



Bitcoin

A Definitive Guide for Investors

Why Bitcoin? Why Now?

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Introduction

Investor interest in crypto assets continues to surge. This emerging asset class continues to demonstrate increasing potential and acceptance as a component of investor portfolios. Financial advisors are working to stay informed on these markets, with the ultimate goal of helping their clients understand and participate in this dynamic new asset class. Investors eager to participate in the crypto economy might need help navigating the complexity of these assets. We believe financial advisors that can help their clients navigate the crypto markets may be better positioned to retain and attract new clients as crypto becomes an increasingly important component of investor portfolios. As one of the world's leading crypto-focused asset managers (and Latin America's largest), Hashdex has compiled this Bitcoin guide to be a resource for advisors wishing to better understand the investment case for this asset.



Welcome to the Definitive Bitcoin Guide for Investors

Content Summary

Bitcoin is the first decentralized digital currency supported by blockchain technology, which has revolutionized modern-day finance and investment practices.

Bitcoin has unique characteristics that give it the potential to be a long-term store of value for investors, such as decentralization, immutability, security, and scarcity.

There are inherent benefits as well as risks when investing with Bitcoin, and both require consideration; however, two primary factors—Bitcoin's function as a potential store of value and as a medium of exchange—fortify the investment case.

Institutional and commercial adoption of Bitcoin has significantly increased over the course of 2021. Additionally, the impact from emerging markets has been notable with global crypto adoption nearly tripling as countries begin to remove restrictions surrounding the currency.

Adding a small Bitcoin allocation to a traditional 60% equity / 40% bond portfolio can potentially increase risk-adjusted returns.

Bitcoin adoption is still in its very early stages of development; there is potentially a large runway for growth as more investors understand the use cases and security benefits of the underlying blockchain technology.



Part 1

Bitcoin Overview



Bitcoin is the first decentralized digital currency to gain real recognition and adoption in the world. The currency is built on a peer-to-peer system and supported by blockchain technology. This is referred to as the Bitcoin network. This technology allows users to securely send and receive Bitcoin payments across the world, without needing a centralized authority to administer the transactions.

The Bitcoin network leverages blockchain technology and a distributed network of users. This allows for the foundational principles of consensus, transparency, and immutability. Bitcoin's blockchain network consists of a series of blocks, each containing transactional information. Once a block is published to the chain, it is impossible to remove or tamper with the information contained within it without controlling more than 50% of the network's compute resources. Such an attack is expensive and very unlikely, thus Bitcoin technology ensures the immutability of any transaction reported on the chain, in practice. New blocks are published and verified by a distributed network of users via a consensus mechanism called "Proof of Work" (PoW). Furthermore, the blockchain is transparent, allowing for constant monitoring by users to ensure its security is never compromised.

From an investment standpoint, there are several aspects of this asset that may drive long-term value for investors. The first is Bitcoin's technological structure, which combines security and transparency with global transaction capability. Furthermore, the distributed blockchain network removes the need for a trusted central authority, which decreases both costs and risks. Additionally, Bitcoin offers a variety of use cases, many of which provide value by overcoming barriers such as distance and traditional drawbacks like inflation. We believe these characteristics will help Bitcoin to grow in value as both a unit of exchange and a long-term store of value.

A Short History of Bitcoin

In response to the 2008 financial crisis, a person or group of people known by the pseudonym Satoshi Nakamoto posted a white paper, Bitcoin: A Peer-to-Peer Electronic Cash System, that introduced Bitcoin to the world. Bitcoin was fundamentally a breakthrough in computer science that built on decades of research into digital currency and cryptography. The network was initially created as an answer to the question of how to establish trust between otherwise unrelated parties over an untrusted network like the internet. By using well-known mathematical computational concepts, the Bitcoin network created a means of transacting money over the internet securely, without the need for intermediaries. Although it was initially used to simply send payments between parties, the core blockchain technologies behind Bitcoin have continued to evolve, inspiring a variety of new assets and protocols.



Part 2

The Building Blocks of Bitcoin



Bitcoin Mechanisms and Actors Involved

Bitcoin is based on decentralization, which is the concept that no individual or specific entity has control over the network, the operations carried out on it, or its records. In this system, agents do not have to rely on a central counterparty (such as a bank) to make transactions. In the words of the creator (or creators) of Bitcoin, the invention is purely a peer-to-peer version of electronic cash that would allow online payments to be sent directly from one party to another without going through a financial institution. To avoid the need for a central counterpart, Bitcoin uses a complex cryptographic system that validates transactions and prevents a holder from spending the same coin more than once. This decentralized system (which helps guarantee security, low transaction costs, and faster speeds) and Bitcoin's inflation-resistant reward structure are two primary reasons why we believe Bitcoin may potentially be an excellent long-term store of value for investors.

So how does this technology work?

The Bitcoin network has two primary components: the first is the underlying blockchain. The second is its distributed network of nodes (users) who verify and mine blocks for the blockchain. Blockchain is the technology used to record and store Bitcoin transaction information. It functions as a kind of public ledger that records transactions permanently, and it is extremely resistant to manipulation. So once a transaction has been registered on the blockchain, it is considered mathematically impossible to remove or change it.¹

Each block contains a summary of transactions, and this transaction data is confirmed by validator nodes. The ledger is fully transparent, enabling any network participant to validate the entire blockchain to see whether it has been changed at some point. This is what makes the blockchain a decentralized registry where only new information can be added, and once data has been validated it cannot be removed.



Bitcoin's Main Features

Decentralization

Bitcoin is not tied to a central bank or entity that governs the cryptocurrency or that can impact its value. Investors do not need to worry about the stability or leadership of the controlling centralized organization, as is the case with fiat currencies. Bitcoin is built on a decentralized network, removing the need for a third party to guarantee all peer-to-peer transactions. This improves efficiency and reduces costs.

Security

Within the technology underlying Bitcoin, each block of data references and contains information about the block previous to it. Together they form a chain, with each new block underpinning the blocks that have come before it. This aspect, together with data immutability, creates a secure network with a trustworthy history—unlike centralized systems, which may only require hackers or bad actors to exploit one point for its system to fail.

