

# THE ABCS OF BITCOIN

## AND A LOOK AT ITS INVESTMENT POTENTIAL



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**Still two years shy of its double-digit birthday, bitcoin's spikes—and falls—are already notable:**

- +411% from 2016 year end to a 9/1/2017 all-time high of \$4,950.72
- -28% and +42% largest single day moves since 2013
- -17% and +25% largest single day moves in 2017

*Cryptocurrencies, or digital currencies, have captured the imagination and interest of investors around the world in recent years and in particular in 2017. Three main factors have driven this interest: the role of cryptocurrencies as bold new upstarts in the world of electronic payments; their meteoric rise in value since they were created less than a decade ago; and the perennial search for long-term stores of value in the face of geopolitical uncertainty.*

**D**igital coins. Electronic money. Cryptocurrency. By any name, the world of digital currency is an unabashed phenomenon, yet largely a mystery to some—indeed incomprehensible to many—due to its labyrinthine structure. In an effort to provide an understanding of this enigmatic space, this paper will focus on the digital currency world through the lens of bitcoin—the first, best-known, and most dominant cryptocurrency by market capitalization, which created the foundation on which other cryptocurrencies were built.

Before we can explore where bitcoin stands currently and whether it should have a place in an investment portfolio looking to preserve wealth for the long term, let's take a look at its beginnings and how it works.

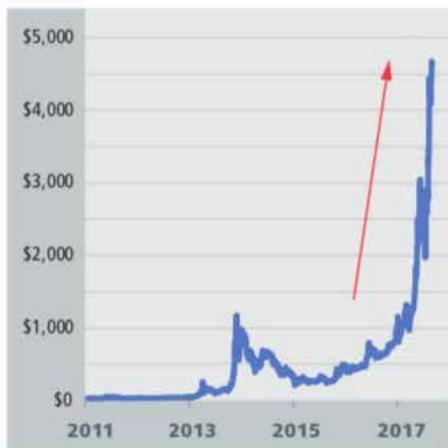
**What is bitcoin and what problem is it trying to solve?**

Bitcoin\* was created by Satoshi Nakamoto, a person (or persons) whose identity remains unknown. On October 31, 2008, Nakamoto emailed a whitepaper outlining the bitcoin system to a cryptography mailing list. It was implemented as open source

*\* By convention, the payment system is generally referred to as Bitcoin, with a capital "B," while the unit of currency is referred to as bitcoin, with a lowercase "b." However, for simplicity, we use bitcoin with a lower case "b" throughout to refer to both the system and currency.*

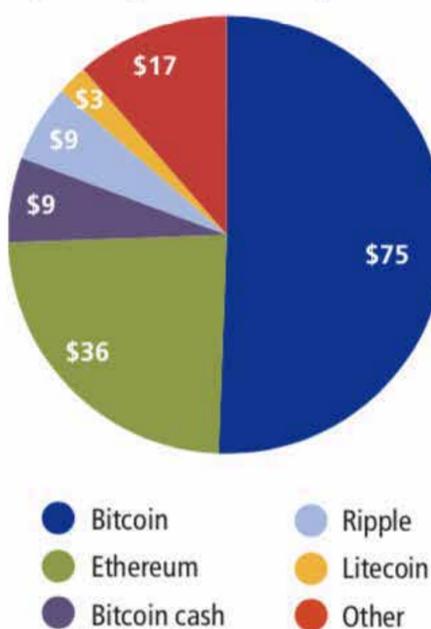
**PLEASE NOTE: We make no recommendations of any currency, product, provider, or protocol; names of same are included solely as examples for purposes of discussion.**

FIGURE 1  
**Bitcoin price (USD)**  
 (as of 8/30/2017)



Source: Bitcoin Price Index, Coindesk.com

FIGURE 2  
**Cryptocurrency market cap**  
 (\$ billions, as of 8/30/2017)



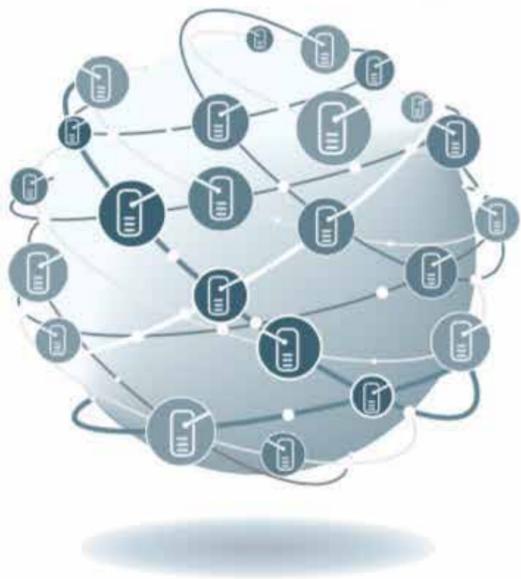
code (public, non-proprietary software) and the first bitcoin transaction occurred in January 2009.<sup>1</sup>

Bitcoin was created to provide a new global form of electronic currency—to be used in place of U.S. dollars, euros, or other traditional currencies. Nakamoto described bitcoin as “a peer-to-peer electronic cash system”<sup>2</sup> that would be fundamentally different from the traditional currency system due to the absence of any central third-party mediators (central banks, credit card companies, and other financial intermediaries). To understand this better, let’s take a look at the workings of today’s traditional or fiat currency system. From the Latin for “let it be done,” “fiat” references the fact that traditional currency has value only because a government “declares” it has value, and because users of the currency expect this value will be maintained in the future. A fiat currency has no intrinsic worth,<sup>3</sup> in that it is not redeemable for any physical asset (in contrast to the way gold or real estate has intrinsic value), so expectation of its future value depends on the ability of a government to maintain that value through its control of supply and demand of the currency.

