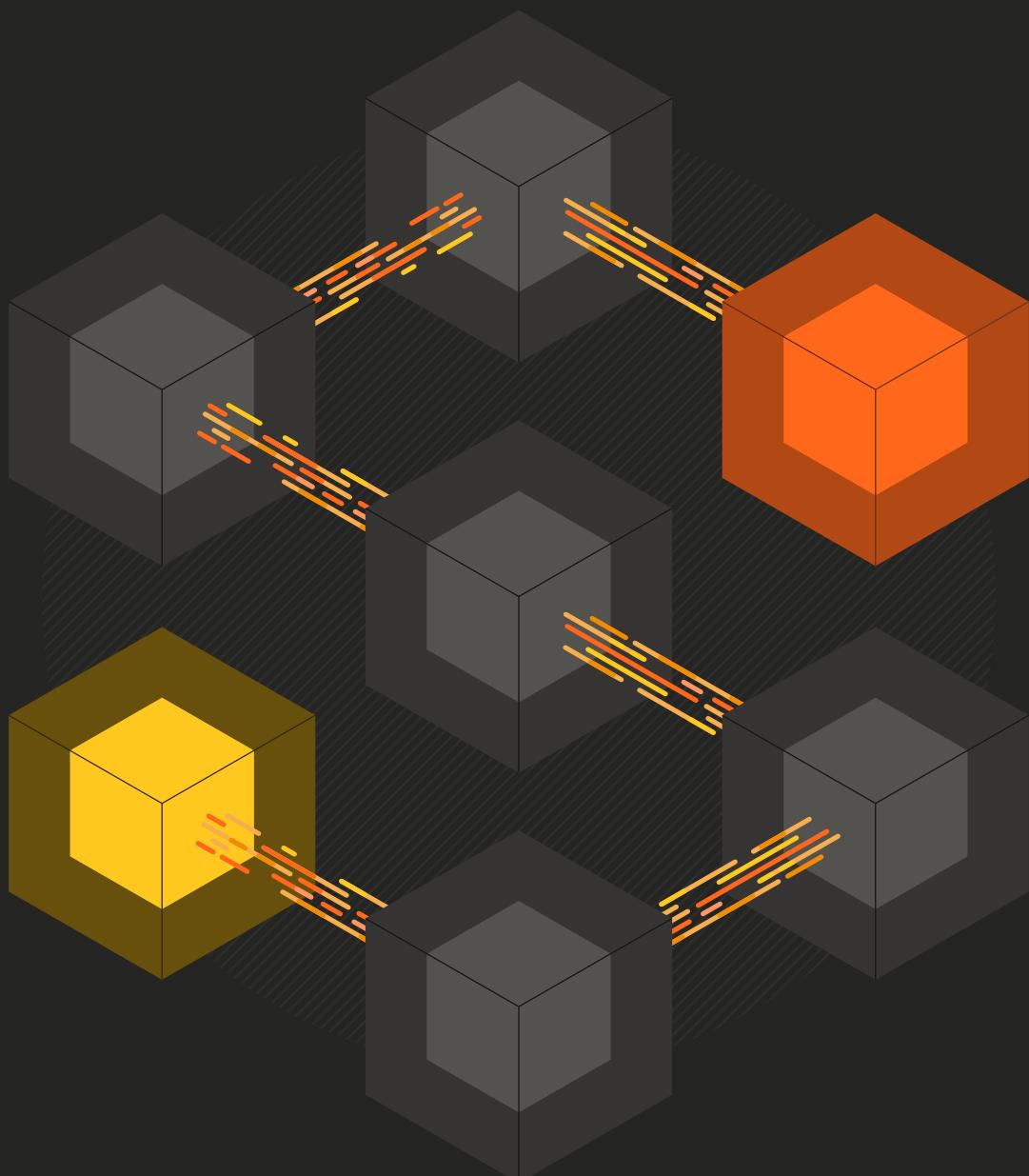




Asset Tokenization:

A comprehensive report and why you should start caring about the technology



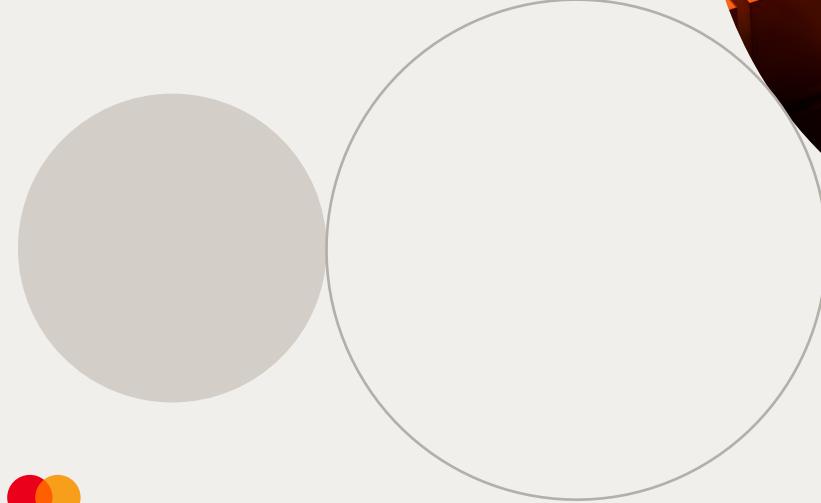
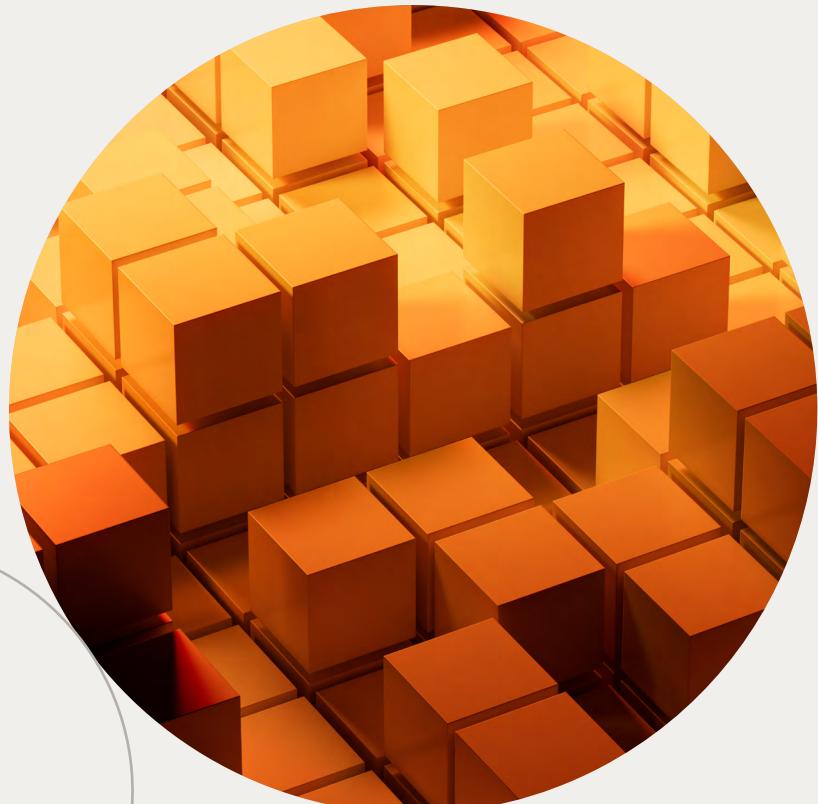
Abstract

Asset tokenization is gaining momentum in the financial sector, influenced by the global surge in interest in blockchain technology. This paradigm shift is reshaping how financial markets operate, introducing possibilities for enhanced efficiency and new products and services. Particularly in Latin America, with its unique market characteristics, the adoption of blockchain technology could provide significant solutions to existing financial challenges.

