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GLOBAL INSIGHT

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Digital Assets

Digital Assets: From Disruption to Convergence

Digital assets are moving from speculation toward financial infrastructure. Our base case is convergence: public protocols develop more permissioning while institutions adopt public rails where distribution and liquidity are key. Adoption and where value will accrue are the key questions.

Key Takeaways

- Finance is blockchain's clearest proving ground: digital cash, collateral, repo, and tokenized funds are emerging use cases.
- Adoption is growing: stablecoins exceed $300bn and tokenized RWA near $40bn; most activity is still crypto-native, but institutions are rapidly entering.
- Adoption does not guarantee token upside: economics can accrue to cryptocurrencies, crypto-native companies, or incumbent financial institutions.
- Bitcoin stands apart: its thesis is 'digital gold'. Broader crypto needs durable usage, credible value capture, and a deeper professional investor base.
- Blockchains compete on network effects and technical specs but also on how well compliance and privacy can be incorporated.

Regulation is defining a more credible path for institutional participation, stablecoins show the potential of digital money, financial markets are extending operating hours, and competition is moving inside the regulatory perimeter. At the same time, crypto prices have fallen sharply despite continued progress in tokenization and institutional infrastructure.

The key milestone is real usage, not just announcements: transaction volumes, assets on-chain, institutional clients, collateral mobilized, and workflows moving into production. Interoperability will determine whether digital assets create a connected financial ecosystem or simply reproduce today's fragmentation.

Investors should separate two questions: 'Is the technology being adopted?' and 'Who captures the economics?' Incumbents may retain the client relationship while using blockchain underneath; crypto-native firms are embracing regulation and can collaborate and compete with incumbents; and public protocols benefit where activity creates durable token demand.

For broader cryptocurrencies, professional capital is increasingly important. Fundamental adoption can strengthen the case for selected networks, but durable price discovery is harder if marginal demand remains dominated by retail flows, leverage, and narratives.

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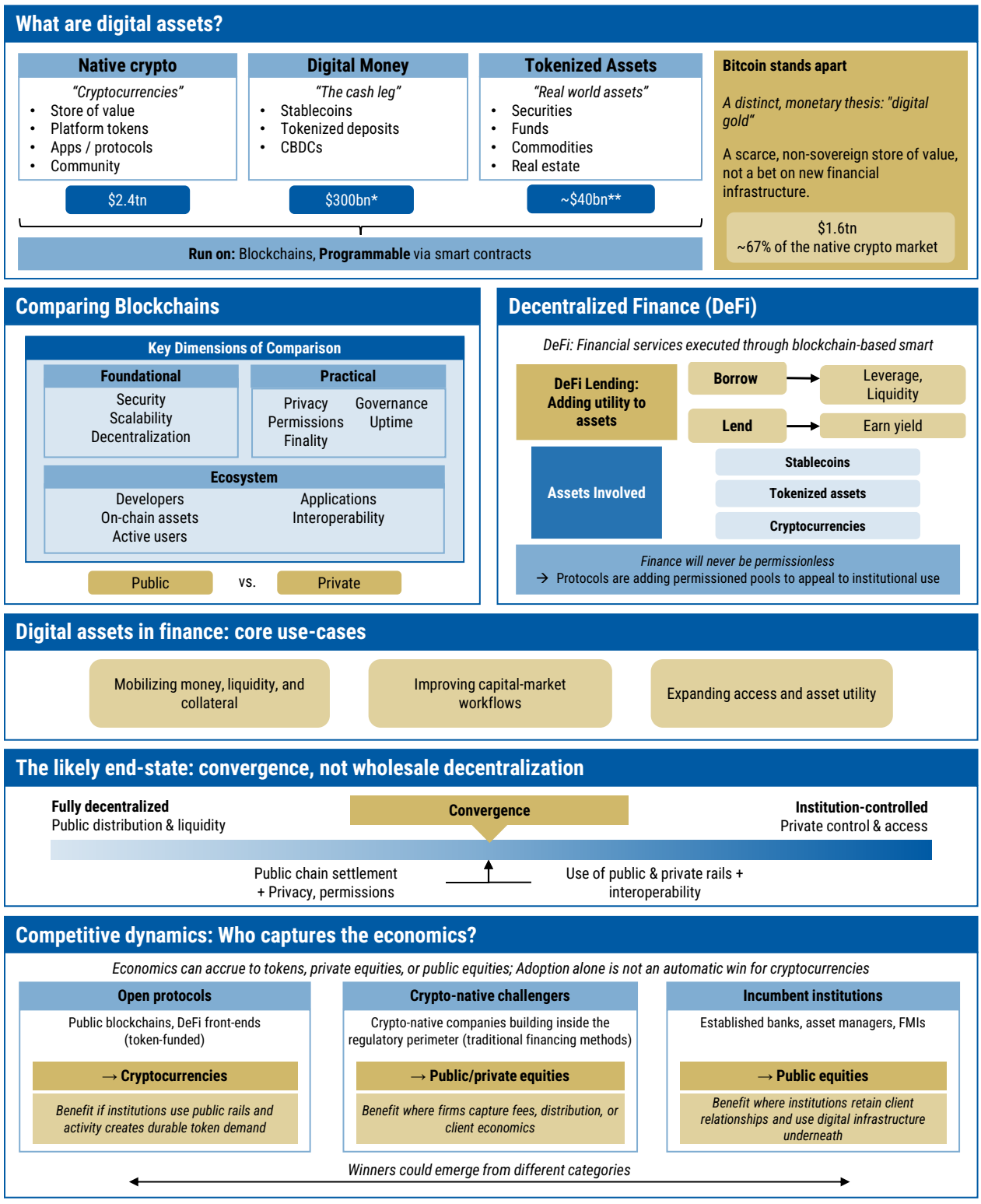
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The Big Picture

Exhibit 1: Digital assets in a nutshell



* Stablecoin market cap
** Includes tokenized crypto-focused funds; excludes assets represented but not traded on-chain

Key Concepts and Frameworks

Exhibit 2: Bitcoin has a distinct, 'digital gold' thesis, dependent on the demand for non-sovereign stores of value and Bitcoin's credibility

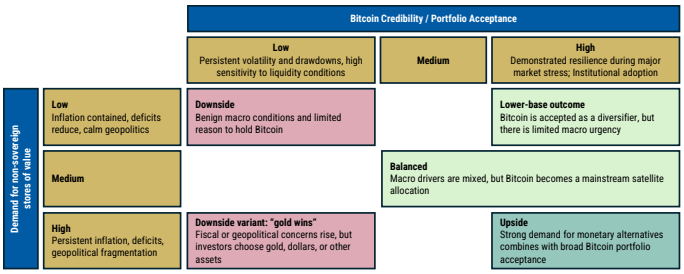


Exhibit 3: Other cryptocurrencies, like the native tokens of public blockchains and DeFi protocols, are more levered to their use in finance

Use-case layer	Existing friction	Digital-asset capability	Potential outcome	Related products	
Mobilizing money, liquidity and collateral	Trapped balances, cut-off times, prefunding and slow collateral movement	Digitally transferable cash and cash-like assets on shared ledgers	More continuous treasury, funding, payments, and margin	Stablecoins Tokenized deposits Tokenized MMFs	Blockchains & DLT
Improving capital-market workflows	Separate records, reconciliation, settlement delays and manual servicing	Shared ownership records and programmable lifecycle rules	More integrated issuance, settlement, and servicing	Tokenized assets Stablecoins Tokenized deposits	
Expanding access and asset utility	Geographic barriers, limited transferability and assets sitting idle	Wallet-based distribution, embedded eligibility and lending	Broader access, collateral use, and integrated portfolios	Tokenized assets DeFi	

Exhibit 4:
Cryptocurrencies have currency-like, equity-like, and crypto-specific value drivers; adoption of digital assets alone does not mean cryptocurrencies will accrue value - the token structure must support value accrual

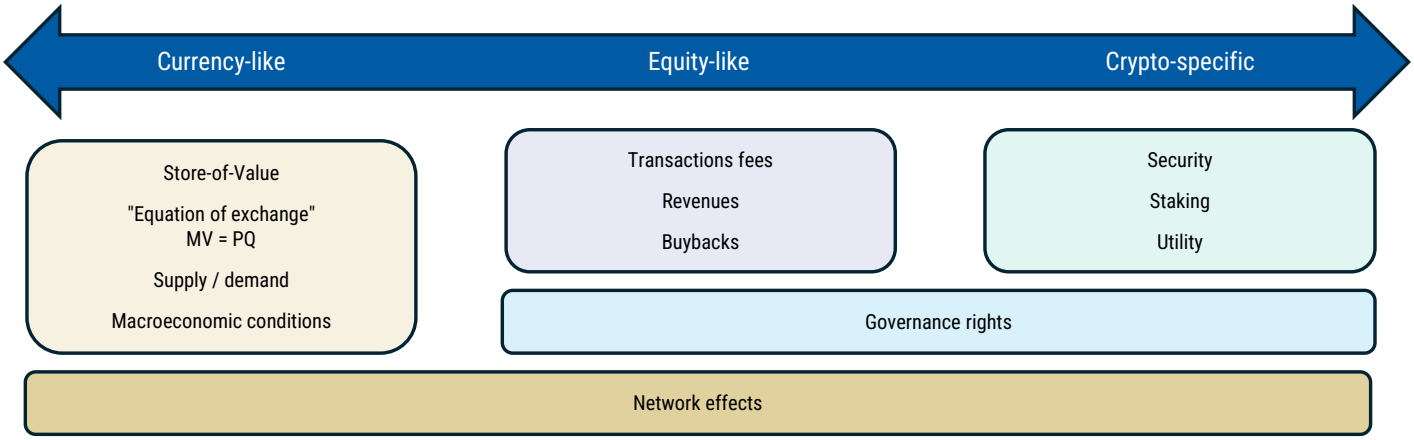


Exhibit 5: Digital assets scale as an ecosystem, not as isolated products; Assets need multiple on-chain applications

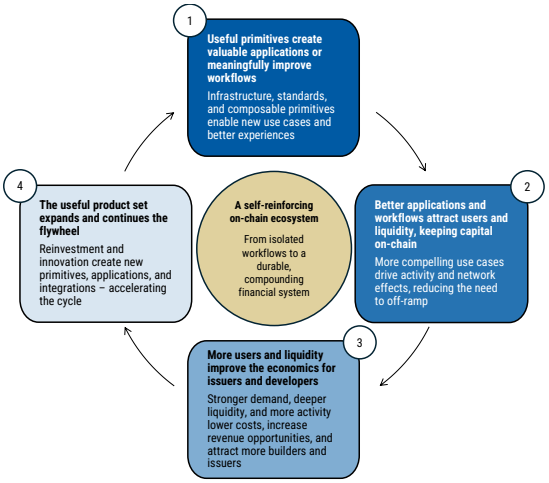
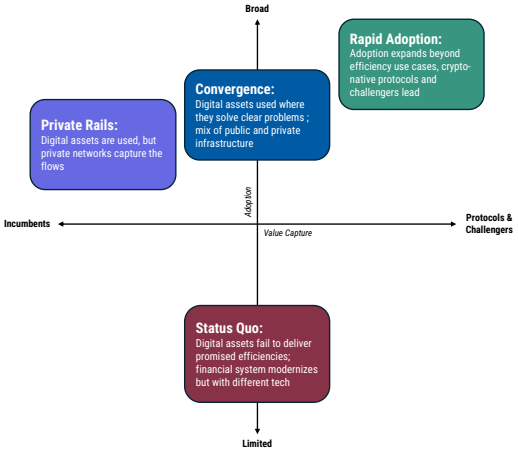


Exhibit 6: The outlook for digital assets hinges on adoption of the technology and which participants capture the resulting economic value



Executive Summary

The institutional debate around digital assets is shifting from speculative crypto toward financial infrastructure. Crypto prices remain well below their 2025 peak (Bitcoin -37%), but development has continued: roughly a quarter of companies in the Bloomberg World Financials Index by count, representing ~60% of market cap, have live, piloted, or announced digital-asset initiatives. Four developments make the theme strategically relevant today: Regulation is defining clearer paths for participation, stablecoins exceed $300bn, financial markets are extending operating hours, and competition is moving inside the regulatory perimeter. Digital rails are the networks and systems used to record, transfer, and settle value, including public blockchains, private DLT networks, and the connectivity between them. The key question is increasingly where these rails deliver measurable advantages and who captures the resulting economics.

Finance is blockchain's clearest proving ground, and institutions are rapidly getting involved. Money, securities, and contracts are already digital, yet operate across fragmented ledgers, institutions, and operating windows. Putting cash and assets on compatible programmable rails can integrate settlement, collateral, compliance, and servicing. Some applications are already operating at scale: Broadridge's Distributed Ledger Repo platform was processing roughly $357bn of repo transactions per day by June 2026, while J.P. Morgan's Kinexys processes more than $7bn of payments daily. The strongest near-term opportunities are practical: B2B payments and treasury, repo and collateral, and asset tokenization. Our global financial analysts discuss key implications in their recent BluePaper and our European diversified financials team discusses implications in their recent initiation.

The likely end-state is convergence rather than wholesale decentralization. Financial institutions require identity, privacy, governance, compliance, and legal controls, making fully permissionless finance unlikely to become core institutional infrastructure. But these controls increasingly can sit around, rather than replace, public networks and protocols. Public blockchains offer broad distribution, shared liquidity, common standards, and access to on-chain applications; asset- and application-level controls can restrict participation, while specialized Layer 2 networks can add further privacy and permissioning. Private networks remain attractive where confidentiality and counterparty control dominate. We therefore expect a mixed architecture, with interoperability determining whether digital assets reduce fragmentation or simply recreate it.

Blockchains will compete on fit for specific workflows, with network effects a key driver. Existing network effects favor established chains like Ethereum and Solana, but privacy, permissions, and tailored technology for financial workflows may push more activity to chains like Canton or customized Ethereum scaling solutions (L2s). Existing network effects have been built largely around retail activity - institutional usage could shift the balance. Interoperability makes a multi-chain future more likely, with nearly $150bn moved across chains via major bridge protocols in the last 12 months.

Bitcoin stands apart from the broader digital-assets theme. Its thesis is principally monetary: a scarce, non-sovereign store of value rather than a bet on new financial infrastructure. Bitcoin's market value is currently ~5% of the value of above-ground gold, leaving significant room for a monetary premium if acceptance broadens. Elevated

government debt, persistent deficits, and geopolitical fragmentation could support demand for non-sovereign stores of value, but Bitcoin must still demonstrate that long-run returns and diversification benefits compensate investors for high volatility and severe drawdowns. Our base case over the next five years is that Bitcoin becomes a more mainstream satellite allocation, with retail allocations potentially in the 1-4% range while institutional investment grows but remains more constrained. Risks to Bitcoin's outlook include quantum computing and continued reliance on retail attention.

Bitcoin's portfolio behavior is supportive of the diversification argument, but not conclusive. Over the last five years its correlation has been negative with the USD (-0.22), low with gold (0.14), US bonds (0.07), commodities (~0.10), and many other traditional assets, while its correlation with the Nasdaq has been higher at ~0.45. Correlations can vary materially through time and tend to rise when common macro and liquidity shocks dominate. Bitcoin's volatility has historically been high, keeping investors on the sidelines, but is now in line with popular tech stocks (~40% annualized).

Broader cryptocurrencies increasingly have observable fundamentals, but usage does not guarantee token returns. Several Layer 1 networks now generate more than $100mm of annualized transaction fees, while leading DeFi applications generate hundreds of millions: Hyperliquid stands out, with annualized fees near $1bn. Still, investors are effectively underwriting nascent networks and applications through liquid tokens, rather than conventional equity claims. Value accrual depends on whether activity creates persistent demand to hold or stake the token, whether fees reach holders, and whether those effects outweigh issuance and selling pressure.

A more durable cryptocurrency market also requires deeper professional participation. Institutional involvement is expanding through ETPs and other investment products (~$150bn AUM) and custody for spot is maturing, but much of price formation remains driven by retail and crypto-native liquidity, leverage, and narratives. We expect professional capital to broaden gradually and selectively toward assets with deep liquidity, credible governance, durable adoption, and demonstrable value capture.

Stablecoins demonstrate both the scale and current limits of on-chain finance. Supply exceeds $300bn, large enough to matter within digital-asset markets but still only ~0.25% of global M2. Gross transfer volume has averaged roughly $7.5tn per month over the last year, but much of that activity reflects crypto trading, CEX wallet movements, and inorganic transactions. Applying filters intended to isolate payments shows average monthly payment volumes of only ~$63bn in 2026. Stablecoins are already important financial infrastructure for crypto markets and on-chain liquidity, but their broader payments role remains much less developed. High velocity may also limit the float needed to sustain even high levels of activity. Longer term, we expect coexistence among forms of digital money: stablecoins lead on public networks, tokenized deposits serve bank-led institutional environments, and on-chain central-bank money can provide a settlement anchor in selected markets.

