EMPIRICAL RESEARCH · BITCOIN FACTORS · CORRELATION VS. LEADING INDICATORS

What actually drives Bitcoin: a high-beta risk asset that follows global liquidity — not digital gold, and not a falling-dollar trade.

v1.4 · Sample 2015–2026 (power law & production floor from 2010) · first-party empirical engine + STORM cross-check ·

+29.8pp

BTC FWD-6M RETURN SPREAD WHEN M2 IS ACCELERATING (THE TOP LEADING INDICATOR)

0.28 → 0.52

BTC–NASDAQ DAILY CORRELATION: FULL SAMPLE VS. LAST 12 MONTHS (RISK-BETA, RISING)

+0.09

BTC–GOLD FULL-SAMPLE DAILY CORRELATION — STATISTICALLY ~ZERO ("DIGITAL GOLD" FAILS)

Executive summary

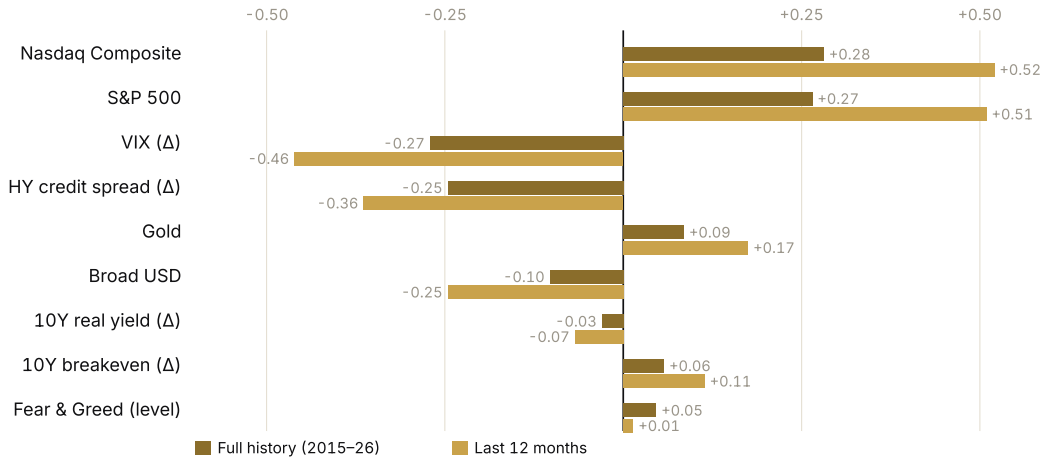
The data overturns the lazy version of every Bitcoin narrative. Bitcoin is, first and foremost, a **high-beta risk asset whose equity correlation has structurally risen** — its daily correlation to the Nasdaq climbed from ~0.28 over the full 2015–26 sample to ~0.52 over the last year — not "digital gold" in the sense of *co-moving* with gold (full-sample correlation ~0.09). That is a statement about behavior, not worth: on the test that actually defines a store of value — purchasing-power growth — Bitcoin has been *superior* to gold (≈59% vs ≈12% annual compounding since 2015), and we treat the low correlation and the equity co-movement as facts about today's marginal holders and flows, not permanent properties of the asset (§7). The single most useful *leading* indicator is **global liquidity / M2 growth**: when US M2 year-over-year is accelerating, BTC's median forward-6-month return is +35.0% versus +5.2% when decelerating — a +29.8pp spread. Crucially, the factors most people *watch* — the Nasdaq, gold, the VIX, credit spreads — are **coincident correlates with no predictive lead**, not leading indicators. And the popular "weak-dollar / falling-real-rates" trade is the biggest myth: on a forward-return basis it is perverse in-sample. This note separates what moves *with* Bitcoin from what moves *before* it, and grades six canonical assumptions against the evidence. It is analysis, not advice, and contains no recommendation regarding any security or digital asset.

The distinction that organizes this note. *Contemporaneous correlation* is co-movement at the same time (coincident beta) — useful for hedging and risk, useless for timing. A *leading indicator* has predictive power with a lead (factor today → BTC return later) — that is what an allocator can act on. Conflating the two is the most common analytical error in this field: a factor can be highly correlated yet have zero predictive value (the Nasdaq), or weakly correlated day-to-day yet a strong forward signal (M2).

1 · Contemporaneous correlation — and its instability

Full-sample daily-return correlations are mostly modest; the story is in the **windows**. Most factors are near-zero over the full sample but strongly correlated over the last 12 months — Bitcoin's correlation structure has shifted hard toward risk-asset behavior in the post-spot-ETF era.

EXHIBIT 1 · DAILY-RETURN CORRELATION TO BTC — FULL HISTORY VS. LAST 12 MONTHS



Pearson correlation of daily log returns (yields/spreads/vol in first differences). Source: TON618 factor engine, 2026-06-18 17:17 UTC. M2 and Fed-balance-sheet contemporaneous figures are YoY autocorrelation artifacts and are assessed as leading indicators below, not here.

