



Bitcoin: Investment or Illusion?

Stay away from bitcoin. It is a mirage. —Warren Buffett¹

It is a fraud. It is worse than tulip bulbs. —Jamie Dimon²

Bitcoin offers a sweeping vista of opportunity. —Marc Andreessen³

I am a believer. —Abigail Johnson⁴

[I am] still thinking about bitcoin...Folks also were skeptical when paper money displaced gold. —Lloyd Blankfein⁵

In September 2017, John Brown, a hedge fund manager in Greenwich, Connecticut, faced a quandary. The tactical hedge fund was mandated to field investment ideas from its limited partners (LPs), and Brown received a call from his largest LP, who asked in less-than-polite terms why Brown's fund had no exposure to digital currencies, specifically bitcoin. The LP had spent his summer in a popular resort town a few hours outside of New York City reading articles and listening to CNBC reports about bitcoin and became increasingly irritated as he listened to his friends and neighbors discussing the paper fortunes they were generating on the back of bitcoin's stunning rise (**Exhibit 1**).

The LP wanted to know why Brown had not considered a bitcoin allocation for the fund, and while Brown explained the long-term importance of other strategic positions he had been working on, the LP wondered aloud rhetorically when the next redemption window was. Brown needed to generate an investment thesis for or against bitcoin, and he had no time to waste.

Brown began to do some initial research. The price of a "bitcoin"—nothing more than a computer program and human imagination—was around USD5,000 (**Exhibit 2**).⁶ During the previous year alone, the price had

¹ Alex Crippen, "Buffett Blasts Bitcoin as 'Mirage': 'Stay Away!'" CNBC, March 14, 2014.

² Hugh Son, Hannah Levitt, and Brian Louis, "Jamie Dimon Slams Bitcoin as a 'Fraud,'" Bloomberg, September 12, 2017.

³ Marc Andreessen "Why Bitcoin Matters," *New York Times*, January 21, 2014.

⁴ Beth Healy, "Abby Loves Bitcoin: Fidelity Chief Touts Digital Currency in First Major Speech," *Boston Globe*, May 23, 2017.

⁵ Lloyd Blankfein (@lloydblankfein), "Still Thinking about #Bitcoin. No Conclusion - Not Endorsing/Rejecting. Know that Folks Also Were Skeptical When Paper Money Displaced Gold," Twitter, October 3, 2017, 11:09 a.m., <https://twitter.com/lloydblankfein/status/915277671831044098> (accessed Oct. 18, 2017).

⁶ Data from CoinDesk accessed on September 13, 2017. USD = U.S. dollars.

appreciated over 700%. Every mainstream observable metric regarding its usage and users' engagement had skyrocketed (**Exhibits 3–5**).⁷ Brown had to admit, too, that it had become impossible to consume news of any kind recently without hearing about bitcoin. He reflected on his LP's question and wondered whether other hedge funds saw an investment opportunity in digital currencies. He wondered if the interest in bitcoin was just in the United States. He wondered about supply and demand factors. He wondered how a bitcoin came into existence. He wondered about volatility. He wondered if bitcoin was actually a currency, an asset, a commodity like gold, all of those things, or none of those things. He wondered what bitcoin might be correlated to, if anything. He wondered if any of this could help him determine answers to his ultimate questions: To invest or not, and why?

He had a lot of work to do, and the clock was ticking.

A (Very) Brief History of Bitcoin⁸

If bitcoin had a birthday (**Exhibit 6**), it would be in October 2008, when a person, or group of people, using the name Satoshi Nakamoto, released a paper titled “Bitcoin: A Peer-to-Peer Electronic Cash System.” This paper, leveraging decades of cryptography research, proposed “a purely peer-to-peer version of electronic cash [which] would allow online payments to be sent directly from one party to another without going through a financial institution.”⁹ The purpose of bitcoin, as expressed in the paper, was to “allow any two willing parties to transact directly with each other without the need for a trusted third party.” It was unclear whether the *intention* of these original electronic cash networks was to circumvent or disintermediate governmental intervention. However, as early as the early 1980s, computer scientists were inventing untraceable payment systems that separated a person's identity from their transactions, and enthusiasts of the technology touted its ability to separate from fiat currencies.¹⁰ Software code would authenticate and protect transactions instead of the trusted third party, such as the bank or Treasury Department, among others. The bitcoin, the actual thing itself, would simply serve as a “certificate of authenticity” of a transaction between two peers.¹¹

The first bitcoin “transaction” occurred roughly three months later, on January 12, 2009, when Satoshi Nakamoto sent Hal Finney, a computer scientist who contributed to an intellectual precursor to bitcoin, 10 bitcoins as a test of the network.¹² By July 2011, the price of bitcoin climbed to around \$15, and tens of thousands of bitcoins were trading on a daily basis. However, by this time, security flaws in the apps used to store bitcoins on a personal computer or mobile device—called *wallets*—were becoming better known and publicized. Bitcoin wallets were—and continued to be—subject to hacking and theft.¹³ While the usage of the “censorship-free currency” was growing quickly, the largest volume of usage at the time remained online gambling and trading in illicit drugs on the Silk Road website (an anonymous black market).¹⁴

Shortly thereafter, in August 2012, Coinbase, a start-up digital currency exchange with turnkey software¹⁵ enabling nontechnical users to trade digital currencies, debuted at Y Combinator's “Demo Day” (Demo Day was an event at which the latest class of Y Combinator–funded founders presented their companies to a room

⁷ Data from Spreadstreet accessed on September 13, 2017.

⁸ “An Abridged History of Bitcoin,” *New York Times*, November 19, 2013.

⁹ Satoshi Nakamoto, “Bitcoin: A Peer-to-Peer Electronic Cash System,” October 2008, <https://bitcoin.org/bitcoin.pdf> (accessed Nov. 21, 2017).

¹⁰ Sundeep Gantori, et al., “Cryptocurrencies: Beneath the Bubble,” UBS, October 13, 2017.

¹¹ Noam Cohen, “Speed Bumps on the Road to Virtual Cash,” *New York Times*, July 3, 2011.

¹² Andrea Peterson, “Hal Finney Received the First Bitcoin Transaction. Here's How He Describes It,” *Washington Post*, January 3, 2014.

¹³ Laura Shin, “Hackers Have Stolen Millions of Dollars in Bitcoin Using Only Phone Numbers,” *Forbes*, December 20, 2016.

¹⁴ Andy Greenberg, “FBI Says It's Seized \$28.5 Million in Bitcoins from Ross Ulbricht, Alleged Owner of Silk Road,” *Forbes*, October 25, 2013.

