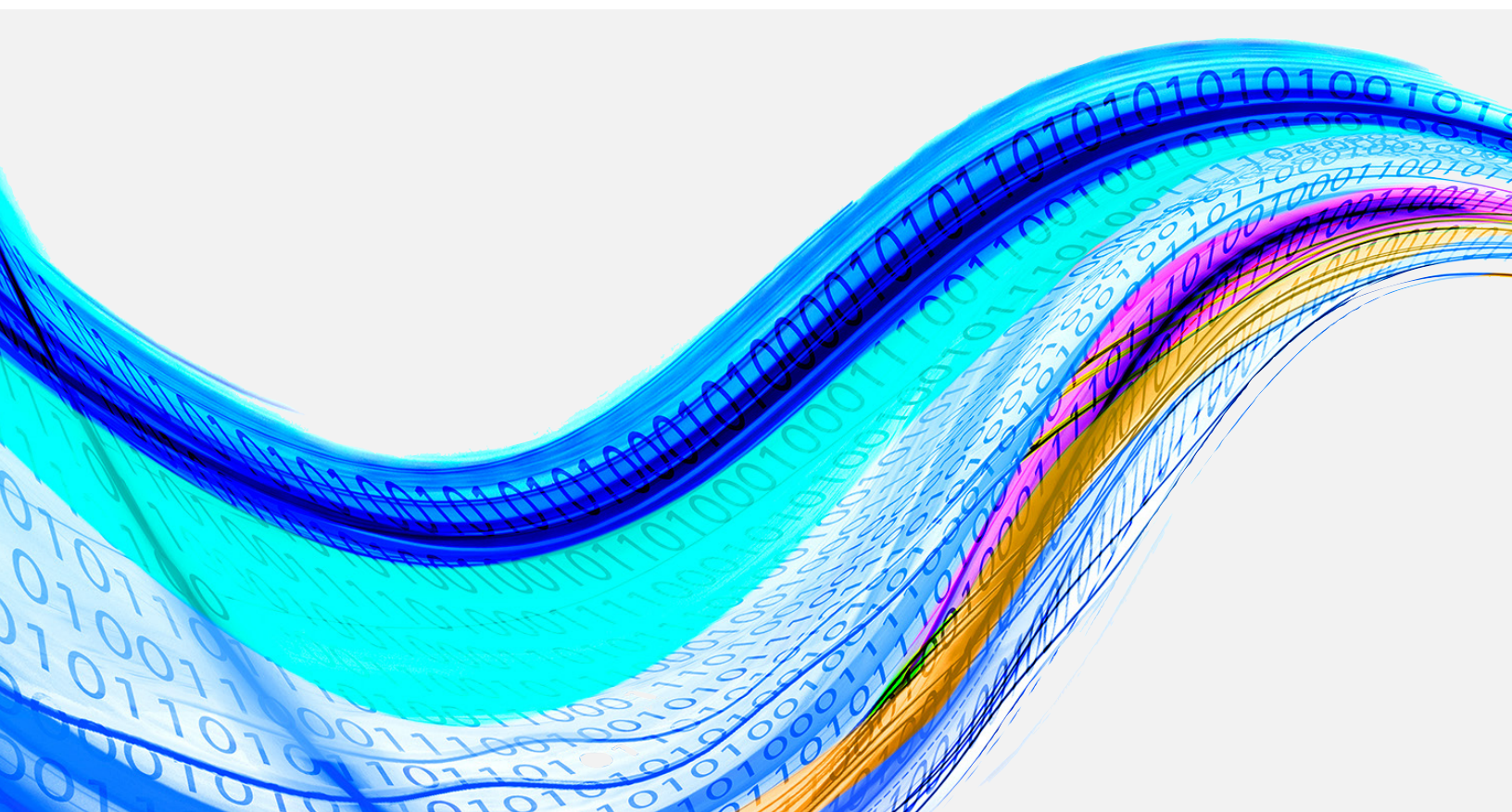


Financial Services Practice

From ripples to waves: The transformational power of tokenizing assets

Tokenized financial assets are moving from pilot to at-scale deployment. Adoption is not yet widespread, but financial institutions with blockchain capabilities in place will have a strategic advantage.