2 · Coincident vs. leading — the critical split

Lead/lag cross-correlation (the lag at which each factor's correlation to BTC peaks) delivers the report's sharpest result:

- **Coincident — correlates, NOT predictors** (peak at lag 0): Nasdaq, S&P 500, VIX, HY credit spreads, gold, the broad dollar. *Everything the market watches as a "Bitcoin tell" moves with*

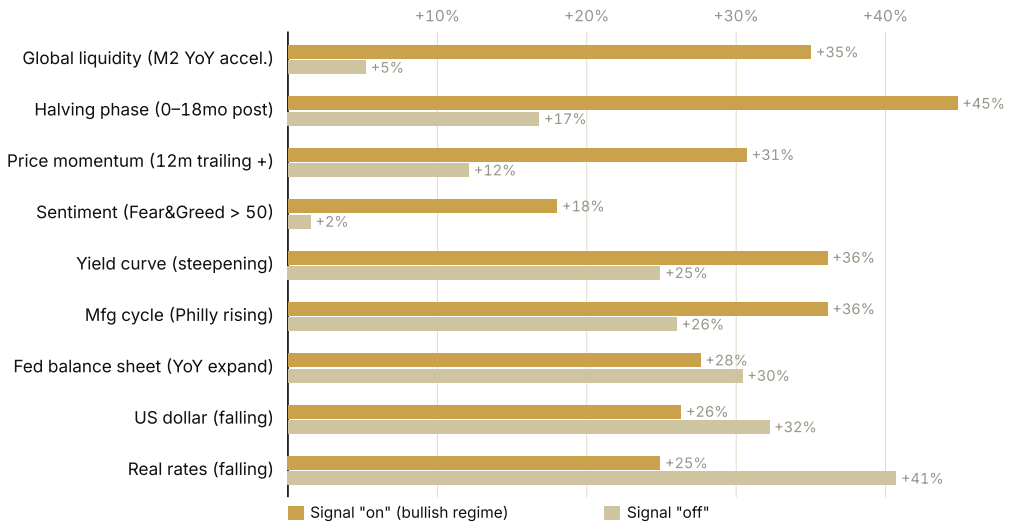
Bitcoin, not before it.

- **Lagging** (Bitcoin leads them): Treasury yields, real yields, transaction count.
- **Leading — genuine forward edge**: global liquidity / M2, Bitcoin's own price momentum, the macro growth-vs-inflation regime, and the sentiment regime. These are few, and they are the only factors with timing value.

3 · Leading-indicator ranking — forward-6-month regime split

Median BTC forward-6-month return when each signal is "on" (bullish regime) versus "off," monthly 2015+:

EXHIBIT 2 · MEDIAN BTC FORWARD-6-MONTH RETURN BY SIGNAL STATE



Source: TON618 factor engine + in-house halving/momentum/PMI models, 2026-06-18 17:17 UTC. **Bitcoin's own 12-month price momentum** is one of the strongest leading signals (+18.6pp). The dollar and real-rate signals are the wrong sign versus popular belief — in-sample, BTC delivered higher forward returns when the dollar was firm and real rates were rising. Fed-balance-sheet YoY and the manufacturing cycle (Philly Fed, +10pp) carry little-to-no timing edge.

4 · The leading indicators, in depth

Only a handful of factors actually *lead* Bitcoin. Each one below gets the same treatment: what we measured, what the data said, and why it earns a place on your dashboard — with its honest caveat. Ordered roughly by strength and reliability.

4.1 Global liquidity — the M2 impulse

What we did. Took US M2 year-over-year growth, split history into months when that growth rate was accelerating vs decelerating (vs 6 months prior), and measured Bitcoin's median forward-6-month return in each state. Cross-checked against an in-house global-M2 level overlay that scans for the best lead time.

What we found. When M2 growth is accelerating, BTC's median forward-6-month return is **35.0%** versus 5.2% when decelerating — a **+29.8pp spread** (predictive correlation +0.33), the widest of any macro factor. The level overlay shows liquidity leading price by roughly 70–90 days.

Why it deserves your attention. Bitcoin is the longest-duration, highest-beta claim on global liquidity; it inhales when money is being created and chokes when it is withdrawn. This is the one macro dial worth watching above all others — but the relationship is time-varying (Granger-causality is sporadic, and M2's explanatory power fell from ~0.8 to ~0.6 since 2022), so treat it as a tide, not a clock.

4.2 The manufacturing business cycle — turning points, not the level

What we did. PMI level alone tells you almost nothing about Bitcoin. So we placed the manufacturing cycle (Philly Fed diffusion, the available ISM proxy) into four business-cycle phases by position (above/below trend) and direction (rising/falling) — isolating the moments just past a trough and just past a peak.

What we found. The **Recovery phase** (below trend and turning up, just past a trough) is Bitcoin's single best macro window: **+70.6%** median forward-6-month return at a **88% hit rate**. The **Slowdown phase** (above trend, rolling over past a peak) is the worst at +18.5%. That is a ~52pp swing driven entirely by *where in the cycle* you are.

