

## CRYPTOCURRENCIES

# Cryptocurrencies: Bubble, boom or blockchain revolution?

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## IN BRIEF

- The current generation of cryptocurrencies,<sup>1</sup> including most notably Bitcoin, are unsuitable as currencies and unlikely to ever be widely used as a medium of exchange.
- While there is great investor interest in cryptocurrencies, their role in portfolios is still evolving. They look like highly speculative assets, with high volatility, unreliable correlations and a significant risk of their values eventually falling to zero. They could, however, have limited uses as call options on the development of blockchain technology<sup>2</sup> itself.
- Private sector stablecoins,<sup>3</sup> while less risky than market-priced cryptocurrencies, provide less security than commercial or central bank deposits and are likely to be the subject of ongoing regulatory scrutiny and tightening.
- Despite the limitations of cryptocurrencies and stablecoins, central bank digital currencies<sup>4</sup> are likely to be introduced in the years ahead. Such a transition should be achievable, if done correctly, without significant financial disruption.
- While some central bank digital currencies may include elements of blockchain ledgers, the utopian (or dystopian) ideal of authority-free and decentralized financial systems, allegedly enabled by blockchain technology, will likely fade in the years ahead.
- Please note that cryptocurrencies are not legal assets in China. Consequently, investors who fall within that jurisdiction should treat this paper as purely informational. More broadly, recent regulatory changes relating to cryptocurrencies serve to underline that the asset class is still in its infancy and is subject to significant practical uncertainties.

<sup>1</sup> A cryptocurrency is a digital currency that is protected from counterfeiting by cryptography and is normally maintained on a blockchain network.

<sup>2</sup> Blockchain technology is code that creates and maintains decentralized, distributed and immutable electronic ledgers of digital asset transactions.

<sup>3</sup> A stablecoin is a cryptocurrency that purports to offer a stable exchange rate relative to a fiat currency and is backed by reserve assets.

<sup>4</sup> A central bank digital currency is a digital token, issued and regulated by the central bank of a country or currency bloc, representing a virtual form of the fiat currency for that region.

## OVERVIEW

Cryptocurrencies, stablecoins and blockchain technology are not only important features of today's financial landscape, but they are also likely to have a meaningful impact on financial markets in the decades ahead. Since the first Bitcoin block was mined in 2009, the price of Bitcoin has soared, trading in mid-October 2021 near peak levels above USD 66,000,<sup>5</sup> with a total market cap exceeding USD 1.24 trillion, according to CoinMarketCap. Bitcoin's success has spawned thousands of competitor cryptocurrencies and helped establish a decentralized finance ecosystem.

The rise of cryptocurrencies and stablecoins has pressured some central banks to issue their own digital currencies, while the blockchain technology that underpins cryptocurrencies has been proposed as a solution to a wide range of financial, economic and logistical problems. In a portfolio context, Bitcoin has been referred to as a safe haven asset, a view we question later in this paper, potentially challenging gold's perceived role.

Yet cryptocurrencies face hurdles and limitations, as currencies and assets, that call into question how much they will ever be adopted as traditional currencies or what roles they should play in portfolios. Bitcoin is highly volatile and hasn't exhibited the characteristics of a reliable portfolio diversifier. Cryptocurrencies have raised environmental, social and governance (ESG) concerns. And while the Bitcoin boom isn't yet of a magnitude that would pose a risk to the economy or financial markets, could cryptocurrencies eventually threaten economic stability, traditional currencies and commercial and central banks? We believe there are sufficient threats to make greater regulation inevitable - and we expect the development of central bank digital currencies (CBDCs) may be one of cryptocurrencies' lasting legacies, even if the boom ultimately goes bust.

## THE RISE OF CRYPTOCURRENCIES

The original cryptocurrency, Bitcoin, first emerged in October 2008 as an idea in a technical white paper by an anonymous author using the name Satoshi Nakamoto. The premise was to enable peer-to-peer online payments without the need for a trusted third party. Nakamoto's white paper also outlined the key properties of blockchain technology:

**TRUSTLESS:** Peer-to-peer transactions are enabled without a trusted third party by leveraging a decentralized network of nodes (i.e., computers running software) that store copies of a blockchain file and agree on updates (i.e., add transactions) to the file through a consensus mechanism called mining.

**PERMISSIONLESS:** The software that powers blockchain is open source, free for all to download.

**CENSORSHIP RESISTANT:** A decentralized network, along with consensus blockchains, makes it nearly impossible for any individual, government or organization to suppress access or deny transactions.

