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The Bitcoin Experiment

Recent appreciation in the cryptocurrency may be tantalizing, but understanding the dynamics behind this speculative asset is crucial before considering it as a potential investment.

The ascent of Bitcoin is capturing the imagination of investors globally. Once dismissed as the product of tech- and anarchist-driven sleight of hand, the cryptocurrency has risen approximately 300% since the U.S. Presidential election.¹ Investors rewarded Bitcoin as vaccine approvals and the resulting cyclical recovery stoked heightened fears of U.S. dollar devaluation and higher inflation. Even more recently, a number of companies and institutions have been tiptoeing into Bitcoin, both as a form of exchange and a “legitimate” asset, with BNY Mellon announcing its availability to asset management clients and Tesla investing \$1.5 billion of cash in the cryptocurrency. Many others, however, believe the recent run is akin to the famous Dutch “Tulip Bubble” of the 1600s—a period of mania that drove prices for an asset with limited intrinsic value. The chasm between supporters and skeptics is wide and one that will likely drive debate for years to come.

¹ Source: Bloomberg. Data through April 18, 2021.

From our perspective, the Bitcoin phenomenon is worth watching closely. Those with exposure should understand the speculative nature of their investment and—potential windfalls notwithstanding—be prepared to part with almost all their committed capital, as suggested by the display below. In this report, we provide some background on Bitcoin essentials, and factors to consider in sizing up the investment category.

BITCOIN: HISTORICAL DRAWDOWNS

Loss From Previous High



Source: Neuberger Berman, Bloomberg. Data through March 31, 2021. For illustrative purposes only.

How Cryptocurrencies Work

Bitcoin and other cryptocurrencies are digital balances kept on a public, decentralized ledger known as a blockchain. Enabled by advanced computing, encryption and crowdsourcing, cryptocurrencies attempt to dispense with financial intermediaries, such as banks and sovereign governments that issue and backstop traditional currencies. Transactions are verified as legitimate (i.e., the payer has the needed funds) through a process called mining, which pays the verifying users in newly mined Bitcoin. This process is intended to establish trust between unrelated parties, a crucial component of financial transactions provided by financial intermediaries, central banks and governments currently.

Bitcoin: Key Terms

Cryptocurrency: A digital asset designed to work as a medium of exchange (currency). Individual coin ownership records are stored electronically using cryptography to secure transaction records, control the creation of additional coins, and verify the transfer of coin ownership.

Bitcoin: Currently the largest cryptocurrency, with an aggregate value of approximately \$1 trillion. The Bitcoin blockchain was released in early 2009, at the depths of the global financial crisis, and became the archetype for dozens of other cryptocurrencies that followed.

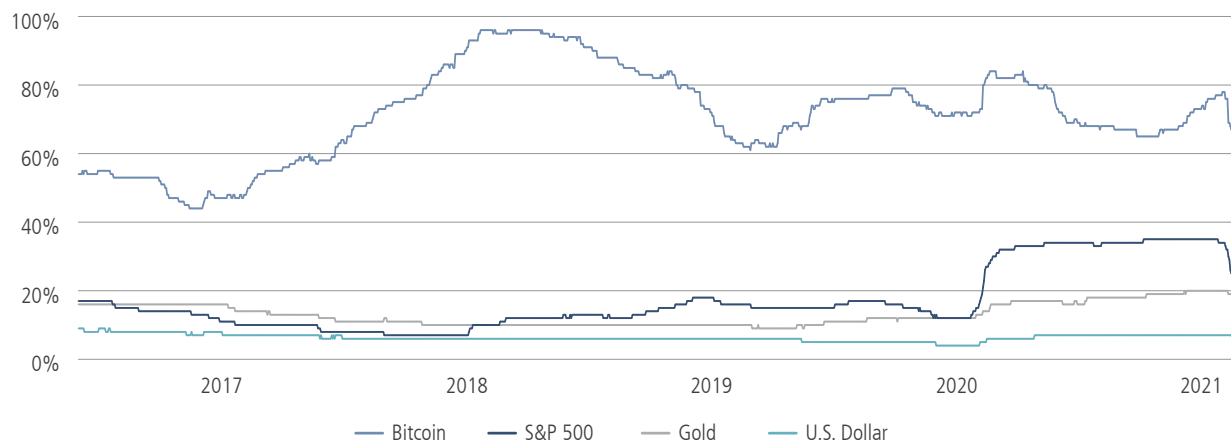
Blockchain: A list of digital records, called blocks, that are linked using cryptography. By design, a blockchain is resistant to modification of its data.

Mining: The process of verifying digital transactions, performed through complex computations by participants in the Bitcoin network, who can be rewarded for their work with freshly minted Bitcoins.

Investment Characteristics

Beyond its tremendous historical volatility (see display), Bitcoin is a controversial investment because it does not fit neatly into common investing frameworks, nor does it have a readily available basis for valuation. Specifically, conventional asset classes such as stocks, bonds and public real estate are generally expected to generate future cash flows, which can be discounted back to the present to identify an intrinsic value. From there, you can employ various metrics to assess their relative worth. Because Bitcoin does not generate cash flows, those computations aren't possible.

