Cryptocurrencies like Bitcoin—Opportunity or Bubble?

**Key takeaways**

- We found that recently high cryptocurrency valuations have led to a deterioration of some of the initial technical benefits of the peer-to-peer network with distributed ledger protocols, such as blockchain.

- We believe that cryptocurrencies and the distributed ledger technology (DLT) are in the early stages of development and still face certain hard-to-overcome hurdles.

**What it may mean for investors**

- The latest cryptocurrency price movements are most likely due to investor speculation and may subject these assets to violent price responses to any market, technological, security, or regulatory developments in the digital currency space.

As we approach the 10-year anniversary of the initial introduction of Bitcoin in October 2008, Bitcoin and related peer-to-peer networks have become a phenomenon that is frequently compared to the introduction of the internet in the 1990s. With an eye-popping 1,165.9% return in 2017 alone, Bitcoin, along with other cryptocurrencies, recently has enjoyed strong investor interest. However, we believe that the latest interest in Bitcoin and other cryptocurrencies has been caused by investor optimism that sometimes favors speculation over fundamentals.

The resulting high valuations in the digital currency space have led to a deterioration of some of the initial technical benefits of the peer-to-peer network with distributed ledger protocols, such as blockchain. We believe that cryptocurrencies and distributed ledger technology (DLT) are in the early stages of their development and that they still face several hard-to-overcome hurdles. In this report, we will discuss DLT and cryptocurrencies, and share our views on their viability as investments.
What is a fair value for Bitcoin and other cryptocurrencies? Is the current rally in Bitcoin based on market sentiment or scarcity?

There is no industry-wide accepted valuation methodology for Bitcoin or other cryptocurrencies. Yet, there are a few different ways to assess the current market price of Bitcoin. Traditional currency-valuation methods, such as the interest-rate-parity method (which assumes demand for the currency is based on interest-rate differentials), does not apply to Bitcoin and other cryptocurrencies. That is because they are not tied to any single country’s interest rates. However, the prices of cryptocurrencies are subject to supply and demand dynamics like other assets. One way to model this dynamic is to focus on the initial utility feature of the cryptocurrency, that is, the demand for the currency to facilitate transactions on the peer-to-peer network. Sources of demand include the desire to mediate fiat-currency-like transactions, and (speculative) demand from investors wishing to hold the currency as an investment. On the supply side, the total amount of Bitcoin in circulation totals 16.8 million, according to coinmarketcap as of January 31, 2018.

A simplified method to assess only the transaction-driven demand is to compare Bitcoin availability (supply) with the amount (in U.S. dollars) of Bitcoin needed to mediate all Bitcoin transactions over a given time period (demand). This is represented by the following equation.

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\frac{\text{Bitcoin in Circulation}}{\text{Duration}^1} \times (\text{Supply}) = \frac{\text{Transaction needs to be mediated by Bitcoin \ ($ per second)}}{\text{Price of Bitcoin \ (in $)}} \times (\text{Demand})^2
\]

Given the market price of Bitcoin in U.S. dollars, the total amount of the currency in circulation, and the median time needed for the transaction payment information contained in each block to be confirmed on the peer-to-peer network (as of January 31, 2018), the implied U.S. dollar transaction volume on the peer-to-peer network exceeds $137 billion per hour.\(^3\) To put that into perspective, the entire 2017 holiday retail sales in the U.S. is estimated to be approximately $680.4 billion.\(^4\) Additionally, the total market capitalization of Bitcoin exceeded the market capitalization of 87% of the companies in the S&P 500 Index at the end of January.\(^5\)

One additional issue to note is the fact that the latest Bitcoin price rally has made the low-transaction-cost feature of this cryptocurrency less attractive. As Chart 1 shows, the recent cost per transaction in the Bitcoin blockchain network climbed to more than $100 from $7 at the beginning of 2017.

The elevated market capitalization and transaction costs point to a Bitcoin rally boosted primarily by market speculation, rather than by the cryptocurrency’s utility function as a method of payment.

