



2021 – A BREAKOUT YEAR FOR CRYPTOCURRENCY PERFORMANCE AND ADOPTION

Cryptocurrency market capitalization recently surpassed \$2.2 trillion, with Bitcoin (BTC) and Ethereum (ETH) accounting for nearly 60% of the aggregate value.¹ BTC rose 60% and ETH surged 378% this year.²

This has been a breakout year for cryptocurrency performance as well as its adoption. We believe that acceptance of cryptoassets is in the early stages and should continue to grow markedly in coming years. This outlook represents an opportunity for investors who can weather the volatility associated with this new market. Our report seeks to provide advisors and investors with a guide to understanding digital currencies and where they might fit in an investment portfolio.

In this report, we explore:

- Cryptocurrency and its future potential;
- Methods for establishing the intrinsic value of cryptocurrencies;
- Associated risks; and
- Cryptocurrencies' fit in a portfolio.

(Related: Learn why second-quarter [cryptocurrency](#) volatility was a buying opportunity in our opinion.)

SECTION 1. WHAT IS CRYPTOCURRENCY?

The technology behind cryptocurrency

Cryptocurrency, or digital currency, is a form of money that is available only in digital or electronic form. Digital

currencies use the blockchain network, a distributed ledger system enforced by a disparate network of computer systems that enables peer-to-peer (P2P) transactions without a bank or a government intermediary. As a result, using cryptocurrencies can be a cheaper, quicker, and more private way to execute financial transactions or transfer data. For example, a typical payment transfer using Bitcoin is generally completed in 10 minutes, compared with three days, on average, for a traditional currency transaction.³

Also, the traditional form of currencies issued by governments, known as fiat currencies, are centralized and can be influenced by regulators for economic policy purposes via interest rate manipulation, foreign-exchange operations, quantitative easing bond purchases, or excessive fiscal spending. Digital currencies have gained in popularity as an alternative payment method because they are not overseen or issued by central bankers, and they are not reliant on banks for payments processing.

Bitcoin rises in popularity - and price

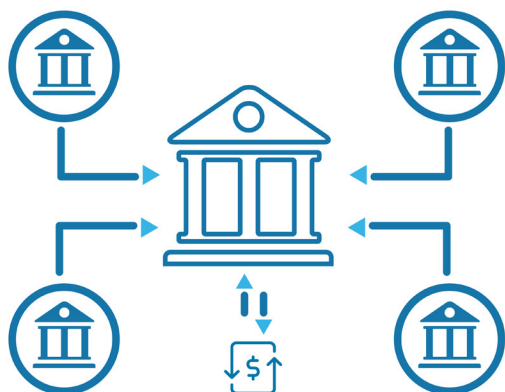
In 2008, Bitcoin debuted as the first digital currency to use blockchain technology. Blockchain technology operates as a database that stores information on transactions processed through this technology, while also creating a network effect by connecting the new transactions with previous ones.

Exhibit 1:

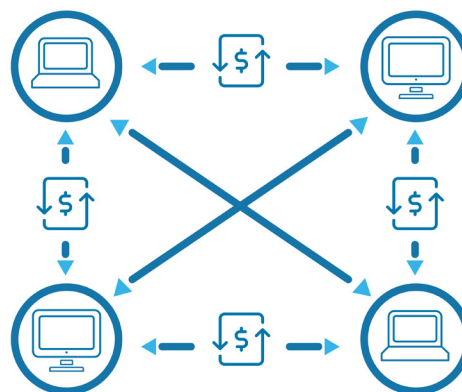
Blockchain technology's potential to revolutionize financial markets

Traditional Banking vs. Blockchain-based Finance

Traditional Financial System



Decentralized Financial System



For illustrative purposes only.

More importantly, each transaction cannot be reversed once it is entered and verified. Since historical transactions can't be modified, the confirmation of each entry is extremely important, and the blockchain technology relies on a consensus method whereby a majority of the computers on the network must agree that the transaction is valid.

The owners of the computers engaged in the verification process are awarded new Bitcoins. This exercise is also commonly referred to as cryptocurrency mining. A main driver behind increasing adoption of blockchain technology is the idea that a computerized system can process transactions faster with fewer errors, saving time and cost while improving trust in the system.