Why it deserves your attention. This is the difference between a factor that looks useless and one that is powerful: it is the second derivative — the turn off a trough — that pays, not the level. It is the cleanest illustration in this note of why business-cycle context beats a raw reading. Caveat: the Philly Fed is a regional proxy for true ISM, and Recovery windows are infrequent (n=17).

EXHIBIT 3 · BTC FORWARD-6-MONTH RETURN BY MANUFACTURING-CYCLE PHASE

CYCLE PHASE	BTC FWD-6M (MEDIAN)	HIT	N
Recovery (below-trend & rising — post-trough)	+70.6%	88%	17
Expansion (above-trend & rising)	+40.7%	66%	70
Slowdown (above-trend & falling — post-peak)	+18.5%	53%	66
Contraction (below-trend & falling)	+43.3%	79%	33

Source: TON618 factor engine; Philly Fed manufacturing diffusion, 3-month smoothed, centered at 0. 2026-06-18 17:17 UTC.

4.3 Price momentum — Bitcoin trends

What we did. Tested time-series momentum: does Bitcoin's own trailing return predict its forward return? Split months by the sign of the trailing 12-month (and 6-month) return and measured forward performance.

What we found. Strongly yes. After a positive trailing-12-month return, the median forward-6-month return is **30.7%** vs 12.1% after a negative one (a +18.6pp spread, 66.0% hit). The trailing-6-month → forward-3-month test is similar (14.1% vs -1.9%).

Why it deserves your attention. Momentum is the leading factor the macro-driver debate ignores, yet it rivals M2 — and it requires no view on the economy at all, only on Bitcoin itself. It is also the most actionable: trend state is observable in real time. Caveat: momentum strategies suffer sharp whipsaws at turning points, exactly when they matter most.

4.4 The macro regime — growth × inflation

What we did. Classified every month into the four-quadrant (Hedgeye GIP / All-Weather 'seasons') regime — growth accelerating/decelerating × inflation accelerating/decelerating — and measured Bitcoin's forward-6-month return in each.

What we found. Bitcoin's best regime is **Goldilocks** (growth up, inflation *down*) at 42.2%; its worst is **Stagflation** (growth down, inflation up) at 20.4%. Growth-accelerating quadrants beat decelerating ones across the board.

Why it deserves your attention. This is the decisive evidence against the inflation-hedge story: an asset that performs *best* when inflation is falling and *worst* when it is rising is a disinflationary-growth (risk-on) asset, not a hedge. It tells you which macro 'season' to lean into. Caveat: monthly regime calls are noisy and the proxy growth series is regional.

EXHIBIT 4 · BTC FORWARD-6-MONTH RETURN BY MACRO QUADRANT (GROWTH × INFLATION)

BTC median forward-6-month return by macro quadrant · darker = higher

Source: TON618 factor engine; growth = Philly Fed 3-month acceleration, inflation = CPI YoY 3-month acceleration, monthly 2015+. 2026-06-18 17:17 UTC.

4.5 The sentiment regime — Fear & Greed

What we did. Split months by whether the Crypto Fear & Greed index sat above or below 50 and measured forward returns — testing whether sentiment regimes persist or mean-revert at the 6-month horizon.

What we found. Greed has begotten more greed: with Fear & Greed above 50, BTC's median forward-6-month return is **18.0%** vs 1.5% below — a +16.4pp spread.

Why it deserves your attention. Over a 6-month horizon Bitcoin sentiment has trended, not reverted — a momentum cousin that confirms the trend signal from a different data source. Caveat: at *extremes* the sign flips (terminal-greed tops, capitulation bottoms), so this is a medium-horizon regime tool, not a contrarian timing trigger.

4.6 The yield curve

What we did. Measured Bitcoin's forward-6-month return in months when the 2s10s Treasury curve was steepening vs flattening over the prior 6 months.

What we found. A steepening curve is modestly bullish: 36.1% vs 24.9% (a +11.2pp spread).

Why it deserves your attention. Curve steepening typically marks early-cycle reflation and easier financial conditions — the macro backdrop Bitcoin likes. It is a real but second-order signal: useful as confirmation alongside liquidity and the business cycle, not as a standalone trigger.

4.7 The halving cycle

What we did. Mapped every month to its distance from the prior halving and measured forward returns by cycle phase, with particular attention to the supply-shock window in the 18 months after each halving.

What we found. The 0–18-month post-halving window has delivered +44.8% median forward-6-month returns vs +16.8% outside it (+28.1pp). **But the forward-12-month spread collapses to +0.7pp**, and the whole pattern rests on only ~3 independent cycles.

Why it deserves your attention. The halving narrative is the most famous Bitcoin signal and the most statistically fragile one here. We include it because you cannot ignore it — but it is heavily confounded with the liquidity cycle, and with n≈3 it is closer to a story than a tested edge. Weight it accordingly.