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1. Duration that Bitcoin is needed by a transaction (seconds): Time it takes for transaction verifications to avoid double spending attempts. In general, each block takes 12 minutes median confirmation time to be added to the blockchain (as of January 31, 2018), and after 6 additional blocks the transaction will be practically considered immutable. \(\text{https://blockchain.info/charts/median-confirmation-time; https://bitcoin.org/bitcoin.pdf}\)
3. Bitcoin in circulation: 16.8 million, price in U.S. dollars: $9,962.32, \(\text{https://coinmarketcap.com/}\); Implied U.S. dollar transaction volume based only on transaction demand: \(\left(16.8\times10^6 \text{Bitcoin} \times \$9,962.32 \text{per Bitcoin} \right) \times \frac{60 \text{ mins}}{12\text{Minutes} \times 6 \text{blocks}} = \$137 \text{ billion per hour}\)
Is Bitcoin a “store of value,” like gold?

Although there are some similarities between Bitcoin and gold, such as divisibility and limited supply, the physical nature and long history of gold as a commonly accepted method of payment makes it a more stable store of value than Bitcoin at this point in time. The intrinsic value of gold—and its use as a medium of exchange—stems from its scarcity, durability and divisibility.6 Similarly, the intrinsic value of Bitcoin lies within the cryptographic proofs accepted by the majority of participants on the peer-to-peer network.7 Currently, there are a few cases in which Bitcoin is preferred over gold as store of value. For example, for those living in areas in which it is believed that the local banking and finance authority is corrupt, and physical personal property is subject to seizure, use of Bitcoin as a store of value can be a preferable option.

What happens when all 21 million Bitcoin are mined? Are we going to see additional “hard forks” like Bitcoin Cash and Bitcoin Gold?

As hardcoded in the script, the total reward of Bitcoin is capped at 21 million, and roughly 80% of it had been mined as of January 31, 2018. The mining reward halves every 210,000 blocks, and there are about 1.6 million blocks yet to be created, before the coin reward decreases from 12.5 to 6.25 coins per block. The estimated “end date” for the network to completely deplete the reward mechanism is around June 2020.8 After that, there will not be additional new supply of Bitcoin, and network participants will only rely on transaction fees to continue to verify transactions on the peer-to-peer network. That could cause “miners” to leave the network and thereafter reduce the security and acceptance of Bitcoin.9

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8 Bitcoinblockhalf.com, January 31, 2017
“Hard forks,” defined as splits from the original blockchain—but containing the same historical transaction data—are designed to resolve technological issues, rather than simply create new cryptocurrencies. The creation and sustainability of a successful currency requires a healthy ecosystem—one that hosts a community of developers and “miners” that believes in the concept, continues to develop relevant features, and reinforces the security of the new network by verifying legitimate transactions.\(^\text{10}\) Their reward, new cryptocurrency, consequently should increase in value to foster growth in the ecosystem. As additional active participants join the network, a positive cycle is formed (Chart 2).

**Chart 2. Cryptocurrency ecosystem**

One way to measure the health of a network is to assess the number of “active nodes.” These are servers or applications that participate in the peer-to-peer network with the ability to propagate broadcasted transaction information and to verify or reject transactions using the same protocol. A “hard fork” most likely will result in a loss of participation in the existing network; thereafter, the original network may have less support. As Chart 3 shows, when Bitcoin Cash officially launched in August 2017, there was a significant dip in active nodes on the Bitcoin network—as a group of community members permanently moved over to support the newly established network.

To summarize, well-intended “hard forks” are not designed to simply create additional cryptocurrency supply and are normally well communicated ahead of time. Additional “hard forks” can be successful only if the proposed new network can attract a group of community members to support it.

What are some of the technical difficulties the “hard forks” try to address? What are some of the pilots and user cases of the technology in existing industries, such as financial services?

Scalability is a difficult hurdle for many cryptocurrencies. Since transactions are verified on the open peer-to-peer network on a majority consensus basis, the size of the transaction information is normally limited to a standardized amount.11 In the case of Bitcoin, every block that has been added on to the blockchain is capped at around one megabyte in size (roughly 2,000 transactions)12 to ensure that data can be spread across the network quickly. Given that each block is designed to be verified in a 10-minute interval, ensured by a cryptographic puzzle difficulty adjustment mechanism, 3-5 transactions can be verified on the Bitcoin peer-to-peer network, on average, per second. To put that into perspective, credit card processing companies (such as Visa) have the capacity of transmitting more than 65,000 transactions per second. This limitation is written into the scripts of many cryptocurrencies and can’t be modified unless there is a “hard fork.”