Why does this matter? Since governments have meaningful control of the value of fiat currency, users must trust that governments will uphold the currency’s value and act in the best interests of their people. This works relatively well, for example, in the United States, where the Federal Reserve may boost the money supply to stimulate the economy but must adhere to an inflation mandate, and is constrained by a 2% inflation target. This has led to relative stability in the value of the U.S. dollar (USD), which underpins overall economic stability. However, in countries like Venezuela, faith in the commitment of the government to protect the currency’s value is not a given. The government has raised money supply drastically in recent years to inflate away the value of its debts. This in turn has led to rampant inflation (the International Monetary Fund predicts Venezuelan inflation of 720% in 2017), rendering the Venezuelan bolivar essentially worthless—wreaking economic havoc as a result, and leaving its users unable to afford the basic necessities of life.

Even in nations with relatively stable currencies, bitcoin was intended to solve for the key problem Nakamoto saw in the current electronic payment system (which uses credit and debit cards, wire transfers, etc.): a lack of trust between counterparties making and receiving payments due to the risk of fraud. The current system depends on central third parties (banks, credit card companies, and other intermediaries) to verify and keep a digital record of monetary transactions and protect users from fraud. According to Nakamoto, we pay for this central verification, record keeping, and fraud protection through loss of privacy (where personal identification information such as name, addresses, and credit card numbers are often required for transactions), and transaction fees, which are paid directly to the central third parties.<sup>4</sup>

## Blockchain technology



The system was created with a predetermined  
**21 million**  
of bitcoin,  
so there is little if any risk that a rise in the money supply would devalue the currency.

### How does bitcoin solve the problem?

Enter bitcoin, which was designed to be decentralized; no central government, company, or other third party determines its value. In addition, the system was created with a predetermined eventual fixed supply of 21 million units of bitcoin, so there is little if any risk that a rise in the money supply would devalue the currency.<sup>5</sup> Bitcoin solves the trust issue and its associated costs in the current electronic payment system through the creation of a distributed ledger, called a “blockchain.” A distributed ledger is a public and complete record of all payment transactions that provides the history and proof of ownership of every bitcoin in circulation, like an open book that everyone can see. A network of computers, called “nodes,” maintains copies of this distributed ledger. This obviates the need for any one central third party to maintain a ledger, removing power from that single institution and dispersing it across many parties through the distributed ledger system. Individuals or companies known as “miners” do the work of maintaining the ledger of accounts by verifying transactions (a job previously done by the central third-party banks and credit card companies). For the time and computing power contributed to maintain the blockchain, miners receive a reward in the form of bitcoin, which gives them a stake in the system. (See Appendix, “Bitcoin: how it works, bit by bit...” for further details.)

The blockchain technology on which bitcoin is built is so important because it has created a completely new system of payment. Previously, all payment enhancements had essentially been incremental updates to a 16th century system.<sup>6</sup> Some have suggested the blockchain innovation could be as disruptive as the advent of the Internet, though it may take years still for its full potential to come to fruition. This concept of decentralizing the record keeping process is revolutionary because it creates a system that enables individuals to be active participants rather than passive recipients.<sup>7</sup> Blockchain can change the way transactions are done not just in the currency space, but in myriad other fields, because of its ability to eliminate the “middle man” and also create transparency and confidence in ownership of assets at all times.

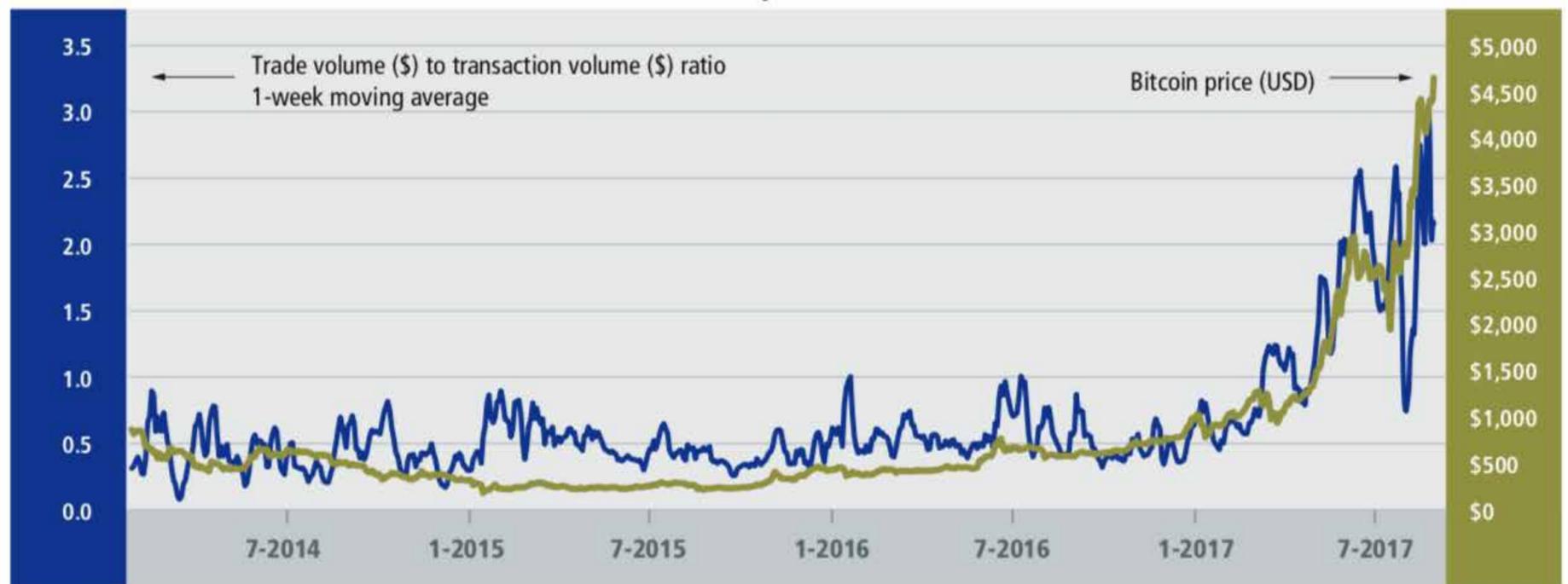
### Are bitcoins “bucks”?

