

Bitcoin

A Universal Store of Value
for the Digital Age

APRIL 2024



Understanding Bitcoin

Defining Bitcoin



Bitcoin: the world's first and largest form of digital collateral

Bitcoin is a revolutionary form of digital currency first proposed in 2008 by a person or group of people known as Satoshi Nakamoto. Unlike traditional currencies, Bitcoin is a digital asset, and does not depend on central banks or governments. Instead, it operates as a completely decentralized system and stores activity on a digital database called the Bitcoin ledger. This decentralization means that no single company or government can make decisions about how the currency works or how people can use it. In fact, the protocol's users collectively help in running it, guided by strict computer-coded rules. These rules set the amount of Bitcoin in circulation and how users trade and create new Bitcoin.

Bitcoin (BTC), the cryptocurrency asset, was originally created to act as a digital medium of exchange. You can buy or sell Bitcoin on most, if not all, crypto exchanges or on dedicated Bitcoin exchanges. The process of generating new Bitcoin is called Bitcoin mining. It involves using powerful computers to process the complex mathematical equations needed to maintain the network.

During the mining process, Bitcoin uses a system involving cryptography and game theory to validate and record transactions. The network stores these transactions on a public database system called a blockchain ledger. As its essential building blocks, the Bitcoin protocol uses:

- Public-key cryptography – Wallet software assigns Bitcoin owners both a public key (which is used by the protocol to prove you own Bitcoin) and a private key (a kind of password that, if secured well, guarantees your Bitcoins can only be accessed by you).
- Peer-to-peer networking – Nodes (computers running the software) review transactions to ensure the software's rules are being followed. Miners (nodes using special computer chips) then compete for the right to batch these transactions into the blocks periodically added to the blockchain.
- A finite supply – According to the software rules, only 21 million Bitcoins can be produced (with approximately 19.5 million mined to date), a limit that gives Bitcoin scarcity value.

Source: Kraken.com, blockchain.com.

How does Bitcoin work?



As stated previously, Bitcoin (BTC) is a virtual currency that operates through the decentralized Bitcoin network, meaning no government or financial institution controls it. The blockchain stores all transactions on a public ledger called the Bitcoin blockchain, which serves as a fully accessible, transparent database. This digital ledger stores bitcoin payments and transfers. The Bitcoin network is a decentralized virtual currency system that operates without a central bank, government authority, or middlemen. Instead, it relies on a network of computers around the world to maintain the integrity of the system.

- **The Blockchain Network:** A globally distributed community of nodes makes up the Bitcoin network. Nodes are computers that are connected to the Bitcoin network and help validate transactions. Anyone in the world can run their own node and participate in running the Bitcoin network. Every node maintains their own copy of the blockchain, which is an unchangeable ledger of cryptocurrency transactions. This process means that there is no central authority that controls the blockchain, making it decentralized.
- **The Distributed Ledger:** These networked computers store a copy of the Bitcoin ledger and, when transactions occur on the network, they use a consensus mechanism to "agree" that a certain action happened. This agreement process guarantees that users cannot create fake transactions or double-spend a Bitcoin. You can own a single Bitcoin or you can own any number of a fractionalized unit called a Satoshi. One Satoshi is worth 0.00000001 BTC. You can buy and sell the currency on Bitcoin exchanges or trade it on the peer network by sending it from wallet to wallet.
- **Transacting in Bitcoin:** You store the access to your Bitcoin in a Bitcoin wallet which acts as a debit card or bank account. When you send or spend Bitcoin the network reassigns ownership over those funds to the recipient's public wallet address. When someone sends Bitcoin to another person, the transaction is verified by a network of "miners." Miners solve complex mathematical equations to guarantee the validity of the transaction and prevent fraud. Other nodes on the network verify the transaction. Once the network verifies the transaction, the successful miner adds it to a block of transactions. These full blocks permanently join the blockchain. No one can alter the data stored in blocks once they're committed to the blockchain. As an incentive to contribute this computational work and security to the network, successful miners are rewarded with newly minted bitcoins plus transaction fees paid by users. This compensation gives miners an economic incentive to act honestly and validate only legitimate transactions.

Investing in Bitcoin

Business Leaders on Bitcoin



Bitcoin “is a remarkable cryptographic achievement. The ability to create something which is not duplicable in the digital world has enormous value.”

March 2014

Eric Schmidt Former CEO and Executive Chairman of Google; former Executive Chairman of Alphabet

Image Credit: guillaumepaumier.com, CC-BY



“What really drove my thinking and drives my passion behind it is, if the internet has a chance to get a native currency, what would that be? To me, it’s bitcoin because of those principles, because of its resilience.”

July 2021

Jack Dorsey Head, Chairman and Co-Founder - Block, Inc



“It has a lot of attraction as a store of value both to millennials and the new West Coast line. It has been around for 13 years, and with each passing day, it picks up more of its stabilization as a brand.”

November 2020

Stanley Druckenmiller Chairman and CEO - Duquesne Family Office



“Bitcoin is not only winning the race against gold, it is winning the race against every asset for a decentralized, uncensorable, terminally scarce, peer-to-peer currency.”

October 2021

Paul Tudor Jones Founder and Chief Investment Officer - Tudor Investment Corporation

Investment Thesis



The investment thesis of Bitcoin is that it is a decentralized digital currency that operates on a peer-to-peer network. Bitcoin is designed to be a store of value and a medium of exchange, with a limited supply of 21 million coins. The decentralized nature of Bitcoin means that it is not controlled by any central authority, such as a government or financial institution. This feature also makes it resistant to censorship and confiscation. Bitcoin has gained popularity as an alternative investment asset due to its potential for high returns and its perceived long-term hedge against inflation.

Next, we will outline how the following points translate into how Bitcoin will prove to be the world's universal store of value for the digital age:

Sound Money



May provide a long-term store of value through a finite supply.

Diversification



Has historically maintained a lower average correlation to other traditional risky assets.

Return Profile



Exhibits an asymmetrical return distribution.

Universal Adoption



Bitcoin's decentralized network of users is global and fast growing.