Industry use of distributed ledger technologies is currently being tested within the Financial Services sector to help improve efficiency in interbank settlements and in trade finance. However, designs of the new protocols are likely to be different than

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commonly known Blockchain technology, since each participant does not necessarily want to share all transaction information processed on the network. Additionally, newly designed networks likely will be “private,” since activity on the network will be executed between existing industry institutions rather than through the public peer-to-peer network. As such, registration to become a new “node” will not be open to anonymous users.

In short, there are still many technical difficulties for existing cryptocurrencies, and industry implementation of the technology cannot simply leverage the Bitcoin blockchain protocol.

**How much data are the various cryptocurrencies’ networks creating? How much energy is being used to support “mining” activities?**

In theory, open-public-network distributed ledgers should allow any anonymous user to participate as an active “full node.” That is to say that any active participant should have the ability to check the full history of all previous transactions that have happened since the start of the network. Currently, the size of the entire Bitcoin blockchain network history is around 154 gigabytes (GB). Assuming the network will be utilized at full capacity, the size will likely increase by roughly 51 GB per year. With all active nodes holding one copy of the full blockchain, the entire network comprises approximately 1,603 terabytes of data. To put that into perspective, the size of all data in Google Maps was estimated to be close to 20,500 terabytes in 2012. Since participants are not obligated to maintain the entire history of any cryptocurrency network, the size of data usage can fluctuate dramatically as participants join or exit. However, since additional data created on all cryptocurrencies’ open networks is calculable, distributed between users, and insignificant when compared to that gathered by one large technology company, the networks are not expected to encounter data storage limitations.

However, energy consumption is a concern, because transaction verification and “mining” activities require a tremendous amount of memory. The concept known as Proof of Work (PoW) serves as a consensus building mechanism to reward legitimate participants and prevent malicious hackers from taking over the network. However, most of the calculations involve trying out nonce (random numbers that can only be used once) to satisfy a desired output format. Generating these outputs is considered by many to be an inefficient use of computing power. With both “mining” difficulty and computing power needed to solve the puzzle expanding exponentially, the Bitcoin network alone has an annual energy consumption of 32 terawatt-hours, nearly six times the amount of energy used by San Francisco in a year.
Developers are working on a solution to the high-energy-consumption problem. One potential solution involves switching the existing PoW model to a Proof-of-stake model in which only one participant (or a few) is assigned randomly to perform transaction verifications. Another solution could be to change the algorithms from generating (otherwise) unusable output to furthering open source scientific research projects, which desperately need additional computing resources.21 If these new methods of verification can be implemented to address concerns about excessive energy usage, we likely will see greater sustainability and acceptance of digital assets.

**What are Initial Coin Offerings (ICOs)? Who can create ICOs? What is the difference between an ICO and an IPO?**

In general terms, ICOs are a crowd-funded source of capital for startup “projects” in the cryptocurrency space. An ICO offering is an unregulated capital-raising process that results in newly created cryptocurrencies, often known as “tokens.” Investors anticipate future utility usage, earnings, or capital appreciation of the tokens from the proposed “projects” in return for their investment. Popular ICOs that have launched in recent years generally involved a core development team and advisors, a detailed white paper of the proposed idea, and a series of marketing efforts to support the initial launch. In theory, however, anyone can create “tokens” on platforms such as Ethereum or Wave for sale with limited legal requirements.

In contrast, preparation of an IPO is an exclusive, comprehensive (but lengthy) process, in which initial participation typically involves only institutional investors and a selected group of wealthy individuals. In addition, the biggest difference between these two capital-raising events is that legally-protected equity ownership and, often, decision-making entitlements are distributed in an IPO, while non-legally-binding promises such as future usage of developed “projects” or potential shares of revenue are attached to ICO token sales.