**INCENTIVES DRIVEN:** Miners run blockchain software and verify transactions to earn the potential reward of newly issued "coins" or "tokens."

Perhaps most importantly, blockchain technology solved the most fundamental problem of any decentralized digital currency - the risk of the same asset being "double-spent." By utilizing a blockchain ledger, any two parties can transfer value over the internet without the need for a trusted third party, since blockchains provide open, transparent and immutable records of who owns what.

## WHAT HAS DRIVEN THE GROWTH OF CRYPTOCURRENCIES?

The growth of Bitcoin owes a great deal to its innovative use of blockchain technology. Predetermined scarcity - a maximum of 21 million bitcoins can ever be mined - has likely enhanced its appeal. Prominent psychological studies have demonstrated that humans find scarce goods more attractive.<sup>6</sup>

Bitcoin is also a sovereign asset - that is, its owner can self-custody, similar to the way someone can keep physical cash or gold in their home. However, unlike cash and gold, bitcoins are easily divisible and transportable, making them exceedingly difficult to seize.

<sup>5</sup> An intraday price on October 20, 2021.

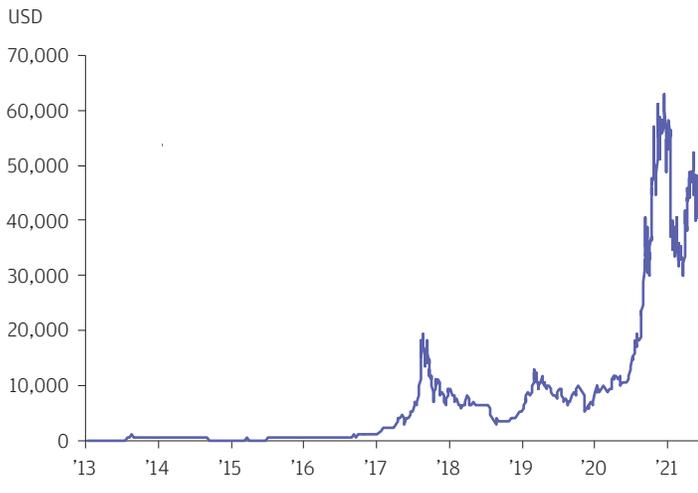
<sup>6</sup> Robert B. Cialdini, *Influence: The Psychology of Persuasion* (Harper Business, new and expanded edition, May 2021).

The period since the global financial crisis has been particularly auspicious for the growth of cryptocurrencies. When Bitcoin was launched in 2009, trust in governments and financial institutions was at a low, making a currency that bypassed both particularly attractive. Many investors were searching for “the next big thing” following the tech, housing and commodity booms. In addition, short-term interest rates have consistently remained close to zero, facilitating investments in a wide range of speculative ventures. Cryptocurrencies may also have benefited from the boom in online sales and digital transactions during the pandemic lockdowns.

While Bitcoin has, from the start, been very volatile, it has also seen massive appreciation (**EXHIBIT 1**). The rapid rise of digital assets and the fortunes made by early adopters have attracted large pools of (mostly retail) capital. Also catering to investors’ speculative appetite has been a largely unregulated, relatively frictionless market where participants can trade on mobile devices 24/7. Cryptocurrency exchanges are the primary venue for trading activity, and Coinbase, the largest regulated crypto exchange in the U.S., has roughly 68 million customers.<sup>7</sup>

### Investors have been drawn to Bitcoin’s sizable price gains, despite its volatility

**EXHIBIT 1: THE PRICE OF BITCOIN (BTC)**



Source: Bloomberg, J.P. Morgan Asset Management; data as of October 18, 2021.

## THE LIMITATIONS OF CRYPTOCURRENCIES AS CURRENCY

Despite their popularity, cryptocurrencies face severe limitations in their efficacy as currencies.

The high volatility of cryptocurrencies makes them poorly suited to the three traditional uses of a currency: as a store of value, as a unit of account and as a medium of exchange. In fact, apart from occasional publicity stunts, it is hard to see why any normal business would be willing to be paid in bitcoins. An auto dealer that agreed to sell a car on Monday for delivery on Friday should not be willing to price the vehicle in bitcoins, for fear that the price would fall during the week. A grocery store would hardly want to put price tags on its merchandise at 9:00 a.m. only to have to retag it all by 4:00 p.m.

