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Bitcoin: from bubble to mainstream?

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07 Bitcoin remains a speculative investment

Key messages

- Bitcoin unlikely to assert itself as a widespread medium of exchange due to low and costly transaction capabilities.
- Past performance has been driven mostly by speculative demand, but the divisibility, fungibility, liquidity, limited supply, decentralisation, security and increasing adoption of bitcoin could pave the way for it to become a store of value in the distant future.
- Long-term upside potential remains high, as are the risks of failure and total loss of value.

01 A brief history of bitcoin

Cryptocurrencies now look back on more than 40 years of history. The first known publications go back to David Chaum and Nick Szabo. In 1983, Chaum came up with the idea of an anonymous electronic currency secured by encryption, which was implemented in 1989 under the name Digicash. Szabo followed in 1998 with the "decentralized" concept bit gold. Bit gold required participants to use computer power to solve cryptographic puzzles (Proof-of-Work, more on that below), with those who solved the puzzle receiving a reward. Transactions were pooled, given a digital time stamp, and stored in a ledger. Szabo's work therefore formed the basis for Bitcoin ("Bitcoin" with "B" refers to the blockchain, while "bitcoin" with "b" refers to the coin). However, it was the white paper by Satoshi Nakamoto (pseudonym, true identity is unknown) in 2008 that marked the beginning of bitcoin as we know it today. Initially, at the heart of cryptocurrencies is the idea of an independent, decentralised digital currency that is not controlled by institutions such as a government or bank. However, for a cryptocurrency to be a payment alternative, it must meet numerous requirements. It must be able to process a huge number of transactions preferably in a traceable manner, be accessible to everyone at all times, secure, reliable and stable in value. To ensure this, cryptocurrencies are based on a protocol that defines the framework and underlying functionality of the system. This specifies, for example, the cryptocurrency's total supply and supply schedule, the security mechanisms as well as verification and settlement mechanisms for transactions.

02 Bitcoin's proof-of-work blockchain

To ensure security and be able to track or verify transactions within a decentralised network, cryptocurrencies use the science of cryptography – hence their name. Each user of the cryptocurrency is assigned two unique codes or keys – a private one, which is only known to the respective user, and a public one. Using the encryption algorithms, the secret code is used to provide transactions with a unique digital signature. The public key in combination with digital signature can then be used to check the correctness or origin of the transaction. If a transaction can be traced back to the person with the corresponding secret key, it will be accepted by the system; otherwise, it will be rejected.

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In the system, which is made up of the computers participating in the cryptocurrency network, the transactions are collected for a certain time and combined into a block. This is where the so-called "proof-of-work" or "puzzle-solving" comes in, which requires immense computing power and is intended to protect the system against fraud. The transactions of a block are carried out by adding them to the existing ledger (blockchain) as soon as one of the computers in the system has figured out a numerical key (hash) that meets predefined requirements. The level of difficulty of the "puzzle" is chosen by the system in line with its governing protocol. In the Bitcoin blockchain, the difficulty of the puzzle is chosen according to the available computing power in the system, so that one puzzle is solved approximately every 10 minutes. The process of solving the puzzle is known as "mining" and the so called 'miners' are usually rewarded with a certain amount of cryptocurrency for their efforts.

The finished block, together with the associated hash, is shared with the entire system, verified by it and "filed" together with the key. A new block, marked with the numerical key of the previous one, is then opened. The beginning and end of successive blocks are thus linked. Due to this chaining, the existing blockchain can only be falsified with immense computational effort. An attacker would not just have to figure out the hash for the manipulated block but also for all subsequent blocks. Furthermore, he would have to convince the system, i.e. all other computers in the system, that his version of the blockchain is correct; after all, the rest of the system still shares the correct blockchain. If plagiarism is now circulating in the system, it will initially continue to run parallel to the original. Ultimately, the system trusts the ledger that shows the most computational effort, or in other words, the ledger to which new blocks are added the fastest. The fraudster would therefore compete against the entire computing power of the system, solve the puzzles much more slowly and the plagiarism would be noticed after a short time.

