WHITEPAPER

Tokenized Funds

The Third Revolution in Asset Management Decoded

October 2024
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Foreword

Sean Park
Managing Director & Senior Partner, BCG

The asset management industry is entering its third revolution through fund tokenization enabled by blockchain technology. After more than a decade working on blockchain initiatives, we believe we have identified one of its most promising and scalable applications: using tokenized money to instantly transact tokenized funds.

Tokenized funds are not only highly scalable—thanks to their replicable structure—but also serve as a catalyst for the broader tokenization of the financial ecosystem. By enabling near-instant transactions, unlocking liquidity, and reducing operational friction, this innovation could generate about US$100 billion in additional annual returns for investors while creating new revenue streams for financial institutions.

We encourage industry leaders to engage with the insights in this report and explore how collaboration, innovation and strategic action can drive sustainable growth. Now is the time to embrace this transformation and lead the next chapter in financial services.

Mo Shaikh
CEO and Co-Founder of Aptos Labs

After more than a decade of development, blockchain technology is finally ready for large scale and sophisticated financial use cases. Private blockchains are concepts of the past and adequate use of public blockchain technology is the key to unlocking the future of open finance.

Aptos Labs is proud to be part of this transformative journey by bringing production-grade public-permissioned blockchain technology for financial institutions, to maintain a balance between innovation and compliance. Riding on proven blockchain capabilities tested by financial institutions, we see the potential to unlock next-generation financial products and services, providing seamless user experience while ensuring robust security.

This whitepaper explores what the blockchain-enabled future of asset and wealth management looks like—a future that is not only cost-saving but also revenue-centric. We hope it inspires new thinking and collaboration across the industry as we shape a more dynamic and resilient financial future together—for the entire industry to jointly capture opportunities from enhanced & new business models.

Andrew Lo
Senior Managing Director and Head of Asia Pacific, Invesco

Digitalization of the asset management industry is happening at breakneck speed, and the future will look very different from what we know today. Fund tokenization using blockchain or distributed ledger technology is one of the exciting trends at the forefront of this revolution. Industry estimates on the potential growth of Tokenized assets vary, however tokenized AUM across its various forms has the potential to be in excess of a trillion dollars by 2030.

We at Invesco believe this innovation has the potential to transform the investment industry to the ultimate benefit of end investors. Once the technical and regulatory barriers are overcome, fund tokenization can enhance the investor experience by shortening trade settlement times, increasing market liquidity, enhancing transaction transparency, and mitigating investment risks.

We are pleased to have collaborated with BCG and Aptos Labs on this white paper that explores the benefits of fund tokenization for investors and the broader financial services community. We hope this research helps to spur further conversations and actions around digital innovation in the asset management space, and we are optimistic about the possibilities that lie ahead.

Executive Summary

Amid all the hype over Generative AI, interest in distributed ledger technologies (DLT) seems to have waned over recent months. But in the financial services industry, DLT-based solutions are attracting increasing levels of interest. Through an innovation called fund tokenization, the technology's many advantages are finding a new home in the asset management space, where they can boost value creation, increase transparency, and streamline transaction processing. When combined with smart contracts, which automate various aspects of business logic, it's clear why market participants are eager to participate.

As DLT use cases proliferate, banks are ramping up initiatives aimed at enhancing efficiency in markets from cross-border payments to fixed income. But fund tokenization – which we call the third revolution in asset management – offers the potential to create billions of dollars of value for both financial institution and end investors. In late 2024, tokenized funds had garnered more than US$2 billion in assets under management (AUM)[1], with one manager raising significant sums in just a few months – and at higher-than-average fees. This reflects a pattern of growing investor demand, particularly from virtual asset owners (i.e., holders of crypto) such as crypto foundations. Over the coming period, we expect demand to continue rising, especially when regulated on-chain money (such as regulated stablecoin), tokenized deposit, and central bank digital currency (CBDC) projects materialize.

In this report, we provide industry practitioners with an overview of the emerging market in fund tokenization, highlighting what the technology can achieve in practice, the incentives for end-investors and financial institutions, a potential tipping point for rollout, and how fund managers can capture opportunities.

First, however, a short primer: Fund tokenization refers to the use of blockchain-based digital tokens to represent fund ownership, functioning similarly to how transfer agents record fund shares today. Early tokenization use cases have seen companies use special purpose vehicles (SPVs) to manage assets such as real estate. Similarly, fund tokenization can be achieved using existing unit trusts and / or fund company vehicles, meaning asset managers should see little friction in the process or in their operations.

Once up and running, tokenized funds offer advantages to investors including 24/7 secondary transfers and fractionalization, a lower threshold for investing, and instant collateralization if regulatory guardrails are put in place. If all the mutual funds globally were tokenized, we estimate that mutual fund investors could realize additional annual investment returns of about US$100 billion, while sophisticated investors could potentially generate US$400 billion by taking positions on intra-day value changes.

1. AUM consists of funds issued by BlackRock, Franklin Templeton, WisdomTree. Data of October 2024.

For financial institutions such as asset managers and wealth managers, there is an opportunity to unlock new investor pools, protect existing investor pools, and enhance business offerings. Indeed, as regulated on-chain money – such as stablecoins, tokenized deposits, and CBDCs – becomes more prevalent, demand for tokenized funds will surge. We estimate that virtual asset owners represent around US$290 billion in potential demand for tokenized funds, with potentially trillions of dollars more driven by the rise of on-chain money adoption among traditional financial institutions. There will also be innovative fund distribution opportunities through secondary tokenized brokerage and embedded investing. And managers have an opportunity to enhance their distribution models, using smart contracts to tailor fund composition and create hyper-personalized portfolios.

Taking lessons from the evolution of exchange-traded funds (ETF) - the so-called second revolution in asset management - tokenized fund AUM could reach 1% of global mutual fund and ETF AUM in just seven years. This would imply AUM of more than US$600 billion[2] by 2030. If regulators permit the conversion of existing mutual funds and ETFs to tokenized funds, even trillions of dollars of AUM would be possible.

We believe there could be an inflection point for tokenized funds in the next 12–18 months, as on-chain money innovation creates a flywheel effect triggered by use of stablecoins among early adopters such as virtual asset owners. Subsequently, we could see rapid scaling with the launch of tokenized deposits and CBDCs. Among asset managers, first-movers are likely to attract significant market share and occupy preferred white spaces, with simple products helping them build brand recognition and economies of scale. Fast followers, by contrast, may need to innovate within niche areas.

To fully realize fund tokenization's potential, the industry must first establish robust foundations, including clarity on regulation, global operating standards, and technical interoperability. From there, financial institutions will benefit from six foundational capabilities: a strategic tokenized fund vision, a use case road map, on-chain compliance, blockchain technology and operational setup, the ability to manage cross-chain interoperability, and a center of excellence to orchestrate their endeavors. Successful execution across these building blocks will open the door to effective adoption and competitive impetus for the longer term.

2. Exchange-traded funds (ETFs) reached about 1% of total fund AUM within 7 years of the launch of the first one in 1993. With features rivaling ETFs, tokenized funds could potentially reach 1% of total AUM by 2030, implying more than US$600 billion in AUM. Tokenized funds could scale even higher if clear and low-friction conversion pathways are established for converting (tokenizing) existing mutual funds and ETFs.

Fund Tokenization

A Game-Changing Blockchain Use Case In Financial Services

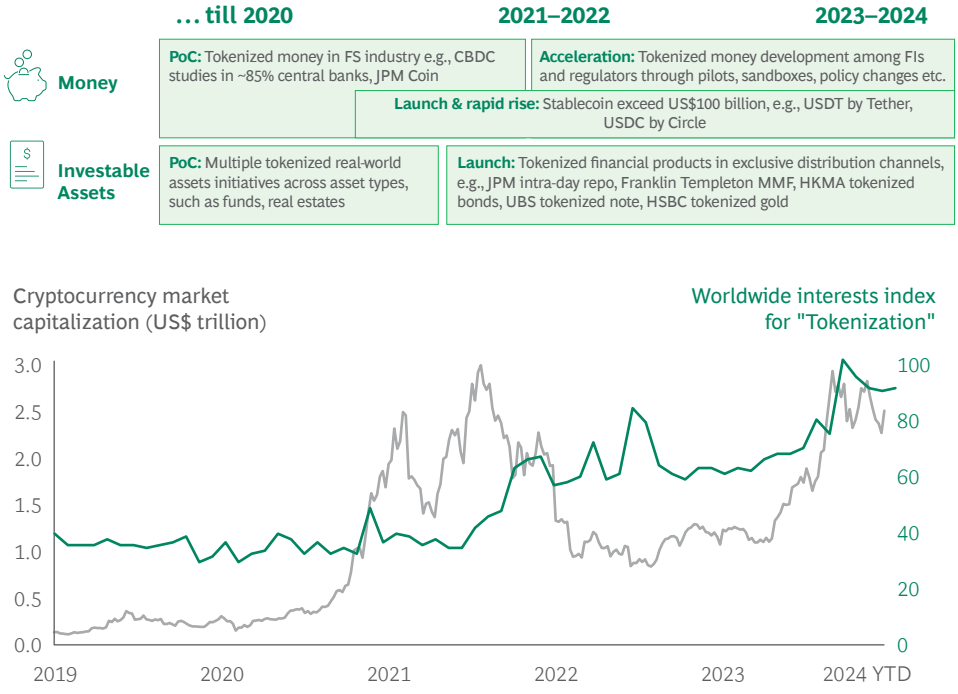
With successful proof-of-concepts, the adoption of blockchain technologies becomes increasingly compelling for financial institutions that have been on the digitization path. The ability to store immutable data from multiple parties creates both trust and significant efficiencies, effectively connecting companies with business opportunities and paving the way for collaborative innovation. Through tokenization, a process to create digitally represented ownership of real-world assets on blockchains, instant delivery versus payment (DVP) could be easier to execute than ever before.