Stablecoins, pegged by the issuer to the local currency, are one possible solution to this problem. Tether, USD Coin and Binance USD, for example, have been launched in recent years. However, for a stablecoin to be completely stable, it needs to be backed by local currency reserves. A coin backed 100% by local currency reserves would not be profitable for the issuer, however. And one backed by less than 100% cash reserves or by reserves held in more volatile assets could leave holders in the lurch in the very possible event of a run on the stablecoin.

There is a potentially profitable middle ground for issuers. A stablecoin mostly backed by local currency reserves could allow the issuer to skim profits off the top and still leave the currency “stable” until most of the coinholders wanted their money back. For users, this should limit the attractiveness of stablecoins relative to national currencies issued and fully backed by central banks. Moreover, central banks are generally hostile to stablecoins, seeing them as both infringing on their territory and adding an unnecessary risk to economic stability.

### Security and transaction volume challenges

Security presents another challenge to holders of cryptocurrencies. As a digital bearer asset, cryptocurrencies belong to the holder of the private keys<sup>8</sup> associated with each token and are therefore inherently susceptible to theft and loss. Several cryptocurrency custodians, such as Coinbase, Anchorage and NYDIG, have emerged to provide professional security services, but investors may still be skeptical of these relatively new vendors.

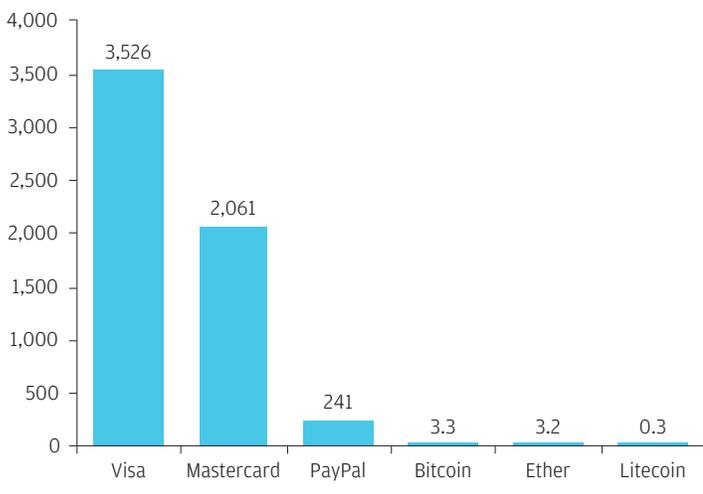
<sup>7</sup> Coinbase, September 26, 2021.

<sup>8</sup> A private key is a code generated by cryptography that allows a user to access their cryptocurrency.

Another, nonobvious limitation to cryptocurrencies is low transaction volume. Current cryptocurrency networks process a fraction of the transactions handled by Visa, Mastercard and PayPal (**EXHIBIT 2**). This may be due to cryptocurrencies’ various limitations as mediums of exchange. In the case of Bitcoin, however, the very energy-intensive nature of its “proof of work” verification structure (described below) imposes a physical limit on the pace of transactions. Other verification processes, such as the “proof of stake” structure used by, for example, the Cardano blockchain, have the potential to be faster. However, the path to speedier transactions generally implies a more centralized, or less secure, network than originally envisioned for cryptocurrencies.