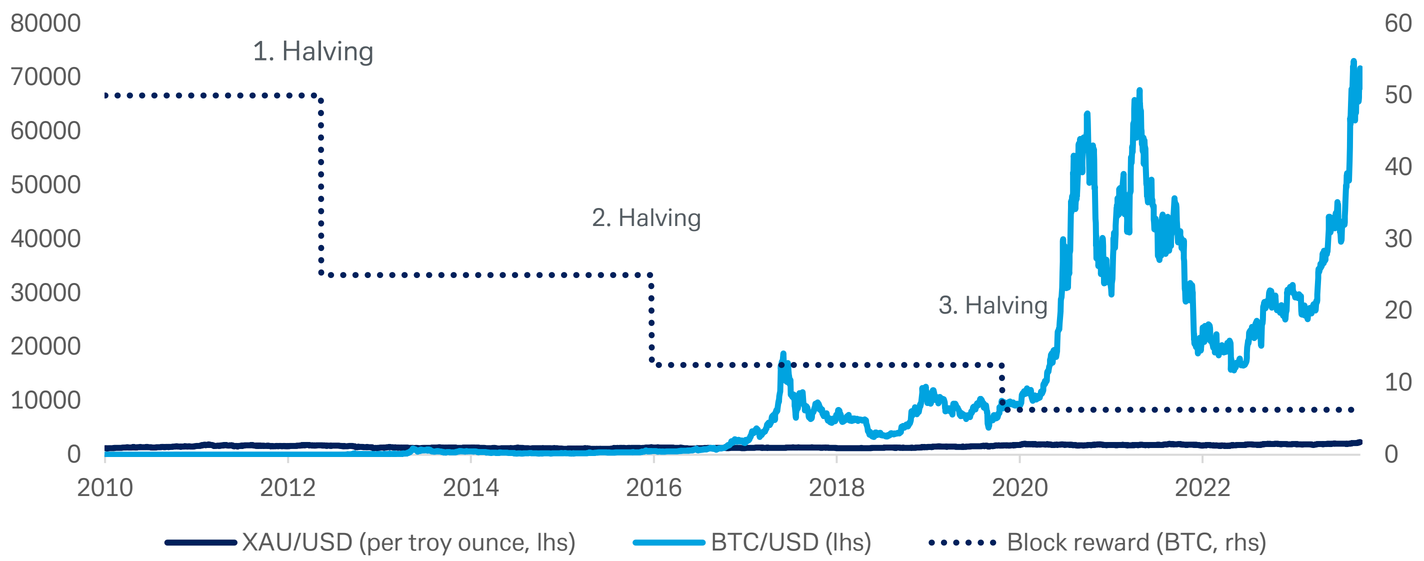
To date, there is also no known way to systematically crack the underlying encryption algorithms and bypass the signatures or "proof-of-work". However, due to the computing power involved, securing the blockchain using "proof-of-work" mechanisms is very energy intensive. A recent increase in mining activity has pushed Bitcoin's energy consumption to around 170 TWh in annualised terms, which is equivalent to roughly 1/3 of Germany's annual electricity consumption.

03 Bitcoin creation and supply

To prevent inflation and the gradual erosion of the cryptocurrency's value, the protocol limits the total supply to 21 million bitcoins. Almost 19.7 million are currently in circulation, with the remaining 1.3 million still to be mined. Currently, the reward for one block which gets mined about once every 10 minutes is 6.25 bitcoins. "Halvings", which occur every 4 years or after every 210,000 mined blocks, reduce the reward by 50%. The next halving is expected this April and will reduce the reward to 3.125 bitcoins, taking supply growth from less than 2% to below 1% p.a. The last bitcoin will be mined around the year 2140. In addition to the capped supply and declining supply growth, some estimates point to about 3-4 million bitcoins being lost forever, stored on wallets with their private keys never to be retrieved.

As the mining reward decreases over the years, the hope is that increasing adoption of bitcoin will drive up transaction fees and compensate miners for the supply of computing power to the system. In the past years, fees as a percentage of block income have been highly volatile, usually fluctuating between 0-5% but reaching 10-20% for a prolonged period and occasionally even jumping over 40%.

Figure 1: Bitcoin price and halvings



Source: LSEG Datastream, Deutsche Bank AG. Data as of April 9, 2024.

04 An alternative currency?

For financial market participants, bitcoin usually offers two propositions, that of a currency and/or a store of value. As for the former, bitcoin is unsuitable due to its volatility. In addition, due to its limited transaction capabilities and high associated costs the adoption of bitcoin as a mode of exchange appears highly unlikely. Currently, the blockchain can only process about 7 transactions per second which pales next to the capacity of the European TIPS (TARGET Instant Payment Settlement) network of 2,000. Transactions on the blockchain network can be prioritised on payment of a fee, where higher fees paid typically translate to faster execution. However, execution speed is constrained by factors such as network congestion and the set execution speed, and the cost is not always guaranteed.

