The Van Vliet Bitcoin Price Conjecture

Mining Economics and the Monetary Premium

A production-anchor framework for interpreting Bitcoin as a scarce monetary commodity whose long-run valuation is shaped jointly by mining economics and monetary demand.

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Abstract

This paper advances the Van Vliet Bitcoin Price Conjecture: that Bitcoin's long-run market value is anchored by a rising marginal cost of production, while its traded price reflects a variable monetary premium above or below that anchor. Bitcoin does not trade permanently above production cost, nor does production cost mechanically determine market price at every moment. Rather, price and mining expenditure interact dynamically through miner entry, miner exit, and difficulty adjustment.

The conjecture holds that Bitcoin's production anchor rises over time because the block subsidy is halved approximately every four years, compressing new issuance and reducing the amount of bitcoin earned per unit of computational work. Unless this decline in subsidy is fully offset by lower operating costs, greater hardware efficiency, or higher transaction-fee revenue, the breakeven BTC price required to sustain mining must increase.

At the same time, Bitcoin often trades materially above this anchor because it is also capitalized as a scarce monetary asset. That premium is shaped by adoption, liquidity, store-of-value demand, macroeconomic instability, and fiat-currency debasement. The model proposed here therefore treats Bitcoin as neither purely speculative nor purely cost-driven, but as a monetized digital commodity whose long-run valuation is jointly shaped by mining economics and monetary demand.

At the center of this thesis is a simple analytical framework:

$$P_t = P_t^* \times M_t$$

where P_t denotes market price, P_t^* the production anchor, and M_t the monetary premium.

1. Introduction

Bitcoin is a monetary network with a fixed terminal supply of 21 million coins and a deterministic issuance schedule enforced through proof-of-work. New bitcoin enters circulation only through block production, and the subsidy paid to miners is reduced by half approximately every 210,000 blocks. This recurring halving mechanism makes Bitcoin fundamentally different from fiat currency systems, whose supply can be expanded discretionarily, and from most physical commodities, whose annual supply can respond more flexibly to price.

At the time of writing, the network is approaching the mining of its 20 millionth coin. More than 95% of all bitcoin that will ever exist is already in circulation, which means future halvings affect an increasingly small flow of new supply against an increasingly large stock of outstanding coins. That late-stage supply condition matters because each halving reduces subsidy revenue while leaving miners exposed to real-world costs such as electricity, capital expenditure, maintenance, labor, and cooling.

The central claim of this paper is that Bitcoin's price is best understood through two interacting components: a production anchor and a monetary premium. The production anchor is the breakeven zone implied by mining economics. The monetary premium is the value the market assigns to Bitcoin because it is held not merely as newly produced supply, but as a scarce monetary asset.

Satoshi Nakamoto captured the heart of this relationship in 2010 when he wrote that the price of a commodity tends to gravitate toward the cost of production. That insight remains foundational here, but this paper refines it in an important way: Bitcoin's cost anchor is dynamic, not static; and as new issuance becomes a smaller share of outstanding supply, the market's willingness to capitalize Bitcoin as a monetary good matters increasingly.

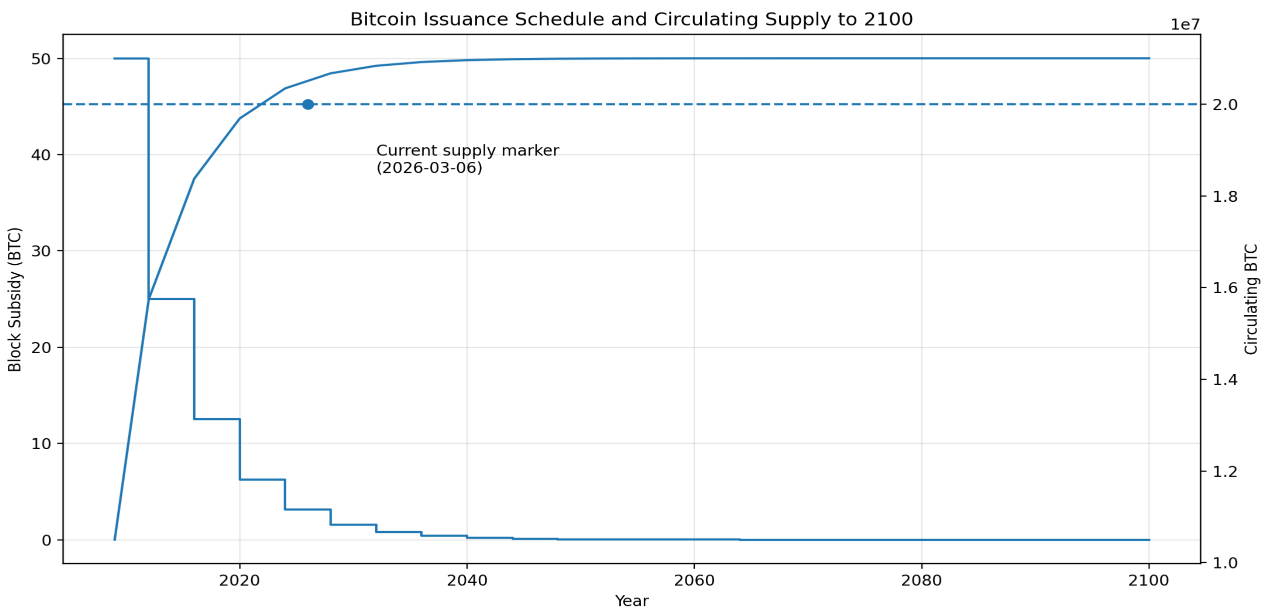

Figure 1. Bitcoin issuance schedule and circulating supply to 2100. The block subsidy halves approximately every four years while cumulative supply asymptotically approaches 21 million BTC.

