

Where to Bitcoin?

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Abstract

A review of bitcoin's history offers lessons for launching new private monies. To gain widespread acceptance, bitcoin had to forego some founding principles. Today, third-party institutions safeguard private keys and facilitate trades. Governments' acceptance reassures investors and enables entrepreneurial efforts. For most owners, bitcoins are a store of value, much like gold. In countries such as Venezuela, bitcoins offer protection against expropriation and a devalued government currency. The bitcoin story continues to unfold, making it impossible to predict what role, if any, bitcoins or other electronic currencies will play in the future.

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I. Introduction

“Markets Take Off in Lockstep, Raising Worries of a Reversal,” declared a June 7, 2017, *Wall Street Journal* headline. The article began, “Stocks, bonds, gold and bitcoin—assets that rarely move in unison—have all been surging this spring, confounding investors.” How has bitcoin become one of four key assets included in such a review of the markets? From its 2009 introduction as a private money championed by libertarians and cypherpunks to a technology lauded by entrepreneurs and studied by central banks, bitcoin has captured the imagination of many, raised alarm among others, and moved

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through several regulatory phases in different countries, all in less than a decade.¹

In mid-2017, at the time of writing, bitcoins are selling for roughly \$2,500 each. Backed by nothing except other people's valuations, plenty of observers see bitcoins as a twenty-first century bubble. But there are other plausible story lines. Bitcoin could overcome its current technological challenges, build on its success, and become "the future of money." Or bitcoin could be the historical antecedent for some future, privately issued electronic currency (or currencies).² Finally, interest in privately issued currencies could fade away entirely. While we cannot guess bitcoin's future, we do believe that its brief history offers lessons about the challenges of introducing a new money.

We begin with an introduction to bitcoin. We then describe its origins, consider its spread among different groups of users, and examine governments' reactions. We conclude with a discussion of future possibilities for bitcoin. Finally, an addendum covers the six months of activity in the bitcoin market that occurred since we originally wrote the paper.

II. What Is Bitcoin?

Bitcoins are a privately issued, decentralized, irredeemable asset designed as an electronic, encrypted alternative to government-issued currencies. On July 1, 2017, bitcoins sold for \$2,460.20, almost 2.5 times their January 1, 2017, price of \$997.69 and more than 3.7 times their July 4, 2016, price of \$661.56.³ The increase in bitcoins' value has been anything but smooth, however. During the first half of 2017, bitcoin prices have been as low as \$802.83 (on January 12) and as high as \$3,018.54 (on June 11).

¹ According to "Who Are the Cypherpunks?" at cryptocompare.com, "cypherpunks" distrust governments and other large organizations, especially when questions of privacy arise. As a community of programmers, cypherpunks seek to use code or cryptography to enhance individual privacy and promote change.

² Hundreds of new cryptocurrencies have been developed since bitcoins were introduced. In mid-2017, Ethereum, in particular, is capturing an increasing share of the cryptocurrency market.

³ Prices were collected from coindesk.com.

Figure 1. Bitcoin Closing Price (logarithmic scale, \$), 2016–17

Source: Data from Coindesk.com.

Despite its recent increase in value, bitcoin's share of the cryptocurrency market has fallen dramatically.⁴ According to Hileman and Rauchs (2017, p. 18), bitcoins accounted for 86 percent of the cryptocurrency market in March 2015 and 72 percent in April 2017. By July 2017, however, bitcoin's share of the market had fallen to just under 48 percent as interest in and the number of other cryptocurrencies grew.⁵ Hileman and Rauchs (2017, p. 27) estimate that there are between 2.9 million and 5.8 million active users of or investors in cryptocurrencies.

⁴ Cryptocurrencies are generally marked by "strong encryption algorithms" used to secure transactions (Extance 2015, p. 21). The terms "altcoins" and "cryptocurrencies" are often used interchangeably, although Hileman and Rauchs (2017, pp. 15–16) make a distinction. In their use of the terms, altcoins are "bitcoin clones," while cryptocurrencies offer some innovation.

⁵ Ethereum, the second most popular cryptocurrency, accounted for 22.7 percent of the market value of cryptocurrencies on July 11, 2017. The market capitalization values for Bitcoin and Ethereum were collected from coinmarketcap.com on July 11, 2017. The website identifies and lists the value of more than 900 electronic currencies.

A. But Is Bitcoin Money?

Bitcoin's creator clearly intended to establish a new type of money. That goal has yet to be fully realized. While bitcoins do have money-like characteristics that other investment vehicles (e.g., stocks, bonds, and real estate) lack, bitcoins currently fail to meet the widely accepted three-part definition applied to a typical "full service" money.