Tokenization has continuously grown in all market conditions

Interest in tokenization has steadily grown, with concrete production-grade initiatives launched in the past five years, led by financial institution incumbents and supported by regulators. With increasing volumes and different asset types in tokenized form, we see the emergence of a stronger foundation for tokenized finance, which could reach a critical inflection point with readily available on-chain money. (See Exhibit 1.)

Fund tokenization is not just another innovation effort by a few asset managers. Instead, it is an industry-wide movement across numerous global asset managers. Franklin Templeton launched its first U.S.-registered fund (Franklin OnChain U.S. Government Money Fund, FOBXX) using a blockchain in 2021, while BlackRock in 2024 launched the BlackRock USD Institutional Digital Liquidity Fund (BUIDL), quickly achieving a market cap of over US$500 million in months.

Exhibit 1 - Development of Tokenized Real-World Financial Assets



Takeaways

Tokenized finance reaching a critical inflection point with readily available on-chain money & investable real-world assets

Tokenized money is already available & rapidly developing

- Stablecoin tested in virtual asset industry
- Accelerated development in CBDC & tokenized deposits, driven by regulators & FIs

Types of concrete investable tokenized real-world assets are launched, e.g., credit, funds, commodity

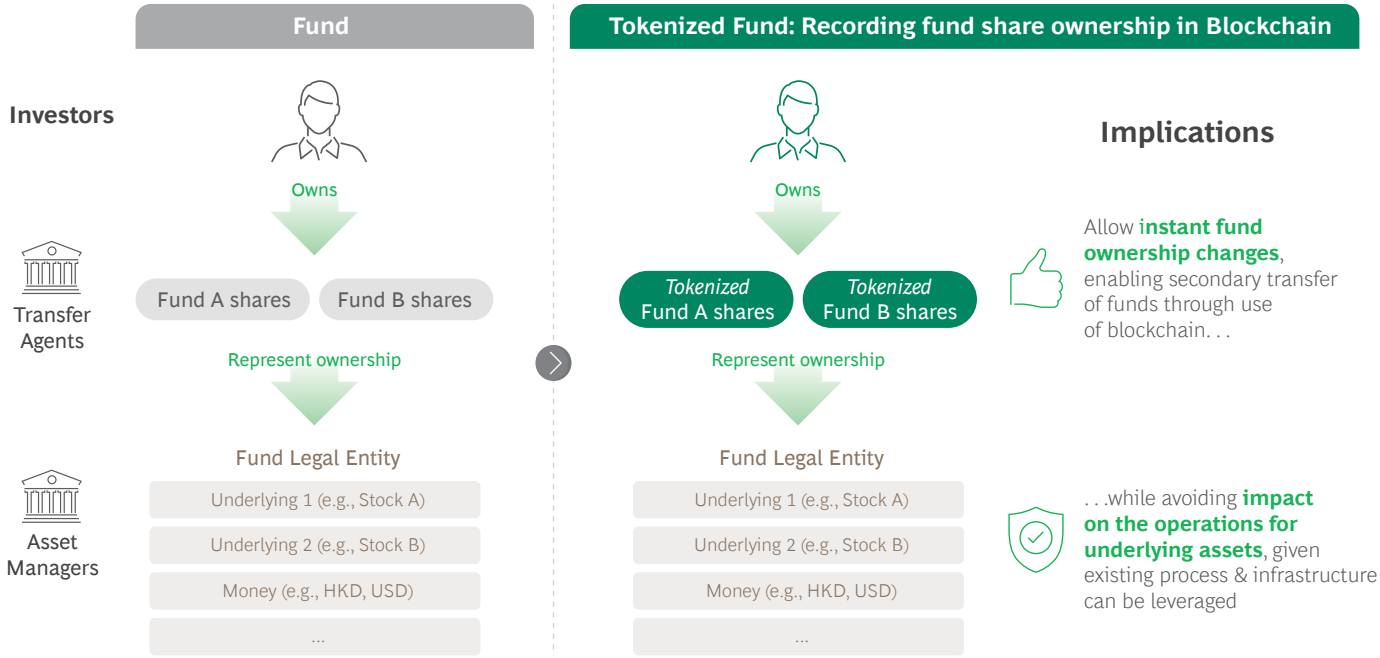
Sources: Press release; Google; CoinMarketCap; Company websites; BCG analysis.

Fund tokenization is scalable and impactful

We perceive this as a two-step transformation. Step One involves registering the fund shares on the blockchain to facilitate instant ownership transfers. Step Two entails utilizing tokenized funds to invest in other tokenized assets, such as tokenized bonds. The completion of Step One can already unlock significant value and pave the way for a future scenario where tokenized funds can directly own tokenized assets.

Tokenization often involves use of SPVs to hold underlying assets, such as real estate, and issuing tokens that represent shares. This is similar to how funds are structured and operated today. For example, asset managers use unit trusts to hold assets like stocks and bonds, with transfer agents managing investor records. However, in contrast to other asset types, fund tokenization does not require use of SPVs. Secondary transfers can take place through price setting by authorized participants and market makers, ensuring compliance with regulatory standards. This makes tokenized funds more comparable with exchange-traded funds (ETFs). (See Exhibit 2.)

Exhibit 2 - Traditional funds versus tokenized funds



Source: BCG analysis.

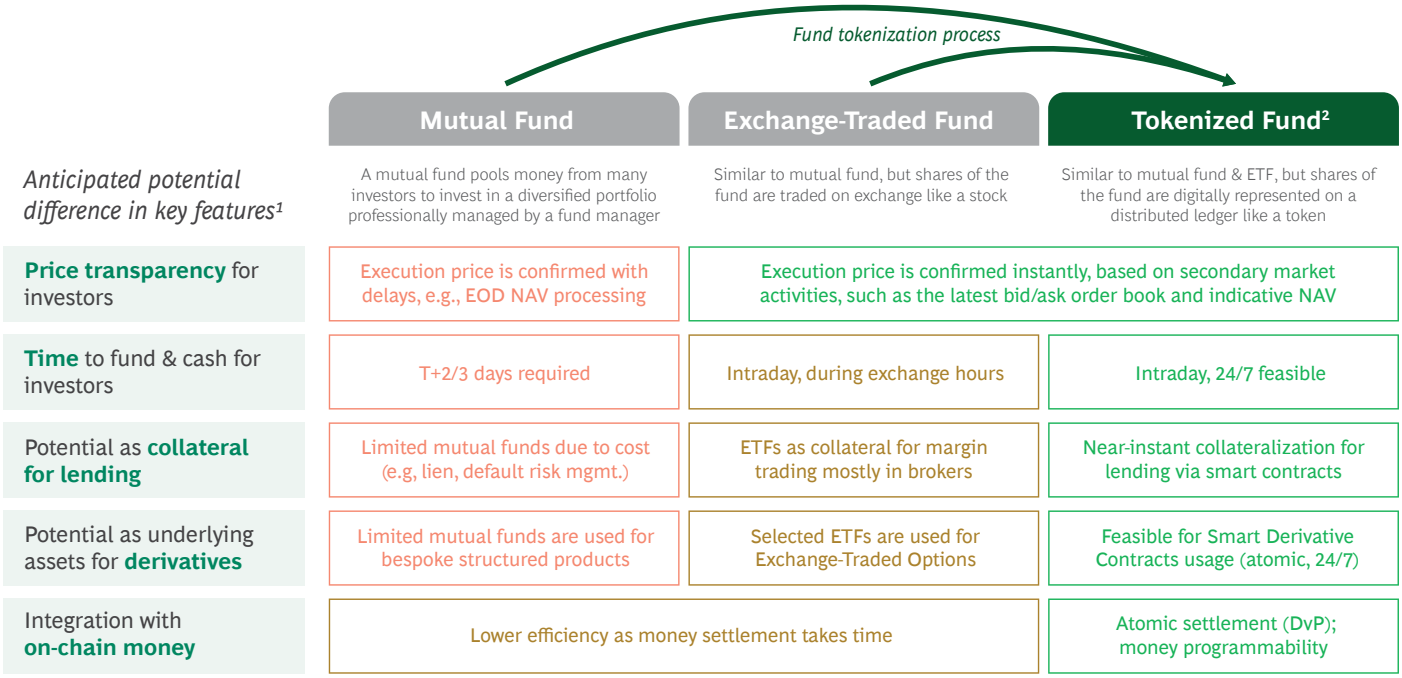
Tokenized funds can rival exchange-traded funds

Tokenized funds have the potential to emerge as the third evolution in the asset management industry, following the establishment of the US$58 trillion mutual fund industry under the Investment Company Act of 1940 and the subsequent revolution sparked by ETFs.

From both investors' and managers' perspectives, tokenized funds share several similarities with ETFs. Both offer a high degree of price transparency, superior liquidity, and more streamlined collateral management compared to mutual funds, among other benefits. (See Exhibit 3.)

There are three main approaches to fund tokenization, each with distinct advantages and challenges. The first is the creation of digital twins, often through Security Token Offerings (STOs), similar to a master-feeder structure. This approach is fast to implement but involves the added expense of managing dual operations. The second approach is developing native tokenized fund vehicles. While this can be simpler to execute, it requires attracting a new pool of investors. Lastly, there's the option of converting existing funds. This method offers scalability but demands care to avoid disruptions.

Exhibit 3 - Feature comparison: Mutual funds, ETF, Tokenized funds



Source: Industry interview, BCG analysis.

[1]Features for tokenized funds are their potentials using blockchain – subject to regulations.

[2]Also known as on-chain fund, digital fund, or blockchain-trade fund.

> **Through an innovation called fund tokenization, many advantages related to distributed ledger technologies are finding a new home in the asset management space, where they can boost value creation, increase transparency, and streamline transaction processing.**

How Tokenized Funds Create Value for Investors and Financial Institutions

Tokenized funds offer virtual asset investors access to professionally managed products through exposure to real-world assets that can generate steady long-term returns. They can also provide conventional investors with benefits including faster access to their earnings. Wealth and asset managers, meanwhile, should be able to accrue upsides that include improved connections to investors, reduced operational costs, round-the-clock investment offerings, and new business opportunities.