The blockchain technology enabled bitcoin to introduce into the system the unprecedented and transformative ability to decentralize the processing of payments. Does this mean the digital currency will succeed in replacing traditional currencies by serving as a form of money? To answer this question, let's step back and examine what money does.

From an economic perspective, money is generally thought of as having three roles:

FIGURE 3

Bitcoin trade volume to transaction volume ratio and bitcoin price

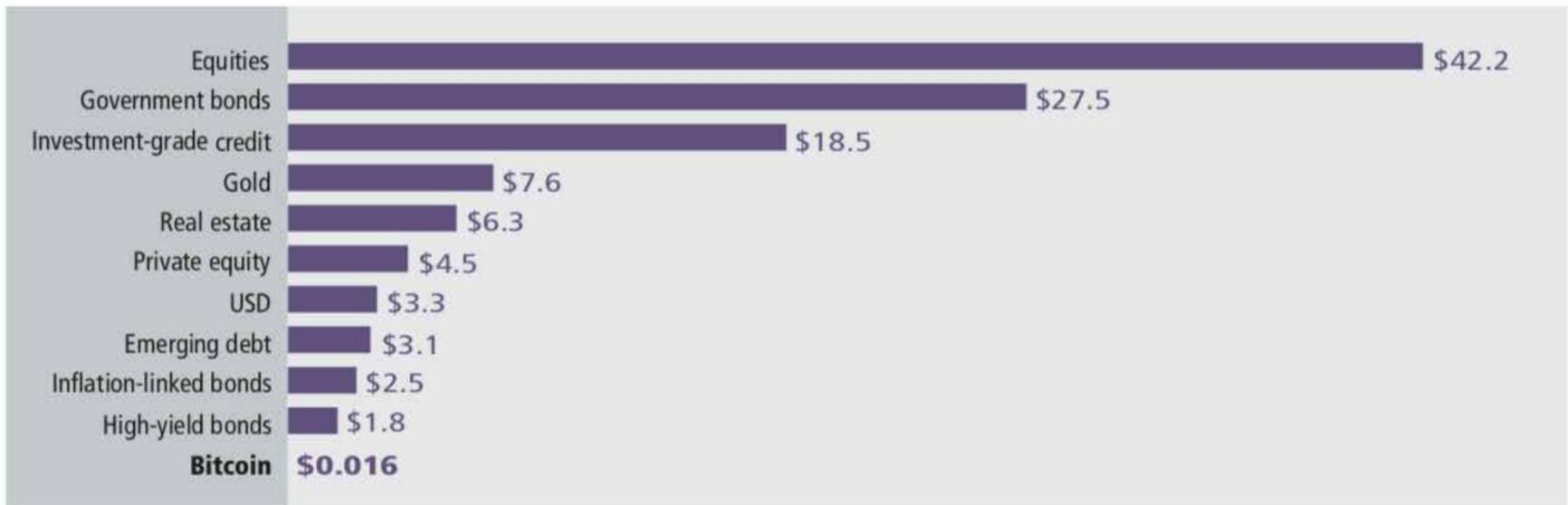


**Given that bitcoin is not yet being used as a widespread medium of exchange or a unit of account, one of the major drivers of its use as a store of value appears to be driven by speculative interest.**

- **Medium of exchange** (ability to be used as a form of payment for goods and services) Bitcoin has made some inroads as far as the currency's ability to be used as a form of payment for goods and services, but has not reached a level of broad usage for numerous reasons. For example, recent reports show that only three of the top 500 Internet retailers currently accept bitcoin.<sup>8</sup> Though some recognizable companies, such as Overstock.com, DISH networks, Microsoft, Paypal (via a subsidiary named Braintree), and Intuit currently accept bitcoin,<sup>9</sup> the currency has yet to gain mainstream acceptance by merchants in the U.S. By contrast, Japan, with its recent recognition of bitcoin as a legal form of payment, has seen rising interest in retailer acceptance.<sup>10</sup>
- **Unit of account** (ability to be used as a direct measure of value of goods and services) Bitcoin does not yet appear to have reached this milestone of having goods and services priced purely in bitcoin, as most items are priced only relative to the USD (or other traditional currencies). Its extreme volatility still presents an impediment to bitcoin being used as a unit of account.
- **Store of value** (ability to allow individuals to defer purchases of goods and services to a future date) Unlike real estate, art, gold, or other similar physical asset often used for this purpose, bitcoin has no tangible commodity backing it. Its intrinsic value, therefore, will likely come from the strength of future demand (given that supply is fixed). Because there is some expectation that bitcoin will survive, it currently does provide a long-term store of value. Only time will tell whether this will continue to be the case.