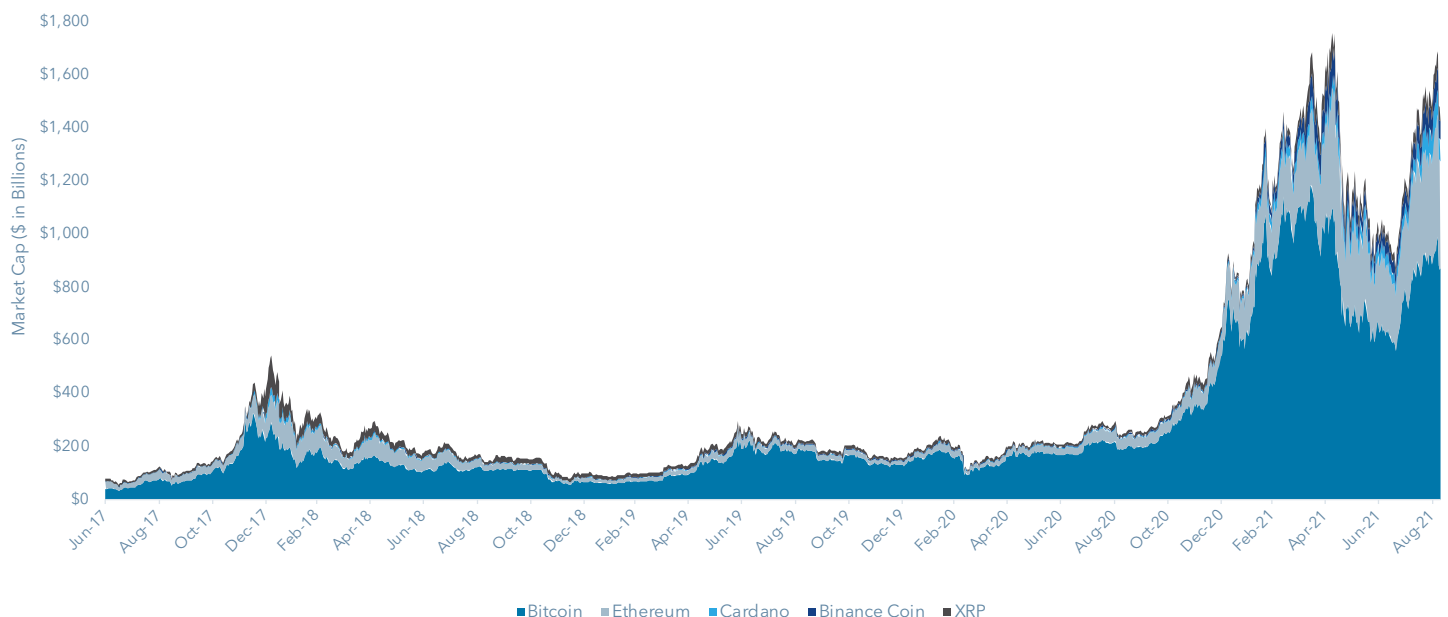
One should think of blockchain as the operating system that is powering this new technological innovation. It is believed that replacing traditional banking infrastructure with blockchain technology could drive down operational costs and processing time by 80% for financial transactions. For example, an international payment transfer using blockchain can save over 90% of the operational costs.⁴

Limited supply and rising adoption lifts Bitcoin

The creators of the blockchain behind Bitcoin only allowed for 21 million coins in total to be awarded to miners, and 18.8 million have been mined to date. Furthermore, the award for mining each Bitcoin halves every four years. In the beginning, miners were awarded 50 Bitcoins per successful transaction. Today they receive 6.25. Bitcoin is scheduled to cut its award in half again in 2024.⁵

Meanwhile, adoption is growing rapidly. For example, the number of addresses with positive balances for Bitcoin surged this year and reached 38 million.⁶ A Bitcoin address refers to a source or destination of a Bitcoin payment that requires opening a new wallet. The increase in addresses indicates increasing interest in using the cryptocurrency for payment. With increasing demand to hold, trade, and transact in Bitcoin comes the need to continue to verify transactions through the mining process, which in turn increases the value of the currencies operating on that blockchain.

Exhibit 2: Digital currencies offer the potential for growth – and volatility *Top Five Cryptocurrencies by Market Cap*



Source: Coin Metrics, June 2017 – August 2021. For illustrative purposes only. Past performance is not indicative of future results.

Due to limited supply and rising adoption, many investors believe that Bitcoin's value will continue to rise. Some investors have labeled Bitcoin "digital gold" because of supply and demand dynamics similar to physical gold. Other digital currencies such as Ethereum, for example, do not have any supply limitations. However, the movement in value of other digital currencies is often correlated with price movements of Bitcoin.

Multiple use cases drive cryptocurrency diversification

While Bitcoin is primarily focused on payments and money transfer applications, other blockchain protocols are focused on enforcement of contracts (smart contracts), ownership verification, media and entertainment rights, supply chain management, health care records, and many other applications.

Over the past decade, as the application of blockchain has increased, independent software developers have created several new digital currencies, including Ethereum, Cardano, Dogecoin, Polkadot, Uniswap, and many others.

Notably, adoption of Ethereum surged this year, approaching nearly 62 million addresses with positive balances.⁷ This standout acceptance of Ethereum, as well as Bitcoin, is largely attributable to the efficacy and progress of the underlying technologies developed by their respective protocols.

Overall, there are over 6,000⁸ digital currencies with unique protocols in circulation today. However, many of these have nascent to no real-world technology adoption yet, and as a result, remain speculative. It is, therefore, very important to verify the underlying technology and to understand adoption drivers before investing in a particular cryptocurrency.

SECTION 2. CURRENT USES AND FUTURE POTENTIAL OF CRYPTOCURRENCIES

From buying pizza to hedging fiat currencies

The pace and scope of adoption is one of the most fascinating aspects of the cryptocurrency evolution. It has been a long journey since Bitcoin first crossed \$1 in value 10 years ago, and computer programmer Lazlo Hanyecz famously bought two pizzas in exchange for 10,000 Bitcoins – worth an estimated \$41 at the time but valued today at nearly \$500 million.

What's behind the rising price of Bitcoin and other cryptocurrencies? Their future potential – from growing business, consumer, and institutional acceptance; to increased circulation in payments/purchases; to rising trading volumes, attributable, in part, to their use as a hedge against fiat currencies.

Growing business, consumer, and institutional acceptance

A flurry of activity this year points to rising adoption across consumers, corporates, and institutions:

- **A growing number of businesses are accepting cryptocurrencies.** The list includes many market-leading companies and continues to expand: Microsoft, Starbucks, AXA Insurance, Amazon, Visa, PayPal, MassMutual, Coca Cola, Tesla, Expedia, Overstock, Shopify, and Subway, among others.