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Tokenization, the process of creating a unique digital representation of an asset on a blockchain network, has reached a tipping point after many years of promise and experimentation. The benefits—including programmability, composability, and enhanced transparency—can empower financial institutions to capture operational efficiencies, increase liquidity, and create new revenue opportunities through innovative use cases. These benefits are being realized today, with the first at-scale applications [transacting trillions of dollars of assets on-chain per month](#). However, there have been many false starts and challenges thus far. Further integration of these technologies into the mainstream in a robust, secure, and compliant manner will require cooperation and alignment among all involved stakeholders. As infrastructure players pivot away from proofs of concept to robust scaled solutions, many opportunities and challenges remain to reimagine how the future of financial services will work (see sidebar, “What is tokenization?”).

If we were to design the future of financial services, we would arguably include many of the features of tokenized digital assets: 24/7 availability; instant global collateral mobility; equitable access; composability, thanks to a common technology stack; and managed transparency. Highlighting the strategic future of this technology, Larry Fink, chairman and CEO of BlackRock, said in January 2024, “We believe the next step going forward will be the tokenization of financial assets, and that means every stock, every bond [...] will be on one general ledger.”¹ More and more institutions are rolling out and scaling tokenized products, from tokenized bonds and funds to private equity and cash.

The digitization of assets seems even more inevitable now as the technology matures and demonstrates measurable economic benefits.

Despite this visible momentum, broad adoption of tokenization is still far away. Modernizing existing infrastructure is challenging, especially in a regulation-heavy industry such as financial services. Overcoming inertia requires coordination across the value chain. Given this, we expect the adoption of tokenization to occur in multiple waves: the first will be driven by use cases with proven return on investment and existing scale. Next will be use cases of asset classes whose current markets are smaller, benefits less apparent, or require solutions to tougher technical challenges.

Based on our analysis, we expect that total tokenized market capitalization could reach around \$2 trillion by 2030 (excluding cryptocurrencies like Bitcoin and stablecoins like Tether), driven by adoption in mutual funds, bonds and exchange-traded notes (ETN), loans and securitization, and alternative funds. In a bullish scenario, this value could double to around \$4 trillion, but we are less optimistic than previously published estimates as we approach the middle of the decade.

In this article, we provide our perspective of how the adoption of tokenization could play out. We describe the current state of adoption (focused mostly on a limited set of assets), as well as the benefits and feasibility of wider tokenization. We then examine current use cases that take aim at a meaningful market share and provide a rationale for waves of growth across different asset classes. For the remainder of the major financial asset classes, we examine the “cold start” problem and offer practical steps for how it may be overcome. Finally, we consider the risks and benefits for first movers, and consider the “call to action” for all participants in the future of financial market infrastructure.

¹“Fink sees financial tokenization of assets as next step,” Bloomberg TV, January 12, 2024.

What is tokenization?

Tokenization is the process of issuing a unique digital representation of an asset on a blockchain, which is a type of distributed ledger. This digital representation is the “token,” which can be invested, exchanged, or pledged (for example, used as collateral). Tokens can represent a broad range of assets, including physical assets such as real estate or art; financial assets such as equities or bonds; intangible assets such as intellectual property; and even identity and unstructured data.

Tokenization effectively creates a large, universally available digital vault in which assets reside and never leave, but whose ownership can be transferred and tracked with total fidelity. Tokenizing assets on a blockchain has many benefits over existing disparate and siloed centralized ledgers.

These include increased operational efficiency (for instance, reduced reconciliation needs and errors), composability (the ability to interact with other assets and applications on the network), and programmability (the ability to embed code in the token and its capacity to engage with smart contracts, enabling higher degrees of automation). Tokenizing creates new possibilities along the value chain for financial institutions engaging with the new financial market infrastructure (FMI), potentially unlocking cost savings, net new revenues, or opportunities to reduce risk across asset classes.

One recent prominent example of tokenization is the increasing adoption of tokenized money market funds, which

surpassed \$1 billion in total value in Q1 2024.¹ Immutable data on the shared ledger reduces data errors associated with manual reconciliation, while 24/7 instant settlement and composability provide better user experience and new revenue sources for FMIs. For example, tokenized money market funds could be used for payments, enhancing capital efficiency for holders. Such products are offered by incumbents BlackRock, WisdomTree, and Franklin Templeton, as well as Web3 natives Ondo Finance, Superstate, and Maple Finance.

¹ Tokenized Treasuries value from RWA.XYZ, accessed May 20, 2024.