¹⁵ A computer system customized for a specific application. See https://www.webopedia.com/TERM/T/turnkey_system.html for more information (accessed Nov. 21, 2017).

full of investors and press).¹⁶ As a digital currency exchange, Coinbase provided its customers a user-friendly platform for buying, selling, transferring, and storing digital currencies.¹⁷ All users had to do was point and click; there was no coding or technical knowhow needed. It was a huge success, and Coinbase grew quickly into the most popular platform for trading digital currencies.¹⁸

In April 2013, the first venture capital flowed into bitcoin-related companies. In September 2013, the first bitcoin investment product was created, the Bitcoin Investment Trust. One month later, the FBI seized the Silk Road website, which preferred bitcoin as the method of payment. Silk Road was believed to be responsible for half of all bitcoin transactions at the time. Even with the seizure, by December 2013, bitcoin surpassed Western Union in daily transaction volume for the first time.

In February 2014, without notice, the then-largest bitcoin exchange (Mt. Gox) suspended customer withdrawals, citing technical issues. It was later revealed in its subsequent bankruptcy filing documents that Mt. Gox was hacked, and 744,000 bitcoins had been stolen, worth approximately USD500 million at the time. In 2015, Coinbase launched its first bitcoin exchange in the United States.¹⁹ While the price of bitcoin kept rising in 2016, observers wondered whether the exuberance was more a function of its underlying technology, blockchain, rather than anything having to do with bitcoin itself.²⁰

Brown wondered what might have driven the price from USD700 to USD5,000? Brown heard that the Mt. Gox exchange was originally created as a platform for exchanging trading cards from the fantasy game Magic: The Gathering.²¹ Something did not smell right.

Bitcoin versus Blockchain²²

In its most abstract sense, blockchain was a new platform technology enabling an improved ability to verify and record the exchange of value among an interconnected set of users; it was a secure and transparent way to track the ownership of assets before, during, and after any transaction. Each transaction between parties in the network was a “block,” and the cumulative set of transactions across the entire network was the “chain”: blockchain.²³

Blockchain was a platform technology allowing any network of users to track and trade virtually anything of value. *Bitcoin* was the required medium of exchange to use one specific public blockchain (i.e., a blockchain that was open to anyone) in order to exchange value on that one blockchain.

Brown recalled that although Warren Buffet and Jamie Dimon had spoken ill of bitcoin, Dimon particularly had been a vocal proponent of blockchain. Brown learned that JPMorgan Chase & Co. had invested in and built a private blockchain (i.e., only open to invited parties), called *Quorum*, specifically for financial institutions, and that it was piloting it as an underpinning of its global payments function.²⁴ Although private blockchains

¹⁶ See <https://www.ycombinator.com/demoday> for more information (accessed Nov. 21, 2017).

¹⁷ See Coinbase.com for more information (accessed Dec. 6, 2017).

¹⁸ Data from Coinbase accessed on September 13, 2017.

¹⁹ “The Entire History of Bitcoin in a Single Infographic,” Futurism.com, <https://futurism.com/images/the-entire-history-of-bitcoin-in-a-single-infographic/> (accessed Nov. 28, 2017).

²⁰ Alicia Naumoff, “Why Bitcoin Boomed in 2016, What Will Happen in 2017,” CoinTelegraph, December 31, 2016.

²¹ David Yermack, “Is Bitcoin a Real Currency? An Economic Appraisal,” NBER Working Paper 19747, December 2013.

²² George (Yiorgos) Allayannis and Aaron Fernstrom, “An Introduction to Blockchain,” UVA-F-1810 (Charlottesville, VA: Darden Business Publishing, 2017).

²³ Allayannis and Fernstrom.

²⁴ As of September 13, 2017, JPMorgan Chase offered an enterprise blockchain platform called *Quorum*, specifically for and marketed to financial institutions.

like Quorum also recorded the exchange of value between parties in a network, access to the network was granted by an administrator, which eliminated the need for a digital currency (i.e., no need for bitcoin or an equivalent). Additionally, Brown discovered that the U.S. Department of State was actively evaluating blockchain as a cornerstone of its restructuring efforts.²⁵

Brown wondered if perhaps blockchain exposure was a better investment idea than bitcoin. He quickly found a report from a leading investment firm that counseled “investors seeking long-term opportunities from blockchain technology [to] start to position in two broad groups: technology enablers and early and successful adopters.”²⁶ Brown was skeptical as he wondered, for example, how much value blockchain could drive for IBM, a vocal innovator of blockchain technology, in the intermediate term. Further, how could he possibly quantify that impact? As far as investing in a blockchain start-up, Brown did not feel confident in his ability to do reliable technical due diligence in that area, so his focus remained on bitcoin.

Bitcoin Exposure

While his investment hypothesis had not yet formed, Brown wondered how an investor actually generated exposure to bitcoin. He was relieved that there appeared to be a finite set of options:

1. Trade bitcoin itself;
2. Trade the Bitcoin Investment Trust (OTCQX: GBTC²⁷);
3. Trade the ARK Web x.0 ETF, which assigned a 6% weight²⁸ to GBTC (NYSEArca: ARKW²⁹);

Brown was somewhat wary of trading the relatively new products but went ahead with reviewing data on GBTC and ARKW (**Exhibits 7 and 8**). He remembered reading an article about how the Chicago Board Options Exchange (Cboe) was planning on designing and offering bitcoin futures.³⁰ If he decided to generate portfolio exposure to bitcoin, perhaps he should wait until that product was available. In the meantime, he was curious how one actually bought or sold a bitcoin. It turns out it was straightforward (**Exhibit 9**):

1. Select a wallet provider (e.g., Coinbase);
2. Create an online account (i.e., bitcoin wallet) and link it to a bank account; and
3. Buy bitcoin.

Brown wondered whether he could generate a short position should his research yield such direction. It appeared that you could use an escrow service to short bitcoin directly, and there were third parties that provided the ability to short futures contracts or buy and sell binary options (i.e., puts and calls) on bitcoin.³¹

Other Digital Currencies, Initial Coin Offers (ICOs), and Hard Forks

²⁵ Aaron Stanley, “US State Department Seeks Blockchain Boost amid \$10 Billion Reboot,” CoinDesk, October 12, 2017.

²⁶ Gantori.

²⁷ See <https://www.bloomberg.com/quote/GBTC:US> for more information (accessed Nov. 29, 2017).

²⁸ See <https://ark-funds.com/arkw> for more information (accessed Nov. 29, 2017).

²⁹ See <https://www.bloomberg.com/quote/ARKW:US> for more information (accessed Nov. 29, 2017).

³⁰ Evelyn Cheng, “CBOE Plans to Launch Bitcoin Futures, Announces Agreement with Winklevoss Brothers’ Digital Currency Exchange,” CNBC, August 2, 2017.

