The 2024 Halving: What Bitcoin Investors Need to Know

Fall 2023

PGP CAPITAL ADVISORS, LLC
The Investment Bank for Emerging Companies

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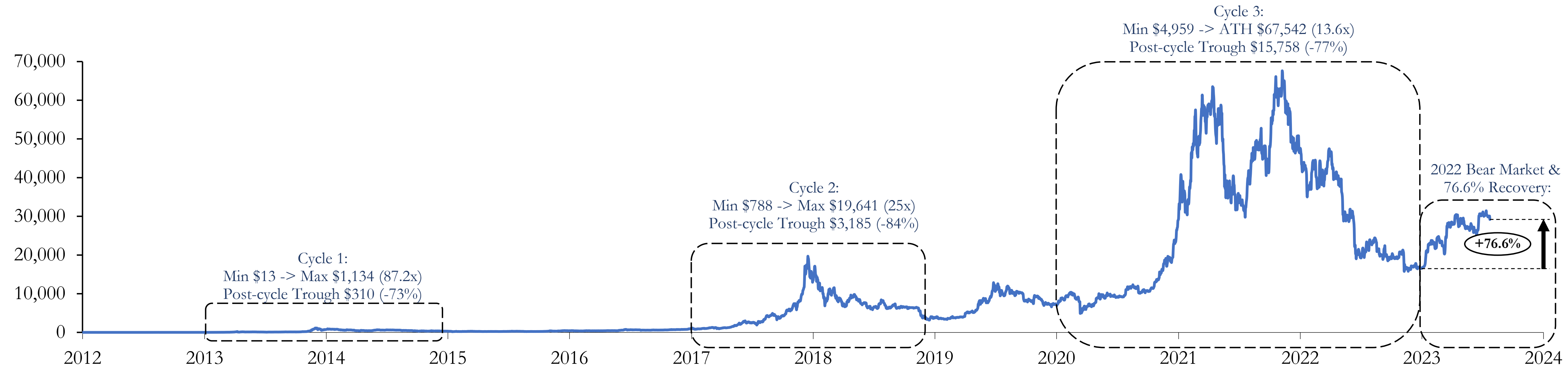
Bitcoin Historical Overview

Following a prolonged "crypto winter", Bitcoin has shown signs of recovery in 2023

- Bitcoin is a digital currency created in 2009 by Satoshi Nakamoto as "a purely peer-to-peer version of electronic cash" allowing direct payments without the need for a financial institution acting as an intermediary
- There have been three notable price cycles in Bitcoin's history: 2013-2014, 2017-2018, and 2020-2022
  - In each major cycle, the price of BTC spiked between 13x~87x before falling by approximately 80% from peak; however, the post-cycle bottom is always above the minimum price level before the cycle
- Bitcoin reached its ATH of approximately $68K in late '21 but has since been hit by an unprecedented 2-year long bear market
  - Prices have recovered in 2023 and rose by 76.6% from year-end 2022 prices

BTC-USD Price History, Linear, 2010-2023[(a)]