FIGURE 4

Size of global markets by asset class (\$ trillions, year end 2016)



**Bitcoin's average daily traded volume:**

**\$86,000 in 2016**

**\$2,000,000,000 in August 2017**

Thus, to date, bitcoin seems to have primarily been used as a store of value, with speculative interest being a particular driver of 2016–2017's volatile price action. One very simple measure that can be used to gauge this is the ratio of bitcoin trade volume value on exchanges relative to transactional volume value on the network,<sup>11</sup> as it shows interest in trading of bitcoin broadly relative to trading for the purpose of transacting in bitcoin. Figure 3 suggests that speculative investment interest in bitcoin has dominated compared to cryptocurrency use in transactions, as the ratio of trade value on exchanges is nearly two times trade value for transactions as of August 2017.<sup>12</sup>

Given that bitcoin is not yet being used as a widespread medium of exchange or a unit of account, and one of the major drivers of its use as a store of value appears to be driven by speculative interest, it does not seem the currency will become a viable alternative to traditional currency in the near term.

**Growth of the bitcoin market**

While bitcoin has been in existence for over eight years, it has grown over time as more users have become involved. Its rise to prominence, especially over the past year, has been driven by its wild price swings and sky-rocketing value. A look at Figures 5 and 6 show how the market has grown since inception. At the start of 2013, bitcoin had a market cap of approximately \$145,000, which began to pick up in size in late 2013, when the People's Bank of China (PBOC) tacitly suggested it would allow investors to participate in the bitcoin market.<sup>13</sup> Many attribute rising activity levels to Chinese investors' desire to sidestep government management of the yuan's value (CNY).

FIGURE 5  
Bitcoin market cap (\$ billions)

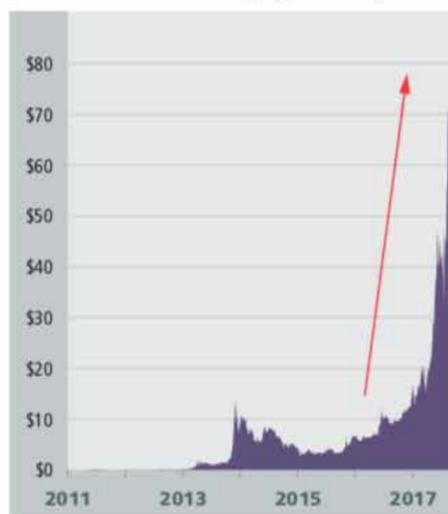
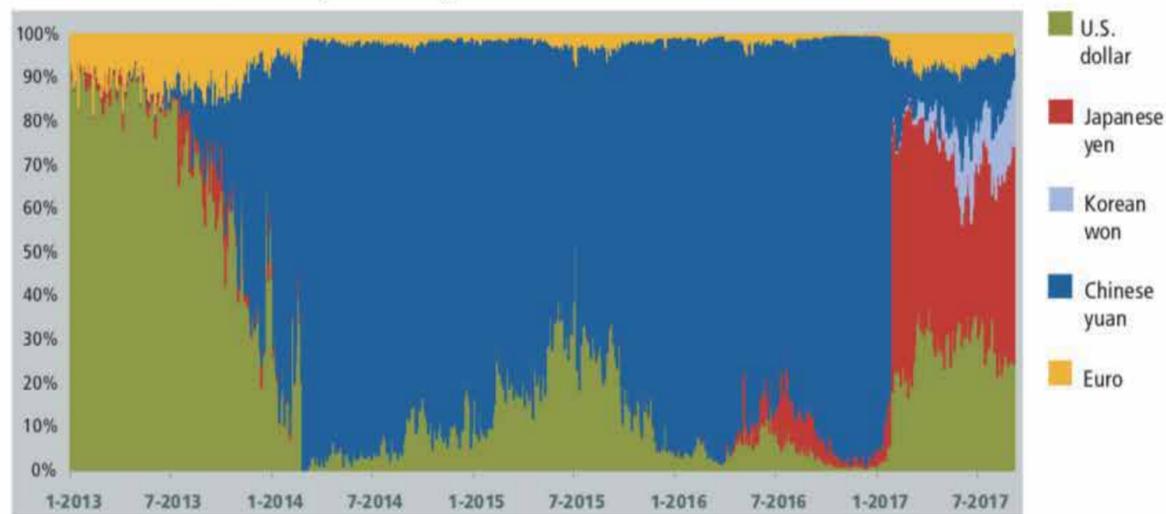


FIGURE 6  
Bitcoin volume share by currency



***The prospect of government regulations to change the structure of cryptocurrency markets remains a wild card.***

Bitcoin's market cap surged to nearly \$14 billion by December 2013 as demand from Chinese investors spiked. The PBOC responded to this rise in activity by implementing restrictions on banks' participation in bitcoin ventures in early 2014, causing a setback in market cap. However, its enforcement of these regulations became lax, and market cap began to rise steadily thereafter.<sup>14</sup> China-based bitcoin users became a dominant force in the market from 2013–2016, with volumes in bitcoin vs. CNY rising to nearly 99% of the market in late 2016 (Figure 6).

As noted in the introduction, the bitcoin market continues to be notoriously unpredictable. Early 2017 saw a drastic plunge in bitcoin trading volume against CNY to near 10%, as Chinese regulators began to investigate two large bitcoin exchanges for violating regulations.<sup>15</sup> However, bitcoin trading volumes against the Japanese yen have picked up markedly since then, as Japan's government announced it would recognize bitcoin as a legal form of payment starting in April 2017<sup>16</sup> (though it is still not considered legal tender). Trading volume of bitcoin vs. the USD and Korean won has also risen. The prospect of government regulations to change the structure of cryptocurrency markets remains a wild card. On September 14, 2017, for example, bitcoin dropped by nearly 35% from its all-time high on September 1, with market cap falling from \$81 billion to \$55 billion in the course of two weeks after it was reported that Chinese regulators would be shutting down bitcoin exchanges<sup>17</sup>

as well as banning initial coin offerings<sup>18</sup> (or ICOs, in which companies raise capital by creating and selling cryptocurrencies, rather than using traditional funding vehicles such as equity or debt issuance). Rumors of a possible ban on mining by Chinese authorities also weighed on the market. In light of such volatility, how does bitcoin stack up as an asset class and potential investment? Let's take a look.