Tokenization is growing, but remains concentrated in areas where investors are already on-chain or where settlement friction is high. Tokenized real-world assets exceed $30bn, roughly six times their level at the start of 2025, with more than $17bn in cash-like rates products. Tokenized money-market funds provide yield to stablecoin issuers, protocol treasuries, and other digital-native investors; tokenized assets are also

beginning to be used as collateral in DeFi. The nearer-term institutional opportunity is collateral mobility and balance-sheet efficiency. The larger prize comes if tokenization ultimately reduces issuance, administration, reconciliation, and servicing costs across the full asset lifecycle.

Adoption alone does not determine investment value. Open protocols, regulated crypto-native challengers, and incumbent institutions are competing across distribution, trading, issuance, settlement, custody, and connectivity. Incumbents bring regulation, balance sheets, trusted client relationships, and distribution; crypto-native firms bring faster iteration and infrastructure designed around programmable assets. Economics can therefore accrue to cryptocurrencies, private-company equity, or public equities. Investors need to separate the question of whether blockchain technology is being adopted from which claim actually captures the resulting value.

Our outlook on digital assets through 2030 contemplates both whether the technology lives up to its potential and who captures the value:

- **Convergence, our base case**: Institutions adopt a mix of public and controlled rails for targeted use cases. Stablecoins lead in public-network activity, tokenized deposits develop in bank-led environments, and permissioned DeFi adds utility to tokenized assets. Incumbents retain many client relationships, crypto-native firms gain share in selected infrastructure and services, and public protocols benefit where activity creates durable token demand. Institutional investment in cryptocurrencies grows but remains selective.
- **Private Rails**: An outcome similar to the base case, but a bear case for crypto-native companies and protocols. Institutions adopt tokenization and DLT mainly through closed or institution-controlled networks. Collateral, settlement, and servicing improve, but public blockchains and DeFi remain largely parallel ecosystems. Most economic value accrues to incumbents and technology providers, while adoption generates limited incremental demand for public-network tokens.
- **Rapid Adoption**: The bull case for crypto-native companies and protocols. Tokenization expands into core capital markets, more assets are issued natively on-chain, and public networks capture a larger share of financial activity. Institutional DeFi develops through regulated access and permissioning, while stablecoins broaden into treasury, payments, and settlement. Greater demand for blockspace and decentralized services, alongside a deeper professional investor base, supports tokens with credible value capture.
- **Status Quo**: The bear case for digital assets more broadly. Finance modernizes primarily through existing databases, payment systems, cloud infrastructure, APIs, and automation. Stablecoins and tokenization remain useful in selected niches, but digital assets do not become foundational infrastructure. Bitcoin can persist as an investable monetary asset, while much of the broader cryptocurrency market remains cyclical, retail-driven, and narrative-dependent.

Key risks: Adoption may stall if digital rails fail to deliver clear economic benefits over improving conventional infrastructure. Digital assets introduce new operational and technology risks alongside familiar financial ones. Hacks, smart-contract bugs, bridge and oracle failures, lost or compromised private keys, blockchain outages, and stablecoin

depegs can cause rapid and sometimes irreversible losses, while public networks also raise challenges around privacy, sanctions exposure, transaction ordering, governance, and legal finality. Longer term, quantum computing could compromise widely used cryptography if networks and custodians fail to migrate in time, while fragmented standards and weak interoperability could recreate the very reconciliation and liquidity problems digital assets aim to solve. For cryptocurrencies, token structure can limit value accrual and persistent reliance on retail flows, leverage, and macro liquidity would limit the shift toward more fundamental, institutionally anchored price discovery.

Exhibit 7: Ways to get exposure to the digital assets theme

Product	Size	What the investor owns	Primary return driver	Crypto Beta	Liquidity	What it adds / enables	Key incremental risks
Spot crypto	$2.4tn	Token directly	Underlying token price; potentially staking/yield	Direct	High for major assets	Direct ownership; preserves native utility such as staking, governance and on-chain collateral use	Custody, key-management, and crypto trading-venue risk
ETFs / ETPs	> $150bn	Fund/ETP shares backed by or referencing crypto	Primarily underlying token price, less fees/tracking effects	Direct	Generally high	Token exposure through familiar brokerage, custody and reporting infrastructure	Fees, tracking differences, and possible loss of staking/native utility
Derivatives	~$150bn *(Open Interest)*	Futures, options, swaps, or perpetual contracts	Token price, basis/funding, volatility and/or leverage	Flexible	High in major contracts	Flexible long/short, leveraged, hedged and volatility exposure; greater capital efficiency	Margin/liquidation risk, basis/roll costs, funding rates, and counterparty/clearing risk
Venture capital	$93bn *(as of Q4'25)*	Stakes in private companies and/or early-stage token investments	Company/protocol growth, exit valuation and manager selection	Indirect / variable	Low	Access to private companies and investments unavailable in liquid markets	Illiquidity, valuation uncertainty, exit timing, and manager-selection risk
Hedge funds	$10-15bn *(as of Q4'25)*	Interest in an actively managed portfolio	Manager alpha, carry, relative value and/or directional crypto exposure	Variable	Medium*	Access to specialist strategies such as arbitrage, basis, market-neutral and volatility trading	Manager, leverage, liquidity, counterparty, and strategy-execution risk
Public equities	~$95bn *"pure play"**** >$13tn *digital assets "exposed"*****	Equity in a listed operating company	Earnings, growth and valuation, often influenced by crypto activity	Indirect	High	Exposure to cash flows of businesses benefiting from digital-asset adoption	Company execution, margins, and equity-valuation risk
Digital Asset Treasuries (DATs)	~$100bn	Equity in a company holding significant crypto assets	Token price plus changes in NAV/share, leverage and capital allocation	High, but nonlinear	High	Token exposure combined with balance-sheet leverage and potential accretive capital raising	NAV premium/discount, dilution, leverage, refinancing, and capital-allocation risk

* Fund-level liquidity depends on the vehicle and redemption terms.
** Excludes Bitcoin mining stocks
*** Financial services companies with some digital assets related business (retail or institutional)

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Key Debates

Why is Bitcoin's thesis distinct from the broader digital assets narrative?

Bitcoin's investment case is primarily monetary; most other digital assets depend more directly on adoption of new financial infrastructure. The "digital gold" thesis does not require Bitcoin to become a leading application platform or attract diverse financial activity. It depends on confidence in its scarcity, security and independence from any issuer, and on demand for non-sovereign stores of value. Fiscal stress or geopolitical fragmentation could support that demand, but Bitcoin must earn a durable monetary premium despite its volatility and lack of contractual cash flows. By contrast, smart-contract and protocol tokens generally need users, liquidity and applications to drive fees, staking or other token demand. Tokenization, stablecoins, and DeFi may therefore matter greatly for ETH, SOL and protocol tokens, but far less for Bitcoin.

What use cases will drive adoption?

Adoption should begin where digital rails solve measurable frictions and add utility. Our global banks and exchanges team discusses institutional use cases in their recent BluePaper and our European diversified financials team discusses implications in their recent initiation. The strongest near-term cases include tokenized cash management, repo and collateral, cross-border and corporate treasury payments, settlement and tokenized funds. These workflows can benefit from continuous operation, faster asset movement, shared records and programmable execution; Broadridge's DLT repo platform and tokenized money-market funds indicate that some are moving beyond pilots. **The larger opportunity comes when these uses connect.** A tokenized asset is more valuable when it can be funded with digital money, transferred as collateral, traded, financed and serviced without repeatedly returning to legacy systems. The long-term test is whether isolated applications develop into an ecosystem that give users reason to remain on-chain.

Where will value accrue?

Adoption and investment value capture are separate questions. Economics may accrue to public blockchains and protocol tokens, but also to incumbent institutions or crypto-native companies that control distribution, custody, trading, issuance, settlement, and connectivity. For a cryptocurrency, greater usage supports value only when the token captures the activity through durable demand for fees, staking, collateral or other functions, net of issuance and selling pressure. Institutions may adopt blockchain technology while retaining the client relationship and economics themselves. Investors must therefore assess tokenomics and competitive positioning alongside adoption.

Will institutions use public blockchains?

Yes, but selectively. Public networks offer shared infrastructure, broad distribution, established liquidity, open standards and access to crypto-native applications. They are most compelling where these network effects matter, including stablecoin settlement, broad asset distribution, and interaction with on-chain liquidity. Private or permissioned networks may remain preferable where confidentiality, counterparty control and governance are more important. Institutions must also manage sanctions exposure,

transaction ordering, privacy, resilience and legal finality. Our base case is a mixed architecture, with interoperability determining whether public and private networks form a connected system or recreate today's fragmentation.

Which blockchains will win?

The future will likely remain multi-chain. Adoption of specific chains will depend on fit for purpose: different networks optimize for different combinations of security, performance, privacy, programmability, and control, making them better suited to different use cases. Network effects will matter, as developer activity, liquidity, users, applications, and institutional infrastructure can reinforce adoption over time. Current network effects have grown largely around retail activity, so institutional usage could still shift the narrative. Interoperability may also reduce the need for one chain to dominate, allowing assets and applications to span multiple networks.

Can DeFi become institutional?

Institutional DeFi will require identity, permissions and accountable controls. DeFi's lasting contribution is the architecture it has demonstrated: common liquidity pools, automated lending and liquidation, composability, transparent collateral, and atomic settlement. Regulated intermediaries can provide access; tokenized assets can embed eligibility and transfer restrictions; and protocols can establish controlled markets for approved borrowers and collateral. Aave Horizon and the use of tokenized funds as DeFi collateral illustrate this direction. The investment question is whether institutions use shared protocols, allowing liquidity and value to accumulate in open infrastructure, or replicate the functionality in closed environments and retain the economics.

Is Finance the only application for blockchain?

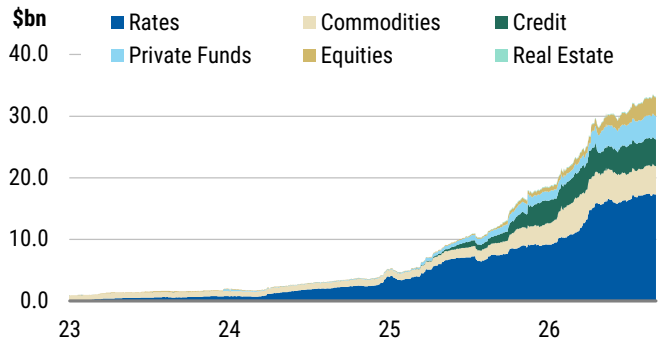
No, but it is the most developed. Outside finance, the strongest potential lies in coordinating distributed contributors and maintaining shared records across organizations without giving one party control. Decentralized infrastructure, product provenance, and AI-related applications are emerging, but remain earlier-stage and lower-probability than financial use cases.

What are the catalysts and milestones to look for?

The best catalysts are hard to predict. The US Treasury's announcement of long-end bond repurchases in August was an unexpected move that might have reignited momentum in crypto prices. However, more generally, continued regulatory progress, particularly passage of the Clarity Act or further SEC rulemaking, remains an important catalyst for institutional digital asset use broadly and cryptocurrency markets more specifically. As regulations become increasingly clear, specific and sustained use by institutions becomes the essential 'catalyst', although we expect adoption to be gradual. Look for increased tokenization volumes, use of digital money and tokenized assets in collateral management, and evidence of digital asset use in treasury and payments. Public chain and protocol usage needs to increase for value to flow to the broader cryptocurrency space. Macro conditions and liquidity remain an important driver of crypto markets and momentum can return quickly, but we view improving usage and fundamentals as the more durable long-term milestones.

Digital Asset Adoption Dashboard

Exhibit 8: Tokenized assets have grown, driven by rates products and commodities



tradable assets

Exhibit 9: Stablecoin transaction volumes are growing, but dominated by noise and crypto activity

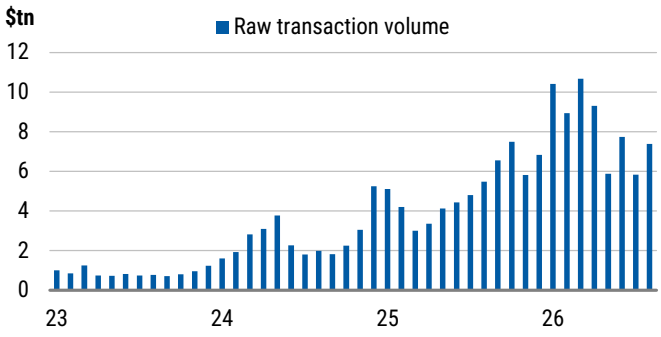


Exhibit 10: Chain fees have dropped as transactions get cheaper and activity falls

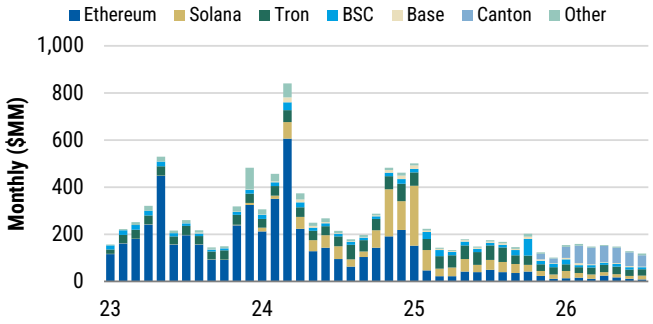


Exhibit 11: Active addresses have fallen for most chains as speculative activity has subsided

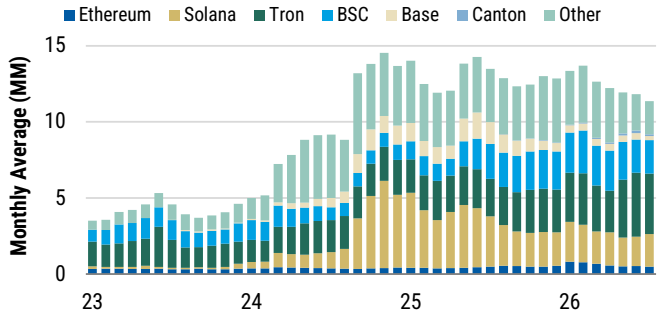
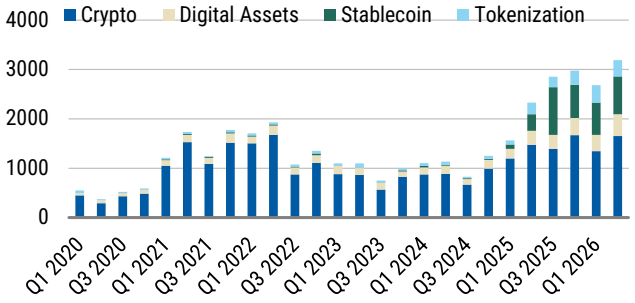
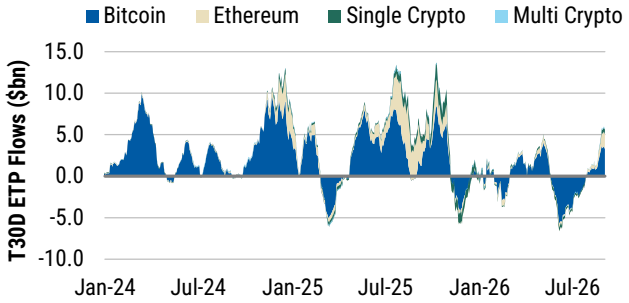


Exhibit 12: Financial institutions are discussing digital assets with increasing frequency



Note: Bloomberg World Financials Index, excluding crypto-native companies

Exhibit 13: Crypto ETP flows have generally been weak in 2026, but have picked up recently



Note: Includes ETFs and other ETPs issued across the world

Initiating Coverage on Digital Assets: Why Now?

With this report, we are initiating thematic coverage of the digital-asset ecosystem: the assets, networks, applications and market infrastructure built around blockchain-based ownership and value transfer. Our focus is the development of the underlying market—its technology, economics, adoption and competitive structure—*complementing* existing companies. This report is a primer spanning cryptocurrencies, crypto-native firms and institutional adoption, intended to help investors get up to speed on the broader narrative.