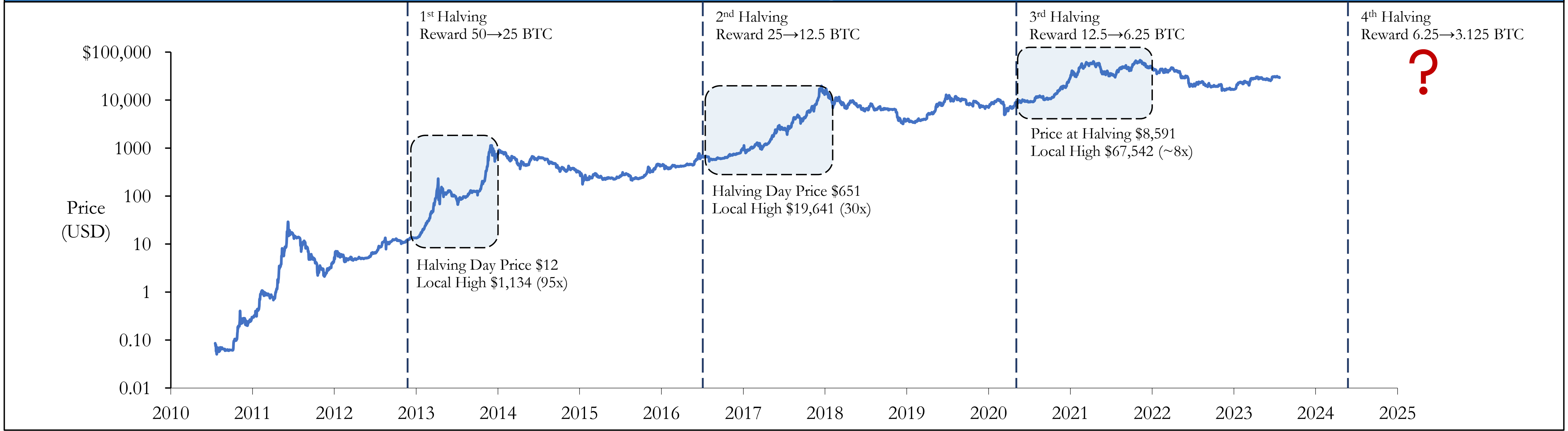
(a) All prices are recorded as of midnight UTC of the current day. Intraday pricing may be higher. Available data from 07/18/2010~07/24/2023
Sources: CoinMetrics, Bitcoin White Paper

The Impact of "Halvings" on BTC Price

The major near-term catalyst for Bitcoin is the next halving event, currently scheduled for April 2024

- Bitcoin was designed to have an immutable fixed supply of 21 million Bitcoin, of which over 19.4 million are in circulation
  - The inability for any central authority to create more BTC above this limit differentiates Bitcoin from fiat currencies
  - Newly minted Bitcoin are issued in the form of block rewards to miners in exchange for securing the network
  - The "halving" reduce the reward provided to miners by 50% every 210,000 blocks (~4 years). The block reward was originally 50 BTC/block and is currently 6.25 BTC/block, which will reduce to 3.125 BTC/block in 2024
- Since one block is mined every 10 minutes on average, a halving takes place every ~4 years; next halving is estimated to take place in April 2024
  - Historical evidence shows that halving events have been traditionally followed by bull runs as the supply of new Bitcoin is halved

BTC-USD Price History, Logarithmic, 2010-2023



Sources: CoinMetrics, Bitcoin White Paper

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Bitcoin Pricing Models and Potential Growth Catalysts

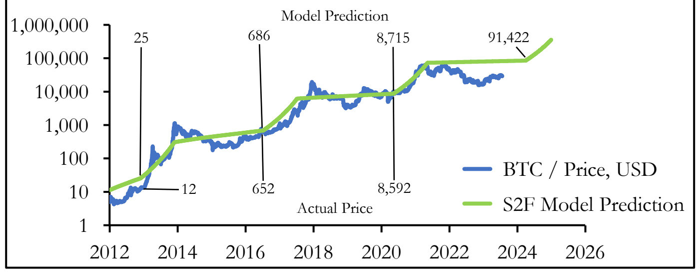
Popular pricing models correctly predicted the bull run in 2021 suggest similar growth for the next halving

- Halvings lower Bitcoin's inflation rate and reduces monthly supply; if demand is constant, this should result in a price increase
  - — The Stock-to-Flow (S2F) model, a commodity valuation model typically used for precious metals, suggests that each halving results in 10x price spike
  - — A competing analysis, the Power-Law Corridor Growth model, suggests Bitcoin's growth will continue but with diminishing returns
- The next halving may mark a transition point for Bitcoin; as its inflation rate declines, its relative volatility should fall and it should mature as an asset
- Halvings are also landmark moments in Bitcoin's history; potential impact of heightened public profile and awareness cannot be discounted