Immutability

Due to the nature of the technology, data registered on the network cannot be changed.¹ For any new transaction, a new registration and validation of the transactions from the previous block will be required. The mechanism of blockchain significantly reduces the risk of fraud, hacks, or malicious actors within the network, issues that have plagued centralized digital currencies for years — the rise and fall of E-Gold may come to mind. Bitcoin investors have confidence that their transactions on the blockchain are secure. This also adds value, as it helps provide a sense of long-term stability and security of the assets.

Scarcity

The number of Bitcoins that can be issued is fixed at 21 million, as this amount is embedded in its source code. Once that number is reached, it is impossible for more coins to be added into circulation. In addition to limited issuance, Bitcoin halves the rate it rewards miners every four years through an event called “halving,” which we’ll cover in greater detail in the next section. This halving was originally designed to reward early network participants by giving them greater benefits. However, this also acts as a disinflationary measure by clearly outlining the issuance plan and increasing supply at a defined rate. These disinflationary measures, which are built into the code, provide investors with structure moving forward, while also providing asset scarcity to help drive value. The mechanisms will be outlined further in the mining section below.



Bitcoin Mining

The Bitcoin mining process and its associated mechanisms are incredibly important to maintaining the integrity of the ecosystem. Mining is the process that sustains network operations by validating transactions and creating the blocks that get posted to the blockchain. The right to perform these actions, and earn the associated reward, is granted to the miner who solves a mathematical challenge. Specifically, the miner must produce a hash (a long string of numbers and letters that results from putting the transaction data through a cryptographic algorithm and which verifies the information's validity without revealing the information itself) in less than a certain amount of time. This challenge changes with every new block, and the first to solve it earns the right to mine that block. This process is referred to as "Proof of Work" (PoW). In return for validating the block, the miner is awarded a predetermined amount of newly issued Bitcoins (BTC); currently the reward is 6.25 BTC plus associated fees. The size of this reward will decline over time through a process called halving. Once a block is mined and the transactions processed, a new PoW challenge is released and the system continues. Through this process, the blockchain is organized into a chain of blocks, as illustrated below. The difficulty level of the most recent block as of September 2021 is 19 trillion; this means a miner has a one in 19 trillion chance of being awarded a block. As a result, miners must expend large amounts of computing power to receive the rewards for confirming blocks.

This proof of work system means transactions are validated by different miners, ensuring the blockchain's decentralized nature and its security. Once a block is mined and added to the blockchain, it is impossible to alter its data or change that block, ensuring all transactions are legitimate. This system provides security to users and investors. Once 21 million Bitcoins have been issued, miners will be rewarded by transaction fees alone.

Addressing Energy Consumption Concerns

Bitcoin's proof of work model has faced criticism due to its high energy consumption. Activists and even some companies have expressed concerns, specifically over the use of fossil fuels to power this process. These concerns are genuine, since it does require large amounts of energy to mine. Additionally, much of this energy is wasted since only one miner earns the rewards each time despite every miner expending energy. Despite these concerns, there are several factors that allow Bitcoin to grow in value and continue to succeed.



1. The Bitcoin mining industry has been transitioning to renewable energy sources and more efficient energy use for those that don't use renewable energy. These concerns have been acknowledged, and a sizable portion of the industry (between 30% and 50%) claim to get their energy from renewable sources.

2. The existing mining model is likely to remain stable; a network shift to a new mining model would be a massive undertaking. Such a change may potentially have a significant risk of failure and would likely elicit pushback from many users.

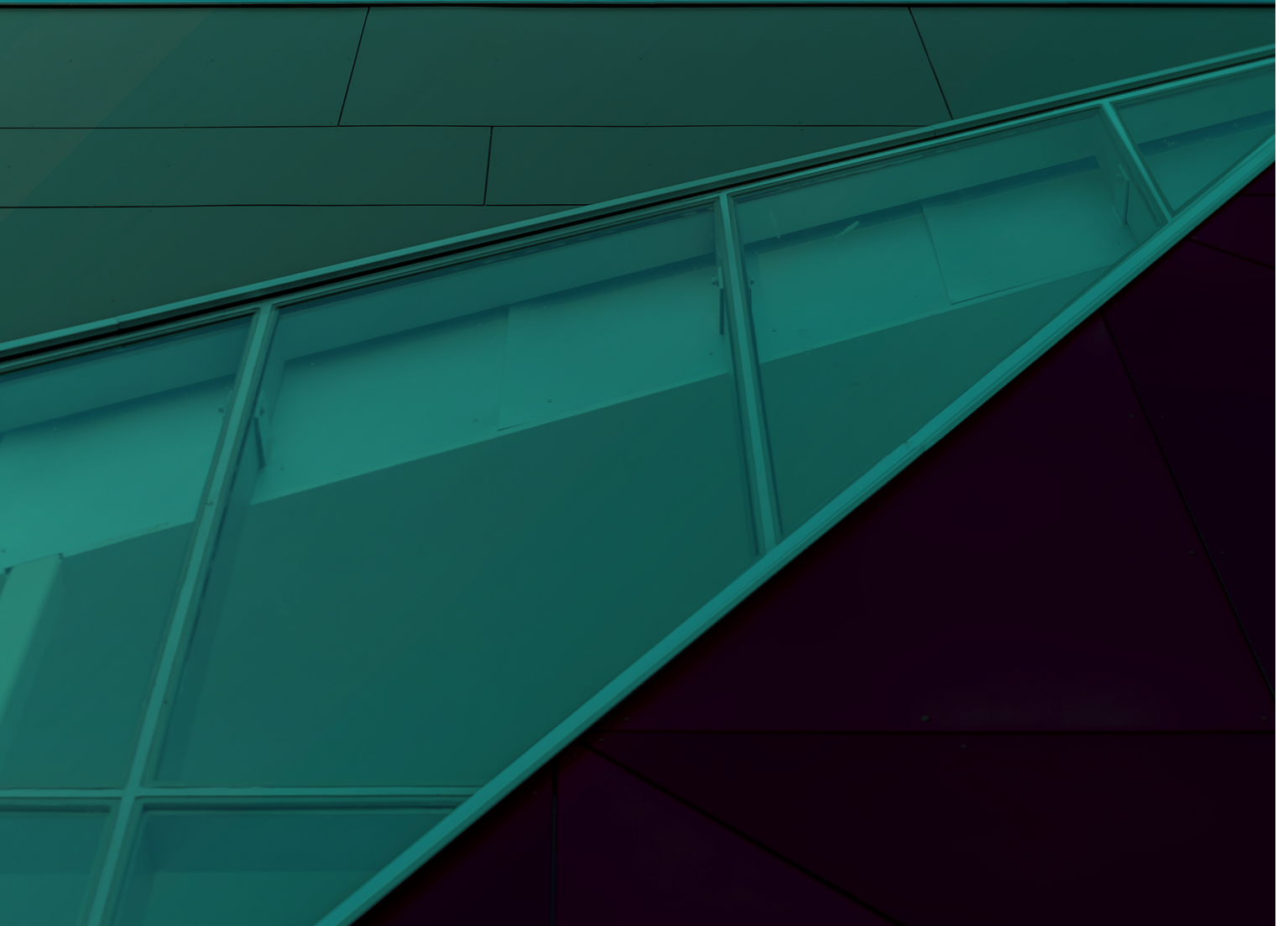
3. Finally, the last factor that reassures both investors and users is that the PoW model, despite being energy intensive, is something we believe currently to be the safest, easiest, and most battle-tested model. A distributed network of miners competing for rewards prevents collusion and ensures fast, inexpensive transactions.