B. A Medium of Exchange?

Bitcoins have not become a generally accepted means of payment. An early bitcoin owner bought two Papa John's pizzas for 10,000 bitcoins in May 2010 (Extance 2015, p. 22), but examples of bitcoins being used to purchase goods and services remain scattered—at least in wealthier economies.

Bitcoins have been used regularly as a medium of exchange where anonymity is important to the buyer and/or seller, raising questions about the legality of these transactions. Bitcoins have also been used in international payments to minimize transaction costs, especially where official exchange rates and government-imposed banking fees dramatically increase the cost of cross-border payments. Some online sellers accept bitcoin payments. In January 2014, Overstock, the first major retailer to accept bitcoins, cited lower transaction costs, fewer chargebacks from customers disputing payments, and less worry about the security of customers' payment information as advantages (Popper 2015, pp. 289–90). In places like Venezuela, where bitcoins are an important resource for purchasing groceries and medicine because of rampant inflation, bitcoin owners must generally use their bitcoins to purchase dollar-denominated gift cards through cryptocurrency-friendly websites and then use the gift cards to purchase needed supplies (Epstein 2016).

Because these examples remain the exception rather than the rule, we must conclude that bitcoins are not a generally accepted medium of exchange.

C. A Unit of Account?

Do we record transactions and write contracts in bitcoins? Is it a unit of account? White (2015, p. 399) notes that because bitcoins have the "thickest" market, they are frequently used to buy and sell other altcoins and cryptocurrencies, making bitcoins the unit of account in this market. This lonely example highlights the limited use of bitcoins

as a unit of account, however. Few prices are quoted or contracts are written in bitcoins today.

D. A Store of Value?

Bitcoin most clearly meets the store of value test. Even in the more developed economies of the United States, Europe, and Japan, proponents view bitcoins as a hedge against possible future inflation or political instability. This is even more true in countries where monetary systems are less stable, political systems more restrictive, and property rights less secure. Bitcoins exist on a decentralized distributed ledger, or blockchain, maintained by computers around the world. Wherever a bitcoin owner has internet access, he or she can access bitcoins. Accounts cannot be “frozen” or “held hostage” by individual governments. As recently as November 2016, Chinese investors were purchasing bitcoins to protect against a falling yuan, despite the government’s efforts to limit purchases (Vaishampayan, Hunter, and Deng 2016).⁶

In summary, bitcoin fulfills just one component of the three-part standard definition of a full-service money. So why study bitcoin? First, by exploring bitcoin’s history, we hope to better understand why it has failed thus far to become a more widely accepted medium of exchange. Second, as a store of value, bitcoin’s role most closely resembles that of gold. Considering the parallels between bitcoins and gold may provide clues to bitcoin’s possible future.

III. The Origins of Bitcoin

“What we really want is fully anonymous, ultralow transaction cost, transferable units of exchange.”

—Adam Back (creator of Hashcash) quoted by Popper (2015, p. 19)

In October 2008, Satoshi Nakamoto shared with a cryptography-focused mailing list a working paper titled “Bitcoin: A Peer-to-Peer Electronic Cash System.” Nakamoto’s stated goal was to eliminate the need to trust third-party financial institutions to hold deposits or process payments.⁷ In Nakamoto’s model, every existing bitcoin is owned by a public address, and each address has an associated private

⁶ The Chinese government restricted payment processors’ ability to transfer payments of individuals seeking to purchase bitcoins. See Popper (2015, p. 284) and Deng (2017a, b).

⁷ Satoshi Nakamoto is a pseudonym for an unidentified individual or individuals who developed the bitcoin proposal and wrote the initial code. A copy of his working paper can be found at Bitcoin.org.

key. Anyone with the appropriate private key could instruct the bitcoin community to transfer bitcoins from one address to another.

Bitcoin's important technological innovation was the introduction of the blockchain, and Nakamoto's original system is still used today. Every bitcoin transaction is recorded by all the computers on the network using a distributed (decentralized) ledger, or blockchain technology. The resulting public record tracks how many bitcoins are owned by each address (Popper 2015, p. 20). The system is maintained by "miners," or servers that devote computing power to keeping records in return for the prospect of receiving newly issued bitcoins (Popper 2015, p. 22). A majority of the programs running the code and communicating over the internet must agree to any change in the transaction record so that bitcoins are controlled by a consensus of those using them rather than by any central authority.

Nakamoto provided the code for bitcoin in January 2009 and explained his vision in a February 2009 post on the P2P Foundation website: "The root problem with conventional currency is all the trust that's required to make it work. . . . The central bank must be trusted not to debase the currency, but the history of fiat currencies is full of breaches of that trust."⁸ To establish trust in the ultimate value of bitcoins, Nakamoto set an upper limit of 21 million bitcoins. Computers participating in the network earn new bitcoins randomly. It is designed so that, on average, every 10 minutes a computer gains the new bitcoins and records some pending transactions, thereby receiving the associated transaction fees. The amount of new bitcoins rewarded halves every 4 years, so that while 16 million bitcoins had been created in July 2017, the total of 21 million will be reached over 120 years later in 2140.

