LIGHTNING ECONOMICS

The Bridge Between Bitcoin's Two Identities

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SUMMARY

Capital deployed to the Lightning Network earns fee income through routing, turning over approximately 7x annually, a velocity matched by only the highest-turnover industries in traditional finance, with a documented 88x on dedicated routing capital, yet at zero leverage, where comparable returns in banking require 10x leverage. Professionally managed operators report 5-6% gross annualized returns. The deployed capital, transacted medium, and earned revenue are the same bitcoin, held by the same person, under the same custody. No property is surrendered. This report formalizes Lightning Routing Income (LRI) as the operational framework for native yield: the third category of Bitcoin treasury returns.

More than 190 public companies hold Bitcoin. For the vast majority, those holdings generate zero operational income. The dominant playbook requires capital markets access, mNAV above 1, and continuous issuance capability. At least 37 of the top 100 Bitcoin treasury companies now trade below net asset value. For most of the market, the only available return on self-custodied Bitcoin is price appreciation. Lightning Economics bridges that gap.

This report examines how Lightning generates returns through capital velocity, why Bitcoin is uniquely suited to this model, which properties must be preserved for yield to qualify as native, how infrastructure integrity is maintained as the network centralizes, and whether the growth trajectory is self-reinforcing. The analysis draws on peer-reviewed economic research, first-party node operating data, and the first published ROIC framework for Lightning-deployed capital.

KEY TERMS

Bitcoin
A digital currency with a permanently fixed supply of 21 million. It can be held directly by its owner, without an intermediary or financial institution.

Lightning Network
A protocol built on Bitcoin for fast, low-cost transactions. Rather than recording every transaction on Bitcoin's blockchain, Lightning routes payments through bilateral channels. Operators who facilitate payments earn fees.

Channel
A shared Bitcoin balance between two parties on Lightning. Payments flow instantly. Final settlement to Bitcoin's blockchain occurs when the channel closes.

Layer 2
Protocols built on top of Bitcoin's base layer to extend its capabilities.

BOLT
Basis of Lightning Technology. The open standard ensuring all Lightning software is interoperable.

INTRODUCTION

Bitcoin (BTC) on corporate balance sheets is no longer experimental. This is an emerging asset class where the strategies for productive deployment are still being developed. More than 190 public companies now hold Bitcoin, with approximately 1.16M BTC in corporate treasuries at the time of publication.[1] Companies like Block open-source their purchase execution and custody frameworks, establishing a culture of transparency around corporate Bitcoin adoption.[2] Yet the institutional infrastructure for making these holdings productive remains nascent. The question facing treasury professionals is no longer whether to allocate. Fidelity's own institutional research addresses that question.[3] The question is what the allocated capital does once it sits on the balance sheet. **For the vast majority of companies, the answer today is nothing.**

When a company enters the Bitcoin treasury space largely determines which playbook it adopts. Companies that held Bitcoin before the treasury company model emerged, primarily miners, defaulted to derivative yield: covered calls, basis trades, and lending relationships. Between 2020 and 2024, Strategy developed and refined the digital credit model, issuing equity, convertible debt, and preferred instruments against Bitcoin holdings to fund further accumulation. By the time the broader wave of treasury companies entered in 2024, it was the only institutional-grade playbook available. Strategy's execution has been extraordinary. Its capital structure now includes multiple preferred instruments with forward annual dividend obligations exceeding $1B, sustained by the expectation that BTC appreciation will outpace those obligations.[4] The model performs well under favorable conditions and it depends on those conditions continuing. Digital credit requires mNAV above 1, capital markets access, investor appetite for preferred equity, legal and banking infrastructure, continuous issuance capability, and demonstrable creditworthiness. Not all companies can meet these requirements, especially newer entrants still building market credibility. At least 37 of the top 100 Bitcoin treasury companies now trade below net asset value.[5] Strive's CEO disclosed that institutional participation in preferred equity required a minimum of $200M in issuance, with meaningful institutional appetite beginning above $500M.[6] At approximately $97,000 per bitcoin at disclosure, the threshold requires roughly 2,100 BTC to enter the digital credit market and over 5,100 BTC for full institutional participation. For most of the 190+ public companies holding Bitcoin, the dominant playbook is something they observe, not something they can execute. This is not a critique of any existing strategy. Each approach reflects the tools available at the time it was adopted. A third category, native yield, became viable in 2025 when the first companies demonstrated that recurring operational income could be earned directly from Bitcoin's own network infrastructure.

The institutional consensus since Burniske and White's 2017 classification has treated Bitcoin as a store of value (SoV).[7] That classification was correct at the time. It is now incomplete. The counter-argument, that Bitcoin should function as a medium of exchange (MoE) exists, but the debate assumes a choice must be made. The entire institutional conversation has been framed as SoV versus MoE, as if activating one requires surrendering the other. The Lightning Network resolves this binary. Not by choosing a side but by demonstrating that value storage and value transfer are economically unified through the same infrastructure. The same bitcoin that stores value in a channel earns income for the operator and facilitates economic activity for the sender. The two identities are not in opposition. They are mechanistically coupled. The Gordon Growth Model functions as a classification heuristic: when g is greater than zero, an asset works. Lightning makes g greater than zero. A company generating operational income from its Bitcoin holdings is a productive asset operator, not a holding company waiting for price appreciation. That distinction changes investor perception independent of mNAV.

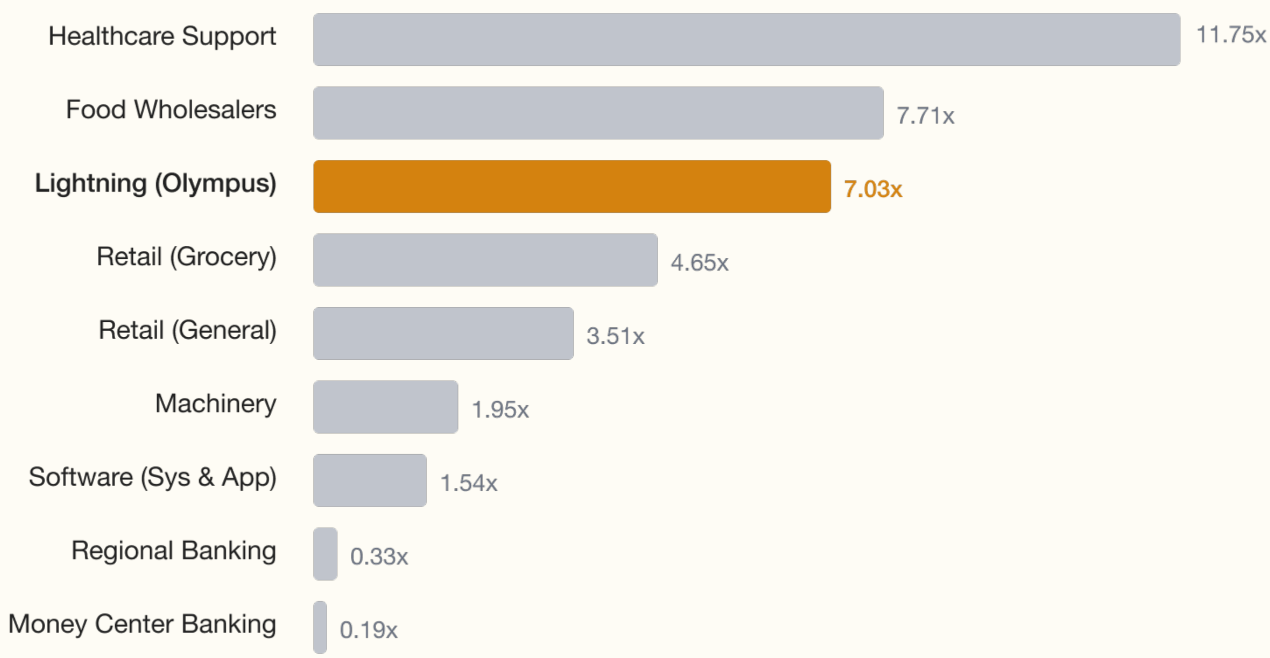
This report argues that the Lightning Network is the economic bridge between Bitcoin's two monetary functions. Capital velocity is the mechanism. The result is that Bitcoin becomes measurably productive without surrendering any of the properties that make it valuable. Bitcoin treasury companies have three distinct approaches to generating returns: digital credit, which issues instruments against holdings to fund accumulation; derivative yield, which uses financial overlays to generate income from price volatility; and native yield, which deploys capital to Bitcoin's own network infrastructure to earn operational income. TOBAM decomposed the return attribution for digital credit.[8] No equivalent framework for native yield has been published. This report formalizes that framework as Lightning Routing Income, or LRI. These categories are additive, not competing. The scope is returns on deployed treasury Bitcoin, not mining. The analysis examines how Lightning generates returns, why Bitcoin is uniquely suited to this model, which properties must be preserved, how infrastructure integrity is maintained at scale, and whether the growth trajectory is self-reinforcing. ZEUS, the author, operates Olympus, a routing node on the Lightning Network, and earns revenue from providing managed Lightning infrastructure to institutional clients. The analysis, sources, and limitations presented here are offered for the reader's independent evaluation; reported yields are not projections.

No published work connects capital velocity to ROIC decomposition, formalizes the property filter that distinguishes native yield from alternatives, or provides the decision framework for institutional deployment. This report proposes the economic framework for native yield from Bitcoin as a productive asset.

CAPITAL VELOCITY

Capital deployed to the Lightning Network cycles through productive use, generating a fee each time it routes a payment. The rate at which this cycling occurs, capital velocity, is the mechanism that makes Lightning economics work. Across independent measurements at network and node level, Lightning-deployed capital turns over approximately 7x annually, a rate matched by only the highest-turnover industries in the 94-industry Damodaran dataset and 21-37x faster than banking at 0.19-0.33x.[9] Capital velocity is not a return figure. It is one half of the return equation. The other half, the Effective Fee Rate earned on each turn, determines whether high velocity translates into high, low, or negative returns. As a category, Lightning does not look like traditional capital markets. As a mechanism, it maps to models the financial world already understands.

Figure 1: Capital Turnover by Industry



Source: Damodaran (January 2026), NYU Stern. Lightning estimate based on Olympus by ZEUS TTM operating data (Apr '25 - Mar '26). Damodaran measures Sales / Invested Capital; Lightning measures throughput / total deployed capacity.