Through a comprehensive analysis drawing on academic literature, news and media publications, case studies, and insights from market experts, we present a nuanced understanding of the market's evolution. Asset tokenization emerges as a likely path for cost and operational efficiency, improved data management and interoperability, as well as new lines of business within the financial sector. Financial institutions may benefit by embracing this technology as a progressive force rather than resisting change.

While regulation remains under definition, it should not be perceived as a roadblock, because timing is critical in adopting such innovations and staying competitive. This paper reviews recent developments, explores relevant use cases, and offers perspectives on the future of the industry as asset tokenization gains traction.

Keywords: Asset tokenization, Blockchain, Financial Innovation, Latin America, Smart Contracts, Decentralized Finance (DeFi), Token Economy.



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What you'll find in this document

- A historical context to how asset tokenization came about.
- The advantages and roadblocks to adopting the technology.
- Key market examples of successful implementation.
- The effects this innovation could have on the future of finance.

Key takeaways

- There are business opportunities that financial institutions can take advantage of within the blockchain ecosystem before regulation is fully consolidated.

- Blockchain is not the same as crypto. The range of applications is wider, making blockchain a technology that can be more applicable to day-to-day business, with the intention to become "invisible" to the end user.
- Major financial institutions have begun exploring the technology for specific applications, and testing how they adapt to it, increasing the trust and confidence in it.
- There are several benefits to this technology that create a more efficient financial system, and Latin America more specifically could especially stand to benefit from it.
- The Latin American landscape presents an opportunity to close socio-economic gaps in the regional economy.

The authors

Ava Labs

Ava Labs makes it simple to deploy high-performance solutions for Web3, led by innovations on Avalanche. The company was founded by Cornell computer scientists, who partnered with Wall Street veterans and early Web3 leaders to execute a promising vision for redefining the way people build and use open, permissionless networks. Ava Labs is redefining the way people create value with Web3.

The Avalanche blockchain is an open-source platform that facilitates building decentralized applications in an interoperable, decentralized, and highly scalable ecosystem. Functioning as an eco-friendly smart contract platform and distinguished by a potent consensus mechanism, Avalanche is the pioneering ecosystem designed to meet the demands of global finance, maintaining near-instantaneous transaction finality.

Mastercard

Mastercard leads the charge in revolutionizing the landscape of digital assets and commerce. Through the fusion of state-of-the-art technology and our extensive payment facilitation expertise, we deliver a comprehensive suite of services. These services act as a crucial link between traditional finance and the dynamic realm of digital assets, unlocking fresh possibilities for both digital-native enterprises and traditional financial institutions.

The excitement for the future of blockchain technology and digital assets is palpable. Beyond mere financial speculation, Mastercard envision these assets creating tangible improvements in e-commerce, trade finance, and cross-border transactions. Blockchain technologies, promising 24/7 availability, rapid cross-border movements, and the programmability of money through smart contracts, have the potential to outshine traditional payment channels.

Mastercard stands ready as a reliable facilitator, dedicated to establishing a secure ecosystem for businesses and consumers to engage in transactions using digital assets. With a legacy exceeding 50 years, we have served as the linchpin, safeguarding and resolving disputes between tens of thousands of financial institutions and their customers. Our commitment to ensuring the safety, simplicity, intelligence, and accessibility of card-based payments remains steadfast for the benefit of our 3 billion cardholders. In recent times, our horizons have expanded to encompass bank account payments, fueling domestic interbank networks on a global scale.



Introduction

In recent years, the financial sector has increasingly explored applications of blockchain. As this technology becomes incorporated into the financial services landscape, financial institutions find themselves at a decision point. Seizing emerging business opportunities within the blockchain ecosystem is a relevant path to consider, even within existing regulatory frameworks.

It is key to distinguish blockchain from its widely recognized cryptocurrency counterpart. Blockchain is not confined to a singular application. Instead, it is a technology with far-reaching implications for day-to-day business operations with the potential to reshape the back-end of the financial industry, attempting to address some of its challenges.

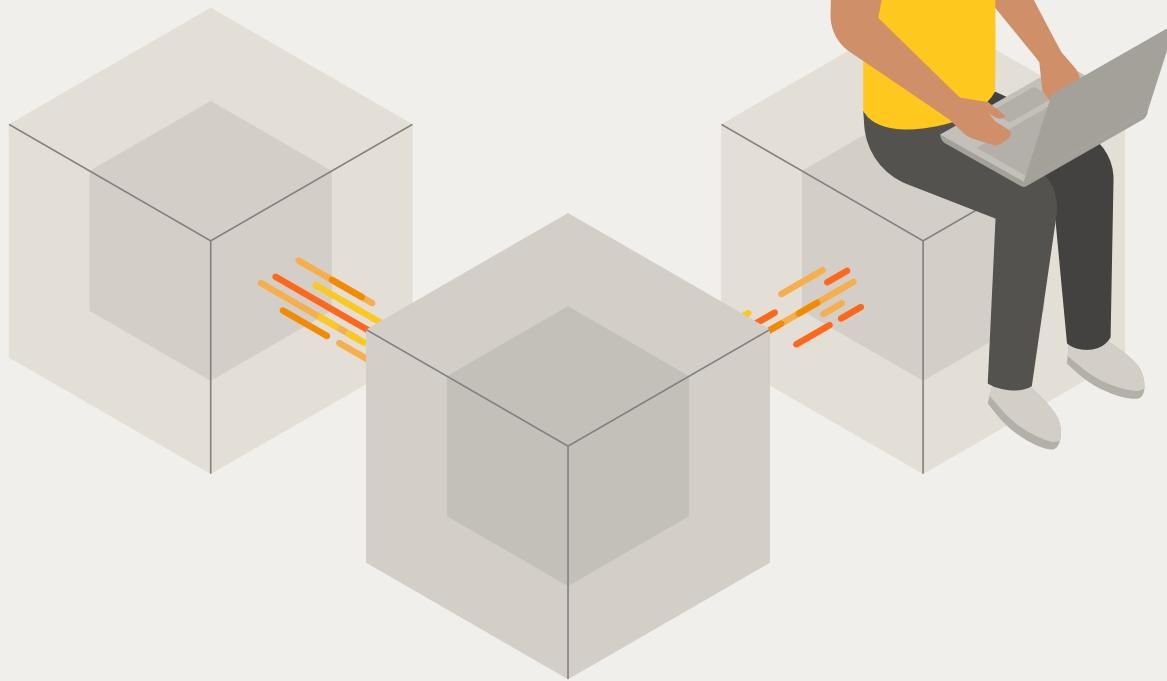
Major financial services institutions have started exploring applications of blockchain technology. Through targeted business cases and rigorous testing, these institutions are not only gauging blockchain's applicability but also contributing to the cultivation of trust and confidence in this technology.