Globally, over 15,000 businesses offer consumers the ability to pay for goods and services using Bitcoin, with a majority of these businesses residing in the United States, China, and Russia.⁹ According to a recent survey, up to 36% of U.S. small- to medium-sized businesses claimed they accepted Bitcoin in 2020.¹⁰

- **Several professional sports franchises (e.g., Dallas Mavericks, Miami Dolphins, Oakland Athletics) are accepting Bitcoin, Litecoin,** and other digital currencies as a form of payment, and some professional athletes are opting to convert their contracts from U.S. dollar to Bitcoin-based payments. For example, 2021 No. 1 NFL pick Trevor Lawrence announced a partnership with cryptocurrency app Blockfolio to have his \$22.6 million signing bonus placed into a cryptocurrency account.¹¹ Similarly, New York Giants' running back Saquon Barkley recently said he would take all future endorsement deals in Bitcoin.¹²

- **Banks, fintechs, and asset managers are ramping up to offer blockchain payments, trading, and investment offerings to consumers.** For example, Signature Bank offers 24-7-365-day, real-time blockchain payments to its commercial customers, and JPMorgan created Liink, a proprietary blockchain payments platform for financial institutions and corporate users.

Fintechs such as Coinbase, Robinhood, and SoFi offer cryptocurrency trading to their customers, and trading volumes are rising. Ethereum's daily transaction count has increased by 35% from one year ago,¹³ and assets under management have been rising, with the five largest regulated U.S. digital asset managers holding over \$46 billion of cryptoassets.¹⁴

- **Corporations are adding cryptocurrencies to their Treasury holdings.** Square, Tesla, and MicroStrategy added cryptoassets to their own corporate balance sheets. These holdings are currently small, valued at approximately \$7.7 billion. However, if global corporates choose to move just a fraction of their \$6.8 trillion in cash – currently earning very little in interest – into cryptocurrency, this could be a significant source of future demand.
- **Venture capital investment in cryptoassets reached \$8.6 billion between January and July 2021,** surpassing the combined total of the previous two years. Since 2015, venture capital funding to build out the of cryptocurrency/blockchain ecosystem has increased almost 760%.¹⁵

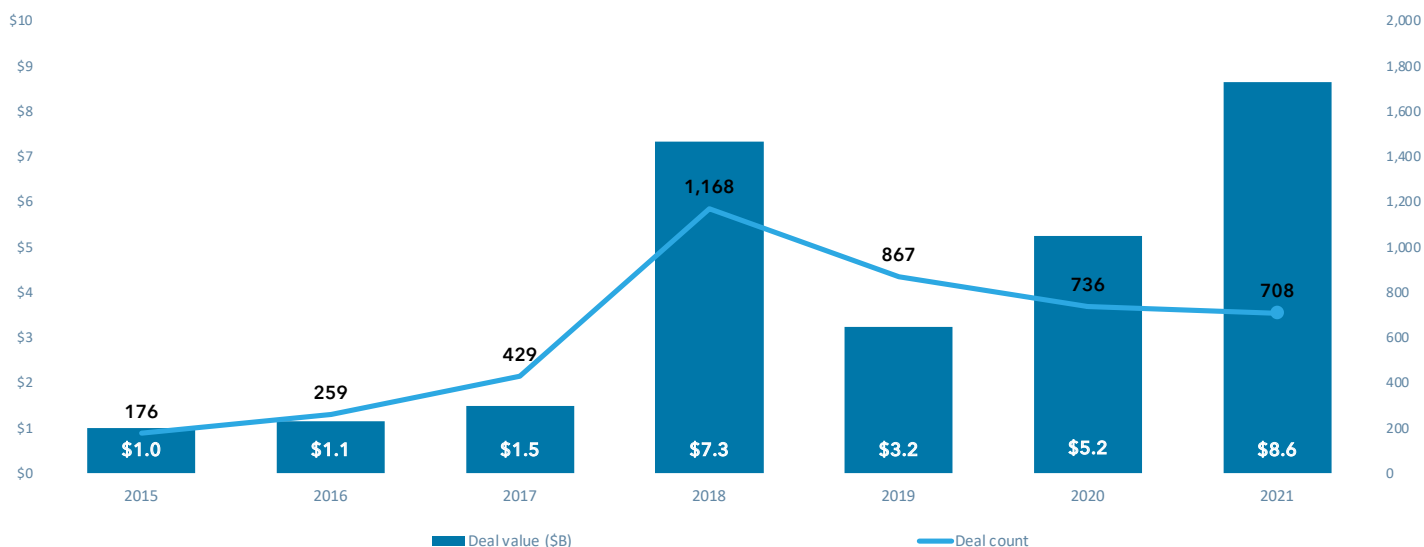
Potential further future use in commerce and cross-border payments

Given the advantages of cryptocurrencies – cheaper, quicker, and private transfer of digital assets – global adoption is poised to increase, and it could expand from nascent into a significant part of the digital payments' infrastructure, in our view.

- **It is predicted, for example, that the digital payments portion of the \$200 trillion global consumer payments market will grow over five-fold by 2030¹⁶ and cryptocurrency has a role to play.** Visa, which offers cryptocurrency-linked cards that can be used at its 70 million merchants worldwide, reported that consumers spent over \$1 billion worth of cryptocurrency across the globe in the first half of this year.