A Store of Value



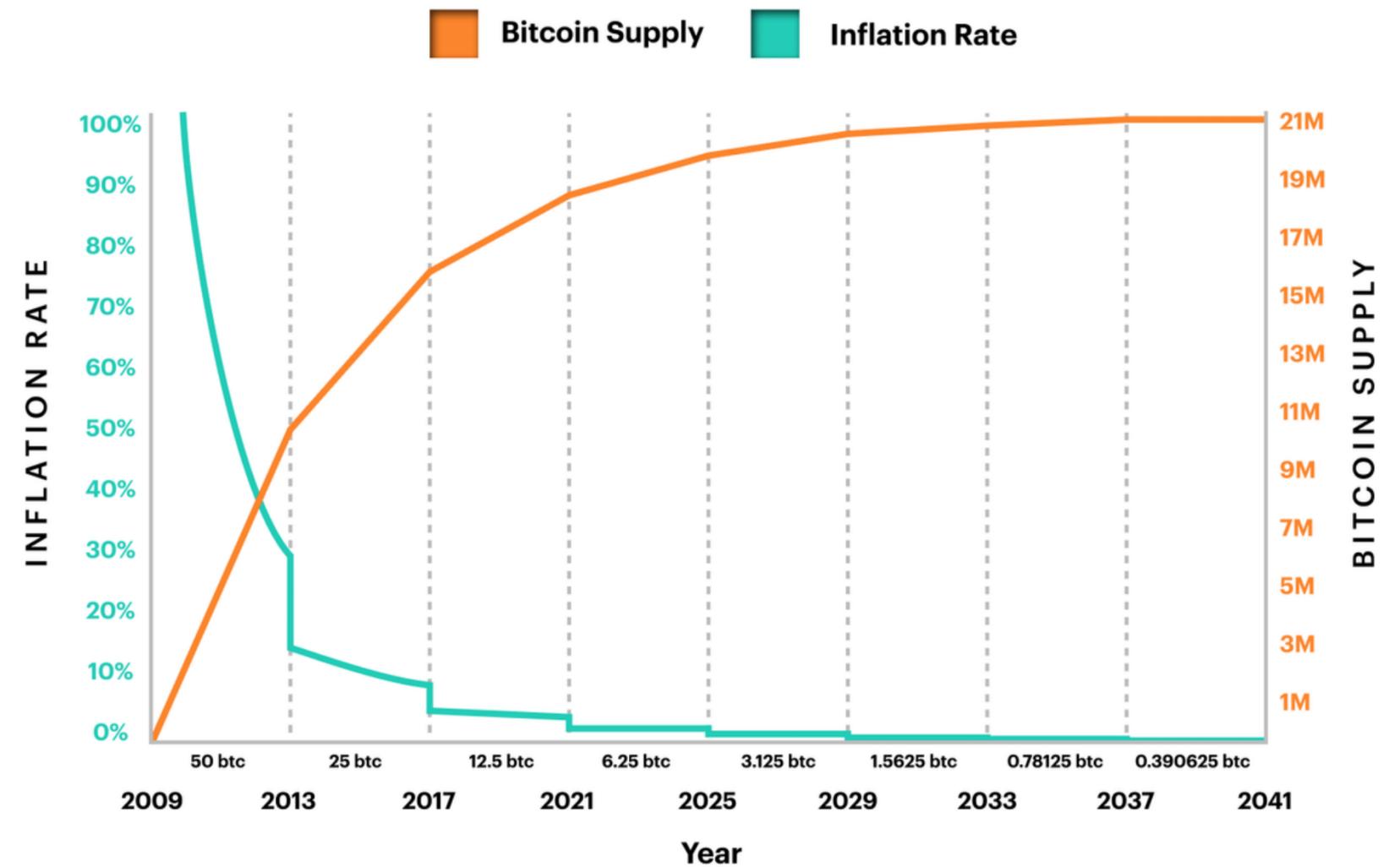
Central banks can print unlimited amounts of fiat money, leading to inflation when the money supply increases. With its capped supply and programmatic halvings, Bitcoin is designed to avoid this problem.

Bitcoin has several features that make it a potential store of value. One is its declining inflation rate after each halving event. As the inflation rate continues to decrease over time, the purchasing power of each Bitcoin is likely to increase. Another feature is Bitcoin's limited total supply of 21 million coins. This built-in scarcity makes Bitcoin more attractive as a store of value compared to fiat currencies, which can have unlimited supplies.

Bitcoin halvings reduce the new supply of Bitcoin introduced into circulation approximately every four years. After each halving, the mining reward rate coded to be slashed in half in order to incrementally reduce the inflation rate. Historically this has led to a rise in Bitcoin's price, as demand stays high while new supply decreases. Investors and the crypto community are likely to be closely monitoring the 2024 halving cycle and its impacts on Bitcoin's price and the broader cryptocurrency market.

The fourth programmatic halving occurred in April 2024, which resulted in the block rewards for Bitcoin miners falling from 6.25 BTC to 3.125 BTC per block. The next halving is projected to occur in 2028. The exact date will depend on the Bitcoin network's hashrate, but current projections estimate the halving will occur when block 1,050,000 is mined.

Bitcoin Issuance Schedule



Source: CF Benchmarks, river.com, illustration is an extrapolation of programmatic halvings and bitcoin issuance, as of April, 2024