The advantages associated with blockchain technology propose a new level of efficiency within the financial system that could contribute to the velocity of money and a consequential economic growth. Latin America and the

Caribbean, a region with unique socio-economic landscape, is ripe for the integration of blockchain because of its potential to optimize financial processes and ultimately address socio-economic gaps in the region.

While there is a wide range of use cases involving asset tokenization, this paper will focus on financial instruments. We have dedicated a section to address how asset tokenization can apply to the Latin American and Caribbean region in light of the particularities in its financial system.

This paper explores the nuances of blockchain technology, the specific application of asset tokenization, and its implications for financial instruments. It also explores business opportunities, technological potential, and socio-economic impacts. By exploring key findings and leveraging insights from the intersection of technology and finance, we seek to illuminate the path forward for financial institutions in Latin America and beyond.



Historical and theoretical context

To understand asset tokenization, it is important to delve into the history of blockchain and the technological developments that enabled tokenization in the first place. While modern blockchains are capable of supporting complex applications, the first blockchain, Bitcoin, was and is extremely basic in its capabilities. The Bitcoin blockchain secures a single asset (Bitcoin) and allows for a very small amount of data to flow through the network, which makes it highly secure and decentralized but not very scalable. Ultimately, all blockchains face a tradeoff between three key characteristics: decentralization, security, and scalability. The Bitcoin blockchain, created in 2009, is a simple ledger that utilizes proof-of-work architecture, optimizing for security and decentralization, but at the cost of scalability. Then, Ethereum (ETH) changed this equation by making different tradeoffs and designing a new blockchain architecture, enabling novel applications of the technology.

Launched in 2015, Ethereum unlocked massive new capabilities and utility with the advent of smart contracts, which are pieces of code on the blockchain that self-execute rules-based workflows and actions. This enabled developers to create a theoretically unlimited number of new tokens representing a whole host of digital assets, as well as decentralized applications or "dApps" that users could interact with. From 2015 to 2020, several dApps were developed, enabling digital assets to be traded, borrowed against, and lent out, paving the way for what is now known as Decentralized Finance, or

"DeFi." A number of applications, such as Uniswap, Aave, and Maker, built the foundation for this functioning on-chain DeFi ecosystem without the need for third-party intermediaries. While Bitcoin established a single-token, single-chain architecture, Ethereum pioneered a multi-token, single-chain architecture. As we now look ahead to where blockchain technology is heading, new solutions have established multi-token, multi-chain architectures that are primed to enable asset tokenization at scale.

Blockchains can be used to secure any type of information, whether that be supply chain history, health care data, or even personal identity. Blockchains can also be used to transfer and settle all types of digital assets immediately – not just cryptocurrencies, but also tokenized assets such as money (e.g., stablecoins, CBDCs, tokenized deposits, etc.), and financial or hard assets (e.g., real estate, commodities, money market funds, etc.). Ultimately, blockchains provide a uniform language and settlement rails for all parties who traditionally operate individually within their own systems that don't "talk" to each other. The key difference between "digitized assets" on a blockchain and crypto-native assets such as Bitcoin or Ether is that they can be created and maintained regardless of a blockchain, and tokenized assets are the subset of digitized assets that use Distributed Ledger Technology (DLT) databases.



Tokenization

Tokenization is the process of converting the ownership records of an asset into a digital token on a blockchain-based ledger. This on-chain representation allows for the assets to be transferred quickly and efficiently—more so than the assets themselves. John Wu, President of Ava Labs, describes it as a process that "creates a faster, more efficient way for companies to issue assets, individuals to own them, and everyone to transfer value." Tokenization not only enhances transaction speed and efficiency but also introduces advanced functionalities such as automated smart contracts, programmability, composability, and seamless integration with DeFi applications. Furthermore, tokenization has the potential to transform the asset value chain, empowering financial institutions to redefine roles and responsibilities while offering innovative, value-added services in a modernized financial landscape.

While the term "Real World Asset" or "RWA" is commonly used to describe assets before they are brought on-chain, we will use "Off-chain assets" as it is a more all-encompassing term. Off-chain assets (OCAs) are simple any asset - whether that be financial such as a stock or bond, or physical such as gold, real estate, or even a luxury watch - that exist outside of the blockchain. When we describe "tokenization", we are describing the process of recording ownership on the blockchain, either via a digital "twin" or direct/native issuance.

To demonstrate how the process of tokenization differs from the traditional method, we will illustrate the steps and parties involved in a bond issuance for each method.

Benefits of tokenization

For a better understanding of this section, let's consider the following as the relevant actors in the ecosystem:



Issuer: the entity issuing the asset, such as a government or bank who wants to raise capital via a bond issuance.



Underwriter: broker/dealer or investment bank (IB) that handles funds on behalf of the issuer and helps to set prices and gauge market interest.



Tokenization service provider: a provider or issuer dedicated to tokenizing the assets. If the broker/dealer has the capabilities, this part can be played by it.



Investors: the individuals and entities that ultimately purchase the tokenized asset.



Exchanges: the venues where the tokenized assets are traded.



Platform provider: the underlying blockchain that the assets are tokenized onto.



Regulatory body: regulator appointed by the government to establish national standards to asset issuance and ensure compliance with them.



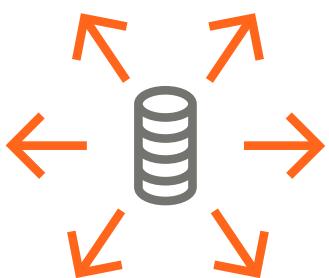
The traditional method of bonds and securities issuance involves massive resources and time from bankers, brokers, lawyers, and appraisers, as multiple checks and balances need to be made throughout each step. Using blockchain, all relevant parties have a cryptographically secure set of information that can be referenced and validated without the need for human verification. Issuers can easily check the status of their liabilities, and investors can verify their ownership and validate that the agreed upon rules are being followed. This transparency, combined with the programmatic nature of blockchain tokens, potentially reduces the chances of fraud, as all parties can view the distribution of assets, and tokens can be programmed to monitor that the assets behave according to the agreed upon terms. Although transparency can be beneficial to the relevant parties involved, the public nature of the blockchain can also result in privacy issues, creating a greater need for custom blockchain implementations where only approved parties can gain access to the network.

While regulators, especially in the US, have cracked down hard on crypto trading due to the associated risks, blockchain technology as a backend creates an opportunity to better operationalize traditional businesses. For example, tokenization enables businesses to optimize speed, transparency, and automated features through smart contracts

Tokenization can also potentially enable new product structures, including fractionalized ownership, real-time payment vehicles, and highly customizable portfolios. This creates a better investor experience while simultaneously offering an unlock to new revenue opportunities for asset managers and issuers. Another important step in the issuance process that is made easier with tokenization is price discovery because previously illiquid markets can become unlocked via tokenization as local markets are opened up to global investors. This not only has repercussions from a business perspective but also has wider implications for the economy as a whole and economic prosperity globally.