Solutions to improve transaction capabilities of the system are based on additional off-chain layers. For example, the Lightning Network is a separate blockchain added on top of Bitcoin designed to accelerate processing times and decrease transactions costs. Since the Lightning Network enables 1 million transactions per second, it can alleviate Bitcoin's congestion problems as transactions could be pooled and only the balances would be settled through the native chain. Nevertheless, the size of the impact is questionable, with on-chain enforcement of transactions to remain costly and slow. In addition, the Lightning Network has its own associated risks comprising centralisation, security and network reliability concerns.

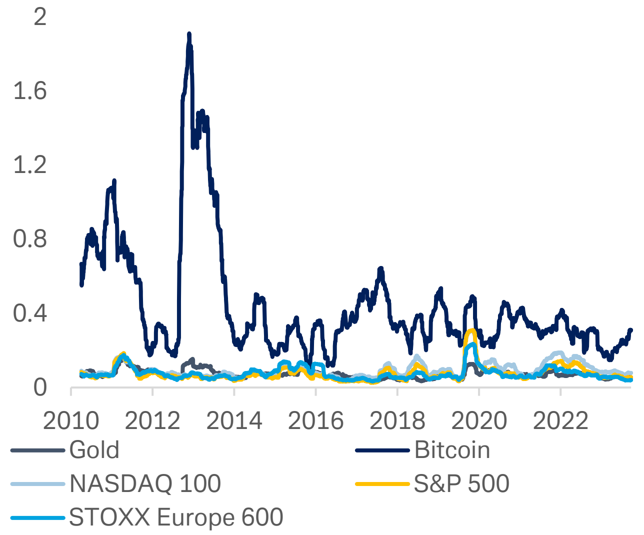
05 A store of value?

Research suggests that bitcoin as well as other cryptocurrencies (except for stablecoins) have primarily been traded to make speculative gains. For example, Mayer and Bofinger (2024) point out that unpegged cryptocurrencies like bitcoin have tended to be used for speculative investment purposes rather than as a medium for exchange throughout the past years. This is supported by bitcoin's high volatility – with drawdowns of more than 50% within a month and peak-to-trough declines of up to 90%, while increasing nearly 22,000% over the last 10 years against the euro. Indeed, high volatility and returns – which in case of bitcoin are often driven by idiosyncratic events – are among the most reliable features of the cryptocurrency. The lack of a stable correlation to other asset classes and macro fundamentals, even though these tend to have an amplifying effect, during bitcoin's brief history suggests that price movements could reflect first and foremost the market implied probability of widespread bitcoin adoption. It is also this idiosyncracy that could provide bitcoin with some utility in a portfolio construction context.

While the previously mentioned features are hardly a good prerequisite for a store of value, bitcoin has parallels with gold in the 1970s. Following the breakdown of Bretton Woods in 1971 gold was characterised by similar levels of volatility. As private investors received permission to buy gold, not only volatility but also returns receded. Accordingly, the idea of bitcoin asserting itself as a conventional store of value given its limited supply, divisibility, fungibility, decentralisation, security and its accessibility by market participants is not far-fetched.

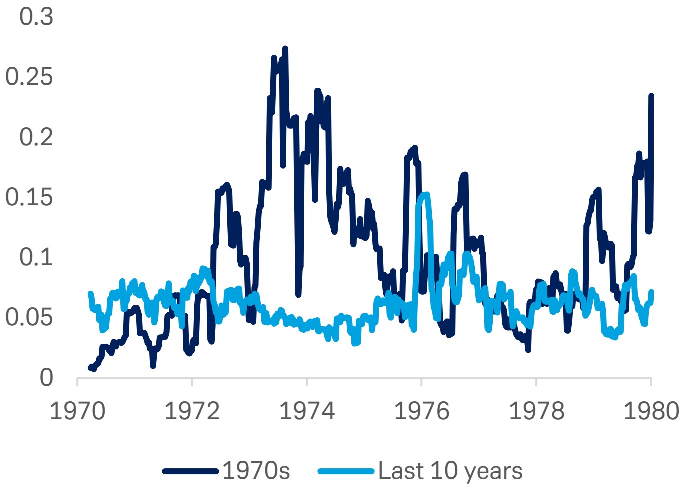
Recent and upcoming regulatory advancements should favour this process and provide investors with clearer framework. The U.S. Securities and Exchange Commission (SEC) on January 10, 2024, approved the first spot bitcoin ETFs. This marked a step towards institutionalising bitcoin and improving its investability as well as social acceptance. The approval triggered substantial net inflows of more than USD11bn into spot bitcoin ETFs between January 10 and mid-March. In addition, one of the bitcoin ETFs set a new record by exceeding USD10bn in assets under management within just seven weeks of its launch. Furthermore, the Commodity Futures Trading Commission (CFTC) revealed that 47 of its enforcement actions, equal to nearly half of total actions, in 2023 involved digital assets, suggesting growing regulatory oversight. The Markets in Crypto-Assets (MiCA) regulation should be implemented throughout 2024, providing clarity and oversight for crypto markets also within EU borders.