The analysis proceeds in four steps. It first defines Bitcoin's production anchor through the economics of mining, then shows why halvings impart an upward structural bias to that anchor, next explains how difficulty adjustment restores equilibrium when price falls below sustainable cost, and finally situates Bitcoin's market valuation within a broader monetary premium shaped by adoption, liquidity, and fiat debasement.

Table 1. Bitcoin block rewards and circulating supply schedule to 2100.

Approx. Year	Block Subsidy (BTC)	Approx. Circulating BTC	% of 21M Mined
2009	50	10,500,000.00	50
2012	25	15,750,000.00	75
2016	12.5	18,375,000.00	87.5
2020	6.25	19,687,500.00	93.75
2024	3.125	20,343,750.00	96.88
2028	1.5625	20,671,875.00	98.44
2032	0.78125	20,835,937.50	99.22
2036	0.390625	20,917,968.75	99.61
2040	0.195312	20,958,984.38	99.8
2044	0.0976562	20,979,492.19	99.9
2048	0.0488281	20,989,746.09	99.95
2052	0.0244141	20,994,873.05	99.98
2056	0.012207	20,997,436.52	99.99
2060	0.00610352	20,998,718.26	>99.99%
2064	0.00305176	20,999,359.13	>99.99%
2068	0.00152588	20,999,679.57	>99.99%
2072	0.00076294	20,999,839.78	>99.99%
2076	0.00038147	20,999,919.89	>99.99%
2080	0.00019073	20,999,959.95	>99.99%
2084	9.537e-05	20,999,979.97	>99.99%
2088	4.768e-05	20,999,989.99	>99.99%
2092	2.384e-05	20,999,994.99	>99.99%
2096	1.192e-05	20,999,997.50	>99.99%
2100	5.96e-06	20,999,998.75	>99.99%

2. Production Anchor and the Economics of Mining

Bitcoin mining is a competitive industrial process that converts electricity, capital, and computational effort into probabilistic access to new coin issuance and transaction-fee revenue. To produce bitcoin, miners must acquire and operate specialized hardware, secure power contracts, maintain facilities, fund cooling systems, and absorb depreciation and financing costs. Unlike fiat issuance, which can be expanded through policy decision, Bitcoin issuance is costly by design.

For this reason, the relevant economic reference point is not simply the historical market price of bitcoin, but the marginal cost of production faced by miners at the edge of profitability. This is the cost level at which an efficient marginal operator can continue mining without persistent economic loss. It is this level that this paper refers to as the production anchor.

A useful first-pass breakeven expression is given below. It is intentionally simple, but it captures the essential economics: miners must cover energy, operating, and capital costs using a combination of subsidy revenue and transaction-fee revenue. Any decline in subsidy must be offset by lower cost, higher fee income, or a higher BTC/USD price.

Breakeven production anchor formula:

$$P_t^* = \frac{E_t + O_t + K_t}{B_t + F_t}$$

Where P_t^* is the implied breakeven BTC price; E_t is energy cost; O_t is operating cost; K_t is capital cost amortization; B_t is expected block-subsidy revenue; and F_t is expected fee revenue.

The production anchor is not a fixed number. It is an emergent threshold shaped by block subsidy, transaction-fee income, energy cost, capital and operating costs, and difficulty-adjusted competition among miners. When price trades materially above sustainable production cost, mining expands and the cost base is bid upward. When price falls materially below sustainable cost, weaker miners shut down, hashrate weakens, and later difficulty adjustments lower the effective marginal cost for surviving operators.

This dynamic is broadly consistent with Nakamoto's own description of Bitcoin's mining economics. Importantly, Nakamoto also recognized that the direction of causality would evolve as Bitcoin matured:

"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."

3. Halvings and the Rising Production Anchor

A recurring mistake in Bitcoin valuation is to treat mining cost as though it were static. It is not. The protocol reduces block subsidy by half approximately every four years. This means that the amount of bitcoin earned for a given quantity of work declines structurally over time. If real-world costs do not fall proportionally, the breakeven BTC price required to sustain mining must rise.

This can be stated more directly as a proportional relationship between the cost base and the revenue available from subsidy and fees. Lower subsidy raises breakeven price. Higher energy cost raises breakeven price. Higher difficulty raises breakeven price. Greater fee yield lowers subsidy dependence. Better hardware efficiency relieves some pressure, but only partially.

Stylized proportional relationship:

$$P_t^* \propto \frac{Cost\ Base_t}{Subsidy_t + Fee\ Yield_t}$$

This is why the production anchor should not be modeled as flat over long periods. Even if mining hardware becomes more efficient, efficiency gains tend to exhibit diminishing marginal returns over time, while miners remain exposed to rising energy prices, operating expenses, and regulatory costs.