Tokenization in waves

Tokenization’s rate and timing of adoption will vary across asset classes resulting from differences in expected benefits, feasibility, time to impact, and market participants’ risk appetite. We expect those factors to characterize likely waves of activity and adoption. Asset classes that have larger market

value, higher friction along the value chain today, less mature traditional infrastructure, or lower liquidity are more likely to achieve outsize benefit from tokenization. For instance, we believe tokenization feasibility is highest for asset classes with lower technical complexities and regulatory considerations.

The appetite for investing in tokenization likely scales inversely to the richness of fees earned from today's less efficient processes, depending on whether the functions sit in-house or are outsourced, and how concentrated the main players and their fees are. Outsourced activities often reach economies of scale, reducing the incentives for disruption. Time to impact—that is, how quickly returns on tokenized-related investments can be achieved—can augment the business case and thus the appetite to pursue tokenization.

A given asset class can lay the foundation for adoption of subsequent asset classes by ushering in greater regulatory clarity, infrastructure maturity, interoperability, and accelerated investment. Adoption will also differ by geography, influenced by a dynamic and shifting macroenvironment, including market conditions, regulatory frameworks, and buy-side demand. And finally, high-profile successes or failures could propel or restrict further adoption.

Asset classes with the fastest paths to adoption

Tokenization is progressing at a gradual pace, with acceleration expected as network effects gain momentum. Given their characteristics, certain asset classes will likely be faster to reach meaningful adoption—defined as more than \$100 billion of tokenized market capitalization—by the end of the decade. We expect the most prominent front-runners will include cash and deposits, bonds and ETNs, mutual funds and exchange-traded funds (ETFs), as well as loans and securitization. For many of these, adoption rates are already material, underpinned by greater efficiency and value gains from blockchain along with higher technical and regulatory feasibility.

We estimate that the tokenized market capitalization across asset classes could reach about \$2 trillion by 2030 (excluding cryptocurrencies and stablecoins), driven mainly by the above assets (Exhibit 1). The pessimistic and optimistic scenarios range from about \$1 trillion to about \$4 trillion, respectively. Our estimate is exclusive of stablecoins, including tokenized deposits, wholesale stablecoins, and central bank digital currencies (CBDCs) to avoid double counting, as these are often used as the corresponding cash legs in the settlement of trades involving tokenized assets.

Mutual funds

Tokenized money market funds have attracted over \$1 billion in assets under management, signaling demand from investors with on-chain capital in a high-interest-rate environment. Investors can choose from funds managed by established incumbents, such as BlackRock, WisdomTree, and Franklin Templeton, as well as Web3 natives such as Ondo Finance, Superstate, and Maple Finance. Tokenized money market funds will likely see sustained demand in a higher-interest-rate environment, potentially offsetting stablecoins as on-chain stores of value. Other types of mutual funds and ETFs could offer on-chain capital diversification to conventional financial instruments.

The transition to on-chain funds can substantially increase utility, including instant 24/7 settlement and the ability to use tokenized funds as payment vehicles. As the scope and magnitude of tokenized funds grow, additional product-related and operations benefits will materialize. For instance, highly tailored investment strategies would become possible through composability across hundreds of tokenized assets. Having data on a shared ledger reduces errors associated with manual

reconciliation, and increases transparency, leading to lower operational and technology costs. While the overall demand for tokenized money market funds partially depends on the interest rate environment, it now acts as the early green shoots of traction for other funds.²

Figure Technologies is one of the largest nonbank home equity line of credit (HELOC) lenders in the United States, with billions in origination volumes. Web3 natives such as Centrifuge and Maple Finance, together with Figure and others, have facilitated the issuance of over \$10 billion of loans involving blockchains.³

Loans and securitization

Blockchain-enabled lending is nascent, but disruptors are starting to see success in this space:

We expect to see more adoption of tokenization for lending, especially with warehouse lending and securitizing on-chain loans. Conventional lending is

Exhibit 1

Industry outlook: Base case estimate of potential value of tokenized assets by 2030 is nearly \$2 trillion.