³¹ Nathan Reiff, “5 Ways to Short Bitcoin,” Investopedia, September 11, 2017.

As Brown learned more and more about bitcoin, he realized he had also accidentally learned quite a bit about Ethereum, which seemed like the most popular digital currency after bitcoin. Brown read that Ethereum was launched through an initial coin offering (ICO), so he did a little digging to learn in more detail what an ICO actually was. An ICO, it turned out, was simply the tendering of a new digital coin to raise money for a blockchain project.

Brown noticed that it looked like there was enthusiasm around Ethereum, and his mind turned to competitive issues: What were the barriers to entry of creating a new digital coin? Brown was stunned to learn there were more than 200 digital currencies in existence.³² “What is stopping someone from creating a digital currency that makes bitcoin irrelevant overnight?” Brown wondered. It appeared as though nothing could prevent that.

Brown knew there was another issue, too, that he could not quantify: the impact of a “hard fork” in bitcoin’s blockchain. Put simply, a hard fork was a change to the rules (i.e., software) of the blockchain, creating a permanent divergence from the previous version. Effectively, hard forks created two blockchains (a new version and a legacy version) where there used to be only one, and the new version did not accept any previous version.³³ The risk, Brown thought, was that this could occur anytime a majority of the users on the bitcoin blockchain decided they wanted the rules of that blockchain to change, and it appeared impossible to determine the price impact (positively or negatively) of a hard fork on a digital currency.

The Supply of Bitcoin

Brown thought he had heard about bitcoin having a finite supply. If there was a finite supply of something—anything—and more people wanted it over time, the price was sure to increase just driven by basic economic theory. David Yermack, a finance academic in the United States, wrote, “bitcoin [was designed to have a] deterministic supply and growth rate tied to [an algorithm]...it provides for the rate of [issue] to slow asymptotically to zero by the year 2140, when the last bitcoin is scheduled to be released and the final total will be fixed at 21 million units.”³⁴ Brown agreed with Yermack’s view³⁵ that the “fixed” nature of the supply was up for debate. He found an interview Goldman Sachs did with Coinbase’s founder in 2014 that made him wonder. The founder said “[if] you needed to create more [bitcoin], you could. That would [only] require 51% of the network switch[ing] their software to adopt the change. Changes to the software have occurred a couple of times in the past.”³⁶ Indeed, Brown remembered hearing about bitcoin forks, which seemed to him to be what the founder was describing. Perhaps the fixed supply was illusory.

Global Interest in Bitcoin and Other Institutional Investors

Brown wanted to gauge general global interest in bitcoin, so he did an Internet search for “bitcoin”; his head began to spin at what stared back at him: 159 million search results. He wasn’t the only one searching, either. The entire planet was searching for information about bitcoin.³⁷ The global Google search volume for “bitcoin” had grown by more than 650% over the previous year. The world appeared to be in the throes of

³² Data from Spreadstreet.

³³ See <http://www.investopedia.com/terms/h/hard-fork.asp> for more information (accessed Nov. 29, 2017).

³⁴ Yermack.

³⁵ Yermack.

³⁶ Goldman Sachs, “All about Bitcoin.” *Global Macro Research*, March 11, 2014.

³⁷ Geographic search data collected from Google Trends on the search term “bitcoin” on September 13, 2017. The only countries with no data were Niger, Chad, and the Central African Republic.

bitcoin fever. He wondered if at least some of the surge in interest was related to investors searching for alternative forms of yield in what had been a prolonged low-yield environment.

Regarding institutional investment, he found articles that mentioned smaller hedge funds and start-ups investing in bitcoin. Brown then pulled some Preqin data to learn that institutional investors were taking a cautious approach to bitcoin, given its lack of regulation, volatility, and liquidity questions.³⁸ The data Brown pulled reflected that as of the previous month, there were only 16 hedge funds in the world with bitcoin exposures, and half of those had launched since the beginning of the year.³⁹ To make matters more ambiguous, while there were hedge funds like Brown's trading bitcoin, the investment industry at large appeared evenly split regarding whether there was opportunity for hedge funds in bitcoin (**Exhibit 10**).

Fidelity, while none of its funds held bitcoin, was experimenting with integrating clients' Coinbase holdings data into its websites so clients could see their Coinbase holdings next to their Fidelity holdings when they logged into their Fidelity accounts.⁴⁰ Fidelity also allowed its employees to pay with bitcoin in its cafeteria.⁴¹ Brown was not sure what to make of all that. What seemed clear, though, was that there was potential opportunity to be an arbitrageur, as it looked to Brown like there were price differences for bitcoin across its various exchanges (**Exhibit 11**).

Using Bitcoin in Daily Life

Brown knew that while there were huge fortunes to be made by investing in nascent technologies, in order for a new technology to be more than a passing fad, a critical mass of people actually had to use it. Brown knew that for people to be able to pay with bitcoin, one of two situations had to exist:

1. Merchants accepting bitcoin as a method of payment for goods and services; or
2. A trusted payments intermediary allowing customers to pay in a fiat currency that was drawn (and converted) from a bitcoin wallet (i.e., an equivalent to Visa or MasterCard but for bitcoin).

Brown learned that while there were fewer than 10,000 merchants worldwide that accepted bitcoin as payment, the largest concentrations were in the United States and Europe, and the growth had been steady and consistent.⁴² Perhaps this was indicative of a larger evolution underway in how goods and services were paid for. Additionally, clever online merchants had found a work-around if there was a retail store a customer wanted to shop in using bitcoin but that store did not accept it as a means of payment: there were several online merchants that accepted bitcoin as payment for gift cards to hundreds of popular multinational retailers.⁴³ From a payments perspective, Brown had read headline-grabbing articles about cases of bitcoin being popular for extorting ransoms,⁴⁴ though he wondered if these were not just the growing pains of an early-stage payments technology.

Regarding the second point, Brown was surprised to learn that in fact there was such a thing as a bitcoin debit card.⁴⁵ This product, marketed by Visa and a company called Shift, worked like a traditional Visa debit

³⁸ Kathleen Lavery, "Volatility, Illiquidity Keeps Institutional Investors out of Bitcoin," FundFire, October 23, 2017.

³⁹ Lydia Tomkiw, "Bitcoin Boom: Hedge Funds Flood Market with Crypto Strategies," FundFire, August 30, 2017.

⁴⁰ Anna Irrera and Gertrude Chavez-Dreyfuss, "Fidelity to Allow Clients to See Digital Currencies on Website," Reuters, May 23, 2017.

⁴¹ Irrera and Chavez-Dreyfuss.