What to expect from our coverage

- Analysis of blockchain ecosystems and their institutional adoption
- DeFi protocol mechanics and usage
- Dynamics impacting cryptocurrency prices
- Regulatory updates and analysis
- Portfolio construction and trading strategies within cryptocurrencies
- Interviews with protocols and crypto-native projects
- Collaborative work with equity and macro analysts

Why now? Digital assets have been discussed for more than a decade, but four developments over the last two years have made the theme strategically relevant today:

1. **Regulation is defining a compliant path:** The US GENIUS Act established a federal framework for payment stablecoins, while CLARITY remains an important market-structure proposal. Frameworks still vary globally, but digital money, service providers, tokenized securities and custody are increasingly moving within regulated perimeters. Institutions and challengers now have a more credible basis to commit capital and launch products.
2. **Stablecoins have reached a scale institutions cannot ignore:** Supply exceeds $300bn, making stablecoins one of the largest live applications of blockchain-based finance. Usage remains concentrated in crypto trading, and raw on-chain volumes overstate payments activity. Their broader significance is as proof that money and assets can share programmable, continuously operating rails.
3. **Financial markets are extending operating hours:** Crypto markets already trade continuously, while Nasdaq, NSCC and NYSE Arca have extended or are preparing to extend trading and clearing windows. Longer market hours require cash, collateral, settlement, risk and treasury functions to operate more continuously as well. Stablecoins, tokenized deposits, tokenized money-market funds and tokenized collateral could help support that transition.
4. **Competition is moving inside the regulatory perimeter.** Institutions are using public blockchains, DeFi protocols are adding permissions and crypto-native firms are entering regulated financial services. Incumbents are simultaneously building

tokenized cash, custody, collateral and settlement capabilities. The emerging market is a convergence of institutions and crypto-native infrastructure, with participants competing and collaborating across distribution, custody, liquidity and settlement.

Digital assets have moved from "technology potential" to "market-structure option value." The near-term base case is probably selective adoption in high-friction workflows, not wholesale infrastructure replacement. However, the long-term impact could transform the financial system, whether led by DeFi, crypto-native challengers, or incumbents.

analysts

Digital Assets Thematic:

- Digital Rails, Real Economics: Digital Assets & the Future of Wholesale Banking (led by Betsy Graseck)
- Re-plumbing the Pipes: Technology's Reshaping of Capital Markets (led by Russell Quelch)
- Stablecoins & their alternatives: a European perspective (led by Giulia Miotto)
- Digital Rails, Traditional Trust; Implications of the Next Market Structure Stack (led by Mike Cyprys)
- Fintech/Stablecoins and the Future of Finance in Japan (Mia Nagasaka)

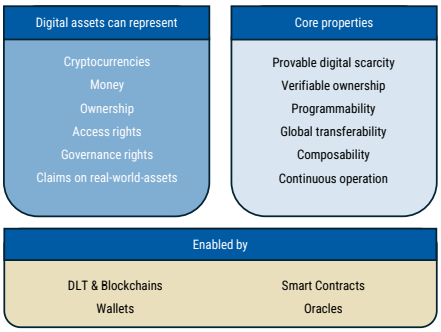
Crypto-native Stocks:

- CRCL Internet Group Inc. (James Faucette)
- Galaxy Digital Inc. (James Faucette)
- Bitcoin miners (Stephen Byrd)
- Gemini Space Station Inc. (Mike Cyprys)

Why Digital Assets Matter

We view digital assets as a broad technology and market-structure theme built around distributed, programmable ledgers that can record, transfer and automate ownership, money and other economic rights. The theme extends beyond cryptocurrencies to the networks where assets move, the software that manages them, new financial and commercial models enabled by internet-native value transfer, and the businesses positioned to benefit.

Exhibit 14: Digital assets are a broad technology and market-structure theme



The internet transformed the cost and speed of transmitting information, but did not create an equivalent native system for value. Information can move globally in seconds, while payments, securities and other claims still pass through multiple institutions, databases and messaging systems. Participants often maintain separate records, creating requirements for reconciliation, settlement-risk management and discrepancy resolution.

Blockchains and other distributed ledger technology (DLT) seek to reduce these frictions by giving participants access to a shared record updated under agreed rules. Smart contracts can go further by automating transactions and asset lifecycle events when predefined conditions are met. This does not eliminate trust. Instead, it can shift trust from bilateral relationships and individual intermediaries toward software, network rules, governance, and the legal structures connecting digital records to real-world claims.

Finance as Blockchain's First Major Proving Ground

Blockchain has potential applications in areas such as data provenance, identity, and decentralized infrastructure, but finance has emerged as its most developed use case. Financial assets are already largely digital, yet markets remain fragmented across separate systems, operate on restricted schedules and often rely on multiple intermediaries between trading and final settlement. Most of finance is a matter of reconciling between ledgers and intermediaries.

Putting money and assets onto compatible digital rails could bring trading, settlement, collateral, custody, compliance and asset servicing closer together. Assets can become programmable: able to move and settle automatically, generate cash flows, satisfy embedded rules and interact directly with other applications. The potential benefits include faster settlement, lower reconciliation costs, improved collateral mobility, broader distribution, and new forms of asset utility.

Exhibit 15: Digital asset uses in finance target three key workflow layers

Use-case layer	Existing friction	Digital-asset capability	Potential outcome	Related products	
Mobilizing money, liquidity and collateral	Trapped balances, cut-off times, prefunding and slow collateral movement	Digitally transferable cash and cash-like assets on shared ledgers	More continuous treasury, funding, payments, and margin	Stablecoins Tokenized deposits Tokenized MMFs	Blockchains & DLT
Improving capital-market workflows	Separate records, reconciliation, settlement delays and manual servicing	Shared ownership records and programmable lifecycle rules	More integrated issuance, settlement, and servicing	Tokenized assets Stablecoins Tokenized deposits	
Expanding access and asset utility	Geographic barriers, limited transferability and assets sitting idle	Wallet-based distribution, embedded eligibility and lending	Broader access, collateral use, and integrated portfolios	Tokenized assets DeFi	

Our global banks analysts, in partnership with Oliver Wyman, highlighted in their recent BluePaper on digital assets that several bank business lines could be impacted by digital assets even in the near-term: Liquidity & Balances, Cross-Border Payments, Trade Finance, FX, and Investor Services. These businesses could see strong adoption as digital rails can deliver lower costs, faster settlement, 24/7 access, and improved collateral mobility. Our US and European diversified financials analysts similarly note (here and here) that tokenization and always-on markets are reshaping collateral, funding, and settlement, while products like perpetual futures, prediction markets, and crypto-native venues are raising the bar for product simplicity, 24/7 access, and user experience. Tokenization and on-chain operations also open up new opportunities for asset and wealth managers, with many managers actively tokenizing funds to meet already-on-chain demand.

Crypto-native markets provided the first large-scale test of the architecture behind these use-cases:

- Bitcoin introduced a digitally scarce asset transferable without a central operator
- Public smart-contract networks created shared execution environments
- Wallets enabled direct asset ownership
- Stablecoins brought fiat-denominated value on-chain
- Decentralized finance (DeFi) recreated activities such as trading, lending and derivatives through software

Common technical standards made these components composable, allowing developers to combine existing assets and applications into new products.

Cryptocurrencies added a separate innovation to advance this infrastructure: the ability to coordinate and incentivize participants economically. They can pay network fees, reward validators, attract liquidity and distribute governance rights, helping new networks bootstrap participation globally. This coordination mechanism helped blockchains scale and even though much of the resulting activity was speculative, it nonetheless provided foundational stress-testing for the infrastructure. Token incentives can also subsidize activity that is not sustainable, making the financial use-cases discussed critical for future growth.

The Tension Between Permissionlessness and Financial Services

Some of the features that make public blockchains attractive to crypto-native users also create challenges for financial institutions. Permissionless networks can allow unknown users to transact and developers to deploy applications without central approval. Regulated firms, by contrast, must identify customers and counterparties, protect confidential information, comply with financial-crime rules, manage operational and settlement risks, and establish accountability when something goes wrong.

Privacy illustrates the trade-off. Public ledgers can improve transparency and auditability, but institutions cannot expose client identities, positions or trading activity. Institutional adoption therefore requires additional infrastructure around the blockchain, including identity, permissions, privacy, compliance, custody and governance. These controls do not necessarily need to be embedded in the underlying network; many can sit at the asset, wallet or application layer.

As a result, adoption has spanned a spectrum of technologies and use-cases. Private and permissioned networks provide greater control and confidentiality, while public networks offer open standards, larger developer ecosystems, liquidity and broader interoperability. Regulated stablecoins, tokenized deposits, tokenized securities and compliance-enabled applications increasingly combine elements of both models.

From Disruption to Convergence

Digital assets are consequently developing along two increasingly connected tracks. Crypto-native firms have built open financial networks and applications around direct ownership, programmability and global distribution. To attract institutional use, these open protocols are now building out support for permissioning and compliance. Meanwhile, established financial institutions started applying many of the same technologies to payments, collateral, securities issuance, fund distribution and post-trade processing, using private rails to implement controls required for regulated activity. Now, these firms are increasingly turning to public networks for their liquidity and distribution, particularly as tokenized assets grow.

The likely end-state is therefore neither a fully decentralized financial system nor one built entirely on institution-controlled infrastructure. Public blockchains, private networks and hybrid models can coexist, with different architectures suited to different use cases. Interoperability will be critical: without it, digital assets risk recreating the fragmentation they are intended to solve.

The broader significance of digital assets is the new design space they create for transferring value: digitally native assets, shared ownership records, programmable transactions and financial services distributed through software. Crypto markets demonstrated what this architecture can enable; institutional adoption is now testing which elements can improve the existing financial system at scale.

Not the First Modernization of Finance

Financial markets have repeatedly modernized by moving legacy processes into new infrastructure. The pattern repeats: shortcomings in the old model, incumbents worry about legal certainty, control, market structure, and intermediaries, regulators respond, and the new infrastructure becomes indispensable.

Dematerialization is the clearest precedent. In the late 1960s, US equity markets faced a paperwork crisis as volumes overwhelmed physical-certificate processing. Trades went unsettled, forcing exchanges to shorten hours, close on Wednesdays, and extend settlement to T+5. The solution immobilized certificates in a central depository and replaced paper movement with book-entry transfers.

The tradeoff was greater intermediation. Issuers and investors raised concerns about communication, proxy voting, privacy, and beneficial-owner identification. Some were justified: under the DTC model, Cede & Co. is generally the registered owner, while end-investors hold beneficial ownership through brokers or custodians. But fears that paperless ownership would make markets less reliable proved overblown. Dematerialization became the foundation of modern securities

settlement, reducing operational risk and enabling scale.

Electronic trading followed the same pattern. Floor- and phone-based markets were poorly suited to rising volumes, global participation, and faster execution. Nasdaq launched electronically in 1971, London's 1986 "Big Bang" paired deregulation with screen-based trading, and CME Globex brought electronic execution to derivatives. Regulators worried about conflicts, investor protection, liquidity, and price discovery. Automation increased dependence on market data, connectivity, venue resilience, and conduct rules, but broadened access, improved audit trails, increased competition, and reduced frictions. SEC analysis found US order-handling reforms narrowed Nasdaq spreads without materially impairing liquidity or volatility.

Algorithmic and high-frequency trading followed. As markets became electronic and fragmented, participants needed to route orders, minimize market impact, and provide liquidity at speed. By 2010, high-frequency firms represented more than half of US equity-market volume, according to the SEC. Concerns about speed advantages, cancellations, dark liquidity, fragmented price discovery, manipulation, and stress-period liquidity were real, but broad dismissal was overblown. Research on NYSE automation found narrower spreads, lower adverse selection, and more informative quotes.

Shorter settlement cycles show modernization can reduce post-trade risk. The US move from T+2 to T+1 reduced exposure between execution and settlement, despite concerns about trade breaks, funding, securities availability, and cross-border processing. T+0 raises deeper issues: SIFMA, ICI, DTCC, and others warn that same-day or real-time settlement could weaken multilateral netting, require prefunding, and increase intraday liquidity needs. DTCC notes that NSCC nets $1.7 trillion of equity transactions down about 98% to around $38 billion for settlement. T+1 reduced risk and clearing-fund requirements without materially worsening fail rates; caution around T+0 remains justified.

Digital assets and tokenization are the next leg of this arc. Finance is digital but fragmented across ownership, payments, collateral, compliance, and servicing ledgers requiring reconciliation. Tokenized money and assets on shared or interoperable ledgers could integrate settlement, compliance, and servicing, enabling atomic settlement, liquidity management, and embedded controls.

Concerns are familiar: legal finality, custody, cybersecurity, smart-contract governance, safe settlement assets, interoperability, and faster transmission of liquidity stress. The FSB has warned of financial-stability risks from complexity, opacity, liquidity mismatch, leverage, and operational fragility. These concerns justify safeguards, not dismissal.

The overblown claim is that digital assets add nothing because finance is already electronic. Earlier waves show innovation comes from redesigning records, workflows, and risk controls. Dematerialization did not eliminate custodians; electronic trading did not eliminate market makers; T+1 did not eliminate settlement risk. Tokenization will likely do the same: reconfigure, not replace, regulated intermediaries around programmable issuance, custody, collateral, settlement, compliance, and asset servicing.

Taxonomy: "Digital Assets" vs "Cryptocurrencies"

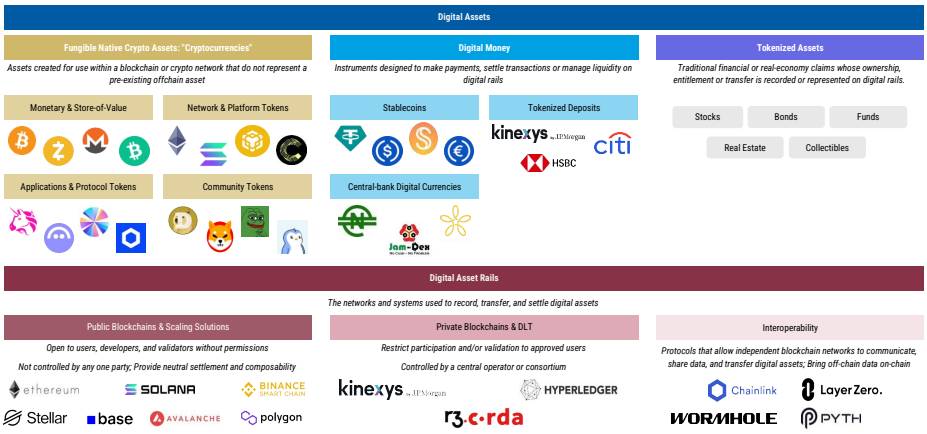
Digital assets encompass a broader set of technologies, instruments and market structures than cryptocurrencies alone. The theme includes blockchain networks, stablecoins, tokenized assets, decentralized applications and the infrastructure used to issue, hold, transfer and service them. Cryptocurrencies are one asset class within this broader ecosystem.

Digital assets rely on infrastructure for recording ownership and transferring value, typically blockchain or distributed ledger technology (DLT). We discuss these rails later; here we focus on what the holder owns. A token may itself be the asset, represent a claim on a bank or central bank, constitute an interest in a fund or other asset, or provide contractual exposure to an underlying asset.

We use three simplified categories based on an asset's primary economic function:

- Native cryptoassets ("cryptocurrencies")
- Digital money
- Tokenized assets

Exhibit 16: Our simple taxonomy for digital assets



We define **native cryptoassets** as assets created for use within a blockchain or crypto network that do not represent a pre-existing off-chain asset.

For simplicity, we generally refer to fungible native cryptoassets as cryptocurrencies, even though many are not intended primarily as currencies.

We divide fungible native cryptoassets into four broad categories:

- **Monetary and store-of-value assets:** Assets designed to function as money or stores of value without reference to an existing fiat currency. Bitcoin is the leading example.
- **Network and platform tokens:** Assets such as ETH and SOL used for transaction fees, staking or security, governance and network incentives.

- **Application and protocol tokens:** Tokens associated with DeFi, data, infrastructure, gaming and other applications, providing functions such as access, incentives, collateral or governance.
- **Community tokens:** Memecoins, fan and social tokens whose value is driven primarily by scarcity, identity, access or community rather than clearly defined economic utility.

Some native cryptoassets are non-fungible tokens (NFTs), although NFTs can also represent tokenized off-chain assets.

Non-Fungible Tokens (NFTs)

NFTs are individually identifiable tokens rather than interchangeable units of a common asset. Each has a unique identifier and may carry different metadata or rights. NFTs can represent digital collectibles, in-game items, memberships, credentials and unique on-chain positions, but can also convey rights to physical assets, intellectual property, securities or other off-chain claims. The NFT format therefore does not determine the asset's economic category.

For our taxonomy:

- an NFT representing a native digital item or on-chain position is a native cryptoasset;
- one representing an existing financial, physical or contractual claim is a tokenized asset; and
- one used solely for identity or access may be better viewed as a digital record rather than investable asset

Whether associated data is stored on- or off-chain is secondary. The key question is what ownership of the token entitles the holder to receive, access, control or redeem.

Digital Money

Digital money comprises instruments designed for payments, settlement or liquidity management on digital rails. The principal distinction is who or what supports the instrument and the nature of the holder's claim. We discuss these in more detail in our section on Stablecoins & Digital Money .

