



Investor Insights: Bitcoin, Blockchain and Beyond

May 2021

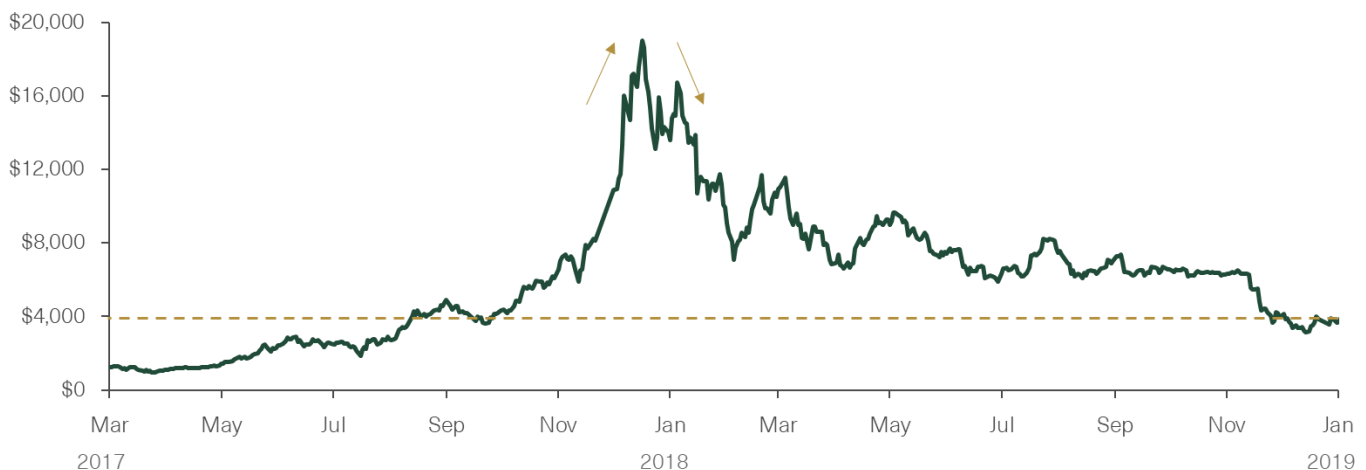
2017: The year bitcoin went viral

For most people, 2017 was the year they first heard about cryptocurrencies. After being largely ignored by market participants since its inception more than a decade prior, a wave of interest from retail investors helped elevate the price of the digital currency from about \$1,000 per coin at the start of 2017 to nearly \$20,000 by the time December arrived. In turn, bitcoin's parabolic growth fueled an explosion of media attention in not only cryptocurrencies, but also in blockchain — the transaction database technology that underpins it (which we will go over later). Once an arcane topic, bitcoin's popularity soared meteorically as the year advanced, attracting a continual entry of retail flows from individuals looking to get in on the action as its performance exponentially outpaced those of traditional asset classes.

Yet, the velocity of bitcoin's ascent drove several financial academic detractors to rule out the cryptocurrency as the "mother of all bubbles," drawing parallels to some of history's most notable manias, including the Dutch tulip bulb frenzy of the 1630s, the South Sea bubble of the 1710s, and the U.S. stock market booms of the 1920s and 1990s. Furthermore, many market strategists rang alarm bells cautioning investors to avoid letting herd mentality and "FOMO" (fear of missing out) cloud their risk tolerance in the pursuit of large returns, alerting that bitcoin's price surge was being driven in large part by speculative momentum. In contrast, proponents argued that the cryptocurrency's disruptive potential was still far from being fully priced in, predicting further appreciation ahead and branding bitcoin a once-in-a-lifetime investment opportunity.

However, in the blink of an eye, the tide turned drastically in early 2018: Uncertainty about trading bans in some parts of the world, concerns of market manipulation by a few "whales" (large investors with the ability to influence prices) and increasing levels of scrutiny from regulators ignited a flash sell-off, which shaved off more than 50% of bitcoin's market value in just a few weeks. As investors rushed for the exit *en masse*, the FOMO euphoria of 2017 morphed into panic selling as investors' confidence in bitcoin's ability to become a legitimate asset dwindled. By the time the year came to an end, the sell-off had turned into a full-blown collapse, with the digital currency losing 85% of its value. If 2017 went down as the year of the bitcoin boom, 2018 closed out as the year of the big bust (see Figure 1).

Figure 1: Bitcoin price (2017-2019)



2021: Deja vu, or something new?