Fund investors can benefit from value-adds

Mutual funds have about US$58 trillion[3] assets under management and have generated 10-year average annual returns of 7.1%[4]. But today's settlement process is inefficient, with T+2/3 settlement periods locking up money and creating operational challenges in offering innovative financial product to end-investors.

Our preliminary estimates suggest that, by solving these problems, fund tokenization could produce about 17 additional basis points of annual return for mutual fund investors, representing about US$100 billion. We see four areas in particular where investor benefits could be manifested. (See Exhibit 4.) First, instant settlement would unlock productivity for trapped capital, potentially adding about US$50 billion[5] annually to investor portfolios. Second, transaction fees would likely be closer to the average ETF fee of 0.09%[6]. We estimate this could create annual investor savings of about US$33 billion, considering some mutual fund subscription and redemptions can be managed through the secondary market. Third, tokenized mutual funds would be easier to lend out than funds such as ETFs, generating about US$12 billion in interest income. Finally, tokenized mutual funds are traded intra-day, creating the possibility for sophisticated investors to capture intra-day fund net asset value (NAV) fluctuations that we believe could create US$80–400 billion of value annually.

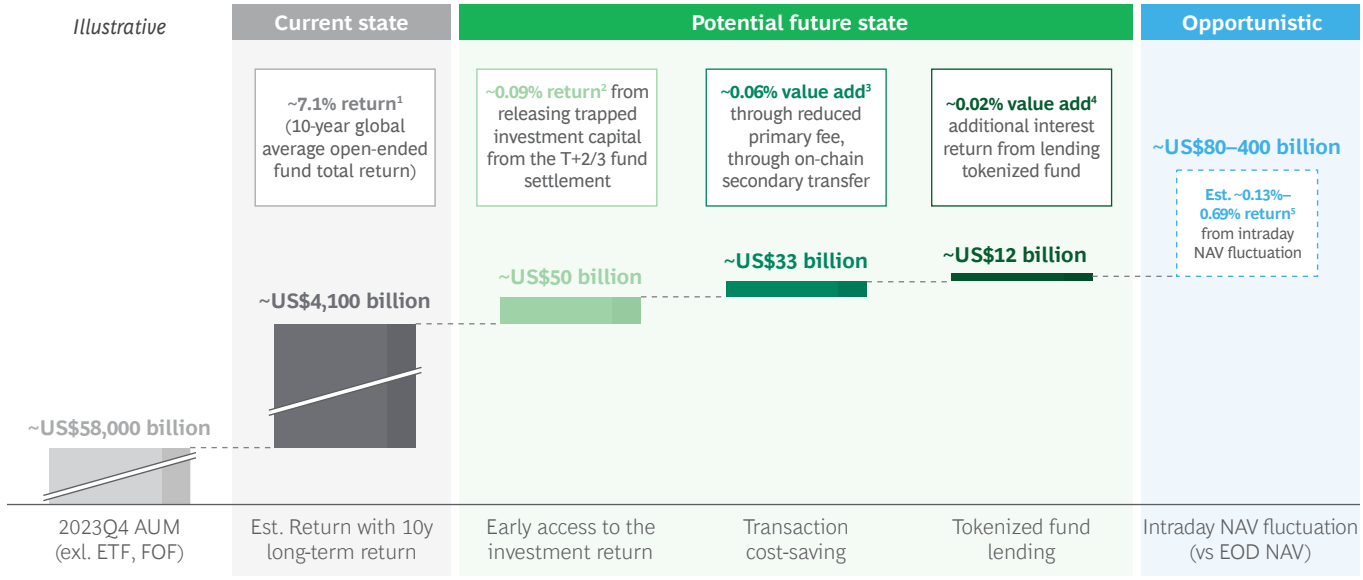
Wealth and asset manager top-line incentives

Wealth and asset managers have an opportunity to commercialize tokenized funds services in five key areas of activity. (See Exhibit 5.) We believe that individually and collectively, proactive engagement would boost sales and revenue margins.

3. Excluded ETF, FoF. Source: International Investment Funds Association (IIFA), Q1 2024.
4. Average open-end fund's total return per year over the 10 years ended Dec 31, 2023, source: Morningstar <Mind the gap 2024>.
5. Estimation of global mutual fund subscription flows and redemption flows are based on fund activities (subscription and redemption) of Luxembourg-registered funds; return of subscription flows use 10yr global open-end fund total return from Morningstar, return of redemption flow use Effective Federal Funds Rate, Source: CSSF Luxembourg, Morningstar, Federal Reserve Bank of New York.
6. Source: <Costs and Performance of EU Retail Investment Products 2023>, take UCITS ETF subscription fees as proxy.

Exhibit 4 - Fund tokenization benefits for global mutual fund end-investors

Benefits for global mutual fund end-investors (US$ billion)



Sources: Morningstar; ICI; Refinitiv; CSSF Luxembourg; BCG analysis.

[1] 10-year Total Return for Open-ended fund, including International Equity, US Equity, Sector Equity, Nontraditional Equity, Allocation, Municipal Bond, Taxable Bond etc.

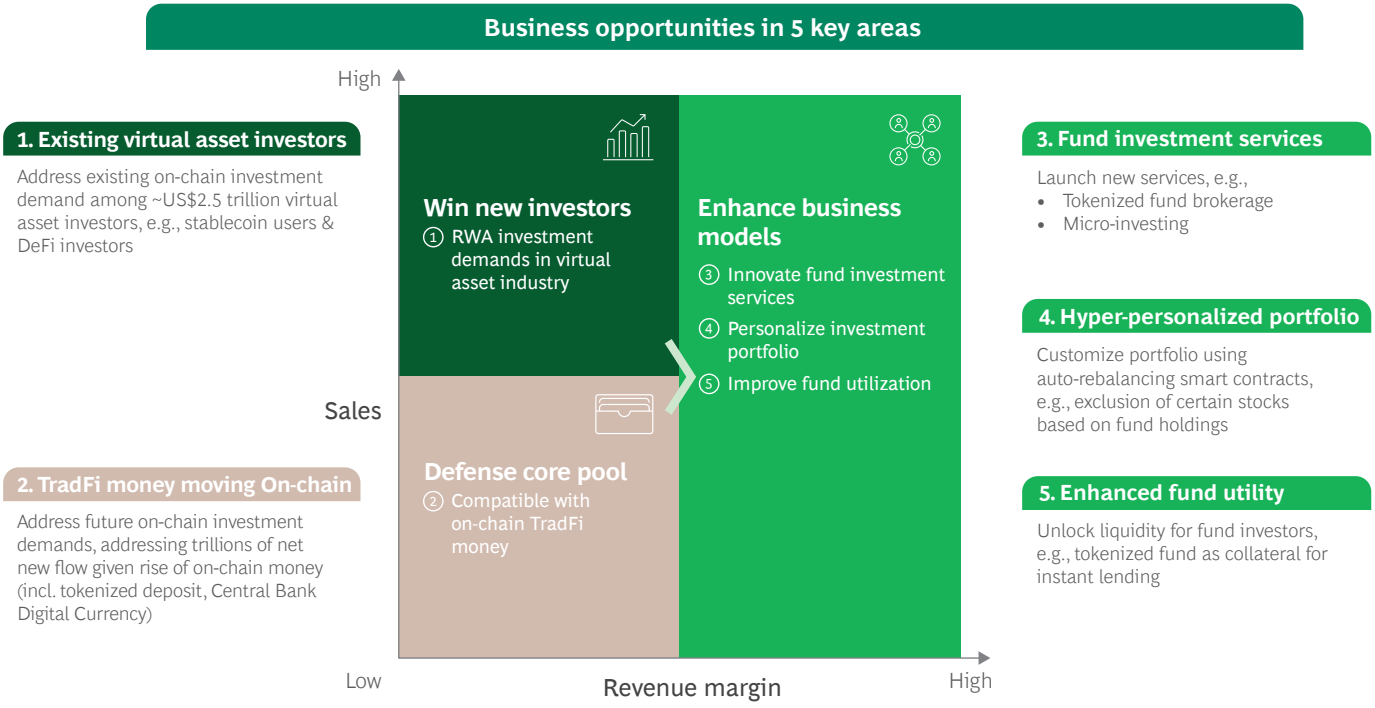
[2]Based on est. global total subscription and redemption activities and additional avg. annual mutual fund return from three days (T+3).

[3]Handle primary subscription and redemption activities to secondary market with lower fees (~0.1% vs. ~0.2% on primary).

[4]Benchmark tokenized fund to ETF on-loan volume as % of AUM with the avg. ETF lending interest rate.

[5]1st and 3rd percentile of EOD NAV and 30-min avg. market price difference among global top 10 ETFs by AUM over the past 12 months.

Exhibit 5 - Five key business opportunities from tokenized funds



Source: BCG analysis.