## Bitcoin as an investment: market cap and volume

FIGURE 7

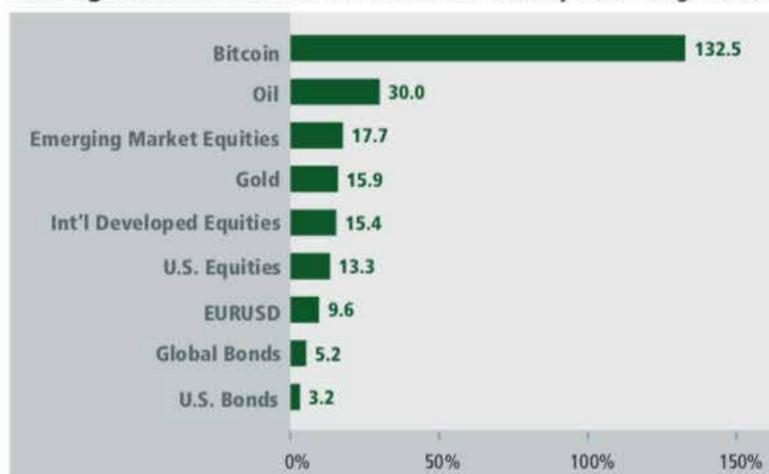
Average annual return (July 2010–Aug. 2017)



Sources: Bloomberg, Coindesk.com, based on weekly returns

FIGURE 8

Average annualized standard deviation (July 2010–Aug. 2017)



To get a sense of where bitcoin stands relative to other asset classes, a look at its market cap can be instructive.<sup>19</sup> As mentioned earlier, it currently stands at approximately \$70 billion, as of August 2017—significantly smaller than most other investable asset classes. A study by Doeswijk, R., Lam, T., and Swinkels,<sup>20</sup> looked at the size of global market caps as of the end of 2016. The size of most other asset classes, like global equity markets (\$42 trillion) and global government bond markets (\$27 trillion), far exceed that of bitcoin, even at its current market cap of close to \$70 billion. It is often compared to gold, which has an estimated market cap of \$7.6 trillion,<sup>21</sup> while the value of the USD stock of “narrow money” (currency in circulation plus demand deposits and other liquid assets) was approximately \$3.3 trillion as of year-end 2016.

The Swiss franc stock of narrow money in comparison is approximately \$500 billion.<sup>22</sup>

From a volume perspective, bitcoin sees a significantly smaller average daily volume traded compared to other markets. In 2016, the USD saw an average daily turnover of \$4.4 trillion,<sup>23</sup> U.S. Treasury markets \$513 billion, U.S. corporate bond market \$30 billion, and the U.S. stock market \$274 billion.<sup>24</sup> Bitcoin's average daily traded volume was just \$86,000 in 2016.

Volumes have picked up significantly since then, with average daily volume in August 2017 at nearly \$2 billion,<sup>25</sup> but are still notably smaller than volumes traded in other major markets.

### Returns, volatility, correlations, drawdowns

A look at the returns, volatility, correlations, and drawdowns of bitcoin provides important color on its characteristics as an investment relative to other assets.<sup>26</sup>

As shown in Figure 7, bitcoin has clearly seen outsized returns in recent years. Those returns, however, have come with dramatically higher standard deviations (a measure of the volatility of returns) relative to other asset classes (Figure 8).

Interestingly, its price volatility has actually declined relative to its early years of existence, as can be seen in the rolling one-year standard deviation of its weekly returns (Figure 9). A comparison of Sharpe ratios (a measure of risk-adjusted return),

FIGURE 9

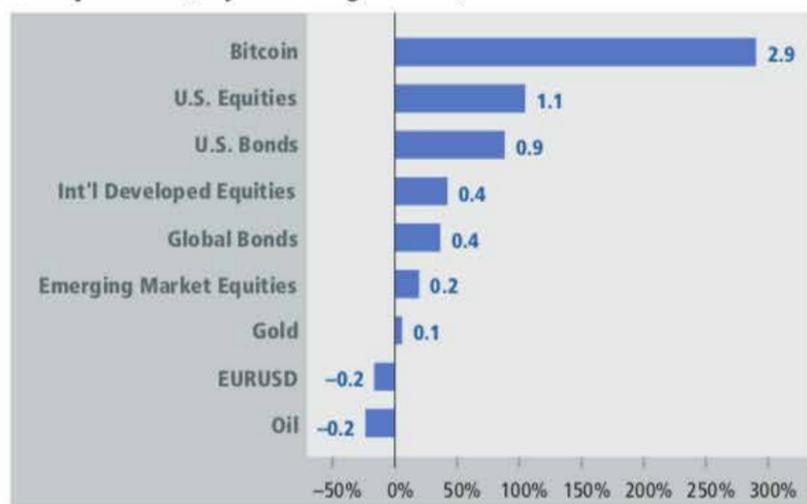
**Bitcoin volatility** (rolling 1-year standard deviation of daily returns)



Source: Coindesk.com

FIGURE 10

**Sharpe ratio** (July 2010–August 2017)



shows well for bitcoin (Figure 10). Correlations with other asset classes have also been low, as seen in the first column of Figure 11.