Protects Purchasing Power

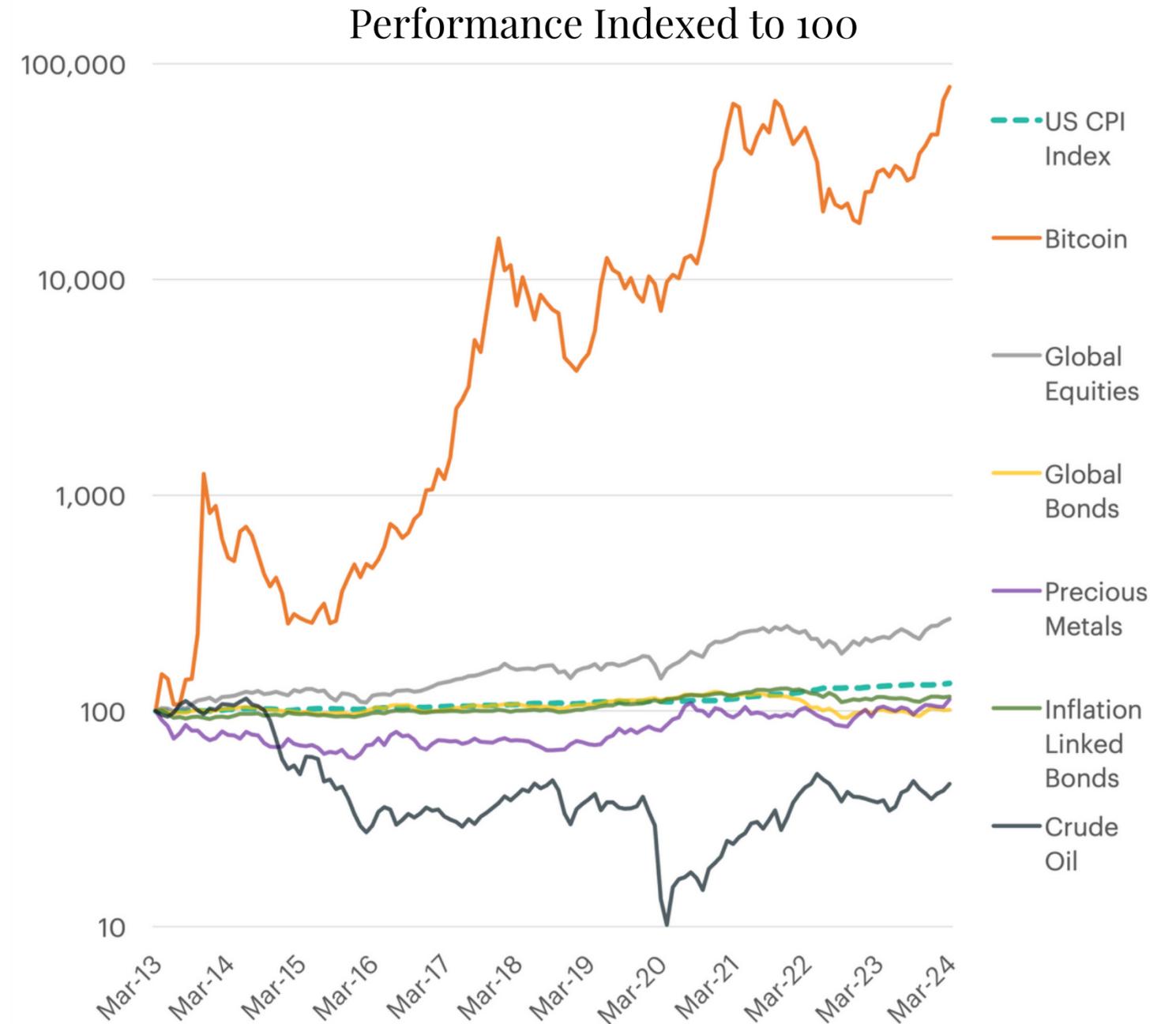


Over the past 10 years, Bitcoin's purchasing power has historically outperformed other major asset classes including equities, bonds, precious metals, and crude oil. Comparing Bitcoin's returns to these other assets shows it has had the highest 10-year return, translating to superior retention of purchasing power in this period.

Of the assets compared, only Bitcoin and equities have managed to consistently outpace U.S. inflation over the past decade. This analysis suggests Bitcoin's potential as a long-term store of value and inflation hedge. Meanwhile, asset classes that are typically associated with providing inflation protection, such as precious metals, crude oil, or even inflation-linked bonds, have done a poor job in outperforming headline price increases over the long run.

Lastly, it is important to note that Bitcoin is still a volatile asset, so its advantages in preserving purchasing power are most apparent over longer time horizons, and Bitcoin may not be suitable for all investors given its price swings. Yet Bitcoin's strong performance historically versus other major asset classes over longer time horizons indicates it could play a role in portfolios as a way to maintain purchasing power. As with any investment, long-term returns rely on future performance and Bitcoin continues to carry risk. But the data shown highlights its potential to act as an inflation-resistant asset for certain investor goals and timelines.

Source: CF Benchmarks, Bloomberg, total return indices are referenced in USD, as of March 31, 2024



Facilitates Diversification



	Bitcoin	S&P 500	Nasdaq 100	MSCI Europe	MSCI Japan	MSCI EM	Global Bonds	2YR US Yield	10YR US Yield	Gold	Crude Oil
Bitcoin	1.00	0.13	0.13	0.12	0.12	0.11	0.09	-0.02	0.02	0.06	0.04
S&P 500	0.13	1.00	0.92	0.74	0.58	0.65	0.23	0.16	0.18	0.13	0.30
Nasdaq 100	0.13	0.92	1.00	0.64	0.51	0.60	0.22	0.10	0.08	0.09	0.21
MSCI Europe	0.12	0.74	0.64	1.00	0.68	0.68	0.06	0.26	0.20	0.04	0.29
MSCI Japan	0.12	0.58	0.51	0.68	1.00	0.57	-0.07	0.24	0.22	-0.05	0.19
MSCI EM	0.11	0.65	0.60	0.68	0.57	1.00	0.32	0.10	0.11	0.25	0.34
Global Bonds	0.09	0.23	0.22	0.06	-0.07	0.32	1.00	-0.46	-0.62	0.58	0.01
2YR US Yield	-0.02	0.16	0.10	0.26	0.24	0.10	-0.46	1.00	0.62	-0.36	0.20
10YR US Yield	0.02	0.18	0.08	0.20	0.22	0.11	-0.62	0.62	1.00	-0.39	0.20
Gold	0.06	0.13	0.09	0.04	-0.05	0.25	0.58	-0.36	-0.39	1.00	0.08
Crude Oil	0.04	0.30	0.21	0.29	0.19	0.34	0.01	0.20	0.20	0.08	1.00

Renowned Nobel laureate Harry Markowitz once said that diversification is the only "free lunch" in the world of investing. This is because the benefits of a properly diversified portfolio with various asset classes can allow an investor to drastically reduce the overall risk of their portfolio, without materially reducing the portfolio's return potential. To put it simply, diversification is a powerful strategy that enables investors to potentially optimize their gains while safeguarding against unnecessary risks.

As illustrated above, Bitcoin's longer-term correlation to equities, bonds, and other traditional asset classes has been relatively low. However, Bitcoin has experienced shorter periods of high correlation to traditional risky assets, namely growth-style equities. This means that Bitcoin's price has not historically moved in sync with other asset classes, which makes Bitcoin an attractive investment for diversification purposes, as it can help add return potential without necessarily increasing the overall risk of a portfolio.