Stock-to-Flow Model

- Stock-to-Flow (S2F) is a ratio used to measure a commodity's relative scarcity
  - — **Stock** represents the total available amount of the commodity in the market
  - — **Flow** represents the yearly amount extracted
- A high S2F ratio suggests scarcity and resistance to dilution
  - — Gold's S2F is 57 while Silver's is 33; BTC currently at ~59 but scheduled to rise to ~110 post-halving
  - — Bitcoin is unique because its S2F increases both **predictably** and **irreversibly**
  - — Controversially, this model predicts BTC price growth constantly rising with no diminishing returns

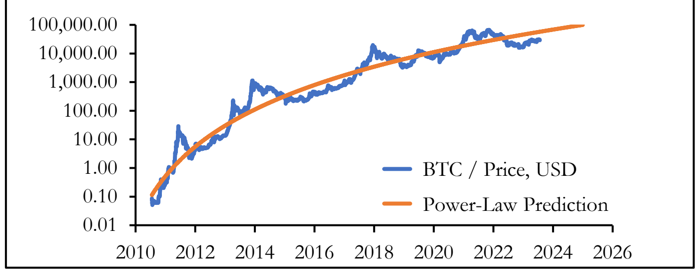
Price with S2F Model Prediction, 2012-2024



Power-Law Model

- The Power-Law Corridor Growth model is a time-based regression analysis model, which argues that Bitcoin's growth will continue but at a slowing rate
- As Bitcoin's scarcity is programmatic and pre-determined, a time-based model can still reflect Bitcoin's scarcity
- The model predicts BTC reaching $100K around the end of 2024, with the lower bound at 2028 (i.e. price will not fall below $100K after 2028)

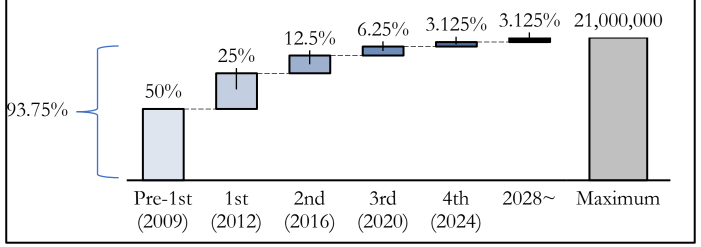
Price with Power-Law Model, 2010-2024



Potential Institutional Capital Inflows

- Currently, around 92.5% of the total Bitcoin supply has been mined; by 2024, 93.75% will have been mined
- As the number of Bitcoins in circulation approaches the maximum, new coin generation will take up a smaller portion of market activity
- Investors will instead place greater emphasis on Bitcoin's status as a durable, supply-constrained asset
- The halving may serve as a transition point for institutional investors entering the market
  - — In June-July 2023, six firms including BlackRock, Fidelity and others filed applications with the SEC to create a spot Bitcoin ETF

Proportion of BTC Supply Created in Each Halving



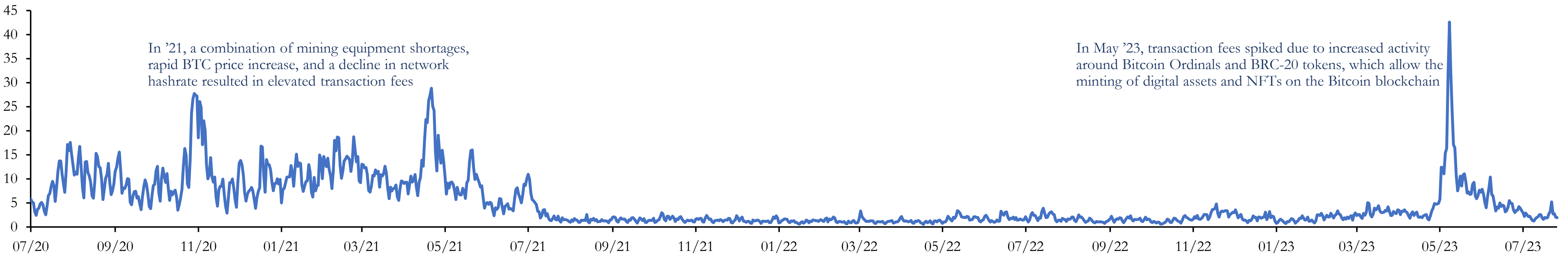
Sources: CoinMetrics, PlanB, Harold Christopher Burger, ARK Invest