Nearly three years after its last debacle, bitcoin has continued to surprise even its skeptics by not only recouping all its losses, but also proceeding to rise well above its previous all-time highs (see Figure 2). Though the cryptocurrency's recent performance is reminiscent of its feverish rally in 2017, it is worth noting that the investment landscape and market dynamics are notably different this time around than during the previous bull run. Appetite for cryptocurrencies — and risk assets in general — cratered during the onset of the COVID-19 pandemic but rebounded as ample economic aid and expansionary monetary policies around the globe provided investors with reasons to be optimistic about a post-coronavirus recovery.

Low interest rates also motivated investors to look at nontraditional investments for yield, or in bitcoin's case, capital appreciation. After the pandemic hit, the Fed cut interest rates to near zero and ramped up its bond-buying program, while Congress approved trillions of dollars of stimulus to help the economy recover from the shutdown. While fiscal spending and liquidity injections were vital in alleviating some of the economic side effects of the pandemic, the ensuing increase of money supply raised concerns of inflationary pressures eroding the purchasing power of government-issued currencies. Though the fear of deficits, debt and currency devaluation has historically driven investors to so-called "traditional inflation hedges" (such as gold and real estate), which tend to — for the most part — hold their value during periods of rising prices, investors have begun shifting to bitcoin as a new non-correlated alternative often referred to as "digital gold."

Unlike fiat money, whose supply is controlled by central banks (such as the Federal Reserve in the U.S.), bitcoin's fixed and finite design limits the number of coins that will ever exist to about 21 million (with roughly 18.6 million in circulation). This limited supply is one of the reasons supporters believe that bitcoin will hold its value with time and won't be debased. Yet, skeptics suggest the threat of new entrants to the cryptocurrency market, already approximately 5,000 in number, weakens the scarcity-based investment thesis in favor of bitcoin. Significant asset flows into existing and new competing cryptocurrencies are driven by similar expectation of finite supply, contributing to overall crypto-market speculation.

Another important driver behind the cryptocurrency price resurgence of last year was the increased inflow of institutional capital into crypto markets. Unlike three years ago, when most of the enthusiasm for digital coins was primarily driven by retail investors, the current rally has been fueled by the entrance of new players, including mainstream asset managers, private firms and major corporations. Over the last year, a growing number of publicly traded companies have not only begun accepting bitcoin for payment but have also purchased the digital coin using cash reserves from their treasuries. Moreover, the growth of the cryptocurrency landscape has been similarly supported by consumer-facing exchanges, which allow retail users and institutions to buy or sell bitcoins using different currencies.

Figure 2: Bitcoin price (2019-2021)