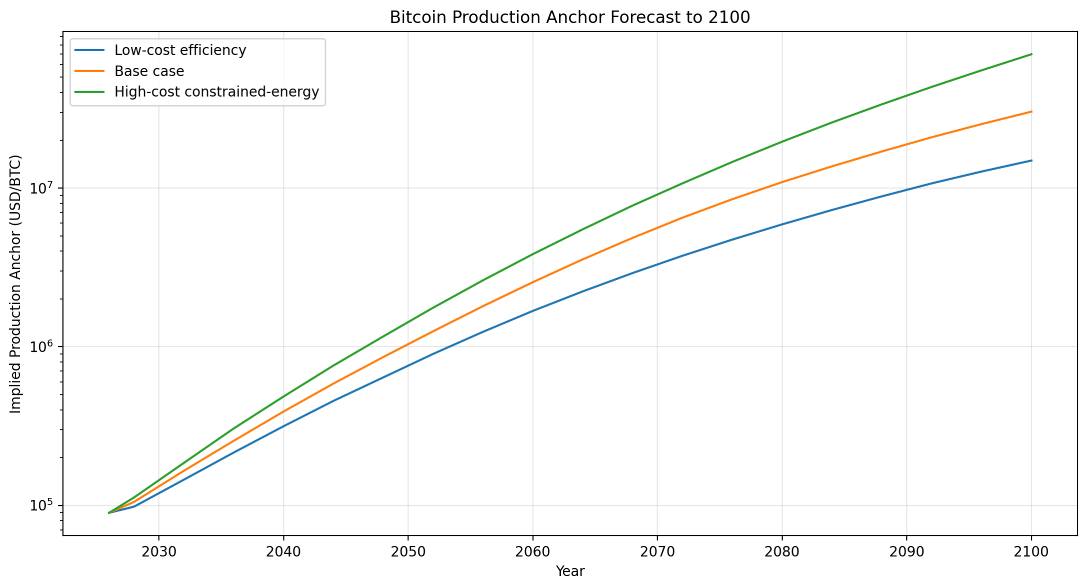

Figure 2. Bitcoin production anchor forecast to 2100. The figure models a rising breakeven zone under low-cost, base-case, and high-cost mining regimes. Table 3 below summarizes the halving effect, fee offset, and efficiency-relief assumptions used to construct the curve.

Table 2. Scenario production anchor forecasts to 2100.

Year	Low-Cost Efficiency Anchor (USD/BTC)	Base-Case Anchor (USD/BTC)	High-Cost Constrained-Energy Anchor (USD/BTC)
2026	89643	89643	89643
2028	98000	105000	112000
2032	145000	165000	185000
2036	215000	255000	305000
2040	315000	390000	485000
2044	455000	585000	760000
2048	640000	860000	1160000
2052	900000	1250000	1760000
2056	1240000	1800000	2620000
2060	1680000	2550000	3830000
2064	2230000	3550000	5490000
2068	2910000	4850000	7750000
2072	3740000	6500000	10700000
2076	4730000	8500000	14600000
2080	5900000	10900000	19600000
2084	7270000	13700000	25900000
2088	8860000	17000000	33700000
2092	10700000	20900000	43400000
2096	12700000	25300000	55200000
2100	14900000	30300000	69700000

These long-horizon projections should be read as structurally illustrative rather than precise forecasts, particularly beyond mid-century, where major changes in ASIC efficiency, energy-market structure, or fee-market depth could materially alter the path of the production anchor.

Table 3. Production-anchor assumptions by era: halving effect, fee offset, and efficiency relief.

Era	Subsidy Compression	Fee Offset	Efficiency Relief	Interpretation
2026–2028	3.125 → 1.5625	5–6%	High	Observed anchor near $89.6k
2028–2036	1.5625 → 0.3906	6–8%	Moderate	Halving dominates, efficiency still helps
2036–2048	0.3906 → 0.0488	8–14%	Moderate-low	Diminishing ASIC gains
2048–2060	0.0488 → 0.0061	14–18%	Low	Fees matter more, subsidy tiny
2060–2100	0.0061 → 0.000006	18–22%	Very low	Late-stage fee-sensitive regime

4. Temporary Undershoots and Difficulty Re-Equilibrium

A rising production anchor does not imply that Bitcoin's market price cannot trade below cost. In practice, it does. This is not a contradiction of the conjecture, but part of the mechanism. The production anchor should therefore be understood not as a hard floor, but as a dynamic breakeven zone around which market price oscillates.

When price rises materially above the anchor, mining profitability expands. New capital enters the network, more machines are deployed, total hashrate increases, and the protocol responds by raising difficulty. When price falls below the anchor, the opposite unfolds: inefficient miners reduce output or shut down, hashrate declines, and later difficulty adjustments reduce the computational burden required to earn block rewards. This lowers the effective marginal cost for the remaining miners and re-establishes a new breakeven zone.

Dynamic feedback representation:

$$\Delta H_t = f(P_t - P_t^*)$$

$$\Delta D_t = g(\Delta H_t)$$

$$P_{t+1}^* = h(E_t, O_t, K_t, B_t, F_t, D_{t+1})$$

Where:

H_t= network hashrate
D_t= mining difficulty
P_t= market price
P_t^*= production anchor
E_t, O_t, K_t= energy, operating, and capital costs
B_t, F_t= subsidy and fee revenue

The interpretation is straightforward. The gap between market price and production anchor affects miner participation. Miner participation affects hashrate. Hashrate affects difficulty. Difficulty then feeds back into the next period's production anchor.