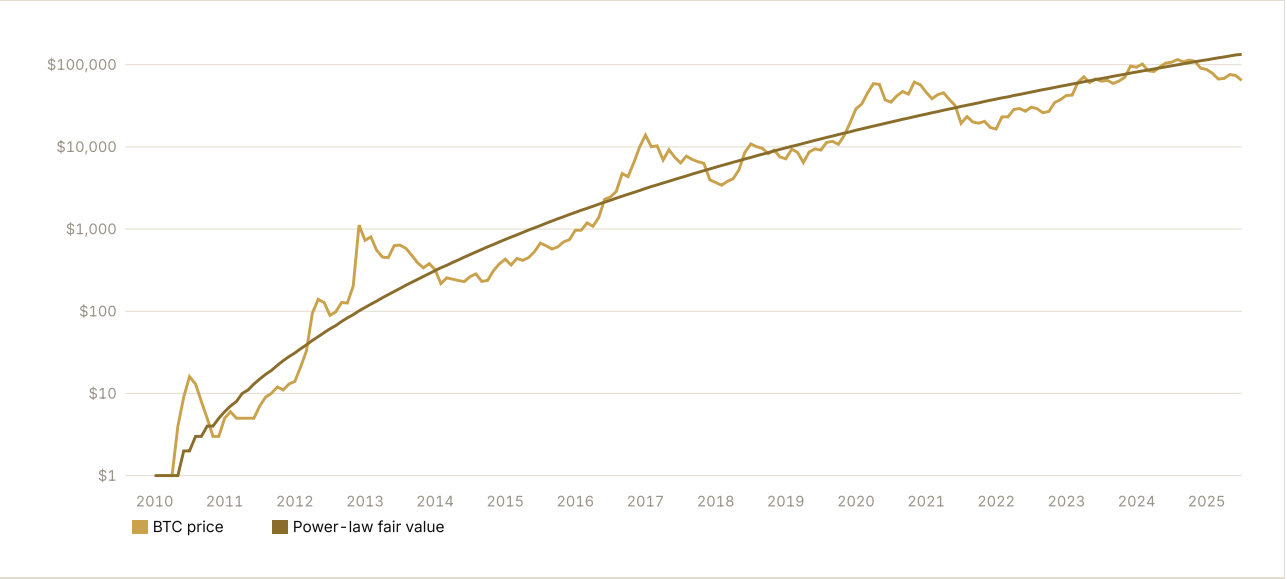
4.8 Power law — the long-run trend and its deviation oscillator

What we did. Fit Bitcoin's entire price history to a power law of time — log price on log(days since the 2009 genesis) — then used the *deviation* from that fair-value line (its derivative) as a valuation oscillator.

What we found. The fit is tight: exponent 5.668, R^2 0.9616. When price trades below power-law fair value, the median forward-6-month return is **+70.6%** (92% hit); when richly extended, -24.9%. Bitcoin currently sits about **-52%** versus fair value near $133,530.

Why it deserves your attention. The power law is the closest thing Bitcoin has to a long-run anchor, and the deviation from it has been a reliable cheap/expensive gauge. The trend line is not a forecast — its slope guarantees deceleration — but the oscillator around it is genuinely useful for sizing conviction. Caveat: the exponent drifts as data accrues, and a high R^2 on a monotonic series flatters the precision.

EXHIBIT 5 · BTC PRICE VS. POWER-LAW FAIR VALUE (LOG SCALE)



Source: TON618 factor engine; OLS fit of log10(price) on log10(days since 2009-01-03), full history. 2026-06-18 17:17 UTC.

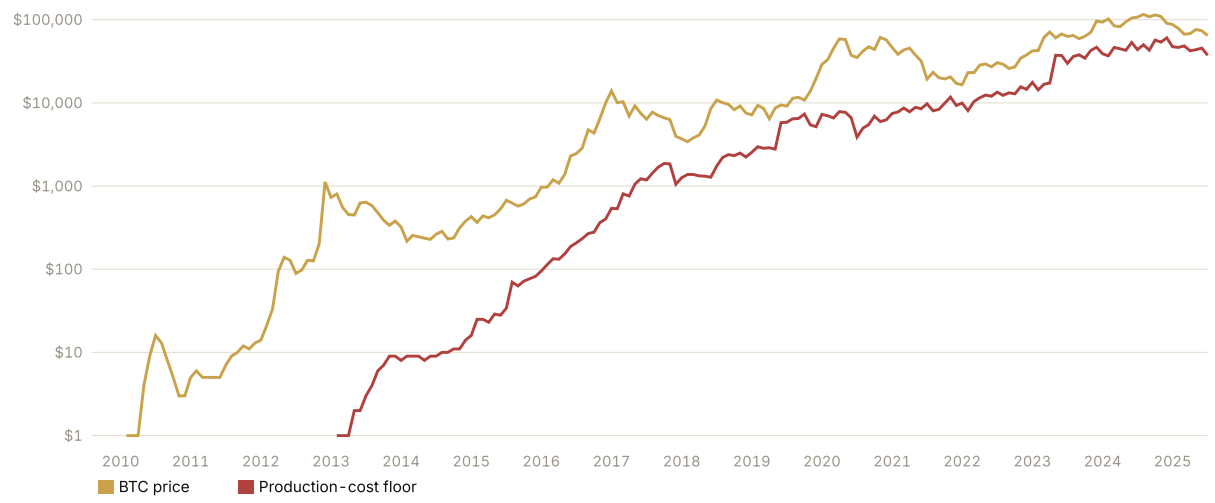
4.9 The electricity / production-cost floor

