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Bitcoin and Blockchain Technology—A Primer

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Key Takeaways

» *Bitcoin has gained tremendous popularity since its launch in 2009, and financial institutions and startup companies are investing increasing amounts in blockchain technology.*

» *While we don't offer guidance on these new types of virtual currencies, we believe that it is important for investors to understand this new technology.*

What It May Mean for Investors

» *It is important that investors understand the risks to investing in Bitcoin, including regulatory risk, security risk, fraud risk and market risk.*

Terminology	Definition
Cryptocurrency	Cryptocurrency is a digital currency in which encryption and decentralized ledger techniques (such as blockchain) are used to regulate the generation of units of currency and verify the transfer of funds.
Blockchain	Blockchain is a peer-to-peer network protocol in which transactions made in bitcoin or another cryptocurrency are publicly and chronologically recorded on its digital ledger.
Bitcoin	Bitcoin is a type of cryptocurrency or digital currency. The Bitcoin global digital payment system was introduced in 2009. Transactions using the bitcoin currency are peer-to-peer and take place without an intermediary.
Convertible Virtual Currency	A convertible virtual currency either has an equivalent value in real currency, or acts as a substitute for real currency.

Source: Wells Fargo Investment Institute, December 11, 2017.

What is Bitcoin?

Conceived in a white paper published by the shadowy figure Satoshi Nakamoto, Bitcoin was first introduced in 2009.[1] Operated as a decentralized network, Bitcoin and its underlying blockchain technology are designed to provide low-cost, anonymous payments over the internet. Unlike government-issued currencies, bitcoin digital currency is not a physical currency, nor is it legal tender—it is not issued or backed by any governmental entities or financial firms. Participants using the Bitcoin network verify the authenticity of bitcoin using a publically available history (or chain) of timestamped transactions recorded on an open-source public ledger.

[1] https://bitcoin.org/bitcoin.pdf

Bitcoin has gained tremendous popularity since its launch, bolstering the awareness of virtual currencies, collectively referred as "cryptocurrencies." As of December 6th, 2017, the total market capitalization for all bitcoin in circulation exceeded $281 billion.[2]

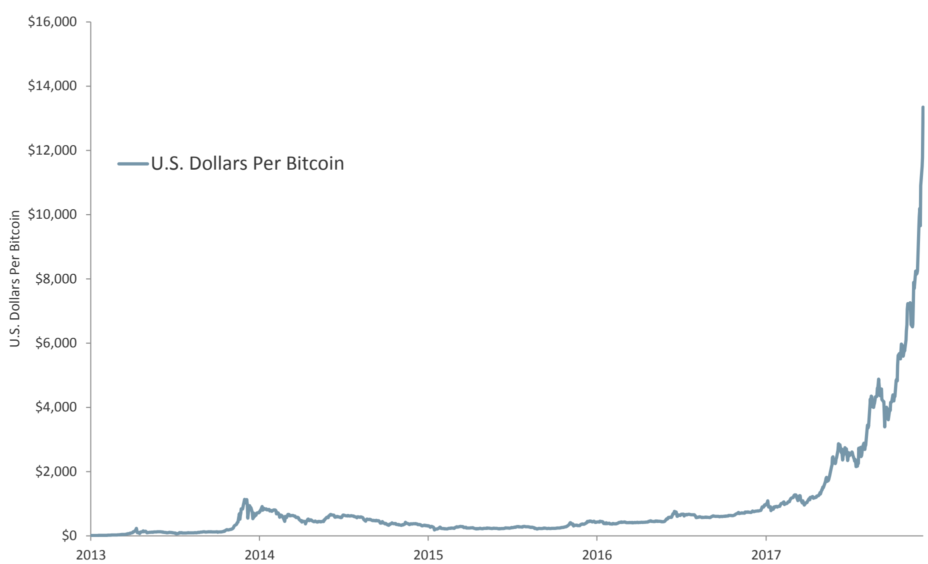
How is Bitcoin Generated?