⁴² See Coinmap.org for more information (accessed Nov. 29, 2017).

⁴³ Claire O'Connor, "How to Use Bitcoin to Shop at Amazon, Home Depot, CVS, and More," *Forbes*, February 17, 2014.

⁴⁴ Samuel Gibbs, "WannaCry: Hackers Withdraw £108,000 of Bitcoin Ransom," *Guardian*, August 3, 2017; Robert Hackett, "Why You Shouldn't Pay the Petya Ransomware," *Fortune*, June 28, 2017.

⁴⁵ See <https://www.shiftpayments.com/card-for-more-information> (accessed Nov. 28, 2017).

card. This debit card, however, was tied to a bitcoin wallet instead of a checking account. It was accepted everywhere that Visa was—over 38 million merchants worldwide.⁴⁶ Brown thought that might be an enabling factor in exploding global usage, as this would allow bitcoin users to buy things with bitcoin whether or not the merchant accepted bitcoin as such; any merchant accepting Visa would accept the Shift card.

What concerned Brown, though, was some data he uncovered around transaction costs and time (**Exhibits 12 and 13**). While merchants accepted the Shift card, paying in bitcoin in any way was still a bitcoin transaction (subject to its fees and transaction times). He wondered if increasing transaction costs and time to complete them would impact whether people used bitcoin to pay for goods and services, and if so, which ones.

Bitcoin: Like Gold or Fiat Currencies?

Brown thought to himself, “Bitcoin itself has no intrinsic value, nor can it generate any cash flows, but it is liquid and I can buy it or sell it any time I want. Wait...is this just like gold?” Perhaps Brown had stumbled upon an investment hypothesis that could be driven by reasoning similar to that which investors used to invest in gold. Brown knew right away that a primary reason to invest in gold was that it offered a noncorrelated source of expected return. Brown began his analysis to see what, if anything, bitcoin was correlated to (**Exhibits 14 and 15**).

Brown tried to structure his thinking around whether or not bitcoin was an asset or a currency. “If it is an asset,” Brown thought, “I can value it.” His instinct that it would be difficult or impossible to value using traditional asset valuation methodologies was confirmed when he read an interview Warren Buffet had given about bitcoin. “People get excited from big price movements, and Wall Street accommodates,” Buffet said, “[but] you can’t value bitcoin because it’s not a value-producing asset.”⁴⁷

Brown started thinking about bitcoin as an alternative to fiat currencies, similar to gold. He reflected on what he believed to be a reasonable set of drivers of any currency’s value: trust in the issuing authority, acceptance in transactions, security, conversion, and storage of value.⁴⁸ He did a quick thought experiment and asked himself whether would he rather buy and hold a U.S. dollar, bitcoin, South African rand, Chinese yuan, or Brazilian real, and why. He had to admit, depending on the fiat currency, he might rather hold bitcoin. He was surprised to admit this to himself, and wondered how this could play into his developing investment thesis. He also remembered seeing a CNBC interview with Professor Aswath Damodaran earlier in the summer in which Damodaran explained why digital currencies might replace gold as an alternative to holding fiat currencies.⁴⁹

“If bitcoin is a currency,” Brown thought, “I won’t be able to determine its intrinsic value...but I may be able to value it relative to other currencies—however, not an easy task.”

As Brown was thinking about bitcoin’s relative value, it occurred to him that he believed equity markets might be due for a haircut. After all, the S&P 500 had nearly doubled within the past decade (**Exhibit 1**). “Everyone seems to think that the S&P is overvalued, and it has only doubled. Yet bitcoin has appreciated more than 10 times during the same period...”

⁴⁶ <https://www.shiftpayments.com/card>

⁴⁷ Nikhikesh De, “‘A Real Bubble’: Billionaire Warren Buffett Doubles Down on Bitcoin Doubt,” CoinDesk, October 26, 2017.

⁴⁸ Aswath Damodaran, “Bitcoin Q&A: Bubble or Breakthrough? Both! Cult or Currency? Both!” *Musings on Markets* (blog), March 9, 2014, <http://aswathdamodaran.blogspot.com/2014/03/bitcoin-q-bubble-or-breakthrough-both.html> (accessed Oct. 27, 2017).

⁴⁹ Tae Kim, “Wall Street’s ‘Dean of Valuation’ Says Digital Currencies are Replacing Gold,” CNBC.com, July 18, 2017.

Regulatory Considerations

Brown knew right away that, like all other early stage technologies or products, governmental regulation in the United States and abroad would have an outsized impact on bitcoin's price and usage. Brown found CoinDesk to be a wealth of news about bitcoin, so he went to the website and searched "bitcoin regulation" and its variants; nearly 3,000 articles appeared in total.⁵⁰ Among the many startling headlines were:

- "China State News Calls for 'Iron Fist' Regulation of Bitcoin Exchanges"
- "A Bitcoin Law for Every State? Interest and Animosity Greet Model US Regulation"
- "Bank of Canada: Digital Currencies Need Regulation to Succeed"
- "China's Central Bank Finds Bitcoin Exchanges Out of Step on Regulation"
- "SWIFT: Bitcoin Regulation in the EU Won't Happen Soon"
- "G7 Pledged Support for 'Appropriate' Bitcoin Regulation at June Summit"

After reading several articles about potential forthcoming regulations, it appeared that two big underlying issues with bitcoin seemed to be control and trust. If indeed control and trust were central issues that governments thought about when determining what to do with bitcoin, Brown wondered how long it would be before formal regulations would be developed for digital currencies. Surely, no government would allow any substantial trade with an unregulated, alien currency to occur within its borders for very long. Brown reflected that while it appeared some form of regulation was inevitable, it was not yet clear what the ultimate regulations would be, or whether they would vary country by country, or in the United States, state by state. Perhaps this was contributing to bitcoin's volatility (**Exhibit 16**).

Brown had read articles about China outlawing ICOs,⁵¹ and remembered reading an article over the summer mentioning that the U.S. government would subject all ICOs to the full canon of securities law applicable in the United States.⁵² Brown saw a news ticker crawl across his computer screen: *China to shut down all bitcoin exchanges by Sept. 15...demands holdings and trading data for all users.*⁵³ Yikes. Brown was not an expert in Chinese security regulation, but the fact that China's government wanted holdings and trading data for every user of every exchange in China concerned him. In addition, if China was taking such an aggressive stance on bitcoin trading, could the other primary economic powers in the world be far behind?