However, a look at the maximum sustained drawdown (maximum loss from peak to trough over a fixed period) of bitcoin from July 2010 to August 2017 compared to other assets does suggest caution is in order. The maximum drawdown for bitcoin was 91%, compared to 17% for the S&P 500 index. Conditional drawdown at risk (the average of the worst 5% of drawdowns) during the same period for bitcoin was 85%, compared to 13% for a more standard measure like the S&P 500. Oil, another volatile asset, has significant drawdowns, but they are still much lower than that of bitcoin.

**Bitcoin: theory vs. reality**

In theory, bitcoin was intended to create a payment system in which: 1) control is entirely decentralized; 2) transaction fees are low; 3) transactions are pseudonymous (individuals do not have to reveal legal identities to transact); 4) secured by cryptography; and, 5) devoid of third-party intermediaries. While the system in its initial stages met these goals, it has run up against some hurdles as the bitcoin market has matured.

First, as the number of transactions in the bitcoin system has increased, the mining process has become more complex and time consuming,

which has caused transaction fees (though voluntarily offered by users) to climb higher to entice miners to confirm transactions more quickly, thus challenging one of the original tenets

of the system. The average transaction fee at the start of 2017 was \$0.34, compared to \$6.90 as of August 31, 2017.<sup>28</sup> The rising complexity of the mining process has also led to the necessity for miners to acquire very expensive and specialized computing power to be able to mine successfully, which has made it impractical for an average individual to be able to be a miner. As a result, miners have formed “pools” to aggregate computing power to be able to mine more efficiently, and split their combined earnings. These factors have diminished the extent to which the system is fully decentralized.

Second, while one of the benefits of bitcoin is the pseudonymous nature of transactions, which allows users to maintain privacy, this has also at times attracted

FIGURE 11

Correlations with other asset classes

	Bitcoin	Oil	Gold	EURUSD	U.S. Equities	Int'l Dev Equities	EM Equities	U.S. Bonds	Global Bonds
Bitcoin	1.00	-0.02	0.08	0.05	0.04	0.05	0.01	0.03	0.07
Oil	-0.02	1.00	0.13	0.16	0.37	0.39	0.41	-0.19	0.04
Gold	0.08	0.13	1.00	0.39	-0.01	0.13	0.20	0.32	0.56
EURUSD	0.05	0.16	0.39	1.00	0.15	0.37	0.23	0.11	0.67
U.S. Equities	0.04	0.37	-0.01	0.15	1.00	0.82	0.68	-0.31	-0.06
Int'l Dev Equities	0.05	0.39	0.13	0.37	0.82	1.00	0.80	-0.17	0.20
EM Equities	0.01	0.41	0.20	0.23	0.68	0.80	1.00	-0.05	0.18
U.S. Bonds	0.03	-0.19	0.32	0.11	-0.31	-0.17	-0.05	1.00	0.68
Global Bonds	0.07	0.04	0.56	0.67	-0.06	0.20	0.18	0.68	1.00

Low correlation: -0.4 to 0.4
  Mid correlation: 0.4 to 0.7
  High correlation: Absolute value greater than 0.7

unsavory and even criminal transactions in the digital currency. Examples include the Silk Road network, an online black market for selling illicit drugs,<sup>29</sup> and the WannaCry Ransomware attack, in which malicious software overtook computers and demanded a ransom in bitcoin to regain access.<sup>30</sup> The resulting association of the digital currency with illicit activity has hindered its acceptance as a mainstream form of payment.

Third, security of transactions is not a given despite the advent of the underlying blockchain system. Mount Gox, one of the largest bitcoin exchanges in 2013, collapsed in early 2014 after losing nearly \$460 million worth of its customers' bitcoin, as it was unable to protect against hackers who had been siphoning money from customer accounts over time. This resulted in customers losing all of their bitcoin held with the exchange, exposing major cybersecurity risks in the bitcoin system. In addition, despite the intended goal of dispensing with third parties, exchanges and wallet providers<sup>31</sup> do essentially serve as a form of intermediary, albeit without the protections of one.

Finally, bitcoin remains in its early stages, with its ability to scale and grow as a system still potentially up for debate. Its August 1, 2017 "fork" (split into two versions of the digital currency) was largely deemed a success, as evidenced by its sky-rocketing post-fork price. (Please see Appendix, "Fork in the Road?" for more details.) However, the instability of bitcoin's price and the uncertainty around the outcome of the fork in the lead-up to August 1 is a reminder that the digital currency is still far from being thought of as an established currency. It remains to be seen how bitcoin will weather future disagreements on how its development should proceed.

FIGURE 12

Maximum drawdown and conditional drawdown at risk



*We are mindful of the high levels of volatility, drawdown risk, security and hacking threats, instability, and lack of predictability.*

### Ether and other cryptocurrencies

In the medium term, bitcoin will also have to contend with rival cryptocurrencies. Since its creation, a variety of competitors have surfaced, over 1,000 at current count, for a total cryptocurrency market cap of \$145 billion as of August 2017.<sup>32</sup> The top five by market cap are bitcoin, ether (with just under half of bitcoin's market cap), bitcoin cash, ripple, and litecoin. Ether has been viewed as a potential future rival for dominance of the market. Like bitcoin, ether uses blockchain technology maintained by miners who are rewarded with cryptocurrency (in this case, ether) for the work done to verify transactions. But ethereum, the blockchain system behind it, was built to be more than just a payment system, and can execute smart contracts (self-executing programmed agreements) that can be used in a variety of fields.<sup>33</sup> Like bitcoin, ethereum would allow for the transfer of payment for goods and services. Smart contracts could also allow, for example, the release of a digital pin code for entry to a rental apartment, or hotel room directly between two parties without the need for an intermediary. If the payment is made, the digital key is released, as written into the smart contract. This idea of smart contracts could revolutionize many industries—including law, insurance, government, healthcare—and makes ether a real contender to potentially eclipse bitcoin's future dominance.