Source: CF Benchmarks, Bloomberg, weekly correlations are calculated on price return indices over the past 10 years, as of March 31, 2024

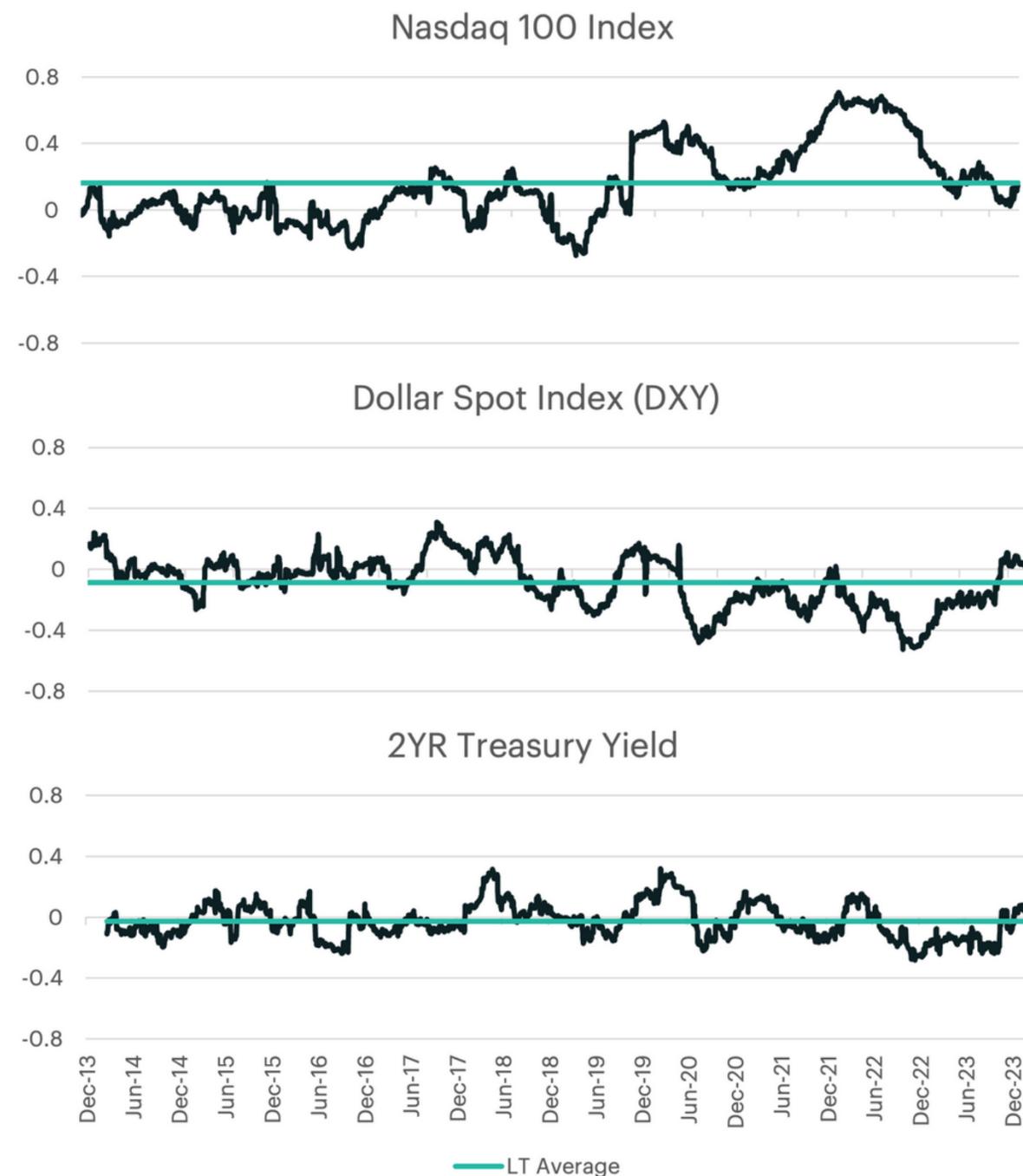
Signs of Returning Decorrelation



In the early days, one of the key advantages of investing in cryptocurrencies like Bitcoin was its close-to-zero correlation to traditional markets. The illustrations to the right depict the rolling 90-day correlation of Bitcoin with the Nasdaq 100 Index, the U.S. dollar, and the 2-year Treasury yield, over the past decade. Prior to 2020, Bitcoin maintained a near-zero average correlation with the tech-centric equity market index. Many practitioners consider any correlation near zero as an indicator of an uncorrelated asset. Furthermore, the pricing relationship between the U.S. dollar and the 2-year Treasury Yield also showed a historically unlinked bias.

However, the COVID pandemic resulted in a regime change for the pricing relationship between Bitcoin and other traditional asset classes. This is likely due to the extensive monetary and fiscal responses by central banks and governments across the globe, which resulted in a wave of spending and easy financial conditions. This has bolstered financial assets across the risk spectrum, including Bitcoin, and resulted in closely tied pricing relationships.

More recently, the emergence of sustained inflation has marked a turning point, unwinding the trend of tight correlation between Bitcoin and traditional assets. As monetary and fiscal stimulus recede in the face of rising prices, Bitcoin's 90-day rolling correlations have begun to revert to their pre-2020 averages. This would signify a decoupling from recent pricing regimes and a return to Bitcoin's roots as an uncorrelated asset. Time will tell whether inflation acts as the impetus for Bitcoin to once again chart its own course independently of macroeconomic forces shaping traditional markets.

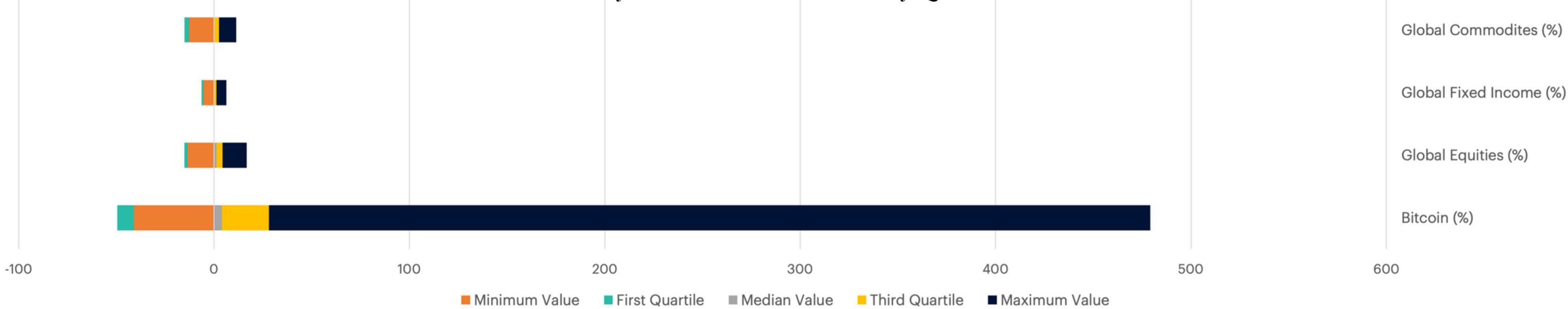


Source: CF Benchmarks, Bloomberg, weekly correlations are calculated on price return indices over the past 10 years, as of March 31, 2024

