google search volume of the word "Bitcoin" and Bitcoin price data from September 18, 2011 to January 18, 2017, including points of positive and negative shocks to public interest. They found that there is an obvious positive relationship between Google searches and price fluctuations. This in turn supports the claim that Bitcoin's price is driven by public interest and media coverage. Their findings supported many other studies relating Bitcoin's price to what people assign it.

The analysis also indicates that the media has a huge impact on Bitcoin's price. When the media breaks a story on a political incident or a statement regarding Bitcoin, the users quickly adjust the price. Positive news increases the price, while negative news decreases the price. Negative shocks have proven to create a larger impact on price due to people's negative reactions to bad press and the uncertainty and fear they face as a result (2018). Behavioral finance's availability and overreaction biases can be attributed to this kind of response. Investors in the Bitcoin market have the tendency to weigh their decisions more heavily on recent information released by the media, sparking the tendency to overreaction and create extreme price spikes and falls. This is one study that

validates the concept that the media and public interest drives Bitcoin's price fluctuations.



**Figure 3. Bitcoin price, Google Trends and Shocks (how Google search volume and the Bitcoin price move together over the period 18.09.2011 to 05.02.2017. The green arrows show positive shocks and the red arrows show negative shocks). Adapted from “How can Bitcoin Price Fluctuations be Explained?” by F. Kjaerland, et al., 2018, International Journal of Economics and Financial Issues, 8(3), 323-332. Copyright 2018 by Creative Commons.**

There is legitimate reason, as referenced above, to believe Bitcoin's price fluctuations are positively correlated to the level of interest of the general public and the media's coverage of situations regarding Bitcoin. There have been a few monumental events and announcements that have considerably impacted the price of Bitcoin over the years. Negative press regarding hacks, governments bans, illegal transactions and influential people within the finance industry speaking adversely about Bitcoin ultimately translates into price decreases. New companies, investors, adoptions, and financial

experts supporting the cryptocurrency have in turn created price increases. All these factors come together to establish the price volatility Bitcoin has experienced.

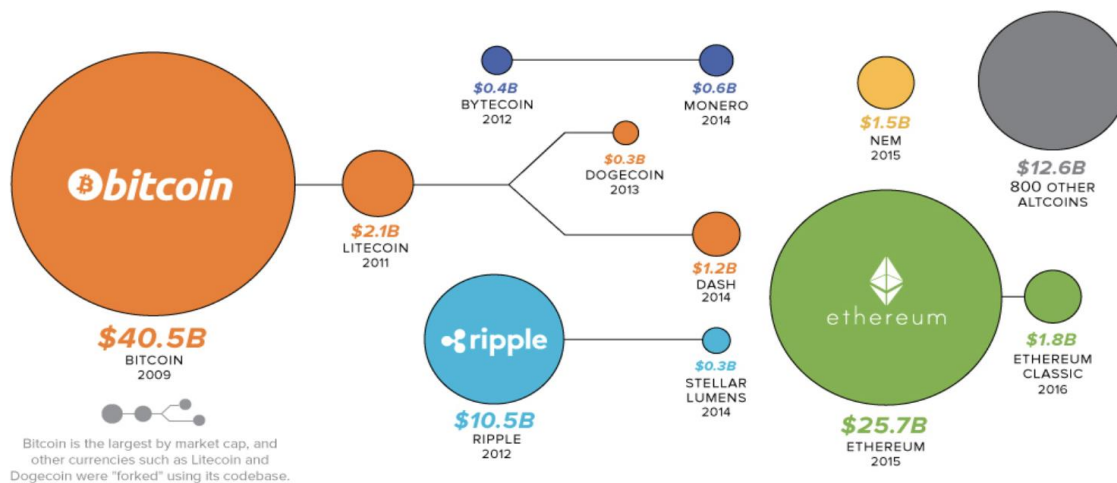
These social impacts amplified by the media are an important element to the causation of the Bitcoin Bubble. Price may be affected by risk and uncertainty, vulnerability to hacks, positive and negative media attention, public opinion, possible government regulation and general speculative behavior. These are all factors that result in a bubble that is created when an asset is overpriced due to its popularity. According to the graph titled “Bitcoin price, Google Trends and Shocks” by Buchholz et al. (2012), the price volatility of Bitcoin presents strong explanation and validation of a market bubble. This is due to the fact that during the growth period of the market bubble within the Bitcoin currency market, many market participants are lured into investing based on the enthusiasm that surrounds the price, viewing this volatility as a method to make large amounts of quick money. Once the bubble bursts market participants become afraid of holding onto their Bitcoins realizing that these fluctuations would ultimately lead to loss of their wealth. This is a direct correlation of the presence of a bubble within the market. The result is a lack of consistency in public opinion, which generates price volatility that cannot be maintained over time and ultimately ends as a burst in a bubble.

## ALTCOIN COMPETITION

According to Coinmarketcap.com, as of November 2018 there are more than 2,000 cryptocurrencies available on the market, with a combined market capitalization of roughly \$212 billion. To put this into perspective, the New York Stock Exchange had a market cap of nearly \$29 trillion as of June 2018. As visualized in Figure 4, the success

of Bitcoin as the first and most commonly adopted peer-to-peer digital currency, led to the emergence of thousands of “altcoins.” Altcoins are defined as the group of cryptocurrency alternatives that launched after the success of Bitcoin. Some of the most prevalent altcoins are Ethereum, Ripple, Bitcoin Cash, Stellar, EOS, Litecoin, and Dash.