Bitcoin cash was formed on August 1, 2017 after the fork in the bitcoin system, with the aim of decreasing the processing time of transactions. (For details, please refer to the Appendix, "Fork in the road?") Ripple, the fourth-largest cryptocurrency, was created in 2013 with involvement by major banking institutions as a financial settlement solution. Litecoin was created in 2011, with slightly different technology, and a goal of faster transaction processing time. Central banks, including the Bank



of England, Bank of Canada, Reserve Bank of India, and Sweden's Riksbank, have also been exploring ways to use blockchain technology and issue cryptocurrencies of their own.<sup>34</sup>

Core narrative

At Wilmington Trust, we are long-term investors who look to buy and hold investments. There is no question that over a short-term horizon, bitcoin investors may be able to realize significant gains (or losses, given a look at past drawdown statistics). And bitcoin's contribution as an innovation to the current payment system in its creation of blockchain technology cannot be denied.

However, our strongest reason for caution against investing in bitcoin at the present time is that its technology and architecture is still in its early stages and very much in flux; and the odds of bitcoin being supplanted by a more evolved form of cryptocurrency is very real. In addition, we are mindful of the high levels of volatility, drawdown risk, security and hacking threats, instability, and lack of predictability (due to forks and potential for regulation). That being said, we will continue to keep an eye on innovations and investment opportunities in the cryptocurrency and blockchain space going forward.

In sum, we feel that there are no cryptocurrencies that would make for an appropriate component of a long-term investment portfolio or even a store of value as a hedge against geopolitical events. While cryptocurrencies may present opportunities for the rapid growth of capital through short-term trading strategies, we believe that even in this domain prohibitive risk is present, including the potential total loss of capital.

FIGURE 13  
Pros and cons of bitcoin as an investment

Pros	Cons
Possible long-term store of value	High volatility of returns
Diversification	Security/hacking threats
	Lack of predictability/potential instability as a system (e.g., forks, regulation)
	Possibility of being supplanted by more evolved cryptocurrency



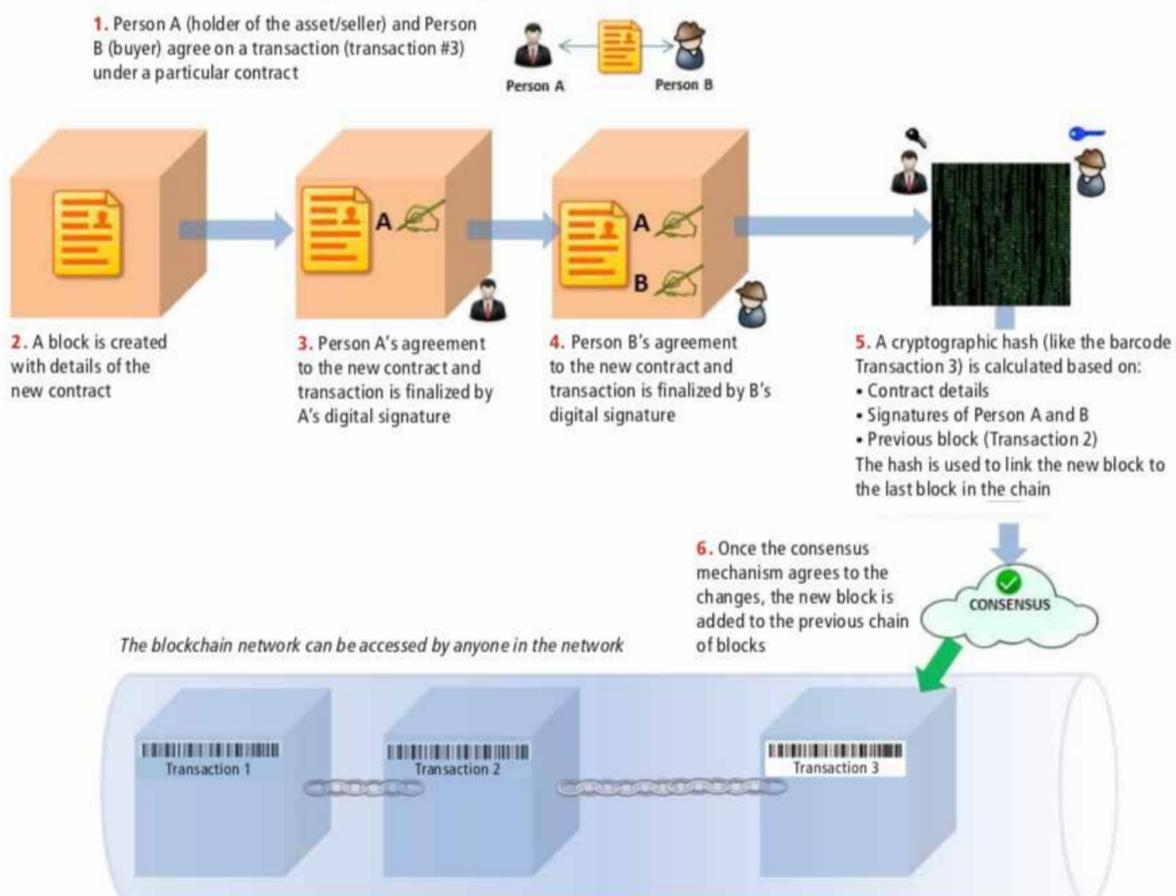
## Bitcoin: how it works, bit by bit...