Seeking Asymmetry



Monthly Return Distributions by Quartile



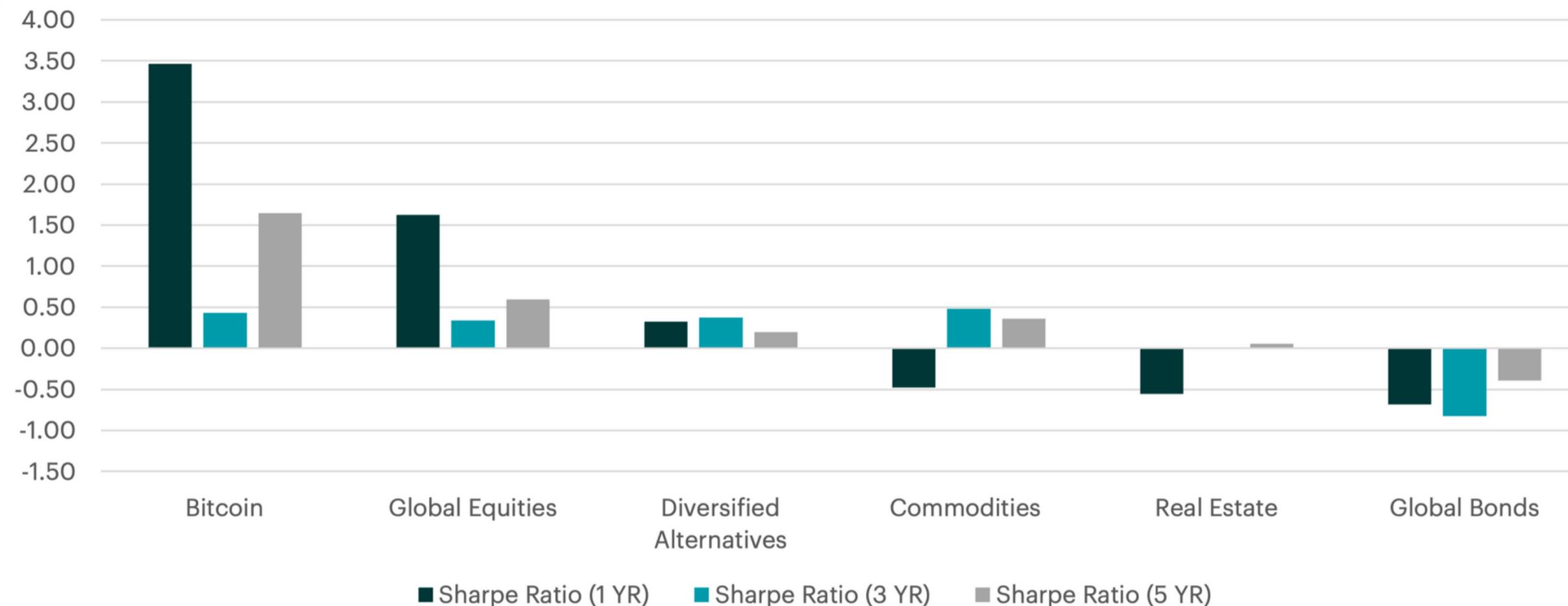
An asymmetrical investment returns profile is one where the potential upside returns are more significant than the potential downside returns. This means that investors have the potential to make more money when the market goes up than they can lose when the market goes down. Asymmetrical investment return profiles are appealing to investors because they offer the potential to generate higher returns with lower risk.

The illustration above highlights Bitcoin has a history of generating asymmetrical investment returns. This means that investors have historically had the potential to make more money on their bitcoin investments when the market goes up than they could lose when the market goes down. If we compare this to global equities, bonds, and commodities, Bitcoin's return profile is more positively skewed despite having larger drawdowns.

	Bitcoin (%)	Global Equities (%)	Global Fixed Income (%)	Global Commodities (%)
Minimum Value	-41.07	-13.50	-5.48	-12.81
First Quartile	-8.39	-1.70	-0.88	-2.25
Median Value	4.07	1.32	0.10	-0.19
Third Quartile	24.02	3.08	1.11	2.58
Maximum Value	451.03	12.33	5.04	8.78

Source: CF Benchmarks LTD., Bloomberg LP, 10-year observation period, as of March 31, 2024

Historical Risk-Adjusted Performance



The Sharpe ratio is a measure of the risk-adjusted return of an investment. It is calculated by dividing the excess return of an investment over the risk-free rate by the standard deviation of its returns. A higher Sharpe ratio indicates better risk-adjusted performance. As a result of its high returns and low beta relative to equity markets, Bitcoin has a Sharpe ratio that is consistently higher than traditional asset classes, particularly over longer-term time horizons. For example, the Sharpe ratio of Bitcoin over the past 5 years is around 1.42, while the Sharpe ratio for global equities over the same time period is around 0.65. This means that Bitcoin has historically generated over twice the degree of excess return per unit of risk when compared to equities.

Source: CF Benchmarks, Bloomberg, total return indices are referenced in USD, as of March 31, 2024