What we did. Built a transparent energy model of Bitcoin's marginal production cost — network hashrate × a time-varying fleet efficiency (J/TH) × an electricity price, divided by daily issuance — and compared price to it through history.

What we found. Production cost is currently near **$37,238**; price is 1.73× that. The structural result: price has **never closed below ~1.14× cost** (0.0% of days below it), and buying near the floor (bottom quartile of price/cost) returned +38.5% over the next 6 months (79% hit).

Why it deserves your attention. Unlike the others this is a *floor*, not a timing oscillator: the cost of production is a soft support that miner capitulation and difficulty adjustment defend. It tells you where downside is structurally cushioned. Caveat: the dollar level is only as good as the efficiency and electricity-price assumptions — the robust finding is that the floor has held, not its exact value.

EXHIBIT 6 · BTC PRICE VS. MODELED PRODUCTION-COST FLOOR (LOG SCALE)



Illustrative energy model — assumptions: fleet efficiency ~80→16 J/TH (exp decay), electricity $0.05/kWh, 144 blocks/day, reward schedule by halving. 2026-06-18 17:17 UTC.

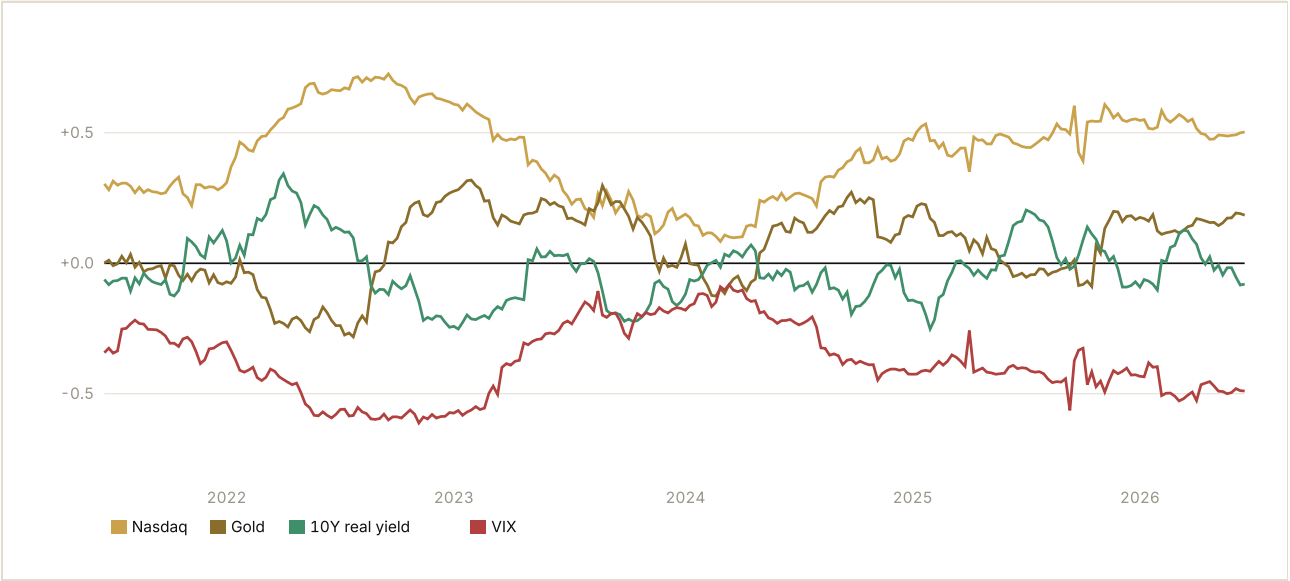
5 · What does *not* lead Bitcoin

Equally important is what to ignore. Three widely-cited "drivers" carry no forward edge in-sample — and some are perverse:

- **The US dollar & real rates.** The "weak-dollar / falling-real-rates debasement trade" is the biggest myth: forward-return spreads are the *wrong sign* (dollar-falling −5.9pp, real-rates-falling −15.8pp). On a tradeable returns basis the BTC–dollar relationship is weak (~−0.20 at best lag), not the −0.58 level correlation people quote.
- **The Fed balance sheet.** "QE drives Bitcoin" does not survive: Fed-balance-sheet YoY expansion carries essentially no timing edge (−2.8pp). Liquidity works through broad money (M2), not the Fed's balance sheet alone.
- **Gold & the things you watch all day.** Gold, the Nasdaq, the VIX and credit spreads are *coincident* — they move with Bitcoin, not before it — so they are risk and hedging inputs, not predictors. (But "doesn't correlate with gold" is *not* the same as "isn't a store of value" — see §7.)