While the current system is not ideal, there are significant steps being made every day to improve the network without sacrificing security or efficiency for investors.



Part 3

Benefits, Use Cases, and Risks for Bitcoin





Benefits

Disinflationary: As mentioned previously, a primary value driver of Bitcoin is that it is inflation resistant. Bitcoin's disinflationary nature comes from several sources. The first is a fixed supply schedule of 21 million Bitcoin, which is built into its source code. By limiting the total number of coins and outlining how they will be brought into circulation, the network removes uncertainty and oversupply, which can heavily contribute to inflation. Additionally, the decentralized nature of the network means no central authority can override these mechanisms and simply mine more coins. The removal of a central authority with the power to control monetary supply further reduces the risk of inflation, as the asset no longer relies on a governing body's policy decisions. Bitcoin's decentralized network ensures it will continue to operate as outlined by its initial white paper, and will not be influenced or changed to meet the wants and needs of a centralized authority.

Global: Bitcoin is not operated by any central entity, and therefore it is not required to operate based on the policies of a single group. This allows Bitcoin to overcome several important barriers in the financial industry, specifically distance and time. As a global, decentralized currency, Bitcoin can be traded any time of the day across any border, with the same fee structure. Due to these characteristics, Bitcoin breaks many current financial paradigms, since (i) it does not measure the value of the transaction or the distance traveled, (ii) there are no intermediaries to make transactions more expensive by charging various fees, and (iii) it lacks any form of bureaucracy that can make transfers difficult. Regardless of the amount transacted or the nationality of the parties, a Bitcoin transaction between two digital wallets will incur similar costs. In addition, transactions over the Bitcoin network usually take just a few minutes, as opposed to hours and sometimes days for the conventional methods of sending international remittances.

ILLUSTRATION 1: Building a blockchain

BLOCK 0: GENESIS	BLOCK 1	BLOCK 2	BLOCK 3
Date/Time	Date/Time	Date/Time	Date/Time
Additional Information	Additional Information	Additional Information	Additional Information
Current Hash	Current Hash	Current Hash	Current Hash
Transaction 1	Transaction 1	Transaction 1	Transaction 1
Transaction 2	Transaction 2	Transaction 2	Transaction 2
Transaction 3	Transaction 3	Transaction 3	Transaction 3



Primary Use Cases

Bitcoin has a variety of use cases, and more evolve every day. A primary value driver of the asset is its adaptability and universality. For the sake of simplicity, these use cases can be broken down into two separate categories: store of value and medium of exchange.

Store of Value: Store of value indicates that the asset will retain purchasing power over time. Specifically, it means that the asset can be saved, stored, retrieved, and exchanged at a later date and be predictably useful to the owner. Examples of assets that provide a store of value in use today are precious metals such as gold and fiat currencies of developed economies. More recently, major global investors have begun to argue that Bitcoin may also be considered as an emerging store of value.

This has become a primary use case for Bitcoin for several reasons. Despite Bitcoin being originally designed to be a currency used for peer-to-peer exchange, the benefits of blockchain technology and Bitcoin's source code make it an excellent way for investors to potentially store value over a long period of time. Bitcoin's disinflationary measures, such as limiting supply and issuance rate, reassured investors that stored assets would retain most of their value in the long term. Blockchain's security and immutability also reassured investors that their assets were safe, even if the investment wasn't backed by a major institution. Finally, as a new asset class, Bitcoin allowed for portfolio diversity and risk hedging, as it would not be impacted by the same events that may cause a recession or stock market crash.

Initially, Bitcoin acted as a store of value with investors using the "buy and hold" strategy, where Bitcoins were bought and stored in wallets. If the price continues to increase, more investment opportunities may arise. Specifically, companies under governments with more adoptive stances, such as Canada and Brazil, have begun incorporating Bitcoin into exchange-traded funds (ETFs), trusts, indexes, and mutual funds. These types of financial products allow investors to store value in a more traditional manner.

Medium of Exchange: Medium of exchange means that the asset can be easily and universally exchanged for goods and services at a constant rate. Furthermore, the standardized nature of this asset means that exchanging it is very simple, unlike making a purchase with assets such as gold or silver. While Bitcoin's store of value may be a long-term opportunity, the day-to-day operations of the network, expansion of partnerships, and growth of ancillary businesses indicate that Bitcoin is still frequently used as a medium of exchange.