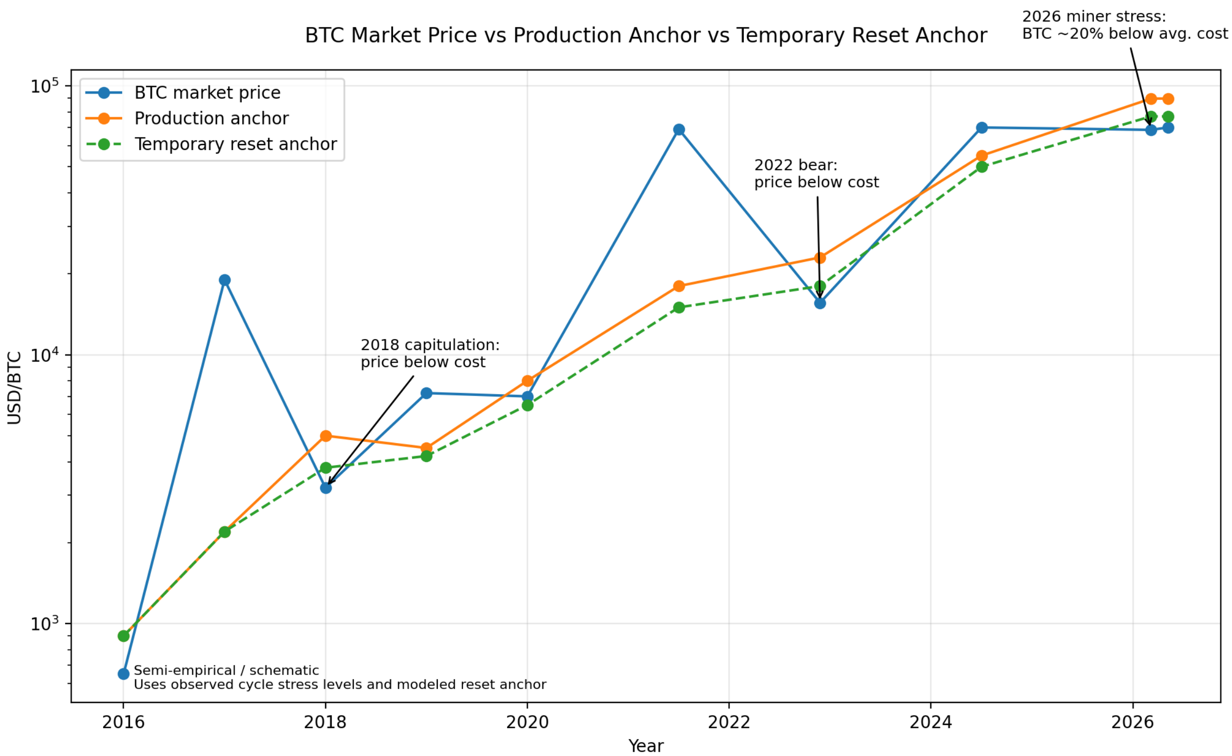

Figure 3. BTC market price vs production anchor vs temporary reset anchor. Price can undershoot the production anchor temporarily; after weaker miners exit and difficulty resets lower, a new temporary reset anchor breakeven zone can emerge.

Table 4. Semi-empirical stress episodes showing price relative to production anchor and temporary reset anchor.

Approx. Date / Episode	BTC Market Price (USD)	Observed / Modeled Production Anchor (USD)	Temporary Reset Anchor (USD)
Dec. 2018 capitulation	~3,160	~5,000	~3,800
Jun. 2019 recovery	~ 7,200	~4,500	~4,200
Mar. 2020 COVID shock	~4,000	~8,000	~6,500
Nov. 2021 cycle peak	~69,000	~18,000	~15,000
Nov. 2022 cycle low	~15,625	~20,000	~18,000
Mar. 2024 new all-time high	~69,325	~55,000	~50,000
Feb.–Mar. 2026 miner-stress episode	~$66,456 to ~$72,670	89,643	~77,800*

Note: Table 4 is episode-based rather than annual. Market-price values are approximate cycle or stress markers. Production-anchor values prior to 2026 are semi-empirical modeled estimates used to illustrate miner-price re-equilibrium and should not be interpreted as exact daily observations. The 2026 production anchor of 89,643 is based on MacroMicro's published average mining-cost estimate on 2026-03-05.

* The temporary reset anchor for the 2026 episode is modeled under the simplifying assumption that the short-run production anchor scales proportionally with difficulty, holding energy prices, hardware efficiency, and non-electric operating costs constant.

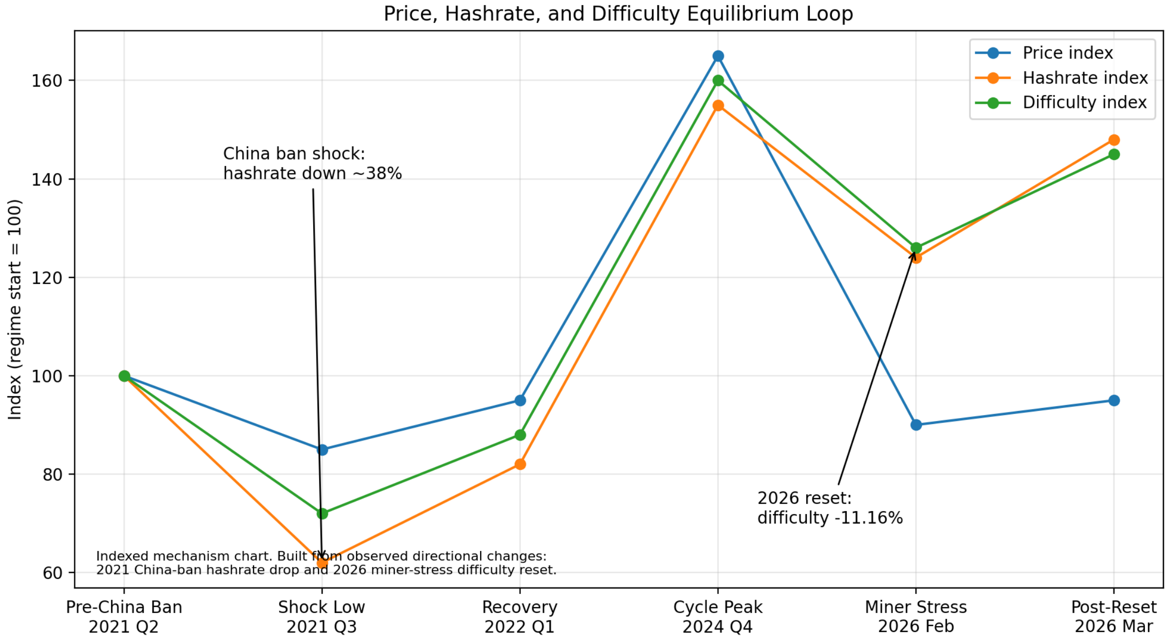

Figure 4. Price, hashrate, and difficulty equilibrium loop. The chart visualizes how miner participation and difficulty re-equilibrate after sharp changes in price or mining profitability.

Table 5. Historical equilibrium episodes and their implications for miner-price correlation.