Ava Labs is firmly dedicated to the mission of "Digitizing All The World's Assets." This bold aspiration underscores Ava Labs' dedication to aiding others the process of transforming traditional finance through blockchain technology. For the avoidance of doubt, Ava Labs is a platform provider, not an issuer or exchange provider. Central to this effort is their development of interconnected, private or permissionless L1s, formerly known as Subnets. These L1s are highly scalable, customizable blockchains designed to operate through a dynamic subset of validators that independently reach consensus. Effectively serving as "Blockchain-as-a-Service," interconnected L1s represent a significant innovation in blockchain technology. Going beyond a financial pledge, AvaCloud, a team within Ava Labs, allows businesses to deploy their own customizable blockchain as a managed service, tailored to meet specific regulatory requirements across different jurisdictions. This strategic initiative not only enhances Ava Labs' technological offerings but also broadens the accessibility and application of blockchain technology in diverse markets.

With a focus on leveraging the power and customizability of interoperable L1s, Ava Labs aims to showcase the transformative value of tokenization across various sectors, including equity, fixed income, real estate, and commodities. And, in this sense, the Avalanche network "is primed to be the bedrock for this new system because of its customizable platform that is built to scale", as put by CEO, Emin Gün Sirer.



Applicability and advantages

Having examined the historical and theoretical underpinnings to contextualize the significance of the discussion and having gone through a detailed explanation of what the tokenization process is, our focus now shifts towards understanding the potential impact this technology might have in our contemporary world. In other words, we will assess how traditional financial institutions can harness the power of tokenization and review some key advantages associated with this technology.

We will explore key practical applications of tokenization, together with key advantages that derive from it – both in theory and backed by empirical evidence. Ultimately, we aim to offer insights into the transformative potential tokenization has for the financial services industry and broader economy writ large.

Institutional applications

Until now, DeFi has primarily entailed trading of cryptocurrencies and other types of crypto-native assets, resulting in a relatively self-contained on-chain economy and ecosystem. In recent years financial institutions have increasingly focused on asset tokenization, as well as the possibilities stemming from on-chain composability, programmability, and atomic value transfer and settlement. As a future possibility, assets such as private credit, real estate, bonds, and stocks could be brought on-chain and establish that assets from traditional institutions can be used in DeFi applications, enabling users to easily swap, transfer, and borrow against these off-chain assets.

Institutions are not only recognizing blockchain's potential for operational efficiency gains, but also identifying opportunities for cost and risk reduction as well as new revenue streams. For example, while it usually takes 1-3 days for a merchant's bank account to get credited after a transaction is processed, this transfer can happen in under a second on some blockchains.

Blockchains can also help simplify custody and settlement processes. For instance, when an asset manager purchases an FX option contract from a bank, they post a large sum of capital in the initial margin to account for the premium settlement window. In addition, throughout the life of the trade, both the asset manager and bank post variation margin based on the option's mark-to-market to account for counterparty default risk throughout the life of the trade. Blockchains enable the possibility of atomic delivery vs payment (DvP) with tokenized

assets and payments leveraging common settlement rails, potentially eliminating premium settlement risk and the need for upfront margin. Meanwhile, smart contracts can automate and enforce the terms of the trade, reducing the need to rely on intermediaries. In the above example, this means that the variation margin can be tracked and auto-swapped based on certain pre-programmed mark-to-market triggers or thresholds. This enhanced visibility and automation can contribute to a more secure and reliable collateral management system tailored to the characteristics of each market. To emphasize this, global investment manager VanEck highlights blockchain adoption as a means of streamlining these intricate processes, potentially resulting in reduced costs for institutions and consumers.

If we consider the "velocity of money" to be the movement of money in an economy or the amount of times the average dollar changes hands over a single year, this leap in the effective velocity of money is an illustration of the wider impact blockchain technology can have on the global economy. Economic growth is highly correlated with the velocity of money as it allows businesses and individuals to get paid faster, reduces the friction of economic transfer, and enables new companies and enterprises to be funded faster. By decreasing the amount of time it takes to settle financial transactions and removing middlemen, tokenization can increase the velocity of money through these channels, thereby potentially accelerating economic growth.



The power of tokenization

The power of tokenization extends to a radical revamp of traditional investment and ownership frameworks; it emerges as an opportunity to overcome barriers in asset liquidity and traditional fractionalization. Asset tokenization has the power to effectively lower barriers to entry into capital markets, offering an opportunity for individuals who remain unbanked – a significant demographic particularly prevalent in developing regions such as Latin America.

Moreover, in the evolving landscape of securities market, traditional methods of order execution are yielding to automated systems and alternative trading platforms. With the rise of blockchain networks and tokens, companies can now be funded through cryptocurrencies, enabling the development of smart contracts that allow for asset tokenization. This shift allows for universal access to different types of assets to participate and invest in starting projects.

Automated market makers (AMMs) have the potential to enhance the way tokenized assets are traded, facilitating continuous trading without the need for a traditional market maker or other intermediary, thanks to third-party liquidity provision for asset pools.

This not only broadens market accessibility but also unleashes new revenue opportunities. For instance, the Project Mariana report introduces an AMM model where central banks provide liquidity in various currency CBDCs to enable FX trades to be priced and executed automatically and settled immediately.

To summarize, there are three main reasons that explain why institutions are starting to explore tokenization:

- To increase **transaction and settlement speed**;
- To enable **fractional ownership**, which broadens access to investment markets, and promotes financial inclusion, and eventually greater asset liquidity; and
- To **reduce various types of risks** associated with historically siloed systems and manual processes.



Customization for institutional use

As financial institutions start integrating with blockchains, they will need to ensure they continue managing compliance, data, legal, and other relevant risks. Enterprise grade systems and applications facilitating time sensitive, high value transactions will require blockchain infrastructure that is scalable, secure, and reliable.

While the Ethereum Virtual Machine (EVM) has so far emerged as the adopted standard among institutional tokenization initiatives, most of the development so far has occurred on private, permissioned enterprise blockchains that are inherently siloed off from each other as well as from permissionless blockchains writ large. These enterprise chains have given comfort to institutions around customizing and controlling their end-to-end blockchain solutions, but at the same time, miss out on the broader DeFi and developer innovation, native integrations, composability, etc., that come with the permissionless blockchain realm.

With the advent of Avalanche L1s – distinguished under the name “Evergreen” – we believe institutions have been able to benefit from the best of both worlds. These blockchains allow institutions to customize an array of features, including user, smart contract deployer, validator permission, gas payment methods, and functionality, as well as transaction throughput and block time. Although blockchains such as Ethereum offer a highly decentralized network and an open-source platform where transactions require payments of considerably high gas fees. These attributes may not align with the preferences of large institutions and regulators.