- **Stablecoins** are privately issued tokens designed to maintain a stable value relative to a reference currency. Fiat-referenced stablecoins typically hold reserves such as cash, deposits or short-dated government securities, while other designs use crypto collateral or algorithmic mechanisms. Redemption rights and reserve structures vary.
- **Tokenized deposits**, or deposit tokens, represent commercial-bank deposits on digital rails. The holder remains a creditor of the issuing bank and generally expects conversion at par into a conventional deposit. Models range from single-bank networks to emerging multi-bank structures.

- **Central-bank digital currencies** and tokenized central-bank money are direct central-bank liabilities. Retail CBDCs target households and businesses; wholesale forms target banks and financial-market infrastructures. Their status as central-bank money does not depend on whether blockchain or DLT is used.

Tokenized Assets

Tokenized assets are traditional financial or real-economy claims whose ownership, entitlement or transfer is recorded or represented on a blockchain, distributed-ledger network or other programmable ledger. Unlike native cryptoassets, they derive their economic value from an underlying asset, contractual claim or legal right that exists outside the token itself.

The underlying economics generally remain unchanged: a tokenized government bond is still a government bond and a tokenized fund interest remains a claim on the fund. Tokenization can, however, change how the asset is issued, distributed, transferred, settled, used as collateral and serviced.

The main categories include:

- **Tokenized financial assets**: government securities, bonds, loans, equities, funds, private credit, private equity, derivatives and structured products.
- **Tokenized non-financial and real-economy claims**: commodities, real estate, receivables, carbon credits, intellectual-property rights and collectibles.

The value and integrity of a tokenized asset depend on the legal and operational link between the token and the underlying claim. Custody, enforceability, transfer restrictions, redemption, servicing and insolvency treatment can therefore matter as much as the ledger on which the token is recorded. We discuss the mechanics, use cases and institutional adoption of tokenization further along in the note.

Sizing the Market

While digital assets are more than just cryptocurrencies, the cryptocurrency market is a useful starting point for sizing up the landscape.

The cryptocurrency market currently has an aggregate value of approximately $2.7tn. Bitcoin accounts for around $1.6tn, or 58%, while Ether at ~$300bn represents approximately 11%, and stablecoins a further $300bn, or 11%. Together, these three categories account for roughly 80% of the market, leaving only around one-fifth spread across the remainder of the ecosystem. However, the remainder of the ecosystem is highly diverse and includes alternative smart-contract platforms, DeFi protocols, infrastructure projects, application tokens and more speculative assets such as memecoins.

While the market has grown over the last 3 years (+158%), it is still some 37% below the peak reached in October 2025 ($4.3tn).

Exhibit 17: The cryptocurrency market is ~$2.7tn

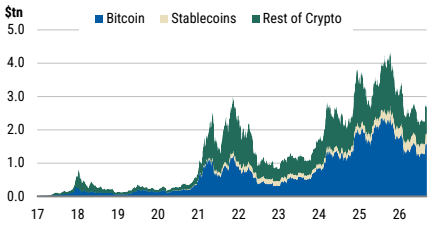
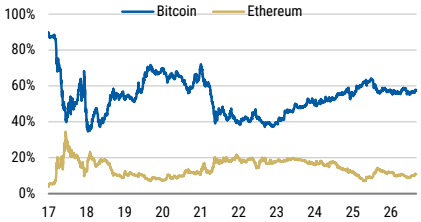
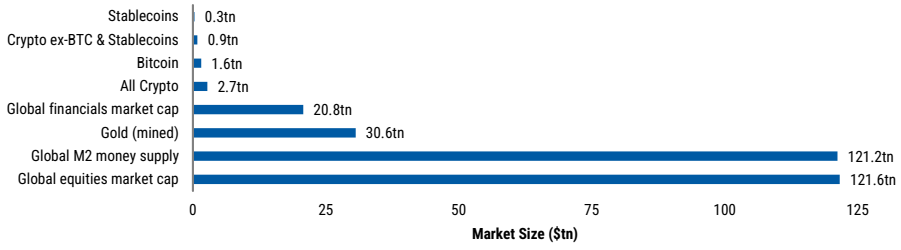


Exhibit 18: Bitcoin and Ethereum remain the dominant tokens



Compared to other markets, cryptocurrencies remain small. Global equities are roughly 44x the market cap of crypto, while gold is 11x. The global financial services industry, which could be evolved or disrupted via digital assets, is about 7.5x the size the crypto market. Meanwhile, stablecoins represent less than 0.25% of the global M2 money supply.

Exhibit 19: Compared to other markets, cryptocurrencies remain relatively small



Cryptocurrencies are heavily traded, with gross spot volume exceeding $39tn over the last 12 months, per CoinGecko, although much of this trading activity is bot-driven or wash trading. Derivatives add even more trading activity, with over $73tn notional traded in perpetual futures over the last 12 months, with average open interest of $96bn. These volumes are not purely retail flows: CME offers futures on 9 cryptocurrencies, with open interest averaging $16bn over the last 12 months.

Exhibit 20: Derivatives volume outpaces spot volume due to leverage

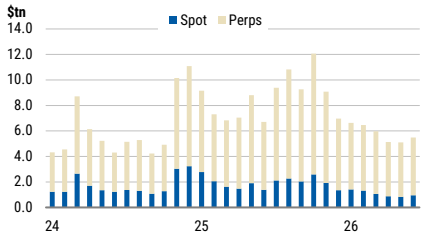
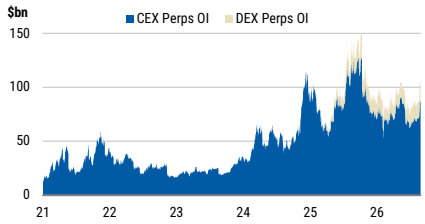


Exhibit 21: Perpetual futures open interest has grown meaningfully



While spot and derivatives markets remain popular ways of gaining cryptocurrency exposure, investors are able to invest in cryptocurrencies via funds as well. US crypto-related ETFs launched at the beginning of 2024, but other ETPs and funds had been available for some time before that. Funds identified by Bloomberg as having cryptocurrency exposure totaled over $150bn as of the end of August, with Bitcoin funds representing 80% of AUM, followed by Ethereum (13%), and other single or multi-crypto exposure (7%).

Exhibit 22: Bitcoin funds dominate crypto investment vehicles

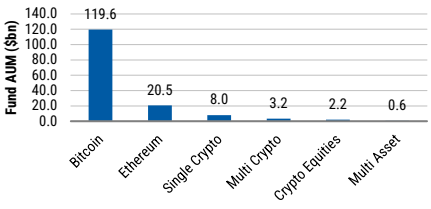


Exhibit 23: Flows have been weak over the past year

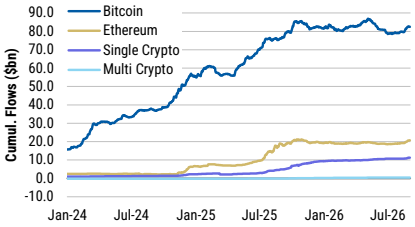
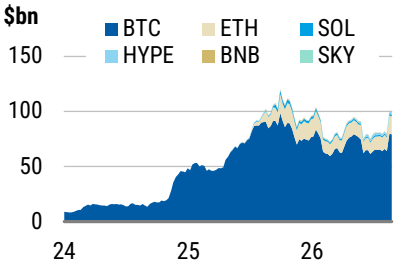


Exhibit 24: DATs hold ~$100bn in crypto



Digital Asset Treasury companies (DATs) emerged as another source of crypto exposure in 2025. These are companies whose primary purpose is to own and manage digital assets on their balance sheet - often replacing or economically dominating any other operating business of the company. DATs hold ~$100bn in crypto, with Strategy (MSTR, not covered), representing over $65bn of the total via its Bitcoin holdings. BitMine (BMNR, not covered) follows, with $12.9bn in Ether holdings. DATs collectively own ~5% of Bitcoin's existing supply and ~6% of the Ether market cap. DATs also own large portions of smaller tokens such as HYPE (~13% owned by DATs) and SKY (~10% owned by DATs).

Similar to ETFs, the appeal of DATs is in their availability as standard listed equities, providing crypto exposure to investors who cannot buy spot crypto or even crypto ETFs. This is useful to both institutional and retail investors, although we believe that most DAT holdings still reflect retail involvement rather than institutional participation.

Fundamentals Emerging

Speculation is still a major driver of the cryptocurrency market, but crypto projects are also starting to show fundamentals. Despite the recent pull back in the crypto market, several L1s show annualized fees of over $100mm. DeFi applications are also exhibiting strong fee-generating ability, with a number of protocols generating 100s of millions in fees, despite the pullback in the crypto market. Hyperliquid, the leading

perpetual futures decentralized exchange, generated nearly $1bn in fees over the last 12 months, and trailing 90 day fees annualized point to over $800mm in fees as activity in the perpetuals market stays strong. Aave, the leading DeFi lending protocol, shows annualized fees over $370mm (includes the interest paid by borrowers).

Although token holders do not have an economic claim on all of these fees, and fees can be skewed by incentives in the short-term, the metric is useful to show aggregate demand for transacting on these chains and protocols. We discuss these dynamics more in our section on token value accrual.

Exhibit 25: Blockchains and DeFi protocols generate meaningful transaction fees, a proxy for aggregate on-chain demand

Top Chains			
Chain	Token	Category	T90D Fees Ann.
Tron	TRX	L1	$330,988,028
Solana	SOL	L1	183,470,173
BNB Chain	BNB	L1	157,326,062
Ethereum	ETH	L1	125,886,889
Bitcoin	BTC	L1	74,692,584
Canton	CC	L1	52,441,281
NEAR	NEAR	L1	40,088,496
Base	-	L2 / scaling	38,900,821
Polygon	POL	L2 / scaling	33,056,513
Robinhood Chain	-	L2 / scaling	23,988,717

Top DeFi Protocols			
Protocol	Token	Category	T90D Fees Ann.
Pump.fun	PUMP	Launchpad / DEX	$1,002,725,627
Hyperliquid	HYPE	DEX (Perpetuals)	853,570,907
Sky (Maker)	SKY	Lending	713,957,838
Uniswap	UNI	DEX (Spot)	419,543,260
Aave	AAVE	Lending	372,909,035
Jupiter	JUP	DEX aggregator	230,721,538
Ethena	ENA	Stablecoins	170,406,949
Morpho	MORPHO	Lending	167,472,332
Spark	SPK	Capital Allocation	159,808,812
Meteora	MET	DEX (Spot)	121,715,534

Note: Fees for lending protocols includes borrow interest; as of 8/26/2026

DeFi protocols more broadly show about $88bn in 'total value locked' (TVL) - a metric used to describe the value of assets held in smart contracts related to a protocol. TVL is a useful metric for gauging on-chain activity, although the metric can also be influenced by incentives. The $88bn figure is reported by popular protocol data platform DeFiLlama and excludes activities like staking which are not indicative of active engagement in DeFi protocols, and seeks to avoid double counting of TVL that feeds into other protocols.

Current DeFi TVL is about 3% of the broader crypto market cap, suggesting that on-chain holdings are still largely passive. DeFi projects in the top 100 cryptocurrencies by market cap have a collective market cap of about $53bn, representing about 7% of the ex-Bitcoin crypto market cap.

Exhibit 26: TVL in DeFi remains a small portion of broader cryptocurrency market cap

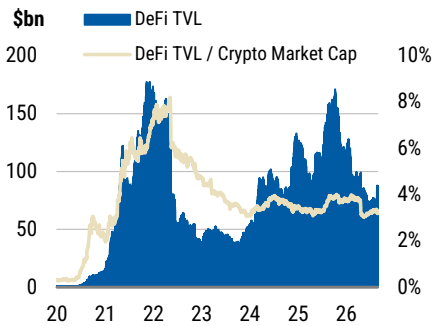
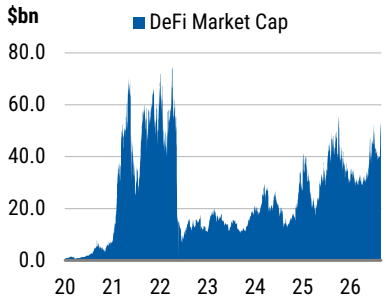


Exhibit 27: DeFi projects in the top 100 tokens by market cap have grown



Who's Who Amongst Tokens

Surveying the top 25 cryptocurrencies by market cap (excluding stablecoins and real-world-assets), shows how concentrated the market is, with the top 10 representing ~90% of the global market cap. Although market cap is concentrated, the actual projects making up the top 25 tokens are diverse. Layer 1 networks account for much of the list, with their native tokens used to pay transaction fees, secure networks and, in some cases, participate in governance. A second group consists of cryptocurrencies designed primarily as monetary assets, many of which have now existed for well over a decade, including privacy-focused currencies including Zcash (ZEC) and Monero (XMR). More specialized tokens round out the mix, including infrastructure projects, DeFi protocols, and centralized exchange ecosystem tokens.

Exhibit 28: Top 25 cryptocurrencies by market cap

	Ticker	Name	Price	Market Cap ($bn)	Sector	Launch Date	What is it	Price YTD
1	BTC	Bitcoin	77,920.00	1,564.3	Currency	2009	The native token of Bitcoin, a decentralized peer-to-peer monetary network with a programmatically limited supply of 21 million coins.	-11.7%
2	ETH	Ethereum	2,405.43	293.4	Layer 1	2015	The native token of Ethereum, used to pay transaction fees and secure a general-purpose blockchain that supports smart contracts and decentralized applications.	-19.5%
3	BNB	BNB	711.38	94.7	Layer 1	2017	The native token of BNB Chain, used for transaction fees, staking, and participation across its blockchain ecosystem.	-20.2%
4	XRP	XRP	1.37	86.0	Currency / L1	2012	The native token of the XRP Ledger, used for transaction fees and as a potential bridge asset for exchanging value between currencies and tokens.	-26.6%
5	SOL	Solana	100.87	59.0	Layer 1	2020	The native token of Solana, a high-throughput smart-contract blockchain, used to pay transaction fees and secure the network through staking.	-19.4%
6	TRX	TRON	0.33	31.1	Layer 1	2017	The native token of TRON, a smart-contract blockchain used extensively for stablecoin transfers, decentralized applications, and related network activity.	14.3%
7	HYPE	Hyperliquid	82.00	18.2	DeFi / Layer 1	2023	The native token of Hyperliquid, an application-focused Layer 1 blockchain built around on-chain trading, used for staking, governance, and network utility.	222.0%
8	ZEC	Zcash	845.60	14.3	Privacy	2016	The native token of Zcash, a decentralized payments network that allows users to protect transaction information through optional shielded transfers.	59.5%
9	DOGE	Dogecoin	0.08	13.0	Memecoin	2013	An open-source, peer-to-peer cryptocurrency originally inspired by the Shiba Inu internet meme.	-30.4%
10	RAIN	Rain	0.02	11.8	Prediction Mkt.	2025	The native token of Rain, an Arbitrum-based prediction-market protocol, used for governance, participant rewards, and access to certain trading functionality.	109.0%
11	XMR	Monero	513.29	9.7	Privacy	2014	The native token of Monero, a decentralized cryptocurrency designed to make transaction amounts, senders, and recipients private by default.	14.0%
12	LINK	Chainlink	11.31	8.5	Infrastructure	2019	The native token of the Chainlink oracle platform, used to pay for network services and support its cryptoeconomic security through staking.	-8.9%
13	WBT	WhiteBIT Coin	71.27	8.4	Exchange	2018	The ecosystem token of the WhiteBIT exchange and native gas asset of Whitechain, providing holders with exchange benefits and access to platform reward mechanisms.	26.1%
14	ADA	Cardano	0.21	7.8	Layer 1	2017	The native token of Cardano, used to pay transaction fees, secure the proof-of-stake network, and represent voting power in its governance system.	-39.7%
15	XLM	Stellar	0.18	6.2	Layer 1	2014	The native asset of the Stellar network, used to pay transaction fees, meet account minimum-balance requirements, and fund smart-contract storage.	-12.8%
16	BCH	Bitcoin Cash	250.42	5.0	Currency	2017	A cryptocurrency created through a fork of Bitcoin and designed to function as fast, low-cost peer-to-peer electronic cash.	-59.2%
17	CC	Canton	0.11	4.3	Layer 1	2024	The native token of Canton Network's Global Synchronizer, used to pay network fees and reward application developers, users and infrastructure operators.	-28.4%
18	LTC	Litecoin	50.69	3.9	Currency	2011	A decentralized peer-to-peer cryptocurrency designed to provide fast, low-cost digital payments using a Bitcoin-derived network.	-35.2%
19	UNI	Uniswap	6.18	3.9	DeFi	2018	The governance token of Uniswap, a decentralized exchange protocol, giving delegated holders voting rights over protocol parameters and treasury decisions.	3.7%
20	GRAM	Gram (prev. Toncoin)	1.34	3.7	Layer 1	2019	The native token of The Open Network, formerly called Toncoin, used for transaction fees, network validation, staking and governance voting.	-19.6%
21	HBAR	Hedera	0.08	3.4	Layer 1	2019	The native asset of Hedera, used to pay network fees, secure the network through staking, and access its transaction, token and data services.	-29.9%
22	AVAX	Avalanche	7.29	3.1	Layer 1	2020	The native token of Avalanche, used to pay fees, secure the platform through staking, and provide a common unit of account across Avalanche-based networks.	-41.6%
23	SUI	Sui	0.77	3.1	Layer 1	2023	The native token of Sui, a high-throughput smart-contract platform, used to pay gas, participate in proof-of-stake security, and support liquidity across the network.	-46.9%
24	SHIB	Shiba Inu	0.000005	3.1	Memecoin	2020	An Ethereum-based, community-driven meme token that serves as the principal token of the broader Shiba Inu ecosystem.	-25.2%
25	CRO	Cronos	0.06	2.7	Layer 1	2018	The native token of the Cronos blockchain ecosystem, used for transaction fees and to support payments, DeFi, and other applications linked to Crypto.com.	-39.8%

Note: Excludes stablecoins, RWAs ; Launch date refers to project launch, not token launch

The Broader Digital Assets Ecosystem

Beyond cryptocurrency-based projects, the digital assets market is best understood as a layered financial and technology ecosystem. At its core are blockchains and scaling networks, supported by foundations, developer companies, validators and token-holder communities. DeFi protocols, stablecoin issuers and other on-chain applications sit above these networks. Tokens may coordinate security, governance or user incentives, but the organizations building them are often conventional businesses with employees, shareholders and venture funding. The market now spans protocols, asset managers, banks, infrastructure providers and specialist financial firms.