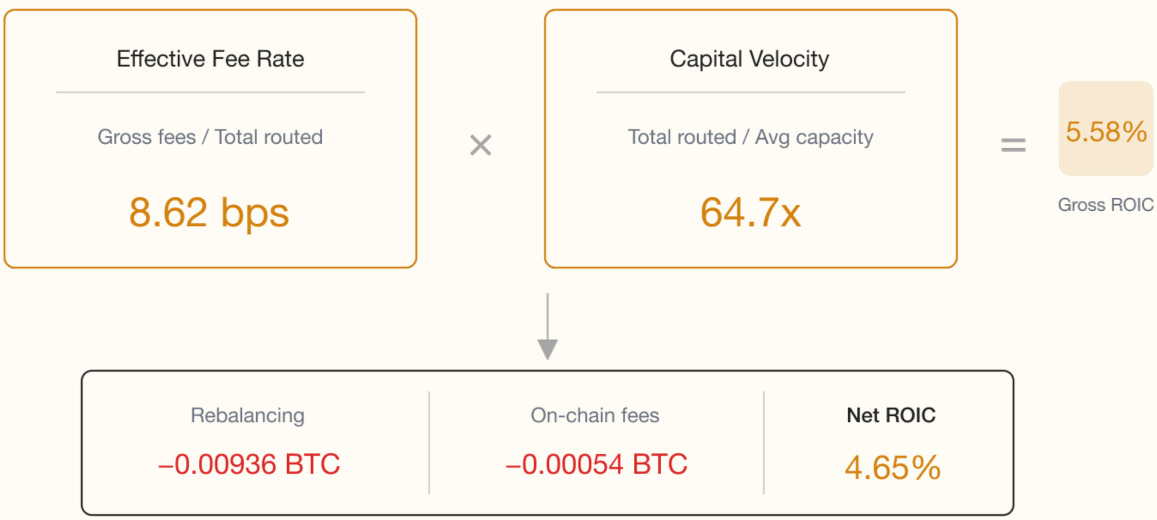
The structural parallel is precise but not identical. Damodaran's capital turnover measures how much revenue flows through each unit of invested capital across all industries. In traditional business, that revenue reflects goods purchased and sold or services delivered. In Lightning, payments route over capital locked in channels without consuming it. Both measure economic activity per unit of deployed capital per year, calculated the same way: throughput divided by total invested capital.

Olympus by ZEUS, a node with more than four years of operating history, has realized a 7.03x annualized capital turnover for the trailing twelve months through March 2026. This measures total payment throughput against the node's 10 BTC total deployed capacity, the same formula and denominator convention used in Damodaran's dataset. River's aggregated data, covering more than 50% of network capacity, calculated a 7:1 ratio using the same methodology at the network level.[10] The result is unrecognizable as a financial asset, which quickly diverts analysts from deeper examination. For clarity, capital velocity throughout this report refers to DuPont-style capital turnover, not Fisher's monetary velocity (MV=PT).

The ROIC decomposition that follows isolates the return on capital specifically allocated to routing. Olympus dedicates only approximately 1.09 BTC of its 10 BTC capacity to routing activity. On this narrower capital base, Olympus achieved 64.7x annualized velocity over the trailing twelve months, an order of magnitude above the 7x network average. The DuPont decomposition shows how thin fee margins compound through this velocity to produce the gross return.

Figure 2: Olympus ROIC Decomposition

1.09 Avg BTC deployed | 12 months | Measurement period: Apr 2025 to Mar 2026



Net ROIC = (Fees − Rebalancing − On-chain) / Avg Capacity, annualized

Source: Olympus by ZEUS operating data.

The quarterly decomposition of Olympus confirms the mechanism is stable across operating conditions. Over five quarters, the effective fee rate compressed from 17.9 bps to 6.8 bps while capital velocity on routing capital accelerated from 33x to 88x. Gross ROIC held between 5% and 6.4% across every quarter. The fee rate fell 62%. Velocity rose 162%. Returns were stable. On a trailing twelve-month basis, Olympus reports 5.58% gross ROIC at an effective fee rate of 8.62 bps and 64.7x capital velocity.

In the trailing twelve months, 69.52 BTC in payments routed through 1.09 BTC of deployed capital.

Figure 3: Olympus Quarterly ROIC Decomposition

Period	Effective Fee Rate	Capital Velocity	Gross ROIC	Net ROIC	Cost Ratio	BTC Routed
Q1 '25	17.92 bps	33.4x	5.98%	5.33%	10.9%	8.85
Q2 '25	14.05 bps	45.6x	6.41%	4.39%	31.6%	12.22
Q3 '25	9.43 bps	52.6x	4.96%	4.78%	3.7%	14.26
Q4 '25	6.81 bps	87.6x	5.97%	4.97%	16.7%	23.72
Q1 '26	6.80 bps	72.9x	4.96%	4.47%	9.8%	19.32
TTM	**8.62 bps**	**64.7x**	**5.58%**	**4.65%**	**16.5%**	**69.52**

TTM covers Q2 2025 through Q1 2026; Q1 2025 shown for trend context.

Source: Olympus by ZEUS operating data. Capital velocity annualized and measured on routing-allocated capacity only (1.09 BTC).

The word that follows these numbers requires precision: yield. In financial economics the definition is precise and consistent across asset classes. Bond coupon yield: income generated by deployed capital, principal intact. Dividend yield: same structure, recurring income from a capital position without liquidating the underlying. The FDIC defines yield on earning assets as total interest, dividend, and fee income earned on loans and investments as a percentage of average earning assets.[11] Note the inclusion of fee income alongside interest and dividends. Lightning routing fees are fee income on deployed capital, expressed as a ratio to that capital, with the principal remaining in self-custody throughout. **By the textbook definition, LRI meets the criteria for yield.**

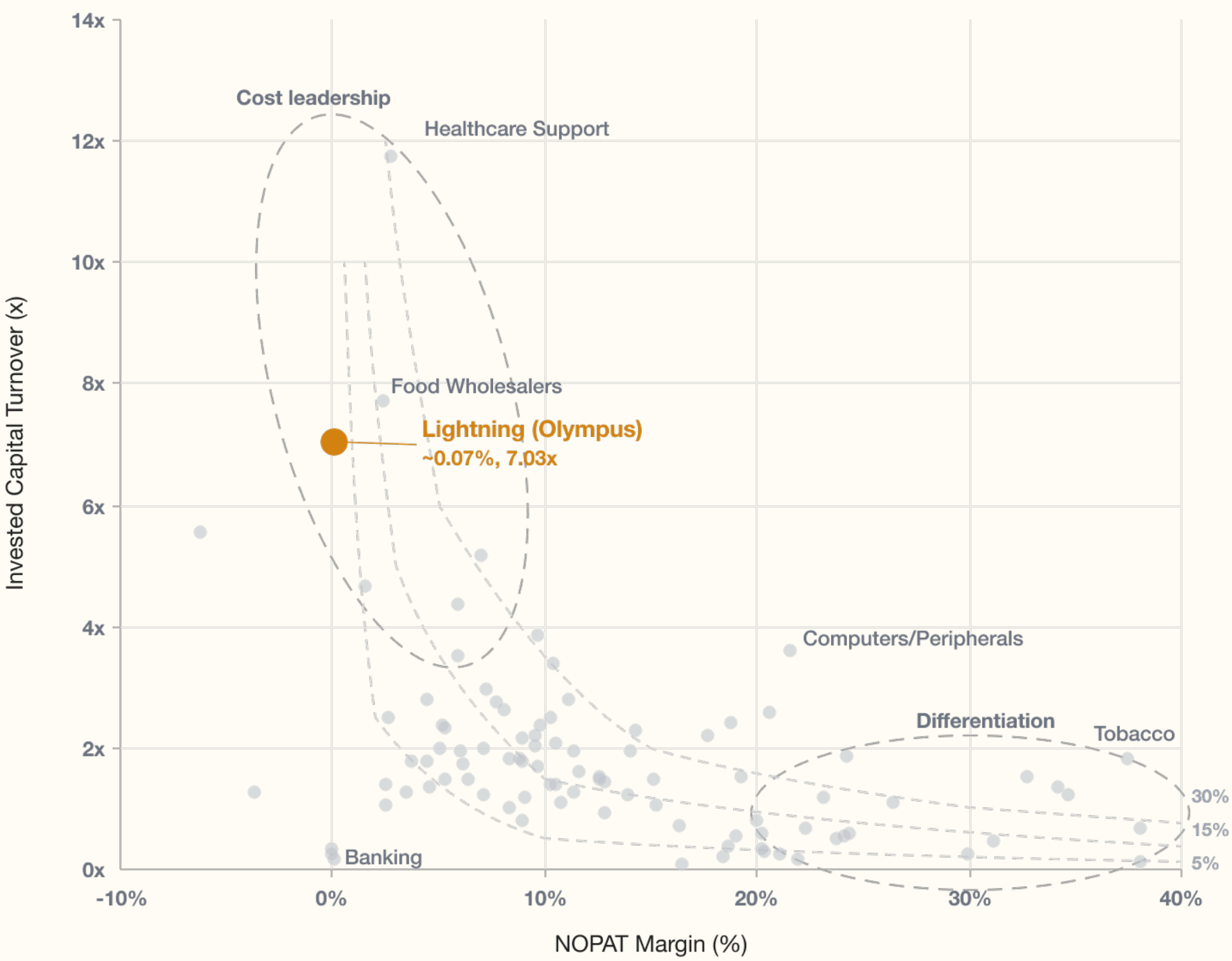
What the digital asset industry has labeled yield largely fails this definition. "BTC yield" as defined by Strategy and adopted by companies following the digital credit model measures the percentage change in the ratio of bitcoin holdings to assumed diluted shares outstanding. It is an accretion metric, not an income metric. Strategy, the metric's originator, states explicitly that it is "not equivalent to yield in the traditional financial context" and "not a measure of income generated by the Company's operations or its bitcoin holdings."[12] No fee income, no coupon, no operational revenue is generated. Centralized lending surrenders custody at deposit. Staking pays newly minted tokens, closer to monetary expansion than income. Each of these fails the canonical test. Lightning routing passes it. Capital is deployed. Fee income is earned through active management of channels, positioning, and rebalancing. The principal remains in the operator's custody. The ratio of annual routing fees to average deployed capital is the routing yield. When operating costs are deducted, the net figure is Lightning Routing Income, or LRI, defined in full below. When expressed as a ratio to deployed capital it is routing yield. When reported on a financial statement it is operational income. Three terms for one economic reality. Each maps to a different audience.

Capital deployed to the Lightning Network produces returns through a DuPont-style decomposition:

ROIC = Effective Fee Rate × Capital Velocity

Lightning is extreme cost leadership: thin margin per transaction, extraordinary turnover. Banks reach 11.35% ROE by stacking 10.7x leverage on 1.14% ROA.[11] **Lightning generates multiples of banking ROA at zero leverage, through velocity alone.**

Figure 4: ROIC Decomposition, Operating Margin vs. Capital Turnover



Includes financial services for comparison.

Framework: Mauboussin, Counterpoint Global. Data: Damodaran (January 2026), NYU Stern. Lightning: Olympus by ZEUS operating data.