One thing that occurred to Brown as he pored over the articles about possible regulations was that virtually none of them mentioned anything about taxes. He had thought up to this point that the debates in the press about whether bitcoin was an asset or a currency were largely academic, but he knew that tax treatments of assets and currencies were different. It appeared as though owning the "asset" bitcoin would generate greater tax exposure as it increased in price versus owning the "currency" bitcoin. Brown thought it was interesting that, with the exception of 2014, bitcoin had indeed outperformed all traditional currencies since 2011. It did not appear, as far as his research was concerned, that this generated any *tax* exposure for any bitcoin holders. He was dubious that—whether bitcoin was an asset or a currency—the lack of regulation or tax treatment could last forever.

⁵⁰ Searches conducted by authors on October 12, 2017.

⁵¹ Stan Higgins, "PBoC Advisor: 'China was Right to Ban ICOs,'" CoinDesk, October 2, 2017.

⁵² Benjamin Bain, "ICO Market is Probably Full of Fraud, U.S.'s Top Financial Cop Warns," *Bloomberg*, September 28, 2017.

⁵³ Tian Chuan and Rachel-Rose O'Leary, "China's Bitcoin Exchanges Receive Shutdown Orders and Closure Timeline," CoinDesk, September 15, 2017.

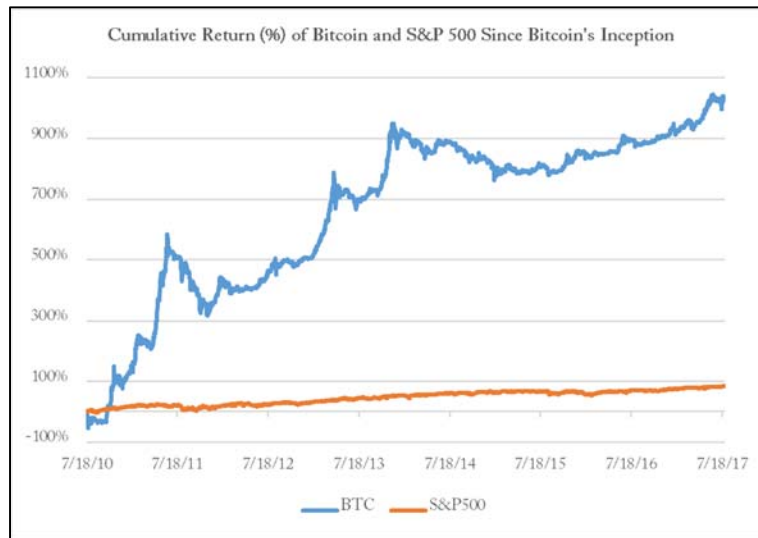
The Clock was Ticking...

Brown's desk had become covered in newspaper articles, correlation analyses, and every piece of reliable data that he could find on bitcoin. Brown reflected for a moment and smiled wryly. "Now," he thought, "all I have to do is solve this incredible puzzle and I'll be able to call my LP back with my thesis."

Exhibit 1

Bitcoin: Investment or Illusion?

Cumulative Return (%) of Bitcoin and S&P 500 since Bitcoin's Inception

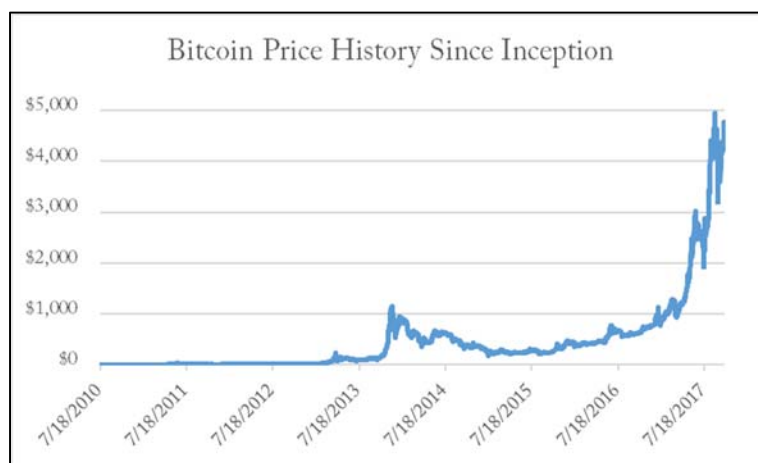


Data source: SpreadStreet. All exhibits created by authors unless otherwise noted.

Exhibit 2

Bitcoin: Investment or Illusion?

Bitcoin Price History since Inception

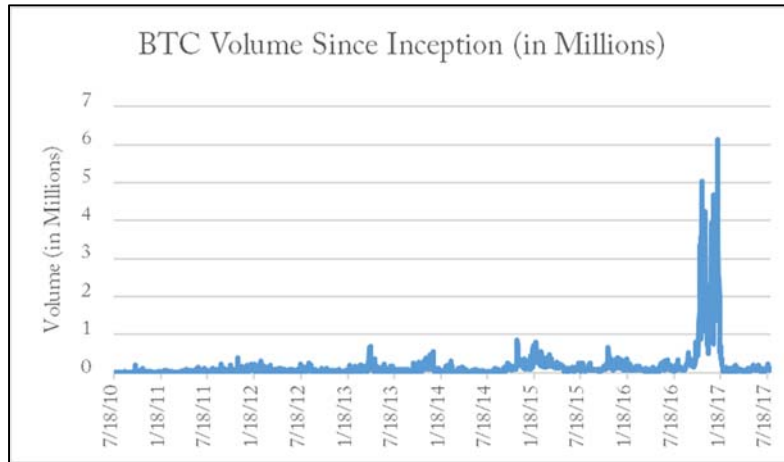


Data source: CoinDesk.

Exhibit 3

Bitcoin: Investment or Illusion?

Bitcoin Trading Volume since Inception

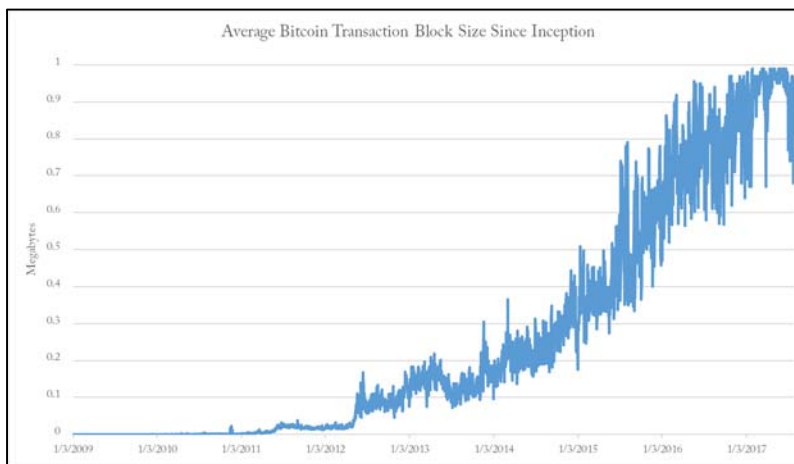


Data source: SpreadStreet.