Episode	Market condition	Price vs anchor	Miner response	Difficulty effect
2014–2015 bear	Post-bubble bear	Near / below cost	Weaker miners exit	Cost resets lower
Late 2018 capitulation	Deep capitulation	Below cost	Shutdowns intensify	Adjustment reduces pressure
2021 China mining exodus	Forced geographic shock	Dislocated vs cost	Relocation / temporary shutdown	Temporary collapse then recovery
2022 deleveraging bear	Macro tightening + miner stress	Near / below cost	High-cost miners stressed	Later normalization
2026 miner-stress episode	Price materially below avg. cost	Below cost	Machines turned off	Difficulty reset lowered burden

5. Demand, Adoption, and the Monetary Premium

Production economics alone cannot explain Bitcoin's market price. If they could, Bitcoin would spend most of its life trading near cost. It does not. Bitcoin often trades at a substantial premium to its production anchor because market participants are not merely purchasing newly produced supply. They are capitalizing Bitcoin as a scarce monetary asset.

The resulting premium reflects store-of-value demand, institutional portfolio allocation, macro hedge demand, treasury reserve demand, reduced liquid float, and expectations regarding Bitcoin's future monetary role. Once most coins have already been mined and new issuance becomes a small percentage of total supply, the outstanding stock of bitcoin and the desire to hold it matter more than the flow of freshly produced units.

Premium multiple:

$$M_t = \frac{P_t}{P_t^*}$$

Where:

M_t= monetary premium multiple
P_t= market price
P_t^*= production anchor

So that:

$$P_t = P_t^* \times M_t$$

In this framework, the premium multiple should be interpreted as the market's capitalization of Bitcoin's expected future monetary relevance. If that is correct, then evidence of accelerated adoption, institutionalization, and expanding access is directly relevant to the behavior of M_t. One useful demand-side signal in this respect comes from BlackRock's public-facing digital-asset framing. BlackRock does not provide a precise long-range price forecast, but it has emphasized that crypto reached 300 million users faster than the internet and mobile phones, implying that digital-asset adoption is diffusing through the global economy at an unusually rapid pace.

This matters not because BlackRock determines Bitcoin's value, but because institutional adoption changes the size, durability, and legitimacy of the market willing to pay above production cost. If Bitcoin is increasingly treated as an investable monetary asset rather than a fringe speculative instrument, then a persistent premium above the production anchor becomes easier to explain. Figure 5 and Table 6 provide stylized support for this demand-side interpretation.

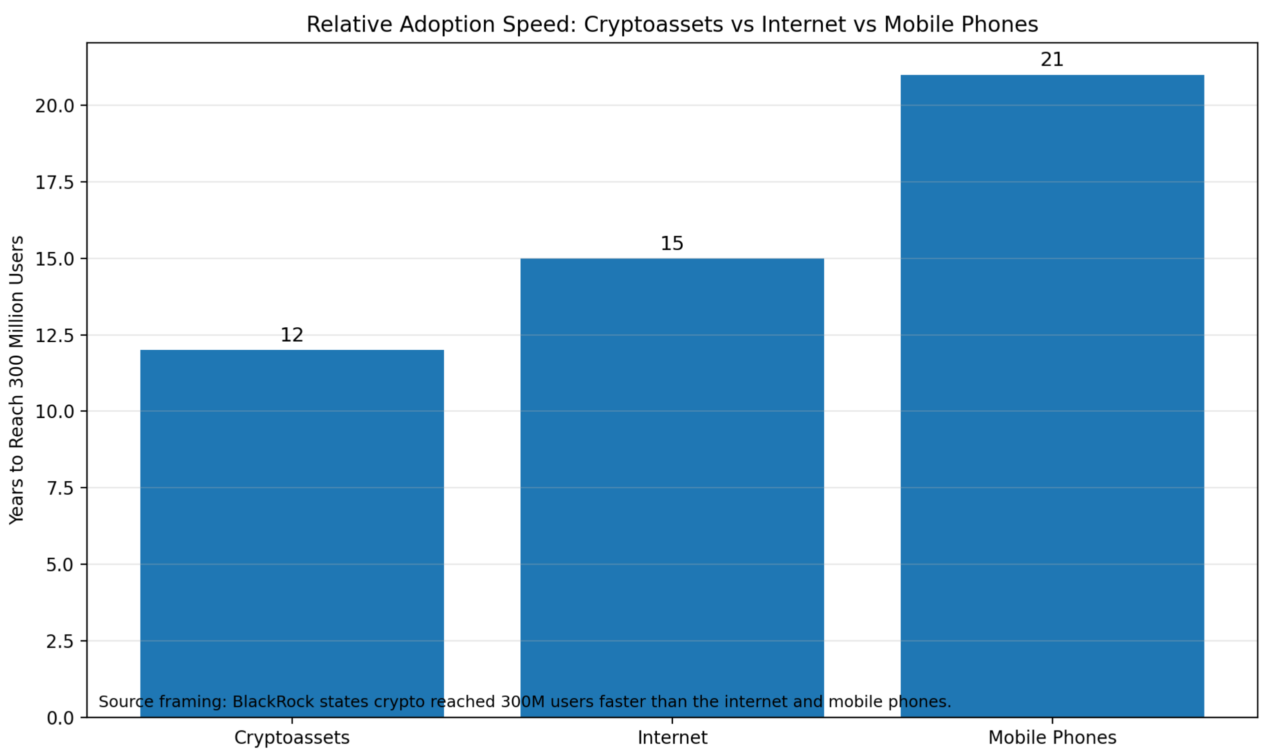

Figure 5. Relative adoption speed: crypto versus the internet and mobile phones. The figure is used as an adoption signal rather than a direct price forecast.

Table 6. Monetary premium scenarios and their interpretation.