Before examining LRI in detail, consider the independent drivers of gross routing revenue:

Lightning Revenue = BTC Price × Sats Deployed × Fee Rate per Sat

There are three distinct growth multipliers with limited correlation, all denominated in the same asset. BTC price flat? Increase deployment and improve routing. Deployment static? Price and fees can still grow. A bond's income is fixed: the coupon rate is set at issuance with no degrees of freedom for the holder. A dividend stock's income has two, earnings and payout ratio, but they're linked: increasing one typically constrains the other through the reinvestment tradeoff. Lightning revenue has three independent multipliers, all denominated in and compounding within a single asset, rather than across a portfolio. That structural independence is why Lightning economics are not dependent on price appreciation, unlike most yield mechanisms tied to a single factor.

Traditional yield models assume capital is committed once and earns a return over time. Lightning inverts this: deployed BTC behaves as working capital, cycling through productive use multiple times per year, rather than static capital committed once and held. The distinction changes which mental model, which metrics, and which organizational ownership apply.

The closest analog in traditional finance is the market maker. A dealer deploys capital to provide liquidity on both sides of a market, earns the bid-ask spread on every transaction, and generates returns through throughput rather than directional exposure. Lightning node operators do the same: deploy BTC into channels, facilitate payment flow in both directions, and earn routing fees on every transaction that passes through. Both face the same core risk: imbalanced flow requiring costly rebalancing, the primary operating cost in LRI.

Translating capital velocity into actual returns produces a wide range of outcomes across the Lightning Network. River's own node reports approximately 1% return as a large passive node baseline.[10] Block announced at Bitcoin 2025 that its node was returning 9.7%.[13] The figure reflects captive payment traffic routed through its own infrastructure at fee rates orders of magnitude above network median,[14] an existence proof of what Lightning can generate under specific conditions, not a benchmark for independent operators. **Execution at the node level is the difference between strong returns and rapid capital erosion.**

Early movers are establishing the model. B HODL listed on the AQSE in September 2025 on the premise of earning routing revenue on Lightning and reported an annualized yield of approximately 6% in its early months of operations.[15]

Compounding the challenge of understanding Lightning economics is the difficulty of observing the data at all. Bitcoin at the base layer is auditable for every block across its entire history. Lightning is nearly the opposite. A node's public data may appear sufficient for analysis. This assumption is incorrect. The Lightning Network has both public (announced) and private (unannounced) channels. Fidelity and Voltage estimate that private channel capacity is "just as substantial" as public capacity, and note that "the entire capacity of the Lightning Network (both public and private) is unknown."[16] Even for visible nodes, an outside analyst cannot determine what percentage of capacity is dedicated to routing versus other operations. This structural opacity is why professionally managed operations with first-party node data hold an information advantage that outside analysts cannot replicate.

This brings us to this report's first original contribution. **We propose static capital bias as the concept that encapsulates the analytical error that traditional financial analysts default to: modeling Lightning as a static yield instrument where the fee rate per transaction looks tiny, therefore returns are tiny.** The analytical error is failing to account for capital cycling through productive use multiple times per year. An 8 basis point fee on capital that turns over 65 times annually is not 8 basis points. It is 520 basis points, before accounting for the compounding effect of reinvested fees. This is supported by Cen, Hilary, and Wei's anchoring bias literature,[17] but the specific application to Lightning is novel. Practitioners recognized the underlying dynamic before it was named. Bhatia's NAR framework captures the correct annualized return but embeds velocity implicitly within total fee revenue rather than isolating the turnover multiplier.[18] Bosworth described the throughput mechanism from operational experience, demonstrating that capital flowing back and forth through a well-positioned channel can generate continuous fees far exceeding the channel's static capacity.[19] The economic intuition existed. What did not exist was the formal decomposition, the named error, or the connection to DuPont-style return analysis.

Static capital bias is not hypothetical. Beres concluded that either traffic or transaction fees must increase by orders of magnitude to make routing economically viable.[20] Gotham documented negative profit for most operators in Ledger,[21] the first peer-reviewed account of the static capital bias in action. Both analyses assessed fee economics at prevailing throughput without modeling how the same fee structures under professional management and higher capital velocity produce qualitatively different returns. Node operators reporting 5-6% gross did not emerge from higher fees or more traffic. They emerged from professional operations that optimize for the velocity and positioning variables the static capital bias omits. No prior use of this term exists in any published source.

Bhatia proposed the concept of Lightning routing fees as Bitcoin's native interest rate in 2019:[18]

$$NAR = [(p + f) / p]^{(52{,}560/n)} - 1$$

Guasoni, Huberman, and Shikhelman proved economies of scale in Management Science: for bidirectional channels, costs scale with the cubic root of payment frequency, meaning doubling payment volume increases costs by only approximately 26%.[22] Bansal, Gentry, and Farrington framed Lightning as "a marketplace for routing."[23] Bansal separately identified "a spatial element to the Lightning Network," where capital must be in the right place to be useful.[24]

Lightning Routing Income incorporates operating costs to measure net yield on capital deployed to Lightning. The three-lever equation above describes what drives gross routing revenue. LRI measures what remains after the costs of earning it. This sharpens what Bhatia first proposed with NAR.

LRI = [(D + F - R - C) / D]^(1/t) - 1

D = average deployed capacity

F = gross routing fees earned

R = rebalancing costs

C = on-chain fees (channel open/close/splice)

Deploying capital alone is insufficient; topology and enterprise-level execution determine returns. Because of the complexity of knowing where to open channels and the ongoing operational load of keeping a node at optimal efficiency, most nodes are economically irrational.[20] The data these studies document is accurate. Their conclusion is incomplete. Profitable routing requires simultaneous optimization of network topology, dynamic fee management, channel rebalancing, and continuous uptime. The operational complexity explains why most individual operators fail and why professionalization, not broader participation, is the path to network-wide economic rationality. By 2013, the introduction of ASIC hardware made individual Bitcoin GPU mining unprofitable almost overnight. Within two years, marginal mining profits converged toward zero.[25] Yet the mining industry survived. It professionalized. Lightning routing appears to be the same dynamic at a similar stage: professionalization, not failure, is the differentiator, and that separation is operational. The parallel extends beyond pattern recognition. Ammous argued from economic theory that Lightning liquidity provision would likely professionalize, that channel balances are investment decisions based on expected routing returns, not cash management decisions.[26] The data now confirms this. The 5-6% returns reflect baseline professional management without aggressive fee optimization or advanced channel positioning. The range is a floor, not a ceiling.

The lack of professional node operations leaves fees underpriced across the network. A separate finding from the same research connects three threads. Beres found that for many possible payments, only one viable routing path exists.[20] Operators on these paths hold local monopoly positions but price their fees as if they face open competition, leaving revenue on the table through ignorance of network topology rather than competitive pressure. This single finding explains why most nodes are unprofitable: they price as commodity providers when they hold local monopoly positions. It validates the managed operations thesis: professional operators with dynamic fee management and strategic channel placement identify these monopoly positions and price accordingly, where passive operators do not. It also strengthens the mining parallel: the same professionalization is underway on Lightning.

The velocity thesis applies to professionally managed infrastructure, not passive participation. This distinction is frequently the first obstacle for analysts evaluating Lightning as a yield-bearing network.

Capital velocity explains how Lightning generates returns. It does not explain why Bitcoin is uniquely suited to this model, or why the same capital velocity model could not be replicated on any other payment network.

BITCOIN'S TWO IDENTITIES

The capital velocity model works on Bitcoin because the infrastructure predates the application. Bitcoin's economic capabilities were designed into Bitcoin’s protocol from the Genesis Block. The Lightning Network activates them. It does not create them. Hash locks, multisig, and reserved opcode slots (OP_NOP2, OP_NOP3) existed from day one.[27] Timelocks were added in 2015-2016 using those reserved slots, and SegWit in August 2017 was the final prerequisite.[28,29] None of this would have been possible without architecture decisions made before the first block was mined. Satoshi stated this directly in a 2010 forum post: "The design supports a tremendous variety of possible transaction types that I designed years ago...they all had to be designed at the beginning to make sure they would be possible later."[30]

This delay between possibility and activation has historical precedent. David documented that electric motors took over twenty years to produce measurable productivity gains.[31] The entire factory had to be redesigned to harness the new potential. Factories already had power: a central steam engine driving every machine through belts and shafts. The electric motor did not add energy to the factory. It decentralized how existing energy was distributed, giving each machine its own power source and unlocking floor plans that the steam model could never support. Lightning does the same thing to Bitcoin's monetary energy. The pattern is not unique to electrification. Fidelity Digital Assets' 2026 report draws a parallel to shipping containers, which reduced loading costs by over 95% but took decades to reach full adoption.[32] The entire logistics pipeline required retooling. Lightning follows the same pattern. It does not change Bitcoin. It standardizes the payment interface, activating transactional capacity that was architecturally present from the beginning. We are still in the retooling phase.

The critical distinction: technical activation is permanent. Reverting Bitcoin to a pre-Lightning state would require a hard fork that breaks backward compatibility. The economic expression, however, is contingent on usage. Bhatia acknowledged this tension when he wrote that Lightning "switches the equation" and "finally allows" this economic effect.[33] **The economic result is novel. The technical mechanism was latent. Both are true at different levels, and this is what makes Lightning Routing Income earned rather than guaranteed.**

The institutional consensus classified Bitcoin as a SoV by 2017. That classification was correct at the time and is now incomplete. Three independent analytical frameworks converged on the same conclusion from different directions. Selgin asked what kind of money Bitcoin is and identified it as the first "synthetic commodity money," occupying a previously empty quadrant in his 2x2 matrix: absolute scarcity with no nonmonetary use.[34] Every unit of demand for Bitcoin is monetary demand. Nothing competes with the monetary function for the same supply. This is structurally different from gold, where industrial and jewelry demand compete with monetary demand for the same physical units.

Figure 5: Base Money Types (adapted from Selgin 2015)

	Nonmonetary Use: Yes	Nonmonetary Use: No
Absolute Scarcity	Commodity (Gold, Silver)	Synthetic Commodity (Bitcoin)
Contingent Scarcity	Coase Durable	Fiat

Boyapati, building on Jevons's historical stages of monetary evolution and Szabo's concept of unforgeable costliness, mapped Bitcoin to the SoV stage in a four-stage sequence: collectible, SoV, MoE, unit of account.[35,36,37] Boyapati was the first to explicitly connect Lightning to Bitcoin's next stage: "The Lightning network will allow the transfer of bitcoins at low cost while requiring little or no trust of third parties." He saw the bridge. This report crosses it by showing that Lightning also generates operational income in the process, unifying Bitcoin's two identities rather than sequencing them. **Once SoV is reached, the monetary functions compound rather than succeed each other, integrating more tightly as the system matures; weakening one weakens the whole.**

Burniske and White placed Bitcoin "primarily under the store of value asset superclass, though with consumable/transformable superclass characteristics as well."[7] Published before Lightning reached mainnet, the paper contains no mention of routing, yield, or income. Fidelity Digital Assets reinforced the SoV framing in 2020 and again in 2022.[38,39] None of these analyses were wrong. They were working with the data available at the time. Lightning changes the data.