An analysis of tokenization waves by asset capitalization potential and adoption drivers

Wave	2030 tokenized asset market capitalization base case, \$ trillion	Examples of use cases driving adoption
1	Cash and deposits ¹ <i>Excluded from total</i> ~1.1	24/7 business-to-business payments
	Mutual funds and ETFs ² ~0.4	Money market fund distribution
	Loans and securitization ³ ~0.3	Streamlined warehouse lending
	Bonds and exchange-traded notes ⁴ ~0.3	Intraday repo/collateral mobility
2	Alternative funds ⁵ ~0.2	Distribution and investor onboarding
	Alternative assets ⁶ ~0.1	Liquid secondary market
	Unlisted equities ⁷ ~0.1	Liquid private markets for secondary sales
	Precious metals ⁸ ~0.1	Collateral in decentralized finance
3	Publicly listed equities ⁹ <0.1	Clearing and settlement efficiencies
	Intangible assets ¹⁰ <0.1	Real-time distribution of royalties
	Derivatives ¹¹ <0.1	Clearing and settlement efficiencies
Total value tokenized in 2030 ~1.9		

¹Tokenized cash and deposits are excluded from total to avoid double counting, since these are involved in the settlements of trades involving tokenized assets. ²ETFs, mutual funds and money market funds. ³Wholesale loans, mortgage and home equity, structured credit. ⁴Government bonds, municipal bonds, corporate bonds, commercial paper, etc. ⁵Private equity/venture capital funds. ⁶Real estate (including real estate investment trusts), carbon, art and collectibles, and commodities (excluding precious metals). ⁷Single unlisted private equity and mezzanine financing. ⁸Gold, silver, platinum, palladium. ⁹Listed corporate equities. ¹⁰Intellectual property (brands, trademarks). ¹¹Options, futures, swaps, warrants, investment certificates, excluding over-the-counter derivatives. Source: Bank for International Settlements; Deal Logic; Federal Reserve Bank of St Louis; Prequin, Savills; Statista; The Block; WFE; expert interviews

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²Dagmar Chiella, "U.S. money market funds reach \$6.4 trillion at end of 2023," Office of Financial Research, March 26, 2024.

³Tokenized private credit value from RWA.XYZ, accessed May 20, 2024.

characterized by labor-intensive processes and high levels of intermediary involvement. Blockchain-enabled lending provides an alternative, with many benefits: live, on-chain data, held in a unified master ledger serving as the single source of truth, fostering transparency and standardization throughout the lending life cycle. Smart-contract-enabled calculations of payouts and streamlined reporting reduce required cost and labor. Shortened settlement cycles and access to a broader capital pool enable faster transaction flow and potentially lower the cost of capital for borrowers.

In the future, tokenizing a borrower's financial metadata or monitoring their on-chain cash flows could enable fully automated, fairer, and accurate underwriting. As more lending shifts to private credit channels, the incremental cost savings and speed represent attractive benefits for borrowers. Additional demand is expected from Web3 natives, as overall digital asset adoption grows.

Bonds and exchange-traded notes

Globally, over \$10 billion worth of tokenized bonds in total notional value have been issued in the last decade (compared with \$140 trillion outstanding notional globally).⁴ Noteworthy recent issuers include Siemens, the City of Lugano, and the World Bank, as well as other corporations, government-related entities, and international organizations. Additionally, blockchain-based repurchase agreements (repos) have found adoption, resulting in trillions of dollars of monthly transaction volume in North America and creating value from operational and capital efficiencies on existing flows.

Digital bond issuance will likely continue given the high potential benefits once scaled, as well as comparably low barriers today, partially driven by an

appetite to spur capital market development in certain regions. For example, in Thailand and the Philippines, the issuance of tokenized bonds enabled inclusion of small-ticket investors through fractionalization.⁵ While benefits so far have been demonstrated mostly for issuance, an end-to-end tokenized bond life cycle could unlock improved operational efficiencies of at least 40 percent through data clarity, automation, embedded compliance (for example, transferability rules encoded at a token level), and streamlined processes (for example, asset servicing). Additionally, lower costs, faster issuance, or fractionalization can improve financing for smaller issuers by enabling "just-in-time" financing (that is, optimizing borrowing costs by raising specific amounts at specific times) and broadening the investor base by tapping into global pools of capital.

Spotlight on repos

Repurchase agreements, or "repos," are one example where tokenization adoption and its benefits can be observed today. Broadridge Financial Solutions, Goldman Sachs, and J.P.Morgan currently transact trillions of dollars of repo volume per month. Unlike some tokenization use cases, repos do not require value-chain-wide tokenization to realize material benefits.

Financial institutions that tokenize repos capture primarily operational and capital efficiencies. On the operational side, smart-contract-enabled execution automates daily life cycle management (for example, collateral valuation and margin top-ups). It reduces errors and settlement failures and simplifies reporting; 24/7 instant settlement and on-chain data also improve capital efficiency through intraday liquidity for short-term borrowing and enhanced collateral usage.