Scenario	Premium multiple	Interpretation
Distress / capitulation	0.8x–1.0x	Price can trade near or slightly below anchor temporarily
Mature base case	1.5x–2.5x	Bitcoin behaves like a monetized scarce asset
Strong adoption premium	3.0x–5.0x	Broad institutional / retail monetization
Late-stage monetary premium	5.0x–8.0x	Reserve-grade collateral or globally recognized store of value

A complete demand-side account must also consider the evolution of miner revenue composition. As subsidy declines, transaction fees become increasingly important at the margin in sustaining the production anchor. This does not eliminate the relevance of production cost; it changes the structure through which production cost is financed over time. In later subsidy regimes, the viability of the anchor depends less exclusively on newly issued bitcoin and more on the interaction between fee-paying settlement demand and the market value of the asset itself.

Accordingly, the premium side of the conjecture should not be interpreted only as a capitalization of expected future holding demand. It may also reflect expectations about the future depth and persistence of Bitcoin's fee market. A brief set of fee-market evolution notes is included in Appendix B to clarify this relationship and to situate the production anchor within Bitcoin's longer-run transition from subsidy-dominant to more fee-sensitive miner economics.

6. Nominal vs. Real Value

One of the most important distinctions in this paper is the difference between Bitcoin's nominal price and its real value. A future BTC/USD price that appears extraordinarily high in dollar terms does not necessarily imply an equivalent increase in real purchasing power. Part of nominal appreciation may reflect Bitcoin becoming more valuable in real terms, but part may also reflect the declining purchasing power of the fiat currencies used to quote it.

The stronger claim here is not simply that Bitcoin goes up. It is that Bitcoin can become increasingly stable in real monetary terms even while continuing to appreciate in nominal fiat terms. If the production anchor rises, if the premium persists or expands, and if fiat currencies continue to depreciate over long horizons, then a widening gap between nominal and real BTC value is not only plausible but expected.

Inflation adjustment:

$$P_t^{real} = \frac{P_t^{nominal}}{(1 + \pi)^{t - t_0}}$$

Where:

P_t^{real}= Bitcoin's value in constant base-year dollars
P_t^{nominal}= Bitcoin's nominal quoted price
π= inflation or fiat-debasement assumption
t_0= base year

Using the production-anchor framework, nominal Bitcoin value can be written as:

$$P_t^{nominal} = P_t^* \times M_t$$

Thus:

$$P_t^{real} = \frac{P_t^* \times M_t}{(1 + \pi)^{t - t_0}}$$

These equations distinguish between Bitcoin's nominal fiat expression and its inflation-adjusted real value. The distinction is necessary because a rise in BTC/USD over long horizons need not represent a one-for-one rise in real purchasing power. Instead, nominal appreciation may reflect both genuine repricing of Bitcoin as a monetary asset and depreciation in the fiat unit used to quote it.

This distinction is central to one of the paper's more original claims. Bitcoin's nominal price may rise sharply over time because three things can occur simultaneously: the production anchor can rise through halving-driven subsidy compression, the monetary premium can expand through adoption and macro-monetary demand, and fiat currencies can lose purchasing power, requiring more currency units to express the same real value.

For that reason, a very high future BTC/USD price should not be interpreted simplistically. It may reflect genuine real appreciation, but it may also partly reflect fiat debasement. In this sense, the nominal BTC/USD path can become visually dramatic while the inflation-adjusted real-value path rises more gradually. The conjecture is therefore not merely that "Bitcoin goes up," but that Bitcoin may become increasingly stable in real monetary terms even while continuing to appreciate in nominal fiat terms. If the production anchor rises, if the premium persists, and if fiat currencies continue to depreciate over long horizons, then a widening gap between nominal and real BTC value is not only plausible but expected.

In the working model, a 3% annual debasement assumption is used as a conservative reserve-currency baseline. This should be treated as a modeling variable rather than a law of nature. At present, the U.S. dollar still dominates global reserve use, accounting for roughly 58% of disclosed official foreign-exchange reserves in 2024, compared with around 20% for the euro, 6% for the yen, and 5% for the pound. That makes the dollar a reasonable base currency for first-pass modeling, but not an eternal constant. A long-horizon Bitcoin analysis should remain open to the possibility that future fiat conditions differ materially from those of the present reserve order.

Accordingly, the inflation adjustment used here should be understood as illustrative rather than definitive. A more complete long-horizon version of the model could replace the U.S.-dollar-only assumption with a weighted reserve-currency basket or a broader purchasing-power index. For present purposes, however, the 3% long-run base case is sufficient to demonstrate the central point: a substantial portion of Bitcoin's future nominal appreciation may reflect depreciation in the quoting unit rather than an equivalent rise in real value alone.

Figure 6 and Table 7 illustrate this distinction by projecting nominal and inflation-adjusted Bitcoin values under the production-anchor-plus-premium framework.