Greer defined three superclasses of investable assets.[40] Capital Assets generate an ongoing stream of value and are valued by discounted cash flow. Consumable/Transformable (C/T) Assets have economic value through consumption or transformation but do not generate ongoing income. SoV Assets cannot be consumed and do not generate income but retain value over time. Most traditional assets occupy one superclass. Gold is the notable exception, touching SoV and C/T.

Greer himself noted that gold "even has a little bit of a capital asset characteristic, to the extent that it can be leased."[41]

By Greer's own account, gold is the only traditional asset to touch all three superclasses. But its properties compete for the same physical unit. Leased gold leaves the vault: Capital Asset activates, SoV is surrendered. Gold consumed in electronics is destroyed: C/T activates, SoV is permanently lost. The same ounce cannot be simultaneously stored, leased, and consumed. Financial instruments such as gold ETFs add yield through securities lending, but the investor holds a share in a trust, not gold itself. The intermediation that enables the yield is the intermediation that breaks the direct custody relationship.

Bitcoin with Lightning resolves this tradeoff. **Bitcoin with Lightning is the first asset to exhibit the economic functions of all three of Greer's superclasses simultaneously without surrendering any base-layer property.** Burniske and White identified SoV and C/T characteristics in 2017. Lightning adds the third: Capital Asset properties through ongoing routing income valued by discounted cash flow.

Figure 6: Gold vs Bitcoin Superclass Comparison

Superclass	Gold	Bitcoin + Lightning
Store of Value	Lost when leased or consumed	Preserved throughout
Capital Asset	Requires leasing out	Earned under same custody
Consumable / Transformable	Requires physical destruction	Role transforms, unit persists
Simultaneity	Properties compete	Properties compound

Bitcoin's superclass properties compound in the same digital unit. The same satoshi that stores value in a Lightning channel generates income for the node operator (Capital Asset) and facilitates economic activity that transforms the sender's payment capacity into the operator's routing capacity (C/T), all under the same self-custody. The sat is not destroyed but transferred, and repeats without decay.

The C/T classification is the most contested application of Greer's framework to digital assets. Greer's original examples are exclusively physical commodities. Burniske and White extended the framework to Bitcoin in 2017, identifying C/T characteristics in on-chain transaction fees, where blockspace is permanently consumed and unavailable to others, in the act of settlement.[7] Burniske later acknowledged the core tension: "in a digital world, there is no natural consumption/

destruction of the commodity," proposing forced burning or extreme scarcity as the digital substitute.[42] Lightning routing fees involve neither. No sats are burned. No supply is constrained. This report proposes a different basis for the C/T function: transformation of economic role rather than physical destruction. The sender's payment capacity is converted into the operator's routing capacity. The economic function of the satoshi changes even though the unit persists. The distinction from ordinary fee payment is structural: Lightning routing fees are denominated in and transform the capacity of the same native asset that constitutes the network's infrastructure. Bitcoin is not a MoE used to purchase an external service. It is the infrastructure being transformed. Whether this extension of Greer's transformable category to digital assets maps precisely to his original framework, or whether it requires updating that framework for an asset with these properties is a taxonomic question. The economic behavior it describes is not. Burniske and White recognized this dynamic in Bitcoin's on-chain transaction fees at the base layer; Lightning extends the same economic logic to Layer 2. This is only possible because the unit is digital and divisible.

Three superclasses, three return drivers, one asset.

What matters is what Lightning changes about how Bitcoin should be valued. Lightning does not make Bitcoin worth more. It makes Bitcoin's existing value extractable in a new form, shifting the character of returns from single-factor (price appreciation) to multi-factor (price appreciation plus operational income). The Gordon Growth Model functions in practice as a classification heuristic before it functions as a valuation tool. When g equals zero, an asset sits on a balance sheet. When g is greater than zero, it works. LRI makes g greater than zero, moving Bitcoin from the first category to the second in every institutional screening framework that distinguishes between productive and nonproductive holdings.

Digital scarcity enables the simultaneity. Same-asset unity compounds it. In rental property, dollars are deployed but the asset held is real estate. In Nvidia equity, the income is denominated in dollars but the holding is stock. There is always a translation layer between the asset and its income. In Lightning, the deployed capital, the transacted medium, and the earned revenue are all BTC, held by the same person, under the same custody. The income never leaves the asset class. No conversion, no basis risk, no intermediary asset. The superclass crossing is not a one-time classification event. It is self-reinforcing: the income has the same properties as the principal, which means the income itself can generate more income with those same properties.

The sender's perspective and the node operator's perspective are two different economic viewpoints on the same atomic event. In traditional commodities, activating one superclass property typically destroys another because physical matter can only be in one state at a time. Digital scarcity does not have that constraint.

Bitcoin is the first asset where income and appreciation are mechanistically coupled through network adoption, not merely correlated. Peterson showed that Bitcoin's market value tracks the square of its user base with R^2 above 80%, consistent with Metcalfe's Law.[43] But every user in that dataset was a holder. Lightning adds transacting users to the holder base, compounding n^2 network value. No other network has replicated this dynamic. Lightning starts with the largest existing base of digital monetary asset holders on earth. A competing network would need to replicate that holder base, underpinned by a market capitalization exceeding one trillion dollars, before generating comparable network effects. The moat is the network, not the technology.

This coupling has structural implications beyond network effects. There is no agency intermediation: the same person provides infrastructure, earns income, and holds the appreciating asset. In equities, income and appreciation are substitutes because dividends distribute asset value. In Lightning, routing income comes from network utility, not from distributing asset value. Divakaruni demonstrated empirically that Lightning adoption reduces mempool congestion:[44] the MoE function makes the SoV function work better. The two functions are complementary, not competing.

Store of value is not the alternative to medium of exchange. It is the prerequisite. SoV creates the base of holders who become Lightning's liquidity providers, and the routing income they earn reinforces the SoV thesis by making the asset productive as well as scarce. This is a self-reinforcing economic loop. Its structural implications are examined in detail later in this report.

Bitcoin did not become a productive asset when Lightning launched. It became measurably productive.

If Lightning activates Bitcoin's latent economic properties, the critical question becomes whether it does so without compromising the properties that make Bitcoin valuable in the first place.

PROPERTY-PRESERVING YIELD

Bitcoin's core properties are what make it valuable: self-custody, permissionless access, trustless operation, native settlement, and fixed supply. A sixth property, often implicit, is denominational unity. The asset held, the asset transacted, and the asset earned are the same bitcoin. These properties are endogenous, not contractual: no counterparty grants them and no authority can revoke them. **Any yield mechanism that routes through permissioned infrastructure converts these endogenous rights to exogenous ones, dependent on counterparty solvency, custodian behavior, or legal enforceability.**

Denominational unity serves as a canary test. If a yield mechanism preserves this unity, with assets held, transacted, and earned all in BTC, it is likely to preserve the other five properties as well. When denominational unity breaks, at least one core property has been compromised. Any yield mechanism requiring surrender of these properties asks the holder to trade what makes Bitcoin valuable for income. **The filter is Bitcoin's own properties, not an arbitrary standard.** Bailey, Rettler, and Warmke have argued that these properties carry moral as well as economic significance,[45] a point not essential to the economic argument but one that reinforces why surrendering them should not be treated as a routine cost of doing business. The following examines what each mechanism requires the holder to surrender.

Centralized lending surrenders self-custody at the point of deposit. Celsius maintained a billion-dollar stablecoin deficit while spending $558M buying its own token with customer funds, a practice its own Coin Deployment Specialist described as "very ponzi like."[46] BlockFi operated at only 16-24% over-collateralization.[47] Genesis owed $3.4B to its top fifty creditors.[48] In aggregate, the centralized crypto lending market collapsed from $34.8B to $6.4B, an 82% decline.[49]

Once custody is surrendered, the lender can rehypothecate, creating claims that exceed actual holdings. This cannot be audited without continuous voluntary disclosure. Better management reduces the probability of rehypothecation but cannot eliminate the structural possibility. The risk is Knightian uncertainty, not calculable risk.

Extending Selgin's framework, rehypothecation is a category change, not merely a risk event.[34] Rehypothecation creates unbacked claims on Bitcoin, converting absolute scarcity to contingent scarcity. The 21M supply cap is meaningless if unbacked BTC-denominated IOUs proliferate at the custodial layer. This mirrors the history of gold certificates under fractional reserve banking: absolute scarcity at the metal layer, contingent scarcity at the paper layer. CeFi yield does not just risk losing Bitcoin. It creates unbacked claims that functionally expand the supply of an asset whose entire value rests on the impossibility of supply expansion.

DeFi wrapping mechanisms, including renBTC, wBTC, and cross-chain bridges, surrender native settlement by design. The holder no longer has Bitcoin but a claim on bitcoin held by someone else.

renBTC became permanently unredeemable after the Alameda collapse cut its funding in December 2022, stranding $19.2M on Ethereum.[50] TVL collapsed from $1.15B to $36M. Holders were warned to "bridge back to native chains ASAP, or risk losing them." Those who did not lost everything permanently. wBTC, with $9.2B in custody, faced a governance crisis when BitGo announced a transfer to a Justin Sun-linked entity, prompting MakerDAO to zero its debt ceiling and Coinbase to delist the asset.[51] More broadly, $2B was stolen across thirteen cross-chain bridge hacks in mid-year 2022, accounting for 69% of all funds stolen at that point.[52]

Derivative yield strategies, including covered calls and structured products, break denominational unity by generating dollar-denominated income on a BTC-denominated position. Grayscale's Bitcoin Covered Call ETF (BTCC) distributed 91% of payments as return of capital per its own 19a-1 notice, while the share price declined from $37.57 to approximately $16.50.[53] The share price erosion is economic, not merely a tax classification artifact: the fund converts future BTC appreciation into current payments while capping upside. **The holder accepts equity-scale risk for bond-scale income.**

Covered call strategies can also surrender self-custody. In January 2026, GameStop pledged 4,709 of its 4,710 BTC to Coinbase Credit under a collateral agreement granting Coinbase the right to rehypothecate, commingle, or unilaterally sell the pledged Bitcoin.[54] Because control transferred, U.S. GAAP required GameStop to derecognize the bitcoin as a directly held asset and record a digital assets receivable instead. The company reported a $131.6M loss on digital assets for fiscal 2025, comprising $71.8M upon derecognition and $59.7M in unrealized losses as Bitcoin declined from approximately $91,000 at the time of pledge to $78,200 at fiscal year end.