**The designs of cryptocurrency verification processes limit transaction speeds**

**EXHIBIT 2: TRANSACTIONS PROCESSED PER SECOND**

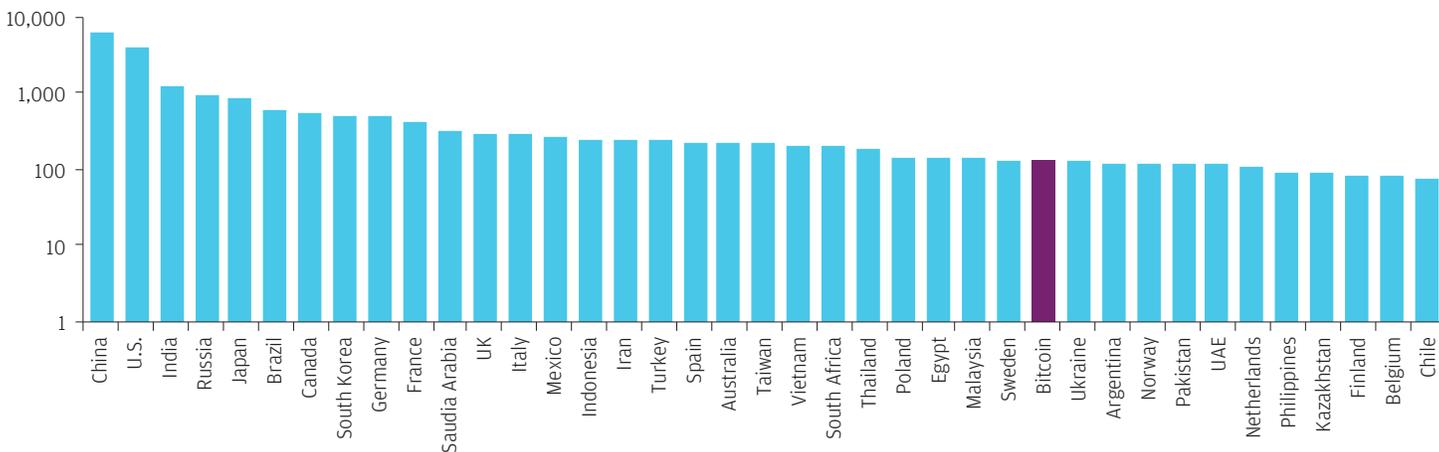


Source: Bank for International Settlements, BitInfoCharts, J.P. Morgan Asset Management; data as of August 31, 2021.

**Bitcoin’s verification process is very energy intensive**

**EXHIBIT 3: ELECTRICITY USE BY SELECTED MARKETS AND FOR BITCOIN**

Terawatt-hours per year, log scale



Source: Bloomberg, J.P. Morgan Asset Management; data as of August 31, 2021.

**THE ESG IMPLICATIONS OF CRYPTOCURRENCIES**

Cryptocurrencies also have significant drawbacks from an ESG perspective.

Energy consumption is one concern. Bitcoin’s annual electricity use is nearly equal to Sweden’s (**EXHIBIT 3**). This is due, again, to Bitcoin’s proof-of-work validation structure, through which miners compete for the right to validate the latest block in the blockchain by solving complex computational problems. The race, repeated roughly every 10 minutes, in which only one of thousands of competitors wins in each iteration, rewards the winner in newly mined bitcoins.

This competition requires significant computing power and thus electricity. Power consumption is one of the reasons for China’s recently introduced restrictions on cryptocurrency mining, which, as widely reported, have at least temporarily led to a significant decline in global bitcoin mining.

However, not all cryptocurrencies use this method of validating transactions. Some blockchains, like Cardano, as previously mentioned, use proof-of-stake validation, in which miners are allocated mining power in proportion to the coins they post as collateral, a method that is meaningfully less energy intensive. Other methods that would consume far less energy are also possible, though they would diminish the security or decentralized nature of blockchain validation.

Even if environmental obstacles can be mitigated, governance issues remain. Most notably, cryptocurrencies have been widely used in financing illicit transactions. That said, the distributed ledger technology stores the history of each user's transactions, so while users may be anonymous, tokens previously involved in illicit activity could, theoretically, be identified and then disqualified from future use. As one often-noted example, a block explorer (an online tool for viewing all transactions that have taken place on the blockchain) was used to recover funds from the Colonial Pipeline hackers, who demanded a ransom in bitcoins.

Finally, from a social perspective, cryptocurrencies purport to be more inclusive and accessible than hard currencies; to some extent, this may be true. They are permissionless and censorship resistant, preventing any government or organization from blocking transactions. In countries suffering from hyperinflation or underdeveloped banking or payment systems, cryptocurrencies could have utility as a medium of exchange (although they would seem to be less useful in this regard than the USD). However, the distribution of cryptocurrency wealth is likely just as unequal as the distribution of conventional wealth, and, in a very new industry, consumer protections need to be enhanced.

## MACRO RISKS FROM THE CRYPTOCURRENCY BOOM

Could volatility in cryptocurrencies trigger risks to global financial stability, as in the tech and housing bubbles? The volatility seen in May 2021, when Bitcoin fell by more than 40%, certainly heightened fears of instability.<sup>9</sup> At this point, we think this comparison likely overstates the risks to the broad economy.

To be sure, there are similarities between the cryptocurrency surge and the internet bubble that burst in 2000:

- Blockchain technology has generated considerable excitement despite confusion about how it works or could be used.
- Price swings in cryptocurrencies appear to be driven by momentum rather than by changes in fundamentals.
- Valuations are very difficult to justify using traditional cash flow discounting models and seem to be based instead on new and untested paradigms.

But there's a difference. Part of the damage caused by the bursting of the tech and housing bubbles came from very broad wealth losses, reflecting the diffusion of tech stocks and toxic credit instruments across households, corporate portfolios and bank balance sheets, as well as significant leverage. By contrast, the effect of the May 2021 Bitcoin collapse was pretty mild, showing that the diffusion of these instruments is not yet large enough to create spillover effects.