Today, this is a tiny fraction of the overall consumer payments markets, but there is significant room for future growth. Indeed, from the perspective of businesses, cryptocurrencies offer lower transaction fees, roughly 1%, compared to an average transaction fee of 2.25% for credit cards.¹⁷

Exhibit 3:
Venture capital investment in cryptoassets surged in 2021
Cryptoasset/Blockchain Venture Capital Deal Activity



Source: PitchBook Data, 2015 – July 12, 2021. For illustrative purposes only. Past performance is not indicative of future results

- **Cryptocurrency may also disrupt the \$682 billion¹⁸** global remittance market, which is projected to grow to \$930 billion by 2026.¹⁹ With less than 1% of cryptoasset volumes in remittances today,²⁰ the opportunity is large.

The typical transaction cost for an international remittance transfer is currently 6.5%, and under the UN Sustainable Development Goals that should be reduced to 3%.²¹ A typical remittance using cryptocurrency takes less than an hour to complete with the potential to drastically reduce the cost of cross-border transactions.

All these scenarios suggest that the number of cryptocurrency addresses should continue to grow. For example, Deutsche Bank estimates that the number of unique Bitcoin and Ethereum addresses, which are approximately 100 million, is expected to increase to 200 million by 2030.²² And this could point to a higher network value than implied by current user numbers today. We'll have more about how to value cryptocurrencies in Section 3.

Potential as an "alternative" diversifying asset

Beyond their utility in global payments, cryptocurrencies' future potential stems from its increasing adoption as a diversifying store of value – digital gold – and/or a potential hedge against consistently debased fiat currencies, especially in the past 15 years. Let's examine how Bitcoin traded relative to gold, the U.S. dollar, and the broad stock market, as represented by the S&P 500, since 2019.

It has indeed exhibited a varying degree of correlation with these assets, and these correlations were not static but evolved over time. It's important to note that Bitcoin is primarily thought of as a store of value, but other cryptocurrencies do not offer similar value proposition.

First, as the Federal Open Market Committee cut rates and the effective federal funds rate fell from 2.5% in May 2019 to 0.10% in August 2020 – pushing real rates into negative territory – gold and Bitcoin rallied +37% and +100%, respectively. Like gold, Bitcoin served as a store of value when central banks were cutting rates.

Then, gold peaked around \$2,000 in August 2020, but Bitcoin surged higher due, partly, to halving taking effect during the summer of 2020. Turns out, Bitcoin rose while the

U.S. dollar fell, and its correlation with the currency was stable and negative from August 2020 through May 2021. This revealed Bitcoin's tendency to hedge against debasement of fiat currencies amid quantitative easing and fiscal stimulus.

Finally, Bitcoin's correlation to stocks has been positive since March 2020. If Bitcoin is to be increasingly used in commerce and payments, it makes sense that it is positively correlated with a risk-on asset like stocks – both corporate earnings and payments transactions should rise during an uptick in economic activity (and where cryptocurrency is gaining market share).

The bottom line here is Bitcoin, at varying times, can serve as a store of value as digital gold; hedge against fiat currency debasement; and function as a risk-on instrument during periods of strong economic growth.

Tactically, this means that successful asset allocators to cryptocurrency should be clear about the prevailing economic regime and how it is likely to behave. Strategically, cryptocurrency has multiple compelling drivers – digital store of value, hedge against fiat currencies, and pro-cyclical high-tech asset – supporting its long-term intrinsic valuation.

In Section 3, we explore three ways investors are quantifying the intrinsic value of cryptocurrencies. It is important to note, however, that the data set is extremely limited, making it difficult to form a conclusive opinion.

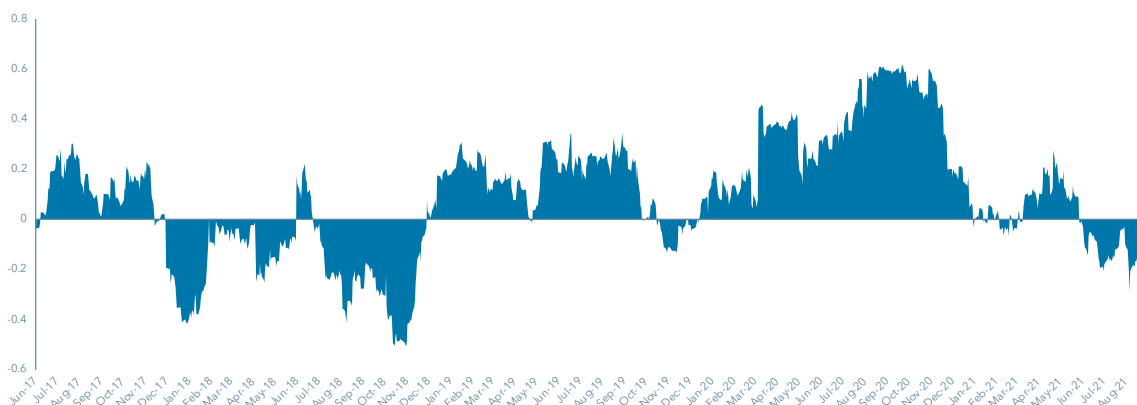
SECTION 3. DETERMINING THE INTRINSIC VALUE OF CRYPTOASSETS

How much is cryptocurrency worth?