Digital credit strategies, including preferred equity designed for Bitcoin treasury companies, create a structural tension: preferred dividends require ongoing cash payments, but pure accumulation strategies generate no operating cash flow. The cash must come from issuing new equity or, under adverse market conditions, selling Bitcoin. The accumulation thesis and the income mechanism depend on continuous capital markets access.

Beyond traditional finance structures, yield mechanisms native to digital assets face their own property failures. Staking on proof-of-stake (PoS) networks fails the property filter on fixed supply. The yield derives from new token issuance, diluting non-staking holders. Activating the income requires delegation to liquid staking protocols such as Lido, which has controlled as much as 32% of all staked ETH, or locking funds in a validator.[55] Either path degrades the SoV property through custody surrender or illiquidity. The properties compete rather than compound. The nominal staking rate of approximately 3% is paid through monetary expansion, not operational income from economic activity.[56]

Liquid, a federated sidechain, requires a 15-member federation that holds user keys, surrendering self-custody, permissionless access, and trustless operation simultaneously.[57] Users hold L-BTC, not native Bitcoin, breaking both native settlement and denominational unity. Ark and statechains, alternative off-chain protocols, require a trusted Application Service Provider (ASP). Somsen, the creator of statechains, updated his own documentation to note the protocol is "only non-custodial IF the Statechain entity behaves correctly," adding that he now prefers the term "pro-actively non-custodial."[58] Spark, an off-chain protocol, operates under a 1-of-n trust assumption with two operators at launch and no additions to date.[59] With n equal to two, the trust assumption reduces to trusting that at least one of two specific companies will behave honestly.

The trust requirements in these systems are architectural, not temporary. Liquid will always require a federation. Statechains will always require a trusted entity. Spark will always require an honest operator set. Lightning's trustlessness is cryptographic, enforced by the penalty mechanism in the BOLT specification, not organizational. Spark's own documentation acknowledges this distinction directly: "The only exception is Lightning, which requires no trusted entities at all."[59]

Every alternative examined above fails at least one core property. The Lightning Network offers a direct contrast. Derivative yield will always break denominational unity. Native yield preserves it.

The income is denominated in BTC, earned in BTC, and remains in BTC. Derivative yield serves companies seeking dollar-denominated income but not as a property-preserving mechanism for Bitcoin itself.

Lightning preserves every core property through specific provisions in the BOLT specification.[60] Self-custody: 2-of-2 multisig funding transactions with unilateral force-close capability (BOLT #3, #5). Permissionless access: no registration mechanism in the specification. Trustless operation: penalty mechanisms that make previous states punishable, with Hash Time-Locked Contracts (HTLCs) binding payments to intended recipients (BOLT #2). Native settlement: all amounts denominated in sats and millisats, cryptographically bound to the Bitcoin blockchain via Genesis Block hash. Fixed supply: routing fees deducted from forwarded amounts, no new Bitcoin created. Denominational unity: the deployed capital, the transacted medium, and the earned revenue are all native BTC under the same custody architecture.

If the node operator disappears tomorrow, the asset holder broadcasts a commitment transaction and recovers all funds within approximately two weeks. No cooperation required.

This property preservation is not merely unique among Bitcoin yield mechanisms. Across all blockchain ecosystems, Lightning is the only Layer 2 protocol that preserves every property of its base layer at production scale.

Figure 7: Property Preservation Across Yield Mechanisms

Mechanism	Self-Cust.	Perm.	Trust.	Native	Fixed	Denom.
CeFi Lending	✗	✗	✗	✓	✗	✓
DeFi Wrapping	✗	✓	✗	✗	✗	✗
Covered Calls	–	✗	✗	✗	–	✗
Digital Credit	✓	✗	✗	✗	✓	✗
PoS Staking	✗	✓	✗	✓	✗	✓
Liquid	✗	✗	✗	✗	✓	✗
Ark/Statechains	✗	✓	✗	✓	✓	✓
Spark	✗	✓	✗	✓	✓	✓
Lightning	✓	✓	✓	✓	✓	✓

✓ Preserved ✗ Surrendered – Conditional *Source: BOLT specifications (Lightning Labs); protocol documentation; Pillay (2023); Hoffman (2019).*

Lightning creates a third custody model. Jensen and Meckling established that the principal-agent problem is inherent: traditional finance offers only custody by a manager or self-custody.[61] Lightning introduces self-custody with managed operations. BOLT #3's key type separation provides the architectural foundation: the *htlc_basepoint* handles operational protocol signing while the *payment_basepoint* controls fund custody. The architecture is designed so the operator manages routing, not assets. Enforcing this separation in production requires a policy validation layer.

Figure 8: Custody Models Compared

Dimension	Traditional Custody	Self-Custody	Lightning (Managed)
Key holder	Manager / custodian	Owner	Owner
Operations	Manager	Owner	Operator
Principal-agent risk	Full	None	Bounded
Fund recovery	Legal process	Immediate	Force-close
Architecture	Legal agreements	Direct control	BOLT #3 + VLS 1.0

The Validating Lightning Signer (VLS) is that policy validation layer. VLS v0.14.0 implements more than fifty validation policies, preventing revoked commitment transactions and channel closures to unapproved destinations.[62] Version 1.0, targeted for 2026, will close the remaining thirty issues for production readiness. Current deployments operate under remote signing without full policy enforcement. VLS already powers Blockstream's Greenlight in production.[63] The architectural foundation is proven; enterprise-grade enforcement is being shipped.

Lightning node operation involves no delegation of custody, no third-party asset management, and no protocol-level rewards. The operator routes payments through bilateral channels, earns fees from users for a service rendered, and never takes custody of client assets. Lightning routing sits well below the threshold of securities classification, provided the operator does not pool client capital, guarantee returns, or exercise discretionary authority over client assets.

Lightning routing involves Knightian risk: channel balances are observable, fee rates are configurable, routing probability is calculable, all failure modes are bounded, and maximum loss is capped at deployed channel capacity. A node operator can build a financial model, forecast revenue within confidence intervals, and present expected returns and downside scenarios to a board. CeFi uncertainty cannot be presented with the same rigor. Counterparty insolvency, rehypothecation depth, and fraud probability are not estimable. No responsible board approves treasury capital deployment into systems where the probability of total loss cannot be quantified. The difference is not safety but quantifiability. **No amount of due diligence converts uncertainty into risk.** Knight established this distinction in 1921.[64] It applies directly to the choice between Lightning routing and every alternative yield mechanism examined in this section.

The property-preserving argument matters for any individual company. But there's a larger question: what happens to Bitcoin's properties when infrastructure choices are made not by individuals but by institutions operating at ecosystem scale?

SCALE DEMANDS INTEGRITY

The Lightning Network is centralizing. The data is unambiguous. Research finds that 10% of nodes hold 80% of network capacity, and the top 50% hold 99%.[65] The Gini coefficient for node strength measured 0.88 in 2020. By 2025, it had reached 0.97 for capacity.[66] Hub formation is a structural consequence of Lightning's design. Node count peaked at approximately 20,700 with about 3,500 BTC on the network.[65] It has since consolidated to about 17,300, while capacity has grown 60% to approximately 5,600 BTC.[67] A single exchange now manages approximately 1,200 BTC across two public nodes, representing 20% of total network capacity.[67] The network is professionalizing: fewer nodes managing more capital, mirroring the consolidation pattern of every maturing infrastructure. Centrality metrics tell a more nuanced story: some indicate increasing centralization while others suggest decentralization potential.[66]

Cloud infrastructure has concentrated to three providers (AWS, Azure, Google) powering 63% of the market, a trend that has only increased.[68] Among websites using third-party services, just three providers serve 92% of websites, with CDN dependencies increasing approximately 14% YoY.[69] Infrastructure centralizes around operational capability. The internet still works despite this concentration. But fragility increases: a single AWS outage affected 11,000+ websites for 8+ hours.[70] **The question is not whether infrastructure centralizes but what the concentrated providers can do with that position.**

Coinbase custodies approximately 11% of all Bitcoin and more than 80% of U.S. Bitcoin ETF assets.[71] FTX reached a $32B valuation with "complete failure of corporate controls."[72] Its centralized structure enabled concealment of insolvency until collapse, a failure mode structurally impossible given Lightning's publicly observable channel graph.[73] Systemic risk at this scale of custodial concentration belongs in any institutional risk analysis.

Albert, Jeong, and Barabasi demonstrated that networks with heavy-tailed degree distributions, including scale-free networks, are robust to random failure but vulnerable to targeted attack.[74] Lightning inherits this topology but adds a property no prior network of this kind possessed: unilateral exit. No node, however dominant, can usurp another node's unilateral exit or censor transactions on the network. Neither property can be altered without a hard fork of Bitcoin itself.

Lightning can degrade in routing efficiency. It cannot degrade in fund safety due to centralization alone. No node, however dominant, gains custodial access to another node's funds through its network position. BOLT #5 ensures "no risk of loss of funds" in standard channel closures,[60] provided the situation is properly handled.

The third custody model described in the preceding section ensures that operational concentration never becomes custodial capture. Guasoni proves hub formation is economically rational: a star is at most 2x the cost-minimizing topology, and finding the true optimum is NP-complete, meaning no efficient solution exists.[75] Centralization is not a bug to be fixed but a bounded cost to be managed, one that improves as more professionally operated nodes join the network. The Gini coefficient can be 0.99 and funds remain safe. Lightning's centralization tendencies are real, measurable, and structurally inevitable at scale. **What distinguishes Lightning from every centralized alternative is not the absence of hubs but the preservation of exit rights: no node, however dominant, can prevent a participant from unilaterally recovering funds, switching providers, or routing around censorship.**

Figure 9: Centralization With and Without Exit Rights

Dimension	Without Exit Rights	With Exit Rights
Example	CeFi (Coinbase, FTX)	Lightning Network
Concentration	11% of all BTC (Coinbase)	Gini 0.97 for capacity
Failure mode	Total loss (FTX: $32B)	Routing degradation only
Fund safety	Custodian dependent	2-of-2 multisig
Exit mechanism	Legal process / bankruptcy	Unilateral force-close
Censorship	Custodian discretion	Route around

Peer modification drives fees below current levels,[76] confirming the underpricing dynamic identified in the analysis of capital velocity. But as the network matures, alternative routes will emerge. Decker, who co-authored the centralization findings cited above, characterized the trend as likely temporary, though subsequent research including his own co-authored work shows concentration has continued to increase.[77] He argued that the goal should be lowering barriers to node operation, not forcing participation, concluding that "as long as a hobbyist with some knowledge can set up a node and actively compete… we have achieved our goal."[78] The permissionless entry right is the governance mechanism. No registration, no license, no minimum capital.