## Are cryptocurrencies in many portfolios?

Tracking the distribution of cryptocurrencies in retail and institutional portfolios is not easy. According to Bloomberg Law, 2% of accounts control 95% of all bitcoins.<sup>10</sup> But these concentration measures could be misleading because they are based on virtual addresses that can hide multiple users.

Another recent report estimates that 31% of bitcoins are held by very large nonexchange entities likely to represent institutions, funds, custodians, over-the-counter desks and some high net worth individuals. On the other hand, it found that smaller entities represent around 23% of owners, indicating significant retail interest that has increased since 2017.<sup>11</sup> Institutional investors are gradually growing but still have a low presence in this market, reducing the risk to financial stability from cryptocurrencies for the time being.

## THE ROLE OF CRYPTOCURRENCIES IN PORTFOLIOS

An explosion of interest in cryptocurrencies as assets has occurred despite obvious questions about their role in portfolios.

We examine three potentially beneficial roles cryptocurrencies might be expected to play within a portfolio: as diversifiers, as inflation hedges or as growth assets (like tech stocks). In each case, we find the potential contributions of cryptocurrencies (specifically Bitcoin, which we focus on, given availability of data) come up short – at least at this stage.

We conclude that an investment in Bitcoin may best be thought of as a call option on its underlying blockchain technology and that even modest allocations should be approached with caution.

<sup>9</sup> It was not the first correction, but it was more worrisome than prior slumps due to Bitcoin's greatly increased market capitalization.

<sup>10</sup> Olga Kharif, "Bitcoin Whales' Ownership Concentration Is Rising During Rally," Bloomberg Law, November 18, 2020.

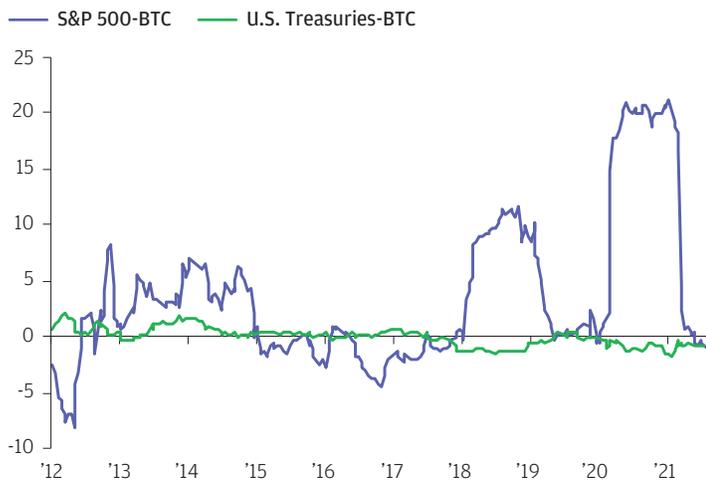
<sup>11</sup> Rafael Schultze-Kraft, "No, Bitcoin Ownership Is Not Highly Concentrated – But Whales Are Accumulating," Glassnode Insights, February 2021.

## Cryptocurrencies as diversifiers

It is clear from our analysis that to date Bitcoin has demonstrated very unstable correlations with stocks and bonds (**EXHIBIT 4**), making it a poor choice as a portfolio diversifier.