⁴ This projection is based on author research derived from public information.

⁵ Wichit Chantanusornsiri, "PDMO launching cheap bonds via blockchain," *Bangkok Post*, June 16, 2020.

Historically, most repo terms were 24 hours or longer. Intraday liquidity can decrease counterparty risks, reduce borrowing costs, enable lending of inert cash for short time increments, and reduce liquidity buffers. Real-time, 24/7, cross-jurisdictional collateral mobility could provide access to higher-yielding, high-quality liquid assets and enable optimized movement of this collateral across market participants, thus maximizing its availability.

Subsequent waves of assets

The first wave of assets described earlier has presented a somewhat independent pathway to adoption today and over the next two to three years. Conversely, tokenizing other asset classes will more likely scale only once the foundation has been laid by preceding asset classes or when a catalyst spurs advancement despite limited evidence for near-term benefits.

One class of assets for which tokenization holds great potential, in the eyes of many market participants, is alternative funds, potentially sparking growth in assets under management and streamlining fund accounting. Smart contracts and interoperable networks can make managing discretionary portfolios at scale more efficient through automated portfolio rebalancing. They may also enable new sources of capital for private assets. Fractionalization and secondary market liquidity may help private funds access new capital from smaller retail and high-net-worth individuals. Additionally, transparent data and automation on a unified master ledger may create operational efficiencies for middle- and back-office activities. There are ongoing experiments from several incumbents, including Apollo and J.P.Morgan, testing what portfolio management on a blockchain could look like.⁶ To fully realize the benefits of tokenization, however, underlying assets must also

be tokenized, and regulatory considerations may limit the obtainable upside.

For several other asset classes, adoption will likely be slower, either because the expected benefits are only incremental or due to feasibility concerns such as satisfying compliance obligations or absence of incentives for adoption for critical market participants (Exhibit 2). These asset classes include publicly traded and unlisted equities, real estate, and precious metals.

Overcoming the cold start problem

A cold start problem is a common challenge to adopting innovation, in which products and their users need to grow at a healthy pace but neither succeeds alone. In the world of tokenized financial assets, issuance is relatively easy and reproducible, yet true scale can be achieved only when network effects are achieved: when users (typically, investors on the demand side) capture real value, whether from cost savings, higher liquidity, or enhanced compliance.

In practice, while there has been traction in proof-of-concept experiments and single-fund launches, token issuers and investors still bump up against a familiar cold start problem: limited liquidity deters issuance due to inadequate transaction volume to establish a robust market; a fear of losing market share may cause first movers to incur additional expense by supporting parallel issuance on legacy technology; and despite considerable benefits, incumbents may experience inertia due to the disruption of established processes (and associated fees).

One such example is the tokenization of bonds. Barely a week goes by without the announcement of a new tokenized bond issuance. While there are

⁶ "The Future of Wealth Management," J.P.Morgan, 2023.

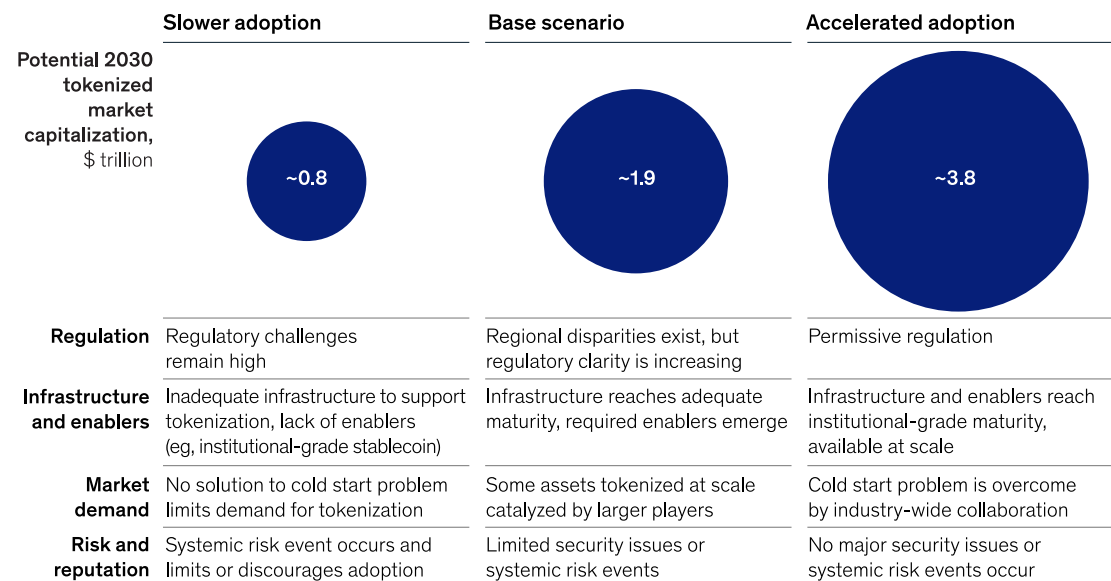
billions of dollars of tokenized bonds outstanding today, benefits over traditional issuance are marginal, and secondary trading remains scarce. Here, overcoming the cold start problem would require constructing a use case in which the digital representation of collateral delivers material benefits—including much greater mobility, faster settlement, and more liquidity. Delivering true, sustained long-term value requires coordination across a multifaceted value chain and widespread engagement of participants with the new digital asset class.