COMPARISON: ONE-YEAR ROLLING ANNUALIZED VOLATILITY



Source: Neuberger Berman, Bloomberg. Data through March 31, 2021. For illustrative purposes only.

Commodities, most currencies and collectibles appear to be a better starting point for comparison. Without cash flows, these assets are instead priced via supply/demand characteristics and economic significance. Scarcity, in relation to economic use, can help inform views on absolute or relative worth. For instance, some commodities may have a high price because of low inventory compared to consumption. Similarly, some currencies may rise because of trade demand and/or stable supply from the issuing country. Collectibles, such as art, wine and antiques, may offer value due to their uniqueness, rarity and/or the personal enjoyment they provide.

In our view, Bitcoin shares some features with these noncash assets. With a finite number of units, it has scarcity value, has generated significant demand (more on this below), and provides some users with economic value. This value can be as a form of exchange, limited regulation, the potential for low transaction costs, and, to some, a degree of separation from the banking system.

All these factors aside, Bitcoin and other cryptocurrencies do not, at least yet, meet the three generally acknowledged requirements for a currency: (1) a unit of account, (2) a store of value and (3) a medium of exchange. For private clients, in particular, a comparison to collectibles may be the most insightful. These items are generally in finite supply, have limited potential for reproduction and are subject to total loss. Although they can be insured, the original asset usually cannot be replaced. Investors may want to consider the role of Bitcoin in a similar fashion—that is, outside their traditional investable portfolio and grouped with other items that are finite and represent the potential for total loss.

Supply/Demand Dynamics

In assessing Bitcoin's prospects moving forward, it's important to understand the supply/demand characteristics that could drive price movement. On the supply side, the picture is relatively straightforward. Just 21 million Bitcoins were hard-coded at the creation of the cryptocurrency, essentially acting as a static monetary base. By contrast, commodity producers and currency issuers often have

an incentive to produce or create more, respectively, as prices rise. Theoretically, this unique characteristic could help preserve value should the demand story remain intact.

As suggested by Bitcoin's surge above \$50,000, recent demand has been intense. We believe the *near-term factors* behind price gains may include:

Massive liquidity from central banks. Given the extraordinary level of global monetary stimulus, investors have the means to crowd into risk assets.

Inflation concerns. Although near-term prospects are limited, there is now widespread concern about an eventual acceleration of inflation. Reasons for this might be large fiscal stimulus/budget deficits, central bank asset purchases, low-to-negative interest rates and historic surges in money supply. Like gold, Bitcoin might be employed to mitigate inflation risk.

Anticipating the "future." Alongside the risk of inflation is the potential for currency debasement, and the appeal of alternative stores of value. The end-of-days environment of the pandemic has furthered apocalyptic viewpoints, but also highlighted the growing dominance of digital business and importance of electronic transfers going forward.

In addition, several *secular trends* could be contributing to current demand, but also provide potential support for prices into the future:

Generational change. During the global financial crisis, many Millennial and "Gen Z" investors saw the harm to their parents' portfolios from macro policy decisions, and tend to be more skeptical of financial institutions. Some may be drawn to cryptocurrency as a substitute for gold, or to conduct business without banks or other intermediaries.

Network effects. At its core, Bitcoin is a digital network, which some argue is similar to major technology companies such as Amazon, Google and Facebook that connect retailers, websites and friends/family. Like the internet itself, the value of Bitcoin depends on a social consensus. Just as it took time for the internet's potential to be understood, proponents claim that Bitcoin could eventually provide viable solutions for a common network of digital transactions, with an acceleration of adaption as that network gets larger.

Growth as a payment method. Bitcoin's function as a method of payment is perhaps its most widely understood use, although it is not yet widely accepted—with notable exceptions including PayPal and (potentially) Tesla. With the growth of the digital economy, Bitcoin may facilitate the exchange of products and services that might otherwise be impractical or cost-prohibitive. By enabling "micropayments" (transactions measured in fractions of a cent), Bitcoin could have additional applicability in advertising, internet content and publishing, to name a few.

At present, there appears to be a stark divide between supporters and skeptics on these topics. Such an environment, which can occur with virtually any asset class, may create feedback loops (both positive and negative) and can help explain, at least in part, the magnitude of Bitcoin's recent volatility, which is multiples of more traditional asset classes.

Investing in Bitcoin

Given the complexity and idiosyncratic nature of Bitcoin, it's important to understand what goes into its purchase and the potential risks involved.

Purchase and Custody

Bitcoin can be purchased directly via cryptocurrency exchanges. It can also be mined, although acquisition in this manner requires considerable knowledge, dedication and computing power. Investors can also generate exposure indirectly, through trusts that hold the currency; futures and options; and shares of companies involved in cryptocurrency development and/or with significant Bitcoin holdings. Exchange-traded products may soon become another means to acquire Bitcoin, with the first North American ETF launched in Canada recently. This development could be a significant source of additional demand as the launch of the first physically backed gold ETF in 2004 influenced the price of gold.