Institutions might prioritize things like transaction and settlement speed, data throughput, and transaction privacy – all of which can be enabled by custom enterprise blockchains, such as Evergreen L1s. At the same time, other Avalanche L1s can be made to be fully public and permissionless and everything in between. They also offer native interoperability among them without the reliance on third party bridges and additional trust assumptions. This, in turn, allows builders to leverage native assets and integrations, users and liquidity, and broader ecosystem innovation.

Another benefit of Avalanche’s L1 architecture is gas token customizability, enabling flexibility for financial institutions, stabilizing costs, and facilitating more accurate gas cost projections. Paying fees in a stablecoin or tokenized deposit like USDC instead of a volatile crypto asset such as ETH will potentially enable institutional users to store a large quantity of gas costs upfront without dealing with the currency and regulatory risk of holding an asset such as ETH. This gas fee isolation also means that congestion on one chain will not impact another. A large spike in transactions that drives up fees on Ethereum Layer 1 inherently increases the fees on all Layer 2 (L2) networks, as L2s ultimately settle to ETH mainnet and pay these higher, volatile fees. On the other hand, a surge in transactions that drives up fees on any given Avalanche L1, including the primary network, has no impact on others, whereas failure on Ethereum mainnet would result in the failure of all Layer 2 networks built on top of it.

In addition, another key benefit of permissioned Avalanche L1s is the network level privacy that comes with a known validator set and security controls that can be built into them. In contrast, permissionless blockchains are accessible by all, enabling anyone to view the transaction history of participants on the chain, meaning potentially sensitive transactions can be viewed by anyone. Financial institutions, therefore, may prefer transacting on private, permissioned blockchains so the details of their transactions can remain private and secure. While this solves the transparency issue, it is an expensive initiative as it requires developing all the elements of network consensus from scratch, including hardware requirements and consensus algorithms.

One key way to distinguish between permissioned (private) and permissionless (public) blockchains is to evaluate their network interconnectivity. Permissioned blockchains operate exclusively on a single private network, which means transactions are validated without data touching any public network. This allows for the network to operate under less strict security assumptions, as malicious actors are unable to access the network.



Application to financial institutions

Even though applications extend beyond financial assets, there has been an increasing inclination among financial institutions towards the trend of asset tokenization—transferring OCAs onto blockchains. The technological challenges to implementing OCAs tokenization may be brand new, but the problems it tries to solve are well known by the financial industry and are common to physical and virtual assets.

In this context, we will explore the aforementioned concepts by presenting illustrative use cases contributed by financial institutions. It is pertinent to underscore that the examples presented here are not exhaustive but serve as illustrations of the broader environment.

Digitizing the financial system

Financial institutions, including banks, are increasingly recognizing the transformative potential of asset tokenization. Raj Dhamodharan, Executive Vice-President of Blockchain and Digital Currencies at Mastercard, highlights Mastercard's commitment to and involvement with helping develop blockchain technology in the financial system: "Setting up and scaling trusted ecosystems to enable commerce is not new to Mastercard. We've done this for years in payments. We look forward to bringing decades of experience to this space to enhance trust and work with the broader industry and governments to enable further innovation."

Rather than merely keeping up to date with developments, Financial Institutions ("FIs") should take a proactive role in asset tokenization. As trusted custodians for various assets, extending these capabilities to tokenized assets can be a natural extension of their existing role. By enabling native on-chain issuance as well as custodial services and other end-to-end administrative

and distribution capabilities, banks can position themselves as key players in the evolving landscape.

While the regulatory environment remains uncertain and fragmented, FIs should pursue digital asset strategies that include upskilling their organizations, understanding operational pain points in their business models and their go-forward strategic imperatives, which they can then use to assess whether and how blockchain and tokenization can help to address and drive them forward.

Waiting for the digital asset industry to mature is not a viable strategy, especially given the disintermediation potential of this collective technology. A certain level of flexibility and proactiveness is fundamental as FIs seek to hold on the profit margins and continue meeting clients' evolving needs and expectations.



Use cases

Exploring the dynamic landscape of blockchain technology and asset tokenization reveals multiple initiatives embraced by well-known financial institutions worldwide. Across the globe, major players are not only adapting but actively pioneering innovation, suggesting a greater transition towards asset tokenization. In this exploration, we will delve into a few developments led by well-known institutions, including JP Morgan Chase, Apollo, BlackRock, Citi, Hamilton Lane, and KKR.

Industry-effort collaboration and strategic alliances

The Monetary Authority of Singapore (MAS) stands out as a pioneer among regulatory bodies in supporting the potential of tokenization and fostering responsible digital asset innovation. In 2022, MAS initiated Project Guardian, a collaborative effort involving policymakers and financial institutions to evaluate the feasibility of asset tokenization and DeFi applications. Over the past couple of years, several global buy- and sell-side institutions have executed asset tokenization initiatives and developed foundational capabilities to scale tokenized markets under this Project Guardian umbrella.

Traditional financial institutions

Kinexys, a program founded by the JP Morgan organization has been at the forefront of this transformative journey. Before the launch of Project Guardian, the bank launched its Liink platform in 2017, which facilitated blockchain-based money transfers between banks. Since then, Kinexys further extended its strategy to include a blockchain-based collateral settlement system, which settled transactions in its tokenized deposit, JPM Coin. It also launched an application called the Tokenized Collateral Network (TCN), which allowed BlackRock to post tokenized money market fund shares as collateral with Barclays for an OTC trade. Most recently, it co-led an initiative with Apollo Global under Project Guardian to demonstrate how tokenizing alternative assets alongside liquid assets and payment means could enable the inclusion of alts in discretionary client portfolios at scale.

Additionally, financial services firm Citi has also embraced blockchain technology and asset tokenization. Under Project Guardian, it showcased a Request for Streaming (RFS) quote application leveraging a combination of Avalanche L1s. The application demonstrated the capabilities of bilateral FX-quote and trade execution between multiple dealers and clients. All pricing quotes and trades were recorded on-chain, which further ensured robust, auditable, and accurate post-trade analytics and reporting.

Also this year, Citi introduced Citi Token Services, a blockchain-based cash management and trade finance solution for

institutional clients. Simply put, the bank developed a platform that transforms client's deposits into digital tokens on a private permissioned blockchain exclusively owned and managed by Citi, to facilitate cross-border payments and boost liquidity. Clients can access these services without the need to host a blockchain node. The primary aim behind this initiative is to reduce the processing time of large transactions and streamline the overall transaction process. According to Citi's Global Head of Services, "the development of Citi Token Services is part of [our] journey to deliver real-time, always-on, next-generation transaction banking services to [our] institutional clients."

Investment banks and asset managers

Historically, investments in private markets have been inaccessible to the broader population due to administrative complexities, prohibitively high investment minimums, asset illiquidity, and manual onboarding and subscription/redemption processes. Tokenization can leverage blockchain technology to help address these challenges through alternative trading systems and digital transfer agents.

Individual investors, especially the growing mass affluent population in the US and abroad, have become one of the target audiences for private markets as investment banks and asset managers search for new distribution markets. The focus on tokenized alternatives among FIs highlights the convergence of important trends:

- Returns on private market investments tend to be more attractive in comparison to those in public markets.
- Private markets offer another source of asset diversification and tend to be less volatile than public markets.
- Diversification of distribution and individual investors' interest in diversification.