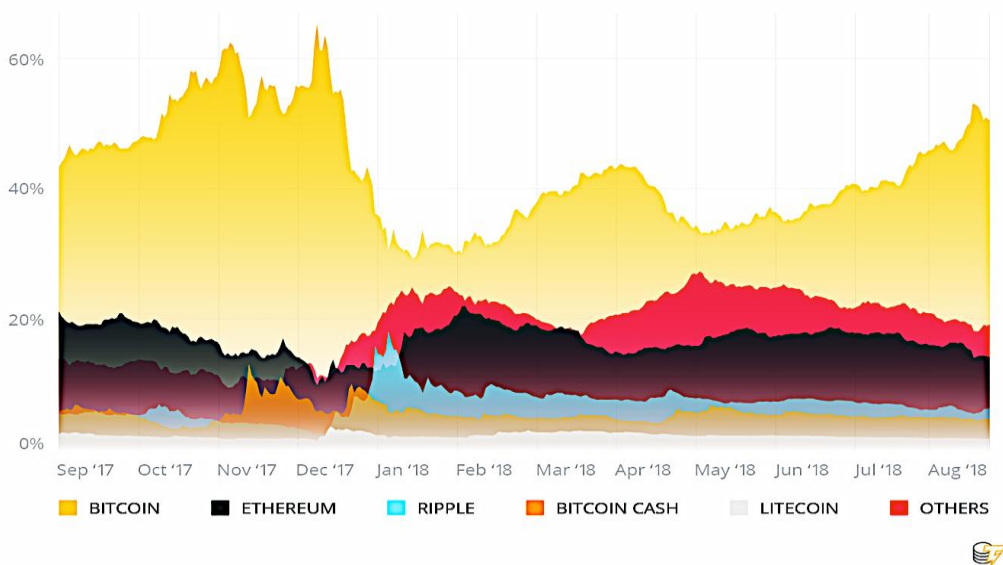
#### THE CRYPTOCURRENCY UNIVERSE



**Figure 4. The Cryptocurrency Universe.** Adapted from “The Coin Universe Keeps Expanding,” by J. Desjardins, 2017, May 26, *Visual Capitalist*. April 29, 2019, from <https://www.visualcapitalist.com/chart-coin-universe-keeps-expanding/>. Copyright 2019 by Visual Capitalist.

Bitcoin dominated the cryptocurrency market from 2014 to 2017 maintaining 80% of the market share on average. Although Bitcoin has the first-mover advantage and still holds 52% dominance on the market, it has been faced with increasing levels of competition from these alternatives. The rise of altcoins has contributed to the drastic decline of Bitcoin’s market share in the cryptocurrency market, as depicted in Figure 5.

## Percentage of total market capitalization



**Figure 5. Percentage of total market capitalization from September 2017 to August 2018. Adapted from “Bitcoin Market Dominance: From 66% to 33% and Up Again,” by P. Thompson, 2018, August 21, *Cointelegraph*. Retrieved November 11, 2018, from <https://cointelegraph.com/news/bitcoin-market-dominance-from-66-to-33-and-up-again>. Copyright 2018 by Cointelegraph.**

The utilization of the second-mover advantage has allowed alternative cryptocurrencies to take a large portion of market share Bitcoin previously dominated. Despite Bitcoin having a considerable first-mover advantage, due to its familiarity and possession of the biggest network, altcoins have taken full advantage of the second-mover advantage by modifying their cryptocurrencies to address the issues and complaints users have regarding Bitcoin (Luther, 2016). Altcoins have been able to fiercely compete with the cryptocurrency giant as a result of the ability to clone Bitcoin’s foundational ideas, such as its decentralized peer-to-peer exchange, open source code, and shared public ledger, while differentiating their cryptocurrency with tailored and personalized features. Almost all altcoins have focused their efforts on improving upon Bitcoin’s transaction speeds, service quality, and security.

Many of the top altcoins have attempted to drive business away from Bitcoin by targeting the blatant flaws associated with Bitcoin's system. One of these altcoins includes, Litecoin, which was introduced in October 2011 and is considered the one of the top rivals to Bitcoin with a current market capitalization of \$3 billion. It was built on the basic framework provided by Bitcoin, but separated itself by allowing mining transactions, the process of verifying and recording transactions to the blockchain, to be approved every two and a half minutes, as opposed to Bitcoin's ten-minute approval time. In addition, Litecoin offers a maximum circulation of 84 million coins, while Bitcoin is limited to just 21 million (Luther, 2016).

Another altcoin that aims to improve upon the transaction speed of Bitcoin is Ripple. Ripple, which was first traded in August 2013, confirms transactions through a "consensus" protocol that works much faster than mining protocols. Capable of confirming a transaction in five seconds versus Bitcoin's time frame of one to ten minutes, Ripple was able to create a substantial transactional time difference between the reigning giant (White, 2015). Consequently, Ripple has successfully become a fierce competitor offering a less expensive and faster cryptocurrency option, allowing it to hold the third largest market capitalization of \$20 billion.

These alterations to the basic framework Bitcoin provides on its open source code have given way to the influx of new and improved cryptocurrencies that have ultimately posed a serious threat to the future of Bitcoin. As more competitors enter the market, they will capture larger portions of the market share that Bitcoin has dominated its entire existence, in turn amplifying Bitcoin's risk of failure. Brad DeLong, a U.C. Berkeley economist, states unless Bitcoin can "somehow successfully differentiate itself from the



latecomers” its market value along with all the other cryptocurrencies’ will be driven to zero (2013). He worries the excessive amount of competition will cause the market to dilute itself and eventually bust.

As Charles Kindleberger explained in his book “Manias, Panics and Crashes”, enthusiasm for new markets and technologies frequently results in excessive optimism, which ultimately collides with reality in a spectacular crash (2005). Therefore, the exponential growth of competition in the cryptocurrency market may prove to be a contributing factor to the burst of the Bitcoin Bubble.

### SECTION III: COMPARATIVE ANALYSIS OF BITCOIN AND PAST BUBBLES

#### DOTCOM BUBBLE

The Dotcom Bubble, or sometimes referred to as the Tech Bubble, took place at the turning point of the 20<sup>th</sup> and 21<sup>st</sup> century. The late 1990's heralded a shift towards a "new economy." This new economy was triggered by the modern invention of the Internet. During this time, the Internet had expanded and computing had become an increasingly important part of everyday life. Thus, its uses and capabilities created an exuberant attitude toward modern businesses and inspired many hopes and dreams for the future of online commerce. This overwhelming popularity and untapped potential, sparked the launch of numerous Internet companies, known as "dotcoms." Venture capitalists poured millions of dollars into web-based companies in order to get them up, running, and onto the market, whether they were promising investments or not. The fear of missing out on the next big thing and the potential for daily gains kept investors piling money into this new, technologically advanced economy. In 1999, there were 457 initial public offerings (IPOs), most of which were dotcom stocks (Whitefoot, 2017). After the first day of trading, a quarter of those IPOs had already doubled in price. This overnight price increases generated mass hysteria that would persist for several months following.