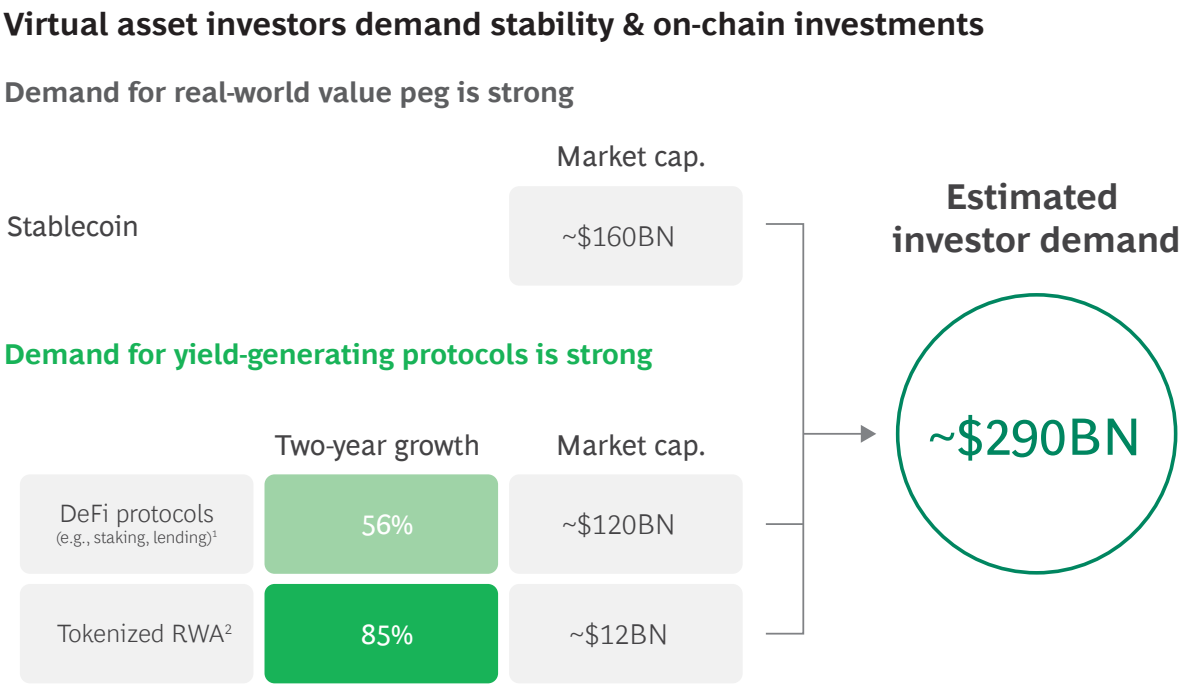
Below we discuss each of the five business opportunities in more detail:

#1: Addressing US$290 billion of existing on-chain investment demand

In the global cryptocurrency market, valued at approximately US$2.5 trillion[7], we estimate there is about US$290 billion[8] of investment demand for tokenized funds. (See Exhibit 6.) The segment includes owners of stablecoins, tokenized real-world assets (RWAs), and DeFi protocols, and it continues to grow rapidly. DeFi protocols (excluding stablecoins) are even larger, with a market cap of about US$120 billion[9] and a two-year average growth rate of 56%. The tokenized real-world asset (RWA) market has reached a market cap of about US$12 billion[10], amid 85% growth over the past two years.

Tokenized funds, as on-chain pooled investments, can effectively meet investment demand by addressing the gap in on-chain offerings, which are currently dominated by DeFi protocols. By leveraging proven investment strategies that asset managers have applied to manage trillions in assets over the past few decades, the funds offer a more robust investment option. Additionally, they provide access to real-world investment opportunities, allowing for better portfolio diversification amid shifting market dynamics. (See Exhibit 7.)

Exhibit 6 - Virtual asset owners are seeking yield-generating investments



Sources: DeFi Llama, RWA.xyz, BCG analysis.

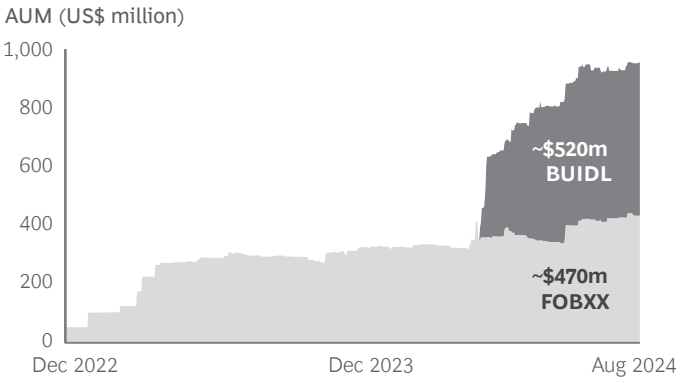
[1]Other DeFi protocols include lending, derivatives, liquid staking, restaking, etc.

[2]Real world asset tokenization. Included tokenized funds (~US$1 billion), tokenized private credits (e.g., Figure, Centrifuge, Maple).

7. Cryptocurrency market capitalization, CoinMarketCap, July 2024.
8. Investment demand is valued by summing stablecoin market cap, tokenized RWA market cap, and total value locked in DeFi protocols.
9. DeFi Total Value Locked, DeFiLlama, July 2024.
10. Total RWA Onchain, rwa.xyz, July 2024.

Exhibit 7 - BlackRock BUIDL and Franklin Templeton FOBXX facts[11]

AUM of Tokenized Money Market Funds
Dec'2022 to Sep'2024



Distribution Snapshot
(Sep'2024)

Fund Name	# of holders	Monthly Txn Vol.	Distribution Channel	Mgmt. Fee (%)
BUIDL BlackRock USD Institutional Digital Liquidity Fund	~20 holders (institutions)	~$60m (~12% of the AUM)	**SECURITIZE** *Intermediary* Digital wealth mgmt. platform, tokenized asset & blockchain focus	0.50%
FOBXX Franklin OnChain U.S. Government Money Fund	~470 holders (retail focus)	–	**BENJI** *Direct-to-client* Franklin Templeton's own distribution channel	0.15%

Sources: rwa.xyz, press releases; BCG analysis.

#2: Defending existing investor pools amid the rise in regulated on-chain money

Traditional finance money is moving on-chain through rapidly developing and regulated on-chain money, including regulated stablecoin, tokenized deposits, and CBDC initiatives driven by regulators and financial institutions. (See Exhibit 8.)

On-chain money is different from dematerialized money on two important dimensions – programmability and atomic settlement with tokenized assets. Programmability will enable the development of programmable money and purpose-bound money, where users can specify the usage of the money through programming logic across the financial institutions and jurisdictions. Atomic settlement with tokenized assets will permit real delivery versus payment (DvP) – the on-chain assets and on-chain money are exchanged simultaneously.

As the adoption of regulated on-chain money progresses, there will be knock-on impacts on net fund flows. If just 10% of investable money is on-chain, there will be billions of dollars of demand for tokenized funds.

Exhibit 8 - Physical money, dematerialized money, and on-chain money

	Physical money	Dematerialized money	On-chain money
Examples	Banknotes and coins	Bank deposits balance Digital wallet	Regulated stablecoin Tokenized deposit Central Bank Digital Currency (CBDC)
Impact for wealth & asset managers	Limited Scalability Complexity in dealing with physical cash transaction	Scalable Grow offline investing alongside bank services Grow online investing, targeting mass at lower cost	Enhanced business models Capture new demands for purpose-bound money, 24/7 instant investing, etc Unlock new business models, e.g., tokenized fund as intra-day lending collateral

Source: BCG analysis.

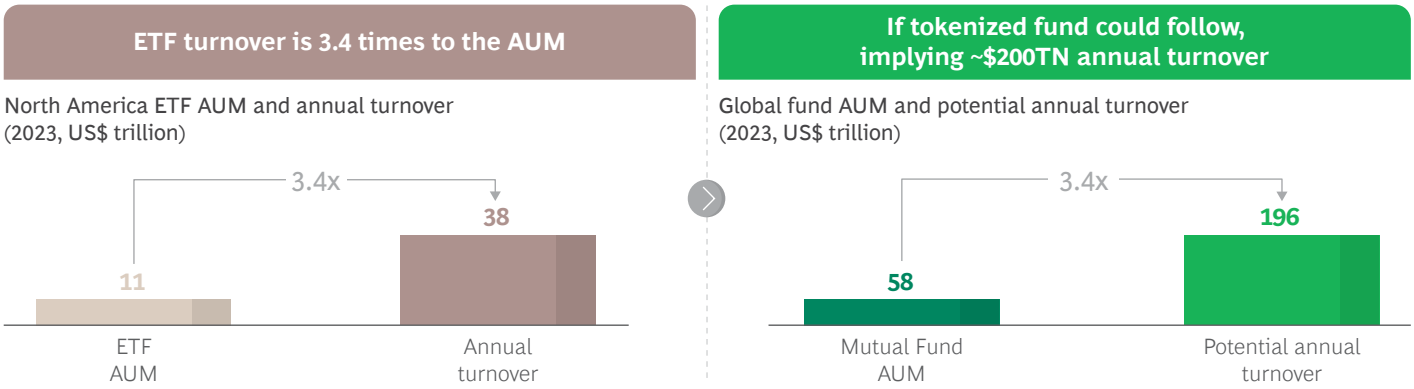
11. Tokenized funds market cap and holding wallets, rwa.xyz, August 2024.

#3: Enhancing fund distribution leveraging instant 24/7 and fractional transfer

Once mutual funds are tokenized, investors can transfer their mutual fund shares to other investors. BlackRock's BUIDL and Franklin Templeton's FOBXX already allow secondary transfer in their managed distribution channels.

If a secondary market for tokenized mutual funds emerges in line with that of ETFs, transaction turnover could reach about US$200 trillion annually, based on the ETF turnover-to-AUM ratio in North America of 340%[12]. (See Exhibit 9.) If the market achieved just 10% of the potential, it is easy to envisage about US$2 trillion of turnover could be serviced by wealth managers.