Asset management firms such as Hamilton Lane and KKR have also actively explored opportunities in the blockchain and asset tokenization space. Collaborating with Securitize, a digital assets securities firm, both firms have tokenized parts of their traditional funds. This strategic move reflects the companies' belief that blockchain and asset tokenization present an opportunity to democratize access to private market investments and enhance the overall user experience for individual investors.

As we navigate through these groundbreaking initiatives, it is crucial to emphasize that several FIs have dedicated significant time and effort during the past decade to advance in this domain. The business and technical developments during this period are starting to be leveraged, as the knowledge accumulated over the past decade is starting to be actively implemented.



Impacts to the financial industry

With the emergence of sophisticated partners in the field, there are now valuable collaborations available to enhance and streamline this process. In essence, this highlights a pivotal moment for FI's to strategically capitalize on their accumulated expertise and engage with strategic partners to optimize their approach to asset tokenization.

A series of benefits are being continuously explored in the asset tokenization space. From operational to strategic benefits, this section focuses on examining what FI's can potentially gain in each aspect of their businesses. We encourage institutions that would like to venture into the tokenization universe to research and understand the implications and ramifications that may impact existing revenue streams on a case-by-case basis.

Cost savings

By digitizing and automating key asset issuance, management, and monitoring processes, FIs can save costs throughout the asset lifecycle. Native on-chain asset issuance and administration has the potential to lower the cost of capital for borrowers and reduce administrative headcount and third party service providers; more resources can instead be allocated toward client-specific services and outcomes instead of administrative and legal processes. At scale, tokenization could result in billions of dollars of savings across a wide range of finance-based verticals.

New financial products

The universe of potentially tokenizable assets is immense. In addition to traditional securities, new types of products can emerge as investable asset classes – e.g., royalty rights or even streaming contracts. As an example, music artists including Justin Bieber (2023) and Rihanna (2023) have issued Non Fungible Tokens (“NFTs”) that provide the holder with a small percentage of the royalties earned on a song, and a number of projects exist that help smaller content creators monetize their intellectual property. Additional future-looking concepts are explored in the last section of this paper.

Additional utility

Tokenization and blockchain-based systems should also be able to bring a level of utility and productivity to assets that is impossible or infeasible in the traditional system. For example, in addition to enabling investors to access certain types of investments more easily, being able to pledge them as collateral to borrow against can be a powerful and compelling reason for them to invest in the tokenized version of an asset.

Via the blockchain, asset issuers can also more easily track the number of owners, flow of funds, and trading activity of the securities they have issued. The lower cost of transactions also encourages greater liquidity and trading activity, helping assets find price equilibrium more quickly. Fundamentally, all markets are simply a collection of buyers and sellers coming together, and with tokenization bringing new utility to assets alongside greater transparency and reduced transaction costs, buyers and sellers can easily find each other and transact, creating a more efficient financial system for all.

Greater participation in financial markets

Stock ownership, enabled by growing financial innovation, has historically generated incredible wealth for the average person. Pension funds, then mutual funds, then Exchange Traded Funds (ETFs), and finally direct trading apps like Robinhood have allowed the everyday investor to participate in the financial success of markets. The potential for less-liquid private equity, venture capital, real estate, etc., to generate wealth in the same manner is tremendous and can potentially be unlocked with asset tokenization.

On the blockchain, the collective savings in costs and operational burdens at scale make smaller deal sizes and lower investment minimums economically viable for asset issuers. To that end, private market investments can be increasingly accessed by a wider investor base.



Particularities to Latin America

Latin America boasts key characteristics that are distinct to the region. The adoption of innovative technologies in the financial system, such as real-time payments, buy now pay later, and digital assets is seen as a solution to some historical issues Latin American countries have faced. The propensity to innovate opens new possibilities and reshapes traditional paradigms, presenting a potentially outsized benefit for the Latin American financial sector.

First, most countries in the region are marked by a prevailing sense of skepticism towards the financial system. This skepticism has led to an unbanked population in some countries, as well as an appetite for innovation in others, fueled by a history of corrupt governance. This scenario presents both a challenge and an opportunity for current governments and private institutions.

The key dilemma revolves around re-establishing trust and transparency, historically hindered by systemic inefficiencies. Here, blockchain technology emerges as a transformative solution, allowing issuers to directly issue on the blockchain, facilitating transparent ownership tracking. Because these assets are issued directly without additional layers of verification needed by third parties, investors do not need to place their trust in auditors or other groups that may provide inaccurate or biased information. This reduces the potential for fraud and corruption and ultimately offers a pathway to rebuild confidence in the financial ecosystem. The technology's intrinsic features, including real-time ledgers and verifiable records of ownership pave the way for a more trustworthy financial landscape.

Expected impact in the region

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Latin America and the Caribbean is among the top regions for digital assets adoption and remittances leveraging digital assets as means of value exchange.

Walter Pimenta

Executive vice president, Product and Engineering, Latin America and the Caribbean

He continued by saying that specific Mastercard solutions, such as Mastercard Crypto Credential, could help to address key challenges that have traditionally hindered mainstream usage of these types of use cases, driving more industry players to join this space in a meaningful way. This could be through defining standards for players, crypto native or otherwise, to scale the ecosystem and enhance trust.

Taking this concept a step further, asset tokenization provides a streamlined approach to transferring ownership of non-cash assets. Distributed Ledger Technology (DLT) is being experimented with in various parts of the financial services industry, as exemplified by the Central Bank of Brazil. The Drex platform, both

created and regulated by the entity, will use the technology to create a system that allows for the tokenization of financial assets such as stocks and bonds, and for settlement among FIs on this platform.

In Latin America more broadly, this has translated into the representation of real estate properties, for instance, as digital tokens on a blockchain. The seamless transferability of these tokenized assets opens avenues for simplified and efficient transactions, departing from the traditional complexities associated with property transfers. Importantly, this ease and simplification enables a more inclusive financial system as people can directly participate in these markets in a permissionless manner.

Key regional players such as Itaú, BTG and Santander have publicly noted the impact and relevance of blockchain capabilities. The coming of age of the new digital generation has also influenced how the financial services industry operates, as put by José Augusto Antunes Filho, Head of Digital Assets at Itaú: "Brazil's central bank has realized that there is a new investor, who is native to the digital market. There is a socio-generational change taking place, and banks need to be ready for it."



Another significant issue in the region pertains to financial inclusion challenges. Peru and Mexico, for instance, exhibit some of the lowest rates of banked populations, standing at 50% and 60%, respectively, as of 2022. Despite strides made through the emergence of digital money and novel payment methods in recent years, a significant effort is needed to overcome this divide. Moreover, both countries predominantly conduct transactions in cash, underscoring a substantial opportunity for blockchain technology and digital payments to play a pivotal role in bridging this gap.