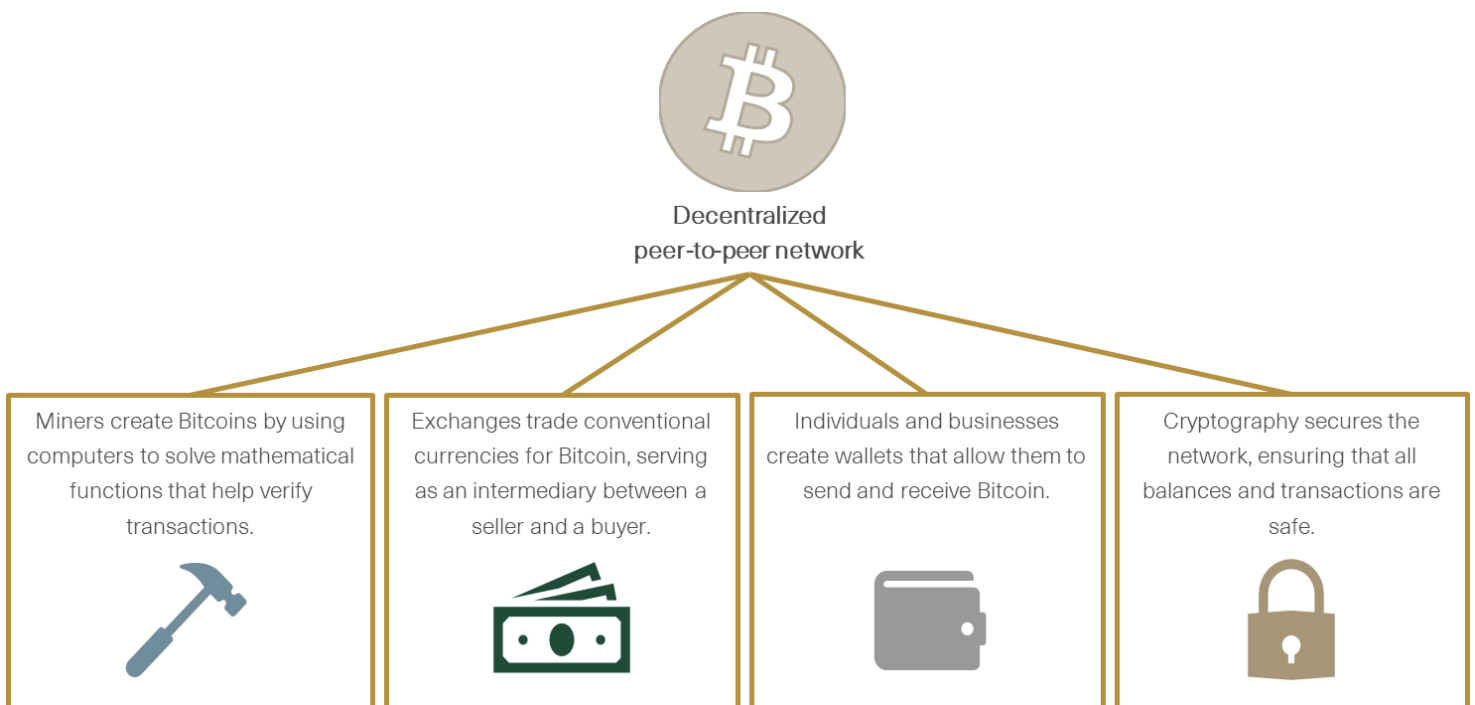
Understanding the basics: Bitcoin 101

Though bitcoin and blockchain technology are closely related, it is important to distinguish what they are and how they are used. Bitcoin and other digital coins have risen in popularity as an alternative to traditional money such as the U.S. dollar, Japanese yen and British pound. While cryptocurrencies can be used as a medium of exchange to buy or sell goods and services online, they are entirely digital in nature and do not have any physical form. Rather than using conventional bills and coins, bitcoin operates and is stored on computers, independent of the purview of any country or financial institution. However, although bitcoin and other cryptocurrencies have gained wider acceptance, they are not considered legal tender by the government nor are they regulated, issued or controlled by a central authority like the Fed.

The digital currency's decentralized peer-to-peer electronic technology does not require the involvement of an intermediary, such as a bank or third-party company, to enable transactions. As a result, some transaction costs are lower for businesses and merchants given that payments can be made directly between two parties that are only required to have so-called "bitcoin wallets," which keep track of the transfer of bitcoins and exist either in the cloud or on a user's computer. In turn, consumers can use bitcoin's network to swiftly send money overseas, avoiding long transmission times and the high costs charged by traditional remittance services. In contrast to debit or credit card transactions, which are recorded in a bank's or financial institution's private server, bitcoin transactions are encrypted on a decentralized ledger known as the blockchain.

This online system keeps records of every transaction and is shared publicly by all parties using the cryptocurrency. The name blockchain refers to the "blocks" of information that get added to a growing "chain" of transaction records over time (which make it difficult for hackers to go back and rewrite or alter older records). While most companies depend on centralized databases or clearinghouses to authenticate and process transactions, blockchain's distributed ledger exists across several locations and among multiple participants. In turn, the ledger is maintained and updated by a network of so-called "miners" that help provide transparency and visibility to bitcoin's online infrastructure by confirming that each transaction is legitimate (see Figure 3).

Figure 3: Bitcoin's characteristics



Dawn of a revolution: The case for blockchain and decentralized finance (DeFi)

By having thousands of computers worldwide independently checking and verifying whether the records are accurate, blockchain technology provides a high degree of security given that hackers would in theory need to take control of not one but several computers in order to change the records. Furthermore, although each bitcoin transaction is recorded in a public ledger, names of buyers and sellers are kept undisclosed, providing users with the ability to transact anonymously.

To illustrate how it all works together, if someone would like to use bitcoin to make a purchase online, the seller's computer would consult the blockchain ledger stored on thousands of computers around the globe to verify whether the buyer's wallet actually has enough bitcoins to buy the item. If there is distributed consensus of the veracity of the transaction among the network of computers, a new data entry would be added to the chain of transactions recording the transfer.