Society's expectations of what the Internet could offer at the time were extremely unrealistic. Everyone had high hopes of becoming dotcom millionaires or even billionaires. The valuations of the stocks continued to rise at unprecedented rates. Although these dotcom stocks were trading at very high values, there was no solid evidence in relation to the economic viability of these companies, to sustain their

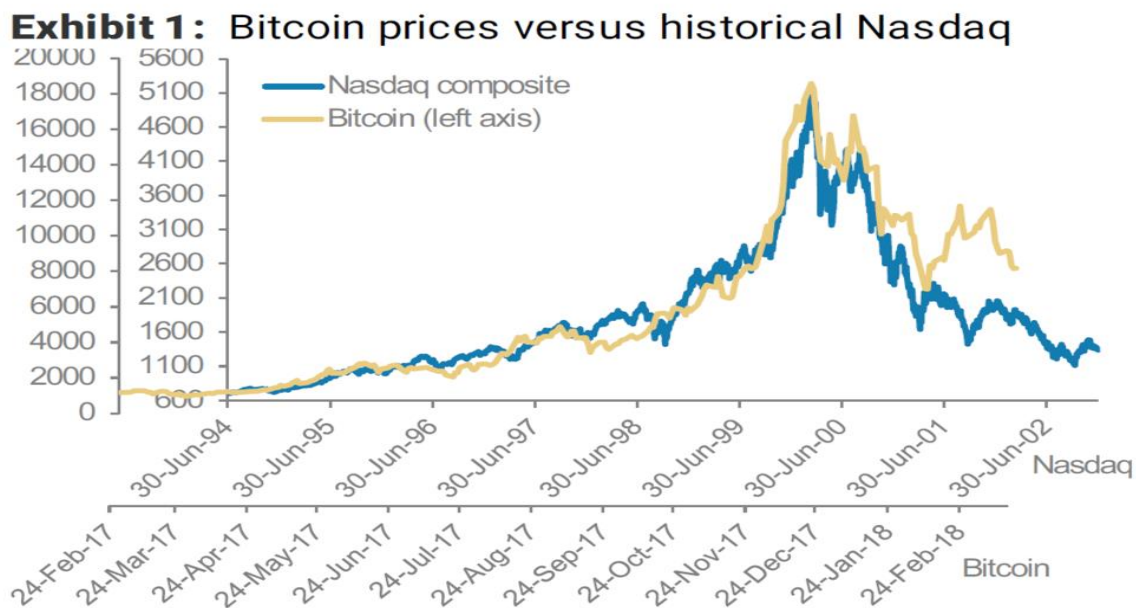
investors' optimistic expectations. According to an article by John Whitefoot, at the peak of the bubble the S&P 500 was overvalued by 176% (2017).

Once investors came to their senses regarding the sustainability of the prices of dotcom stocks, they realized they were not being valued fairly and had not proven to have any market potential. In March 2000, without any warning or indication, investors started selling their dotcom stocks in a desperate attempt to get out of their investments before they lost everything. As stated in an article written by Ben Geier for *Time Magazine*, on March 10, 2000 the combined values of all the stocks on the NASDAQ totaled \$6.71 trillion; with March 11 dating the beginning of the crash, the NASDAQ was valued at \$6.02 trillion by the end of the month. The devastation only continued its downward trend with the NASDAQ valuing at \$5.78 trillion by April 6, 2000. In less than a month, close to a trillion dollars' worth of stock value had completely vanished (2015).

The Dotcom Bubble presents a great comparative tool for the assessment of a Bitcoin Bubble. There are many parallels to be drawn between the bust of the booming market that emerged around the early applications of the Internet and the highly volatile market that has emerged around blockchain technology. These parallels consist of the price volatility and the psychological factors that drove the price valuation process, which are and were present in both markets.

Many economists and financial analysts believe the most substantial evidence foreshadowing the bust of the Bitcoin Bubble is embedded within the comparison of price volatility between the dotcom stocks in the late 1990's and Bitcoin today. In January 2018, Goldman Sachs stated in their company outlook report that the price surge in Bitcoin has surpassed the historical highs seen in the Dotcom Bubble (Kutlu, 2018).

The highest the market rose during the Dotcom Bubble was around 250% to 280%, but Morgan Stanley strategist, Sheena Shah, has claimed Bitcoin's market is accelerating nearly fifteen times that speed (Carey, 2018). In addition, as illustrated in Figure 6, Bitcoin's price chart has largely mirrored the NASDAQ composite index during the Dotcom Bubble, which should give rise to the notion that the Dotcom Bubble can be used to validate the future of cryptocurrencies, specifically Bitcoin.



Source: Bloomberg, Morgan Stanley Research

**Figure 6. Bitcoin prices versus historical Nasdaq.** Adapted from “Bitcoin Bust Reminds Morgan Stanley of Nasdaq Crash, but Faster,” by C. Russo, March 19, 2018, *Bloomberg L.P.* Retrieved February 5, 2019, from <https://www.bloomberg.com/news/articles/2018-03-19/bitcoin-bust-reminds-morgan-stanley-of-nasdaq-crash-but-faster>. Copyright 2019 Bloomberg L.P.

In regard to the price graphs of Bitcoin and dotcom stocks presented above, it is important to address that the time scales of the two graphs are not identical. The NASDAQ took several years to reach its peak, while Bitcoin's price rose nearly 20 times in less than a year. Nonetheless, the pricing patterns exhibit undeniable similarities. As Sheena Shah analyzed in her research for Morgan Stanley in March 2018, there have been three waves of weakness since Bitcoin peaked in December, with prices falling

between 45 percent and 50 percent each time, before rebounding. The Nasdaq's bear market from 2000 had five price declines, averaging a similar 44 percent. In addition, she also draws comparisons between the two markets when they are on the rebound stating there have been two Bitcoin bear market rallies of 43 percent on average, while the Nasdaq bear market rallies averaged 40 percent (2018). This correlating data helps with the assumption that the price volatility Bitcoin has experienced during its rise to fame parallels to that of which was present during the Dotcom Bubble, thus resulting in the fact that the Bitcoin Bubble has begun to burst and Bitcoin could soon face a matching fate that impacted so many in the tech market in 2000.

In addition to the correlation Bitcoin and the Dotcom Bubble have in regards to their price volatility, they also share psychological factors that are associated with the fluctuations in their prices. Alan Greenspan, Chairman of the Federal Reserve Board from 1987 to 2006, cautioned against irrational exuberance during the period leading up to the Dotcom burst (Morris & Alam, 2008). The term irrational exuberance, coined by Greenspan, refers to psychologically driven volatility resulting from investor enthusiasm that drives asset prices up to levels that are not supported by fundamentals. This concept was extremely relevant to dotcom stocks and coincidentally to the Bitcoin market as well.

The drastic price increases witnessed by both Bitcoin and online companies in the late 1990's can be attributed to the speculative behavior of investors. Investors with little knowledge of the new technology, in addition to assets with basically no concrete financial backing, allowed for misleading price valuations in both sectors. The obsession over the idea of a "new technology" conjures up dreams of wealth and modern-day

success. This environment was prevalent during the dotcom era and is a leading factor in the present-day Bitcoin craze.