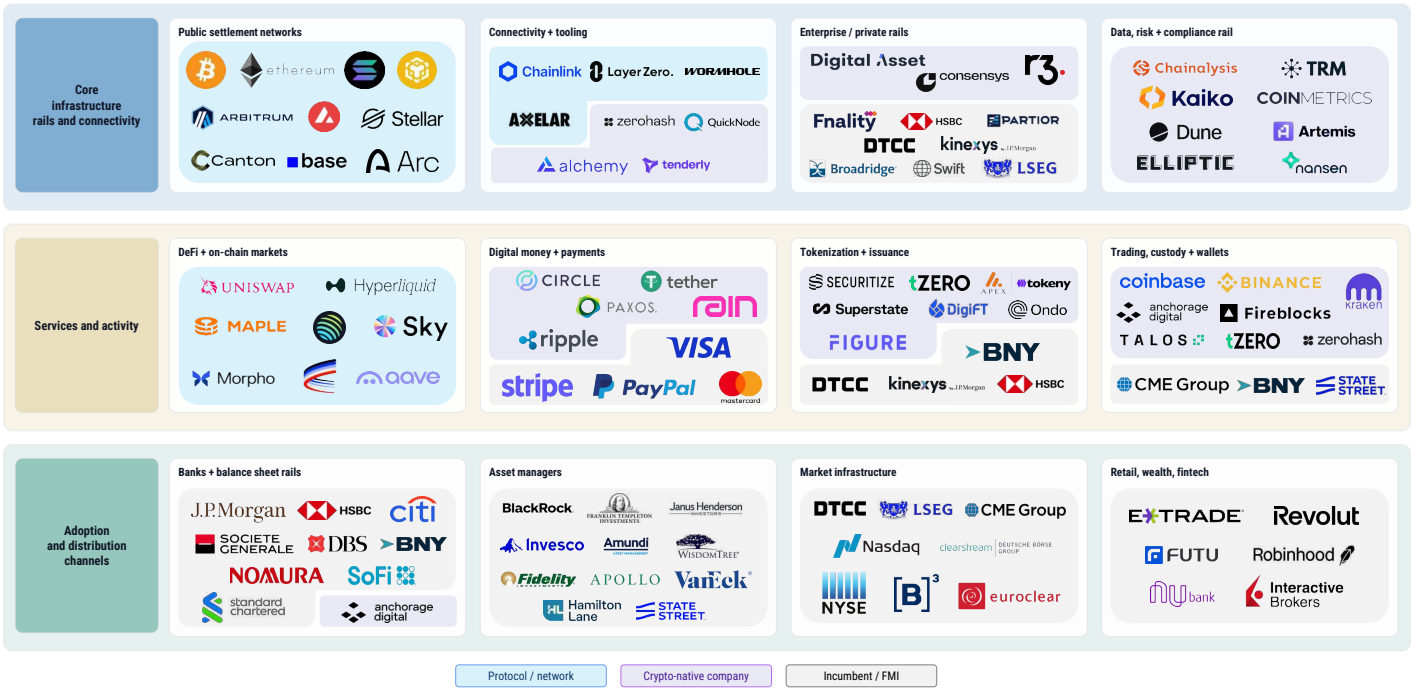
Around this on-chain core is a substantial equity-funded industry. Centralized exchanges and brokerages provide market access, while custodians, prime brokers and market makers support institutional trading. Other companies provide wallets, payments infrastructure, blockchain data, compliance tools, mining and validation services, or

connectivity between networks. Some are public companies, such as Coinbase and Circle; others, including Fireblocks, Anchorage Digital and Chainalysis, remain major private businesses. Their economics generally accrue through sales and profits and ultimately to shareholders, rather than through appreciation of a native token.

Traditional financial institutions are increasingly part of this market structure. Asset managers offer crypto investment products and tokenized funds; banks and custodians provide trading, custody and settlement; and payments companies are integrating stablecoins into existing merchant and cross-border payment networks. BlackRock's BUIDL fund and Stripe's acquisition of stablecoin infrastructure provider Bridge illustrate how blockchain-based products can be distributed through established financial and technology companies, with much of the resulting value accruing to conventional equity.

Exhibit 29 maps the digital-assets ecosystem by the functions participants perform, from underlying settlement and connectivity through financial services to client distribution. The aim is to show that the theme extends well beyond cryptocurrencies: public protocols, crypto-native companies, and incumbent financial institutions increasingly operate alongside one another across the same value chain. The resulting market structure is therefore less a standalone "crypto industry" than a growing overlap between new digital infrastructure and existing financial services.

Exhibit 29: The digital assets theme is home to a wide range of crypto-native protocols, startups, and incumbent institutions



Note: Indicative range of participants for financial use cases - non-exhaustive

Recent Market Behavior

Crypto remains well below its 2025 highs, although a sharp rally in late August has reversed some of the past year's losses. Bitcoin was around $113,000 in August 2025 and Ether was above $4,000, supported by ETF inflows, corporate and digital-asset-treasury (DAT) buying, and an increasingly supportive US policy backdrop. Bitcoin subsequently reached a record ~$126,000 on October 6. That proved to be the high-water mark: even after rallying by more than 20% in late August, Bitcoin remains around 30% below its level a year ago and nearly 40% below the October peak, while Ether remains down around 45% year-on-year. Performance past the majors has also been weak over the period: an equal-weighted basket of the top 100 cryptocurrencies by market cap remains down materially year-on-year (-56%).

Exhibit 30: Crypto markets have drawn down steeply over the past year

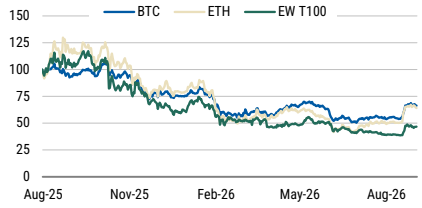


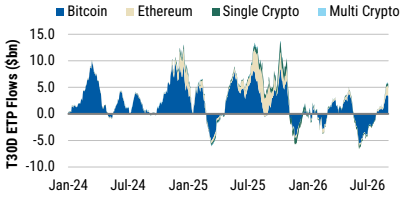
Exhibit 31: Crypto has underperformed equities and gold

	Price change (thru 02/09)	1Y	YTD	3M	1M
Crypto	Bitcoin	-31%	-12%	15%	23%
	Ethereum	-45%	-20%	26%	29%
	Solana	-52%	-20%	32%	37%
	Ripple	-52%	-27%	11%	27%
	EW Top 100 Crypto	-56%	-23%	-4%	19%
Equities	S&P 500	20%	12%	1%	2%
	NASDAQ Composite	23%	13%	-3%	3%
	MSCI World	19%	12%	1%	2%
	MS Broad AI Index	68%	41%	-19%	-1%
	Gold	24%	1%	-2%	8%

The major inflection point was October 10, 2025, or "10/10." The immediate catalyst was an escalation in US-China trade tensions: after China tightened controls on rare-earth exports, the US administration proposed an additional 100% tariff on Chinese imports. Risk assets sold off, but crypto's reaction was dramatically amplified by its own market structure. Large leveraged-long positions in perpetual futures were liquidated as prices fell, market makers withdrew liquidity, and pricing diverged across venues. **Roughly $19bn of leveraged positions were liquidated, the largest deleveraging event in crypto's history.** Bitcoin fell around 10%, while many other cryptocurrencies declined 40-70% or more intraday. The episode was therefore less a reassessment of crypto fundamentals than a macro shock hitting an overleveraged, relatively thin market, exposing weaknesses in collateral, liquidation, pricing, and liquidity infrastructure.

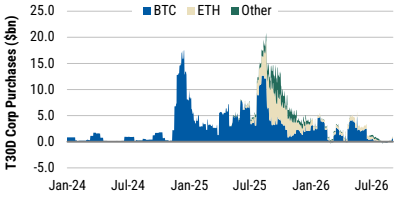
The leverage reset did not produce an immediate recovery. Instead, 10/10 marked the start of a broader deterioration in risk appetite. Late-2025 weakness was reinforced by reduced expectations for Fed easing, ETF outflows, and fading demand from some of the corporate treasury buyers that had helped drive the earlier rally. Early optimism in 2026 subsequently gave way to a more macro-driven market: renewed tariff uncertainty, the US-Iran conflict and associated oil-price risk, firmer inflation expectations, a stronger dollar, and a more hawkish Fed all tightened the liquidity conditions to which crypto has become increasingly sensitive.

Exhibit 32: Crypto ETP flows were weak in 1H2026, but have picked up



Note: Includes ETFs and other ETPs issued across the world

Exhibit 33: DAT & corporate flows have subsided in 2026 as well



Note: When not disclosed, corporate purchases in USD are estimated using average token price between transactions or t30d token price

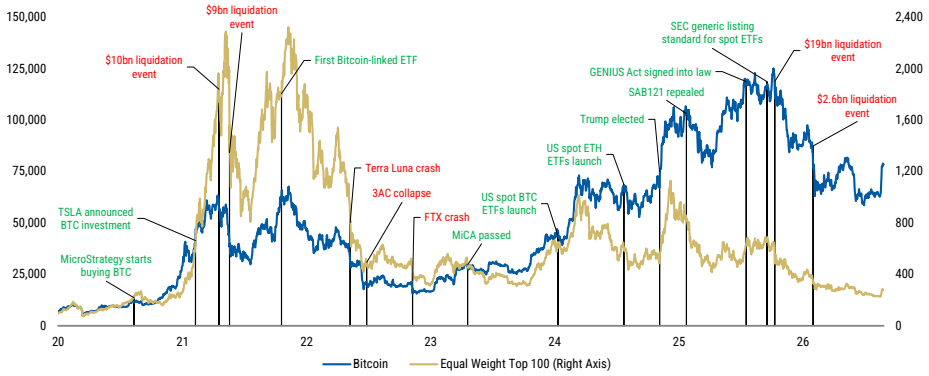
Notably, weak price action persisted through most of 2026 despite positive news flow around the adoption of digital assets in finance. However, as we discuss in the next section, Bitcoin's investment thesis is less related to the use of digital assets in financial infrastructure, while adoption of public blockchains and DeFi has not yet produced the sort of sustained increase in on-chain activity that could drive materially greater value to cryptocurrencies.

Crypto has also faced a competing narrative for investor attention. **AI has increasingly absorbed marginal risk capital, institutional focus, and retail enthusiasm that might otherwise have flowed toward crypto**, supported by visible earnings growth, enormous infrastructure spending, and strong equity-market performance. Equities benefited from strong earnings and AI leadership, while crypto's performance through most of the past year remained more dependent on liquidity and flows. This does not directly weaken crypto's underlying adoption story, but it matters for prices: with AI offering investors another high-beta secular growth theme, crypto has had to compete harder for both capital and narrative mindshare. **That competition increasingly exists within the crypto ecosystem itself**: tokenized equities now give on-chain users exposure to AI-related stocks through crypto exchanges, wallets, and DeFi-compatible assets, reducing the friction of rotating from crypto into equities without fully leaving digital-asset rails.

More recently, however, crypto markets have staged a sharp rebound, interrupting the weak trend that characterized most of the past year. Bitcoin rallied by more than 20% following the US Treasury's August 19 announcement that it would at least double the size of long-end liquidity-support buybacks, while Ether and a number of other cryptocurrencies rose even more sharply. The move was seen as showing policy makers' unease with elevated borrowing costs in the long end, playing into the fiat debasement narrative central to Bitcoin's thesis. The dollar has fallen ~0.80% since the announcement, noted that renewed focus on US currency policy could weigh on the USD in the near term. The move was amplified by a substantial short squeeze, with >$4bn of bearish crypto positions liquidated, alongside renewed ETP inflows and improving institutional flows. Renewed US regulatory momentum provided another tailwind. Whether the rally marks a durable change in trend will likely depend on whether improving flows and liquidity conditions persist after the short-positioning reset.

We explore Bitcoin's specific investment thesis and market behavior in more detail in the following section.

Exhibit 34: Historical crypto market performance



Note: Equal weight top 100 excludes stablecoins, real world assets, and rehypothecated tokens

Bitcoin: Digital Gold

Bitcoin vs Other Cryptocurrencies

Within the universe of cryptocurrencies, we see one particularly important distinction: Bitcoin versus other cryptocurrencies. Bitcoin's investment thesis is principally monetary; most other cryptocurrencies depend more directly on practical network adoption. Bitcoin's case rests on security, decentralization, fixed supply, and potential adoption as a non-sovereign store of value. The rest of the market is more heterogeneous, spanning programmable networks, applications and incentive systems. For cryptocurrencies such as ETH and SOL, value is more closely tied to usage, fees, staking demand and ecosystem growth. We discuss these value drivers in a later section. Finance is currently their leading use case, reflected in stablecoins, trading, lending and other DeFi applications.

As the largest and most established cryptocurrency, we analyze Bitcoin first and separately.

Exhibit 35: Bitcoin's price has not been highly correlated with its usage...

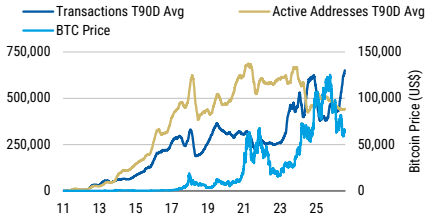
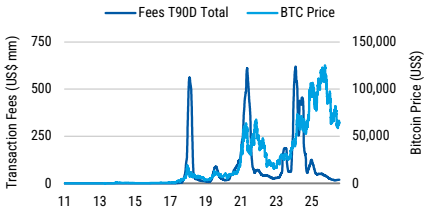


Exhibit 36: ... nor its transaction fee generation



Bitcoin's origins and original purpose

Bitcoin was introduced in a 2008 white paper and launched in January 2009 as the first widely adopted blockchain-based digital asset. Its aim was to enable **peer-to-peer electronic cash** without banks or payment processors. It addressed the double-spending problem by replacing a central authoritative ledger with a distributed network governed by protocol rules and proof-of-work consensus.

Users authorize transfers with private keys, nodes verify transactions, and miners compete to add them to the shared ledger in blocks. Miners receive newly issued Bitcoin and transaction fees, aligning economic incentives with network security. Bitcoin therefore serves both as transferable value and as the reward for securing the network. Issuance follows fixed protocol rules: block rewards decline over time and total supply is capped at 21 million Bitcoin, with no central issuer able to change it.

From electronic cash to a scarce monetary asset

Bitcoin's dominant role has shifted from everyday payments toward a long-term store of value. The base layer prioritizes security and decentralization over throughput, while limited capacity, variable fees and price volatility constrain routine payment use.

