

What is bitcoin's target price?



Image source: iStock

Introduction

The price of bitcoin has surged sharply since the beginning of the year, having increased almost fivefold from its 2022 lows. How high can the price go? In this article, we attempt to answer this question using two very distinct valuation models.

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Almost one hundred years ago, Henry Ford, the man behind the Ford Motor Company, imagined an "energy currency", suggesting that instead of gold, nations could base their currencies on energy resources. While this idea never materialised - probably due to its potential to undermine government control over wealth- Ford's concept is partly reflected in bitcoin. This cryptocurrency, often referred to as digital gold, operates on a decentralised network and is created via a "mining" process that requires a significant amount of energy. Indeed, some argue that the value of bitcoin is intrinsically linked to the energy expended in its creation.

Capriole Investments developed the "Energy Value Equivalence" model, which calculates the value of bitcoin based on its energy consumption. According to this model, bitcoin's intrinsic value is higher than its current price.

Another valuation model for bitcoin is the "stock-to-flow" ratio, which assesses its scarcity by comparing existing supply with annual production. This model has attracted considerable interest for its ability to accurately predict bitcoin's price movements.

The two above models offer distinct but complementary perspectives, highlighting the dynamics driving bitcoin's appreciation. Overview below.

Bitcoin 101

As a reminder, bitcoin is not controlled by a central authority such as a bank or government. Instead, a global network of computers, known as miners, verify and record every bitcoin transaction on a decentralised network powered by the blockchain. These miners compete to solve complex mathematical puzzles to confirm and add transactions to the blockchain. Miners invest in high-performance computing devices and consume large amounts of electricity to solve these puzzles and earn rewards in the form of bitcoins. This process is known as "Proof-of-Work" (PoW) and is the reason why bitcoin is so secure and immutable.

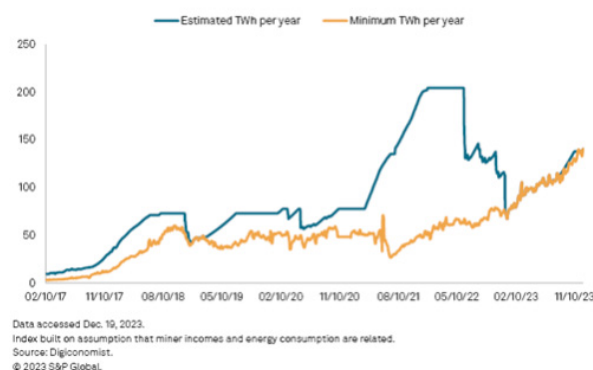
When it was launched in 2009, the bitcoin protocol included a set of predefined rules, one of which stipulates that a new block containing a set of transactions must be verified and recorded on the blockchain every 10 minutes or so. It also sets a limited supply, capped at 21 million bitcoins by the year 2140. Currently, around 19.6 million bitcoins are in circulation, with the production of new bitcoins halving every four years, a phenomenon known as halving.

Unlike traditional assets such as stocks or bonds, bitcoin lacks tangible metrics like earnings, dividends, or net assets that investors typically rely on to gauge value. Consequently, determining a fair value for bitcoin remains elusive, as conventional valuation methods are not directly applicable. The price of one bitcoin will thus tend to align with factors such as supply and demand dynamics, geopolitical events, investor sentiment and its production cost through the mining process.

"The price of any commodity tends to gravitate toward the production cost. If the price is below cost, then production slows down. If the price is above cost, profit can be made by generating and selling more. At the same time, the increased production would increase the difficulty, pushing the cost of generating towards the price. In later years, when new coin generation is a small percentage of the existing supply, market price will dictate the cost of production more than the other way around." - Satoshi Nakamoto, pseudonymous developer of bitcoin, 2010

The bitcoin Energy Consumption Index tracks real-time energy usage in the bitcoin network, with electricity as the primary expense in mining. As of March 2024, bitcoin's annualised energy consumption is 151.28 TWh, equivalent to Malaysia's annual power consumption. And energy consumption for bitcoin mining is set to rise even further. Bloomberg reports that miners are rapidly increasing their energy consumption due to factors such as the soaring price of bitcoin, the launch of exchange-traded funds (ETFs) for bitcoin cash and "halving", the halving the marginal supply of bitcoin scheduled for April.

Global energy consumption from bitcoin mining doubled in 2023 (TWh/year)



The energy value model explained

In 2019, Capriole Investments developed an interesting model known as the Energy Value Equivalence, focusing on the energy expended in bitcoin's production. At its core, this model seeks to assess the intrinsic value of bitcoin by quantifying the energy expended in its production and compare it to the energy required to produce other assets or commodities.