The dotcom stocks and cryptocurrency companies have employed similar tactics to spark consumer interest and demand. During the dotcom era companies would simply put dot com behind their names and their stocks would soar. The most famous dot com company flop was pets.com. Pets.com was based on an Amazon style internet purchasing system that sold pet supplies. It's February 2000 IPO raised \$82.5 million. The shares began at \$11 and quickly rose as high as \$14. The overwhelming interest and excitement that surrounded the emerging e-commerce market was deflated by the company's inability to produce monetary gains. Consequently, the viability of this avant-garde business plan did not sustain a financially stable company, causing pets.com to file for bankruptcy by the following November with its shares trading at \$0.19 (Goldman, 2010).

Similarly, companies have attempted to take advantage of the Bitcoin mania in this same fashion. For example, the popular beverage company, Long Island Iced Tea Corporation recently changed its name to Long Blockchain Corporation. This proved to be a successful attempt at cashing in on the cryptocurrency craze as their stock surged 200% shortly after the news broke on December 21, 2017, with their price peaking at \$7.66 (Cheng, 2017). Their attempt, along with many other companies, has proven to be unsuccessful as Long Island Blockchain Corporation recently closed at a price of \$0.40 on April 12, 2019.

The popularity and media attention of both dotcom stocks and Bitcoin have proven to make a huge impact on their price valuation and ultimately the instability that

results. Financial analysts and economists have drawn parallels between the Dotcom Bubble and the current bubblelike properties present within Bitcoin.

## DUTCH TULIP MANIA

In addition to the Dotcom Bubble, many analysts and academics have referenced the “Dutch Tulip Mania” as a comparative tool for the presence of a bubble within Bitcoin. The Tulip Mania is widely regarded as the first recorded financial bubble and crash in history. In the mid-1500s, after the tulip was first imported to Europe from Ottoman Empire, the Netherlands became a hub of cultivation and development of new tulip varieties.

The scarcity and beauty of these flowers made them valuable and attracted the attention of members of the aristocratic society who viewed them as a status of wealth. A market for rare varieties of tulips was created and bulbs were sold at extremely high prices. As the tulip market flourished, demand for these flowers grew immensely, and prices sky rocketed as a result. “For, example a Semper Augustus bulb sold for 2000 guilders in 1625, an amount of gold worth about \$16,000 at \$400 per ounce” (Garber, 1990). The rising prices attracted more and more speculative buyers, driven by the pursuit of wealth.

The development of the bubble lasted from November 1636 to January 1637, during this period people were not growing tulips, but instead selling them. The decrease in production propelled the prices to unprecedented levels. At this point, tulip prices had no correlation to any fundamental value and the demand could not be maintained. At the mania’s peak investors were trading their houses and business in exchange for tulips.

In February 1637, the tulip bubble abruptly popped after it was finally realized that tulip prices had grown too high and demand was eliminated. In conclusion, the value of tulip bulbs plummeted to virtually nothing and investors began frantically selling. This dramatic ending to the Tulip Mania created economic devastation in the Netherlands for years to follow (Sornette, 2003).

The Bitcoin bubble has been compared to the Tulip Mania mainly due to its speculative nature and price volatility. Elliot Prechter, the son of renowned stock market analyst Robert Prechter, was one of the only financial analysts who predicted the success of digital currencies when they were selling at just six cents. Years later he now has a different perspective on the future of the cryptocurrency market. In an interview with CNBC in 2017, Elliot Prechter stated “the price activity and manic sentiment that led to (Bitcoin’s) present prices have dwarfed even the Tulip mania of nearly 400 years ago” (Cheng, 2017).

Prechter compares the forecasts for Bitcoin’s dramatic rise to that of the Dotcom bubble in 1999 and the excitement that has surrounded those forecasts to the Tulip Mania in the early 1600s. This is presented visually in Figure 7. Prechter’s prediction is based on the fact that “technology has advanced greatly, but human psychology is still the same” (Cheng, 2017).



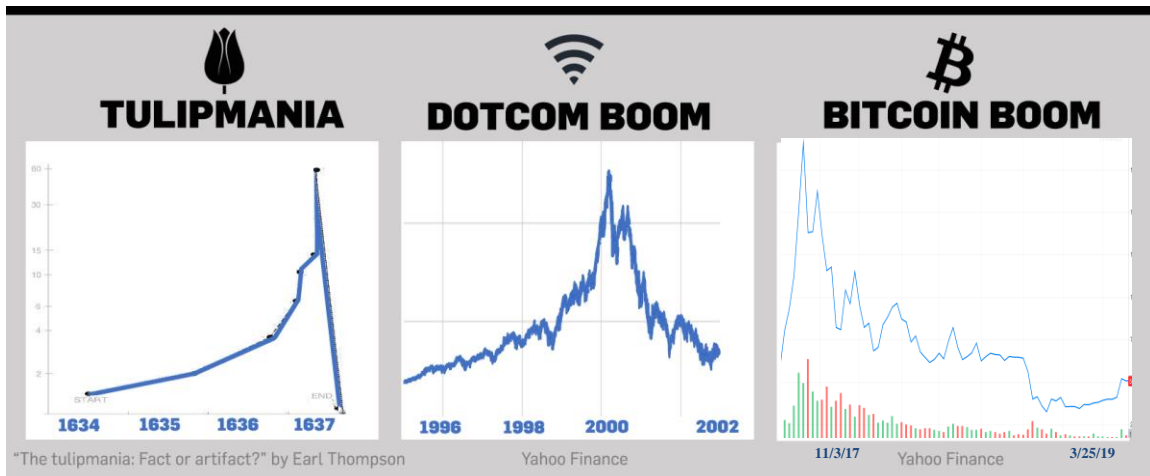


Figure 7. Comparative pricing chart of the Tulip Mania, Dot Com Boom and Bitcoin Boom. Adapted from "Look How Bitcoin's Rise Stacks up Against the Internet Bubble and Tulipmania," by C. Nolter, December 11, 2017, *thestreet.com*. Retrieved December 27, 2019, from <https://www.thestreet.com/story/14416869/1/bitcoin-bubble-versus-dot-com-boom-tulipmania.html>. Copyright 2019 TheStreet Inc.

Andrew Kenningham, chief global economist at Capital Economics, has a similar opinion to that of Elliot Prechter. In a note to clients he makes the connection that like Bitcoin, tulips during the Tulip Mania became popular because of “their strangeness and rarity” and because they “were new arriving from the Ottoman Empire in the late 16<sup>th</sup> century” (Archer, 2017). This is an example of “irrational exuberance” that Alan Greenspan cautioned about leading up to the Dotcom bust. At the beginning cautionary signals are ignored due to the reports of unbelievable success stories and the potential for extreme returns made in a short amount of time. The media outlets fuel the herd mentality, which results in large groups of people wanting to get in on the possibility of acquiring great wealth. This ignites the “fear of missing out” stage that justifies investments based on emotion rather than financial fundamentals. At the end of the process, the greater fool theory is the result. The bubble will continue to grow as long as early investors, “the fool,” can find a new investor, “greater fool,” to purchase their overvalued investment.