"No PoS protocol can achieve censorship-resilience, if the censoring validators make up more than 50% of the validator committee."[79] Ethereum's builder landscape has demonstrated this vulnerability in practice. Each alternative Layer 2 surrenders at least one base-layer property, as the preceding section established. The governance question is separate: how does each system handle concentration? Liquid has 80+ members but only 15 functionaries control the peg. Spark has only 2 operators with no additions to date. Bitcoin's own governance offers a recent example. The OP_RETURN controversy resulted in Bitcoin Knots reaching approximately 20% of reachable nodes.[80] No chain split occurred. Disagreement was expressed through implementation diversity, not centralized authority. The protocol survives severe disagreements without depending on good behavior by any single actor.

A single user on a federated sidechain does not meaningfully degrade Bitcoin's properties. The network is anti-fragile; it absorbs edge cases. But when enterprises serving millions of users or deploying hundreds of BTC make the same trust compromise, it concentrates trust at a systemic level. If treasury capital moves off the base layer into wrapped or bridged constructions, that shifts economic activity away from Bitcoin's native settlement. At individual scale, that's a tradeoff. At ecosystem scale, it's a direction. Individual trust compromises are permissible. Enterprise trust compromises are directional. This matters to returns, not just ideology. As established earlier, property degradation weakens Bitcoin's value proposition, which undermines the SoV thesis, which undermines the appreciation that makes treasury holdings valuable. **Protecting Bitcoin's properties is fiduciary responsibility, not altruism. Lightning is the only infrastructure where enterprise-scale participation reinforces every Bitcoin property simultaneously.** Every channel opened adds liquidity to an open, permissionless network. Every BTC deployed for routing remains self-custodied and settled to the base layer.

Responsible scaling means professional infrastructure that concentrates capacity while preserving exit rights. The Lightning Service Provider (LSP) model provides competitive alternatives for enterprise onboarding, with over ten operators offering programmatic channel access and liquidity services across independent infrastructure. Lightning has no central gatekeeper, with options increasing as the network professionalizes. Ostrom's commons governance principles have been mapped to blockchain affordances.[81] Lightning's penalty mechanism, fee market, and unilateral exit rights satisfy several of these principles without centralized enforcement. As Lightning scales, the properties that make it valuable are preserved by design, not by hoping concentration doesn't happen. This is a novel application of what scholars have termed governance by infrastructure: the protocol governs what concentrated actors can do, not whether they exist.[82]

Lightning's centralization is governed not by antitrust law or regulatory oversight but by the structural impossibility of custodial capture.

If Lightning's centralization tendencies are governed by protocol-level exit rights rather than regulatory oversight, the remaining question is whether the economic incentives align: does growing the network actually strengthen it?

LIGHTNING'S FLYWHEEL

The Lightning Network exhibits the positive feedback dynamics characteristic of successful payment networks: more users attract more liquidity, more liquidity improves routing reliability, better reliability attracts more users. Unlike prior payment network flywheels, Lightning's flywheel operates without a central coordinator and compounds the value of the underlying asset rather than extracting from it. The self-reinforcing loop identified earlier operates through three feedback mechanisms that map to the three-lever equation: transactions driving fee revenue (inner/Fee Rate), capital improving liquidity and enterprise integration (middle/Sats Deployed), and routing revenue strengthening BTC demand (outer/BTC Price). Arthur demonstrated that technologies with increasing returns to adoption become self-reinforcing: the more they are adopted, the more they improve.[83] Lightning displays these properties: each new channel improves routing reliability for every existing participant. Rochet and Tirole's analysis of two-sided markets confirms the pattern: platforms underprice during the subsidy phase to build network scale.[84] Lightning usage reduces mempool congestion at the base layer,[44] making SoV work better precisely because MoE is active.

River estimates Lightning processed $1.17B in November 2025, driven primarily by exchange-to-exchange flows rather than retail micropayments. Volume grew 266% YoY with an average transaction value of $223, up 89% YoY.[85] The flywheel is driven by institutional and exchange use, the volume pattern that drives capital velocity. High-value, high-frequency flows between well-connected nodes generate the throughput that compounds thin fee margins into meaningful returns. Retail micropayments contribute to network adoption but do not move the velocity needle for routing economics. The implication for treasury companies: businesses that integrate Lightning infrastructure improve the fee environment for every routing operator, including themselves. Fidelity and Voltage reported a 2,424% increase in payment volume between 2022 and 2024, based on proprietary data that does not disclose absolute figures, with more businesses integrating Lightning in 2024 than in any prior year.[16] Coinbase, which integrated Lightning in April 2024, reported 15% of its BTC transactions on Lightning within a year.[86] In March 2026, Square updated its Bitcoin Terms of Service, confirming that Lightning payment acceptance is default-enabled for all eligible sellers.[87] The enterprise activation phase is underway. Olympus routing throughput confirms the trend at the node level, growing from 8.85 BTC in Q1 2025 to 23.72 BTC in Q4 2025, a pace consistent with River's network-wide 266% YoY volume growth. Olympus average payment size tripled over the same period, consistent with institutional and exchange-to-exchange flows driving volume.

Routing yield projections vary, consistent with an early-stage market professionalizing.

Figure 10: Reported Lightning Routing Yields

Operator	Yield	Scale	Characteristic
River	~1%	~68 BTC (2 nodes)	Passive management
Olympus by ZEUS	5.6%	10 BTC	4+ years operating
B HODL	6.0%	10 BTC initial	Early months operating
Block	9.7%	~182 BTC	Captive traffic

Reported yields range from approximately 1% for large passive nodes to 9.7% for vertically integrated captive operations. Olympus reports 5.58% gross ROIC on a trailing twelve-month basis, with quarterly gross returns consistently between 5% and 6.4%. B HODL reported comparable figures in its early months. The sample is small but convergent: the differentiator is operational professionalism, not whether returns exist. Despite quarterly cost ratios ranging from 3.7% to 31.6% of gross fees, Olympus net ROIC converged to 4.65% over the TTM. Rebalancing costs, which constitute 94.5% of Olympus operating costs and can exceed gross routing revenue for unmanaged nodes, are the primary driver of the gap between professional and passive operations.

Figure 11: Illustrative LRI by deployment size

Deployed	Idle (0%)	1% LRI	3% LRI	5% LRI	7% LRI
25 BTC	0 BTC $0	0.25 BTC $17,500	0.75 BTC $52,500	1.25 BTC $87,500	1.75 BTC $122,500
50 BTC	0 BTC $0	0.50 BTC $35,000	1.50 BTC $105,000	2.50 BTC $175,000	3.50 BTC $245,000
100 BTC	0 BTC $0	1.00 BTC $70,000	3.00 BTC $210,000	5.00 BTC $350,000	7.00 BTC $490,000
250 BTC	0 BTC $0	2.50 BTC $175,000	7.50 BTC $525,000	12.50 BTC $875,000	17.50 BTC $1,225,000
500 BTC	0 BTC $0	5.00 BTC $350,000	15.00 BTC $1,050,000	25.00 BTC $1,750,000	35.00 BTC $2,450,000

Illustrative only. USD at $70,000/BTC. Assumes stated deployment for 12 months.

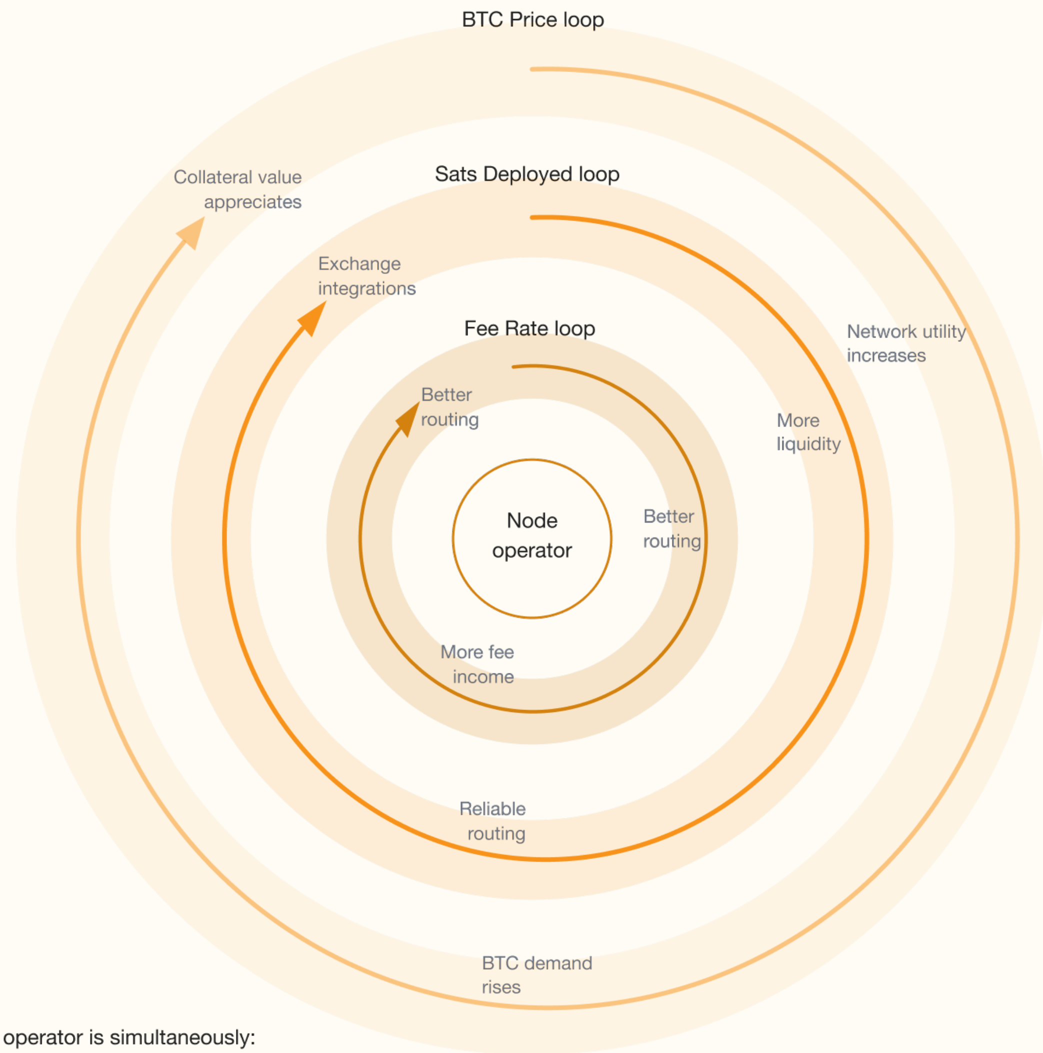
Partial deployment (10-20% of holdings) is typical. Actual returns depend on fee environment and operational execution.