The model highlights several key insights: firstly, that energy, measured in raw Joules, is a fundamental determinant of bitcoin's fair value. Secondly, increased energy input corresponds to a higher fair value for bitcoin. Moreover, the Energy Value model suggests that bitcoin's price tends to revert to its mean Energy Value over time.

The assumption underlining the model suggests that bitcoin's intrinsic value is a function of the amount of energy expended in its production, the rate at which its supply grows, and a conversion factor to fiat currency for energy expenditure.

All units cancelling out, the equation suggests that the fair value of bitcoin (V) is a function of the Joules of energy spent to produce it.

On this basis, Capriole Investments built a statistical model on daily data from January 2010 to 2019. The resulting R-squared of the model in relation to the actual bitcoin price of 80%, the higher the R-squared, the more reliable the model. As shown in the graph below, bitcoin's price and its energy value tend to converge, despite occasional deviations, driven by the invisible hand of the market. According to the Energy Value model, bitcoin's intrinsic value currently stands close to \$81,000.

This piece of information was not overlooked by Bill Ackman, CEO of Pershing Square Capital Management. In a post on X, Ackman outlined, "Bitcoin price rise leads to increased mining and greater energy use, driving up the cost of energy, causing inflation to rise and the dollar to decline, driving demand for Bitcoin and increased mining, driving demand for energy and the cycle continues." He added humorously, "Bitcoin goes to infinity, energy prices skyrocket, and the economy collapses."

Bitcoin Energy Value

The intrinsic value of Bitcoin as priced by raw joules of electricity into the mining network only. Read more: capriole.com/bitcoin-energy-value-equivalence



Source: Capriole Investments - Created with Datawrapper

Source: Capriole Investments

Stock-to-flow model explained

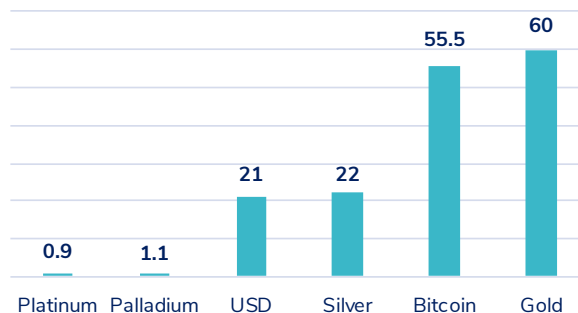
Also in 2019, Plan B, a mysterious Dutch institutional investor, presented the Stock-to-Flow (S2F) model assessing the value of bitcoin with surprising accuracy. This quantitative model attempts to predict the theoretical value of bitcoin over time based on asset scarcity. Initially greeted with scepticism, in 1999 the model predicted a rapid rise in bitcoin to \$55,000 after the May 2020 "halving". A prediction that proved accurate, as bitcoin reached this level in 2021, reinforcing its credibility through its ability to predict prices.

In simple terms, the "Stock-to-Flow" model is an indicator of the scarcity (or abundance) of a commodity. It is the total amount of a resource's reserves (the "stock") divided by its annual production (the "flow"). The Stock/Flow ratio therefore measures the annual marginal supply, or additional supply, in relation to existing reserves. The higher this ratio, the less supply is renewed, and therefore the more the asset in question can be considered "scarce".

This model is generally applied to precious metals, such as gold. Current gold reserves (the "Stock") are estimated at around 192,000 tonnes. The "Flow" corresponds to the quantity of gold extracted each year, i.e., 3,200 tonnes. Dividing the total supply by the "Flow" gives a ratio of ~60. This means that, at current production rates, it would take around 60 years to extract 192,000 tonnes of gold.

Given bitcoin's unique properties (e.g., time-limited supply), the stock-flow model seems to apply to bitcoin in the same way as it does to precious metals. Bitcoin currently has a "stock" of around 19.6 million and a "flow" of 0.353 million per year, giving a SF of 55.5. Before the May 2020 "halving", the SF was 25 (the SF was even lower a few years earlier). In the future, bitcoin's SF should continue to rise, influenced by its limited supply and the halvings every 4 years. The SF is predicted to be 110 after the April 2024 halving.

Comparing Stock-to-Flow Ratios of Various Assets



Source : Athena Alpha

The statistical model built on gold, silver and bitcoin revealed a strong correlation between SF and asset value, with a 95% coefficient of determination. This suggests that as scarcity increases, so does asset value.

To estimate the price of Bitcoin, the model suggests using the 365-day average of the SF ratio. The stock-to-flow model has an R-squared of 88% on the same data used in the energy value model. The current model price currently stands close to \$100,000...

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