This sequence of events can be used to compare the Tulip Mania to Bitcoin. In the beginning, Bitcoin, being perceived as a unique and somewhat unknown application of modern technology, gained a great deal of attention and interest. Comparable to Bitcoin, during the 1600s tulips were popular due to their rarity and strangeness. In both cases, these sentiments fueled their initial rise in prices. As people and the media began tracking Bitcoin's growth, more and more people invested in cryptocurrency in hopes they would be the next millionaire to emerge from the latest trend. This caused the price to rise dramatically and investors to start regarding the speculative price as the intrinsic value, setting the stage for the popping of the bubble.

William Deringer, a historian at MIT, presents a parallel between the Tulip Mania and today's Bitcoin boom by connecting the fact that "the value of the thing was not just about a calculation of its economic return, but also about the aesthetic value of its coolness" (Lee, 2017). Just as tulips were representative of a status symbol in the 1600s, Bitcoin also carries the cool factor relative to its classification as a fashionable, technology driven investment. As Bloomberg columnist, Noah Smith, reported in December 2018, Bitcoin's spectacular rise and fall is due to "a combination of herd behavior, cynical speculation and the entry into the market of a large number of new, poorly informed investors" (2018). Just as people were exchanging their homes and businesses for tulip bulbs in the Netherlands, people around the world are investing their life savings into Bitcoin. Unfortunately, these investors are not educating themselves on the amount of risk they are assuming. Bitcoin, like the tulip bulbs are not sure bets. Although the Tulip Mania happened in the 1600s, the similarities between Bitcoin's speculative behavior and psychological factors that influence human decision-making

result in a valuable comparison that provides evidence that Bitcoin could face the same fate as the Tulip Mania.

#### SECTION IV: BLOCKCHAIN IN THE FUTURE

A great deal of current evidence points to the fact that Bitcoin will not survive the test of time, but many believe the underlying technology it operates on is here to stay. Blockchain, also known as distributed ledger technology, has seen widespread acceptance since its introduction as the foundation of Nakamoto's bitcoin cryptocurrency system. Due to its complex nature, many of blockchain's potential benefits have not yet been realized.

The emergence of blockchain technology has the potential to provide "general-purpose technology for companies and governments to support information exchange and transactions that require authentication and trust" (Ølnes, Ubacht, & Janssen, 2017). Although blockchain initially gained popularity as a revolutionary alternative to the use of traditional financial intermediaries, over the last decade blockchain has demonstrated its potential to transform business, government, and society in a multitude of ways. The technology blockchain provides will be capable of changing how we exchange value.

The 1990's, which introduced the innovation of the internet, gave people the access to a completely new and innovative method of exchanging information and value. Today, blockchain is the latest technology that is capable of facilitating these exchanges by "creating a record of human exchange, of exchange of currency, of all kind of digital and physical assets, and even personal attributes, in a totally new way" (Walburg, 2016). Andrew Gazdecki, founder and CEO of Altcoin.io, claims that blockchain is the ultimate

enemy of bureaucracy, capable of removing the middle man from complex tasks, resulting in less expensive, quicker, and more transparent technological frameworks (2018).

Blockchain is just now entering the initial stages of global adoption, with Dubai leading the pack. An article written by Forbes in December 2017, reported that Dubai has vowed to replace all government systems with digital ledger technology-based digital structures by 2020. They intend on utilizing blockchain technology to transact all visa applications, bill payments and license renewals. Dubai's commitment to moving to a blockchain based government has the potential to save them \$1.5 billion per year and 25.1 million-man hours, significantly improving their city's overall efficiency. Through the implementation of blockchain in the next year, Dubai hopes to create partnerships in order to enhance banking, mortgages and utilities and maintenance operations (D'Cunha, 2017).

Although Dubai is one of few governments that has fully committed to the blockchain movement, there are a multitude of reasons people believe blockchain will become rapidly accepted and even have the potential to take over the world in the near future. One of which is blockchains ability to aid in medical treatments by creating an accessible, permanent blockchain record of an individual's complete medical history. This simple application of blockchain could potentially improve the diagnoses and treatment of patients around the world.

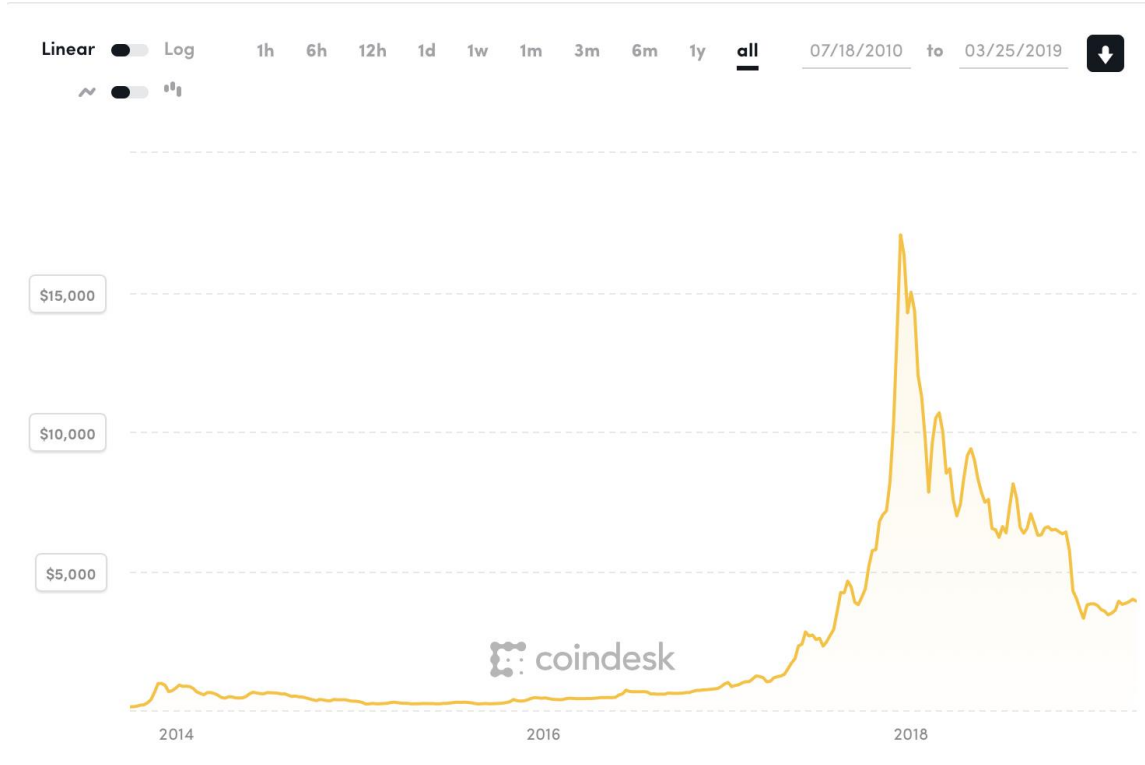
Another very popular and useful application of blockchain are smart contracts. Smart contracts are defined by IBM as "lines of code that are stored on a blockchain and automatically executed when predetermined terms and conditions are met" ("What,"