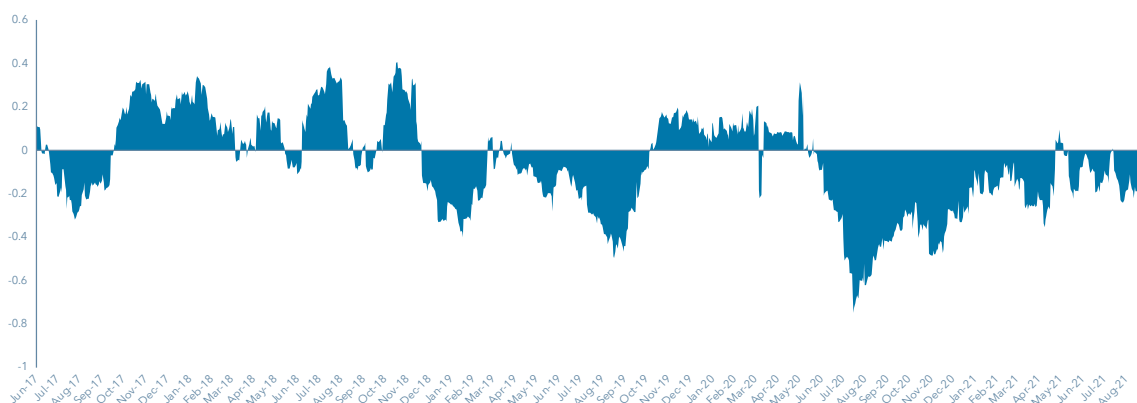
There are a number of valuation models, but these three resonate with us: demand-based network value, supply-based stock-to-flow, and cost-of-production. These valuation methods suggest that the fair price of Bitcoin is between \$11,000 and \$33,164 on the low end but could scale up to \$99,334 or \$118,544 on future assumptions on the high end.

This is a significant spread, and it points to the volatile and speculative nature of cryptocurrency investing. No model is perfect, but these three can provide a framework and help investors begin to anchor the range of potential outcomes for Bitcoin and other digital currencies.

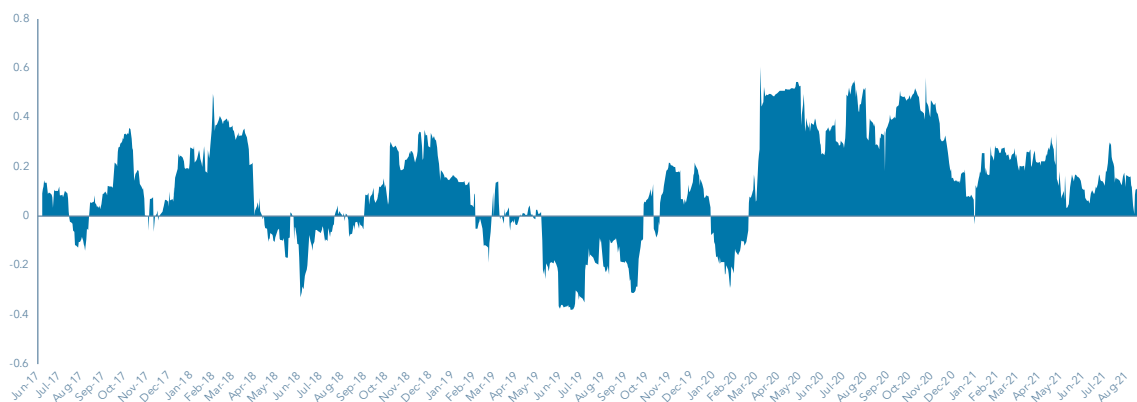
Exhibit 4:
Bitcoin displays diversification and store-of-value benefits
Gold vs. Bitcoin Correlation



U.S. Dollar vs. Bitcoin Correlation



U.S. Stocks vs. Bitcoin Correlation*



Source: Bloomberg, June 2017 - August 2021. The correlation coefficient is depicted on a scale of +1 through 0 to -1, and it quantifies the relationship of two variables. A measure of +1 indicates perfect positive correlation – the variables move in the same direction. 0 indicates no correlation between the variables; A coefficient of -1 denotes perfect negative correlation – the variables move in opposite directions. For illustrative purposes only. Past performance is not indicative of future results.
 * As represented by the S&P 500.

- **The demand-based model is grounded in Metcalfe's law** which states that a network's value is proportional to its user base squared.²³ As the number of Bitcoin and Ethereum addresses increase, so should the network value and market capitalization of the cryptocurrencies.

The rise in cryptocurrency addresses with non-zero balances helped explain 81%²⁴ and 93.8%²⁵ of cryptocurrency and Bitcoin market-cap appreciation, respectively. As Bitcoin approaches 41 million addresses, the fair value price level should be approximately \$33,000. As the expected number of addresses grows, so could the price level. For example, if addresses approximately double, Bitcoin's valuation could be \$118,544.²⁶

- **The supply-based stock-to-flow model** applies the concept often used in supply-constrained natural resources, such as gold and silver, and assumes that Bitcoin's value should be related to how long it takes to replace existing supply. Bitcoin's supply is approximately 18.7 million and is constrained to 21 million in total, according to its protocol. The Bitcoin stock-to-flow model currently suggests the price should be around \$99,334.²⁷