Network effects

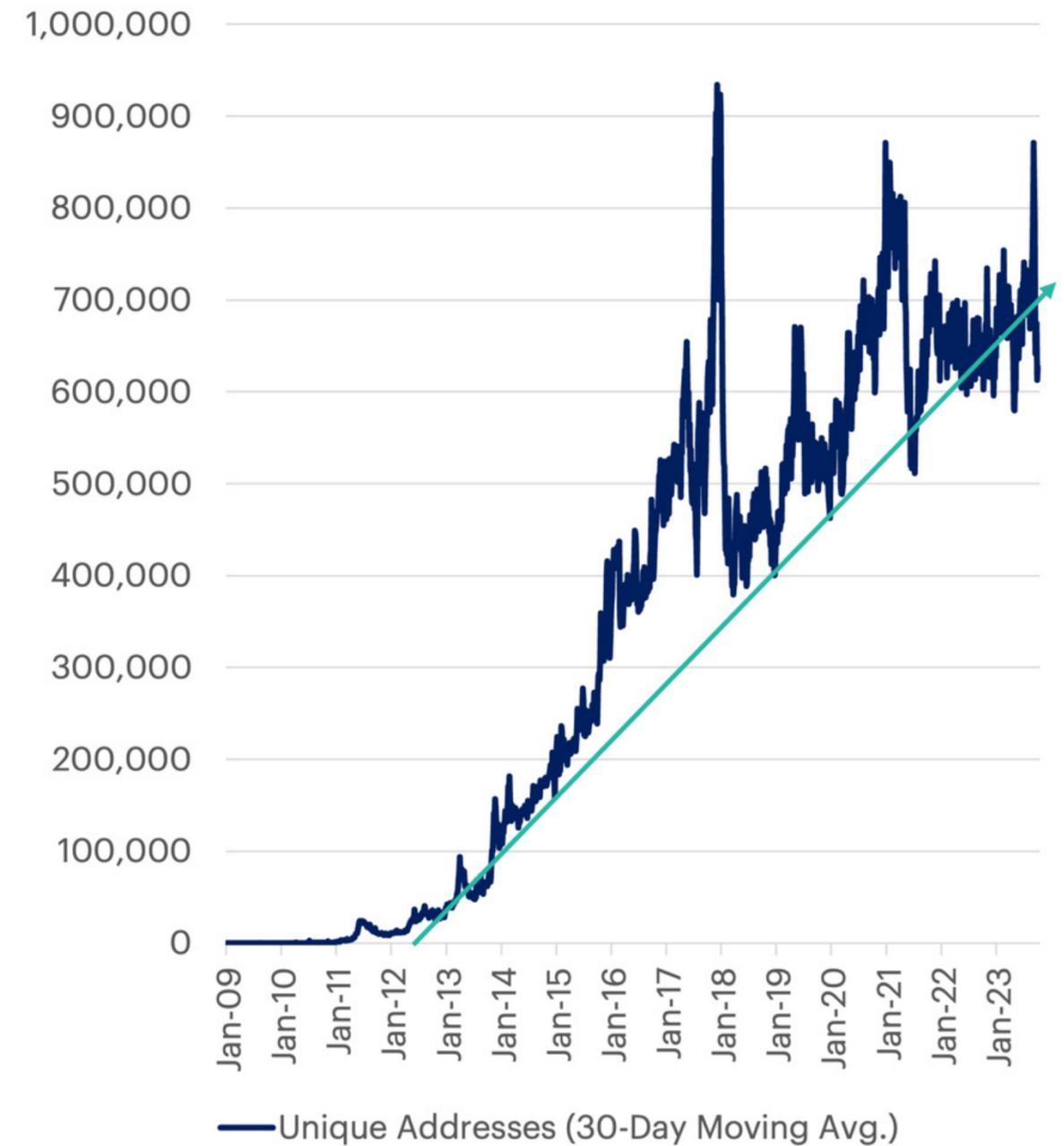


Network effects are a phenomenon in which the value of a product or service increases as more people use it. This occurs because a larger user base makes the product or service more useful to everyone. For example, a social networking platform is more valuable to its users if more of their friends are on it. A messaging app is more useful if more of the people you want to communicate with are using it. And a marketplace is more attractive to buyers and sellers if it has a large number of both.

Bitcoin has several network effects that make it more valuable as more people use it:

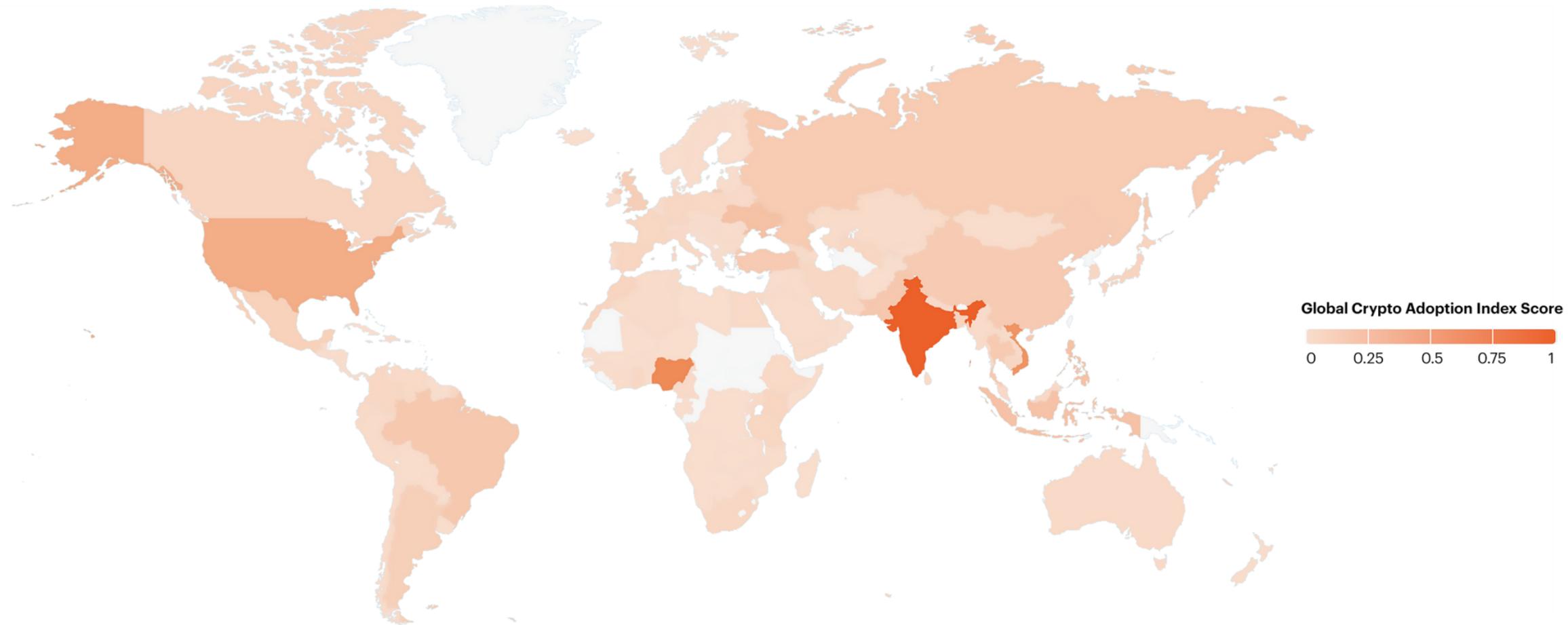
- **Liquidity:** As more people use Bitcoin, it should become easier to buy and sell, meaning Bitcoin's liquidity increases. This is because greater adoption leads to more buyers and sellers in the market, which is particularly important as institutional adoption continues growing.
- **Acceptance:** Bitcoin is gaining wider acceptance as a payment method as its user base expands. Merchants and businesses are more inclined to accept Bitcoin if they know customers can use it to pay.
- **Security:** Bitcoin's decentralized network gets more secure the more people use it. This is due to more miners and nodes validating transactions and bolstering the network's security.