6 · No correlation is stable

EXHIBIT 7 · ROLLING 90-DAY CORRELATION OF DAILY RETURNS (5 YEARS)



Source: TON618 factor engine, 2026-06-18 17:17 UTC. BTC–Nasdaq has ratcheted toward +0.5; BTC–real-yield turned sharply negative only recently; BTC–gold is positive but unstable. The instability is itself the most robust finding — any single-number correlation is regime-conditional.

7 · Is Bitcoin a store of value? Correlation is the wrong test

A finding from §1 — Bitcoin barely correlates with gold (~0.09) — is easy to misread as "Bitcoin fails as digital gold." It does not follow. **Co-movement with gold is not the test of a store of value; preservation and growth of purchasing power over time is.** An asset can be a *superior* store of value precisely *because* it does not behave like gold.

What we did. Measured the only thing that defines a store of value — purchasing-power growth — for Bitcoin vs. gold vs. CPI across the full sample and trailing windows, alongside the volatility and drawdown that are the price of that growth.

What we found. Over 2015–2026 Bitcoin compounded at **59.1%** a year versus gold's 12.0% and cumulative CPI of +42.3% — it outgrew gold roughly **55.5×** in purchasing-power terms. On the store-of-value test that matters, Bitcoin has been superior, not inferior. The cost is volatility and depth of drawdown (67.5% annualized vol and a -83.8% worst drawdown, vs gold's 16.5% and -23.1%).

EXHIBIT 8 · STORE-OF-VALUE SCORECARD — PURCHASING-POWER GROWTH AND ITS COST

HORIZON	BTC CAGR	GOLD CAGR	BTC VOL	GOLD VOL	BTC MAX DD	GOLD MAX DD
full	59.1%	12.0%	67.5%	16.5%	-83.8%	-23.1%
5y	12.5%	19.8%	53.2%	18.4%	-76.7%	-23.1%
3y	34.7%	31.2%	46.3%	20.6%	-51.3%	-23.1%

Source: TON618 factor engine; BTC (CoinMetrics), gold (Yahoo GC=F), CPI (FRED). 2026-06-18 17:17 UTC.

Why this year understates the case. The "Bitcoin isn't digital gold" narrative is loudest exactly when Bitcoin is in a drawdown — as it is now — and the windows confirm the regime-dependence: over the trailing *five years* gold actually out-compounded Bitcoin (19.8% vs 12.5%), the mirror image of the full-sample result. A single weak window is not the structural verdict. We believe this year's readings are better explained by *flows* than by fundamentals:

- **It was sold to raise cash, not because its model broke.** In a Bitcoin bear market overlapping an AI capital-raising scramble, Bitcoin was a liquid source of funds — sold alongside the software complex to finance AI bets and de-risk books. But Bitcoin's "business model" is a monetary network; unlike software companies, *it is not threatened by AI disruption*. Co-selling with software was a portfolio-plumbing artifact, not a statement about Bitcoin's franchise.
- **The marginal seller shapes the correlation.** Measured correlation reflects who is trading at the margin. If the marginal holders are allocators — often an older generation of PMs — who bucket Bitcoin as speculative risk-tech rather than as hard money, the asset will trade like risk-tech regardless of its monetary properties. As the holder base rotates toward long-horizon, treasury, and sovereign holders who hold it *as* a store of value, the equity correlation can fall and the gold-like behavior can emerge. Correlation is a fact about today's holders, not a permanent property of the asset.

The honest other side. This remains a thesis, not a proof. The store-of-value-superiority case rests on continued adoption; the volatility and -83.8% drawdowns are real and disqualifying for some mandates; and if the holder base stays risk-asset-oriented, the elevated equity correlation could persist for years. The data supports "superior long-run purchasing-power growth," not "low-volatility safe haven" — those are different claims, and only the first is established.

8 · The assumption scorecard

Six canonical beliefs, graded against the first-party evidence:

COMMON ASSUMPTION	VERDICT	EMPIRICAL BASIS
"Bitcoin is digital gold / an inflation hedge"	FALSE as co-mover — but see store-of-value (§7)	Two distinct claims. *Co-moves with gold / hedges CPI:* FALSE — BTC–gold daily corr +0.09 (≈0), 10Y-breakeven ≈0, and BTC's worst macro regime is stagflation. *Superior long-run store of value:* SUPPORTED — BTC compounded ~59%/yr vs gold's ~12% (2015–26), outgrowing gold ~55× in purchasing power; correlation is the wrong test (§7). Volatility is the cost.
"Bitcoin is a risk-on Nasdaq / tech-beta asset"	TRUE — strengthening	Daily corr 0.28 (full) → 0.52 (1y); VIX −0.46, HY −0.36 over 1y; correlation rises in risk-off. The dominant contemporaneous relationship.
"Bitcoin is driven by global liquidity / M2, with a lead"	TRUE — best leading indicator	M2-accelerating regime → +35.0% vs +5.2% fwd-6m (+29.8pp, corr +0.33); in-house overlay shows ~80-day lead. Note: Fed-balance-sheet YoY alone has no timing edge.
"The ~4-year halving cycle drives price"	FRAGILE / partly true	0–18mo post-halving → +44.8% vs +16.8% fwd-6m (+28.1pp), but the forward-12-month spread collapses to +0.7pp and the test rests on ~3 independent cycles; heavily confounded with liquidity.
"Bitcoin is a weak-dollar / falling-real-rates debasement trade"	DENIED as a predictor	Forward-return spreads are perverse: dollar-falling −5.9pp, real-rates-falling −15.8pp. Only a weak, recent *coincident* dollar effect (−0.25, 1y).
"On-chain metrics (MVRV/NUPL/SOPR) time tops & bottoms"	MIXED — useful at extremes	First-party valuation metrics auth-gated this run; network-usage on-chain is reflexive/coincident, not leading. Published backtests (3 cycles) credit MVRV/NUPL with real risk-adjusted edge at extremes — but as zones, on ~3 samples (see external corroboration).

External corroboration

Independent published evidence gathered via a STORM-method, perspective-structured research pass (Stanford OVAL method, adapted); each claim cited in Sources. Where external evidence and our first-party empirics agree, confidence rises; where they diverge, we flag it.

ASSUMPTION	WHAT THE PUBLISHED LITERATURE / PRACTITIONER EVIDENCE SHOWS
Digital gold / inflation hedge	Corroborated (fails). A factor-model study finds BTC's adjusted R^2 on equities jumped from ~0.11 pre-ETF to ~0.30 post-ETF, and the ETF-impact paper concludes managers should treat BTC as "a high-growth technology proxy rather than a defensive asset"; BTC's equity correlation peaked ~0.87 in 2024.[3][4] Our own four-quadrant test agrees: BTC's *worst* macro regime is stagflation (growth-/inflation+) and its *best* is Goldilocks (growth+/inflation-) — the inverse of an inflation hedge.
Risk-on Nasdaq / tech beta	Confirmed, with a nuance. The correlation *level* rose post-ETF (multiply corroborated). But adversarial verification flags that the same paper's Chow test on the *instantaneous beta* found *no* structural break (p=0.87) and its rolling-correlation Chow statistic (139–269) is autocorrelation-biased — so the co-movement level rose more cleanly than the beta did.[3] BTC also carries standalone downside tail risk: in the Oct-10-2025 leverage flush it fell ~30% while the Nasdaq barely moved.[8]
Global liquidity / M2 (with a lead)	**Confirmed but time-varying.** Time-varying Granger-causality work finds M2→BTC causality is sporadic and regime-dependent, with no full-sample cointegration on global M2;[5] a separate US-M2 study does find cointegration (long-run elasticity 2.65, CI 2.06–3.24).[6] Practitioners note BTC's M2 R^2 fell from 0.71–0.90 (2022) to ~0.59 by early 2026 as ETF flows became the dominant transmission channel[7] — matching our finding that M2 leads but the relationship is unstable.
On-chain valuation times tops & bottoms (MVRV/NUPL)	**Partly corroborated, with caveats.** A peer-reviewed backtest across three cycles (2013–2025) finds the MVRV Z-score beats buy-and-hold and Monte-Carlo random entry, flagging tops/bottoms — but as *zones*, on only ~3 independent cycles, with maturation risk.[9]
Weak-dollar / falling-real-rates debasement trade	Corroborated (denied as a tradeable signal). The headline BTC–dollar level correlation (~−0.58) is spuriously inflated by shared trends; on a tradeable *returns* basis it is ~0.04 same-day and only ~−0.20 at the best 33-day lead — weak, matching our perverse forward-return result.[10]

Methodology & data

Sample: daily, 2015-01-01 to 2026-06-17. **Primary, first-party data:** BTC price and on-chain metrics — CoinMetrics community API; macro, rates, credit, liquidity — FRED; gold and equity indices — Yahoo Finance; sentiment — alternative.me Fear & Greed. Correlation is computed on returns/changes, never raw trending levels (price → log return; yields/spreads/vol → first difference; slow liquidity → YoY). Estimators: Pearson and Spearman over four windows; lead/lag cross-correlation; rolling-90-day correlation; a forward-return regime split (median BTC fwd-6-month return, bullish vs bearish); a four-quadrant growth×inflation regime map; a time-series-momentum test; a manufacturing business-cycle phase model (position × direction, capturing troughs and peaks); a power-law fit (log price on log time-since-genesis) with its deviation oscillator; and a transparent production-cost / electricity-floor model. **Disclosed gaps:** on-chain valuation metrics (realized cap, MVRV) were auth-gated this run and are adjudicated via published evidence; no free true ISM PMI exists on FRED, so the Philly Fed diffusion index is used as the manufacturing-cycle proxy; the HY credit-spread series is available only from mid-2023; small-sample cycle claims (halving, n≈3) are flagged. Methods: in-house empirical engine (primary) plus

a STORM perspective-structured qualitative cross-check (Stanford OVAL method, adapted; 12 perspectives, 187 findings and 34 adversarial verdicts recovered and folded into the external-corroboration section after the run reached its compute limit during final synthesis).