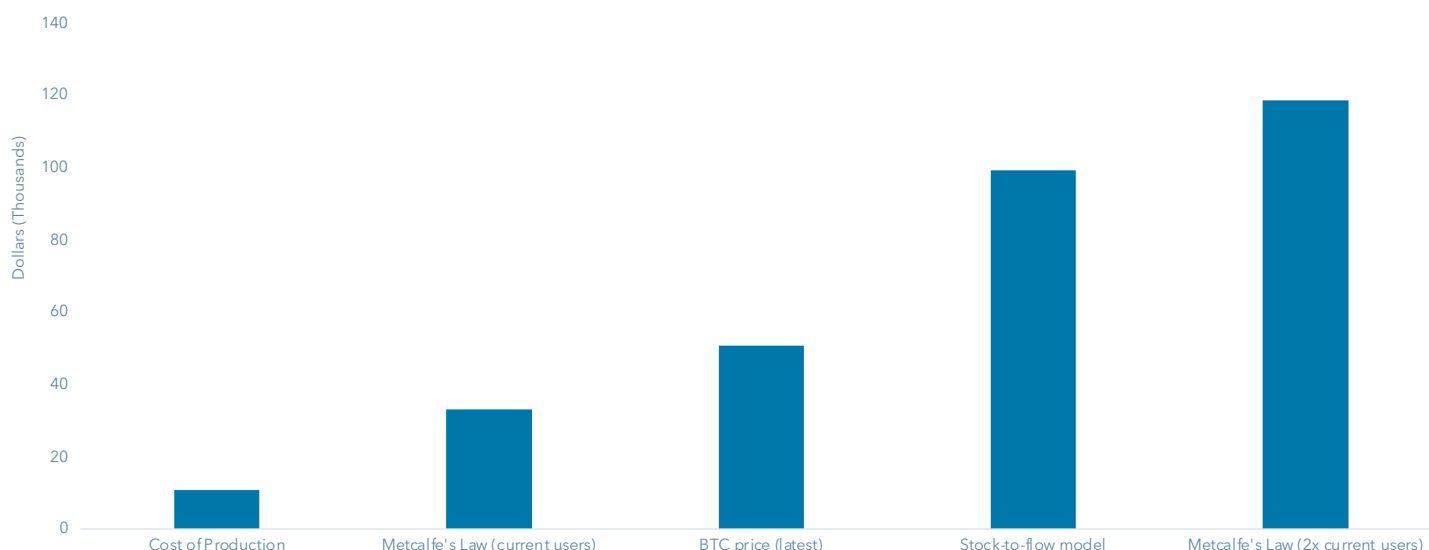
- **The cost-of-production approach** evaluates the marginal cost to produce cryptocurrencies and factors in miners' costs, including equipment (such as semiconductor chips, which are rising in price and complexity), electricity, and any additional labor. This is currently estimated at around \$11,000 for Bitcoin. As long as mining activity continues, the cost of production represents a valuation floor through which the price of Bitcoin is unlikely to sink.

Factors behind cryptocurrency volatility

If the long-term outlook for cryptocurrency is bullish, how do we explain its recent short-term volatility? Like any currency, there are short-, medium-, and long-term factors that determine valuations. For example, market sentiment often dictates short-term demand for the U.S. dollar, while interest rate differentials determine fair value over the medium term.

For cryptoassets, despite the longer-term valuation models described previously, there are several sources of short-term volatility:

Exhibit 5:
What's the fair value of Bitcoin? It depends
Bitcoin Intrinsic Value Models



Source: New York Digital Investment Group (NYDIG), November 2020. For illustrative purposes only.

- First, fluctuations in miners' inventory (whether they are selling their mined Bitcoins or hoarding them) could have a big impact on price, since they account for the highest percentage of total Bitcoin flowing to exchanges (above 25%).
- Second, regulation and other headlines may impact the overall levels of exchange trading activity. For example, trading activity slowed since May as regulatory uncertainties around cryptoassets rose.
- Third, while an estimated 79% of Bitcoin holders are presumed to be long term, traders account for 21% of supply²⁸ and can drive short-term price swings.

ICOs by volume were scams, according to cryptocurrency advisor Statis Group. While many of 2017's ICOs were fraudulent, the actual dollar loss was small according to Statis, which also concluded that more than 70% of total investment went to high-quality projects.

Investors must be vigilant when evaluating cryptocurrency investments, especially in coins that are not mainstream. We recommend investing via a reputable exchange with stringent requirements for adding new cryptocurrencies for trading. Alternatively, investors may want to partner with a third party with the capability to conduct comprehensive due diligence.

SECTION 4. WHAT ARE THE RISKS OF BITCOIN AND OTHER CRYPTOCURRENCIES?