2018). These contracts can be used for supply chain management, car purchases, house purchases, intellectual property, insurance and many other business applications. The streamlining capability of smart contracts allows for complex processes to be expedited with the accessibility of an individual's stored identity on the blockchain in order to ensure their creditworthiness and bypass the need for intermediaries. Smart contracts are not yet used to their full potential, but they are gaining popularity and are expected to be an integral part of business deals in future.

Just as the internet emerged from the Dotcom Bubble, blockchain is predicted to withstand the potential failure of Bitcoin and other cryptocurrencies. With its many time and cost saving applications as well as its early adoption by large firms and governments, blockchain is on the rise and will definitely be making an impact on society in the foreseeable future. This is supported by the opinions of many as reflected in a 2018 survey done by Deloitte which found that 59% of early adopters in the business community believe in blockchains potential to disrupt and revolutionize their industries, as well as the overall economy ("Global," 2018).

With that being said, it appears that blockchain technology will have a far greater impact on global commerce and the exchange of information and value than Bitcoin as a cryptocurrency. Society should rest assured Bitcoin has the ability to leave behind a revolutionary technology that has yet to realize its fullest potential.

## DISCUSSION AND CONCLUDING REMARKS



**Figure 8: Bitcoin's (USD) price from 01.01.18 to 03.25.19. Coindesk.com. Retrieved March 25, 2019, from <https://www.coindesk.com/price/bitcoin>.**

After comparing the Dotcom Bubble and the Tulip Mania to Bitcoin, there are many indications that the burst of the Bitcoin Bubble has already begun. Consistent with the two financial bubbles analyzed, price volatility and the psychological factors driving price formation are the two major components that have provided a direct correlation to past trends of historic bubbles. The conclusion of 2018 brought even more evidence of the Bitcoin Bubble popping. Reports of depreciation of more than 70% from its opening price of \$13,062, at the beginning of the year, resulted in the worst year in Bitcoin's history. As mentioned earlier, Bitcoin has continued to depreciate as it currently selling at \$3,910 on March 25, 2019. In comparison to 2014, prices fell roughly 55% from open to

close (Ouimet, 2019). These statistics have painted a grim picture for the future of Bitcoin and create even more creditable proof of the existence of a Bitcoin Bubble.

By comparing all the properties of past bubbles that exist in Bitcoin, Harvard University lecturer Vikram Mansharamani, author of “Boombustology: Spotting Financial Bubbles Before They Burst” provides personal experience of the bubble-like properties Bitcoin has shown over the course of a two-year period. In March 2017, Mansharamani started hearing that Bitcoin was a mania, but he disagreed and bought his own Bitcoins for roughly \$1,000 each. By December 2017, when Bitcoin was on its ascent towards \$20,000 he sold his lot and made a significant return. At this point in time, Mansharamani realized that Bitcoin had nearly covered all the criteria he had in place for a bubble. In the ten months he personally owned Bitcoins, the market had changed tremendously. When he initially invested, Bitcoin had not yet reached a level of widespread participation, due to the technical hurdles involved with buying cryptocurrencies, as opposed to tech stocks, tulips or houses. By the end of 2018, media attention and Google searches provided the widespread notoriety Bitcoin had lacked when he first entered the market.

The use of leverage was another criterion that Bitcoin had to reach in order to qualify as a bubble. This was achieved once stories emerged of people selling all their belongings and using all their savings to invest in Bitcoin when it was at a peak, much like what happened during the Tulip Mania. Another of Mansharamani’s bubble indicators was reflexivity, defined as prices going up simply because they are increasing without an anchor in objective reality. At the end of 2017, over-trusting investors were

willing to purchase crypto-related investments that did not prove to have any store of value.

Similar to the Dotcom Bubble in the early 2000s, poorly performing companies are attempting to and sometimes finding temporary success in multiplying their value by associating themselves with cryptocurrencies, such as Long Island Iced Tea Corp. In addition to all these signals, overconfidence in the Bitcoin market replicated that of the dotcom stocks, even further supporting its qualification as a potential bubble (Jakab, 2018). Bitcoin's ability to meet the majority of Vikram Mansharamani's criteria over a two-year period have solidified the argument that Bitcoin is indeed representative of a typical bubble.

Mansharamani is not the only reference backing this claim, as cryptocurrency and blockchain were popular topics of discussion at the January 2019 World Economic Forum in Davos, Switzerland. Many well-known investors spoke on the future state of Bitcoin and cryptocurrencies in general, most notably was Jeff Schumacher, a large investor in blockchain-focused companies and founder of BCG Digital Ventures. When speaking on the future of Bitcoin Schumacher declared, "I do believe it will go to zero. I think it's a great technology but I don't believe it's a currency. It's not based on anything" (Kharpal, 2019). The amount of wealth tied up in Bitcoin, approximately a few hundred million dollars that is dispersed across the globe, in reality is small compared to the 2000s housing bubble and the 1990s Dotcom bubble (Smith, 2018). The impact of the Bitcoin market crash will not have as large of a financial impact that past bubbles have had on the economy.



Although, a large portion of financial analysts, renowned investors, and economists have predicted the fall of Bitcoin, there is a sliver of positive news. If the Bitcoin Bubble does bust there may be a net good for society

Most importantly, blockchain technology, is expected to have a much larger impact on society and commerce than Bitcoin itself. All things considered, Bitcoin has proven to be a revolutionary technological advancement that has opened the door for future ways of conducting global commerce and revolutionizing the way information is communicated and stored through its introduction of blockchain technology to the modern world.