Initially, Bitcoin saw limited adoption as a medium of exchange outside of certain networks with other users on the internet; however, following price surges in the late 2010s and early 2020, Bitcoin began to see more widespread acceptance. Specifically, several large companies have begun accepting Bitcoin in exchange for goods and services. These companies include Microsoft, PayPal, Starbucks, and online retailer Etsy. From an investor standpoint, these adoptions are promising. They represent growth in the market and an increase in underlying value as Bitcoin becomes more useful to average consumers.

ILLUSTRATION 2: Comparison of mediums of exchange

CHARACTERISTIC	BITCOIN	GOLD	FIAT CURRENCY
Verifiability	High	Moderate	Moderate
Fungibility	High	High	High
Portability	High	Low	High
Durability	Low	High	Low
Divisibility	High	Low	Moderate
Scarcity	High	Moderate	Low
History	Low	High	Low
Resistance to Censure	High	Moderate	Low
Decentralization	High	Moderate	Low



Risks

Volatility

Digital assets have a history of experiencing significant price movements, both in the long and short term. Bitcoin is no different. Since its creation, it has seen price jumps and drops for a variety of reasons and in varying degrees of severity. Recent volatility has been due to macro effects such as partnership announcements or industry adoption. The risk of volatility is important to understand as an investor, even if simply planning for a long-term investment. Day-to-day volatility makes it more difficult for users and traders to operate with the asset as a medium of exchange. Improper pricing and losses can arise due to the constantly changing value. Furthermore, continued volatility will impact how readily it is accepted by more traditional institutions that value price stability.

While this risk is important to be aware of, in our opinion, it will not be the downfall of Bitcoin. Many users see Bitcoin's volatility as an opportunity to profit. For instance, the futures and derivatives markets have seen sizable increases in 2021 and have helped boost the popularity of the asset. Investors who are aware of this risk and properly plan for it can potentially see large gains while minimizing their losses and diversifying their portfolios.



Regulations

One of the largest outside factors that can impact a crypto asset such as Bitcoin is regulation. As a relatively unique and new asset class, regulation surrounding Bitcoin remains unclear. However, as Bitcoin becomes more accepted, it will naturally attract more regulatory attention and restrictions. The primary risks regarding regulations are:

**Increased reporting requirements,
which reduce the pseudo-
anonymity that attracts users**

**Transaction reporting that
allows for taxation of Bitcoin**

**Broad use restrictions in
response to Bitcoin being used
in criminal enterprises**

All of these potential restrictions would erode the benefits that attract users and create underlying value for the asset. Much like the volatility risk, investors have little control over restrictions in the short term, although recent lobbying efforts in the community have been powerful. By understanding the risks posed by regulation and maintaining awareness about the issue, investors can adequately respond to the risks and continue gaining value from Bitcoin.

Additionally, we believe that over the long term regulation leads to institutionalization and overall is a welcomed and critical step in the evolution of a nascent asset class. With regulation comes increased comfort and generally more demand from more investors embracing a new asset class or investment.



Part 4

Investment Thesis and Opportunities

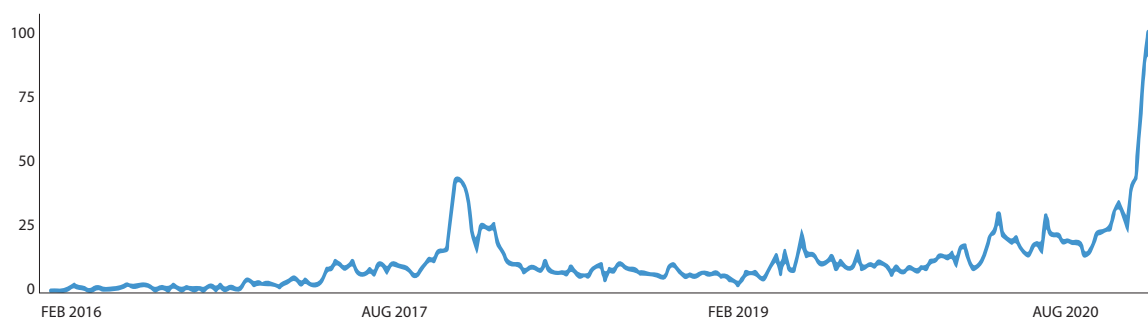


2020 and Its Impact on Emerging Economies

The U.S. dollar loses purchasing power over time even as the world's strongest currency. Now, let's consider a currency in an emerging market such as Brazil. The Brazilian real was ranked sixth among currencies that showed the most depreciation in 2020, as it fell an incredible 28% against the U.S. dollar, behind Argentina and Venezuela. With public debt rising, a record deficit and no recovery plan in sight, investors decided to withdraw from Brazil. In fact, over R\$80 billion left the country.

In Argentina, uncontrolled devaluation of the currency led to demand for assets capable of holding their purchasing power against inflation, thus boosting Bitcoin purchases. The chart below shows exponential growth in the number of Argentines' googling the search term "Bitcoin."

ILLUSTRATION 3: Argentine residents showing interest in "bitcoin" as a search term over time



Source: Google Trends 2/7/16 – 1/31/21

Institutional Adoption

As the crypto assets market has grown and consolidated, several high-profile investors and institutions have realized the value of this asset class and allocated part of their assets to cryptocurrency. In addition to the Winklevoss brothers and Alan Howard (co-founder of Brevan Howard Asset Management), we have compiled a list of other institutional investors who advocate for the use of Bitcoin as a hedge against inflation and as a store of value.



“I believe Bitcoin is one hell of an invention. To have invented a new type of money via a system that is programmed into a computer and that has worked for around 10 years and is rapidly gaining popularity as both a type of money and a storehold of wealth is an amazing accomplishment.”²

RAY DALIO, Wall Street investor worth over \$16 billion. Dalio founded Bridgewater Associates, an investment manager that has more than \$168 billion under management. Having long been very critical of Bitcoin, Dalio has changed his mind in the last few months and is considering using Bitcoin for an alternative alt-cash fund and an excellent opportunity as store of value.