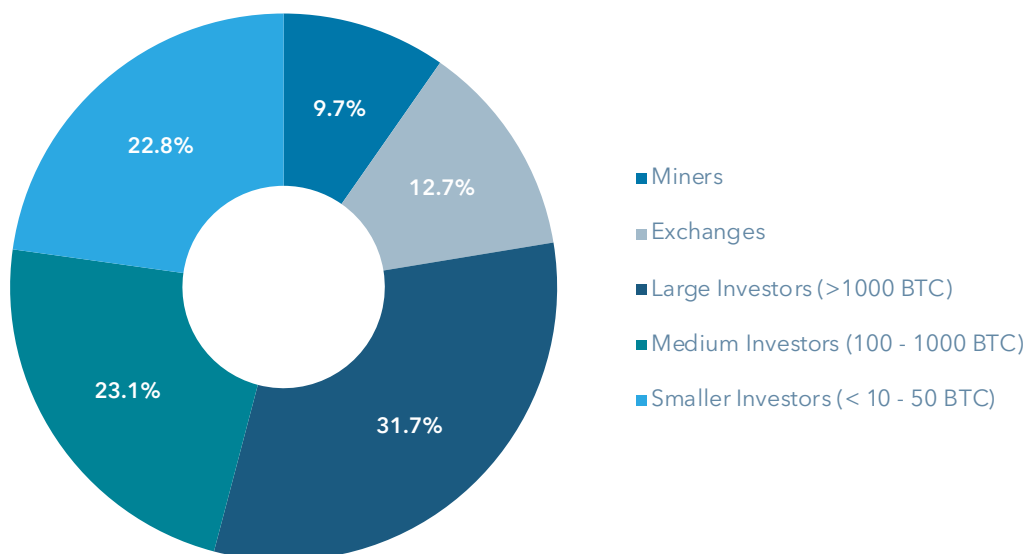
Fraud and security risks

Cryptocurrency is a dynamic and quickly evolving market, and regulators have not yet formed an oversight plan for the more than 6,000 coins in circulation. Not surprisingly, there have been several instances of fraud. In 2017 – the peak year for initial coin offerings (ICOs) – more than 80% of

Monetary authority regulation

To date, central banks and regulators in the developed world have allowed digital currencies to operate without any major interference. The first and most important issue that concerns many investors is the threat of regulation that could delegitimize digital currencies. The digital currency market poses risk to the validity of fiat currencies, and central banks around the world could lose significant control over their monetary policy.

Exhibit 6:
Bitcoin's diverse investor base
Holders of Bitcoin Supply



Source: Glassnode, January 2021. For illustrative purposes only.

Central bank digital currencies

Governments are exploring launching their own digital currencies. China, for example, introduced the digital yuan, and there are concerns that other governments may follow suit, which will lead to headwinds in the cryptocurrency market. In our view, China's entry provides credibility and demonstrates the potential power of this asset class, as they acknowledge the technological advancement of blockchain.

Cryptocurrency market volatility

The annualized daily volatility of 70% - 90% for cryptocurrencies easily tops all other assets. Retail investors account for a large share of digital currency ownership and they could be more prone to frequent trading, which adds to the volatility profile. Digital currencies have generated returns that are generally providing the requisite premium to investors holding such a volatile instrument. As such, we believe that an allocation to cryptocurrencies should be driven by each investor's tolerance for extreme volatility.

The environmental impact of digital currencies

Lastly, Bitcoin mining requires a significant amount of electricity, which has had a negative impact on carbon

emissions. There have been reports that energy used to mine Bitcoin is equivalent to the amount of electricity consumed by Argentina and New Zealand, respectively. Consequently, some environmentalists have pushed for ending Bitcoin mining.

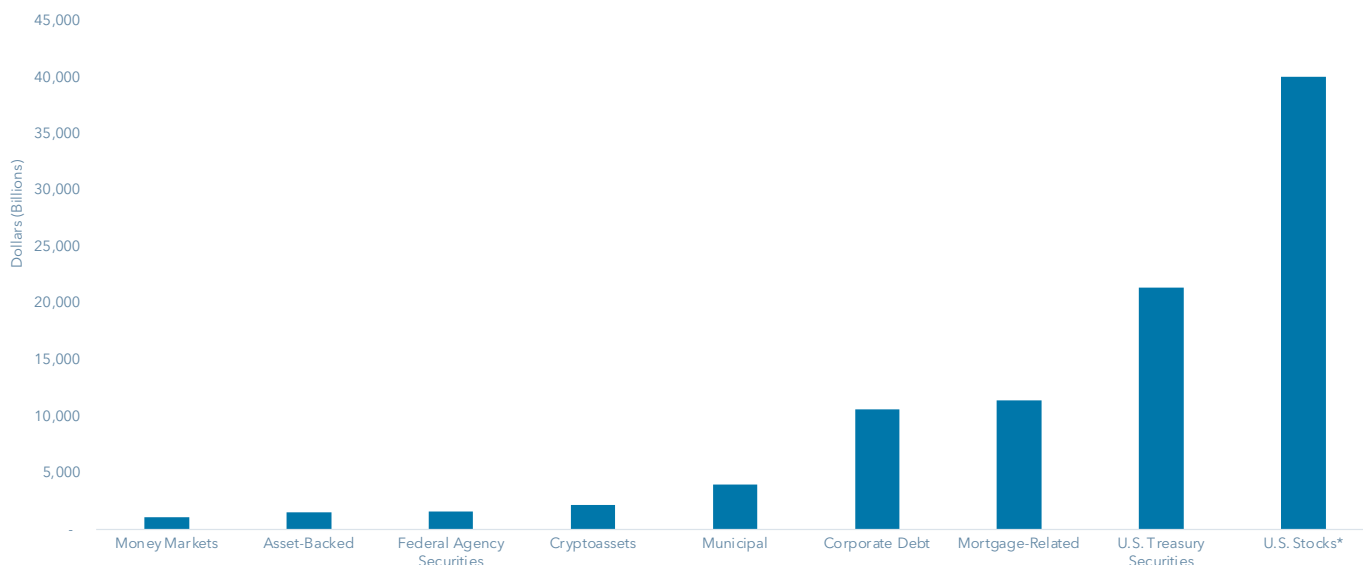
While Bitcoin mining requires a significant amount of electricity, other digital currencies such as Ethereum are more energy efficient, and they account for more than 50% of total market capitalization. Efforts are being made to transfer the Bitcoin mining process to renewable sources, as well as shift mining to hours when the supply of electricity exceeds demand to minimize the carbon footprint.