## REFERENCES

- Archer, S. (2017, December 8). There's a lot to learn about bitcoin from looking at the tulip bulb bubble | Markets Insider. Retrieved from <https://markets.businessinsider.com/news/stocks/bitcoin-price-and-tulipmania-have-a-lot-more-in-common-than-you-might-think-2017-12-1010622704>
- Bitcoin Crypto-Economics Index by CoinDesk. (n.d.). Retrieved from <https://www.coindesk.com/price/bitcoin>
- Buchholz, M., Delaney, J., Warren, J., & Parker, J. (2012). Bits and bets: information, price volatility, and demand for Bitcoin, Retrieved from <https://www.reed.edu/economics/parker/s12/312/finalproj/Bitcoin.pdf>
- Carey, J. (2018, Mar 20). Bitcoin PRICE SHOCK: Stark warning cryptocurrency could 'CRASH' faster than dot-com bubble. *Express (Online)* Retrieved from <https://proxy.lib.utc.edu/login?url=https://search-proquest-com.proxy.lib.utc.edu/docview/2015649799?accountid=14767>
- Cassidy, J. (2008, February 4). The Minsky Moment. Retrieved from <https://www.newyorker.com/magazine/2008/02/04/the-minsky-moment>
- Cheng, E. (2018, May 08). Bill Gates: I would short bitcoin if I could. Retrieved from <https://www.cnbc.com/2018/05/07/bill-gates-i-would-short-bitcoin-if-i-could.html>
- Cheng, E. (2017, December 26). \$24 million iced tea company says it's pivoting to the blockchain, and its stock jumps 200%. Retrieved from <https://www.cnbc.com/2017/12/21/long-island-iced-tea-micro-cap-adds-blockchain-to-name-and-stock-soars.html>
- Cheng, E. (2017, July 20). Bitcoin bubble dwarfs tulip mania from 400 years ago, Elliott Wave analyst says. Retrieved from <https://www.cnbc.com/2017/07/20/bitcoin-bubble-dwarfs-tulip-mania-from-400-years-ago-elliott-wave.html>
- Darlington, J. K. (2014). *The Future of Bitcoin: Mapping the Global Adoption of World's Largest Cryptocurrency Through Benefit Analysis* (Thesis). Retrieved from [http://trace.tennessee.edu/utk\\_chanhonproj/1770](http://trace.tennessee.edu/utk_chanhonproj/1770)
- D'Cunha, S. D. (2017, December 18). Dubai Sets Its Sights On Becoming The World's First Blockchain-Powered Government. Retrieved from <https://www.forbes.com/sites/suparnadutt/2017/12/18/dubai-sets-sights-on-becoming-the-worlds-first-blockchain-powered-government/#5c95ff20454b>
- DeLong, B. (2013, December 28). Watching Bitcoin, Dogecoin, Etc... Retrieved from <https://equitablegrowth.org/watching-bitcoin-dogecoin-etc/>
- Dyhrberg, A.H. (2015). Bitcoin, gold and the dollar-A GARCH volatility analysis. *Finance Research Letters*, 16, 85-92.
- England, C., & Fratrick, C. (2018). Where to bitcoin? *Journal of Private Enterprise*, 33(1), 9-30. Retrieved from <https://proxy.lib.utc.edu/login?url=https://search-proquest-com.proxy.lib.utc.edu/docview/2043221157?accountid=14767>
- Fiorillo, Steve. (2018, August 17). Bitcoin History: Timeline, Origins and Founder. Retrieved from <https://www.thestreet.com/investing/bitcoin/bitcoin-history-14686578>
- Galka, M. (2018, February 12). How Bitcoin compares to historical market bubbles. Retrieved from <https://elementus.io/blog/bitcoin-bubble/>

- Garber, P. (1990). Famous First Bubbles. *The Journal of Economic Perspectives* (1986-1998), 4(2), 35. <https://doi.org/10.1257/jep.4.2.35>
- Garcia, D., Tessone, C. J., Mavrodiev, P. & Perony N. The Digital Traces of Bubbles: Feedback Cycles between Socio-Economic Signals in the Bitcoin Economy. *Journal of the Royal Society Interface*, 11(99). Retrieved from <http://rsif.royalsocietypublishing.org/content/11/99/20140623>
- Gazdecki, A. (2018, September 07). Five Ways Blockchain Could Change The World. Retrieved from <https://www.forbes.com/sites/forbestechcouncil/2018/09/07/five-ways-blockchain-could-change-the-world/#752595a773d7>
- Geier, B. (2015, March 12). What Did We Learn From the Dotcom Stock Bubble of 2000? Retrieved from <http://time.com/3741681/2000-dotcom-stock-bust/>
- Global Blockchain Survey | Deloitte US. (2018, August 30). Retrieved from <https://www2.deloitte.com/us/en/pages/consulting/articles/innovation-blockchain-survey.html>
- Goldman, D. (2010, March 10). 10 big dot.com flops. Retrieved from [https://money.cnn.com/galleries/2010/technology/1003/gallery.dot\\_com\\_busts/](https://money.cnn.com/galleries/2010/technology/1003/gallery.dot_com_busts/)
- Gordon, J. D. (2011). Defining a Common Enterprise in Investment Contracts. *Ohio State Law Journal*, 72(1), 59–94. Retrieved from <https://proxy.lib.utc.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ofm&AN=502635630&site=ehost-live>
- Grewal-Carr, V., & Marshall, S. (2017, September 27). Blockchain - Enigma Paradox Opportunity | Deloitte Switzerland | Innovation. Retrieved from <https://www2.deloitte.com/ch/en/pages/innovation/articles/blockchain.html>
- Guzzetta, J. W. (2018). How Bitcoin Works - A Technological Description of Blockchain-Based Cryptocurrencies for Nontechnical Lawyers. *The Computer & Internet Lawyer*, 35(3), 21+. Retrieved from [http://link.galegroup.com/apps/doc/A530008529/AONE?u=tel\\_a\\_utc&sid=AONE&xid=16300ec4](http://link.galegroup.com/apps/doc/A530008529/AONE?u=tel_a_utc&sid=AONE&xid=16300ec4)
- Hileman, G., & Rauchs, M. (2017 April 6). Global Cryptocurrency Benchmarking Study. Retrieved from <https://ssrn.com/abstract=2965436>
- Kindleberger, C. P. (2005). Manias, Panics, and Crashes: A History of Financial Crises. Hoboken, NJ: John Wiley & Sons Inc.
- Kharpal, A. (2019, January 23). 'Bitcoin will go to zero': Davos talks up the future of blockchain tech. Retrieved from <https://www.cnbc.com/2019/01/23/bitcoin-price-going-to-zero-davos-future-of-blockchain-tech-.html>
- Kjærland, F., Meland, M., Oust, A., & Øyen, V. (2018). How can Bitcoin Price Fluctuations be Explained?, *International Journal of Economics and Financial Issues*, 8 (3), 323-332.
- Kutlu, Ö. (2018, Jan 24). Bitcoin tops dot-com, tulip mania bubbles: Goldman S. *Anadolu Agency : AA* Retrieved from <https://proxy.lib.utc.edu/login?url=https://search-proquest-com.proxy.lib.utc.edu/docview/1990528839?accountid=14767>
- Jakab, S. (2018, December 14). Bitcoin Wasn't a Bubble Until It Was. Retrieved from <https://www.wsj.com/articles/bitcoin-wasnt-a-bubble-until-it-was-11544783400>