Our illustration highlights the number of unique Bitcoin addresses, which serve as a proxy for the number of active Bitcoin users. When a new user creates a Bitcoin wallet, they generate a new unique address that can be used to send and receive Bitcoin. By tracking the number of unique Bitcoin addresses over time, we can gauge how the Bitcoin network is growing. Despite the recent 'Crypto Winter', the positive trend of increasing addresses remains intact. This indicates that more users are joining the Bitcoin network even during downturns in the cryptocurrency markets. The continued growth in unique addresses points to Bitcoin's resilience and expanding user base.



Source: blockchain.com

Adoption growing fast, but it's still early

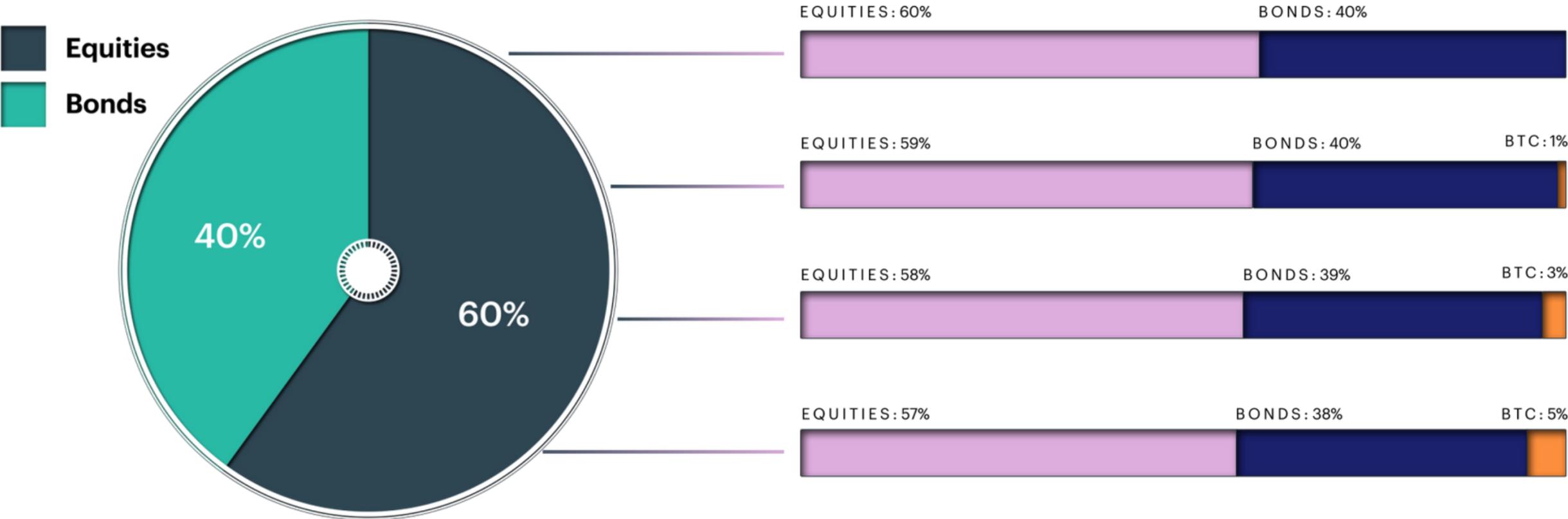


Bitcoin adoption is still in its early stages, but it is accelerating rapidly. According to the Chainalysis 2023 Global Crypto Adoption Index, the number of cryptocurrency users worldwide surged 880% between 2019 and 2022. The research found adoption has been primarily driven by emerging market countries with lower gross national income per capita levels. Another recent survey, the 2023 Global Crypto Ownership Data from Triple-A, estimated that around 4.2% of the global population, approximately 420 million people, now own cryptocurrency. While still a small fraction of the world's population, these figures indicate impressive growth in cryptocurrency adoption in a short timeframe. With more people entering the crypto ecosystem annually, Bitcoin continues solidifying its position and expanding its user base globally.

Source: chainanalysis.com, triple-a.io

Portfolio Construction

Rightsizing your Allocation



Practitioners use a 60/40 equity to fixed income portfolio because it offers a good balance of risk and return. Equities have the potential for higher returns, but they are also more volatile. Meanwhile, bonds typically have lower returns, but they are also less volatile. By allocating 60% of a portfolio to equities and 40% to bonds, practitioners consider this to be a 'balanced' portfolio, which is often associated with investors who have a moderate risk tolerance.

In the following exercise, we will analyze various allocations of a traditionally balanced portfolio that has allocated a pro-rated percentage amount into Bitcoin to better understand how this impacts a portfolio's risk and return characteristics.

Source: CF Benchmarks, Bloomberg, total return indices are referenced in USD, as of March 31, 2024

Historical Drawdowns



Analyzing historical Bitcoin drawdowns

	Maximum Drawdown	Length (Days)	Recovery (Days)	Performance Rebound (%)
2011 - 2013	-93%	112	328	11326%
2013 - 2015	-84%	328	661	7966%
2017 - 2018	-83%	311	640	2045%
2021 - Today	76%	377	473	???

Portfolio impact of 3% allocation on \$100K amount

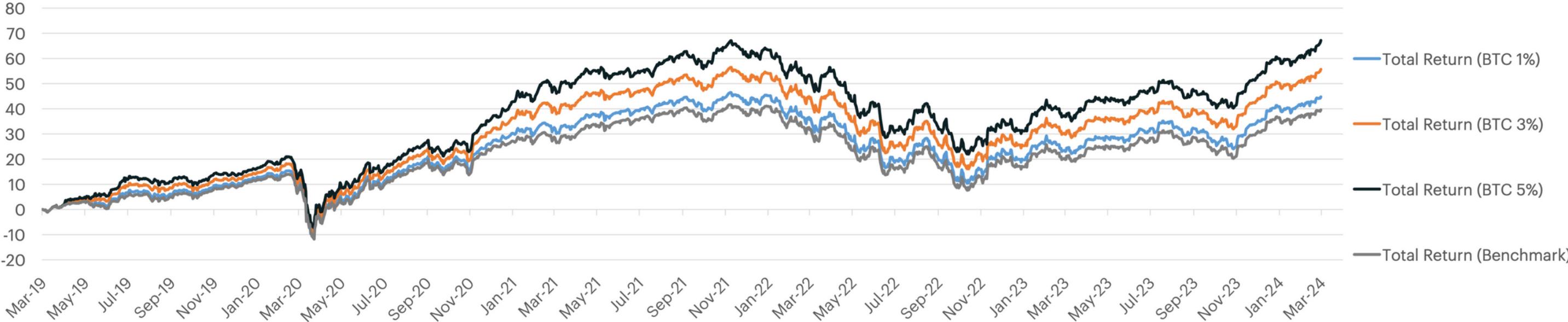
Drawdown Assumption	Total Loss
90%	\$2,700
80%	\$2,400
70%	\$2,100

One of the main challenges of investing into Bitcoin is deciding exactly the right size for your initial investment, and subsequently, how to maintain your exposure going forward. As highlighted previously, Bitcoin as an asset has experienced outsized gains, along with periods of sizable drawdowns. Therefore, an investor can choose to allocate a portion that is large enough to provide a material positive contribution to their portfolio, but small enough to make sure that the client and overall portfolio can weather periods of volatility.