Exhibit 4

Bitcoin: Investment or Illusion?

Average Block Size of Bitcoin Transaction since Inception

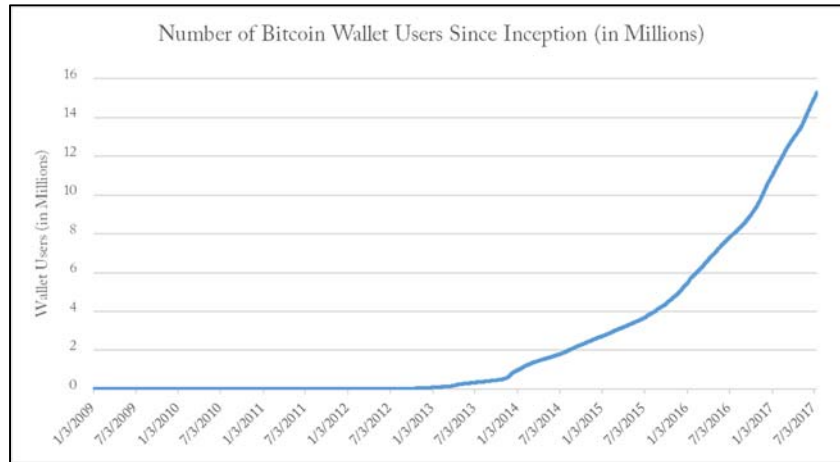


Data source: SpreadStreet.

Exhibit 5

Bitcoin: Investment or Illusion?

Number of Bitcoin Wallet Users since Inception (in Millions)

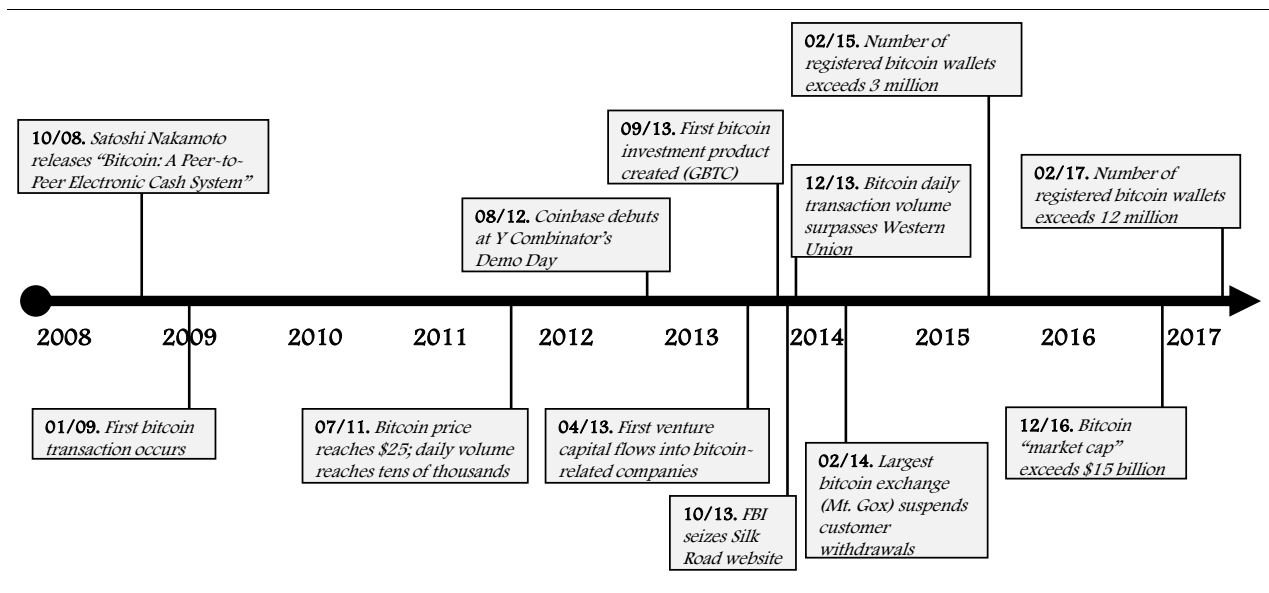


Data source: SpreadStreet.

Exhibit 6

Bitcoin: Investment or Illusion?

Abridged Bitcoin Timeline (2008–2017)



Source: Created by authors using publicly available information.

Exhibit 7

Bitcoin: Investment or Illusion?

Price of Bitcoin Compared to ARKW and GBTC

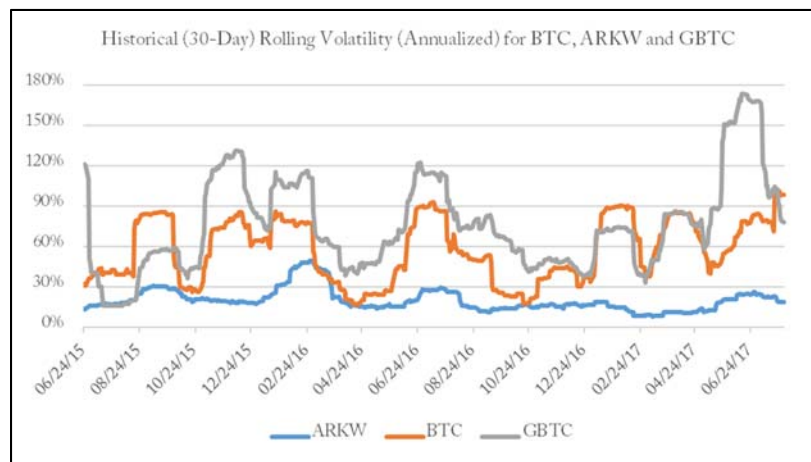


Data source: Spreadstreet and Yahoo! Finance.

Exhibit 8

Bitcoin: Investment or Illusion?

Historical (30-Day) Rolling Volatility (Annualized) for BTC, ARKW, and GBTC



Data source: Spreadstreet and Yahoo! Finance.

Exhibit 9

Bitcoin: Investment or Illusion?