- Lee, T. B. (2017, December 08). Is Bitcoin a bubble? Here's what two bubble experts told us. Retrieved from <https://arstechnica.com/tech-policy/2017/12/is-bitcoin-a-bubble-heres-what-two-bubble-experts-told-us/>
- Lehman, R. (2017, December 14). A Behavioral Finance View of Cryptocurrencies. Retrieved from <https://www.behavioralfinance.com/bitcoin-behavior/2017/12/13/a-behavioral-finance-view-of-cryptocurrencies>
- Litwack, S. (2015). Bitcoin: Currency or Fool's Gold?: A Comparative Analysis of the Legal Classification of Bitcoin. *Temple International & Comparative Law Journal*, 29(2), 309–348. Retrieved from <https://proxy.lib.utc.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ofm&AN=121641367&site=ehost-live>
- Luther, W. (2016). Bitcoin and the Future of Digital Payments. *The Independent Review*, 20(3), 397-404. Retrieved from <http://www.jstor.org.proxy.lib.utc.edu/stable/24562161>
- Mandjee, T. (2015). Bitcoin, its Legal Classification and its Regulatory Framework. *Journal of Business & Securities Law*, 15(2) 157–219.
- McLean, S., & Deane-Johns, S. (2016). Demystifying blockchain and distributed ledger technology - hype or hero? *Computer Law Review International*, 17(4), 97-102. doi:<http://dx.doi.org.proxy.lib.utc.edu/10.9785/cr-2016-0402>
- Monaghan, A. (2018, February 2). Bitcoin biggest bubble in history, says economist who predicted 2008 crash. Retrieved from <https://www.theguardian.com/technology/2018/feb/02/bitcoin-biggest-bubble-in-history-says-economist-who-predicted-2008-crash>
- Morris, J. J., & Alam, P. (2008, June 27). Analysis of the Dot-Com Bubble of the 1990s. Retrieved from <http://dx.doi.org/10.2139/ssrn.1152412>.
- Murphy, D. (2017, December 12). Bitcoin is a 'dangerous speculative bubble,' Yale expert says. Retrieved from <https://www.cnbc.com/2017/12/04/bitcoin-is-a-dangerous-speculative-bubble-yale-expert-says.html>
- Murthy, S. S. N. (2018). Bitcoin – the high volatile crypto currency. *Sansmaran Research Journal*, , 1-15. Retrieved from <https://proxy.lib.utc.edu/login?url=https://search-proquest-com.proxy.lib.utc.edu/docview/2090302696?accountid=14767>
- Nolter, C. (2017, December 13). Look How Bitcoin's Rise Stacks up Against the Internet Bubble and Tulipmania. Retrieved from <https://www.thestreet.com/story/14416869/1/bitcoin-bubble-versus-dot-com-boom-tulipmania.html>
- Ølnes, S., Ubacht, J., & Janssen, M. (2017). Blockchain in government: Benefits and implications of distributed ledger technology for information sharing. *Government Information Quarterly*, 34(3), 355-364. doi:10.1016/j.giq.2017.09.007
- Ouimet, S. (2019, January 02). Down More than 70% in 2018, Bitcoin Closes Its Worst Year on Record. Retrieved from <https://www.coindesk.com/down-more-than-70-in-2018-bitcoin-closes-its-worst-year-on-record>
- Russo, C. (2018, March 19). Bitcoin Bust Reminds Morgan Stanley of Nasdaq Crash, But Faster. Retrieved from <https://www.bloomberg.com/news/articles/2018-03-19/bitcoin-bust-reminds-morgan-stanley-of-nasdaq-crash-but-faster>

- Shah, S. (2018, March 19). Features of a bitcoin bear market. Retrieved from [http://www.fullertreacymoney.com/system/data/files/PDFs/2018/March/21st/MS%20CRYPTOCURRENCY\\_20180319\\_0000.pdf](http://www.fullertreacymoney.com/system/data/files/PDFs/2018/March/21st/MS%20CRYPTOCURRENCY_20180319_0000.pdf)
- Shiller, R. (2003). From Efficient Markets Theory to Behavioral Finance. *The Journal of Economic Perspectives*, 17(1), 83-104. Retrieved from <http://www.jstor.org/stable/3216841>
- Smith, N. (2018, December 11). Yep, Bitcoin Was a Bubble. And It Popped. Retrieved from <https://www.bloomberg.com/opinion/articles/2018-12-11/yep-bitcoin-was-a-bubble-and-it-popped>
- Sornette, D. (2003). Critical market crashes. *Physics Reports*, 378(1), 1–98. [https://doi.org/10.1016/S0370-1573\(02\)00634-8](https://doi.org/10.1016/S0370-1573(02)00634-8)
- Warburg, B. (2016, June). How the blockchain will radically transform the economy. Retrieved from [https://www.ted.com/talks/bettina\\_warburg\\_how\\_the\\_blockchain\\_will\\_radically\\_transform\\_the\\_economy?language=en](https://www.ted.com/talks/bettina_warburg_how_the_blockchain_will_radically_transform_the_economy?language=en)
- What are smart contracts on blockchain? (2018, December 03). Retrieved from <https://www.ibm.com/blogs/blockchain/2018/07/what-are-smart-contracts-on-blockchain/>
- White, L. H. (2015). The Market for Cryptocurrencies. *CATO Journal*, 35(2), 383–402. Retrieved from <https://proxy.lib.utc.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ofm&AN=102976693&site=ehost-live>
- Whitefoot, J. (2017, March 27). The Dotcom Bubble Crash Explained in a Timeline. Retrieved from <https://www.lombardiletter.com/the-dotcom-bubble-crash-a-timeline/9251/>
- Williams-Grut, A. (2018, October 31). Bitcoin turns 10: An annotated timeline. Retrieved from <https://finance.yahoo.com/news/history-bitcoins-first-decade-one-chart-003220581.html>