SECTION 5. WHERE AND HOW DOES CRYPTOCURRENCY FIT IN A PORTFOLIO?

Asset allocation and cryptocurrency

Cryptocurrency as an asset class is still relatively new, and some have argued that it is a premature characterization because it lacks long-term data required to be included in an asset allocation framework. While we agree, cryptocurrencies have already exhibited characteristics of a separate and unique asset class, and we expect key measures, including volatility, correlation, and return drivers, to continue to evolve.

Exhibit 7:
Crypto's exponential market-capitalization growth
Market-cap Comparisons of Various Asset Classes



Source: Bloomberg, August 31, 2021; SIFMA, July 2021. For illustrative purposes only. * As represented by the S&P 500.

Take, for example, our earlier examination of Bitcoin and Ethereum's low and fluctuating correlation with gold, the dollar, and stocks, which points to their idiosyncratic risk-and-return drivers. Also, with a market cap that exceeds \$2.2 trillion – well below the \$92 trillion global equity market – this nascent asset class has already eclipsed both asset-backed and federal agency securities, and money markets

As regulators debate whether cryptocurrencies should be classified and regulated as commodities or securities, investors are contemplating where it fits among their holdings. In our view, a decision to add a new asset to a portfolio must meet the following characteristics: a higher-than-portfolio weighted-average Sharpe ratio, and a diversification benefit with low-to-negative correlation with other asset classes. Bitcoin and Ethereum meet those criteria. How much should investors allocate to cryptocurrency? Given the 70% - 140% volatility of Bitcoin and Ethereum, we would consider sizing the allocation as any other highly volatile security with promising potential but also plenty of idiosyncratic risk.

We, therefore, would consider a cryptocurrency allocation of between 1% and 3% as a starting point in an all-equity portfolio, and less than that in balanced ones. We would

fund this commitment from the equity sleeve of the portfolio, because of positive correlation with equities and volatility profile.

Parallels with gold's role in a diversified portfolio

In the future, if cryptocurrency volatility subsides, and if its potential evolves as expected, this allocation could be increased. Indeed, this is a process that we have witnessed with other assets.

Morgan Stanley recently made an apt comparison of Bitcoin with gold, concluding that by the late 1980s, gold "had completed its 18-year transition from new asset to a recognized part of an institutional portfolio. Over that time, the dynamics around the volatility and correlations have matured, with gold consistently and predictably moving inversely with the trade-weighted U.S. dollar and U.S. real interest rates."²⁹

Cryptocurrencies may not yield the astronomical returns of the prior decade (or past two years). However, investing in an asset class with the potential for upside beyond traditional stocks and bonds and a low correlation with equities and fixed income could help improve potential risk-adjusted portfolio returns. And if the current inflationary environment is anything but transitory – and the Fed is behind the curve – cryptocurrency could help serve as a fiat currency hedge.

Exhibit 8:

Potential of cryptocurrencies to contribute to risk-adjusted return

Risk and return metrics for Bitcoin, Ethereum and U.S. Stocks and Bonds

Index	Annualized Return	Annualized Standard Deviation	Sharpe Ratio
S&P 500	14%	19%	0.65
Bloomberg U.S. Aggregate Bond	4%	3%	0.81
Bitcoin	134%	76%	1.74
Ethereum	269%	122%	2.19

Source: Coin Metrics; Bloomberg, September 10, 2021. Calculations are based on data from August 8, 2015 through September 9, 2021.

Adoption of the cryptoasset ecosystem is growing

Our long-term conviction is that the adoption of cryptocurrencies will continue to grow, and investors may want to begin to add an allocation to their portfolios. Indeed, 45% of recently surveyed family offices are interested in cryptocurrencies, and 15% have already invested in Bitcoin.³⁰

Last but not least, the applications of cryptocurrency are numerous: from P2P payments; to other decentralized finance (DeFi) concepts; to use in payments between IoT devices; to digital identity verification; to smart contracts execution, and more. With well over 4,000 tokens for various applications, and potentially rapid shifts in adoption, we would consider diversifying cryptocurrency holdings among several key tokens with promising potential.

Familiar, yet unique, risk and return drivers

Cryptocurrencies provide investors with the potential to improve absolute and risk-adjusted performance when

compared with portfolios that are limited to publicly traded stocks and bonds. And, similar to any new asset class, this return-enhancing opportunity introduces additional risks in the form of elevated volatility and potential security risks associated with the specific investment type.

Volatility can be managed through disciplined asset allocation and consistent portfolio diversification; as noted in this paper, we suggest “vol-adjusting” exposures over time to account for the larger moves in cryptocurrency versus traditional assets. Security risks can also be controlled by focusing on the largest, most secure currencies that are backed by sound technology, widely accepted protocols, and overseen by established organizations.

Understanding the potential risk and reward and the multiple benefits of cryptocurrencies – protection against fiat currency debasement; a diversifying store of value; exposure to its disruptive impact on the global remittances and consumer payment industries – may help advisors and their clients achieve their long-term portfolio goals and objectives.



END NOTES

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Kunal Shah
Managing Director, Head of Private Equity Solutions,
Co-Head of Research



Joseph Burns
Managing Director, Head of Hedge Fund Solutions,
Co-Head of Research



Anastasia Amoroso
Managing Director,
Chief Investment Strategist



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