Keep in mind that with direct ownership, the loss of a password could render an entire investment worthless. Other forms of custody have issues that need to be understood before taking action.

Potential Investment Risks

Volatility/Loss. Bitcoin's price fluctuations dwarf those of many traditional asset classes, including stocks, bonds and currencies. Over the last seven years, for example, the cryptocurrency has seen drawdowns of over 50% on several occasions. Since 2010, its annualized volatility has been close to 100% or more than six times that of the S&P 500. Though its price never went to zero, we believe that should be considered a possibility.

Liquidity. Although continued adoption could reduce transaction costs and market volatility, Bitcoin is an inherently illiquid investment compared to U.S. dollars, gold and more traditional investments. Investors should not assume that they can transact at quoted prices, especially in large volumes, during volatile periods.

Substitution. At some point, Bitcoin may face competition from other cryptocurrencies that offer cheaper, faster and/or safer means of transacting. Substitution could be mandatory: Governments could conceivably begin issuing digital versions of their currencies, further supporting the notion that the blockchain technology is real but may not ultimately reinforce Bitcoin usage. Although outlawing Bitcoin could be difficult in some countries, in others it could happen quickly and with little warning.

Security. On numerous occasions, Bitcoin holdings have been hacked, stolen or lost outright, although it may be possible to take reasonable precautions to avoid such issues by investing in investment vehicles rather than directly. In addition, Bitcoin's mining process relies on solving cryptographic problems to verify transactions. Quantum computing, given its use for complex code-breaking, could eventually threaten the security that makes blockchain technology, and thus Bitcoin, feasible and trusted.

Bitcoin Through an ESG Lens

Considering our view that material environmental, social and governance (ESG) factors can have an impact on business and security performance, we believe it's useful for investors to consider the ESG ramifications of cryptocurrency. In a broad sense, the development of more efficient, cheaper transactions could have benefits, but certain characteristics are less positive:

Environmental. Computationally intensive mining operations require massive electricity consumption, which will likely increase as adoption and transaction volumes increase. Consistent with most of Bitcoin's traits, there is debate as to the extent and impact of this issue. Worldwide, Bitcoin currently consumes 124.2 TWh of electricity annually, or about the level of electricity production in Norway.²

Social. More efficient, cheaper transactions could have positive benefits, particularly for less wealthy nations. However, Bitcoin has been criticized for its use in facilitating a wide range of criminal activity, such as money laundering and illegal drug and human trafficking.

Governance (regulatory). Beyond environmental and social issues, regulators have focused on allegations of market manipulation, the failure/theft of some cryptocurrency exchanges and general protections for investors. As with any new investable asset, these developments will require close attention from investors in the space.

Impossible Dream: Sizing Exposure

Despite all the potential risks, let's assume that you are interested in Bitcoin exposure. In that case, how do you determine an appropriate weighting in your portfolio and from where should the investment be funded? The answers are probably more art than science.

We believe that the conventional asset allocation tools are of limited use. Bitcoin's historical price volatility renders its correlations to other asset classes, which might otherwise inform an allocation decision, irrelevant. And although funding could come from a variety of asset classes, such as cash or gold, you can't expect it to replicate the same characteristics as the source investment. In other words, you are investing in something entirely different, for better or worse.

² Source: Cambridge Bitcoin Electricity Consumption Index, as of February 23, 2021.

Instead, when considering how much to invest, bear in mind the asymmetric outcomes possible with Bitcoin that are somewhat analogous to venture capital investing. Specifically, though the price increases of late could continue, a binary outcome could be a total loss. The contrast between these potential results suggests: (1) a reduced allocation relative to other assets with similar characteristics and (2) funding with assets that, if lost, would not impair your investable portfolio from meeting your goals and objectives.

Final Thoughts and Caveats

Frankly, when it comes to Bitcoin, deep analysis might be beside the point. For many long-term investors, with supply fixed, the key question is what happens to demand. This outcome depends on whether the social perception of value in Bitcoin becomes more widespread. Consider that gold has been deemed valuable for more than 2,000 years—along with its tangible uses. Bitcoin's recent ascent appears driven by more institutional investors buying into a similar perception, leading to a legitimacy that could continue the virtuous cycle. In our view, a stake in Bitcoin envisions an eventual "state of the world" in which demand for a decentralized, supply-constrained currency increases at the expense of other stores of value or cash-generating assets. The path to such a scenario might be through the benign spread and acceptance of global digital services, or, more pessimistically, through events that undermine monetary policy and debase traditional currencies, among many others. From our perspective, as a fundamentals-driven asset manager, an investment in cryptocurrency should not be considered part of a standard asset allocation. Instead, we'd rather view it as an option that pays off when expectations for an uncertain, inflationary future increase, and make the finite, non-human controlled supply dynamics of cryptocurrencies valuable.

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