A. Why Bitcoin? Why Now?

The motivation for the issuer or developer of a new money is clear. As with any new product or service, if users attach more value to the money than its cost of production, the issuer or developer will earn a profit. But why would users adopt a new type of money? Historically, new monies generally appeared when a medium of exchange was needed to support trade,⁹ distant traders needed a more widely

⁸ See P2P Foundation (2009). On this site, Satoshi Nakamoto is identified as a 42-year-old man from Japan, although that information has never been verified.

⁹ Examples of new monies designed to support trade include furs and tobacco in the American colonies during the seventeenth and eighteenth centuries or cigarettes

accepted form of money, the existing money failed to hold its value, or governments found it useful to issue new monies as a means of generating seigniorage.¹⁰

None of these conditions seemed to exist in 2008 and 2009 when Nakamoto launched bitcoin. Widespread inflation in the 1970s and 1980s had generated interest in alternatives to government-issued fiat currencies. Bordo (1981), Hall (1982), and Goodfriend (1988), among many others, explored the possibilities for a modern gold standard. Vaubel (1986), Yeager (1983), and Taub (1985), to name just three authors, described privately issued competing currencies, including fiat currencies.¹¹ But inflation in the United States peaked at 12.4 percent in 1980 and has trended downward since. By 2008, the inflation rate averaged just 2.3 percent.¹² Other developed economies have had similar experiences. But for Nakamoto and other bitcoin fans, several themes came together, beginning in 2008–09, that increased interest in finding an alternative to government-issued currencies.

First, advances in cryptography, as well as improved communications and increased computing power, had dramatically changed the technological landscape since 1990. The white paper released by Nakamoto in 2008 and the code that followed in early 2009 provided a path to a reliable, decentralized, privately issued, anonymous payment system.

Second, there was growing concern about infringements on individual privacy. Since 2001, US and European governments had expanded surveillance of private residents in the name of fighting terrorism and increasing national security. Large companies both cooperated with government agents and engaged in their own data

in prisoner-of-war camps during World War II. These new types or forms of money should be distinguished from instances in which the government failed to provide sufficient circulating currency and market participants responded with a new form of “note” denominated in the government-issued money. Land banks located in the Massachusetts Bay Colony issued promissory notes denominated in pounds sterling, for example, and the personal checks of solvent individuals sometimes circulated in lieu of bank notes during the Depression.

¹⁰ Many books explore the history of money. See, for example, Goetzmann (2016) and the extensive bibliography he provides.

¹¹ Dorn (2017) is a collection of papers on monetary policy published by the Cato Institute over the past 30 years. The book includes a section on “Alternatives to Government Fiat Money” as well as an excellent reference section that points interested readers to additional papers on the subject.

¹² According to the Bureau of Labor Statistics, inflation averaged just 3.08 percent in the 1990s, 2.54 percent in the 2000s, and 1.86 percent in the 2010s.

collection to produce ever more individually targeted marketing. There was a growing sense that “someone is always watching.” The cypherpunks, among bitcoin’s earliest fans, looked to technology and cryptographic advances to help “alter the balance of power between governments and corporations on the one hand and individuals on the other” (Popper 2015, p. 8).

Third, in the wake of the 2008 financial crisis, central banks around the world were pumping reserves into the system. Many observers expected that inflation would follow. Gold prices also increased dramatically during this period, with the price of an ounce of gold rising by 44.48 percent in 2009, by 28.15 percent in 2010, and by 25.33 percent in 2011.¹³

Finally, there was dissatisfaction with banks and other large financial institutions. Misguided lending and investment policies led to the subprime mortgage crisis and a worldwide recession. Many people felt that established players in the financial system overcharged for their services and limited innovation in the money transfer and payment markets. Technology had empowered buyers of airline tickets, cars, books, and music, so why not buyers of financial services as well? Perhaps a new electronic currency could provide low-transaction-cost, readily transferable units of exchange, especially across national borders (Popper 2015, p. 19).

As McCann (2016) described the era, “The collapse was coming. The banks were shorting out. The real estate market was a confederacy of dunces. Bernie Madoff’s shadow loomed. Occupy was on the horizon. And all those Wall Street yahoos were beginning to squirm.”

IV. Waves of Bitcoin Users

Bitcoin’s first adopters were technologically savvy and suspicious of government and large financial institutions. They were attracted by the private, peer-to-peer, decentralized nature of bitcoin as originally envisioned by Nakamoto. In return for increased privacy, early adopters were willing to forego government protections and depend on an incentive structure that encouraged responsible behavior by others within a like-minded community.