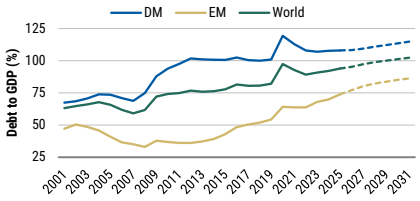
Its investment case is now more closely tied to fixed supply, network resilience and demand for a non-sovereign monetary asset. This underpins the "digital gold" analogy: Bitcoin is globally transferable and scarce, and its value depends largely on confidence in its durability rather than productive use or contractual cash flows. The analogy describes its potential monetary role, not its risk profile; Bitcoin remains far younger and more volatile than gold. Payments, collateral and other applications may expand its utility, but remain secondary to the monetary thesis.

The 'digital gold' thesis

We see the 'digital gold thesis' as the most appropriate framework for Bitcoin.

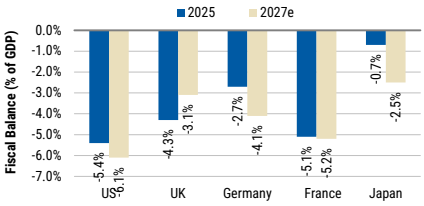
Bitcoin is often described as 'digital gold' because, like gold, its value is derived primarily from scarcity and demand to hold it as a monetary asset rather than from productive use or contractual cash flows. Gold's market value far exceeds what can be explained by its industrial applications, reflecting its long-standing acceptance as a store of wealth. The digital-gold thesis holds that Bitcoin could develop a similar monetary premium if investors continue to value its fixed supply, portability and independence from any single issuer.

Exhibit 37: Global government debt to GDP has steadily risen



Source: IMF

Exhibit 38: Deficits are expected to keep expanding in most major economies



The fiscal case for Bitcoin follows from this scarcity. Persistent deficits and rising government liabilities can increase concern that purchasing power will ultimately be eroded through inflation, currency depreciation or financial repression, supporting demand for scarce assets outside any single sovereign system. Because Bitcoin's supply is fixed, broader acceptance as a store of value would be expressed primarily through a higher monetary premium rather than increased supply. This is a long-term monetary-debasement thesis, not a claim that Bitcoin should reliably rise with short-term inflation. Over shorter periods, its price remains sensitive to liquidity conditions, real interest rates, the US dollar, risk appetite and crypto-specific market cycles, and it may behave more like a volatile risk asset than a defensive inflation hedge.

Exhibit 39: Bitcoin shows some correlation with inflation expectations...

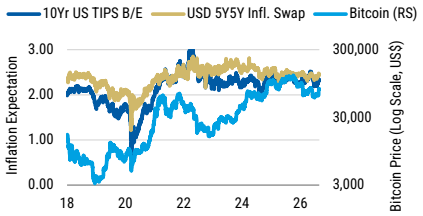
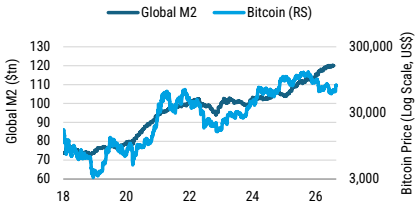
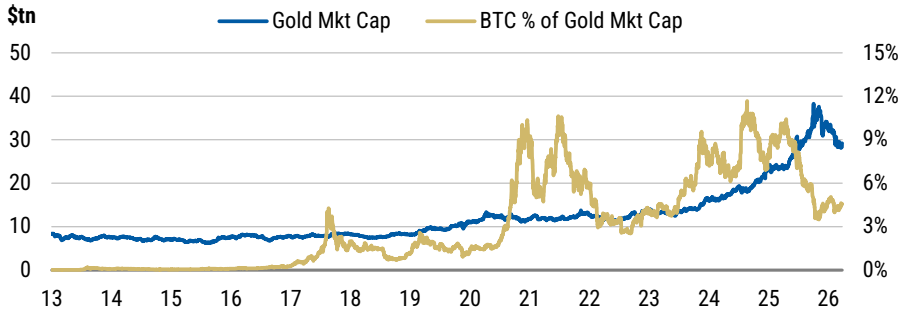


Exhibit 40: ... while showing a strong relationship to global M2 until the last year



Today, Bitcoin's market cap is about 5% of the value of above-ground Gold (~$31tn), although during prior bull markets this ratio exceeded 10%. Ultimately, gold remains the best benchmark for Bitcoin's long-term value, but the assets will compete for the store-of-value crown. Gold has thousands of years of human history proving its long-term value, but there are practical trade offs as well. It can be difficult and costly to store in physical form, and while gold ETFs have streamlined access, redemption for physical gold is generally subject to high minimums and operational burden. Bitcoin on the other hand is accessible to investors across the world and can be self-custodied without great expense, although loss or hacking of private keys remains a risk.

Exhibit 41: Bitcoin is currently worth ~5% of the global gold market



Source: Bloomberg, World Gold Council

The long-run Bitcoin outlook

Over the next five years, Bitcoin's outlook will depend less on its known supply schedule than on the breadth and durability of demand to hold it.

Barriers to retail and institutional access have fallen materially. In the US, Bitcoin is treated as a non-security digital commodity, banks can provide or outsource crypto custody, restrictive accounting guidance has been rescinded, and regulated ETFs/ETPs provide exposure without direct key management. Custody and operating controls still matter, but access is no longer the central constraint.

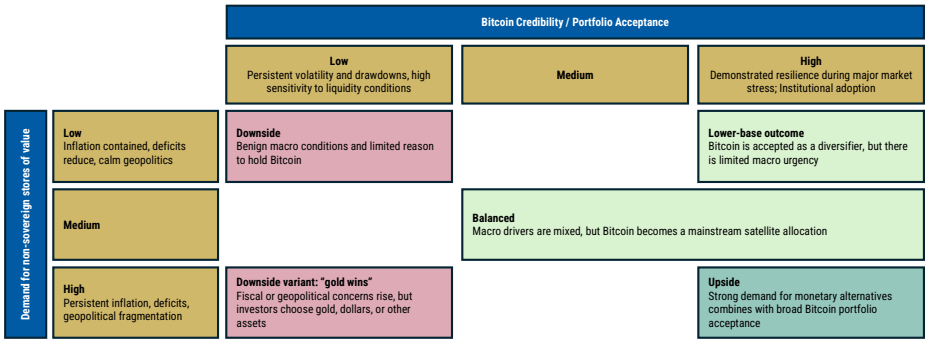
The bigger question is whether Bitcoin can earn a durable place in portfolios. That requires investors to gain confidence in its resilience through market cycles, diversification properties, liquidity and custody infrastructure, and expected return relative to its volatility and drawdowns. Fiscal and geopolitical stress could expand global demand for

non-sovereign stores of value; Bitcoin's upside then depends on how much of that demand it captures rather than gold, dollars, or other alternatives.

We therefore frame Bitcoin's long-term (5+ years) path around two variables: global demand for non-sovereign stores of value and the share captured by Bitcoin:

- **Balanced**: Bitcoin becomes a mainstream satellite allocation. Fiscal and geopolitical uncertainty sustain moderate demand for scarce assets, while access, custody and liquidity continue to improve. Bitcoin survives further cycles without a major technical or credibility failure, supporting allocations of roughly 1–4% across retail and selected institutions. Volatility and inconsistent defensive characteristics keep it complementary to gold rather than a replacement.
- **Upside:** Bitcoin becomes a strategic monetary asset. Persistent fiscal stress, financial repression, capital controls or geopolitical fragmentation materially increase demand for portable, non-sovereign assets. Bitcoin also demonstrates resilience through major market stress and gains deeper institutional acceptance. Allocations of 5%+ become credible for some investors, with adoption expanding to pensions, corporate treasuries, sovereign wealth funds and potentially sovereign balance sheets.
- **Downside:** Bitcoin remains a niche, cyclical asset. Demand for monetary alternatives stays limited, or investors respond to fiscal and geopolitical concerns by favoring gold, dollars or other assets. Persistent volatility, large drawdowns and sensitivity to liquidity conditions keep allocations small or tactical and limit adoption by pensions, corporate treasuries and sovereign investors.

Exhibit 42: The Bitcoin outlook is dependent on demand for non-sovereign stores of value and the credibility of the digital gold thesis



The Quantum Question

Quantum computing could eventually undermine some of the cryptography securing Bitcoin, but the principal risk is to ownership of coins, rather than Bitcoin's proof-of-work or transaction history. A sufficiently powerful quantum computer running Shor's algorithm could derive a private key from an exposed public key, allowing an attacker to steal the associated Bitcoin. By contrast, SHA-256, which underpins Bitcoin mining and hashing, is less vulnerable: quantum algorithms offer a more limited quadratic speed-up rather than the exponential advantage against digital signatures.

Bitcoin's exposure therefore depends heavily on whether a coin's public key is already visible. Project Eleven estimates some 7.5mm BTC (35% of the maximum supply) are at risk of quantum attack. These balances could theoretically be stolen once a sufficiently capable quantum computer exists. Other Bitcoin outputs hide the public key until they are spent, reducing long-exposure risk, although a sufficiently fast attacker could eventually target keys between transaction broadcast and confirmation.

The risk is credible, but timing remains highly uncertain. No existing quantum computer can break Bitcoin's cryptography at the required scale, but fast progress cannot be ruled out. Many leading quantum computing developers are targeting commercially relevant fault-tolerant quantum computers by around 2030. For reference, the US government has established deadlines requiring high-priority federal systems to migrate to post-quantum cryptography by 2030–31. Our global technology teams discuss quantum security in their recent report: Hardware Quantum Security – Building Defenses for Q-Day and Beyond.

The bigger challenge may be migration rather than invention. Post-quantum signature schemes already exist, and Bitcoin developers are considering upgrade paths, including proposals that would remove exposed key paths and ultimately replace vulnerable signatures. Any transition would still require network consensus, wallet and custodian upgrades, and action by holders. **The hardest issue is dormant or lost coins that cannot migrate**: allowing a future quantum attacker to recover them could return large amounts of bitcoin to circulation, while disabling them raises difficult governance and property-rights questions. Quantum is therefore best viewed as a manageable but material tail risk, with the key question being whether Bitcoin can execute an orderly migration before the threat becomes urgent.

Bitcoin's market behavior

The Halving Cycle

Bitcoin's "halving" is a programmed feature of the network that cuts the block subsidy paid to miners by 50% roughly every four years. By reducing the flow of newly issued Bitcoin, each halving lowers a source of structural sell pressure and reinforces the asset's scarcity narrative. Historically, Bitcoin has delivered strong returns in the 12–18 months following the 2012, 2016, 2020 and 2024 halvings, helping establish the idea of a recurring four-year market cycle.

That pattern should be treated cautiously. Four events are too few to establish a reliable statistical relationship, and each occurred under different conditions for liquidity, adoption, regulation and market structure. The absolute reduction in new supply also becomes smaller with every halving, while ETF flows, corporate demand, long-term-holder selling and macro conditions can now outweigh changes in miner issuance. We therefore view the halving as a supportive supply-side catalyst, rather than a standalone timing signal: historical performance can inform a weak prior, but investment decisions should be anchored with long-term demand for the asset in mind.

Exhibit 43: Bitcoin has historically followed a 4 year cycle

		Cycle Peak					Post-Peak Trough				
Halving Date	BTC Price T-1	Date	Years vs Prior Peak	BTC Price	Change vs Halving	Days After Halving	Date	Years vs Prior Trough	BTC Price	Change vs Peak	Days After Halving
11/28/2012	12.20	12/1/2013		1,137	9220%	368	1/14/2015		183	-84%	777
7/9/2016	660.70	12/17/2017	4.0	19,042	2782%	526	12/15/2018	3.9	3,157	-83%	889
5/11/2020	8,675.29	11/9/2021	3.9	67,734	681%	547	11/21/2022	3.9	15,632	-77%	924
4/20/2024	64,071.26	10/6/2025	3.9	125,261	96%	534	6/30/2026	3.6	58,642	-53%	801

Note: For performance since 4/20/2024 halving: Assumes cycle-to-date peak for peak (Oct 2025) and most recent low as the trough

Volatility

Volatility in Bitcoin is not what it once was. The asset has been known for wild price swings, but as it has matured, its volatility profile has leveled off as well. Annualized T180D volatility for Bitcoin is at ~40%, which is optically high relative to a stock index like the Nasdaq, which shows annualized T180D volatility of just under 20%. However, it is not fair to compare a single asset to a diversified index. Bitcoin is better compared to individual stocks, such as the Mag 7, whose constituents show volatility between 26% (AAPL) and 45% (TSLA), with an average of 36%.

Another way of assessing Bitcoin's volatility is in its drawdowns. These have clearly been severe, with three ~80% peak to trough moves over the last decade and a current drawdown of ~50%. These numbers seem extreme compared to the 10-20% drawdowns investors might expect from equity indices. But again, the comparison of a single asset to an index is problematic. Research done by the Counterpoint Global team in Morgan Stanley's Investment Management division shows that the median drawdown for stocks between 1985 and 2024 was 85%. While the frequency of such drawdowns has been higher for Bitcoin than other assets, the magnitude is not too dissimilar to the risk of individual stock positions.

Exhibit 44: Bitcoin's volatility has decreased meaningfully ...

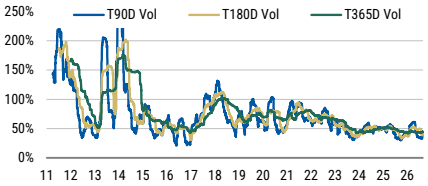


Exhibit 45: ... and is comparable to high-beta stocks

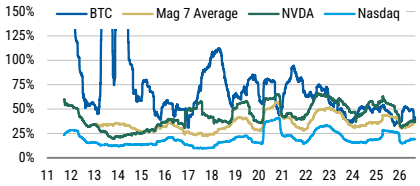


Exhibit 46: Drawdowns have been severe and frequent ...

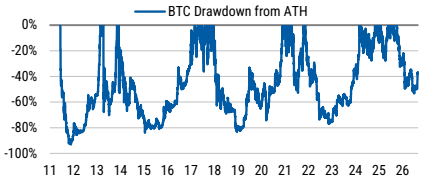


Exhibit 47: ... but not dissimilar in magnitude to what the median stock experiences

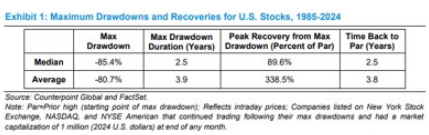


Exhibit 1: Maximum Drawdowns and Recoveries for U.S. Stocks, 1985-2024

	Max Drawdown	Max Drawdown Duration (Years)	Peak Recovery from Max Drawdown (Percent of Par)	Time Back to Par (Years)
Median	-85.4%	2.5	89.6%	2.5
Average	-80.7%	3.9	338.5%	3.8

Source: Counterpoint Global and FactSet.
Note: Par=Prior high (starting point of max drawdown); Reflects intraday prices; Companies listed on New York Stock Exchange, NASDAQ, and NYSE American that continued trading following their max drawdowns and had a market capitalization of 1 million (2024 U.S. dollars) at end of any month.

Source: Counterpoint Global

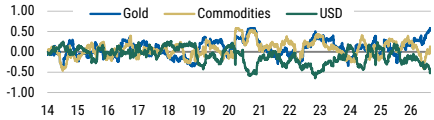
Correlations

Bitcoin has historically exhibited relatively low correlations (between -0.5 and 0.5) with

established asset classes, including equities, bonds and commodities, giving it a return profile that has often been distinct from traditional portfolio exposures. It has also shown a more pronounced negative correlation with the US dollar since 2020, in line with the thesis on debasement, although gold has generally been more negatively correlated with the dollar. These correlations have supported the argument that Bitcoin can provide portfolio diversification despite its high standalone volatility. However, correlations are not stable: Bitcoin can trade more like a risk asset during periods dominated by common macro or liquidity shocks, and its correlation with equities has periodically risen materially. Investors should therefore view low historical correlation as a potentially useful portfolio characteristic, rather than assume Bitcoin will reliably hedge traditional assets during periods of market stress.