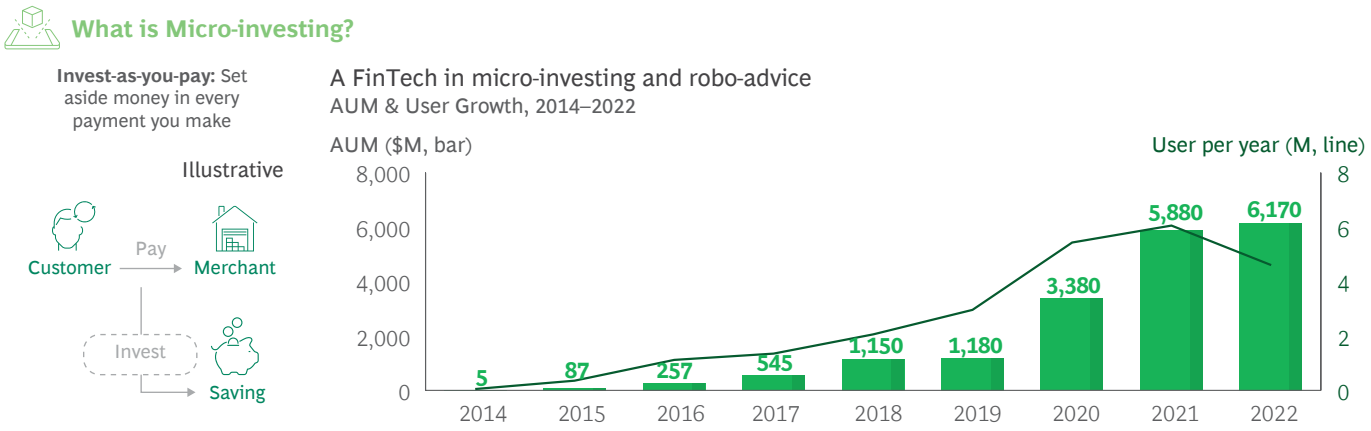
Exhibit 9 - Tokenized fund secondary market potential volume



Sources: SimFund, BCG analysis.

Tokenized funds also enable innovative fund distribution methods (or investment approaches for investors), leveraging fractionalization and instant 24/7 execution in a fund that significantly reduces barriers to investment. Micro-investing, for example, is a segment in which FinTechs are growing fast. (See Exhibit 10.) To catch up, wealth managers could use tokenized funds to enhance their offerings. If wealth managers can enhance the customer experience, they are likely to attract younger investors and help them develop investing habits early.

Exhibit 10 - What is micro-investing?



Sources: Investing in the Web; BCG analysis.

12. ETF turnover data from U.S. ETF TRADING FACTS: WHAT TO KNOW FROM 2023, BlackRock, 2024; North America ETF AUM data from SimFund, 2024.

#4: Offering hyper-personalized portfolio management through smart contracts

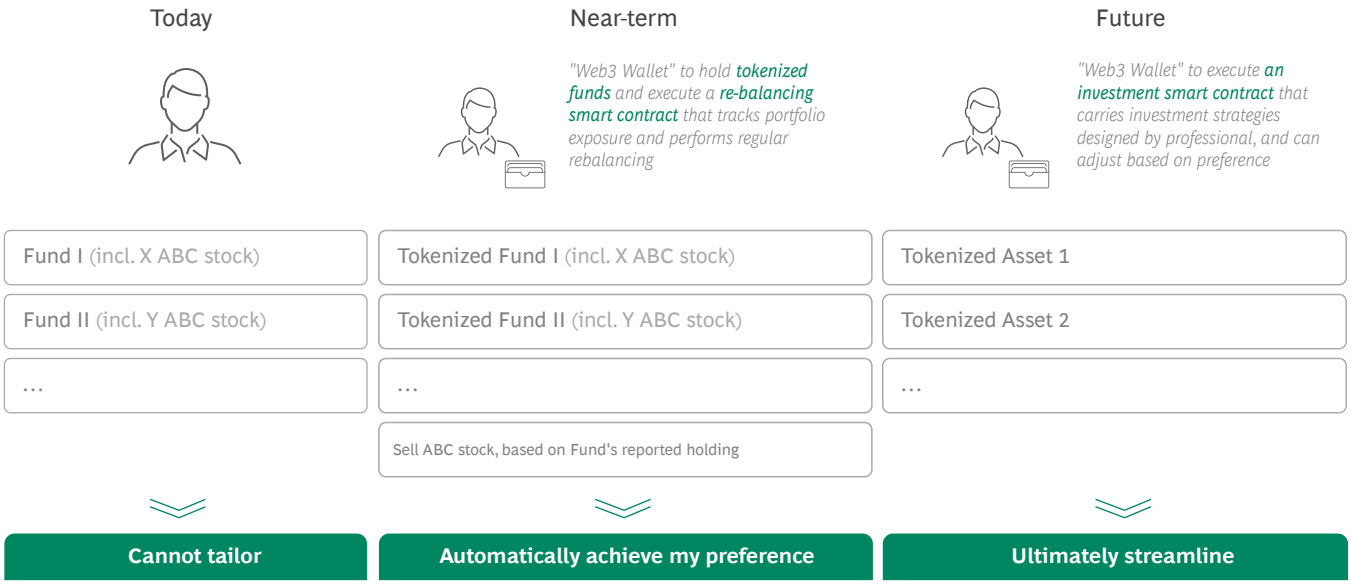
A hyper-personalized investment portfolio can significantly improve client experience and client retention rates. And while customization is limited in the mass market, it is increasingly seen as a must have among wealthier investors.

With the help of smart contracts and tokenized funds, personalization can be made available to all. For instance, investors could track their tokenized fund's disclosed holdings in real time and leverage a re-balancing smart contract to take regular long or short positions to achieve their optimal exposure.

Meanwhile, for financial institutions, customization could unlock an array of revenue streams and create a foundation to better service the investor needs. (See Exhibit 11.)

Exhibit 11 - Smart contracts can enable personalization

Illustration:
Investor A wants to restrict his/her exposure in Stock ABC to X, across his/her 2+ funds



Source: BCG analysis.

#5: Enhancing asset utility to unleash liquidity through more efficient risk management

Loans against mutual funds are established financial products in multiple markets, especially in those with high interest rates. However, borrowing against the funds is complicated by operational complexities and collateralization periods of three to five business days. With tokenized funds, the process can be streamlined, reducing collateralization times to less than one day. Also, loan terms can be pre-programmed, enabling lenders to reduce their credit risk and offer more tailored financing rates.

As we approach a critical inflection point over the next 12–18 months, wealth and asset managers must act swiftly to seize the opportunity. While early movers have already achieved some success, the establishment of regulatory guidelines, global standards, and technological enablers will be critical to create solid foundation for a frictionless, globally interconnected industry.

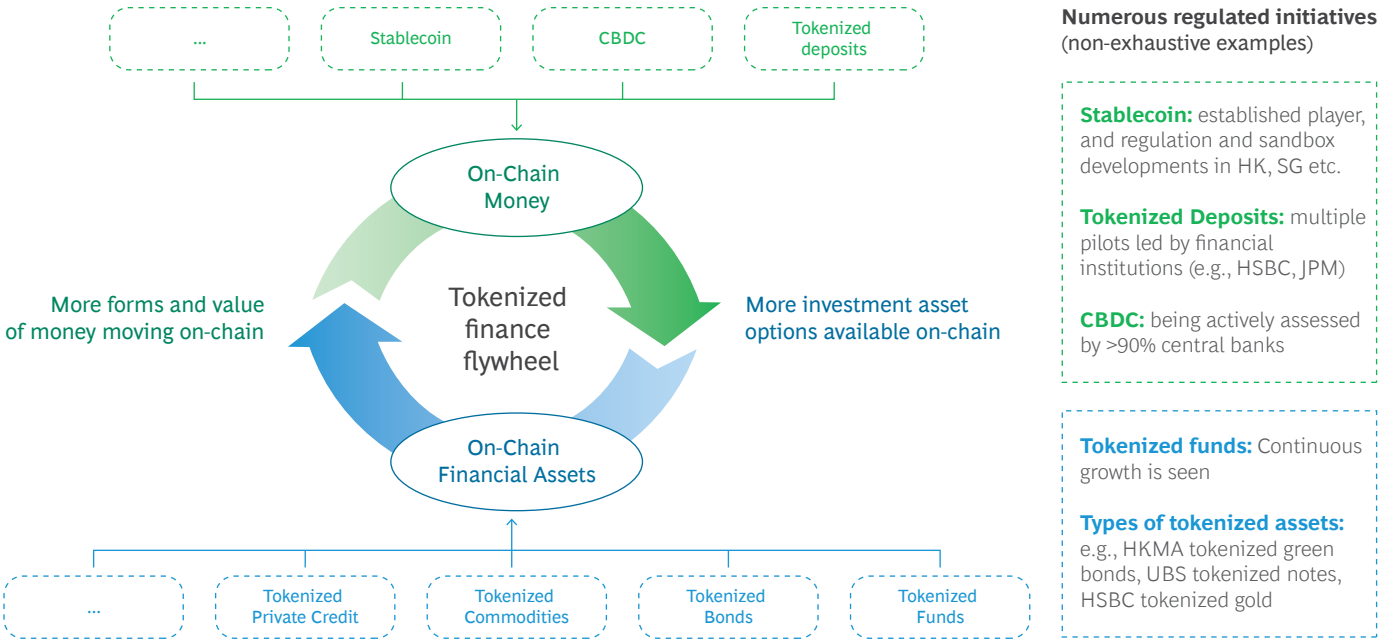
Adoption and the Opportunity for More Active Industry Participation Over the Next 12–18 Months

Amid rapidly developing regulation for on-chain money and assets, the financial services industry is approaching a pivotal moment. A tokenized fund growth flywheel effect signals significant potential ahead, driven by various adoption pathways. In addition, the overall tokenized finance ecosystem is advancing quickly, and effective orchestration can reduce adoption costs.

A tokenized finance inflection point could potentially be reached in the next 12–18 months

We expect momentum to accelerate over the next 12–18 months in some markets, as regulated on-chain money such as regulated stablecoin, tokenized deposits, and CBDCs become more established in key international finance centers. Taking Hong Kong as an example, there are numerous regulatory initiatives at play, including Stablecoin sandbox, Project e-HKD+ and Project Ensemble. Alongside developments in markets such as Singapore, Japan, Taiwan, the United Kingdom, and the Middle East, the future of finance is closer to us than ever before. (See Exhibit 12.)