The range is wide because the market is early. This is a feature for first movers, not a bug. Retail adoption faces structural friction, including capital gains treatment on every transaction. The flywheel is real but constrained. Payment success rates currently decline at scale. Fidelity and Voltage's data show 75% success for payments above 1M sats,[16] a limitation that enterprise-grade operations must architect around through multi-path routing and channel management. M-Pesa, a mobile money platform, reached 7M active users in Kenya in two and a half years, yet failed entirely in South Africa.[88,89] Network effects are not automatic. Lightning's flywheel works because of exchange integration and capital efficiency improvements, not agent density, but the lesson holds: scale is earned, not guaranteed. The flywheel can also run in reverse. If capital withdraws faster than adoption grows, routing reliability degrades, which accelerates further withdrawal. The network's current reliance on a small number of well-capitalized operators makes this a concentration risk, not a theoretical one.

Lightning is a two-sided market. Payment senders want cheap, fast, and reliable transactions. Routing node operators want fee revenue on deployed capital. Rochet and Tirole showed that two-sided platforms must choose a price structure, not just a price level, often subsidizing one side to attract the other. Evans and Schmalensee documented this empirically: below-marginal-cost pricing on one side is prevalent across payment card systems, software platforms, and media.[90] Lightning's fee underpricing follows the same pattern. The analysis of capital velocity identified the phenomenon. Fee convergence from the analysis of network governance confirms: underpricing is the subsidy phase of a two-sided market. The LSP model is the price structure solution: subsidize onboarding to build the network, earn on routing. Every successful payment network follows this arc.

In traditional payment networks, the flywheel benefits the platform operator: Visa's interchange revenue accrues to Visa, not to cardholders or merchants. In Lightning, the flywheel benefits the asset holder. Lightning's flywheel contains a self-reinforcing yield loop. The flywheel concept is not new; Gentry described it in 2021.[91] **The structural distinction: Lightning's flywheel returns value to the asset holder, not to a platform operator.** Same-asset unity means all three loops compound in the same asset. The three-lever equation maps to three flywheel loops: BTC Price = outer, Sats Deployed = middle, Fee Rate = inner. This is not a payment network that uses Bitcoin. It is Bitcoin's payment network. Capital velocity generates returns on an asset whose dual identity Lightning activates without surrendering its core properties, through infrastructure that governs its own integrity. Every data point in this section trends in one direction. **Executives who wait for conclusive evidence will be deploying into a mature market with compressed margins.**

Figure 12: Lightning's Three-loop Flywheel



The node operator is simultaneously:
the infrastructure provider, the income earner,
and the asset holder, all compounding in one asset.

Visa's flywheel benefits → Visa.
Lightning's flywheel benefits → the asset holder.

Source: ZEUS. Flywheel concept: Gentry (2021).

CONCLUSION

The distinction between storing value and transacting value is an artifact of pre-Lightning analysis. Bitcoin's two identities were never in opposition. Lightning revealed them as one economic function viewed from different positions. The holder who deploys capital to a Lightning channel is simultaneously storing value, earning income, and facilitating activity. The deployed capital, transacted medium, and earned revenue are the same bitcoin, held by the same person, under the same custody. No other asset has this property. Bitcoin did not become a different asset.

The measurable evidence of what it can do expanded. What this means for capital allocators depends on variables this report identifies but cannot resolve for any individual company.

Lightning Routing Income provides the operational framework for native yield, the third category of Bitcoin treasury returns identified here. **Unlike digital credit and derivative yield, native yield requires no surrender of the underlying asset's properties, including no break in denominational unity.** The materiality of LRI for any specific company depends on three variables: deployment size, fee environment at time of entry, and operational execution. The correct hurdle rate is not WACC. **The opportunity cost of idle, self-custodied Bitcoin that preserves all six properties is zero.** Any positive operational income changes the calculus entirely. For companies trading at or below net asset value, the implication is structural: LRI makes g greater than zero in the Gordon Growth framework, moving the company from nonproductive holding to productive asset in every institutional screening framework. The income does not depend on mNAV premium, capital markets sentiment, or BTC price appreciation.

Lightning is in the subsidy phase. Fee environments are favorable, network positioning is available, and channel relationships can be established before competition intensifies. Companies generating their own Lightning traffic hold a structural advantage, which is why vertically integrated operators report higher returns. Network position, once established, becomes harder to replicate as the topology matures. Capital must be in the right place to be useful, and the right places fill. If the deployment does not perform, the exit is bounded: unilateral force-close recovers capital within two weeks. The third custody model this report formalized resolves the historical binary. Companies no longer choose between managing their own infrastructure and surrendering their keys.

This report has documented the limitations of current data throughout, including data opacity, non-replicable benchmarks, centralization dynamics, and the gap between gross and net yields. These limitations constrain the precision of projections but do not invalidate the mechanism. Three additional limitations require direct acknowledgment. First, the aggregate Lightning routing fee market is early-stage and not directly measurable. The mechanism is proven at the operator level; no network-wide fee total is yet observable. This report's thesis rests on a growth trajectory that the evidence supports but cannot guarantee: volume growing 266% YoY and enterprise integrations accelerating. Second, enterprise signing infrastructure (VLS) remains pre-production, with current deployments operating under remote signing without full policy enforcement. Third, implementation fragmentation slows network-wide improvement. LND holds approximately 90% of node market share.[92] Routing and payment innovations shipped in CLN, LDK, and Eclair reach a minority of the network. The BOLT specification provides the compatibility standard, but Katz and Shapiro predicted this exact dynamic: network externality markets face coordination failures in achieving compatibility even when compatibility is socially optimal.[93]

Three regulatory and accounting domains apply to Lightning routing deployment, none of which have been specifically addressed by their respective authorities. On securities classification, regulators classified staking as administrative despite involving delegation, third-party management, and protocol-level rewards.[94] Lightning involves none of these elements. On money transmission, non-custodial operation trends favorably under federal frameworks,[95] though no Lightning-specific guidance exists and jurisdiction varies. On accounting, routing fee income may fit service revenue recognition standards and balance sheet treatment falls under digital asset guidance, though no firm has published Lightning-specific guidance.[96,97] Companies should obtain jurisdiction-specific securities, money transmission, and accounting guidance before deployment.

Figure 13: Risk Characteristics Compared

Dimension	Lightning	CeFi / Alternatives
Channel balances	Observable	Opaque
Fee rates	Configurable	Set by counterparty
Failure modes	Bounded	Unbounded
Routing probability	Calculable	N/A
Counterparty insolvency	N/A	Not estimable
Rehypothecation	Structurally impossible	Length unknown
Board-presentable model	Yes	No

This report introduces static capital bias (the error obscuring Lightning returns), formalizes the third custody model (self-custody with managed operations), establishes the property filter eliminating every alternative Bitcoin yield mechanism, identifies the self-reinforcing yield loop, and applies Knight's distinction between risk and uncertainty to the choice between Lightning and alternatives. The field requires further work. Empirical yield benchmarking remains sparse; standardized LRI analysis would benefit every participant. The hashrate futures precedent, where the Luxor Hashprice Index evolved into Bitnomial exchange-listed contracts,[98] suggests a path for structured products on LRI. Lightning-specific accounting guidance from major firms would remove a practical barrier to institutional deployment at scale. AI agent settlement, where autonomous systems transact via Lightning micropayments, represents an emergent demand source for volume growth.[85] The infrastructure is live. The economics are documented. The properties are preserved. **The remaining question is not whether Bitcoin generates operational income through Lightning. It is when the companies holding Bitcoin decide to find out.**