If we revisit historical drawdowns from the major Bitcoin bear market cycles, we can see how an investor can begin to understand how much should be allocated, based on the potential loss from the investor's Bitcoin allocation. In this example, we have illustrated various drawdown assumptions based on a 3% allocation to Bitcoin, and how this would translate into portfolio losses.

Source: CF Benchmarks, Bloomberg, total return indices are referenced in USD, as of April, 2024

Portfolio Impacts: Holding Bitcoin Over Time



The positive asymmetry of Bitcoin’s return profile can make a sizable impact on a balanced portfolio over time. Our analysis illustrates that even only a 1% allocation has increased returns without materially increasing the overall risk of the portfolio. In fact, the standard deviation of the balanced portfolio does not start to materially increase until the allocation to Bitcoin exceeds 5%, if rebalanced frequently. Lastly, if we account for risk-adjusted performance, adding Bitcoin to the portfolio has boosted Sharpe Ratios by 13% to 58% over a 5-year period.

Portfolio Statistics	BTC 1% Portfolio 1-year	BTC 3% Portfolio 1-year	BTC 5% Portfolio 1-year	Benchmark 1-year	BTC 1% Portfolio 3-year	BTC 3% Portfolio 3-year	BTC 5% Portfolio 3-year	Benchmark 3-year	BTC 1% Portfolio 5-year	BTC 3% Portfolio 5-year	BTC 5% Portfolio 5-year	Benchmark 5-year
Return Metrics												
Total Return	18.59	20.80	23.02	17.50	11.33	13.00	14.63	10.49	46.85	58.14	70.12	41.45
Risk Metrics												
Standard Deviation (Annualized)	7.42	7.53	7.76	7.41	10.43	10.78	11.24	10.29	11.57	11.90	12.37	11.47
Downside Risk (Annualized)	5.15	5.24	5.41	5.15	7.43	7.72	8.07	7.31	8.63	8.92	9.29	8.53
Risk Adjust Return Metrics												
Sharpe Ratio	1.83	2.10	2.32	1.69	0.14	0.19	0.23	0.11	0.58	0.70	0.81	0.51
Jensen Alpha	1.11	3.35	5.62		0.26	0.79	1.32		0.78	2.36	3.95	

Source: CF Benchmarks, Bloomberg, as of March 31, 2024. Portfolio represents a traditional 60/40 equity to fixed income portfolio with a pro-rated allocation to bitcoin, rebalanced monthly. The benchmark represents a 60/40 equity portfolio without any bitcoin exposure.

Bitcoin is Digital Collateral Redefining Money and Investing

- Bitcoin is a groundbreaking decentralized digital currency and payment network that operates without central control from governments or financial institutions. Instead, Bitcoin relies on principles of cryptography, a transparent public ledger called the blockchain, and a distributed network of peer-to-peer nodes that validate transactions. New bitcoins are created through a competitive process known as mining, where computers race to solve complex mathematical problems that add verified transactions to the blockchain ledger.
- With a fixed eventual supply of 21 million bitcoins and no central authority, Bitcoin has distinctive advantages as a censorship-resistant store of value, digital payment method, and portfolio diversifier. Its decentralized open source design gives Bitcoin immunity to manipulation or restrictions by third parties. As a scarce transparent digital asset, Bitcoin has continued to gain significant popularity for its potential use cases and its perceived qualities as a long-term hedge against inflation.
- Bitcoin's network effects, sound money properties, asymmetric return profile, and accelerating global adoption lend strong support to the investment narrative that Bitcoin will emerge as the world's preeminent universal store of value in the digital age. Historical data shows even small portfolio allocations to Bitcoin increased returns while marginally impacting overall risk. In fact, standard deviation of a balanced portfolio does not substantially increase until Bitcoin allocations exceed 5% with frequent rebalancing. Moreover, Bitcoin has materially boosted risk-adjusted returns, as measured by Sharpe Ratios, over longer-time horizons.
- Ultimately, Bitcoin represents a monumental paradigm shift in money and investing due to its decentralized structure, role as a digital store of value, and demonstrated ability to enhance portfolio performance over the long run. As the first cryptocurrency, Bitcoin stands to fundamentally transform finance as it continues to become the global standard for digital value storage and transfers.



Appendix

Further Resources



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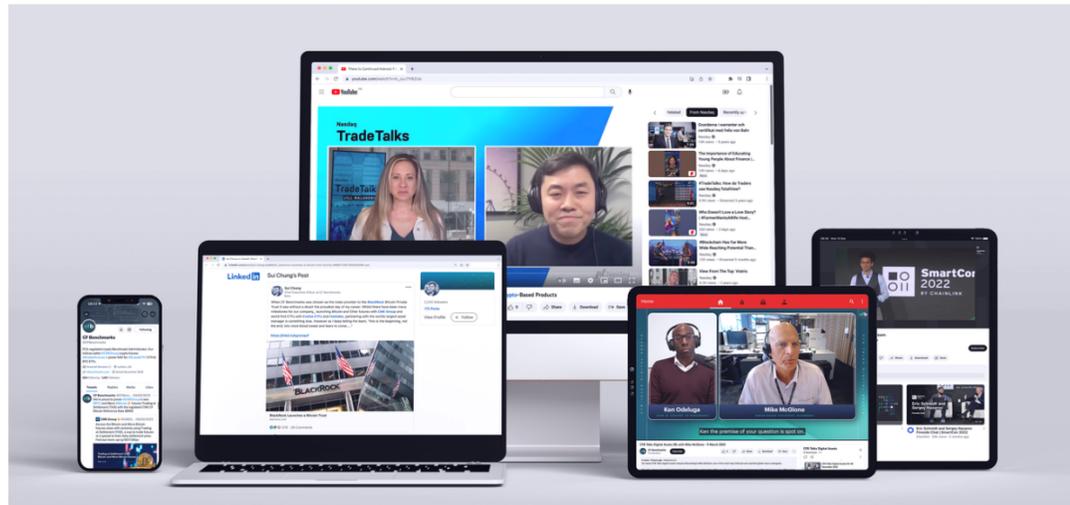
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- [CF Digital Culture Composite Index](#)
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