Exhibit 12 - Critical mass through a flywheel effect and regulatory initiatives

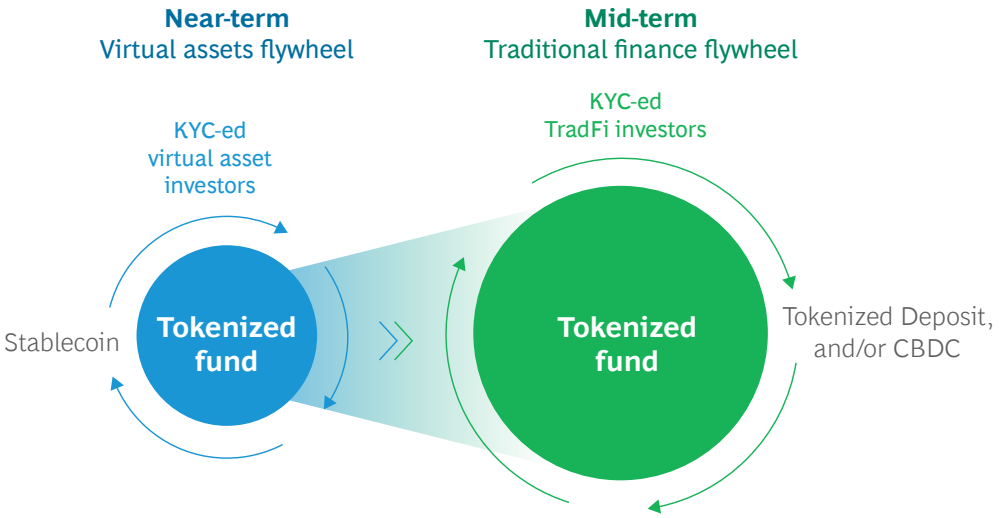


Source: BCG analysis.

A tokenized fund growth flywheel is triggered

We estimate around US$290 billion in existing investment demand for tokenized funds from virtual asset owners, with trillions more driven by the rise of on-chain money adopted by traditional financial institutions (TradFi). Increasing adoption of stablecoins and a rising need for virtual asset owners, such as crypto foundations, will drive a near-term flywheel effect. (See Exhibit 13.)

Exhibit 13 - A flywheel effect will accelerate adoption



Source: BCG analysis.

With features similar to those of ETFs, tokenized funds could potentially lead the next revolution in global investment. Exchange-traded funds (ETFs) reached about 1% of total fund AUM within 7 years of the launch of the first one in 1993. With features rivaling ETFs, tokenized funds could potentially reach 1% of total AUM by 2030, implying more than US$600 billion in AUM. Tokenized funds could scale even higher if clear and low-friction conversion pathways are established for converting (tokenizing) existing mutual funds and ETFs.

We see two potential growth paths. First, managers may launch vehicles to tap into new investor pools. At the same time, regulators and private sector players could identify pathways to upgrade existing vehicles. (See Exhibit 14.)

Exhibit 14 - Tokenized fund development under two paths[13]

	What if #1 **Grow Gradually like ETF**	What if #2 **Upgrade Existing Fund Vehicles**
Key elements required	Clarity on requirements for secondary transfer Continued development on stablecoins, tokenized deposits and CBDC Asset managers launching new fund vehicles to attract new investors	Clarity on requirements for secondary transfer Continued development on stablecoins, tokenized deposits and CBDC Asset managers launching new fund vehicles to attract new investors *Easy-to-follow conversion path for existing fund vehicles*
Potential AUM of tokenized fund in 2030	~US$600 to 1,000 billion ETF achieved 1% of total AUM in ~7 years after its first launch in major market	US$ trillions+ Subject to guidance from regulators

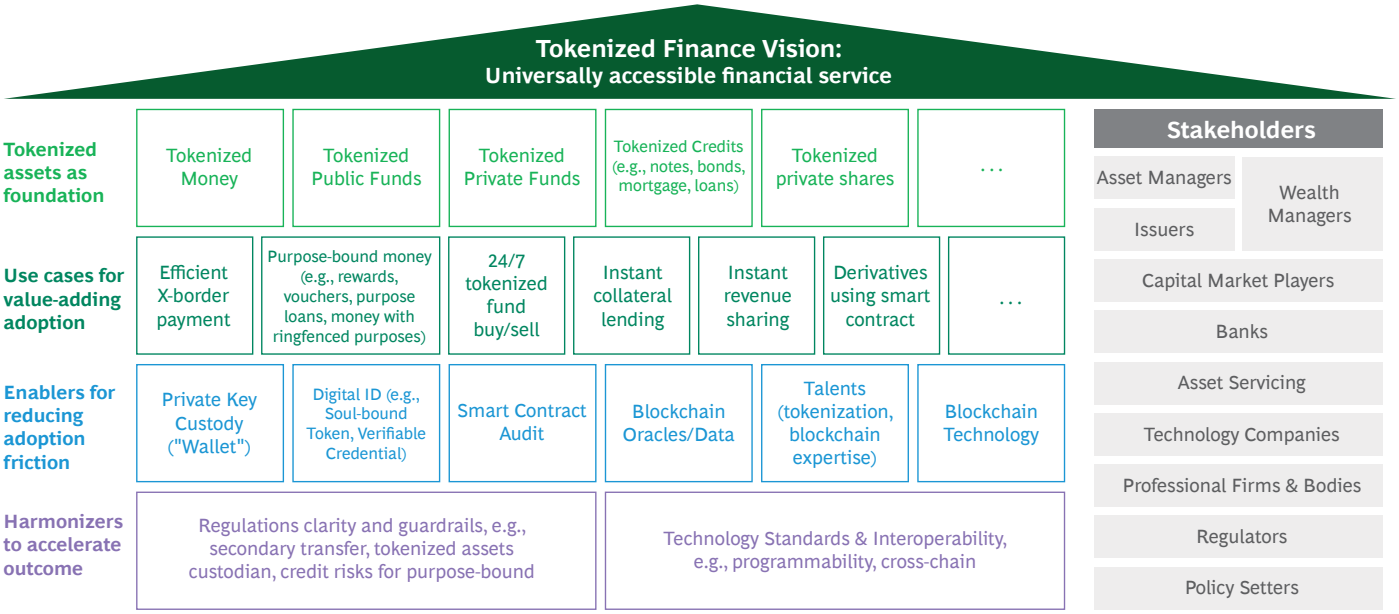
Source: BCG analysis.

13. Mutual fund and ETF data from SimFund database; Tokenized fund AUM and all forecasts are estimated by BCG.

Financial institutions need to collaborate for a frictionless third industry revolution

Successful development of fund tokenization will be built on ecosystem orchestration, an important element of which is to define a clear vision of a universally accessible financial services, taking in foundational capabilities, use cases, enablers to reduce friction in the transition, and harmonizers to accelerate positive outcomes. (See Exhibit 15.) The current moment echoes the earlier development of ETFs, with stakeholders required to develop their product offerings, adapt technologies and operations, and identify ecosystem partners such as market makers.

Exhibit 15 - Developing a vision for tokenized finance



Source: BCG analysis.

Global collaboration is essential to ensure aligned standards

Standards matter, and the tokenized fund ecosystem will require globally recognized standards that ensure legitimacy and interoperability across infrastructures and regions. Standards will also facilitate collaboration through the value chain. Priority topics include:

1. **Tokenized fund regulation clarity** to facilitate a smooth development, including AML/CFT, KYC, security/custodian guidelines for digital assets, requirements for tokenized fund operations, and secondary transfer.

2. **Common tokenized operational standards** to ensure connectivity, including digital asset data standards to ensure inter-company operations and a process to deal with on/off-chain records.

3. **Technical interoperability** to foster innovation, including interoperability across database/chains and cost-effective and risk-managed adoption of public chains. A global protocol is imperative for achieving cross-chain and cross-border interoperability and composability.

Key areas for global collaboration	
Tokenized fund regulation clarity	**Reusing existing vehicles:** What setup is needed to allow fund tokenization to reuse existing fund vehicles? Funds can convert to tokenized form directly, instead of creating new structures to reduce costs and adoption implications. **Secondary transfer allowed:** What guardrails should be put in place to protect investor interests? Solutions may include KYC-ed wallets, bid/ask spread management, and tokenized fund broker qualifications. **Qualification for tokenized fund operations:** What are the requirements to operate tokenized funds, across fund management, asset custodian, transfer agent and fund administrators? What tokenized money should be accepted (e.g., stablecoin by licensed players to manage issuer risk)?
Common tokenized operational standards	**Global tokenized fund passporting:** How should tokenized funds be designed to support cross-jurisdictional distribution, including use of existing Mutual Recognition of Funds arrangements. **Common controls adhered by all:** What should be the common set of protocols to implement automated controls? Potentially control layers could be defined by specific regulators, asset managers, distributors, and programs. **Operations for tokenized underlying asset:** If managers decide to manage tokenized underling assets via tokenized funds leveraging smart contracts, what should be the setup?
Technical interoperability	**Blockchain interoperability:** What should be the common cross-chain interfaces to ensure features embedded in funds via smart contracts (e.g., secondary transfer controls, collateral management) can remain effective under a multi-chain set-up? **Risk-based security standards:** What should be the principles for data management and cyber-security to protect privacy, safety of tokenized funds?