² Ray Dalio: (January 28, 2021 investor letter)



“Bitcoin reminds me so much of the internet stocks of 1999 because the internet was in its infancy. No one knew how to value it because of the world of possibility that lay ahead.”³

In addition to a personal net worth close to \$6 billion, **PAUL TUDOR JONES** manages about \$40 billion for his asset management firm, Tudor Investment Corporation. Jones said he believes in Bitcoin’s potential as a hedge for inflation and states that there are similarities between this new market and the technology companies’ innovations when the internet was emerging.

³ Paul Tudor Jones: Yahoo Finance interview, December 3, 2020.



“We see this as a small but potent insurance policy against the continuing devaluation of the world’s major currencies.”⁴

RUFFER INVESTMENT COMPANY, one of the U.K.’s biggest investors, announced at the end of 2020 that it had hedged against continuing depreciation of the world’s major currencies while reducing its gold exposure by 2.5% to allocate more than \$700 million in Bitcoin.

⁴ Ruffer Investment Company: Memo obtained by Reuters.



“I believe that cryptocurrencies are here to stay, that they are durable assets, and that they have enormous potential to replace gold.”⁵

In an interview for CNBC, BlackRock’s CIO RICK RIEDER said that he believed cryptocurrencies are “here to stay.” In addition, he noted that BlackRock Fund Advisors holds almost 15% of MicroStrategy, the first public company to rely on Bitcoin as a store of value.

⁵ Rick Rieder: CNBC interview.

Major Institutions

It is not only institutional investors that are adopting Bitcoin; many major companies are also doing so. Several companies have not only started accepting Bitcoin as a means of payment (like PayPal before them) but have also announced they will be allocating some of their cash into Bitcoin as part of their investment strategy.



MicroStrategy and Morgan Stanley

MicroStrategy was the first publicly traded company to convert part of its cash into Bitcoin as a means of preserving equity, and currently has more than \$2.2 billion in Bitcoin. The company is organizing a conference for thousands of executives to explain how to add Bitcoin to their balance sheets; the company's main shareholders include BlackRock (with around 15%) and Morgan Stanley (with just over 10%).



BlackRock

With more demand from investors and increasing consolidation of the market, in January 2021, BlackRock announced that the SEC (United States Securities and Exchange Commission) had authorized two of its funds to use Bitcoin futures contracts in their investment strategies. More managers are expected to follow suit and apply for permission to have crypto exposure in their funds.



Office of the Comptroller of the Currency (OCC)

As banks have increasingly shown growing interest in Bitcoin, the U.S. regulator published a letter stating that all regulated banks in the U.S. could use blockchain technology for transactions and provide custody services and payments with cryptocurrencies. This document is an important step showing that government agencies are committed to maturing and regulating this market.



MassMutual

Founded in 1851, the American insurance company has more than 5 million customers and over \$230 billion invested. In December 2020, the company invested \$100 million in Bitcoin in order to leverage new opportunities and further diversify its portfolio. The investment amounted to about 0.04% of its total equity.



Square Inc.

Payments company Square, Inc., created by Twitter founder Jack Dorsey, also believes Bitcoin is a means of economic empowerment and has invested more than \$50 million (about 1% of total equity) as a way of preserving its capital in the long term.



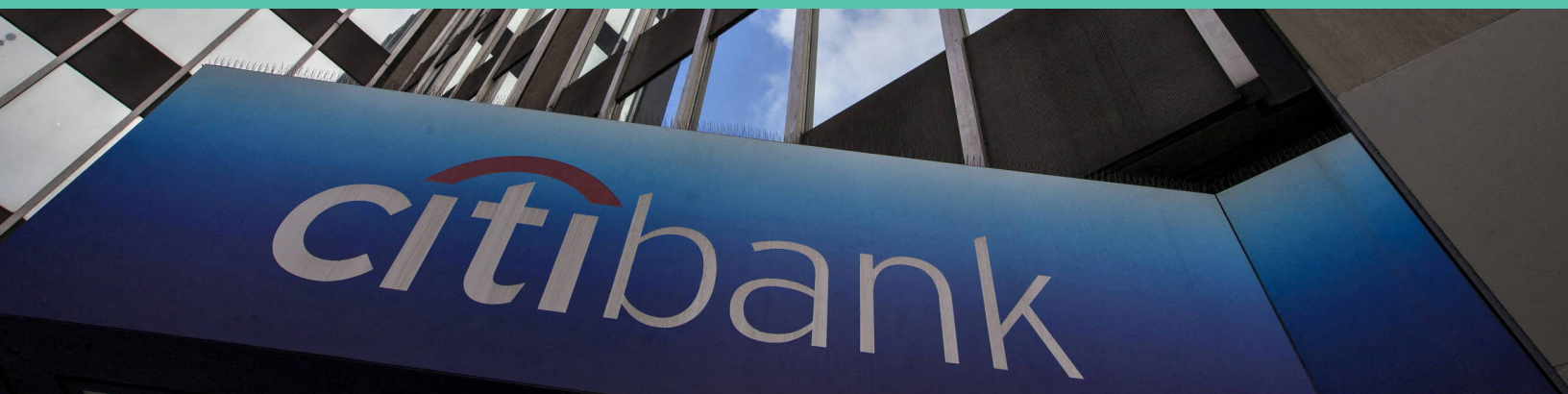
PayPal

Despite the exponential growth of institutions buying Bitcoin, the news that drew the most attention in 2020 was that PayPal, the world's largest payment platform, would start trading Bitcoin for all users of its platform. PayPal stated that Bitcoin's daily volume was over \$99 million.



JP Morgan

Earlier this year, JP Morgan published a study of the upside potential for cryptocurrencies, especially Bitcoin. As it consolidates as a “competitor” for gold, its value could reach \$146,000 by December 2021, showing a gain of almost 500%.