Risk factors & limitations

- **Regime instability is the master risk** — every correlation is window-dependent and may invert; the post-2024 ETF era is a small sample.
- **Endogeneity** — on-chain network metrics are partly caused by price; not exogenous drivers.
- **Small-sample cycle claims** — the halving rests on ~3 independent cycles and is not statistically robust.
- **In-sample inference** — 2015–26 contains few independent macro cycles; forward returns are not guaranteed.
- **Current-window / bear-market bias** — this note is written during a Bitcoin drawdown, which inflates the measured gold and equity correlations and depresses trailing relative performance; several readings may be regime outliers, not structural (see §7). Correlation is also *holder-base-conditional* — it reflects who trades at the margin, and can shift as the holder base rotates.

What we are watching

- Whether the post-ETF jump was in the correlation *level* or the *instantaneous beta* — the structural-break evidence conflicts (rolling-correlation Chow highly significant; beta Chow not), and a 2026 partial-decoupling has appeared.
- The M2 cointegration debate — a US-M2 study finds a stable 2.65 long-run elasticity, while global-M2 work finds no cointegration and only time-varying causality; reconcile scope (US vs global) and method.
- Whether the BTC price-momentum edge persists out-of-sample or decays as the asset institutionalizes.
- Power-law durability — does the ~5.7 exponent hold or decay as the asset matures (the model guarantees deceleration); and does the current ~50%-below-fair reading mean-revert as it has historically.
- Production-floor robustness — re-estimate with live fleet-efficiency and regional electricity data; watch whether the ~1.1× historical floor holds post-halving as issuance falls.
- A true ISM series (vs the Philly Fed proxy) for the business-cycle phase model, and replicating the Recovery-phase signal on global PMIs.
- MVRV / NUPL / SOPR cycle-timing efficacy — obtain a non-gated realized-cap source and test first-party.
- Whether the 2024–26 BTC–gold warming is durable, and whether the halving signal survives once liquidity is controlled for.

Sources

1. TON618 Capital factor engine (first-party): `factor_analysis.py`, run 2026-06-18 17:17 UTC. Inputs: CoinMetrics community API (BTC price, on-chain); FRED / Federal Reserve Bank of St. Louis (macro, rates, credit, liquidity); Yahoo Finance (gold, equity indices); alternative.me (Fear & Greed).
2. TON618 Capital in-house models: `btc_halving_phase.py` (halving-cycle forward returns), `btc_m2_correlation.py` (M2 lead overlay), `btc_regime_ranking.py`.
3. Hong, Feng, Wang & Li (Olin Business School, WUSTL), "Impact of Bitcoin ETF approval on hedging properties," arXiv 2512.12815 (2025-12) — incl. factor-model R^2 and the Chow-test caveat surfaced in adversarial review.
4. Di Wu, "Institutional Adoption and Correlation Dynamics," arXiv 2501.09911 (2025-01) — BTC–equity correlation peaked ~0.87 in 2024.
5. Gu & Chen, "Global M2 Money Supply and Bitcoin: A time-varying causality approach," Jönköping (2025) — sporadic, regime-dependent Granger causality; no full-sample cointegration on global M2.
6. Kokabian, "The M2–Bitcoin Elasticity: A Cointegration Analysis (2015–2025)," Preprints.org 202506.1963 — US-M2 Johansen elasticity 2.65 [2.06–3.24].
7. CF Benchmarks (G. Selby, 2026) — BTC's M2 R^2 fell 0.71–0.90 (2022) → ~0.59 (Feb 2026); ETF flows the primary transmission channel since 2024.
8. Crypto.com, BTC–Nasdaq Oct-2025 decoupling / Oct-10 leverage flush (BTC −30% on a ~$19B liquidation cascade).
9. On-chain measures backtest (NUPL, MVRV Z-score, CVDD), ScienceDirect S0275531926002138 (2013–2025).
10. CryptoSlate (2025-11) — BTC–DXY returns vs levels: ~0.04 same-day, ~−0.20 best 33-day lead, vs −0.58 spurious level correlation.

Use of AI & feedback. Artificial intelligence was used in the creation of this report; all methodology and data integrity have been reviewed and approved by a professional. Direct feedback to CIO Keyth Beck, keyth@ton618capital.com. **Version** 1.4 · analyst: TON618 Empirical Research.