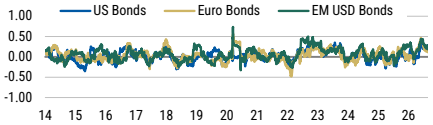
Rolling 90 Day Correlations:

Exhibit 48: Bitcoin vs commodities, USD



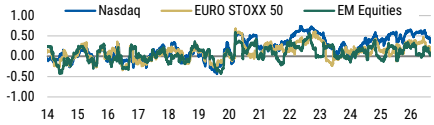
Note: Commodities = Bloomberg Commodity Index; USD = Bloomberg Dollar Spot Index

Exhibit 49: Bitcoin vs bonds



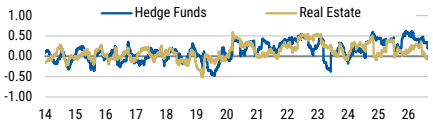
Note: US bonds = Bloomberg US Agg; Euro bonds = Bloomberg Euro Agg; EM USD bonds = Bloomberg EM Hard Currency Agg

Exhibit 50: Bitcoin vs equities



Note: EM equities = MSCI Emerging Markets Index

Exhibit 51: Bitcoin vs other investments



Note: Hedge Funds = Bloomberg All Hedge Fund Index; Real Estate = Bloomberg REIT & Real Estate Index

Exhibit 52:

Long-run correlations between Bitcoin and other asset classes are also low

5 Year Correlation	Bitcoin	Gold	USD	Commods	US Bonds	Euro Bonds	EM USD Bonds	Nasdaq Composite	European Equities	EM Equities	Hedge Funds	Real Estate
Bitcoin	1.00											
Gold	0.14	1.00										
USD	-0.22	-0.46	1.00									
Commods	0.10	0.40	-0.22	1.00								
US Bonds	0.07	0.29	-0.43	-0.03	1.00							
Euro Bonds	0.07	0.19	-0.19	-0.09	0.65	1.00						
EM USD Bonds	0.15	0.23	-0.45	0.02	0.76	0.58	1.00					
Nasdaq Composite	0.45	0.12	-0.32	0.11	0.16	0.14	0.30	1.00				
European Equities	0.22	0.09	-0.31	0.07	0.08	0.10	0.39	0.44	1.00			
EM Equities	0.15	0.20	-0.27	0.17	0.05	0.03	0.37	0.24	0.43	1.00		
Hedge Funds	0.30	0.23	-0.26	0.13	0.12	0.08	0.43	0.59	0.60	0.58	1.00	
Real Estate	0.27	0.16	-0.37	0.10	0.36	0.29	0.43	0.49	0.29	0.12	0.34	1.00

Note: See Exhibits 48 - 51 for indices used

Value Drivers for Broader Cryptocurrencies

Bitcoin has a relatively distinct investment thesis; the rest of the cryptocurrency universe is far more heterogeneous. Tokens span blockchains, scaling networks, DeFi protocols, oracle networks, and other applications, with functions ranging from transaction fees and network security to governance and access rights.

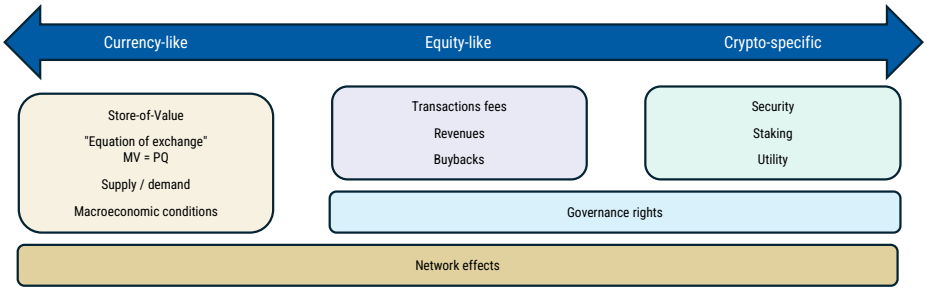
Despite this diversity, usage is the fundamental long-term starting point. Networks and protocols need to attract users, assets, developers, liquidity and economically productive activity, with network effects potentially reinforcing adoption as ecosystems grow. Over the past year, top blockchains have recorded over 126bn transactions, but for context, McKinsey estimates global payments at 3.6tn transactions worldwide in 2025, while WFE data suggests some 60-70bn equity trades are executed on exchanges per year. Even limited penetration in key financial workflows could mean substantially higher usage for public protocols.

However, network growth does not necessarily translate into token returns. Cryptocurrencies generally lack the residual claims on assets and earnings associated with equities, so value capture depends on token structure: whether activity creates persistent demand to hold or use the token, whether fees accrue to holders or are burned, and how these sources of demand compare with issuance and dilution.

Understanding Token Value Accrual

Cryptocurrencies combine characteristics seen in several traditional asset classes with crypto-specific drivers. Some have **currency-like properties**, such as store-of-value or medium-of-exchange demand. Others have **equity-like economics**, including transaction fees, revenues or buybacks. Tokens can also derive demand from **utility**and **governance rights,** such as participation in a DAO that steers a project's direction. Across these models, **network effects** matter: an ecosystem with more users, assets, liquidity and applications can become increasingly valuable to participants.

Exhibit 53: Cryptocurrencies have currency-like, equity-like, and crypto-specific value drivers



Tokenomics

Tokenomics is the economic design that determines how network activity translates into token supply and demand. It governs issuance, distribution, incentives, utility and the rights associated with a token. Tokens can also coordinate participants by rewarding

certain activity, helping networks overcome early cold-start problems. Sustainable ecosystems should become less dependent on subsidies as organic activity develops.

Fundamental analysis starts with what value the network creates and whether the token is necessary to capture it. Utility alone is insufficient. A token may be widely used for transactions yet generate little persistent demand if users hold it only briefly and recipients immediately sell. More durable demand can arise from use as collateral, staking, governance or other economically productive reasons to hold the asset.

This creates an important distinction between flow demand and stock demand. Transaction activity generates demand to acquire or spend a token; value capture becomes stronger when participants also need to retain meaningful balances. Artificial lock-ups or issuance-funded rewards can suppress selling temporarily, but do not necessarily create underlying value.

Supply determines how much value accrues to each token. Investors should assess circulating and fully diluted supply, issuance, vesting and unlocks, burns, ownership concentration, and likely recipient selling. Token issuance effectively pays for security, liquidity, adoption or other services; stronger models convert those incentives into durable activity while reducing reliance on subsidies.

Exhibit 54: Framework for assessing tokenomics

Stage	Component	Fundamental question	What to examine
Value creation	Purpose & participants	What activity does the network coordinate?	Network participants: the actions required from each; rewards for useful behavior and penalties for harmful behaviour.
	Utility & necessity	What does the token enable, and is it necessary?	Payment of network fees; access to products or capacity; collateral; governance; discounts; rewards. Consider whether the same service could operate without the token.
Value capture	Flow demand	Why acquire or spend the token?	Transaction fees, payments, service consumption, and other recurring uses. Determine whether demand scales with actual network activity or is largely speculative.
	Stock demand	Why hold the token?	Staking, collateral, working balances, access, governance, buybacks, burns, or store-of-value demand. Assess the size and duration of these balances.
Value retention	Supply & distribution	What value survives dilution and selling?	Circulating and fully diluted supply; issuance and burn rates; allocations and unlock schedules; ownership concentration; likely recipient selling.
	Sustainability & control	Is the model sustainable, and who controls it?	Organic fees relative to token incentives; user retention; validator economics; governance power; authority to change supply, fees or tokenholder rights.

Liquid but not yet institutional

Most cryptocurrencies combine continuous liquidity with venture-stage economics. Prices are observable, but valuation, disclosure, market structure, and investment products remain less developed than in other asset classes. Liquidity can therefore create an impression of maturity that the underlying economics and investor base do not yet support.

Fundamental value capture is necessary, but it is not sufficient for durable price discovery. A broader base of professional investors can bring dedicated research, relative-value analysis, longer investment horizons, two-sided liquidity, hedging capacity, benchmarks, and diversified products for end clients. These features can help distinguish networks creating durable economic value from tokens benefiting mainly from momentum or narrative.

The relevant milestone is not simply more institutional activity. This should be accompanied by valuation-sensitive allocations across assets with credible portfolio roles, sufficient liquidity, robust governance, and demonstrable value capture.

The broader cryptocurrency universe spans highly diverse projects and use cases. There is no single valuation framework for "altcoins": investors need to assess the activity, competitive position and token economics of each network or protocol individually.



The Rails: Understanding Smart Contract Platform Blockchains

Early blockchains were designed primarily to issue and transfer a single native asset. Bitcoin, for example, created a decentralized ledger for Bitcoin but offered limited flexibility for more complex applications.

Smart contract platforms expanded blockchains into programmable infrastructure. Developers can deploy code that issues assets, executes transactions and coordinates activity when predefined conditions are met. This allows a single network to support a variety of applications: exchanges, lending, stablecoins, tokenized securities, payments and others.

Because these applications share a ledger, they can interact with the same assets, users and infrastructure. A token can be held in a common wallet, traded on one protocol and used as collateral in another without relying on separate reconciliation systems. This **composability** can lower integration costs and allow new services to be assembled from existing components.

Shared infrastructure can also create network effects. Developers gravitate toward networks with users, liquidity and established standards, while users and issuers prefer ecosystems with useful applications and deep markets. This can reinforce activity around leading platforms, although differences in security, cost, performance and governance support multiple competing ecosystems.

Bitcoin vs. smart-contract blockchains

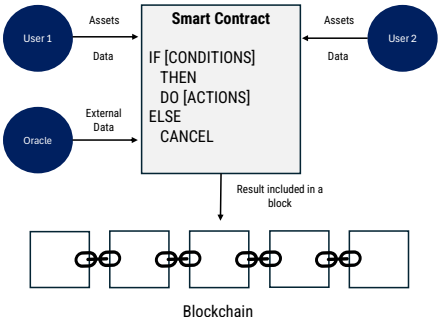
Bitcoin is primarily a specialized monetary network, designed to transfer and secure a scarce native asset with deliberately limited programmability. **Smart-contract platforms** such as Ethereum or Solana are general-purpose programmable networks on which developers can issue assets and build applications such as stablecoins, trading, lending, and tokenization. Bitcoin's investment case therefore depends mainly on confidence in its scarcity, security, and role as a store of value, while smart-contract platform tokens depend more directly on usage of the network, demand for blockspace, ecosystem growth, and the way that activity accrues value to the native token.

Smart Contracts: Turning a Ledger Into a Computer

Exhibit 55: Smart contracts follow coded logic to take actions that are recorded on the blockchain

Blockchains create a shared record of ownership; smart contracts make that record executable. They can determine how an asset moves, who may hold it, when payments are released or how collateral is treated. Rules currently spread across legal documents, operations teams, messaging systems and reconciliations can therefore be expressed as executable logic within shared infrastructure.

Three capabilities are particularly relevant:



- **Programmability:** rules can be embedded directly into assets and workflows.
- **Composability:** contracts can interact, allowing processes to be assembled from reusable components.
- **Atomicity:** linked actions can succeed or fail together, reducing the risk that only one leg of a transaction settles. This is particularly relevant for delivery-versus-payment, payment-versus-payment and collateral substitution.

Smart contracts are best suited to deterministic, rules-based functions rather than workflows requiring qualitative judgement. However, they can incorporate external information through oracles, which transmit verified off-chain data to on-chain applications.

Execution also has a cost. Public blockchains generally charge transaction fees, with more complex contracts requiring more computation and storage. Scaling solutions can lower these costs by moving some execution away from the base layer while retaining settlement or verification there. Permissioned networks may not charge transaction fees in the same way, but still incur development and operating costs.

For financial markets, the main potential benefits are automation, lower operational friction, greater auditability and more predictable execution. Relevant applications include settlement and payment servicing, corporate actions and asset lifecycle management, and fund processes such as subscriptions, capital calls and redemptions.

The result is a more executable form of market infrastructure, where assets, money, permissions, and rules can operate in a shared environment rather than across disconnected systems.

The Different Types of Blockchains and DLT

A distributed ledger is a database shared across multiple participants; a blockchain is a type of distributed ledger in which transactions are grouped into cryptographically linked blocks. In practice, both terms are often used to describe shared, programmable infrastructure for recording and transferring value.

Blockchains are difficult to categorize, as many specialized versions exist, with different capabilities. One key dimension is the participation model: public vs private.

- **Public Layer 1 blockchains**, such as Ethereum and Solana, are generally open to users, developers and validators.They provide neutral settlement, composability and access to established liquidity and developer ecosystems, but introduce considerations around transparency, variable fees, transaction ordering, governance and regulatory exposure. Applications can still impose identity or transfer controls on top of the open network.
    - Layer 1 blockchains tend to prioritize security and decentralization, but can suffer on scalability. **Layer 2 networks** increase capacity by processing transactions separately and submitting data, proofs or state commitments back to an underlying L1. This can lower costs and improve throughput, while allowing **greater customization around features such as privacy or permissioning**. Many L2s are more centralized in transaction processing and ordering, often relying on a single sequencer.

- **Private or permissioned networks restrict participation and validation to approved institutions, with governance controlled by an operator or consortium.** They offer greater control over privacy, compliance, performance and system changes, but rely on a narrower trust base and can limit interoperability and network effects.

The distinction is a spectrum rather than a binary one. Public networks can support permissioned applications or L2s; private systems can connect to public networks; and some publicly accessible networks use permissioned validator sets.

For closer comparison, we focus primarily on public L1s and L2s, where architectures and operating characteristics are observable.

Comparing Public Blockchains

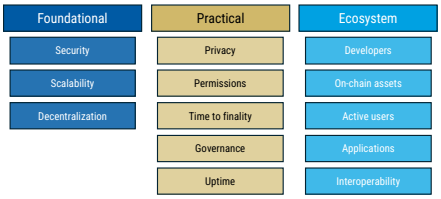
Blockchain comparisons have historically centered on the blockchain trilemma: the difficulty of maximizing decentralization, security and scalability within one architecture. Broad participation and replicated verification can strengthen resilience and neutrality but constrain throughput; smaller, more powerful validator sets can improve performance while concentrating control.

Modular architectures, including Ethereum rollups, seek to ease these constraints by separating execution from settlement and data availability. This can increase capacity while retaining some base-layer security, but introduces new trade-offs around sequencers, proofs, bridges, governance, data availability and users' ability to exit independently.

Exhibit 56: The blockchain trilemma: chains cannot equally succeed in decentralization, security, and scalability

Dimension	What it means	Why it matters	Typical trade-off
Decentralization	How broadly validation, governance and infrastructure are distributed.	Reduces reliance on a single operator and supports neutrality, resilience and censorship resistance.	More independent participation can limit speed and capacity; smaller or more powerful validator sets can improve performance but concentrate control.
Security	Ability to maintain a correct, final ledger despite attacks, failures or misconduct.	Determines settlement confidence and how much value can safely operate on the network.	Stronger verification and finality can increase resource use and latency. External security can add bridge, sequencer or governance dependencies.
Scalability	Ability to support more transactions at acceptable cost and latency.	Determines whether the network can handle commercial-scale activity economically.	Higher throughput can require more powerful hardware and reduce validator participation. Layer 2s add capacity but increase complexity and dependencies.

Exhibit 57: Dimensions of blockchain comparison



The trilemma captures only part of what matters. Developers, particularly institutions, must also assess practical technical characteristics, including privacy and permissioning, transaction finality, governance, resilience and uptime. Beyond the protocol itself, the broader ecosystem also matters: programmability, developer activity, on-chain assets and liquidity, user adoption, application depth, and interoperability can all influence whether a network is suitable for a given use case.