“Miners” are individuals who use their computing power to complete complex mathematical problems (cryptographic “proofs of work”) to verify that a person sending a payment actually has the funds he/she intends to spend. Miners receive bitcoin (currently at a rate of 12.5 bitcoin per block), along with transaction fees (offered voluntarily by those wanting their transactions confirmed more speedily), as a reward for the use of their time, effort, and computing power to maintain the blockchain.

The transaction is bundled along with other valid transactions into a “block” only if other nodes in the network also confirm that the transaction is authentic, using a “consensus mechanism” written into the code for the bitcoin system. This block is then added to the “blockchain,” so named because each transaction is linked to the previous transactions in a chain via a “hash function” (an encoded identifier). This makes it very difficult for someone to amend any part of the history of the chain since the newest transactions would no longer be consistent with the existing chain (because a change to the history would change the hash, which is carried forward in part into all future transactions in the blockchain), causing the newest block to be rejected, rendering the fraudulent transaction worthless.<sup>35</sup> (Figure 14)<sup>36</sup>

FIGURE 14

### Blockchain network – stylized example of a transaction





## Key players in the bitcoin market

As mentioned, miners do the work of verifying each transaction within the blockchain, and in the process extract (“mine”) bitcoin directly from the system. Developers who manage and design the software to keep the bitcoin protocol running are another key part of the bitcoin ecosystem. Exchanges provide a platform for buyers and sellers to trade bitcoin (Coinbase, Kraken, and Gemini are examples of names in this space). Providers of digital “wallets” (software that connects a user to the blockchain) allow users to make and receive bitcoin payments, store and manage balances, and convert bitcoin into other currencies; examples of wallet providers are Coinbase and Blockchain.

While the services they provide are similar to that of banks, a major contrast is that wallet providers do not offer any protection for bitcoin stored or used on their platforms in the event of loss or hacking (unlike banks, which by regulation are required to do so).<sup>37</sup> One can transact in bitcoin by obtaining a digital wallet via a wallet provider’s website. Use of a wallet is similar to that of an email address; it allows individuals to send, receive, and store bitcoin. Each wallet has a “private key,” similar to a password that authenticates transactions made from the wallet and safeguards the bitcoin held within.<sup>38</sup> To obtain bitcoin without mining, a user can accept the currency as payment for goods and services via a wallet, or purchase it on an exchange.<sup>39</sup>

## Fork in the road

Bitcoin recently faced a major hurdle to its stability. A debate had been ongoing within the bitcoin community on how to allow for higher transaction volumes going forward. Prior to August 1, the bitcoin system was able to handle six transactions per second, compared to close to 1,600 for VISA.<sup>40</sup> The debate centered on how to allow the system to handle more transactions with greater speed. Competing proposals on how best to achieve this surfaced, each of which benefits various players in the bitcoin market.

One solution supported by developers of bitcoin software (often referred to as SegWit, or UASF—User Activated Soft Fork) would free up space in each block of the blockchain by allowing some of the data stored in each block to be stored outside of it, thereby enabling more transactions to be stored per block while maintaining its existing size. Those in favor of this solution believed that keeping the block size small would keep the system less vulnerable to attacks from hackers.

The competing proposal, favored by miners (also known as SegWit2x, or MASF— Miner Activated Soft Fork), would be a longer-term fix to the problem. The miners’ solution would be to implement the solution supported by developers, but also double the current size of the block (from 1MB to 2MB). While this solves the longer-term

problem of system capacity, the potential downside is that the number of miners would likely drop as some would not be able to afford the software and hardware upgrades required to mine these larger-sized blocks. As a result, control of the blockchain would be more centralized among this smaller group of miners, going against the founding principles of the bitcoin system.<sup>41</sup>

This disagreement had threatened to cause a “split,” or “fork,” where different versions of software representing the various views of how bitcoin should scale would be released. As of July 25, 2017, it had appeared the bitcoin community was close to reaching a compromise on this debate, supporting the developers' solution of increasing the number of transactions in a block, while working toward the miners' solution of increasing the block size to 2MB by November 2017. This would have averted a fork in bitcoin on August 1, 2017, the deadline for the decision on these possible solutions to the bitcoin scaling issue.

However, reports on July 26 suggested another group of miners would push for a new solution, called bitcoin cash, which would increase the block size to 8MB. This would greatly increase the efficiency of the system, but likely concentrate control into the hands of a smaller group of miners who can afford the necessary computing upgrades, and would also create multiple versions of bitcoin depending on the number of miners that support bitcoin cash relative to other solutions.<sup>42</sup> Given the uncertainty around the future of bitcoin, wallet and exchange sites advised bitcoin holders to be very cautious and avoid trading during the time of the potential fork due to possible instability and potential loss of bitcoin.<sup>43</sup>

As of August 1, 2017, a “hard fork” occurred, as bitcoin cash was released, while the original bitcoin continued adopting the compromise version of the solution, resulting in two competing versions. The original bitcoin's post-fork value stayed fairly stable, at around \$2,700 per bitcoin, while bitcoin cash settled at around \$400 per coin. In the weeks following the fork, original bitcoin's price surged, rising above \$4,000, as concerns on the viability of the digital currency subsided for the time being, and went on to rise to new highs close to the \$5,000 level in early September before being set back by potential regulatory risks in China as mentioned earlier. Future potential forks will be watched, but this event highlighted the potential for substantial event risk around future forks.