The initial bitcoin enthusiasts failed to take full account of the competitive advantages enjoyed by a reasonably well-performing

¹³ See “Gold Price Historical Chart,” roslandcapital.com. Gold prices fell between 2012 and 2014, however.

incumbent money, however. Luther (2016, p. 398) identified switching costs and network effects as problems any new money would need to overcome if it was to enjoy widespread success. Adopting a new money requires new mechanisms to set prices and to settle accounts. These switching costs increase when the new money's value is volatile relative to the existing form of money. A related but even more important consideration is the network effect. The value of a money is determined in large part by how many of one's trading partners will accept that money in exchange for real goods and services. This is especially true for fiat currencies that have no value other than as a medium of exchange or a store of value.¹⁴

Bitcoin's initial fans were a small group. The number and size of their economic interactions with one another were minuscule compared to their interactions with those who used dollars, euros, and yen. After an initial burst of enthusiasm, bitcoin failed to gain traction and seemed about to fade away. In May 2010, a potential user asked the bitcoin mailing list how he could accept bitcoins for his web-hosting business. Months later, the same user posted, "Wow, not one response in months. Amazing" (Popper 2015, p. 40).

Then, in January 2011, Ross Ulbricht launched Silk Road, a site on the dark web that offered contraband goods for sale in exchange for bitcoins (Popper 2015, p. 74). This site drew into the bitcoin community a new group of users who took comfort in the currency's promised anonymity. In June 2011, when Senator Chuck Schumer (D-NY) denounced Silk Road and bitcoin, charging that they represented a form of "online money laundering used to disguise the source of money and who's both selling and buying the drug," Bitcoin's price tripled from \$10 to \$30 per bitcoin (Popper 2015, p. 84). Individuals engaged in illegal transactions believed they had found a money that would serve their purpose.

Meanwhile, more legitimate entrepreneurs also took an interest in bitcoin, in part to serve the bitcoin community. Not all users were comfortable keeping their private keys on their own computers. Concerns about lost, stolen, or destroyed computers; hacking; and the general challenge of keeping up with the information created a demand for bitcoin "wallets" maintained by third parties. In addition, individuals interested in buying and selling bitcoins wanted a site on which they could execute desired trades. So the first bitcoin

¹⁴ There is debate about whether gold became a money because it was valued as a decorative commodity or became a decorative commodity because it was valued as a money.

companies appeared. Mt. Gox opened in the summer of 2010. MyBitcoin, BitInstant, BitPay, and others soon followed. Among the bitcoin entrepreneurs were individuals who had spent the past decade identifying industries with inefficiencies that were ripe for disruption. These bitcoin promoters saw an opportunity to provide more efficient payment systems within and across national borders. Hileman and Rauchs (2017, p. 21) divided the current cryptocurrency industry into four primary sectors: exchanges, wallets, payments, and mining. By April 2017, they estimated that more than 1,800 individuals, not including miners, were working full time in the industry (Hileman and Rauchs 2017, pp. 24–25).

A fourth group are the bitcoin users living in countries with unstable monetary and economic systems. Epstein (2016) described the role of bitcoins in Venezuela in “helping to keep pantry shelves full and medicine cabinets stocked” in a country in which “supermarket shelves are bare. Children are fainting from hunger in their classrooms. [And a] mob recently broke into the Caracas zoo to eat a horse.” Bitcoin mining is made affordable by government policies that subsidize electricity, pricing it near zero. Power outages can create headaches for bitcoin miners, of course, but the payoff is the ability to import food, medicine, and supplies to keep other businesses running. Not surprisingly, the Venezuelan government frowns on the use of bitcoins to evade official exchange rates and restrictions on trade.¹⁵ Officially, bitcoin miners are charged with abusing electricity. They have been arrested and imprisoned, although at least some secret police will look the other way in exchange for bitcoins. Compared to the bolivar, bitcoins have a stable value. They are harder to steal than hoarded US dollars, and they can be traded without clearing the transaction through a third-party intermediary. In Venezuela, bitcoins exhibit the advantages Nakamoto originally envisioned.

Finally, attracted by the rising value of bitcoins, investors and speculators have joined other bitcoin advocates. These individuals just want a return on their investment. Vigna (2017) quoted 78-year-old Tony Horsley, who indicated that he might invest in bitcoins to add “a little excitement to the mix” of his current twelve-stock portfolio. The participation of investor/speculators like Horsley increases the depth of the market and helps push prices higher, but

¹⁵ In December 2016, the Venezuelan government also announced significant new restrictions on cash used in “contraband” trades. See Kurmanæev and Vyas (2016).

speculators trading into and out of bitcoins may also increase market volatility, and these users are more likely to expect government regulation to ensure an “orderly” market.