How to Buy a Bitcoin

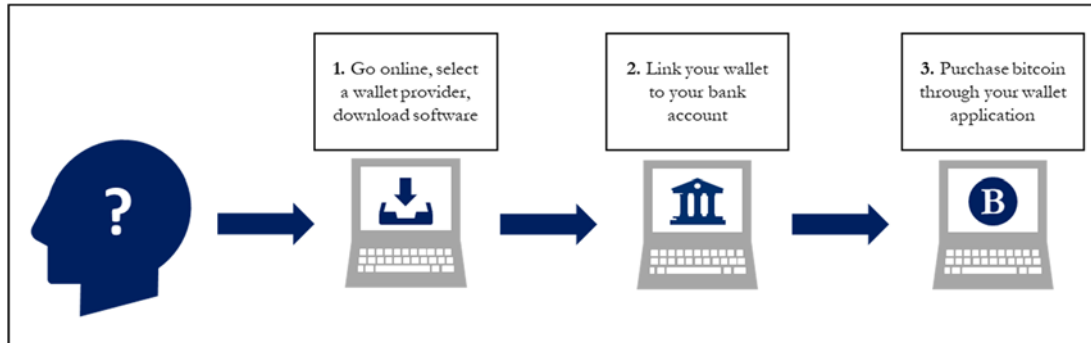
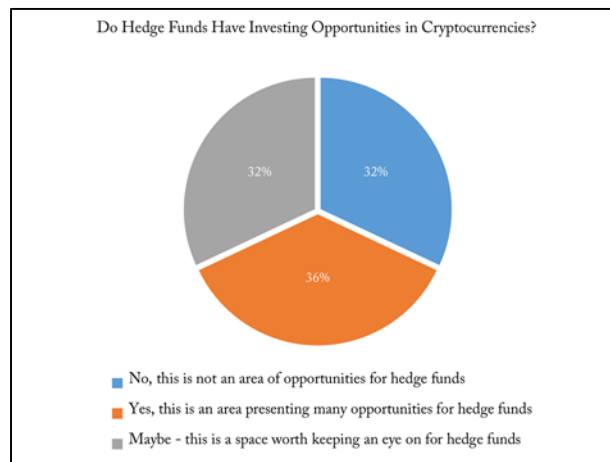


Exhibit 10

Bitcoin: Investment or Illusion?

Do Hedge Funds Have Investing Opportunities in Cryptocurrencies?



Data source: FundFire survey conducted on October 4, 2017.

Exhibit 11

Bitcoin: Investment or Illusion?

An Illustration of Arbitrage Opportunities across Global Bitcoin Exchanges

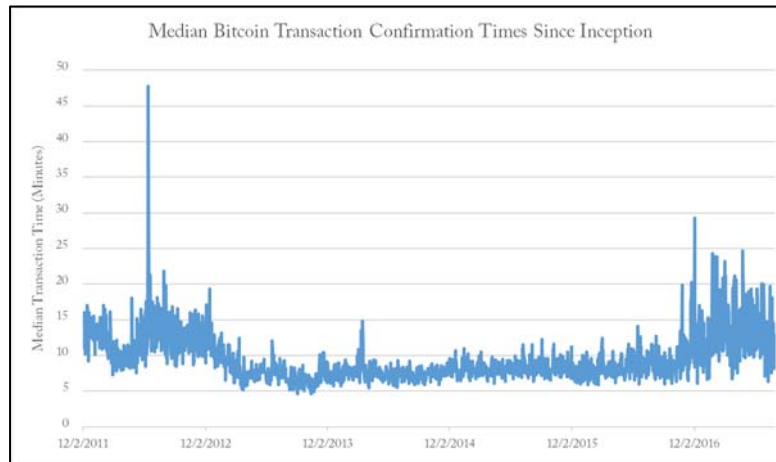
		Bitcoin Exchange													
		bit-x	bitfinex	bitmex	bitstamp	campbx	cex.io	coinbase	exmo	gemini	hitbtc	itbit	kraken	localbitcoins	therocktrading
		\$ 7,200.00	\$ 7,214.70	\$ 7,214.40	\$ 7,227.56	\$ 7,600.00	\$ 7,462.80	\$ 7,219.00	\$ 7,250.00	\$ 7,236.94	\$ 7,215.79	\$ 7,228.14	\$ 7,254.10	\$ 7,927.20	\$ 7,256.52
Bitcoin Exchange	bit-x		0.00%	0.20%	0.38%	5.56%	3.65%	0.26%	0.69%	0.51%	0.22%	0.39%	0.75%	10.10%	0.79%
	bitfinex	\$ 7,214.70		0.00%	0.18%	5.34%	3.44%	0.06%	0.49%	0.31%	0.02%	0.19%	0.55%	9.88%	0.58%
	bitmex	\$ 7,214.40	-0.20%		0.00%	5.34%	3.44%	0.06%	0.49%	0.31%	0.02%	0.19%	0.55%	9.88%	0.58%
	bitstamp	\$ 7,227.56	-0.38%	-0.18%		5.15%	3.25%	-0.12%	0.31%	0.13%	-0.16%	0.01%	0.37%	9.68%	0.40%
	campbx	\$ 7,600.00	-5.26%	-5.07%	-5.07%		0.00%	-1.81%	-5.01%	-4.61%	-4.78%	-5.06%	-4.89%	-4.55%	-4.31%
	cex.io	\$ 7,462.80	-3.52%	-3.32%	-3.33%	1.84%		0.00%	-3.27%	-2.85%	-3.03%	-3.31%	-3.14%	-2.80%	-2.76%
	coinbase	\$ 7,219.00	-0.26%	-0.06%	-0.06%	5.26%	3.38%		0.43%	0.25%	-0.04%	0.13%	0.49%	9.81%	0.52%
	exmo	\$ 7,250.00	-0.69%	-0.49%	-0.49%	4.83%	2.94%	-0.43%		0.00%	-0.18%	-0.47%	-0.30%	9.34%	0.09%
	gemini	\$ 7,236.94	-0.51%	-0.31%	-0.31%	5.02%	3.12%	-0.25%	0.18%		0.00%	-0.29%	0.24%	9.54%	0.27%
	hitbtc	\$ 7,215.79	-0.22%	-0.02%	-0.02%	5.32%	3.42%	0.04%	0.47%	0.29%		0.00%	0.17%	9.86%	0.56%
	itbit	\$ 7,228.14	-0.39%	-0.19%	-0.19%	5.14%	3.25%	-0.13%	0.30%	0.12%	-0.17%		0.36%	9.67%	0.39%
	kraken	\$ 7,254.10	-0.75%	-0.54%	-0.55%	4.77%	2.88%	-0.48%	-0.06%	-0.24%	-0.53%	-0.36%		9.28%	0.03%
	localbitcoins	\$ 7,927.20	-9.17%	-8.99%	-8.99%	-4.13%	-5.86%	-8.93%	-8.54%	-8.71%	-8.97%	-8.82%	-8.49%		-8.46%
	therocktrading	\$ 7,256.52	-0.78%	-0.58%	-0.58%	4.73%	2.84%	-0.52%	-0.09%	-0.27%	-0.56%	-0.39%	-0.03%	9.24%	0.00%
	wallofcoins	\$ 7,255.00	-0.76%	-0.56%	-0.56%	4.76%	2.86%	-0.50%	-0.07%	-0.25%	-0.54%	-0.37%	-0.01%	9.27%	0.02%

Data source: Bitcoinity.org.