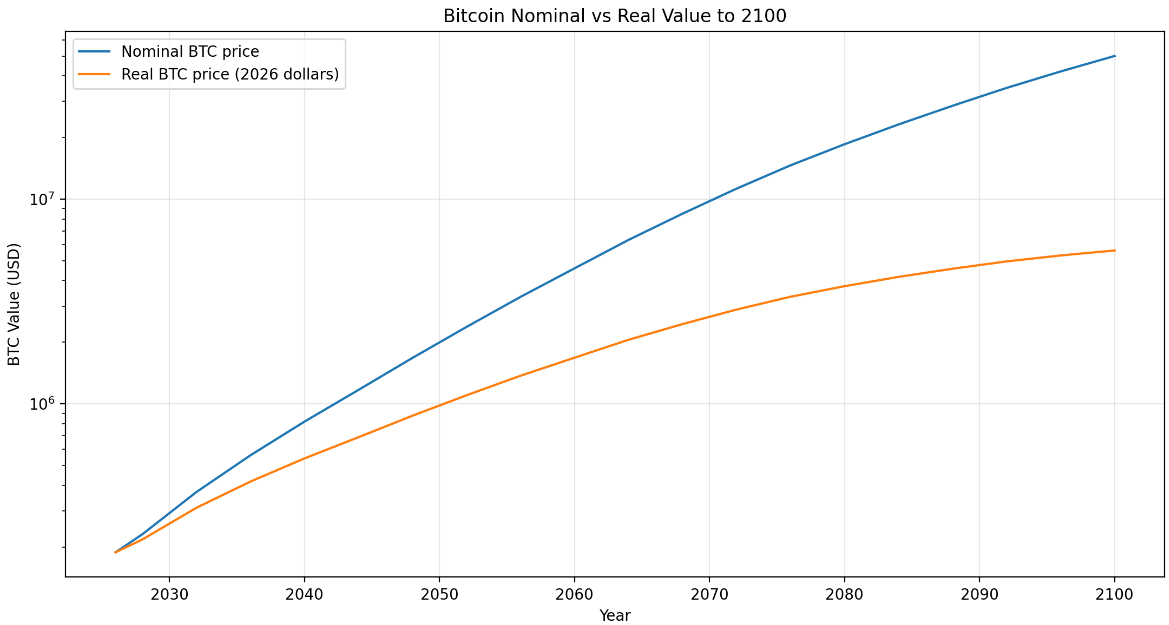

Figure 6. Bitcoin nominal vs real value to 2100 under the production-anchor-plus-premium framework. The chart distinguishes genuine monetary repricing from fiat-currency debasement.

Table 7. Nominal vs real BTC value scenarios to 2100 under the base-case production anchor and premium path.

Year	Production Anchor (USD/BTC)	Premium Multiple	Nominal BTC Price (USD)	Real BTC Price in 2026 Dollars (3% inflation assumption)
2026	89,643.00	2.10	188,250.00	188,250.00
2028	105,000.00	2.20	231,000.00	217,740.00
2032	165,000.00	2.25	371,250.00	310,916.00
2036	255,000.00	2.20	561,000.00	417,437.00
2040	390,000.00	2.10	819,000.00	541,455.00
2044	585,000.00	2.00	1,170,000.00	687,252.00
2048	860,000.00	1.95	1,677,000.00	875,214.00
2052	1,250,000.00	1.90	2,375,000.00	1,101,275.00
2056	1,800,000.00	1.85	3,330,000.00	1,371,916.00
2060	2,550,000.00	1.80	4,590,000.00	1,680,146.00
2064	3,550,000.00	1.78	6,319,000.00	2,055,104.00
2068	4,850,000.00	1.75	8,487,500.00	2,452,541.00
2072	6,500,000.00	1.73	11,245,000.00	2,887,002.00
2076	8,500,000.00	1.72	14,620,000.00	3,334,926.00
2080	10,900,000.00	1.70	18,530,000.00	3,755,479.00
2084	13,700,000.00	1.69	23,153,000.00	4,169,157.00
2088	17,000,000.00	1.68	28,560,000.00	4,569,306.00
2092	20,900,000.00	1.67	34,903,000.00	4,961,419.00
2096	25,300,000.00	1.66	41,998,000.00	5,304,237.00
2100	30,300,000.00	1.65	49,995,000.00	5,610,117.00

Note: Table 7 uses a modeled premium path rather than a fixed premium multiple. The implied premium multiple begins above 2.0 in the early forecast years and then gradually compresses over time, reflecting a working assumption that Bitcoin may continue to trade at a substantial monetary premium above the production anchor while that premium becomes less extreme as the asset matures. The path is illustrative rather than deterministic and is intended to provide a transparent baseline for comparing nominal and inflation-adjusted real-value trajectories.

7. Formal Statement of the Van Vliet Bitcoin Price Conjecture

The Van Vliet Bitcoin Price Conjecture proposes that Bitcoin's long-run market value is best understood as the interaction of two analytically distinct but economically interdependent components: a production anchor and a monetary premium.

The production anchor is the breakeven zone implied by mining economics under prevailing conditions of subsidy, fees, energy cost, capital expenditure, and difficulty-adjusted competition. The monetary premium is the valuation the market assigns above or below that anchor because Bitcoin is not priced solely as a produced unit of output but also capitalized as a scarce monetary asset.

The conjecture can therefore be expressed in two linked equations.

Equation 1. Breakeven production anchor

$$P_t^* = \frac{E_t + O_t + K_t}{B_t + F_t}$$

Equation 2. Market price as anchor times premium

$$P_t = P_t^* \times M_t$$

Formal statement:
Bitcoin's long-run market price converges around a rising production anchor shaped by block-subsidy reduction, mining difficulty, transaction-fee income, and real-world operating costs, while its traded price diverges above or below that anchor according to adoption, liquidity, macroeconomic demand, and monetary confidence. When market price rises materially above sustainable production cost, mining expands, hashrate increases, and difficulty bids the anchor upward toward price. When market price falls materially below sustainable cost, inefficient miners exit, hashrate weakens, and later difficulty adjustments lower marginal production cost until a new breakeven equilibrium emerges. Over time, halvings structurally raise the production anchor, while the monetary premium reflects the market's willingness to capitalize Bitcoin as a scarce monetary asset.

This conjecture is broadly consistent with Nakamoto's own early description of Bitcoin's price-production relationship:

> *"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." — Satoshi Nakamoto*

8. Implications

The Van Vliet Bitcoin Price Conjecture carries implications for several distinct audiences.

For investors, the conjecture suggests that Bitcoin should not be evaluated solely as a speculative growth asset. It may also be understood as a produced monetary commodity with a rising cost structure and a variable premium above that structure. In this framework, the production anchor offers one way to interpret periods of miner stress, apparent undervaluation, or cyclical dislocation, while the premium multiple offers a way to think about adoption-driven repricing and monetary revaluation over longer horizons.

For miners, the conjecture formalizes what operations already experience in practice: profitability is jointly determined by block subsidy, fee revenue, energy cost, capital efficiency, and market price. Mining economics are not governed by price alone, but by the spread between realized revenue and full-stack production cost. As subsidy declines, the importance of fee revenue, cost discipline, and capital efficiency becomes correspondingly greater.