**What are the current regulatory actions related to cryptocurrencies and what are their implications?**

Future regulatory action is, arguably, the biggest unknown factor related to distributed ledger technology. Concerns surrounding usage of cryptocurrencies in illegal activities, such as money laundering, are well founded. However, in the U.S., existing regulations are equipped to ensure user identification confirmation on major cryptocurrency exchanges. We believe that additional regulatory efforts will be focused on two areas: ICOs, and cryptocurrency-related packaged products (such as exchange-traded funds, or ETFs).

In the summer of 2017, the Securities and Exchange Commission (SEC) issued an official report22 on the investigation of an ICO sale in 2016, ruling that tokens sold were indeed “securities,” and that such an activity was an unregistered securities offering. The statement clarifies that the SEC is welcoming distributed ledger technology and that not all tokens are necessarily “securities,” but any participants, including

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organizers, investors, and resellers, in a token sale that appears to be investment-related are subject to federal security laws and registrations. The governing body’s legal position on ICOs sent a shock wave through the cryptocurrency world. Consequently, since the SEC report was issued, well-organized ICOs typically have highlighted the utility function of the tokens, rather than investment opportunities—and have required U.S. participants to meet qualified investor requirements.

Additionally, both the CME (Chicago Mercantile Exchange) and CBOE® launched Bitcoin futures products that triggered additional interest in creating cryptocurrency-related packaged products toward the end of 2017. However, as of January 31, 2018, the SEC had not approved any proposals for such products, and Chairman Jay Clayton warned investors to “be especially wary” when it comes to investment in cryptocurrencies.  

How does one invest in cryptocurrency or distributed ledger technology?

There is an important distinction between the open “public network” where most cryptocurrencies reside and a “private network,” which many companies are trying to leverage to improve their operational efficiency. Key differences between these two networks are access rights and consensus-building mechanisms. On most of the public network, any anonymous individual can become an active participant, broadcast and propagate transactions, and view the full history of all previous transactions made by all participants on the network. In contrast, on the “private network,” participants are normally known counterparties with agreed-upon protocols and sometimes limited transparency.

While the open distributed ledger technology caught most headlines, many startups and corporate-sponsored projects are specializing within the “private network” space. Private network uses include solving relatively sophisticated issues such as trade finance, food logistics and identity management—and they often involve balancing each party’s interests and adding extra infrastructure equipment. Private network startups are still in their early stages of development, and projects initiated by large companies are unlikely to have a meaningful impact on corporate earnings in the near term.

In addition to the security, market volatility, and regulatory risks mentioned in our previous report, investors should be aware of potential fraud risk—as small public companies may try to take advantage of the investor interest in distributed ledger technology by renaming themselves or making announcements that associate them with the technology. It is possible that distributed ledger technology and cryptocurrencies could contribute significantly to future operational efficiencies, but at this time, we would like to remind investors of the extreme volatility in the cryptocurrency space and urge caution and prudence when it comes to these nascent technologies.

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Bitcoin Risks

Buying, selling and using Bitcoins carry numerous risks. Digital currency such as Bitcoin is not legal tender. No law requires companies or individuals to accept Bitcoins as a form of payment. Instead, Bitcoin use is limited to businesses and individuals that are willing to accept Bitcoins. If no one accepts bitcoins, bitcoins will become worthless.

Platforms that buy and sell bitcoins can be hacked, and some have failed. In addition, like the platforms themselves, digital wallets can be hacked. As a result, consumers can have lost money.

Bitcoin transactions can be subject to fraud and theft. For example, a fraudster could pose as a Bitcoin exchange, Bitcoin intermediary or trader in an effort to lure you to send money, which is then stolen.

Unlike U.S. banks and credit unions that provide certain guarantees of safety to depositors, there are no such safeguards provided to digital wallets.

Bitcoin payments are irreversible. Once a transaction is completed, it cannot be reversed. Purchases can be refunded, but depend solely on the willingness of the establishment to do so.

Bitcoin has been used in illegal activity, including drug dealing, money laundering and other forms of illegal commerce. Abuses could impact consumers and speculators; for instance, law enforcement agencies could shut down or restrict the use of platforms and exchanges, limiting or shutting off the ability to use or trade bitcoins.

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