Exhibit 12

Bitcoin: Investment or Illusion?

Median Bitcoin Transaction Confirmation Times since Inception

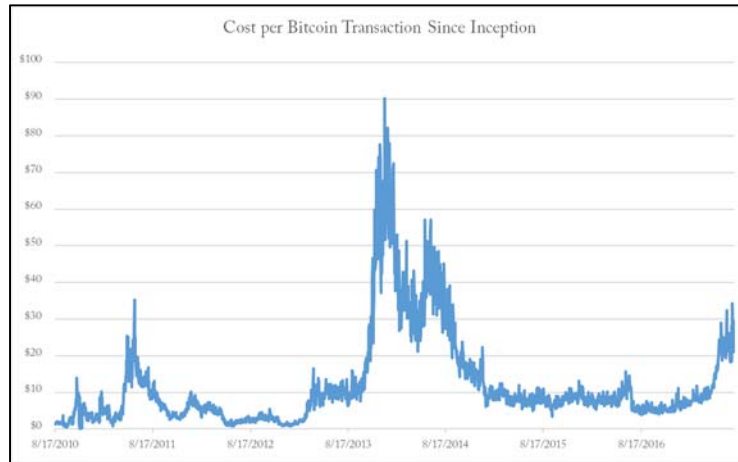


Source: George (Yiorgos) Allayannis and Aaron Fernstrom, "An Introduction to Blockchain," UVA-F-1810 (Charlottesville, VA: Darden Business Publishing, 2017).

Exhibit 13

Bitcoin: Investment or Illusion?

Cost per Bitcoin Transaction since Inception

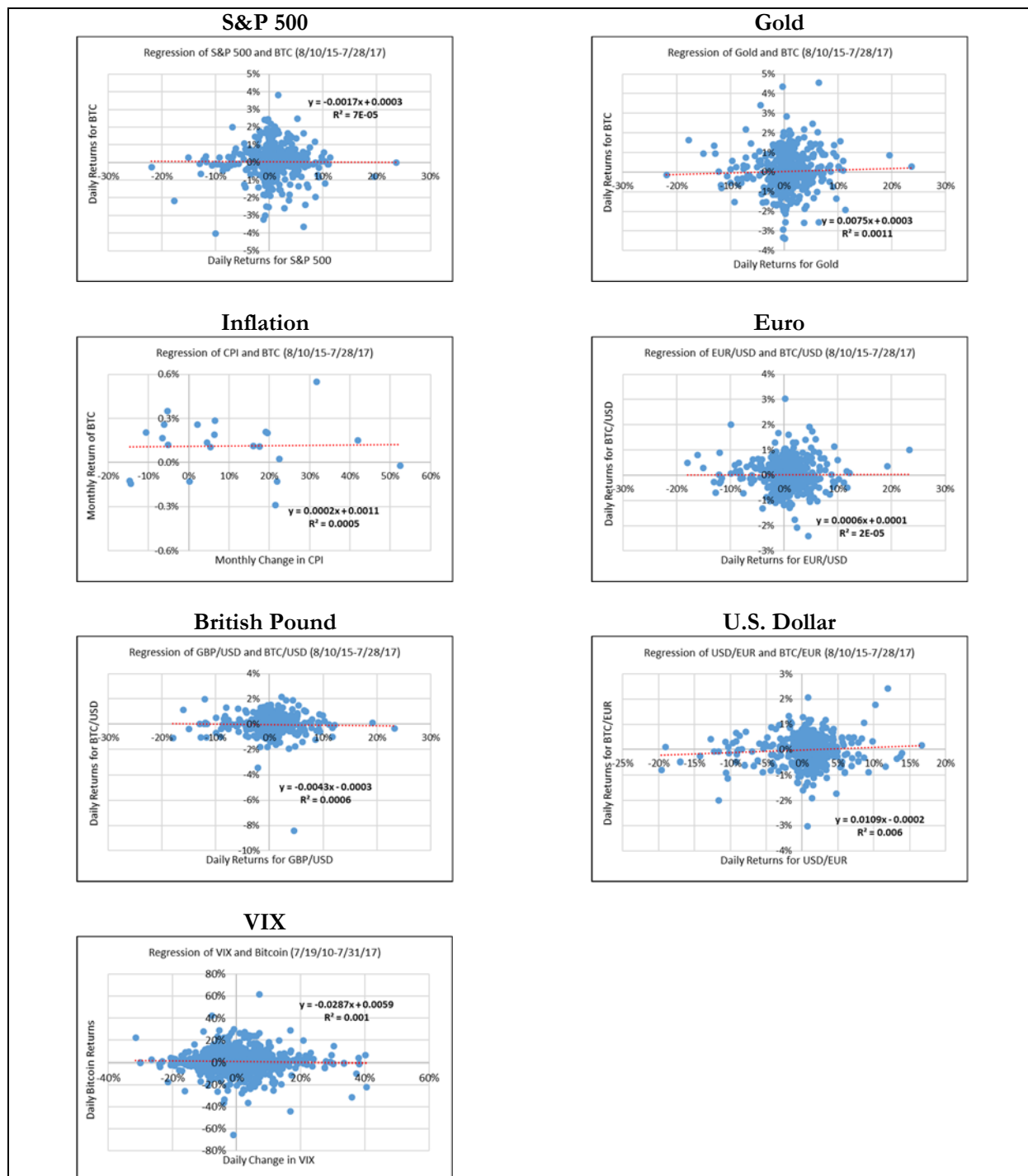


Source: George (Yiorgos) Allayannis and Aaron Fernstrom, "An Introduction to Blockchain," UVA-F-1810 (Charlottesville, VA: Darden Business Publishing, 2017).

Exhibit 14

Bitcoin: Investment or Illusion?

Bitcoin Regressions



Data source: SpreadStreet and Cboe.

Exhibit 15

Bitcoin: Investment or Illusion?

Bitcoin Correlation Table

Correlation Table						
	<i>Gold</i>	<i>CPI</i>	<i>Euro</i>	<i>GBP</i>	<i>USD</i>	<i>VIX</i>
Bitcoin	0.0336	0.0229	0.0039	-0.0235	0.0777	-0.0310

Data source: SpreadStreet and Cboe.

Exhibit 16

Bitcoin: Investment or Illusion?

Historical (30-Day) Rolling Volatility (Annualized) for Bitcoin since Inception