Potential Challenges Presented by the Halving

However, the 2024 halving also presents potential challenges for the Bitcoin ecosystem, especially with respect to the mining community

- All else equal, miners will see an equal halving to revenue and even the most efficient ASICs will have margins below zero if all-in costs exceed 5.7c/kWh
  - — Miners with older, less efficient models will be forced to shut down their equipment making the network less secure and/or slower
  - — Prolonged correction timeline will create significant pressure on miners, data centers, and energy providers creating a long-term drag on growth
- Distressed miners may begin to sell their BTC reserves and immediately liquidate newly mined Bitcoin, putting downward pressure on Bitcoin's price
  - — Large liquidations and a continued new supply into the market could cause price stagnation at best, or push Bitcoin prices downward
  - — Increased supply could be sufficient to offset reduced supply from the halving, which may cause Bitcoin to deviate from historical price trends
- Transaction fees will eventually rise in order to compensate miners, making it more expensive for retail consumers to transact on the network
  - — As seen in May 2023 with the rise in Ordinals, transaction fees can make transacting in Bitcoin as designed prohibitively expensive
  - — Prolonged high transaction fees could significantly curb demand and/or create a significant back-log of transactions of unknown consequence

L3Y Fee-to-Rewards Ratio (%)



Note: Fees and Rewards both in BTC
Sources: BlockChair.com, Bitcoin.com News, Coindesk

Exogenous Factors to Watch

Several upcoming events and factors have the potential to boost or hinder Bitcoin's value in the medium- to long-term

Regulatory Threats

- Regulators have put **increased scrutiny** on the industry in the wake of significant bankruptcies, headlined by FTX
  - The SEC filed **lawsuits against Binance and Coinbase**, which are de-risked following Ripple's July '23 victory
  - **S-1 and S-4 filings** for public miners have seen unprecedented delays due to **extended reviews** from regulators
  - The SEC has **postponed its decision on several spot Bitcoin ETFs** despite court ruling against the SEC's rejection of Grayscale's application to convert its GBTC fund into a spot Bitcoin ETF
- Tax reforms and new programs to **increase tax revenues from crypto activities have been proposed**
  - Proposed increased reporting requirements on exchanges and consumers to include ALL trading activity
  - Digital Asset Mining Energy (DAME) excise tax included in the initial draft of 2024 budget sought to impose a 30% tax on electricity costs (>85% of mining costs), would likely drive miners out of the US

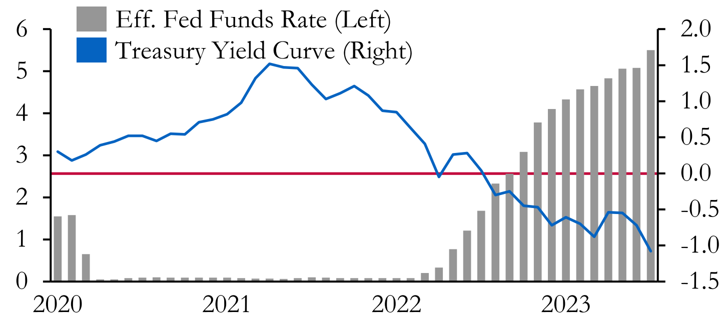
Market & User Sentiment

- In the very short term, **notable 'sell-off' events may test Bitcoin's price support**; however, lasting effects unlikely
  - The creditors of Mt. Gox, an exchange hacked for 850,000 BTC in 2014, will receive ~142,000 BTC in the next several months. If creditors choose to sell en masse, prices could be temporarily depressed
  - Similarly, the US government is in the process of liquidating ~50,000 BTC seized from a hacker in 2021
- Meanwhile, the number of **unique active Bitcoin addresses has declined from its 2021 peak** as retail investors have largely exited the space following the collapse of FTX and retail lenders Celsius, Blockfi, and Genesis
- Consumers **may adopt stablecoins, CBDC's, or another cryptocurrency as the primary form of digital payment**, which could reduce Bitcoin's demand as a peer-to-peer system of payment