Citibank

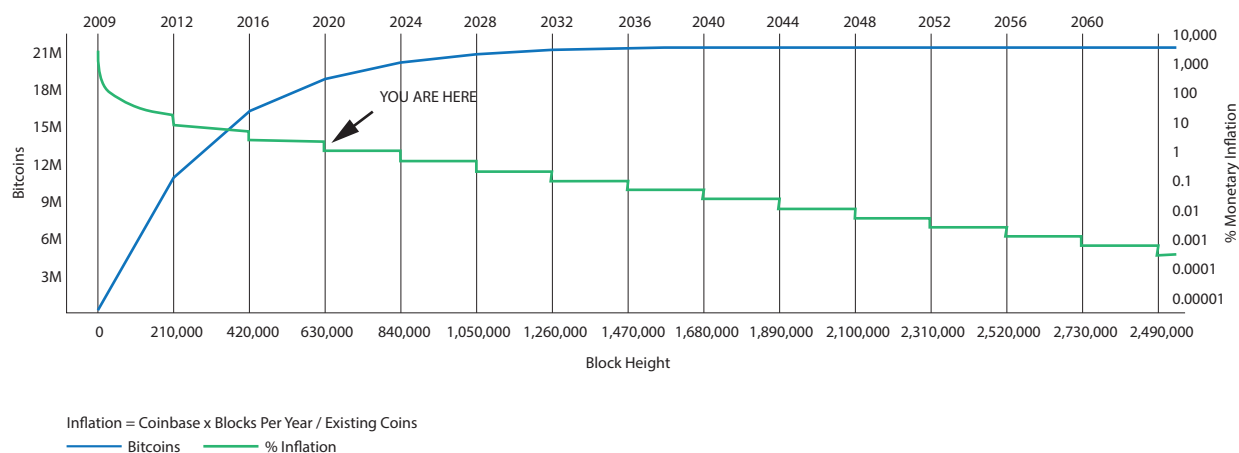
In a letter to more aggressive investors, Citibank analysts stated that Bitcoin could be worth over \$300,000 before the end of the year—approximately 10 times its current level. The report also mentions Bitcoin’s similarities to gold in 1971.



Inflation Rate

One of the great advantages of Bitcoin is the fact that the rules of the game are already given, and they are fixed. As a decentralized asset, there is no institution that can influence the future of Bitcoin. Its supply and its inflation have already been determined with the maximum number of Bitcoins fixed at 21 million, and its issuance made by the reward paid to miners for validating the network's transactions. This reward is halved every 4 years (in an event called "halving," as mentioned previously). The cut in the reward acts as a disinflationary mechanism, so gradually there will be fewer Bitcoins issued until a supply cap is reached. This mechanism ensures Bitcoin is inflation resistant, unlike its fiat-currency counterparts.

ILLUSTRATION 4: Monetary supply (black) and inflation rate (blue) x quantity of blocks



Source: https://bashco.github.io/Bitcoin_Monetary_Inflation/

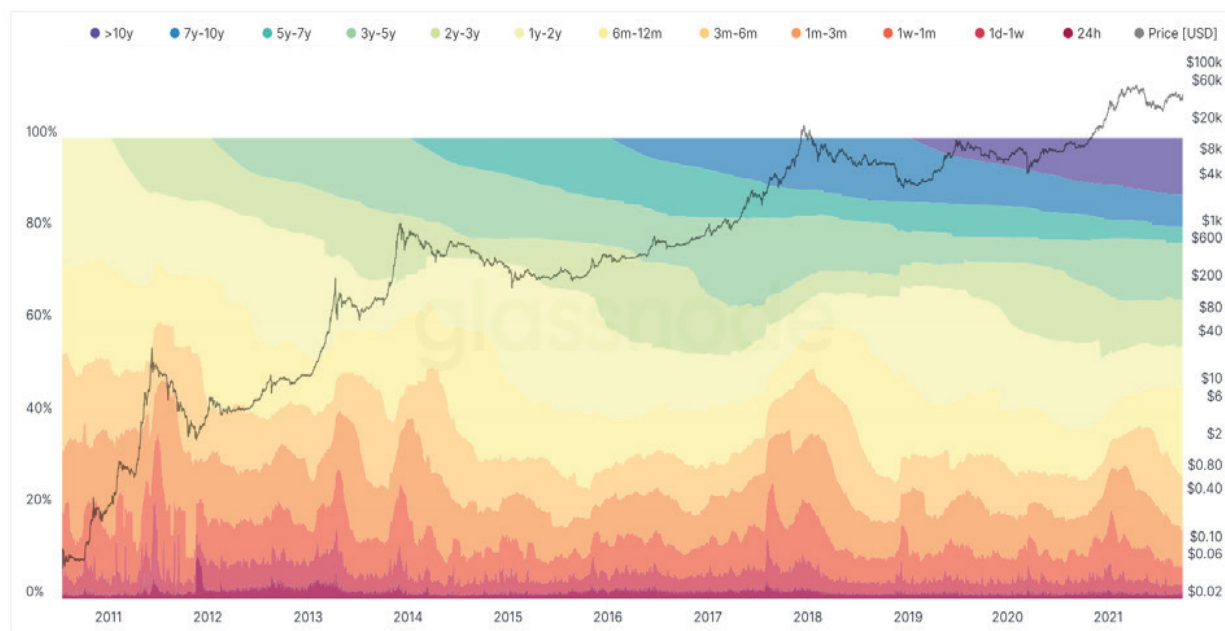


Holder vs. Speculator Index

Every market has different investor profiles with different strategies. The crypto assets universe follows this same logic. Through blockchain records, the date of a portfolio's latest transaction may be verified, showcasing both speculative (short-term) and cumulative (long-term) profiles. This metric can provide an overall sense of market behavior for the asset. See the chart below.

Illustration 5 shows that in 2021, more than 20% of Bitcoin holders had held the asset for at least 5 years; 10% of investors had been holding the asset for more than 10 years. A very small percentage had owned the asset for a week or less.