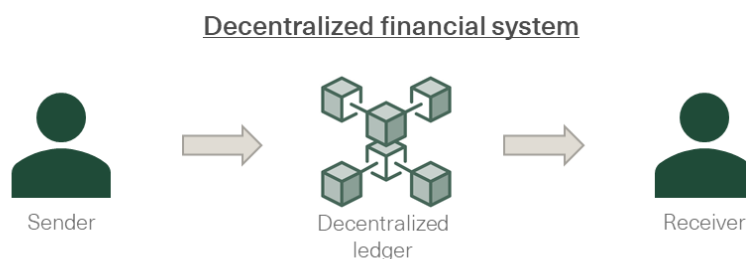
Even though many people remain skeptical about bitcoin's value as an alternative currency, there is wider consensus that blockchain technology could be extrapolated for use in areas unrelated to bitcoin and enhance existing ways of conducting business. The distributed ledger technology that underpins bitcoin has the potential to help secure, store, manage and validate several other types of digital records, not just payments and money transfers. As such, it is already being implemented by some high-tech organizations that aim to simplify and improve the recordkeeping and management of data. Some examples include medical information, legal contracts, shipping logistics and other real-world applications that depend on legacy systems to perform similar verification processes.

The financial industry in particular is expected to benefit greatly from this decentralized ecosystem. Decentralized finance — also known as DeFi — is a rapidly growing area of exploration for many financial institutions that seek to manage transactions (from banking, loans and mortgages, to complex asset trading and management) leveraging the benefits of blockchain (see Figure 4). By integrating these new technologies into their existing operations, financial institutions are expected to improve transmission speeds, expand hours of operation and reduce costs. However, although DeFi is projected to help disintermediate the financial system, it is still in early stages of development and far from replacing the conventional infrastructure that institutions and individuals currently depend on.

Figure 4: Centralized vs. decentralized financial systems



A centralized ledger keeps record of transactions within the financial system between institutions.



A distributed ledger eliminates the need for a third-party to verify transactions. Instead, verifications are performed by the network of users.

Bitcoin's future in question

To some investors, this year's run-up in cryptocurrency prices may seem to validate the long-term case for investing in bitcoin and other digital coins. After all, a large part of bitcoin's valuation is derived from the conviction that it will eventually replace government-backed fiat money and displace banks, as its peer-to-peer network will render financial institutions obsolete. While we recognize the numerous benefits of blockchain and decentralized ledgers, we believe that this technology will reinforce the current financial ecosystem rather than replace it.

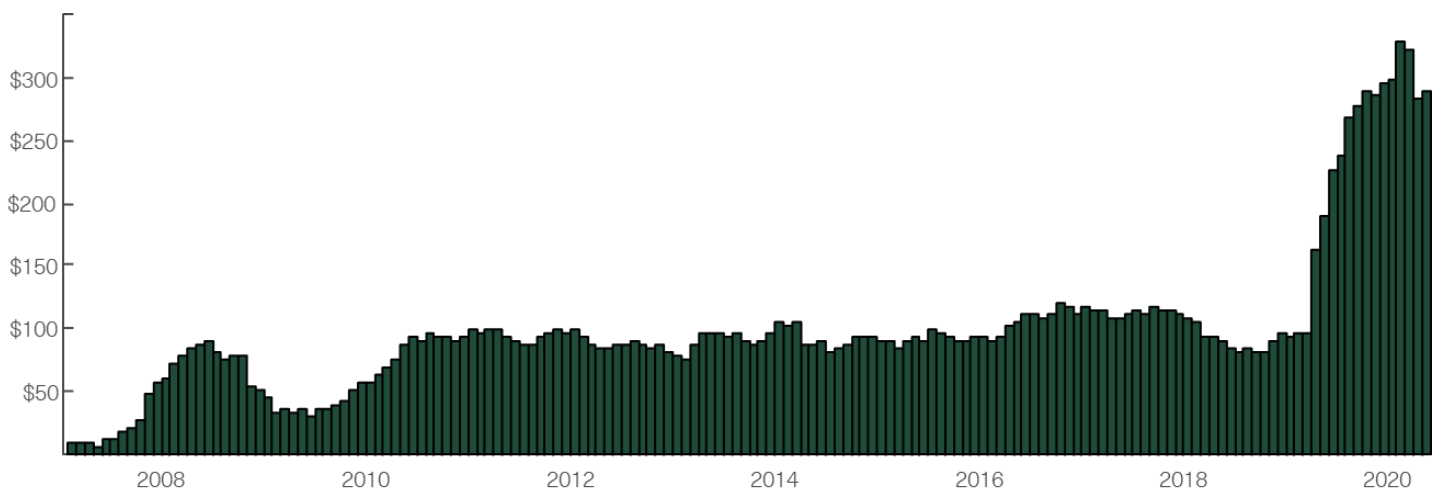
Bitcoin detractors have long warned that there are still several downside risks that could get in the way of bitcoin's large-scale adoption, which may not be "priced-in" its current market value. For one, governments derive significant benefits from the ability of their central banks to manage the supply of money. By having the power to increase or decrease the amount in circulation, central banks can help reinvigorate economic activity during periods of slow growth or reduce the risk of inflation during periods of strong growth. The existence of fiat currencies also provides central banks the capacity to set interest rate levels and act as a lender of last resort to help ensure financial stability as seen during last year's downturn.