As new waves of users joined the bitcoin bandwagon, their interests with respect to the role of government have diverged. Early libertarian-oriented users see bitcoin through a philosophical lens first and an economic lens second. As McCann (2016) reported, early adopters hoped that bitcoin would become “the frictionless currency of the people, changing the way people move money around the world, bypassing the banks, disrupting the status quo.” According to McCann (2016), these so-called “true believers” express scorn for the later-arriving entrepreneurs, investors, and speculators seeking government approval and protection. “What they want to do is lobotomize bit-coin [*sic*], make it into something entirely vapid.”¹⁶ The first bitcoin enthusiasts fail to acknowledge that the success of any new money ultimately depends on practical considerations. How many other individuals will accept bitcoins in exchange for other assets and/or real goods and services? The arrival of the entrepreneurs, investors, and speculators almost certainly saved bitcoin from early oblivion.

V. Enter Governments

Despite the original intent of Nakamoto and his early fans, governments are part of the bitcoin world. Governments issuing an accepted money conduct monetary policy, generate seigniorage revenues, and monitor electronic balances and payments for signs of illegal activity, including tax avoidance. Government officials understand these benefits. As Luther (2016, p. 399) observed, if a new money begins to infringe on one or more of these government advantages, the government will take steps to preclude or dissuade users from adopting it.

The first government inquiries into bitcoin markets were, in fact, at the invitation of bitcoin users who had lost money in the market. It did not take long for thieves to enter bitcoin’s libertarian paradise. The weak link was users’ willingness to have third parties hold their private keys and help facilitate trades. In January 2011, “Baron” stole \$45,000 by hacking other users’ accounts in Mt. Gox (Popper 2015,

¹⁶ In this case, McCann (2016) had asked specifically about the efforts by Cameron and Tyler Winklevoss to gain SEC approval of a bitcoin-based exchange-traded fund. In March 2017, the SEC denied the Winklevoss petition, expressing concern that the market was still subject to manipulation. See Michaels and Vigna (2017).

p. 67). In July 2011, the founder of MyBitcoin, an online wallet holding individuals' private bitcoin keys, walked away with customers' bitcoins (Popper 2015, p. 98). Hackers continued to attack Mt. Gox and other Bitcoin-based companies, halting transactions and holding information for ransom (payable in bitcoins, of course). The largest and best known of these thefts was from Mt. Gox in February 2014. Hackers stole 750,000 bitcoins, clearing out Mt. Gox customers' accounts and taking 100,000 bitcoins from the exchange itself, causing Mt. Gox to fail (Popper 2015, pp. 312–15).

In each case of major theft, bitcoin users turned to government authorities for help (Popper 2015, p. 114). The irony of such requests was not lost on government observers. While bitcoin users embraced a decentralized money that avoided government authorities, these same users then turned to intermediaries to hold their private keys, entrusted their money to a new form of unregulated "financial institutions," and wanted the government to help recover their property when things went wrong.¹⁷

Meanwhile, government agents were increasingly concerned about the role bitcoins were playing in illegal activities. There was a concerted effort to uncover the creator of and participants in Silk Road and other contraband markets that used bitcoins. Growing interest in bitcoins during 2012 and 2013 raised concerns about money laundering and possible links with terrorism, drawing governments' interest. As bitcoin exchanges brought new bitcoin users into the fold, they needed banks and other financial institutions to process payments involving government currencies. As the size of transactions grew, the common use of pseudonyms by many bitcoin users created problems for regulated financial institutions required to meet government disclosure requirements. By 2013, banks had begun to back out of agreements with bitcoin-based exchanges and/or limit the size of transactions they would process in any single day.

In March 2013, the Financial Crimes Enforcement Network (FinCen) began to apply the Bank Secrecy Act to virtual currencies. Anyone selling virtual currencies for "real currency" would be considered a "money transmitter" and subject to government regulation (Popper 2015, p. 194). In May, as part of their Silk Road investigation, US authorities seized \$5 million from two American

¹⁷ Although government authorities found irony in these appeals for government aid against theft, libertarians would argue that one of the legitimate roles of government is, in fact, protection of private property by prosecuting theft and enforcing private contracts.

bank accounts and accused Mt. Gox of violating federal money transmitting laws (Popper 2015, p. 213). In July, financial regulators in New York issued subpoenas to every major company in the bitcoin space, asking for documentation related to consumer protection and anti-money-laundering programs, and the US Senate Committee on Homeland Security and Governmental Affairs sent a letter to federal financial regulators and law enforcement agencies asking about the “threats and risks related to virtual currencies” (Popper 2015, p. 224).