Given the complexity of upgrading the underlying operating platform for the financial services industry, we posit that a minimum viable value chain (MVVC) (by asset class) is required to enable the scaling of tokenized solutions and overcome some of its challenges. To fully realize the benefits laid out in this article, financial and partner institutions must cooperate on common or interoperable blockchain networks. This interconnected infrastructure represents a new paradigm and has triggered regulatory concerns and some feasibility challenges (Exhibit 3).

Exhibit 2

The potential scale of tokenization adoption hinges on multiple factors.

Forecasts of three potential adoption scenarios, 2030, nonexhaustive



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There are several ongoing efforts to build common or interoperable blockchains for institutional financial services, including the Monetary Authority of Singapore’s Project Guardian and the Regulated Settlement Network. In Q1 2024, the Canton Network pilot brought together 15 asset managers, 13 banks, plus multiple custodians, exchanges, and a financial infrastructure provider to perform simulated transactions.⁷ This pilot validated that traditionally siloed financial systems can successfully connect and synchronize, utilizing a public-permissioned blockchain while maintaining privacy controls.

While there are successful examples on public and private blockchains, it is unclear which will host the most transaction volume. Currently, in the United States, most federally regulated institutions are discouraged from using public blockchains for tokenization. But globally, many institutions are

choosing Ethereum, a public network, for the liquidity and composability it enables. As unified ledgers continue to be built and tested, the public versus private network debate is far from over.

A path forward

Comparing the current state of tokenization of financial assets with the emergence of other paradigm-shifting technologies suggests we are in early stages of adoption. Consumer technologies (such as the internet, smartphones, and social media) and financial innovations (such as credit cards and ETFs) typically exhibit their fastest growth (over 100 percent annually) in the first five years after inception.⁸ Thereafter, we find annual growth slows to around 50 percent, and ultimately a more modest compound annual growth rate of 10 percent to 15 percent is achieved after ten-plus years. Significant issuance of tokenized assets was

Exhibit 3

Collaboration between financial institutions and market infrastructure players is required to create a minimum viable value chain.

Roles of industry participants, illustrative, nonexhaustive

Sell side	Intermediaries	Buy side	Regulators
<ul style="list-style-type: none"> Align with intermediaries to collaborate and achieve interoperability across data systems and platforms Develop capabilities to handle tokenized asset and stablecoin transactions for settlement 	<ul style="list-style-type: none"> Agree on shared platforms, networks, or data sources as single source of truth Define standardized data types, protocols, and processes across networks to enable interoperability 	<ul style="list-style-type: none"> Develop capabilities to trade tokenized instruments Provide liquidity to enable the development of the ecosystem and capture benefits long-term 	<ul style="list-style-type: none"> Develop a comprehensive legal framework for the tokenized assets to provide regulatory clarity Set clear participation requirements for retail investors

Stakeholders along the value chain need to align on the common financial benefits and goals that can be unlocked through collaboration

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⁷“The Canton Network completes the most comprehensive blockchain pilot to date for tokenized real world assets,” Canton, March 12, 2024.

⁸This percentage is derived from public figures sourced from CoinMarketCap, Gold.org, Insider Intelligence, ITU, McKinsey Organizational Data Platform, Meta Platforms, Morgan Stanley, ResearchGate, SEC, Statista, Synergy Research Group, The Block.

not seen until the last few years, even though trials began as early as 2017. Our market capitalization estimates for 2030 assume, on average, a compound annual growth of 75 percent across asset classes, with Wave 1 assets leading the way.