The appropriate trade-offs depend on the use case. A high-frequency trading application may prioritize throughput, latency and transaction cost, while tokenized securities may place greater weight on distribution, permissioning, and settlement finality. Similarly, a consumer-facing application may benefit from a large developer ecosystem and broad liquidity, whereas an institutional workflow may value governance, resilience and interoperability with existing financial infrastructure more highly. **There is therefore no universally "best" blockchain; suitability depends on the requirements of the activity.**

Exhibit 58: Popular blockchain platforms today

Chain / network	Description	Consensus model	Active Validators (or similar role)	Theoretical max TPS[1]	Time to finality	*Sequencer Confirmation Time*	Avg. Transaction Cost[6]	Primary smart contract languages	Privacy	Permissioning[10]
Ethereum	A permissionless general-purpose Layer 1 that also provides settlement and data availability for rollups. Intended to serve as a neutral, credibly decentralized security base for applications and scaling networks.	Proof of Stake	900,000	238	13-15m		$0.09	Solidity, Vyper	Public; app/L2-level ZK or encryption	App / asset: ERC-3643 / ERC-7943 or custom contract eligibility controls
Ethereum Scaling Solutions — ↳ Base	A public OP Stack optimistic rollup settling to Ethereum. Intended to extend Ethereum with lower-cost, higher-capacity execution.	Optimistic rollup on Ethereum	Centralized sequencer	3,571	~20m[3]	*200ms*[3]	$0.006	Solidity, Vyper	Public; app-level privacy or operator-run private ledger	Native asset / app: B20 transfer policies and issuer roles; contract gating
Ethereum Scaling Solutions — ↳ Arbitrum One	A public Nitro-based optimistic rollup settling to Ethereum. Intended to scale general-purpose EVM execution while retaining Ethereum as the underlying settlement layer.	Optimistic rollup on Ethereum	Centralized sequencer	6,095	~15-20m[3]	*250ms*[3,6]	$0.008	Solidity, Vyper	Public; app-level ZK or encryption	App / asset: EVM regulated-token standards or contract eligibility controls
Ethereum Scaling Solutions — ↳ Optimism	A public OP Stack optimistic rollup and reference chain within the Superchain model. Intended to scale Ethereum through standardized, interoperable Layer 2 infrastructure.	Optimistic rollup on Ethereum	Centralized sequencer	714	~15-30m[3]	*200ms*[3]	$0.001	Solidity, Vyper	Public; app-level ZK or encryption	App / asset: EVM regulated-token standards or contract eligibility controls
Ethereum Scaling Solutions — ↳ Polygon PoS	A public EVM-compatible Proof-of-Stake sidechain connected and checkpointed to Ethereum. Intended to provide inexpensive, high-capacity execution using its own validator security.	Proof of Stake side chain	Up to 105	3,810	2-5s		$0.01	Solidity, Vyper	Public; app-level privacy or private CDK deployment	App / asset on PoS; network / RPC controls on dedicated CDK chains
BNB Smart Chain	A public EVM-compatible Layer 1 developed by Binance, the largest CEX by volume. Intended to provide inexpensive, high-capacity smart-contract execution.	Proof of Staked Authority	45	6,349	0.65s		$0.03	Solidity, Vyper	Public; app-level ZK or FHE	App / asset: EVM regulated-token standards or contract eligibility controls
XRP Ledger	A public financial Layer 1 with native payment, asset-issuance and exchange functions. Intended to support fast, low-cost value transfer and tokenization without relying on a general-purpose virtual machine.	XRPL Consensus Protocol	150	2,000+	3-5s		<$0.0001	No general-purpose smart-contract language[9]	Public ; privacy features proposed	Native asset / credential: holder authorization; Credentials and Permissioned Domains
Solana	A permissionless, monolithic general-purpose Layer 1. Intended to combine execution, consensus and shared state in one high-throughput, low-latency network.	Proof of Stake	682	65,000	12.8s[4]		$0.004	Rust	Public ; Optional confidential token balances and amounts	Native token / program: Token-2022 / Token ACL allowlists and issuer controls
Stellar	An open financial Layer 1 with native asset issuance and transfer functions, supplemented by programmable smart contracts. Intended to connect issuers and applications through fast, deterministic settlement.	Stellar Consensus Protocol	94	3,351	5s		$0.0001	Rust	Public; app-level privacy tooling	Native asset: issuer holder authorization; freeze / clawback and contract controls
Canton Network	A network of sovereign Daml applications connected through synchronizers. Intended to allow regulated institutions and financial-market applications to interoperate without placing all data and control on a single shared ledger.	Proof-of-Stakeholder + Synchronizers	55 Super Validators	100,000+[2]	No fixed interval[5]		Variable[8]	Daml	Native need-to-know, sub-transaction privacy	Native contract / network: Daml party roles; participant and synchronizer permissions
Avalanche	Multi-chain public blockchain ecosystem combining a shared Primary Network with sovereign application-specific L1s; intended to support both general-purpose execution and customizable dedicated networks.	Proof-of-Stake (Primary Network) ; PoS or PoA for individual L1s	600 on primary network ; Centralized for dedicated L1s	1,191	<1s		$0.002	Solidity	Public; Configurable privacy for dedicated L1s	App / asset on C-Chain; transaction / validator allowlists on dedicated L1s

1 A protocol's maximum capacity under ideal conditions; Theoretical max TPS is generally equal to Maximum Block Capacity (number of transactions) / Block Time

2 Canton throughput is not directly comparable with public-chain TPS because transactions are processed only by relevant participants and can execute in parallel across independent synchronizers, rather than being globally replicated and ordered by the entire network.

3 Sequencer confirmation is a trust-based L2 preconfirmation; finality shown is Ethereum-backed finality after transaction data is posted to, and finalized on, L1. Standard bridge withdrawals may take longer.

4 Current TowerBFT finality; Alpenglow targets ~150ms but is not yet active on mainnet.

5 Canton finality is deterministic once a transaction's commit verdict is sequenced, but latency varies by participants and synchronizer, so there is no comparable network-wide interval.

6 Arbitrum's sequencer provides ~250ms soft confirmation; current Timeboost ordering can add ~200ms for non-express transactions.

7 Approximate recent average transaction fee; actual cost varies with network demand and transaction complexity.

8 Canton charges for synchronizer traffic based on transaction size and complexity, with a free traffic allowance; there is no directly comparable average per-transaction network fee.

9 XRP Ledger does not support general-purpose smart contracts on its mainnet, but full Ethereum Virtual Machine (EVM) smart contracting is available through the XRPL EVM Sidechain

10 Permissioning refers to controls used to enforce participant eligibility, including KYC/AML requirements. Public networks generally remain permissionless even where individual assets or applications restrict participation. Freeze, clawback and forced-transfer rights are separate issuer enforcement controls.

Blockchains are becoming more performant, but their focus on security and decentralization mean they still do not generally outperform conventional financial infrastructure on raw speed or throughput - at least on the surface. Bitcoin processes only a handful of transactions per second, Ethereum Layer 1 roughly 15–20, and even high-performance networks such as Solana process user transactions in the low thousands per second (the theoretical max throughput for these chains is significantly higher, but assumes ideal, optimized conditions). By comparison, Visa can process tens of thousands of transaction messages per second, while modern exchange infrastructure (like Nasdaq) can handle hundreds of thousands of executions per second. However, these figures are not directly comparable: a card authorization or stock-market execution is one step in a broader process, whereas a blockchain transaction can simultaneously transfer an asset, settle payment, and execute application logic on a shared ledger. U.S. equities, for example, trade in microseconds but generally settle on T+1. In contrast, The Clearing House RTP Network (an electronic payment method that allows money to move instantly between bank accounts 24/7/365) shows average daily transactions of ~1.5mm, or ~18/second on average - illustrating that useful

payment rails do not necessarily require enormous TPS.

State of the Chains

Ethereum is a general-purpose Layer 1 that supports both direct execution and a broader Layer 2 ecosystem. Its architecture has historically emphasized security and broad decentralization, reducing throughput. However, scaling is now occurring both through greater L1 capacity and rollups. L2s such as **Arbitrum**, **Base** (operated by Coinbase) and **Optimism** execute transactions separately and settle back to Ethereum.

As Ethereum's own capacity expands, L2s increasingly provide more than cheaper transactions. Public L2s generally remain permissionless, but can support institutional controls at the asset and application level; Base's B20 standard, for example, embeds configurable transfer policies and issuer controls into its native token framework. More specialized deployments can go further: ZKsync's Prividium allows institutions to operate private, permissioned chains with identity- and role-based access controls, while keeping transaction data private and anchoring state updates to Ethereum through zero-knowledge proofs. The emerging model is therefore a scaled L1 alongside an increasingly differentiated L2 ecosystem.

Solana takes a different approach, concentrating execution and shared state on a high-performance, monolithic Layer 1 rather than relying primarily on rollups. Its architecture prioritizes low latency and high throughput, supporting applications with frequent, low-cost transactions. Solana also supports permissioned assets through token-level controls, including tooling designed for allowlisting and KYC/AML requirements. However, acting as a validator requires significantly faster hardware than a chain like Ethereum, meaning its validator set is less decentralized. **BNB Smart Chain** similarly prioritizes inexpensive execution while maintaining EVM compatibility, making Ethereum applications and tooling easier to port. Validation is constrained to only 45 nodes total.

Stellar and the XRP Ledger are more explicitly oriented toward financial transactions, with protocol-level functionality for payments, asset issuance and value transfer. Both also provide native controls relevant to regulated assets: Stellar issuers can authorize which accounts may hold and transact in an asset, while XRPL supports issuer-authorized holders as well as credential-based access controls for permissioned services. Stellar combines these capabilities with smart contracts (since 2024), while XRPL lacks general -purpose programmability via smart contracts but includes native cross-currency payments and exchange functionality. Features of these chains can simplify financial workflows, although their ecosystems and programming models differ from Ethereum's EVM-centric environment.

Canton takes a different approach, built specifically for regulated financial activity. Rather than replicating transaction data across a globally transparent ledger, Canton uses selective disclosure so participants receive only information they are entitled to see. Permissions are embedded into the architecture through Daml-defined roles and authorization, alongside infrastructure-level participant controls. Separate financial applications and institutions can transact atomically while preserving privacy and control over data. Although commonly referred to as a public-permissioned chain, the base network is open-source and public, meaning anyone can build on it or set up a participant node. Network operator roles at the synchronization layer do require sponsorship and

coordination through the Canton Foundation.

Financial companies are also launching purpose-built chains. Beyond Coinbase's Base, Circle's Arc is an open Layer 1 designed around stablecoin payments, FX, and capital markets (CRCL is covered by James Faucette), while Robinhood Chain is a permissionless Ethereum Layer 2 built on Arbitrum for tokenized assets and financial applications (HOOD is covered by Michael Cyprys). Robinhood launched its public mainnet in 2026, while Arc remains in public testnet. These networks allow firms to tailor infrastructure around their products and users while retaining broader on-chain connectivity, although their ability to attract usage and ecosystem scale remains to be proven.

These different platforms illustrate different architectural priorities: Ethereum emphasizes a decentralized base layer and modular scaling, with institutional controls increasingly layered into assets and specialized L2s; Solana concentrates performance on one shared network; Stellar and XRPL embed financial and asset-control functionality at the protocol level; Canton embeds privacy and institutional permissions more deeply into its architecture; and newer company-led networks such as Arc and Robinhood Chain tailor blockchain infrastructure around specific financial ecosystems. Blockchain selection is therefore increasingly about fit for purpose and network effects rather than headline throughput.

Exhibit 59: Popular blockchains compared on key metrics

Chain / network		Token	Market Cap ($)	DeFi TVL ($)	RWA On-Chain ($)	Monthly Active Addresses	Developers
Ethereum		ETH	293.4bn	41.8bn	15.2bn	8.9mm	2,784
Ethereum Scaling Solutions	↳ Base	No token	-	4.7bn	174mm	3.0mm	274
	↳ Arbitrum One	ARB	908mm	1.2bn	830mm	1.6mm	287
	↳ Optimism (OP Mainnet)	OP	227mm	305mm	26mm	438.5k	185
	↳ Polygon PoS	POL	987mm	795mm	211mm	3.7mm	316
BNB Smart Chain		BNB	94.7bn	4.9bn	5.3bn	26.0mm	146
XRP Ledger		XRP	86.0bn	31mm	222mm	199.7k	93
Solana		SOL	59.0bn	4.8bn	2.6bn	33.2mm	690
Stellar		XLM	6.2bn	225mm	3.2bn	274.1k	474
Canton Network		CC	4.3bn	-	-	-	-
Avalanche		AVAX	3.1bn	1.2bn	1.2bn	1.5mm	154

Note: Data unavailable or non-comparable for Canton

Which blockchain wins?

The future will likely remain multi-chain. Adoption of specific chains will depend on fit for purpose: different networks optimize for different combinations of security, performance, privacy, programmability, and control, making them better suited to different use cases. Network effects will matter, as developer activity, liquidity, users, applications, and institutional infrastructure can reinforce adoption over time. However, current network effects have grown largely around retail activity, so institutional usage could still shift the narrative, particularly for intra-institution usage. Interoperability (see next section) may also reduce the need for one chain to dominate, allowing assets and applications to span multiple networks.

Challenges to the Adoption of Public Blockchains

Public permissionless blockchains are well suited to a more open, interoperable financial system, but regulated institutions face legitimate constraints when using them.

- **Sanctions and Counterparty Exposure:** Public blockchains make it difficult to fully control who an institution interacts with economically. Gas fees may flow to unscreened validators, builders, or other infrastructure participants, while unsolicited transfers can introduce unwanted assets or addresses into transaction histories. The same openness and neutrality that make public networks attractive can therefore weaken the clean perimeter institutions rely on for sanctions, AML and counterparty controls.
- **Transaction Integrity and Ordering:** Pending transactions on public blockchains may be visible before finalization, creating opportunities for front-running, sandwiching, and other adverse ordering (generally referred to as MEV). For institutions, this can raise issues around best execution, market integrity, client protection and predictability. Private transaction pools, encrypted mempools and controlled routing can mitigate these risks, but sequencing may still depend on infrastructure outside the institution's control.
- **Data Confidentiality and Privacy:** Public blockchains are transparent by design. Transaction amounts, wallet relationships and asset flows may reveal sensitive client, trading, or treasury information even where identities are pseudonymous. Institutions therefore need to preserve auditability and regulatory access without broadly exposing commercially sensitive activity. Zero-knowledge proofs, permissioned application layers and selective disclosure can help, but the core trade-off between public verifiability and confidentiality remains. As discussed for Bitcoin, quantum computing is a credible long-term threat to blockchains that will require upgrades to ensure security.
- **Settlement Certainty and Finality:** Financial markets require clarity on when a transaction is legally final and irreversible. On public blockchains, finality depends on network design and can be complicated by reorganizations, bugs, or contentious forks. Institutions therefore need to map technical confirmations into legal, accounting, risk and operational frameworks. The key issue is whether blockchain finality can meet the legal standards required in regulated markets.
- **Network Governance and Operational Resilience:** Public blockchains are not governed like traditional financial-market infrastructure. Risks include censorship, congestion, validator or client concentration, forks and liveness failures. Because no single operator controls the network, institutions rely on decentralized governance, developers, validators and market incentives to maintain the base layer. Firms can control their own applications and processes, but not the underlying network on which they depend.

Interoperability

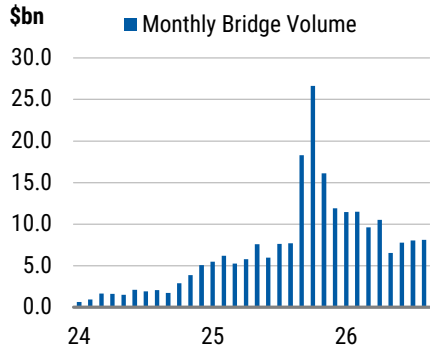
Blockchains operate as independent ledgers: each validates its own transactions but does not natively know what has occurred on another. This creates a challenge when assets or instructions need to move across networks, particularly in a multi-chain ecosystem.

Interoperability protocols connect blockchains by transmitting authenticated messages between them. A typical cross-chain transaction records an instruction on the source chain, verifies that it has become final, and submits a proof or attestation to the destination chain. If valid, a destination contract executes the corresponding instruction. Blockchains therefore "communicate" through messages that coordinate changes across separate ledgers rather than through a shared ledger.

A **bridge** applies this process to assets. Under **lock-and-mint**, an asset is locked on the source chain and a wrapped representation issued on the destination. **Burn-and-mint** removes tokens from one network and issues them on another, while **liquidity-based bridges** pay users from liquidity already available on the destination and rebalance later. No asset literally travels between chains; the systems coordinate entries on separate ledgers. Each model introduces different risks, including concentrated bridge collateral, minting authority and reconciliation, or liquidity and settlement dependencies.

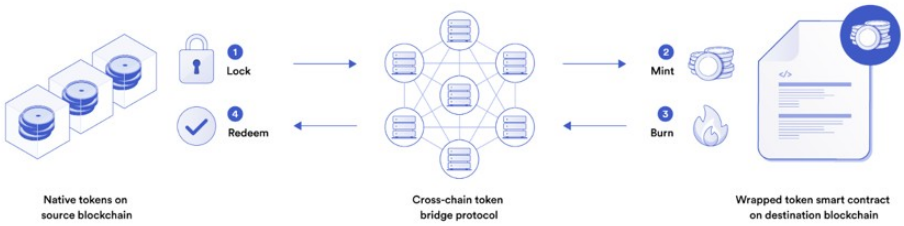
Over the last 12 months, nearly $150bn in value has flowed across bridges in nearly 70mm transfers.

Exhibit 60: Bridges carry substantial volumes across chains



protocols tracked by Allium

Exhibit 61: A simplified illustration of how lock and mint token bridges work



Source: Chainlink

Protocols such as **Chainlink CCIP** and **LayerZero** extend interoperability beyond asset transfers to arbitrary data and programmable instructions. CCIP covers 77 blockchains and uses Chainlink oracle nodes to verify source-chain events and relay instructions to destination chains, with token pools supporting lock/burn and mint/release mechanisms. LayerZero supports over 160 blockchains and allows applications to select their own verifier sets and thresholds before messages are executed on the destination. Both illustrate how interoperability can connect applications across otherwise independent networks.

Interoperability also introduces an additional security layer that may be weaker than either underlying blockchain. Attackers can target validator keys, message-verification code, administrative controls or destination contracts. Historical attacks illustrate the range of failure modes: The 2022 Ronin theft ($642mm lost) followed the compromise of five of nine validator keys; Wormhole's bridge accepted a forged message because of a signature-verification flaw ($326mm lost); and a faulty Nomad upgrade allowed invalid messages to pass its verification process ($190mm lost). They also show why security and decentralization must be assessed across the entire transaction pathway: strong