01. BitcoinTreasuries.net. Data as of April 2026.
02. Block, Inc. "Bitcoin Blueprint for Corporate Balance Sheets." Updated April 2024.
03. Fidelity Digital Assets. "Getting Off Zero: Evaluating Bitcoin in 2026." January 2026. fidelitydigitalassets.com/research-and-insights/getting-zero-evaluating-bitcoin-2026
04. Strategy, Inc. Annual Report on Form 10-K, Fiscal Year 2025. Filed February 2026. SEC.
05. DL News. "Bitcoin treasury blues mount as 40 percent trade at discount." January 2, 2026. dlnews.com/articles/markets/bitcoin-treasury-blues-mount-as-40-percent-trade-at-discount/. Data from BitcoinTreasuries.net.
06. Matt Cole (CEO, Strive). Stefan Livera Podcast, January 14, 2026.
07. Burniske, Chris and Adam White. "Bitcoin: Ringing the Bell for a New Asset Class." ARK Invest / Coinbase, January 2017.
08. Choueifaty, Yves, Tristan Froidure, and Axel Cabrol. "Accounting for the Performance of MicroStrategy: First Decomposition." TOBAM, March 2025.
09. Damodaran, Aswath. "Margin/ROIC by Sector (US)." NYU Stern, January 2026. pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/mgnroc.html
10. River Financial. "The Lightning Network in 2023." October 2023. river.com/learn/files/river-lightning-report-2023.pdf
11. FDIC. Quarterly Banking Profile, Q2 2025. fdic.gov/analysis/quarterly-banking-profile
12. Strategy, Inc. Form 8-K, EX-99.1. May 1, 2025. SEC.
13. Block, Inc. / Miles Suter. Bitcoin 2025 conference, Las Vegas. 9.7% annual return announcement.
14. Masutti, Riccardo. "According to Block, routing on Lightning yields 10% annually: but the yield comes from fees." Atlas21, March 10, 2026. atlas21.com/lightning-routing-yields-10-annually-blocks-announcement/
15. B HODL. AQSE listing documentation and investor updates, September 2025.
16. Fidelity Digital Assets / Voltage. "The Lightning Network: Expanding Bitcoin Use Cases." January 2025.
17. Cen, Ling, Gilles Hilary, and K.C. John Wei. "The Role of Anchoring Bias in the Equity Market." Journal of Financial and Quantitative Analysis 48(1), 2013.
18. Bhatia, Nik. "The Lightning Network Reference Rate." Medium, March 11, 2019. timevalueofbtc.medium.com/the-lightning-network-reference-rate-98e41a9dadfa
19. Bosworth, Alex. "Lightning Routing: Building a New Economy." Lightning Hack Day, March 27, 2021. diyhpl.us/wiki/transcripts/lightning-hack-day/2021-03-27-alex-bosworth-lightning-routing/
20. Béres, Ferenc, István András Seres, and András A. Benczúr. "A Cryptoeconomic Traffic Analysis of Bitcoin's Lightning Network." Cryptoeconomic Systems 1(1), 2021. doi.org/10.21428/58320208.d4cd697e
21. Gotham, Edward. "Irrational Economic Action: Running a Bitcoin Lightning Node for Negative Profit." Ledger 8, 2023. doi.org/10.5195/ledger.2023.289
22. Guasoni, Paolo, Gur Huberman, and Clara Shikhelman. "Lightning Network Economics: Channels." Management Science 70(6), 2024.
23. Bansal, Dhruv, Ryan Gentry, and Allen Farrington. "The Bitcoin Stack." Axiom BTC Capital, 2024. axiomventures.vc/stack
24. Bansal, Dhruv. Stephan Livera Podcast, Episode SLP445.
25. Derks, Jona, Jaap Gordijn, and Arjen Siegmann. "From Chaining Blocks to Breaking Even." Electronic Markets 28(3): 321-338, 2018. doi.org/10.1007/s12525-018-0308-3
26. Ammous, Saifedean. The Fiat Standard. Saif House, 2021, pp. 252-254.
27. Bitcoin source code, version 0.1.0, January 2009. github.com/bitcoin/bitcoin
28. BIP 65 (OP_CHECKLOCKTIMEVERIFY), Peter Todd, December 2015. BIP 112 (OP_CHECKSEQUENCEVERIFY), BtcDrak/Friedenbach/Lombrozo, July 2016.
29. BIP 141 (Segregated Witness), Lombrozo/Lau/Wuille, activated August 24, 2017.
30. Satoshi Nakamoto. BitcoinTalk Post #126, June 17, 2010. satoshi.nakamotoinstitute.org/posts/bitcointalk/126/
31. David, Paul A. "The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox." American Economic Review 80(2): 355-361, 1990.
32. Fidelity Digital Assets. "2026 Look Ahead." January 2026.
33. Bhatia, Nik. "The Time Value of Bitcoin and LNRR." Medium, June 8, 2018. timevalueofbtc.medium.com/the-time-value-of-bitcoin-and-lnrr-e0c435931bd8
34. Selgin, George. "Synthetic Commodity Money." Journal of Financial Stability 17: 92-99, 2015.
35. Boyapati, Vijay. "The Bullish Case for Bitcoin." 2018.
36. Jevons, William Stanley. "Money and the Mechanism of Exchange," Chapter III. 1875.
37. Szabo, Nick. "Shelling Out: The Origins of Money." 2002.
38. Fidelity Digital Assets / Bhutoria. "Bitcoin Investment Thesis: Bitcoin as an Aspirational Store of Value." July 2020.
39. Fidelity Digital Assets / Kuiper and Neureuter. "Bitcoin First." January 2022.
40. Greer, Robert J. "What Is an Asset Class, Anyway?" Journal of Portfolio Management 23(2): 86-91, Winter 1997.
41. Greer, Robert J. "The Superclasses of Assets Revisited." Global Commodities Applied Research Digest, Winter 2018, p. 64.
42. Burniske, Chris. "Value Capture and Quantification: Cryptocapital vs Cryptocommodities." Placeholder VC, April 2019, p. 9.
43. Peterson, Timothy. "Metcalfe's Law as a Model for Bitcoin's Value." 2018.
44. Divakaruni, Siddharth and Peter Zimmerman. "The Lightning Network: Turning Bitcoin into Money." Federal Reserve Bank of Cleveland Working Paper 22-19, 2023.
45. Bailey, Andrew M., Bradley Rettler, and Craig Warmke. "Philosophy, politics, and economics of cryptocurrency II: The moral landscape of monetary design." Philosophy Compass 16:e12784, 2021. doi.org/10.1111/phc3.12784
46. Pillay, Shoba. Independent Examiner's Report, Celsius Network LLC, Court Filing 23-01024-mg, January 31, 2023.
47. SEC. "In the Matter of BlockFi Lending LLC." Administrative Proceeding File No. 3-20758, February 14, 2022.
48. Genesis Global Holdco LLC. Chapter 11 Petition, Case No. 23-10063, U.S. Bankruptcy Court, SDNY, January 19, 2023.
49. Galaxy Research. "The State of Crypto Lending." April 2025.
50. Blockworks (December 19, 2022) and The Block (December 17, 2022). renBTC shutdown after Alameda collapse. Ren Protocol tweet, December 7, 2022.
51. BitGo blog (August 9, 2024), CoinDesk, The Block. wBTC governance crisis, Justin Sun-linked entity, MakerDAO zeroed debt ceiling, Coinbase delisted.
52. Chainalysis. "Cross-Chain Bridge Hacks Emerge as Top Security Risk." August 2, 2022. chainalysis.com/blog/cross-chain-bridge-hacks-2022/
53. Grayscale Bitcoin Covered Call ETF (BTCC). 19a-1 notice, January 14, 2026. etfs.grayscale.com/btcc
54. GameStop Corp. Form 10-K, filed March 24, 2026. SEC EDGAR.
55. Lido market share data. Lido tokenholder updates, DeFi Llama, CoinDesk. Peak 32.3% late 2023.
56. Ethereum Foundation. ethereum.org/en/staking/
57. Blockstream. Liquid Network documentation.
58. Somsen, Ruben. "Statechains: Non-custodial Off-chain Bitcoin Transfer." Medium, June 4, 2019.
59. Spark. Technical documentation. docs.spark.money/learn/tldr
60. BOLT specifications. github.com/lightning/bolts
61. Jensen, Michael C. and William H. Meckling. "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure." Journal of Financial Economics 3(4): 305-360, 1976.
62. VLS Project. vls.tech. v0.14.0 release, fifty+ validation policies, v1.0 targeted 2026.
63. Blockstream. Greenlight documentation.
64. Knight, Frank H. Risk, Uncertainty, and Profit. 1921.
65. Lin, Jian-Hong, Kevin Primicerio, Tiziano Squartini, Christian Decker, and Claudio J. Tessone. "Lightning Network: a second path towards centralisation of the Bitcoin economy." New Journal of Physics 22, 2020. arXiv:2002.02819
66. Atmanavičiūtė, Gabrielė (Laura), Tomas Vanagas, and Saulius Masteika. "Quantitative analysis of centralization in the Bitcoin Lightning Network through centrality metrics." IEEE Access, 2025.
67. Bitcoin Visuals (bitcoinvisuals.com) and mempool.space. Lightning Network data, April 2026.
68. Synergy Research Group. Cloud infrastructure market share data.
69. Kumar, Rashna, Sana Asif, Elise Lee, and Fabian E. Bustamante. "Each at its Own Pace: Third-Party Dependency and Centralization Around the World." ACM SIGMETRICS 2023. doi.org/10.1145/3579437
70. AWS US-EAST-1 outage, December 7, 2021. Pingdom/SolarWinds, CNBC, CBS News.
71. Coinbase. Q4 2025 SEC filing and shareholder letters.
72. Ray, John J. III. First Day Declaration, FTX Trading Ltd. Chapter 11 bankruptcy, Case No. 22-11068 (JTD), U.S. Bankruptcy Court, District of Delaware, November 2022.
73. Vidal-Tomás, David, Antonio Briola, and Tomaso Aste. "FTX's downfall and Binance's consolidation: the fragility of Centralized Digital Finance." arXiv:2302.11371v3, December 2023.
74. Albert, Réka, Hawoong Jeong, and Albert-László Barabási. "Error and Attack Tolerance of Complex Networks." Nature 406: 378-382, 2000.
75. Guasoni, Paolo, Gur Huberman, and Clara Shikhelman. "Lightning Network Economics: Topology." Management Science 71(7): 5477-5490, 2025. doi.org/10.1287/mnsc.2023.03872
76. Carotti, Federico, Carlo Sguanci, and Anastasios Sidiropoulos. "Rational Economic Behaviours in the Bitcoin Lightning Network." arXiv:2312.16496, December 2023. IEEE ICBC, 2024.
77. Zabka, Philipp, Klaus-T. Förster, Christian Decker, and Stefan Schmid. "A centrality analysis of the Lightning Network." Telecommunications Policy 48(2): 102696, 2024. doi.org/10.1016/j.telpol.2023.102696
78. Decker, Christian. Quoted in CoinDesk, February 20, 2020.
79. Wahrstätter, Anton et al. "Blockchain Censorship." LIPIcs, Advances in Financial Technologies (AFT).
80. Yellow.com. "Bitcoin Core v30 Release Guide." June 2025.
81. Rozas, David, Antonio Tenorio-Fornés, Silvia Díaz-Molina, and Samer Hassan. "When Ostrom Meets Blockchain: Exploring the Potentials of Blockchain for Commons Governance." SAGE Open 11(1), 2021.
82. De Filippi, Primavera and Benjamin Loveluck. "The invisible politics of Bitcoin: governance crisis of a decentralised infrastructure." Internet Policy Review 5(3), 2016. doi.org/10.14763/2016.3.427
83. Arthur, W. Brian. "Competing Technologies, Increasing Returns, and Lock-In by Historical Events." The Economic Journal 99(394): 116-131, 1989.
84. Rochet, Jean-Charles and Jean Tirole. "Platform Competition in Two-Sided Markets." Journal of the European Economic Association 1(4): 990-1029, 2003.
85. Wouters, Sam / River Financial. Lightning data, February 19, 2026. Via Bitcoin Magazine (Micah Zimmerman).
86. Lightspark announcement, April 28, 2025. Coinbase 15% of BTC transactions on Lightning within one year.
87. Square. Bitcoin Terms of Service. squareup.com/us/en/legal/general/square-bitcoin-alpha-terms. March 2026.
88. Jack, William and Tavneet Suri. "Mobile Money: The Economics of M-Pesa." NBER Working Paper 16721, January 2011.
89. Vodacom press statement, May 9, 2016. M-Pesa South Africa discontinued June 30, 2016.
90. Evans, David S. and Richard Schmalensee. "The Industrial Organization of Markets with Two-Sided Platforms." NBER Working Paper 11603, September 2005.
91. Gentry, Ryan. "The Flywheel Is Starting to Spin: Lightning Network Effects in Action." Lightning Labs Substack, July 22, 2021.
92. Mizrahi, Ayelet and Aviv Zohar. "Congestion Attacks in Payment Channel Networks." Financial Cryptography and Data Security (FC 2021), LNCS 12675, pp. 170-188, Springer. arXiv:2002.06564
93. Katz, Michael L. and Carl Shapiro. "Network Externalities, Competition, and Compatibility." American Economic Review 75(3): 424-440, 1985.
94. SEC Division of Corporation Finance. "Statement on Certain Protocol Staking Activities." May 29, 2025.
95. FinCEN FIN-2019-G001. Blanche Memo, April 7, 2025. CLARITY Act, July 2025.
96. ASC 606 (Revenue from Contracts with Customers).
97. FASB ASU 2023-08 / ASC 350-60.
98. Luxor Technology / Bitnomial. "Hashrate Futures Now Live." May 28, 2024.

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