### Bitcoin’s correlations with stocks and bonds have been unstable

**EXHIBIT 4: BITCOIN 1-YEAR ROLLING CORRELATIONS**

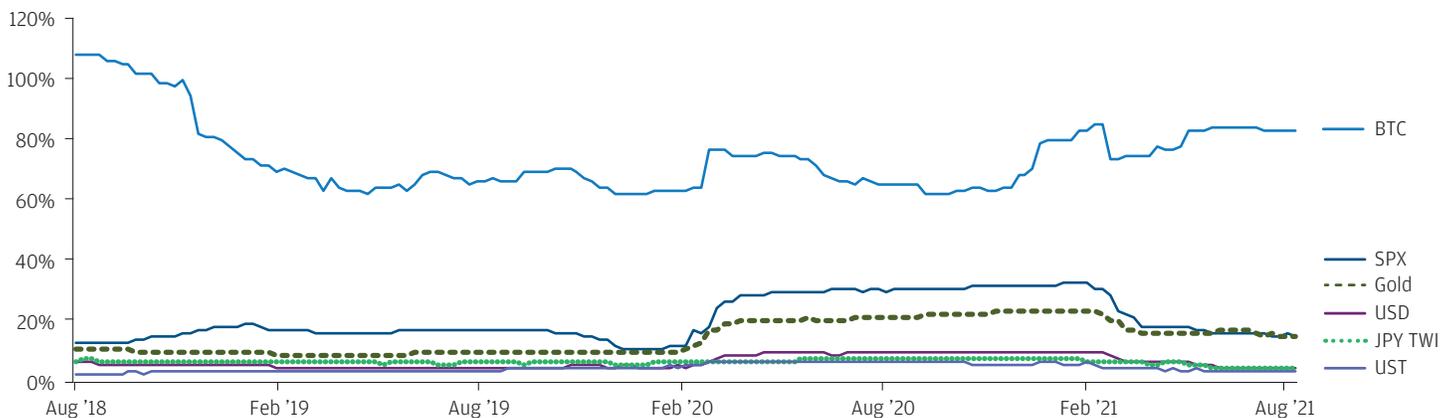


Source: Bloomberg, J.P. Morgan Asset Management; data as of August 31, 2021. U.S. Treasuries represented by Bloomberg US Treasury Index (LUATTRUU).

Nor has Bitcoin exhibited the characteristics of a safe haven asset. Like gold, Bitcoin is not issued or controlled by any entity, institution or government. That characteristic has allowed gold to serve as a safe haven during some periods of increased political and/or economic uncertainty. Our analysis thus far suggests that Bitcoin’s price has not mimicked gold’s and that Bitcoin has been far more volatile than gold or traditional assets (**EXHIBIT 5**).

### Bitcoin is highly volatile and has not exhibited a strong correlation to gold

**EXHIBIT 5: BITCOIN VS. OTHER ASSETS - 52-WEEK ROLLING VOLATILITIES (ANNUALIZED, %)**

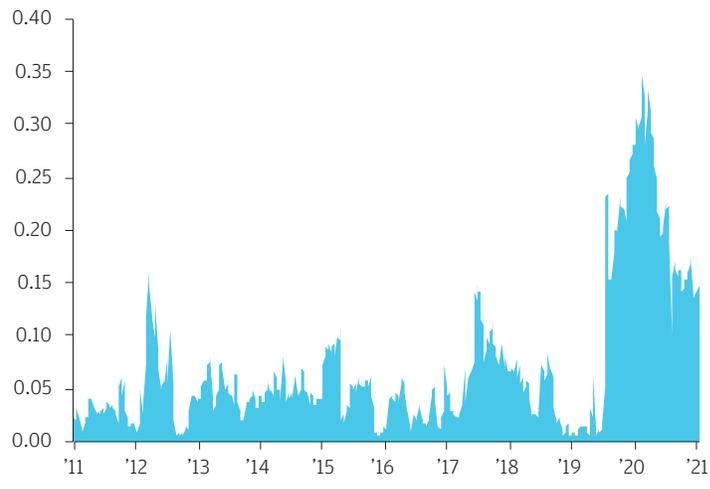


Source: Bloomberg, J.P. Morgan Asset Management; data as of August 31, 2021. SPX refers to the S&P 500, JPY TWI to the Japanese Yen Trade-Weighted Index and UST to the 10-year U.S. Treasury.

Moreover, when trying to assess the macroeconomic or market-related drivers of cryptocurrencies’ performance, we find that Bitcoin exhibits a significant amount of idiosyncratic risk; its performance so far has not been easily explained by that of other assets or macro-linked commodities (**EXHIBIT 6**). While idiosyncratic sources of return can improve portfolios’ risk-return profiles, we caution that the volatility this cryptocurrency delivers dominates and overrides the majority of the risk-return benefits.

### Bitcoin has exhibited high idiosyncratic risk since its inception

**EXHIBIT 6: 1-YEAR ROLLING R<sup>2</sup> FROM REGRESSION OF BITCOIN ON S&P 500, U.S. 10-YEAR TREASURIES, COMMODITY INDEX AND CBOE VOLATILITY INDEX - WEEKLY CHANGES**



Source: Bloomberg, J.P. Morgan Asset Management; data as of August 31, 2021.

### Cryptocurrencies as an inflation hedge

Also like gold, bitcoins are limited in supply, suggesting they may offer some degree of inflation protection. The evidence so far, however, doesn't seem to support this thesis. Consider the relationship between Bitcoin's price and two measures of expected future inflation: the University of Michigan's survey readings on inflation expectations and market breakeven rates. Although Bitcoin has briefly acted like gold (most notably around the Federal Reserve's announcement in March 2020 of its plans to support the economy amid the pandemic), it has not exhibited the correlation with macro inflation expectations that investors seek from an effective inflation hedge (EXHIBITS 7A and 7B).