Increasingly, the entrepreneur-investors in bitcoin sought to cooperate with government authorities and put a more “mainstream” face on bitcoin. Patrick Murck, a Seattle attorney who worked for the Bitcoin Foundation, contacted federal regulators, beginning with the head of FinCen, to explain the legitimate uses of bitcoins and other virtual currencies, especially in international payments and remittances. In fact, Murck welcomed a role for financial regulation of third-party payment processors as a means of protecting consumers (Popper 2015, p. 234). Meanwhile, BitInstant registered with FinCen as a money transmitter (Popper 2015, p. 201). Coinbase increased the rigor with which it vetted clients in an effort to ensure its service was not used for illegal means, and BitStamp required all customers to go through an identity verification process (Popper 2015, p. 235).

In November 2013, the Senate Homeland Security and Governmental Affairs Committee and the Senate Banking Committee held hearings on bitcoin and other virtual currencies on consecutive days. The work by Patrick Murck and the cooperative attitudes of major players in the bitcoin industry paid off. The *Washington Post* headline on November 19, 2013, read, “This Senate Hearing Is a Bitcoin Lovefest” as the head of FinCen, the head of the Criminal Division in the Department of Justice, and the head of criminal investigations at the Secret Service all assured senators that they were not overly concerned about bitcoins’ use in criminal activities (Popper 2015, pp. 265–67). Panelists emphasized that using bitcoins was, in fact, “a terrible way to break the law” precisely because of its fully public, blockchain record of all transactions (Popper 2015, p. 269). With government approval, bitcoin prices surged (Popper 2015, p. 267).

While the US government expressed satisfaction with the bitcoin industry, the Chinese government was less impressed. In December 2013, the People’s Bank of China released its own virtual currency

regulations. Concerned by Chinese citizens' efforts to evade limits on how much money could be sent out of China, the government required that bitcoin exchanges register with the Ministry of Information. Further, the Chinese government ruled that bitcoin was not a money (because it lacked government backing), and therefore banks and payment processors within China could no longer deal with bitcoins either directly or indirectly (Popper 2015, pp. 273–74).¹⁸ In February 2017, the People's Bank of China again tightened oversight related to "money laundering and foreign-exchange management" at Chinese bitcoin exchanges, forcing the exchanges to suspend withdrawals before allowing them to resume again in June (Deng 2017a, b).

The latest government-fueled bitcoin push has come from Japan. On April 1, 2017, the Japanese government officially recognized bitcoins as a legitimate payment method. While official recognition included regulations related to minimum capital standards, segregation of customer accounts, and restrictions designed to monitor for criminal activity, the resulting surge in bitcoin interest has helped buoy bitcoin prices worldwide (Vigna and Tsuneoka 2017).

VI. The Future of Bitcoin?

If nothing else, Satoshi Nakamoto and bitcoin will be remembered for introducing the blockchain, a major innovation in financial markets. Variants of the blockchain are being adopted by financial institutions around the world as a more secure way of recording transactions and ownership. But does bitcoin's brief history allow us to say anything else about its future?

Bitcoin's trajectory during its first eight years has not been what its creator and early advocates envisioned. In retrospect, a committed, libertarian-oriented community was not enough to support a new, private, peer-to-peer money. Furthermore, even early bitcoin enthusiasts welcomed intermediaries to secure private key data and to facilitate the trading of bitcoins. As the market expanded, bitcoin entrepreneurs needed to interact with government-regulated financial institutions as they exchanged government monies into and out of bitcoins. As predicted by Harwick (2016, p. 580), regulated

¹⁸ Mining became particularly popular in China because it allowed Chinese citizens to gain bitcoins without going through the increasingly regulated exchanges (Popper 2015, p. 329). As in Venezuela, Chinese mining activities were further supported by the Chinese government's subsidization of electric rates.

financial institutions became a pressure point for governments, increasing the costs to potential bitcoin users interested in adopting the new money. To grow, bitcoin needed widespread acceptance, respectability, and ultimately government approval. In fact, as bitcoin has become more integrated into the mainstream economy, government approval has become important in driving bitcoin value, much to the dismay of the earliest advocates.

Nor has bitcoin's recent growth proceeded smoothly. The large and growing size of the blockchain is causing problems. Increasing numbers of transactions have slowed payment processing significantly. As predicted by Dowd and Hutchinson (2015), resources devoted to mining have become more concentrated as costs have risen.¹⁹ Transaction fees have increased dramatically since early 2016, threatening the use of bitcoins as a low-cost payment system and making bitcoins less useful for small transactions. New cryptocurrencies designed to address these problems have flooded the market, and many of them are gaining traction. One of these competitors may prove once again that the "first-mover advantage" is not always permanent, especially when new entrants can capitalize on lessons learned by the pioneer.

So assuming bitcoin survives, what role might it play in the future?

A. Bitcoins as a Store of Value

Currently, bitcoin's primary use is as a store of value, providing a hedge against economic and political uncertainty. In unstable economic and political environments, bitcoins' advantage is that they do not depend on local institutions' financial records. There is no physical manifestation of bitcoins that can be discovered and confiscated via search, and bitcoins can be accessed from anywhere in the world.