Figure 2: 3-month volatility of selected asset classes



Source: LSEG Datastream, Deutsche Bank AG. Data as of April 9, 2024.

Figure 3: 12-week volatility of gold



Source: LSEG Datastream, Deutsche Bank AG. Data as of April 9, 2024.

The uptake in acceptance is also reflected in the resurgence in bitcoin market capitalisation. Over the past 5 years it increased from less than USD100bn to almost USD1.4tn currently – albeit with large volatility, while the number of bitcoin wallets with non-zero balance doubled to 51 million. Imminent policy rate cuts and growing investor risk appetite as well as elevated government spending, debt levels and inflation could bolster the current cryptocurrency upcycle.

However, the lack of cashflows, underlying tangible assets or utility make a straightforward valuation of bitcoin impossible. One alternative would be to use the cost of production which is governed by the cost of computing and electricity. While some argue that the cost of producing a bitcoin should rather be seen as a price floor, we tend to disagree. Something made at a certain cost does not have to sell for at least the same price. This for example can be observed in the Chinese housing market where inefficiencies have led to the creation of a bubble with entire ghost towns or nascent technologies like hydrogen production that rely on subsidies for reaching the break-even point. In the long run the linchpin of bitcoin's value is demand. Demand will ultimately depend on bitcoin's acceptance by market participants as a means of value storage. Should it in distant future rival that of gold (market cap of approx. USD15tn) the corresponding bitcoin price would be north of USD700,000, ten times its current price. A milestone toward this goal was achieved in March of this year, when bitcoin's market capitalisation reached USD1.414tn, briefly surpassing that of silver at USD1.38tn.

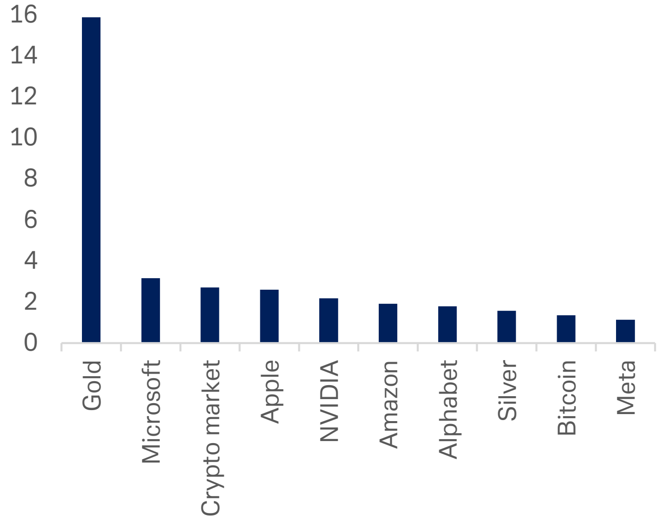
06 Potential for a "hard landing"

While the new highs indicate an increased probability that bitcoin might be on track for widespread adoption, several substantial risks threaten the journey. Besides the large environmental footprint that could favor more efficient competitors from the crypto universe, the concentrated bitcoin ownership as well as mining capacity are sources of concern. While several sources including Bloomberg indicated that 2% of all wallets hold nearly 93% of all bitcoins, the true supply concentration is likely to be lower, as for example exchange wallets hold large amounts that belong to many different owners. A study by Glassnode found that about 70% of all bitcoins are held by the top 2% entities. Nevertheless, large owners (also referred to as whales) have allegedly manipulated crypto prices in the past, for example through pump-and-dump schemes. In addition, over 80% of computing power in the Bitcoin blockchain stemmed from just 5 countries in 2022 (U.S. 38%, China 21%, Kazakhstan 13%, Canada 6%, Russia 5%) leaving the system vulnerable to centralisation and manipulation. Centralisation could increase as the mining reward decreases over time if transaction fees do not compensate miners and computing power is withdrawn from the system. Regulatory changes could upend cryptos' rise any time. Several countries have banned cryptos entirely. Last but not least, the development of quantum computers poses security concerns, particularly with regards to cracking secret private keys.