Additionally, the process of creating money represents a source of revenue for governments, which generates billions of dollars each year in seigniorage – profit made by issuing currency (see Figure 5). As an example, it costs the U.S. Treasury just a few pennies to print a \$100 bill. However, the face value of that bill far outweighs its production costs. In a scenario under which alternative currencies such as bitcoin compete directly with national currencies, seigniorage benefits would be reduced and central banks' ability to use monetary policy would be significantly constrained. One of the major arguments against bitcoin is that as cryptocurrencies gain widespread acceptance and use, governments could view them as a threat to their national authority and enact regulations to control (or entirely ban) cryptocurrencies.

Saudi Arabia, Bolivia, Iceland, Ecuador and Vietnam are some countries that have already taken that route and made it illegal to own bitcoin. This month, Turkey's central bank joined the list, highlighting lack of regulation, supervision mechanisms or central regulatory authority, combined with the potential for criminal activity and high volatility as significant risks.

Bitcoin's legal status is likely to remain ambiguous in the near future, with some countries defining its tax implications in different ways. In the U.S., the Internal Revenue Service views bitcoin as property, making it subject to capital gains tax. Thus, if one person uses bitcoin to buy a product, it is similar to selling an investment asset to do so, triggering the need to report its cost basis and any potential gain or loss on the digital currency. This is one of the reasons Bitcoin is mostly being used as a store of value, rather than a medium of exchange.

Figure 5: U.S. seigniorage revenue (\$ in billions)

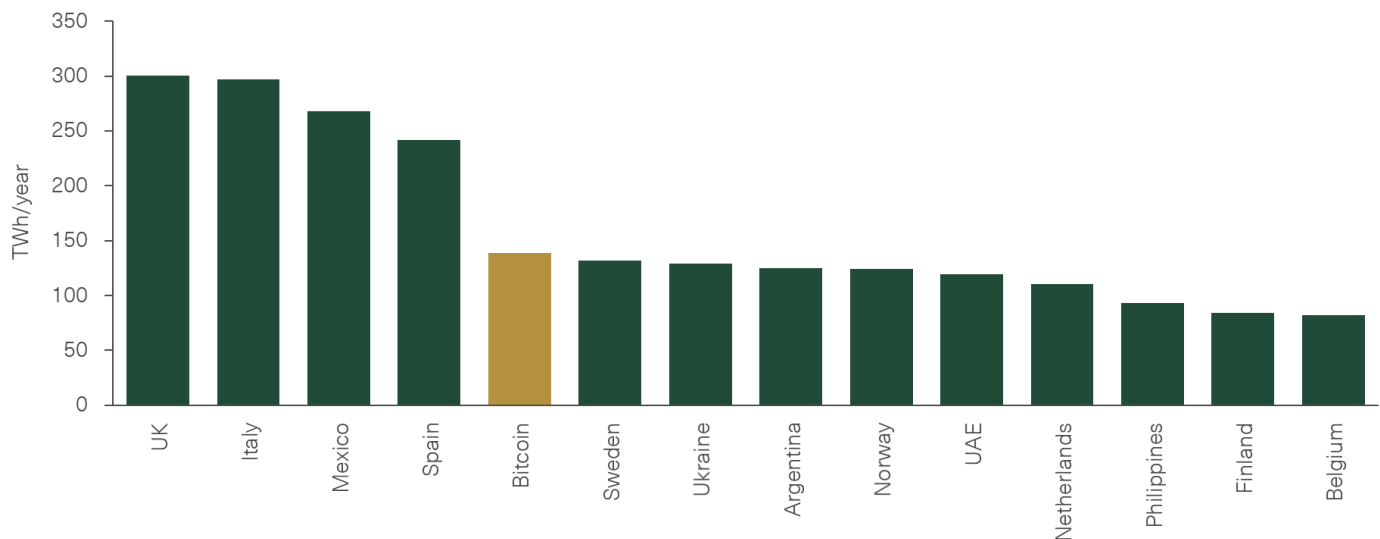


Bitcoin and the environment

Another area that has been attracting the attention of governments and regulators is bitcoin's negative effect on the environment. According to a study conducted by researchers from the Cambridge Centre for Alternative Finance, bitcoin's infrastructure utilizes 121.26 terawatt-hours per year — which translates to more electricity consumed than that of entire countries (see Figure 6). Mining bitcoin is extremely energy-intensive because verifying, processing and recording bitcoin transactions and maintaining the blockchain network require calculating complex algorithms that demand a lot of computing power and electricity. Given the large amounts of energy needed to operate, miners gravitate toward locations that offer the cheapest costs for power. As a result, more than two-thirds of bitcoin mining takes place in China, where coal (which is considered a “dirty fuel” given its high carbon content) is the main source for generating electricity.