Furthermore, the potential impact of blockchain technology extends beyond digital payments; it has the power to democratize finance in the region through more decentralized financial services. Envision the profound influence this could have in markets where a significant portion of the population lacks access to the banking system. In the end, this not only addresses financial inclusion challenges but also creates paths for broader participation in investment opportunities, changing the way the populations relate to global finance.

In addition, Latin America distinguishes itself through its adoption and development in the DeFi space, with developers from the region helping to build OpenZeppelin and MakerDAO. The integration of tokenized assets into the DeFi landscape has empowered users to borrow against a diverse array of assets, unlocking access to funds through decentralized lending platforms. Simultaneously, these tokenized assets create opportunities for others to earn additional yield by engaging in DeFi lending activities. If one were to question why this is the case, the response relates to matters of

economic uncertainty and the prevalent economic instability that many countries in the region, including Argentina, grapple with – a historical and persisting challenge, marked by soaring inflation rates that affect purchasing power. This economic landscape prompts individuals to seek alternative methods of protecting their savings, contributing to the growing use of stablecoins and cryptocurrencies.

These developments underscore Latin America's dynamic approach to financial innovation, embracing blockchain to address historical challenges and capitalize on new opportunities and shining a light on the potential of asset tokenization. With countries such as Brazil, Argentina and Mexico among the top 20 in highest crypto adoption, it would be expected that many Latin American regulatory bodies would adapt to this new economy, however only Brazil has enabled conducive regulation as a consequence of CVM's (Comissão de Valores Mobiliários, the securities market authority in Brazil) efforts in understanding the appropriate mechanisms to deal with the technology.

The region's financial landscape is evolving in a way that prioritizes efficiency, inclusivity, and transparency. As Latin American entities, including trusted banks and issuers, continue to explore and implement these technologies, the region is carving a unique path in the global blockchain revolution. The combination of transparent ownership tracking, simplified asset transfer, and integration with DeFi could position Latin America at the forefront, although with a high dependency on governmental buy-in.



Widespread adoption

Although the technological and business benefits of tokenization are abundant, a number of hurdles that need to be overcome in order to scale tokenized assets to the mainstream. On the business side, regulatory, accessibility, and governance issues may hinder the adoption of tokenization by large players in the industry, while ease of implementation, custodial complexities, and interoperability are the main technological challenges.

Business

The financial markets are some of the most heavily regulated industries, and for good reason. Investors, financial institutions, and companies need to operate in a safe, fair, and standardized manner to maintain the proper facilitation of capital through the economy. With regard to asset tokenization and digital assets as a whole, there has yet to be a comprehensive regulatory framework for tokenizing entities to operate under. The novel abilities unlocked by blockchain have yet to be universally established, however, regulatory sandboxes in Singapore, United Arab Emirates, and the United Kingdom have begun to establish proper regulatory controls and enable the use of tokenization at large FIs. Clear definitions, consistent guidelines, and robust compliance mechanisms are essential to foster investor confidence and regulatory compliance.

Investor protections

Maintaining investor protections akin to the traditional financial system will be critical in scaling tokenization to trillions of dollars. Addressing concerns related to security, fraud prevention, and dispute resolution has enabled the traditional financial markets to prosper, and the same will need to be done in the tokenized world.

Accessibility and identity

Facilitating that all participants have fair access to the market, in alignment with international rules and local standards for seamless cross border transactions, remains critical. Fully KYC-compliant blockchain-based platforms will be required to monitor that illegal activity does not transpire through tokenized assets. This means establishing a link between the parties involved in an on-chain transaction and their off-chain identity.

Technology governance

To maintain the reliability and security of technology, standards governing system performance, data quality, and data privacy must be incorporated into blockchain systems. The application of established standards from traditional stock exchanges to the tokenized world will be essential to guarantee stability and performance in tokenized asset ecosystems.

Technical

In order for tokenization to become widely adopted, it not only needs to make sense from a direct business and economic perspective, but the right technological solutions need to be available in the market to facilitate adoption.

Ease of implementation

The technological burden of asset tokenization needs to be as low as possible so financial institutions can focus on what they do best and abstract away the technical components. Tokenization platforms play a pivotal role in alleviating the technological challenges associated with the tokenization process. By streamlining complex procedures and offering out-of-the-box solutions, these platforms will potentially make tokenization more accessible to a broader range of stakeholders.

Furthermore, the up-front costs of developing a blockchain in-house need to be reduced over time, the same way AWS achieved this for web hosting. The inability to reverse transactions may pose potential risks for traditional financial institutions in the event of a hack or technical malfunction of automated systems. Regulators and operators might require the ability to amend instances where fraud or malfunction has occurred, and to establish "circuit breakers" during times of heightened stress or volatility.

Interoperability

The promise of blockchain technology lies in its ability to create a seamless and efficient ecosystem. Interoperability, therefore, is a key consideration to maintaining that liquidity is not fragmented across various blockchains, as this could undermine the efficiencies promised by blockchain technology, limiting its transformative impact on financial markets. Establishing standardized or cross-network protocols for interoperability will be needed so different blockchain networks can communicate effectively and liquidity can safely and efficiently move between chains without requiring that participants share a common network.



Custody

The issue of custody presents a unique set of challenges in the adoption of blockchain technology, particularly for the average investor. Self-custody, wherein individuals are responsible for safeguarding their cryptographic keys and assets, can be daunting and confusing. This complexity poses a barrier to entry for many potential participants in the DeFi ecosystem. To overcome this hurdle, the development of custodial solutions similar to traditional banking practices is crucial. This shift towards more user-friendly custody solutions will be instrumental in democratizing access to decentralized financial services and making blockchain-based assets more accessible to a global audience.

Paths to implementation

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The potential for digital currencies to change everyday payments is massive. As a leading technology player, Mastercard is helping to shape it, guide it and provide consumer protections and security

Walter Pimenta

Executive vice president, Product and Engineering, Latin America and the Caribbean

Issuers contemplating the tokenization of assets face a critical decision in determining the necessary technological framework. While it is conceivable for issuers, such as governments or banks, to construct their own tech capabilities for asset tokenization, the intricacies and challenges involved in working directly with blockchain require heavy lifting. Developing a robust blockchain infrastructure, maintaining regulatory compliance, and designing an intuitive interface for investors demand substantial time, expertise, and resources.

As a result, issuers may find that leveraging the services of platform providers is a better use of time and resources. These specialized entities offer turnkey solutions, providing out-of-the-box blockchain platforms. Opting for a platform provider not only expedites the tokenization process but also grants issuers access to established expertise, ongoing support, and the assurance of a technologically sound foundation. This strategic choice enables issuers to navigate the complexities of asset tokenization more efficiently, allowing them to concentrate on their core objectives.

Compliance-first platform

The establishment of a compliance-first platform will be critical advancing the adoption of tokenization in the long run. This would involve integrating a standardized set of rules to ensure universal and enforceable compliance, guided by clear regulatory controls. A compliance-first platform, such as the Multi-Token Network (MTN) proposed by Mastercard would address the need for a standardized and legally robust platform. Furthermore, there is a need for legal and regulatory frameworks that address edge cases specific to blockchain transactions that may not be adequately covered by existing laws. If these new frameworks can be implemented and built-in at the ground level, it will help instill confidence in market participants and help facilitate the onboarding of the traditional financial world on-chain.