ILLUSTRATION 5: Holder vs. Speculator Index



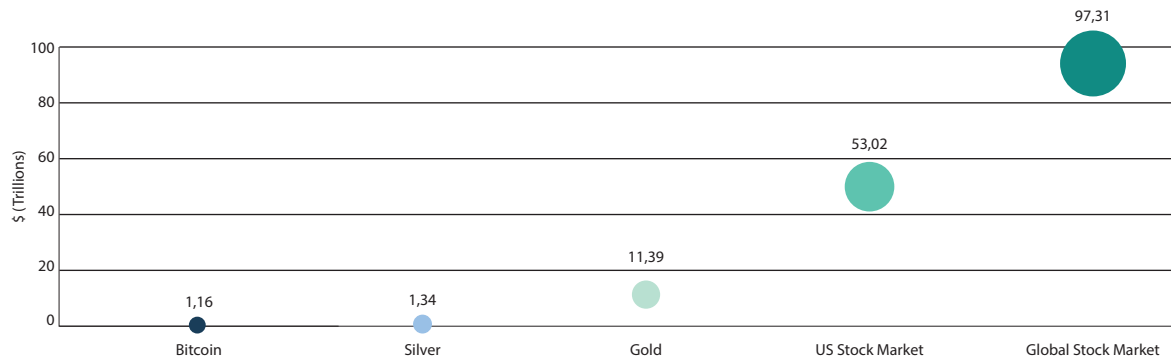
Source: Glassnode. Data from 7/14/2010 - 9/30/2021.



Total Market Cap

After recent rises, Bitcoin has been the center of attention and many investors feel they may have missed the right time to invest. However, we believe the asset should be seen from a different angle. Bitcoin is still relatively new and is being discovered by a large part of the market. Additionally, Bitcoin has a very low market value compared to other asset classes, with ample potential for growth.

ILLUSTRATION 6: Total Market Cap



Sources: Bloomberg, <https://companiesmarketcap.com/gold/marketcap/>,
<https://messari.io/asset/bitcoin>. As of 10/29/2021.



Bitcoin Volatility and Price

Bitcoin is still in its embryonic stages of development and may show high volatility that could scare off some investors. Note, however, that volatility is a basic concept in the capital markets and one of the most important risk measures that may make a difference for the investor.

In financial theory, volatility is a measure of the dispersion of returns on an asset or a market index. Mathematically, it is just the standard deviation across rates of return on assets. Therefore, we may consider volatility analysis a valuable ally when building investment portfolios.

Price history is an important metric to review when analyzing Bitcoin. Since its inception Bitcoin's price has been gradually increasing, reaching a higher annual "low" (minimum valuation) each year. Based on data compiled by Hashdex, Bitcoin's annual low in 2021 was \$29,534 (month quoted: September). This was up 504% from 2020's low, which was \$4,860.35. Looking back another year, 2019's low was \$3,400.60. Given the above-mentioned prices, despite the asset's high level of great volatility, Bitcoin continues to exhibit a series of higher highs and higher lows.

The following table shows Bitcoin's historical minimum prices rising.

YEAR	Annual Low (\$)	Year Over Year Change (%)
2016	\$362.43	-
2017	\$788.66	118%
2018	\$3,237.06	310%
2019	\$3,400.60	5%
2020	\$4,860.35	43%
2021	\$29,351.31	504%

Source: Glassnode. As of 9/30/21. Bitcoin calendar-year low



Portfolio Configuration

Correlation

Correlation is a statistical measure that may vary from -1 to 1. It determines how an asset behaves in relation to others, so there is a perfectly positive correlation when two assets behave identically, and their correlation is 1 (or 100%).

The correlation between two assets is a very important factor to help investors determine their portfolio composition.

ILLUSTRATION 7: Effect of Bitcoin Allocations to 60/40 Portfolio

Small Allocations to Bitcoin Can Enhance Risk-Adjusted Returns

(October 2016 – September 2021)

	MSCI ACWI Index	Bloomberg US Aggregate Bond Index	Bitcoin	60 / 40 Portfolio	Allocation to Bitcoin within 60/40 Portfolio (Allocation sourced from MSCI ACWI)		
					+1%	+2.5%	+5%
Return of Index or Portfolio	13.20%	2.95%	134.48%	9.28%	10.48%	12.29%	15.33%
Standard Deviation	14.65%	3.31%	91.10%	8.97%	9.11%	9.46%	10.41%
Sharpe Ratio	0.82	0.55	1.46	0.91	1.03	1.18	1.36

Source: Bitcoin returns sourced through Bloomberg; Portfolio analyzed through Zephyr.

Given the type of characteristics digital assets may have, we might typically source allocations from alternatives or tech/growth allocations.

Past performance is no guarantee of future results.

Index returns are for illustrative purposes only. Index performance does not reflect management fees, transaction costs or expenses. Indexes are unmanaged and one cannot invest directly in an index. Bitcoin returns are calculated by tracking the CMBI Bitcoin Total Return Index. The “60/40

Portfolio” is a hypothetical portfolio composed of a 60% allocation to the MSCI All Country World Index and 40% allocation to the Bloomberg U.S. Aggregate Bond Index. The allocation to Bitcoin was taken from the MSCI ACWI allocation for each respective measure. Risk is measured by each index or portfolio’s standard deviation metric.

Hypothetical portfolio returns do not reflect actual trading and may not reflect the impact of material economic and market factors that might have influenced an investor’s or advisor’s decision-making had they been managing clients’ money and investment loss would have been a possibility. Standard deviation measures an investment’s historical volatility, calculated using the investment’s annual rate of return. (For example, if a fund has a 12% average rate of return and a standard deviation of 4%, its return will range from 8% to 16%.)

Sharpe ratio is the average return earned in excess of the risk-free rate per unit of volatility or total risk. (For example, a Sharpe ratio of 0.2 means that the volatility of the return is 5 times that of the average return. Some investors may not want investments that are up 10% one month and down 15% the next month, etc., even if the investment offers a higher overall average return. Sharpe Ratio General Ranking: < 1 Inadequate risk/return profile.)



The table below shows correlations between Bitcoin, the S&P 500® Index, the FTSE 3-month T-Bill , and gold:

CORRELATION BETWEEN ASSETS AND INDICES OVER THE LAST FIVE YEARS

	BTC	S&P 500	FTSE 3-Month T-Bill	Gold
BTC	1			
S&P 500	0,21	1		
FTSE 3-Month T-Bill	-0,17	-0,18	1	
Gold	0,11	0,11	0,11	1

Source: Zephyr. Data from October 2016 – September 2021

The low correlation between Bitcoin and other assets explains why Bitcoin is considered an un-correlated asset, which may offer benefits for an investor's portfolio. When an investor allocates funds in an asset with low correlation, the portfolio becomes more diversified, potentially making it less susceptible to major drawdowns.