07 Bitcoin remains a speculative investment

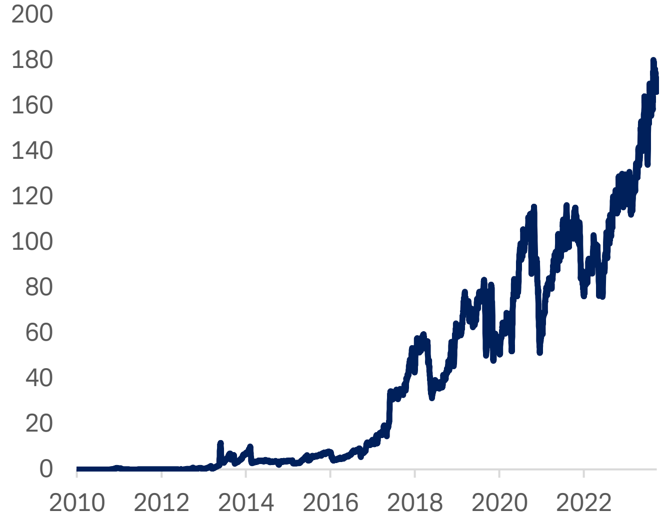
Accordingly, the investment case for bitcoin becoming a conventional store of value in the long term is itself speculative. Bitcoin is currently going through an adoption process that has the potential for large gains, but also for complete failure that would, in hindsight, expose it as a bubble. While recent developments have shifted the odds slightly towards success, the final outcome remains highly uncertain. Therefore, bitcoin is solely for risk-tolerant investors. Investors should only allocate "risk" capital and not more than a small proportion of the portfolio to bitcoin or other cryptos.

Figure 4: Market cap (USD trillion)



Source: LSEG Datastream, Deutsche Bank AG. Data as of April 8, 2024.

Figure 5: Power consumption estimate (TWh, annualised)



Source: Cambridge Blockchain Network Sustainability Index: Mining Map: Visualisation (ccaf.io), Deutsche Bank AG. Data as of April 8, 2024.

Glossary

Bitcoin refers to a cryptocurrency where units of currency are generated by computers solving mathematical problems.

Blockchain is a continuously growing list of records, called blocks, which are linked and secured using cryptography.

BTC is the code for Bitcoin.

Cryptocurrencies are digital currencies with transactions verified by a decentralised system.

The U.S. Commodities Futures Trading Commission (CFTC) regulates the American futures and options markets.

Exchange Traded Funds (ETFs) are investment funds traded on stock exchanges.

Market capitalisation represents the total dollar market value of a company's outstanding shares of stock.

The Markets in Crypto-Assets Regulation (MiCA) institutes uniform EU market rules for crypto-assets.

The NASDAQ Composite index is a market-capitalisation weighted index of around 3,000 equities listed on the NASDAQ exchange.

The Securities and Exchange Commission (SEC) oversees securities exchanges, securities brokers and dealers, investment advisors, and mutual funds in an effort to promote fair dealing, the disclosure of important market information, and to prevent fraud.

The Stoxx Europe 600 is an equity index that tracks the performance of the securities of a total of 600 of the largest companies from 17 countries in the European Union.

The S&P 500 is a share index (price index) in the U.S.. It includes shares of the 500 largest and highest-turnover companies in the country.

TARGET Instant Payment Settlement (TIPS) enables payment service providers to offer fund transfers to their customers in real time and around the clock, every day of the year.

U.S. is the designation for the United States.

USD is the currency code for the U.S. dollar.

The volatility of a financial asset is the degree of variation of its trading price series over time. It is usually measured by the standard deviation of logarithmic returns from the asset's average value.

XAU is the ticker for gold.

Performance	10.4.2019 - 10.4.2020	10.4.2020 - 10.4.2021	10.4.2021 - 10.4.2022	10.4.2022 - 10.4.2023	10.4.2023 - 10.4.2024
S&P 500	-3.4%	48.0%	8.7%	-8.4%	25.6%
STOXX Europe 600	-14.2%	31.8%	5.4%	-0.4%	10.4%
NASDAQ 100	8.2%	68.1%	3.5%	-8.9%	38.0%
Bitcoin	30.5%	746.4%	-26.4%	-32.4%	139.5%

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