But what advantages do bitcoins offer in more stable economic environments where expropriation is less likely? Why would bitcoins be considered "gold 2.0," in the words of Vigna and Eisen (2017)? It is helpful to compare bitcoins with gold specifically rather than with other monies.

Gold also fails the three-pronged test for money. Few people today conduct transactions using gold coins. Nor do we find prices

¹⁹ The rate of growth in the number of bitcoins is slowed by requiring more "work," i.e., the recording of more transactions, to earn each new bitcoin.

or contracts regularly denominated in gold. Like bitcoins, gold's function is currently as a store of value, a hedge against uncertainty. Like gold, bitcoins are of limited supply, durable, and can't be counterfeited.

Mining new bitcoins requires an increasing commitment of resources, much like finding new gold. But the ultimate limit on bitcoins is more certain than for gold, as it is written into bitcoin's code. Who knows if there are untapped sources of gold awaiting discovery on Earth or elsewhere?

Gold does not rust, corrode, or deteriorate over time. Bitcoin's durability depends on the internet and the willingness of people to run the software. The internet relies on electricity and technology in a manner that a gold coin does not. However, the internet as a whole is more robust than a single gold coin, which can be lost or confiscated. As for people running the software, as long as bitcoins are valuable, people will run the software.

Gold is not easily counterfeited. When gold circulated as a medium of exchange, it was easy to ascertain that a coin was actual gold and not just gold-like. The nature of the distributed ledger and the requirement that a majority of record keepers agree to any change in ownership via the blockchain also make bitcoins difficult, if not impossible, to counterfeit.

Bitcoins have other features that may make them a more attractive store of value than gold. Bitcoins are divisible and more portable than physical gold or even wealth held in a local financial institution. Bitcoins can be accessed from anywhere with an internet connection and a private key.

Given bitcoins' role as a store of value, are there circumstances under which they might fulfill other functions of money? We might ask the same question of gold. Given that neither gold nor bitcoins meet the current definition of a full-service money, why invest in them? Part of the reason, we would argue, is that as recognized stores of value, both assets have the potential to play other money roles. Certainly owners of gold believe that if some natural or manmade catastrophe were to disrupt markets, gold coins would become an acceptable medium of exchange. But this argument should hold for any reasonably durable, portable, divisible store of value.²⁰ This

²⁰ Is gold more likely to play this role than other assets? It would probably depend on the nature of the catastrophe. It is possible to imagine a dystopian future in which everyone loses access to the internet. But how many owners of gold actually physically possess it? In the face of some natural or manmade catastrophe, in the

consideration brings us to two other possible future uses of bitcoins (or other cryptocurrencies).

B. Replacing Government Currencies

Bitcoin's replacing a government currency as a primary monetary unit is the least likely scenario, especially in wealthier economies that enjoy reasonably stable currencies. Bitcoins would be most likely to replace a government currency in a country with extreme economic and political instability. As noted, some people in Venezuela, a site of extreme economic hardship, are turning to bitcoin as an alternative currency.

Ali et al. (2014) and Harwick (2016), among others, are dismissive of bitcoins' replacing government-issued money because bitcoin does not lend itself to conducting countercyclical monetary policy. The total supply of bitcoins is limited to 21 million, and the rate of increase in the bitcoin supply is unrelated to the macroeconomic conditions of the countries in which bitcoins are used. Furthermore, the structure of bitcoins is incompatible with fractional reserve banking, whereby banks or other depository institutions can increase the money supply by making loans. But it was Nakamoto's distrust of these mechanisms as exercised by central banks and large financial institutions that led to his creation of bitcoins in the first place. Residents of a country with a collapsing currency might embrace bitcoins precisely because they are the antithesis of government-manipulated monies.

Naturally, the Venezuelan government is imposing punitive anti-bitcoin policies, and the role of bitcoins in countries with failing economies remains to be seen. Ultimately, as long as governments only accept tax payments in government-issued monies, private currencies will have a difficult time fulfilling all three traditional functions of a money.

C. International Payments

Finally, bitcoins could become an accepted form of international payment. They are currently being used to effect international transfers. Vigna (2017) reported that Kenya-based BitPesa has helped 6,000 users across eighty-five countries send and receive bitcoin

absence of the internet, would owners of gold be able to access their gold? Do they even know where it is?

payments. Epstein (2016) noted the increasing use of bitcoins as a way for expats to send money to their families in Venezuela.