### Cryptocurrency - growth asset or call option?

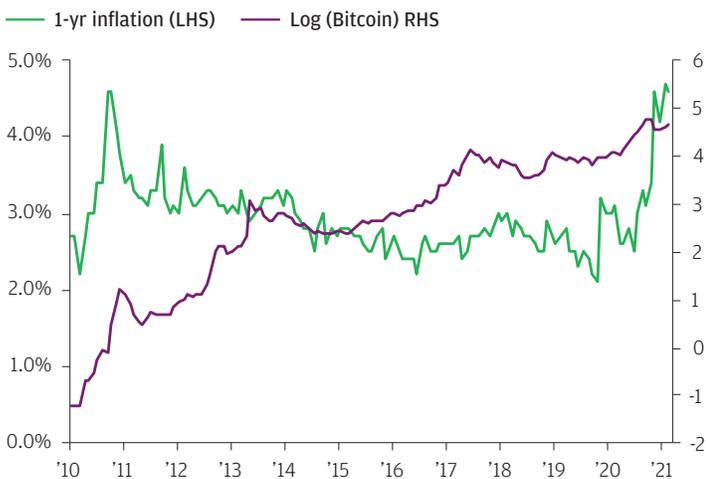
Recently, a close correlation between the prices of Bitcoin and tech stocks has led some investors to view cryptocurrencies as a way to gain exposure to the tech sector. We would question this view for several reasons. First, this correlation could be spurious, capturing retail investors' quest for "the next big thing" rather than an evaluation of Bitcoin's technological underpinnings.

Second, cryptocurrencies lack key features of tech stocks - namely, equity ownership and control. Whereas shareholders of Apple, Microsoft or Google can in aggregate shape these companies' strategies, holders of cryptocurrencies do not have similar privileges. In addition, as noted in a recent paper by Nassim Taleb, while growth stocks with no current dividends can rationally have high valuations due to the prospect of future dividends or buybacks, the valuation of cryptoassets, which lack both earnings and residual values, is more problematic.<sup>12</sup> Finally, cryptocurrencies are significantly more volatile than tech stocks.

Perhaps the most appropriate way to think about a cryptocurrency in a portfolio is as a call option on its underlying blockchain technology. In the same way that a call option holder cannot influence the direction of the underlying company, investors in Bitcoin cannot easily shape the evolution of the currency. And, as with equity options, the holders of cryptocurrencies need to be able to stomach higher volatility than is normally seen with equities. Here, it is important to distinguish between cryptocurrency platforms that are continuing to develop and evolve, such as Ethereum, and those that stick more closely to their original coding, such as Bitcoin.

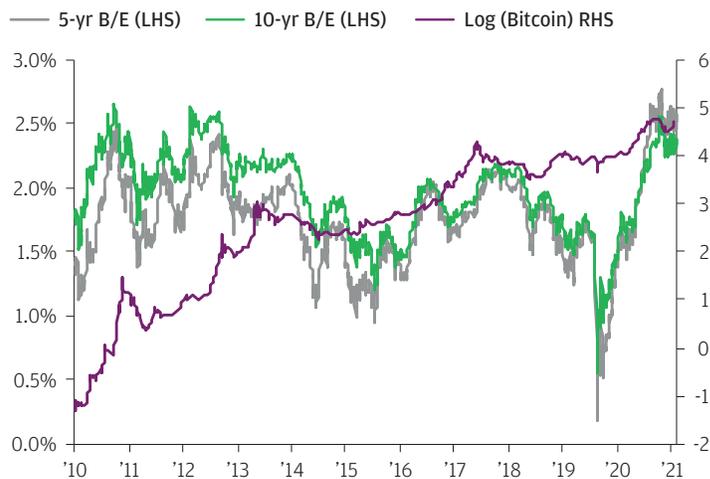
#### Bitcoin has not yet proven its effectiveness as an inflation hedge

EXHIBIT 7A: UNIVERSITY OF MICHIGAN INFLATION EXPECTATIONS AND LOG (BITCOIN)



Source: Bloomberg, University of Michigan, J.P. Morgan Asset Management; data as of August 31, 2021.

EXHIBIT 7B: MARKET INFLATION BREAKEVENS AND LOG (BITCOIN)



Source: Bloomberg, J.P. Morgan Asset Management; data as of August 31, 2021.

<sup>12</sup> Nassim Nicholas Taleb, "Bitcoin, Currencies, and Fragility," Tandon School of Engineering, New York University, June 2021.