Since Bitcoin is an excellent asset for a diversified portfolio, allocating even small amounts may enhance a portfolio's Sharpe ratio by increasing returns without significantly increasing risk.



Part 5

Conclusion

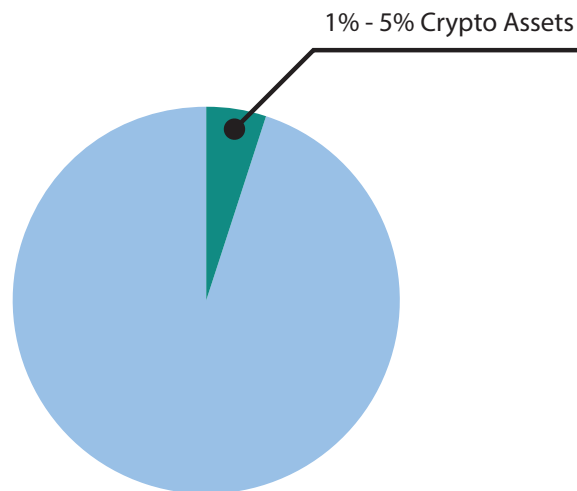


Adding Crypto to a Portfolio

A small allocation to crypto assets (between 1% and 5%) may complement traditional portfolio allocations by providing potential upside performance with a marginal increase to risk.

In the example below, we've looked back from October 2016 to September 2021 in order to assess how various allocations to Bitcoin would have compared to a hypothetical 60/40 portfolio of stocks and bonds.

As you can see, even with Bitcoin's recent volatility, a small allocation at 1% could have enhanced returns when compared to the portfolio made up of 60% MSCI All Country World Index and 40% Bloomberg U.S. Aggregate Bond Index. What is important during this time frame to re-emphasize is that the 5-year analysis captures both of the large drawdowns in Bitcoin (in late 2018 and in May of 2021).





Why Bitcoin? Why Now?

When the internet was first introduced, email was the first major application with astounding potential—but in the early days, investors doubted its ability to transform the world. Then came search, social and e-commerce... Decades later, it's almost impossible to imagine a world without the internet, so those who believed in its potential and invested during the early years have earned stellar returns over the past 20 years.

Like any innovation, Bitcoin is navigating the uncertainties that accompany the early years of many emerging technologies, such as security, regulatory issues, and societal trust. As Bitcoin becomes more widely used, its potential to increase in value rises. With chapter 1 of Bitcoin's history still being written, this cryptocurrency has managed to break countless paradigms, thus becoming more widely utilized and a consideration among institutional investors. In addition, several surveys show that the younger generations who will be holding capital in the future already tend to invest in businesses that have some participation in crypto assets — which may potentially be reflected in Bitcoin's growth.



Main Questions and Myths

What is Bitcoin backed by?

After the gold standard ended in 1971, fiat currencies no longer had physical backing so each fiat currency was primarily based on the strength of its country's economy. Likewise, Bitcoin does not have any kind of physical backing—its value is associated with the network's ability to produce valuable services, and its backing is the so-called network economy. Additionally, Bitcoin is scarce and functions as a kind of common currency for the crypto world, similar to the U.S. dollar's role in international trade.

Is crypto investment regulated?

Assets bought directly on exchange are not subject to SEC or FINRA supervision.

How are new Bitcoins created?

Bitcoin miners are extremely powerful specialized computers that store and validate every single transaction on the Bitcoin network. As their reward for validating a block, a miner gets new Bitcoins. Production of these new Bitcoins is halved approximately every 4 years. This "halving" is guaranteed by the Bitcoin code, and this is what characterizes Bitcoin as disinflationary, whereas governments and central banks can print excessive amounts of their fiat currencies.



Why is Bitcoin sometimes referenced along with gold in explanations of this emerging asset?

The comparison between gold and Bitcoin is based on several fundamental characteristics, in particular scarcity—in the case of gold this is due to natural factors, while limits on Bitcoin are programmed in the blockchain. Furthermore, at the height of the March 2020 crisis, both assets behaved similarly—initially falling together with other risk assets, but then recovering faster than other assets such as equities. However, gold is unlike Bitcoin in that it is a physical commodity with industrial and commercial uses.

What is blockchain?

Blockchain is the technology used to record and store data for Bitcoin and other leading crypto assets. It functions as a kind of public ledger that makes permanent and tamper-proof records of transactions, so that when a transaction is registered in the blockchain, the likelihood of it being reversed or tampered with is mathematically highly improbable.

How does Bitcoin improve a portfolio's risk / return ratio?

A very important variable that must be considered in the composition of a robust portfolio is the correlation between different asset classes. In order to optimize portfolio risk, its assets should ideally show as little correlation as possible, thus maximizing the investor's return and reducing risk. As a new asset class that has very low correlation with other assets and high volatility, we believe Bitcoin may potentially improve almost any investment portfolio's risk/return ratio.

What is the difference between crypto and government-issued digital currencies?

While crypto assets are based on the concept of decentralization and do not require the presence of a central counterparty, CBDCs (central bank digital currencies) are centralized by nature and the government acts as a trusted central counterpart.



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Investments in crypto assets are speculative and involve a high degree of risk. The trading prices of digital assets have experienced extreme volatility in their history (including in recent periods) and may continue to do so. Trading prices for digital assets could experience steep declines in value and could lose all or substantially all of their value. Due to the limited history of cryptocurrencies and the rapidly evolving nature of the cryptocurrency market, it is not possible to know all the risks involved in making an investment in cryptocurrencies, new risks may emerge at any time and additional risks are impossible to predict. Cryptocurrencies have gained commercial acceptance only within the past decade and, as a result, there is little data on their long-term investment potential.

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