One feature that most cryptocurrencies (including bitcoin) share is a digital ledger technology known as blockchain. Users of this digital, peer-to-peer network are known as "miners." Bitcoin miners own the governing computing power and are motivated by "rewards"—the release of new bitcoins in the network.[3] Supported by a verifiable open-source algorithm, the release of bitcoin is designed at a fixed, but periodically declining rate (determined by increasing the amount of computing power needed to solve a computational puzzle). Thus, the total supply of bitcoin is predictable (it is forecasted to reach approximately 21 million bitcoins by 2140).[3] In terms of size, one bitcoin can be denominated in units as small as one-hundred millionth of one bitcoin.

Can I Use Bitcoin as a Currency?

By conventional economic wisdom, a currency functions as a "unit of account," "medium of exchange," and a "store of value." On the one hand, Bitcoin currently in circulation is easily accessible and transferable and is slowly gaining recognition as a new payment method. Yet, Bitcoin often doesn't operate well as a currency because its value fluctuates dramatically on a daily basis (Chart 1).

Chart 1: Bitcoin–U.S. Dollar Spot Rate



Sources: Wells Fargo Investment Institute, Bloomberg, December 11, 2017.

Some countries, such as China, currently ban the usage of bitcoin as a currency, although investors can own it as an asset. Meanwhile, it is gradually being accepted as a method of payment for some of the products and services from many companies, including Microsoft, Expedia, and Intuit. Additionally, individuals can trade bitcoin as a

[2] https://coinmarketcap.com/

[3] https://bitcoin.org/en/faq

currency on a daily basis on more than 40 active exchanges worldwide.[4] As of December 6th, 2017, the three most active exchanges processed bitcoin daily trading volume of more than $4.5 Billion.[4]

What Is the Future of Bitcoin and Other Forms of Blockchain Technology?

Today, governmental regulations are catching up with this rapidly developing cryptocurrency. The U.S. Treasury classified bitcoin as a "convertible decentralized virtual currency" in 2013.[5] The Commodity Futures Trading Commission (CFTC) classified bitcoin as a commodity in September 2015.[6] However, in early 2017, the McKinsey consulting firm noted that it seems unlikely the Federal Reserve and U.S. Treasury will start accepting bitcoin as a form of payment anytime soon due to regulatory risks.[7]

From an industry perspective, financial institutions and startup companies are investing in the underlying blockchain technology to increase trading efficiency and improve other operational clearing processes. According to CB Insights in March 2017, "there are over 50 financial-services firms or their strategic investment arms that have invested in a Bitcoin or a blockchain-specific startup since the start of 2014."[8]

Despite its advantages, such as lower transaction costs easy transferability, and open-source verifiability, bitcoin is subject to several types of risks that are hard to overlook.

What are the Regulatory Risks of Bitcoin?

Although bitcoins are technically legal in most of the world's major economies, methods of trading, conversion, and mining vary significantly. This cryptocurrency's usage may be subject to sudden regulatory changes due to involvement of the currency in some black-market transactions, money laundering, and other illegal activities. As a result, governments may seek to control, restrict, or even ban the use and sale of bitcoins without notice. For instance, several Bitcoin exchanges in China delayed or halted Bitcoin withdrawals in February 2017.[9]

The rapid pace of cryptocurrency and blockchain-based technology development can make it difficult for regulators and the investment community to stay abreast of the changes. It would not be surprising for a regulatory body to impose regulations that could disrupt the availability, accessibility, and liquidity of bitcoin.[10]

What are the Market Risks of Bitcoin?

Bitcoin can suffer from dramatic price swings and a high correlation to market choppiness. The price volatility of bitcoin can be meaningfully higher than that of traditional currencies or investment vehicles. Additionally, other blockchain-powered cryptocurrencies with a similar design and purpose are attracting recognition. For instance, on August 1, 2017, Bitcoin Cash was created as a duplicate of Bitcoin with