For policymakers and researchers, the conjecture provides a framework for thinking about Bitcoin that is neither purely ideological nor purely speculative. It treats Bitcoin as an economic system with measurable industrial inputs and monetary outputs, and therefore as a subject that can be studied through the interaction of issuance, cost, demand, and market structure. In this respect, the conjecture invites a more integrated treatment of Bitcoin as both a production system and a monetary asset.

9. Directions for Further Research

Several extensions of this framework remain open for future work. One important direction would be the more explicit empirical estimation of the full-stack production anchor using jurisdictional energy prices, machine-level efficiency data, public miner disclosures, and observed fee-share dynamics. A second would be deeper historical study of miner-capitulation and re-equilibrium episodes, including late 2018, the 2021 China mining exodus, the 2022 miner deleveraging cycle, and the 2026 miner-stress episode.

Further work is also needed on the evolution of the fee market under declining subsidy, particularly with respect to fee sufficiency across different adoption regimes and the sensitivity of miner economics to base-layer settlement demand. On the demand side, the monetary premium could be modeled more rigorously through proxies such as ETF flows, long-term holder supply, inactive or lost coin estimates, sovereign adoption, treasury reserve behavior, and cross-asset hedge demand. Finally, the real-value component of the model could be extended by replacing the present single-currency inflation adjustment with a reserve-currency basket or broader purchasing-power framework.

10. Conclusion

This thesis has argued that Bitcoin’s long-run market value is best understood through the interaction of a rising production anchor and a variable monetary premium. The production anchor emerges from the economics of mining: energy expenditure, operating cost, capital intensity, fee income, block subsidy, and difficulty-adjusted network competition. The monetary premium emerges from the market’s willingness to capitalize Bitcoin as a scarce, non-sovereign monetary asset.

Bitcoin is not simply a speculative price series disconnected from real-world constraints. Proof-of-work ensures that new supply is costly to create, while the halving schedule ensures that the subsidy earned for that work declines over time. For that reason, the breakeven cost of sustaining the network cannot remain flat across eras unless one assumes extraordinary offsetting efficiency gains or unusually deep fee replacement. The production anchor should therefore rise over time.

At the same time, Bitcoin is not reducible to production cost alone. Market price frequently trades well above mining cost because holders value Bitcoin for reasons that extend beyond immediate industrial economics. Adoption, liquidity, macroeconomic instability, institutional normalization, and fiat-currency weakness can all expand the premium above the anchor. Bitcoin's market value is therefore not explained by mining alone, but neither is mining irrelevant to price formation. The central contribution of this thesis is to provide a framework in which those two dimensions can be analyzed jointly rather than in isolation.

If the conjecture is broadly correct, then Bitcoin's long-run history will not be one of random appreciation, but of repeated re-equilibrium around a structurally rising production anchor, punctuated by waves of demand that expand or compress the premium above it. Its nominal fiat price may continue to rise sharply over time, but the more important development may be that Bitcoin becomes increasingly intelligible as a monetary asset in real, rather than merely nominal, terms. Under this view, Bitcoin's future valuation should be understood not merely as a matter of speculation, but as the continuing negotiation between the cost of producing new supply and the market's willingness to hold the existing stock as money.

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Appendix A. Historical Re-equilibrium Notes

The historical record supports the conjecture's central claim that Bitcoin can trade below production cost temporarily without invalidating the production-anchor framework. During the late-2018 capitulation, the 2021 China-ban shock, the 2022 miner deleveraging cycle, and the 2026 miner-stress episode, market price moved near or below estimated breakeven levels for meaningful portions of the mining sector. In each case, miner economics deteriorated, weaker operators were forced out or forced to relocate, and the network later rebalanced through changes in hashrate, mining geography, difficulty, or some combination of all three.

These episodes matter because they show that the conjecture does not depend on a naïve hard-floor claim. The more defensible interpretation is that Bitcoin repeatedly oscillates around a moving breakeven zone. The production anchor can be violated in the short run, but miner shutdowns, hashrate contraction, geographic redistribution, and difficulty adjustment together provide the restoring mechanism that eventually pulls cost and price back toward one another.

Appendix B. Fee-Market Evolution Notes

Bitcoin's fee market remains small relative to total miner revenue under ordinary network conditions, but its strategic importance increases with each halving cycle. In Bitcoin's early eras, block subsidy overwhelmingly dominated miner income. In later eras, transaction fees increasingly influence how much security expenditure the network can sustain without requiring unrealistically low operating costs. Future production-anchor estimates are therefore sensitive not only to electricity prices, hardware efficiency, and difficulty, but also to the depth and persistence of base-layer settlement demand.

The practical implication is that fee growth should be understood as a partial offset rather than a complete escape hatch. A stronger fee market can slow the rate at which the production anchor rises, but it is unlikely to keep the anchor flat unless fees expand both substantially and persistently. For that reason, the main text treats fee share as a growing but incomplete offset to subsidy compression rather than as a full substitute for block-subsidy revenue.

Appendix C. Equation Formatting and Editing Note

The equations in this thesis are inserted as Microsoft Word Office Math objects so that they remain editable within Word. If a formula must be revised manually, press **Alt + =** to open an equation field, then enter the corresponding linear input form shown in Table 8.

Table 8. Word linear input forms for the principal equations used in the thesis.

Equation	Word Linear Input Form
Market price decomposition	P_t = P_t^* M_t
Breakeven production anchor	P_t^* = (E_t + O_t + K_t) / (B_t + F_t)
Anchor proportionality relation	P_t^* \propto CostBase_t/(Subsidy_t + FeeYield_t)
Premium multiple	M_t = P_t / P_t^*
Nominal price expression	P_t^(nominal) = P_t^* M_t
Real value adjustment	P_t^(real) = P_t^(nominal) / (1 + \pi)^(t - t_0)