Scientists believe that the growing energy consumption and associated carbon emissions of bitcoin mining could potentially undermine global sustainability efforts, with projections by the scientific journal *Nature Communications* estimating bitcoin mining in China to generate more than 130 million metric tons of carbon emissions by the time the technology's energy consumption peaks in 2024. Compared to other existing systems of payment, bitcoin also ranks very low from an environmental perspective — a single bitcoin transaction consumes more than four times as much energy as 100,000 Visa transactions. Therefore, companies that are looking for ways to reduce their carbon footprint and improve their environmental, social and governance (ESG) standards are likely to avoid transacting or investing in bitcoin.

Figure 6: Annual electricity consumption



Enter central bank digital currencies (CBDCs)

In response to growth in the crypto space, some nations are contemplating launching their own digital currencies in the future (see Figure 7). Similar to bitcoin, these central bank digital currencies (CBDCs) would only exist digitally and would help reduce service and security costs (after all, creating a digital coin is cheaper than printing a bill). However, CBDCs would be electronic versions of a fiat currency, preserving the central bank's monetary policy capabilities. Although the largest central banks haven't rolled out an official digital currency yet, several smaller institutions have begun testing some prototypes. The Central Bank of the Bahamas is an example of one with its own national digital currency: the Sand Dollar (which is a digital version of the Bahamian dollar). By deploying its virtual currency, policymakers aim to facilitate access to financial services to people and businesses in the archipelago, whose complex geography of 700 islands and islets and over 2,000 cays in the Atlantic Ocean make it challenging to securely collect and circulate physical cash.

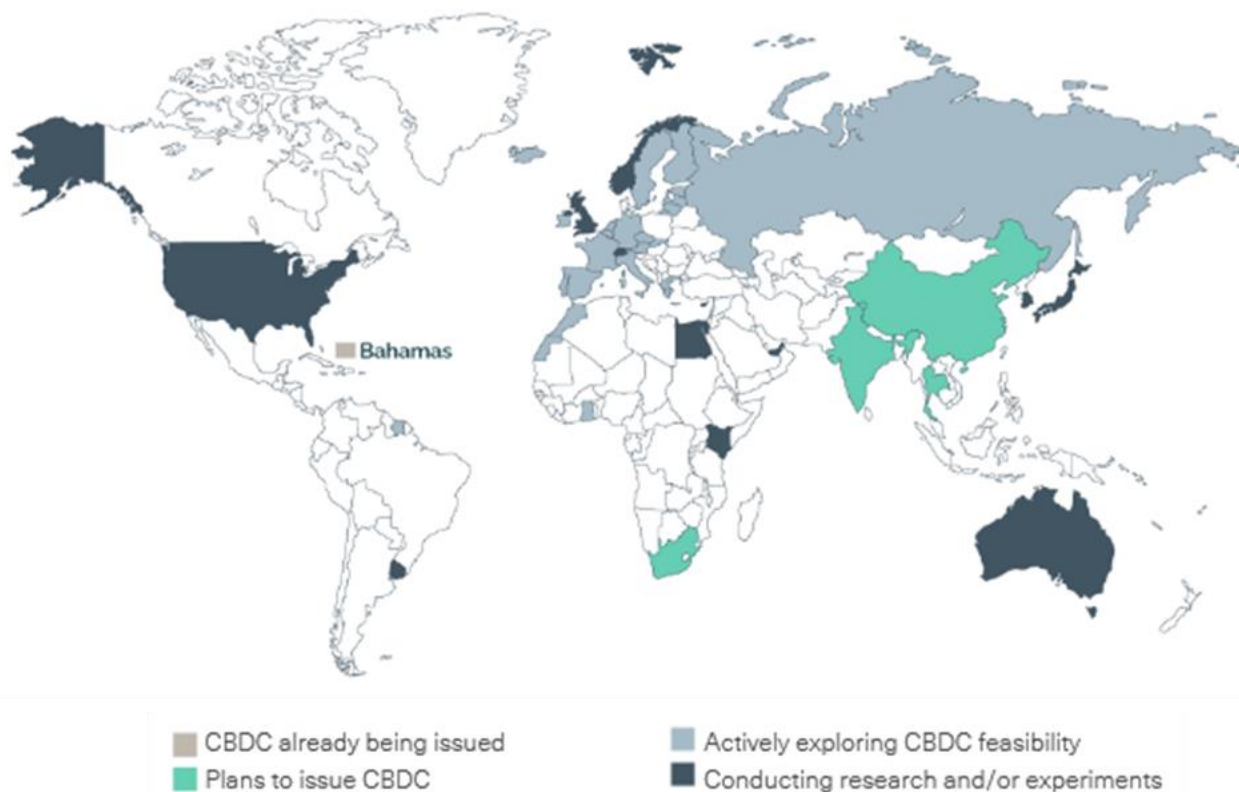
Other nations, such as Cambodia, have also taken steps to issue their own digital coins, which are expected to increase financial inclusion particularly in the developing world. CBDCs could help extend services to those sectors of society currently lacking access to banking institutions. Depending on the chosen technological design, CBDCs could operate under a distributed ledger that would not necessarily depend on the energy-intensive “mining” process that is a feature of bitcoin, making it much more environmentally friendly. China is already working on a CBDC system as it races toward an entirely cashless society. In turn, the Fed has stated that it will tread very carefully into the digital currency space, given the important role the U.S. dollar plays in the global economy and the lack of an urgent need to make the shift to CBCDs.