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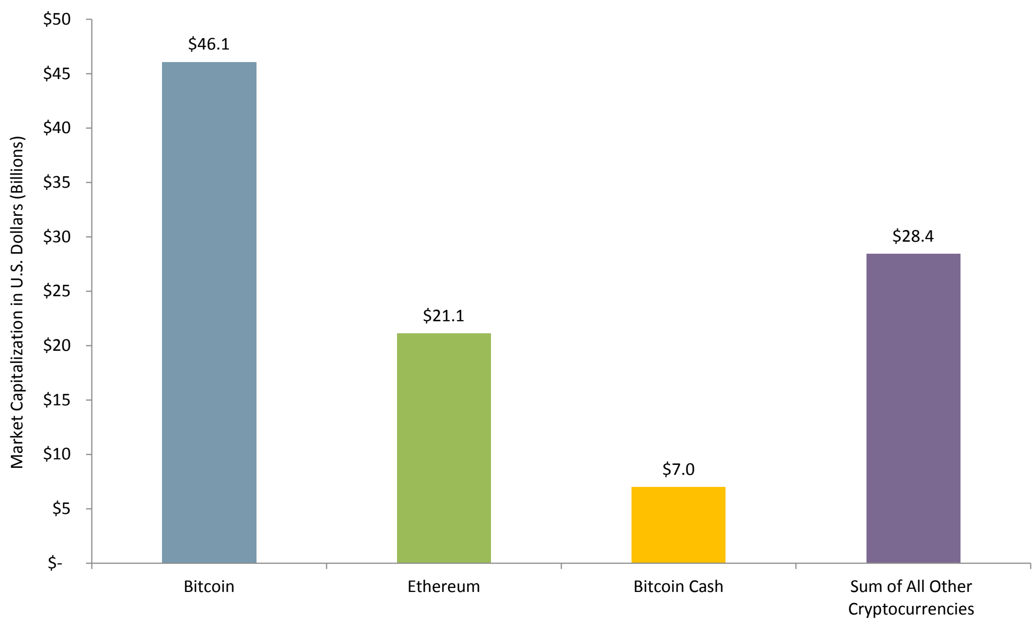
[4] https://www.cryptocoincharts.info/markets/info
[5] https://www.fincen.gov/sites/default/files/2016-08/20131119.pdf
[6] http://www.cftc.gov/PressRoom/PressReleases/pr7231-15
[7] https://www.treasury.gov/initiatives/fio/Documents/McKinsey_FACI_Blockchain_in_Insurance.pdf
[8] https://www.cbinsights.com/research/financial-services-corporate-blockchain-investments/
[9] https://themerkle.com/major-chinese-exchanges-announce-extended-bitcoin-withdrawal-delays/
[10] https://www.sec.gov/news/press-release/2017-131

shared historical transactions but an independent blockchain going forward (known as a "fork"). In just two days, Bitcoin Cash formed the third largest cryptocurrency by market capitalization (Chart 2). The new cryptocurrency's surge was only based on expectations that, like the original Bitcoin, Bitcoin Cash would be widely accepted by users.

Chart 2: Cryptocurrencies by Market Capitalization in U.S. Dollars



Source: Wells Fargo Investment Institute (WFII), CoinMarketCap, 8/3/17.

As of December 6th, 2017, there were more than 831 cryptocurrencies available that had a market capitalization of at least $1 million.[11] Investors should exercise caution—as any turbulence or consolidation within the clustered cryptocurrency market could lead to a significant drop in a cryptocurrency's valuation.

What are the Security Risks of Bitcoin?

Bitcoin (or blockchain technology) may be hacked despite its decentralized nature. Operational glitches or malware also can impact the peer-to-peer network. Bitcoin stored in either an owner's private digital wallet (most likely on a hard drive) or a virtual online wallet provider, such as a Bitcoin exchange, is subject to security breaches. Cyberattacks can lead to stolen private encryption keys and loss of ownership of any type of cryptocurrency. An example of this is when Hong Kong based Bitfinex was hacked in August 2016 and $65 million in Bitcoin was reportedly stolen. [12]

Are There any Risks of Fraud for Bitcoin Users?

The peer-to-peer design of cryptocurrency provides anonymity for the participating parties but also increases the risk of fraudulent activity. The nature of blockchain technology and the absence of regulatory oversight can create an environment that hinders investigations, since many transactions are irreversible.

[11] https://coinmarketcap.com/all/views/all/
[12] https://www.wsj.com/articles/bitcoin-sinks-after-exchange-reports-hack-1470195727

What Else Do I Need to Know about Bitcoin?

The rapid development of cryptocurrencies and blockchain-based technology may leave regulatory bodies and market participants behind in their understanding of the technology and associated risks. Valuation risks, together with the potential for unpredictable regulations and a lack of investor protection, can outweigh any benefits of holding cryptocurrencies like Bitcoin as an asset. Furthermore, funds that track Bitcoin may be subject to additional risks of tracking error and potential illiquidity.

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