Although it is fair to expect tokenization to spur such a multidecadal transformation of the financial industry, there may be particular benefits for early movers who are able to “catch the wave.” Pioneers can capture oversized market share (especially in markets benefiting from economies of scale), enhance their own efficiency, and set the agenda for formats and standards, as well as benefit from the reputational halo of embracing emerging innovation. Early movers in tokenized cash payments and on-chain repos have demonstrated this.

But many more institutions are in “wait and see” mode, anticipating clearer market signals. Our thesis that the case for tokenization is at a tipping point suggests that this mode may be too slow once we see some important signposts, including the following:

- **infrastructure:** blockchain technology able to support trillions of dollars of transaction volume
- **integration:** blockchains for different applications demonstrating seamless interconnectivity
- **enablers:** widespread availability of tokenized cash (for example, CBDCs, stablecoins, tokenized deposits) for instant settlement of transactions
- **demand:** appetite from buy-side participants to invest at scale in on-chain capital products

- **regulation:** actions that provide certainty and support a fairer, more transparent, and more efficient financial system across jurisdictions, with clarity on data access and security

While we have yet to see all these markers emerge, we anticipate waves of adoption (with widespread use) to follow the waves of tokenization described earlier. Such adoption will be led by financial institutions and market infrastructure players that assemble to establish leading positions in the capture of value. We call these collaborations minimum viable value chains. Examples of MVVCs are the blockchain-based repo ecosystems operated by Broadridge, and J.P.Morgan’s Onyx with Goldman Sachs and BNY Mellon.

Over the next few years, we anticipate many more MVVCs emerging to capture value from additional use cases, such as instant business-to-business payments via tokenized cash; dynamic “smart” management of on-chain funds by asset managers; or efficient life cycle management of government and corporate bonds. These MVVCs will likely be supported by network platforms created by incumbents and fintech disruptors.

There are risks as well as rewards for early movers: the up-front investment and risks of investing in new technology can be substantial. Not only is there a spotlight on first movers but developing infrastructure coupled with running a parallel process on a legacy platform is time and resource intensive. In addition, in many jurisdictions the regulatory and legal certainty to engage with any form of digital assets is lacking, and critical enablers, such as widespread availability of wholesale tokenized cash and deposits for settlement, have yet to be supplied.

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Exhibit 4

Benefits and liabilities of tokenization depend on stakeholder archetype.

Impact from tokenization by archetype, illustrative

● Positive impact ○ Negative impact

Pioneer

- Increase market share
- Tap into new market segments or geographies
- Generate additional fees on new products
- Develop a differentiated competitive position in a developing new area of growth
- Incur up-front investment for new capabilities and parallel technology costs for the transition period
- May face the risk of sunk cost through commitment to a wrong choice of technology

Late follower

- Save up-front investment costs
- Leverage more mature infrastructure at a later stage
- May lose market share
- May face margin compression
- May be disintermediated

Buy side

- Gain access to new products and issuances
- Benefit from increased liquidity
- Capture potential pass-through cost savings

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The history of blockchain applications is littered with casualties of such challenges. That history may deter incumbents who may feel more secure following business as usual on legacy platforms. But such a strategy creates risk, including material loss of market share. As today’s high-interest environment has produced clear use cases for some tokenized products such as repos, market conditions have the potential to quickly sway demand. As signposts for the adoption of tokenization emerge, such as regulatory clarity or maturing infrastructure, trillions of dollars of value can move on-chain, creating a sizeable value pool for first movers and disruptors (Exhibit 4).

In the near term, institutions, including banks, asset managers, and market infrastructure players, should assess their product suites and identify which assets would most benefit from transitioning to tokenized products. We suggest questioning

whether tokenization can accelerate strategic priorities, such as entering new markets, launching new products, and/or attracting new customers. Are there potential use cases that can create value in the near term? And what internal capabilities or partnerships are required to capitalize on the opportunities created by this shift in the market?

By aligning pain points (on the buy- and sell-sides) with buyers and market conditions, stakeholders can assess where tokenization creates the greatest risk to their market shares. But realizing the full benefits will require assembling counterparties to collaborate in creating a minimal viable value chain. Working through such growing pains now can help incumbent players avoid playing catch-up when demand inevitably surges.

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