A Blueprint for an Ecosystem with New Capabilities

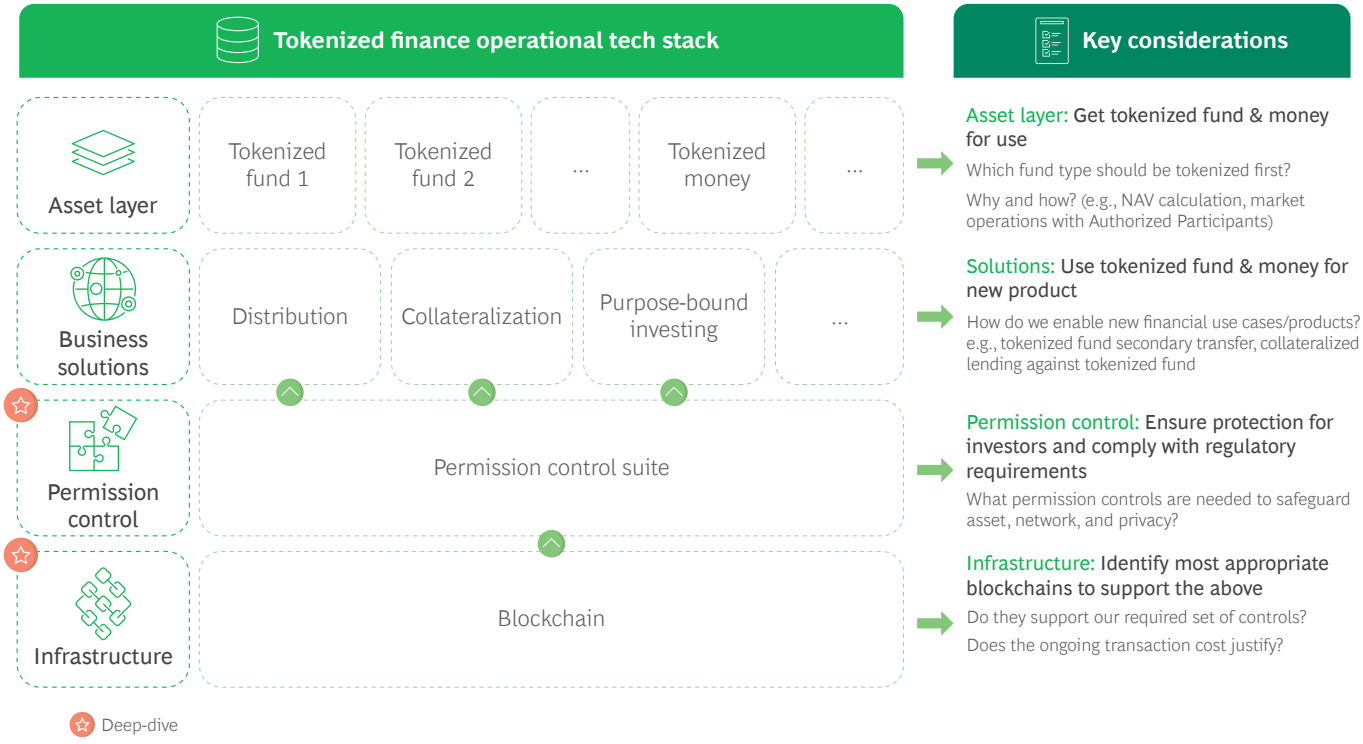
Financial institutions in the wealth and asset management value chain face a moment of truth, at which some will thrive in a new era of tokenized funds while others may be left behind. Technology will play a critical role in enabling tokenization but will require rapid upgrades in the initial stages of development. Taking blockchain as an example, there are more than 1,000 individual chains and the number is rising fast.

A cost-effective path forward: the modularized technology stack

Adding the variables of different forms of tokenized assets, business solutions, and permission controls, the development of solutions for everyday use cases could be challenging.

With this complexity in mind, financial institutions would benefit from designing modularized tech stacks comprised of four essential layers: an asset layer to manage types of tokenized assets, solutions, permission control to manage different compliance asks, and infrastructure for safety and scalability. (See Exhibit 16.)

Exhibit 16 - A modularized tech stack would solve for complexity



Source: Aptos Ascend analysis.

Below we deep dive into two key considerations, reflecting the need to balance compliance and commercial cost factors:

Deep-dive #1: Permissioned control for compliance needs

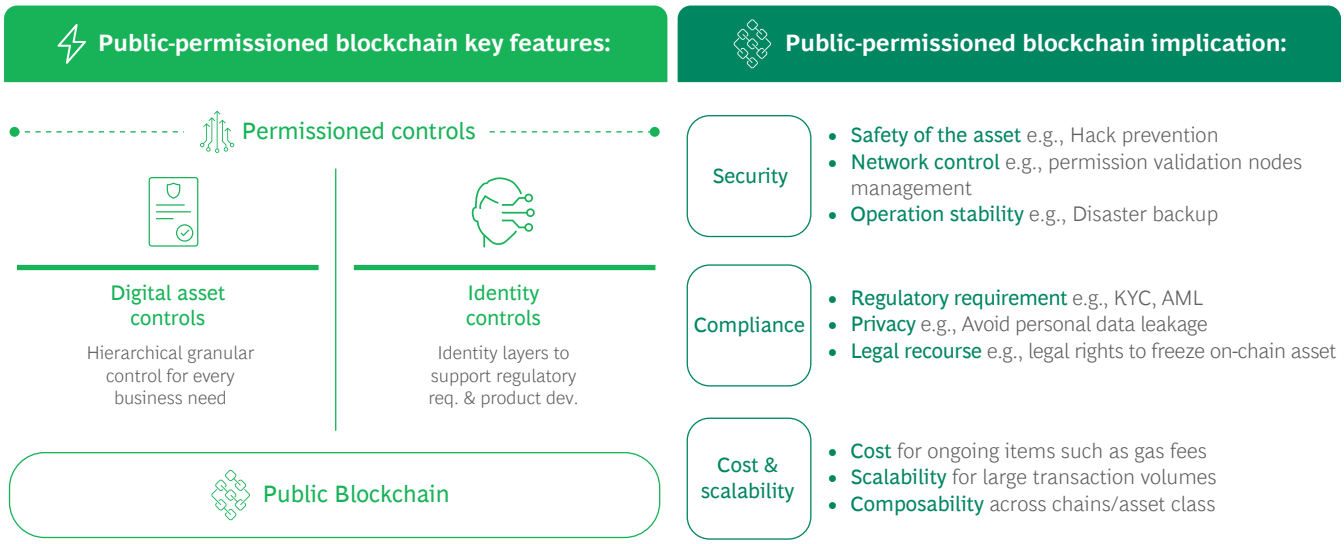
A key task for any tokenized fund initiative is to address risks around data privacy and other regulatory requirements such as cybersecurity. Below are some key questions we often see raised in industry discussions.

Areas	Select specific questions
Security and Encryption	How resilient is the blockchain's security model against cyber threats, including hacking, fraud, and unauthorized access? Can we ensure the token/assets in the blockchain are only transferred to authorized parties (e.g., KYC-ed wallets)? Can we design so that only vetted participants can validate transactions? What is the process for making changes or updates to the blockchain, and are there safeguards in place to prevent malicious actions by network participants?
Data Privacy and Confidentiality	How does the blockchain ensure data privacy at asset, transaction, and wallet levels, e.g., robust encryption methods to protect sensitive financial data and transactions? Does the platform support advanced cryptographic techniques (e.g., zero-knowledge proofs, multi-signature) to ensure data integrity and confidentiality?
Disaster Recovery and Continuity	Is there a clear continuity plan in place that aligns with institutional requirements for uptime and operational resilience, including during blockchain feature upgrade? In the event of a network failure, how does the platform handle recovery without risking data integrity or compromising transaction records?

Many financial institutions have explored private or consortium-led blockchains to achieve the above-mentioned compliance aims, but they have found them to be costly to develop. While public blockchains are known for their cost efficiency, some people believe they do not have sufficient permission controls, creating apparent adoption barriers. However, it is worth noting that the evolving "permissioned" setup within public blockchains has already offered financial institutions a way to significantly reduce costs while maintaining control. (See Exhibit 17.)

In recent years, many financial institutions have leveraged Ethereum, a public blockchain, for their tokenization efforts – for example, BlackRock's launch of BUIDL on Ethereum in May 2024. ABN AMRO used a public blockchain for bond tokenization, while UBS introduced Hong Kong's first tokenized warrant on a public blockchain. Other institutions, including J.P. Morgan and Franklin Templeton, have also taken steps to roll out fund tokenization and digital assets, leveraging platforms such as Avalanche. Aptos Labs, a co-author in this report, has also been involved in supporting diverse tokenized asset initiatives. This involvement includes the launch of Brevan Howard's Master Fund, Hamilton Lane's Senior Credit Opportunities Fund, BlackRock's ICS Money Market Fund, and Franklin Templeton's Onchain Money Market Fund on the Aptos Network in September 2024.

Exhibit 17 - How public-permission setup can combine the merits of private chains (security and compliance) and public chains (cost & scalability)



Source: Aptos Ascend analysis.

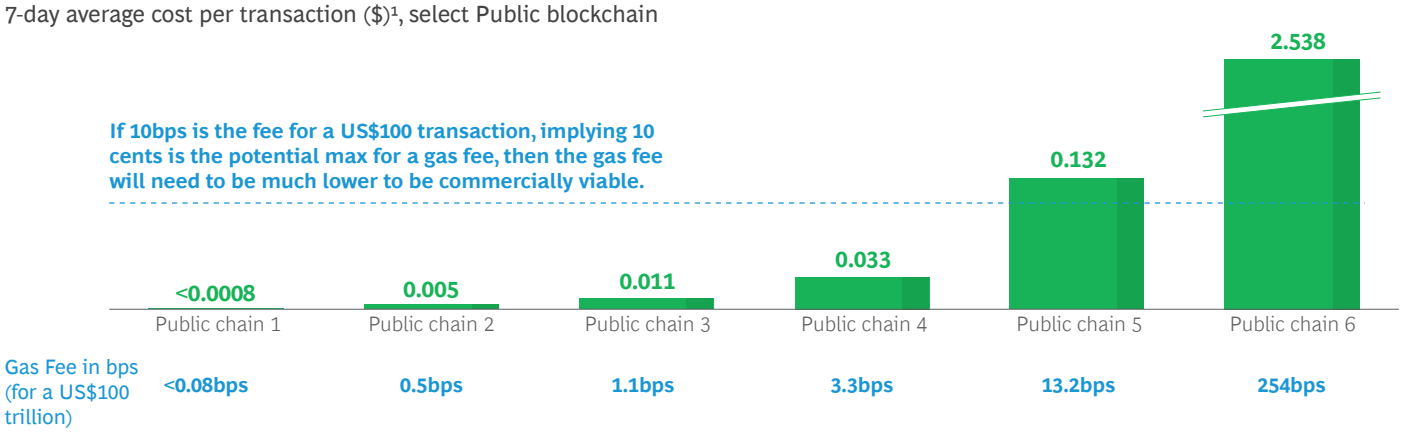
Deep-dive #2: Blockchain for scalability

Subscription and redemption fees for investors could be as low as about 10 basis points[14], leaving little room for increased transaction costs. Gas fees, which are the costs required to execute transactions or smart contracts on a public blockchain, range from less than US$0.001 to as high as US$2 per transaction, depending on the blockchain. (See Exhibit 18.)