Investor takeaways and portfolio recommendations

Needless to say, bitcoin’s performance over the past 12 months has been nothing but eye-catching. However, while we see the possibility of additional upside amid increased interest on the digital currency and wider acceptance by market participants, we recommend that investors exercise a high degree of caution while navigating the cryptocurrency space. Investors should keep in mind that since bitcoin’s creation a decade ago, it has survived several boom-and-bust phases, generating large gains over short periods of time for some people, but also significant losses just as quickly for others. Consequently, investors should only invest small amounts they are prepared to possibly lose.

Identifying the level at which to buy or sell bitcoin is another difficult exercise, given that unlike a business, bitcoin doesn’t generate revenue or earnings, doesn’t pay interest or dividends, and doesn’t have any other fundamental metric by which to judge its present market value (essentially, people buy bitcoin expecting someone else will be willing to pay them more for it in the future). Given that bitcoin has no intrinsic value, it is difficult to forecast just how high it may rise or how low it may fall in the future. In this sense, bitcoin is similar to gold, given that its valuation tends to be narrative- and sentiment-driven.

Figure 7: Central bank digital currencies’ status across the world



It is also worth noting that, at present, bitcoin is almost entirely used as a speculative investment despite its innovative underlying technology. As of today, very few companies have approved bitcoin as a payment method, given that its sharp price swings make it difficult to use as a measurement of value. A report by Bloomberg concluded that bitcoin is still far away from becoming a common medium of exchange, with merchants amounting to an estimated 1% of crypto transactions between mid-2019 and mid-2020. The Visa network, for example, handles over 5,000 times more transactions a second than the bitcoin mempool (where all the valid transactions wait to be confirmed by the bitcoin network).

In our view, this could be a risk to bitcoin's current price levels given that valuations appear to reflect the future expectation that bitcoin and its related technology will eventually become a mainstream mechanism for payments. For these reasons, the price of bitcoin is likely to remain highly volatile and prone to move sharply for quite some time. That said, investors still looking for exposure to bitcoin could have a small place for it in their portfolios. Investing in cryptocurrencies can be done through digital exchanges such as Coinbase, open-ended funds or private passive funds. Due to the expected volatile nature of cryptocurrencies (that are likely to trade on scarcity value), the potential for increased government regulation and the impending arrival of CBDCs, we find investments in cryptocurrencies appropriate only for investors with the highest risk tolerance and recommend that they not take up more than 1% to 3% of an investors' total assets.

Chart sources:

Figure 1: Bloomberg.

Figure 2: Bloomberg.

Figure 3: First Republic Investment Management & Research.

Figure 4: First Republic Investment Management & Research.

Figure 5: BCA Research.

Figure 6: BCA Research.

Figure 7: Bloomberg, BCA Research.

Risk Factors Related to Investment in Digital Currencies

The trading prices of Digital Currencies are subject to extreme volatility.