Macroeconomic Environment

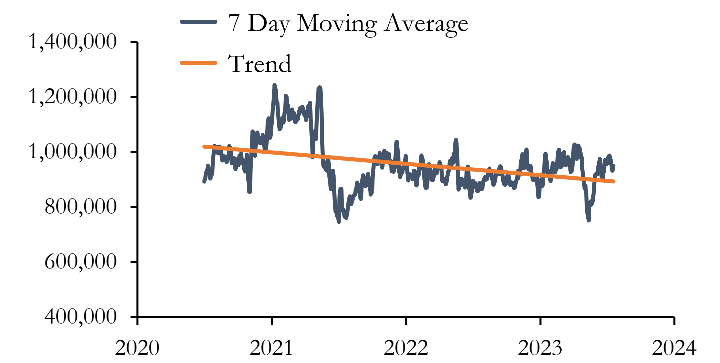
- The **rapid rise in interest rates** from the Fed was **one of the primary drivers** of the 2022-2023 **bear market**; prolonged tightening could further damage Bitcoin's position
  - **Current risk-off environment** and **high rates** on CDs may be sufficient to overcome positive marco-principles inherent to the halving
- Leading indicators in the US continue to **anticipate a recession**, which **will test the "store of value" hypothesis**
  - **Bitcoin has never faced a recession**, and despite a growing sentiment as a "store of value asset" from bitcoin-bulls, this **hypothesis has limited support beyond the recent price movement** correlated with the banking crisis in the first half of 2023

L3Y Fed Funds Rate and Treasury Yield Curve (%)



* An inverted yield curve has accurately foreshadowed all 10 recessions since 1955, according to data from the Federal Reserve Bank of San Francisco

L3Y Number of Active Bitcoin Addresses



Note: Treasury Yield Curve is difference between 10-year and 2-year T-notes and only tracks data from first trading day of the month
Sources: Coinbase, CoinMetrics, St. Louis Fed, Wall Street Journal

Key Takeaways

Historical volatility, halving dynamics, and macro environment create optimal conditions for volatility in 2024

- Historically, Bitcoin halvings featured (i) substantial volatility and (ii) beginnings of a bull-run
  - Post prior three halvings, Bitcoin prices reached local highs of ~95x, ~30x, and ~8x the halving day price, where with each subsequent halving volatility declined reflecting increased maturity of Bitcoin as an asset
  - With Bitcoin now squarely in the mainstream and turbulence following the collapse of FTX and other major players in the space, will this trend continue in 2024?

- 2024 halving will test mainstream hypothesis, pricing models, and pundits – many suggest Bitcoin will reach highs over $100k by YE 2024
  - Several pricing models created between the second and third halving periods, correctly predicted the bull-run in 2021 but it remains to be seen whether predictions of diminishing returns, expected volatility, etc. will hold through the 4th halving
  - Introduction of spot Bitcoin ETFs from large institutions (e.g., BlackRock) could lead to unprecedented demand and redefine portfolio construction – studies by BlackRock and ARK Invest found an optimal portfolio allocates ~3 to 5% to Bitcoin

- As the industry continues to mature, Bitcoin faces new headwinds that put continued growth at risk
  - Miners may face significant distress as revenues are cut in half, resulting in a less secure and temporarily slower network
  - New entrants offering stablecoin and CBDC diminish Bitcoin's utility as "electronic cash" – as it was designed
  - Regulatory pressures create uncertainty for exchanges, impede access to capital for companies, and unfavorable tax reforms create drag on growth
  - Fed tightening and fears of impending recession ultimate test for Bitcoin as a store-of-value
  - Fallout from significant sell-off in 2022 and collapse of notable retail lenders and exchanges resulting in stagnating retail participation

The 2024 halving marks another pivotal moment in Bitcoin's short history and should not be ignored. Time will tell if $100k predictions are correct, if miners will be closing their doors, or if we land somewhere in the middle, but the one certainty is the 2024 halving will be a unique opportunity for investors.

Sources: CoinMetrics, World Gold Council, BlackRock, ARK Invest