As trade has expanded and the number of cross-border transactions has increased, a single, widely accepted form of money would have advantages. In addition to lower transaction costs, an internationally accepted money could help mitigate the impact of exchange-rate fluctuations and make cross-border pricing more transparent, especially if bitcoins also became the unit of account in international transactions.²¹ Further, making or accepting payments with bitcoins would carry no “political baggage” that might be associated with dealing in the currency of an enemy state. While this scenario is more likely than bitcoins’ replacing a government-sponsored money, the current system of international payments functions reasonably well. To overcome the switching costs and network effects identified earlier, users would need a reason to significantly expand bitcoins’ role in the market—either a failure in the current system or additional advantages from using bitcoins.

Even without bitcoins actually replacing government-issued fiat currencies in either domestic or international markets, there are advantages to the cryptocurrency as a potential competitor. By providing a possible alternative, the existence of bitcoins or other private monies can encourage governments to protect the value of their fiat currencies.²² But to remain an effective potential competitor, bitcoins must remain viable.

VII. Conclusion

At some point in the future, an economic historian is likely to write, “It should have been obvious that bitcoin would succeed/fail.” Bitcoin’s future is certainly not obvious to us in mid-2017. Indeed, reviewing bitcoin’s history in the midst of its ongoing story, we are very aware of Kahneman’s (2011, p. 201) warning about the “pernicious illusion” that “future states of the world are more knowable than they are.” He continued, “A general limitation of the

²¹ This was the idea behind the euro, and to a certain extent it succeeded. The challenge for a government-issued multinational currency is the lack of coordination between joint monetary policy and individual nations’ fiscal policies. A privately issued international currency would, presumably, avoid many of these pitfalls.

²² Similarly, many observers believe that the institution of floating exchange rates and the elimination of capital controls for most developed countries in the late 1970s increased competition among the fiat currencies, resulting in the significant reduction in inflation discussed earlier. See, for example, England (1997, p. 141).

human mind is its imperfect ability to reconstruct past states of knowledge or beliefs that have changed” (p. 202). Part of our goal here is to capture what we don’t know at this point about the future of bitcoin.

It is too early to be certain whether bitcoins will succeed as a store of value or fulfill any other role as a traditional money. Gold’s great advantage is its long history. Bitcoin has a short track record and an uncertain future. Unlike earlier monetized assets that had some intrinsic value, bitcoins and other cryptocurrencies rely on a common belief in their value and the willingness of others to accept them. If you had to bet whether gold or bitcoins would be more valuable in ten, fifty, or one hundred years, gold would be the safer bet. But if bitcoin continues to add to its record of success, if bitcoins continue to retain their value year in and year out, the case for bitcoin as a viable alternative to gold will continue to build. Skeptics today should become less skeptical every year that bitcoins maintain or increase in value.

Will bitcoins join the history of bubbles from tulip bulbs to dot coms? Or are bitcoins the leading edge of a new form of money that will exist alongside and perhaps even challenge more traditional forms of payment and stores of value? Only time will tell.

Addendum

Accompanying bitcoin’s rising price during the second half of 2017 (see figure 2) were other changes that moved bitcoin further into the financial mainstream. On December 10, the Cboe Futures Exchange introduced a bitcoin futures contract; the CME group did the same on December 18. The Cboe website touted “transparency, efficient price discovery, deep liquidity and centralized clearing” in a “highly regulated marketplace” as advantages to investing in bitcoin futures. Further, according to Osipovich and Rubin (2017), the bitcoin exchanges with which Cboe and CME partnered had all embraced regulation and anti-money-laundering laws. Commodity fund managers also demonstrated growing interest in bitcoins during the latter half of 2017. Yang and Sider (2017) reported that of the 171 cryptocurrency funds that existed in December 2017, 123 had launched that year.

Figure 2. Bitcoin Closing Price (logarithmic scale, \$), July–December 2017



Source: Data from Coindesk.com.

This interest from institutional investors and regulated exchanges was obviously driven by rising investor attraction to bitcoins and other cryptocurrencies. But it also recognized bitcoins as more than the playthings of a few fringe investors. By late 2017, bitcoins had become a recognized feature of the financial marketplace. While futures contracts can increase market volatility, they can also deepen and help stabilize the market by making it easier for more investors to participate.

The latter half of 2017 did not answer our questions about the future of bitcoin, though it did add to the story of bitcoins as a volatile but appreciating store of value. Will the trend continue generally upward? Or is the 2017 run-up in prices a prelude to a crash? Both skeptics and enthusiasts cited the rising price of bitcoins as evidence supporting their predictions. Skeptics saw further evidence of a bubble, while enthusiasts viewed the ascending price as a natural progression toward a market capitalization for bitcoins in line with other stores of value like gold. The dramatic nature of the seven-fold bitcoin price increase during the final six months of 2017, the addition of futures contracts, and the increasing number of cryptocurrency-based funds certainly drew increased attention to bitcoins and other cryptocurrencies. But they did not tell us what to

expect next. The changes of late 2017 were simply the most recent chapter in a story that was still being written as the year drew to a close.

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