Extreme volatility in the future could have an adverse effect on the value of Digital Currencies and, as a result, investors' investments in Digital Currencies may lose value. The market price of Digital Currencies is highly volatile, and subject to a number of risks, including, but not limited to:

- Global supply;
- Global demand;
- Interest rates;
- Currency exchange rates, including the rates at which Digital Currencies may be exchanged for "fiat currencies" (traditional currencies issued by governments);
- Interruptions in service from or failures of major Digital Currency Exchanges;
- Investment and trading activities of large investors, including private and registered funds, that may directly or indirectly invest in Digital Currencies;
- Monetary policies of governments, trade restrictions, currency devaluations and revaluations;
- Regulatory measures that may restrict the use of Digital Currencies;
- Competition from other Digital Currencies that may displace demand for a specific Digital Currency;
- Potential fraud, security failures or operational problems surrounding the operations of Digital Currency Exchanges or Digital Currencies;
- The treatment of Digital Currencies for U.S. federal income tax purposes;
- The loss, theft or destruction of a private key required to access a Digital Asset;
- Malicious actors, hackers or botnets on Digital Currency Exchanges or surrounding Digital Currencies;
- Global or regional political, economic or financial events and situations;
- Expectations among Digital Asset economy participants that the value of a Digital Asset will soon change;
- Manipulative trading activity on Digital Currency Exchanges, which are largely unregulated; and
- Investors' own acquisitions or dispositions of Digital Currencies, since there is no limit on the number of Digital Currencies that investors may acquire.

Digital Currencies have been around for only a few years and are continuing to develop. There may be future risks that are unanticipated. There is no assurance that any Digital Currency will maintain its value or that there will be meaningful levels of trading. If the price or the demand for trading Digital Currencies decreases, investors would lose value.

Regulatory changes or actions may affect the value, associated expenses, and liquidity of Digital Currencies.

Congress and a number of U.S. federal and state agencies as well as foreign governments have been considering Digital Currency Exchanges and Digital Currencies, with particular focus on the extent to which Digital Currencies can be used to launder the proceeds of illegal activities or fund criminal or terrorist enterprises and the safety and soundness of exchanges and other service providers that hold Digital Currencies for users. Many of these state and federal agencies have issued consumer advisories regarding the risks posed by Digital Currencies to investors. Ongoing and future regulatory actions with respect to Digital Currencies may alter the nature of an investment in Digital Currencies. Further, regulatory changes or interpretations could cause a significant decline in value in investments in

Digital Currencies. Digital Currency transactions may trigger tax reporting and payment obligations. The tax treatment may change and become even more burdensome in the future.

Digital Currencies have unique risks relating to legal status, core development and market penetration.

Digital Currency Exchanges and investment in Digital Currencies is relatively new and, in many cases, unregulated. While many prominent Digital Currency Exchanges provide the public with significant information on their ownership structure, management teams, corporate practices and regulatory compliance, many Digital Currency Exchanges do not provide this information. As a result, the marketplace may lose confidence in Digital Currency Exchanges and Digital Currencies.

In addition, over the past several years, some Digital Currency Exchanges have been closed due to fraud and manipulative activity, business failure or security breaches. In many of these instances, the customers of such Digital Currency Exchanges were not compensated or made whole for the partial or complete losses of their investments in Digital Currencies. While smaller Digital Currency Exchanges are less likely to have the infrastructure and capitalization that make larger Digital Currency Exchanges more stable, larger Digital Currency Exchanges are more likely to be appealing targets for hackers and malware and may be more likely to be targets of regulatory or enforcement action.

Digital Currencies are a speculative investment and involve a high degree of risk. As relatively new products and technologies, Digital Currencies have not been widely adopted as a means of payment for goods and services by major retail and commercial outlets, and non-financial use cases for Digital Currencies remain limited. Conversely, a significant portion of the demand for Digital Currencies is generated by speculators and investors seeking to profit from the short or long-term holding of Digital Currencies. The relative lack of non-speculative uses for Digital Currencies, and the potential failure of such use cases to increase, may result in increased volatility for investment in Digital Currencies.

Digital Currencies were invented, in part, to create a medium of exchange that avoids the expense and delays of the traditional banking system. By holding Digital Currencies through a bank, trust company or broker-dealer, the owner will incur fees, expenses and be subject to transfer delays that could be avoided if the owner held the digital keys directly.

IMPORTANT NOTICE: The foregoing list of risk factors does not purport to be a complete enumeration or explanation of the risks involved in an investment in Digital Currencies. Prospective investors should consult with their own legal, tax and financial advisers before deciding to invest in Digital Currencies.

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