## What could a cryptocurrency allocation mean for a 60/40 portfolio?

Taking a total portfolio view, we ask what the expected return for various Bitcoin allocations to a 60/40 portfolio would have to be to maintain the portfolio's volatility-adjusted return (Sharpe ratio). The answer: The required return is extremely high, and any allocation should be approached with caution.

For example, assuming Bitcoin volatility remains at its historical level, our analysis shows that even a 2.5% allocation to Bitcoin increases the annualized volatility (risk) of the portfolio by close to 2%. Given Bitcoin's extreme volatility, an annualized return of 33% - or 316% over five years - would be needed to maintain the portfolio's Sharpe ratio and for the investment to be considered an appropriate use of the risk budget (**EXHIBIT 8**).

## CENTRAL BANK DIGITAL CURRENCIES

One of the most important macro implications of cryptocurrencies is the pressure they place on central banks to issue digital currencies.

The rise of cryptocurrencies and stablecoins has prompted dozens of central banks to study, pilot and, in one case, launch digital currencies of their own. These currencies are mostly designed to be direct claims on a country's central bank and equal in value to its physical currency. While some CBDCs may use blockchain technology, in many ways they would upend the pseudo-anonymity promised by cryptocurrencies, providing central banks with much more visibility into transactions throughout the economy.

Most notably, the People's Bank of China (PBOC) has been researching a digital yuan since 2014. Its pilot programs resulted, by the middle of 2021, in the opening of almost 25 million e-CNY wallets, enabling citizens and companies to transact in digital yuan. As the PBOC has made clear, a digital yuan would be linked one-to-one with cash and could provide obvious efficiencies relative to cash and be useful in regions where financial services are scarce.<sup>13</sup>

### Offsetting Bitcoin's impact on portfolio risk requires a high expected rate of return

**EXHIBIT 8: EXPECTED RATES OF RETURN NEEDED TO MAINTAIN A 60/40 PORTFOLIO'S SHARPE RATIO, FOR DIFFERENT BITCOIN ALLOCATIONS, %**

BITCOIN ALLOCATION	60/40 ALLOCATION	PORTFOLIO RETURN	PORTFOLIO RISK	REQUIRED BITCOIN EXPECTED RETURN TO MAINTAIN SHARPE RATIO
0.0	100.0	4.33	8.28	N/A
1.0	99.0	4.50	8.72	21
<b>2.5</b>	<b>97.5</b>	<b>5.05</b>	<b>10.13</b>	<b>33</b>
5.0	95.0	6.44	13.69	46
10.0	90.0	9.90	22.58	60

Source: Bloomberg, J.P. Morgan Asset Management; data as of June 30, 2021.

<sup>13</sup> "Progress of Research & Development of E-CNY in China," Working Group on E-CNY Research and Development of the People's Bank of China, July 2021.

The PBOC is also exploring regulations to prevent a central bank digital currency from triggering financial institution disintermediation, or bank runs, should citizens quickly transfer funds into e-CNY accounts in times of stress. E-CNY would, in principle, employ “managed anonymity” – that is, anonymity for small value transactions and traceability for high value transactions.

The Federal Reserve (Fed) is also investigating the launch of a digital U.S. dollar. This is in part an effort to provide digital central bank money as a superior alternative to private sector stablecoins and cryptocurrencies. Some Fed officials have expressed skepticism about whether a digital USD would really increase economic access for the unbanked or is necessary to combat any risks stablecoins pose to financial stability.<sup>14</sup> However, a digital USD might be necessary just to maintain the global dominance of the dollar in the face of international competition; this reality could fast-track the development of a digital currency, already set in motion by the arrival of cryptocurrencies.

## CONCLUSION

At this point, we see cryptocurrencies as having significant shortcomings as broad mediums of exchange, and we take a cautious view of their role in portfolios beyond that of a call option on their underlying technology. We expect central bank digital currencies to become a part of the financial market landscape over the next decade or two and see this digital transition as achievable without significant financial disruption. But while some central bank digital currencies may incorporate elements of blockchain technology, the resulting landscape is likely to be something short of the idealized, authority-free, decentralized financial systems originally envisioned with the unveiling of the technological innovation that has made the explosive growth of cryptocurrencies possible.

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<sup>14</sup> “Parachute Pants and Central Bank Money,” remarks by Randal K. Quarles, Vice Chair for Supervision, Board of Governors of the Federal Reserve System, June 28, 2021.

## PORTFOLIO INSIGHTS



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