A single fund secondary transfer may involve multiple transactions, for example where market participants execute a smart contract for validating the money's purpose-bound conditions, adding extra steps. To maintain economic efficiency, the total transaction cost, including gas fees for all on-chain transactions, must be significantly lower than US$0.10 per transaction.

Exhibit 18 - Average costs per transaction vary significantly

7-day average cost per transaction ($)[1], select Public blockchain



Sources: The Block; Dune; BCG analysis.

[1]7-day average gas price calculated in USD as of August 15, 2024.

14. ESMA market report Costs and Performance of EU Retail Investment Products.

Swift Action Is Required

Reflecting the growth of tokenized money, the financial services industry is on the brink of tokenized transformation. And, in turn, we believe tokenized funds will be a major trigger for tokenization of underlying assets.

In our base case, tokenized funds could offer end investors the potential of about US$100 billion in investment returns and US$400 billion in underlying opportunities, while financial institutions could create value in many aspects of operations. In multiple scenarios, tokenized funds could reach trillions of dollars of AUM by 2030.

As we approach a critical inflection point over the next 12–18 months, wealth and asset managers must act swiftly to seize the opportunity. While early movers have already achieved some success, the establishment of regulatory guidelines, global standards, and technological enablers will be critical to create solid foundation for a frictionless, globally interconnected industry.

As a first step, firms need to understand how to leverage permission features and to comply with security and data privacy requirements. Looking ahead, the door is open to both cost efficiencies and significant competitive advantage. Finally, we see six key questions that can help decision makers shape their strategies and position themselves to play a leading role in the transition to come. (See Exhibit 19.) Through vision, compliance, interoperability, use case roadmap, center of excellence (CoE), and foundational technology and operations capabilities, financial institutions can transform a nascent growth area into a financial powerhouse fit for the modern age.

Exhibit 19 - Six key questions can help financial institutions create a tokenization strategy playbook

Tokenization vision

What elements of **competitive advantage** will remain and erode?

How must we evolve our **business model?**

How will we **measure & steer value?**

On-chain Compliance

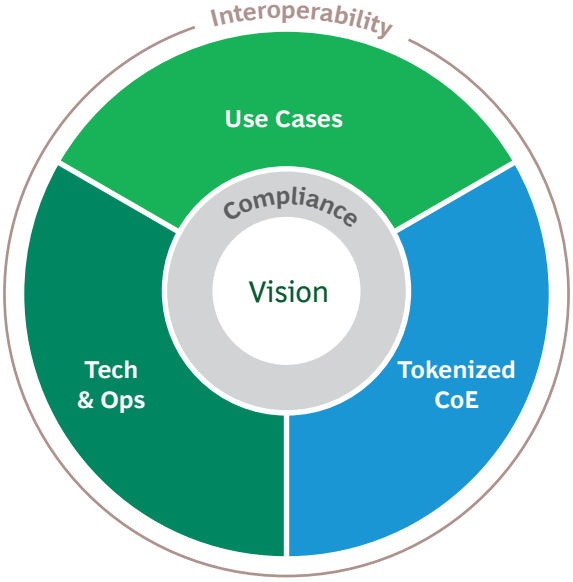
What is the potential for **data privacy and security risks?**

How can these **risks be mitigated?**

Interoperability

What **standards and tools** should we put in place to ensure our interoperability (seamlessly connected with other parties)?

How will we **manage our digital ecosystem and partnerships?**



Tokenized Fund Use Case Roadmap

What **use cases are most valuable**, e.g., new ways of distribution, new product utility such as lending?

How will we **sequence roll-out?**

Tokenization CoE

How will we **drive adoption and manage the change?**

How will **talents and skills need** change, and **operating model shift?**

Blockchain Tech & Ops

What **blockchain and how should we replace/integrate** with existing tech and process?

Source: BCG analysis.

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Aptos Ascend

Aptos Ascend is a business unit within Aptos Labs, dedicated to co-creating the future of finance in partnership with ecosystem stakeholders. By harnessing the cutting-edge capabilities of the Aptos Network, Aptos Ascend plays a pivotal role in bringing public-permissioned blockchain technology to financial institutions, helping to reshape the landscape of modern finance in cost efficient and compliance manner.

The Aptos Network is a Layer 1 blockchain, renowned for its breakthrough technology and Move programming language. Aptos Network is designed to continuously evolve, deliver exceptional performance, and reinforce user security safeguards. It is the first blockchain to achieve sub-second end-to-end (E2E) latency, setting a new standard in blockchain performance.

As of September 2024, Aptos Labs facilitated the launch of key tokenized financial products, including Brevan Howard's Master Fund, Hamilton Lane's Senior Credit Opportunities Fund, BlackRock's ICS Money Market Fund, and Franklin Templeton's Onchain Money Market Fund. Additionally, Aptos Labs is the only public blockchain company participating in the Hong Kong Monetary Authority's (HKMA) Project e-HKD+, a collaboration with BCG and Hang Seng Bank, focused on exploring the commercial viability of settling tokenized funds against central bank digital currencies (CBDCs) and tokenized deposits on public-permissioned blockchains. Aptos Labs has also invested into various digital assets FinTech, including Securitize and RD Technologies. For more information, visit aptosascend.com.

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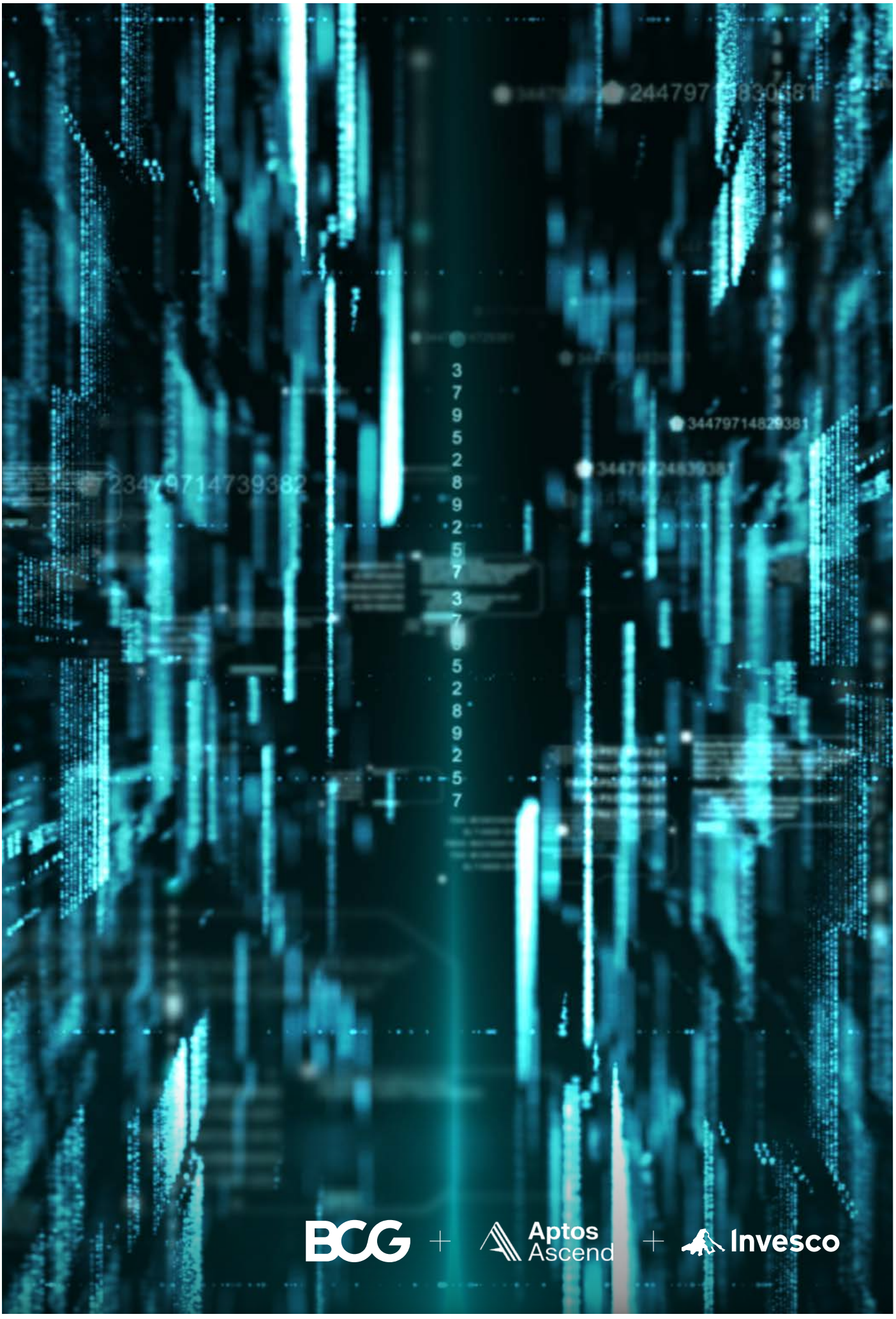
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