Identity-based custody solutions

To bridge the familiarity gap and enhance security in blockchain transactions, identity-based custody solutions will need to emerge as a critical component for user onboarding. The blockchain-based experience will need to offer the same level of identity and fraud protection as traditional banking systems, assuring users that their assets are safe and secure. Furthermore, attaching human identity to platform access will relieve concerns around Know Your Customer (KYC) and Anti-Money Laundering (AML) for large institutions. This is an issue that Mastercard is helping to tackle through its Crypto Credential platform, which enables institutions and consumers to interact on the blockchain in a user-friendly and verifiable manner.



Interoperability

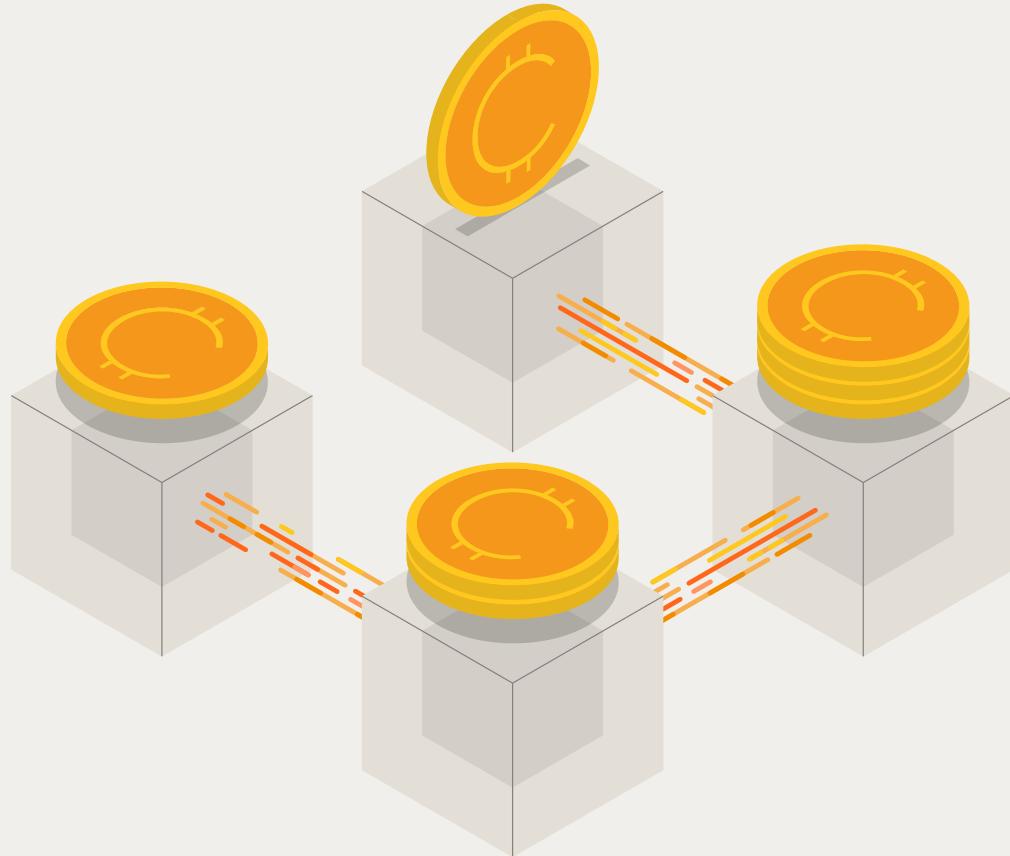
Currently, liquidity in DeFi is segmented across a number of Layer 1 and Layer 2 chains, necessitating the use of bridges to transfer value across blockchains. The mechanism used to do this traditionally involves locking a token (such as USDC) in a smart contract on one blockchain and then “minting” an equivalent token on another blockchain, simulating a transfer. This presents security problems as it locks up a significant amount of value inside these smart contracts, making them targets for hackers looking to steal the funds.

Solutions such as LayerZero provide an alternative approach by enabling applications to function across multiple chains simultaneously, but ultimately this does not solve the difficulty involved in connecting multiple blockchains that have their own complexities and technical differences together. For example, the Ethereum blockchain executes transactions in a fundamentally different way than Solana, and applications are written in Solidity on Ethereum and Rust on Solana. This means there is no native way to move assets between these blockchains or an application that is compatible with both. By contrast, all L1s in the Avalanche ecosystem are interoperable with one another, enabling the native transfer of assets and information across other chains within the ecosystem. Teleporter facilitates the execution of smart contracts across any chain in the Avalanche ecosystem. This enables cross-chain messaging in a similar fashion to LayerZero, using Avalanche Warp Messaging (AWM) to send messages natively across Avalanche L1s.

The Mastercard MTN also aims to link permissioned and permissionless blockchains with the traditional financial system in a fast and scalable manner. This integration would enable the flow of assets between blockchain networks and conventional financial institutions, reducing concerns of fragmented liquidity and growing the value of the network for all participants.

Ease of implementation

Simplifying the implementation of blockchain solutions is essential to encouraging wider adoption. Large institutions may leverage blockchain-in-a-box solutions such as AvaCloud, which provide comprehensive hosting, setup, and maintenance services for custom blockchain platforms. These solutions relieve financial institutions of the technical intricacies and allow them to focus on the core aspects of their business. This will not only lower the barrier to entry for asset tokenization but also enable institutions to save on technical costs without the upfront hassle or extensive technical know-how traditionally associated with developing a custom blockchain instance.



Future developments

While still in its early stages of development, there's been a resurgence in focus towards asset tokenization. Some of the speculation around what the future holds for asset tokenization has been published by reputable institutions such as Roland Berger, BCG, and Morgan Stanley, among others. With increasing interest from investors in alternative and digitally native investments and a global market size estimated in the trillions of dollars in the next few years, the adoption of this new technology and its coming iterations is expected to be driven by efficiency, simplicity, and cost reductions, and new products and services.

Bank of America's Global Research division has published a visionary and optimistic perspective, foreseeing the tokenization of traditional assets as a force that will "reshape

financial markets over the next 5 to 15 years," thus redefining the way assets are managed and traded in a short term. One of the ways FIs are expected to do this is through using the technology for back-end processes, where the blockchain becomes "invisible" to the end user, and the focus stands on the improved experience.

The following table illustrates what the market has observed regarding some of its main formats of financial assets: investment funds, equities, and bonds. The benefits from tokenization are evident and address pain points from institutions and consumers when it comes to issuing or interacting with these types of financial instruments.

| | Investment funds | Equities | Bonds |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Market Size | USD 155 tn | USD 123 tn | USD 314 tn |
| Examples of implementation | <ul style="list-style-type: none"> • Hamilton Lane • KKR | <ul style="list-style-type: none"> • Dinari Global | <ul style="list-style-type: none"> • Bradesco • Santander Brazil |
| Benefits over traditional methods | <ul style="list-style-type: none"> • Provide new options for individual investors who are looking to diversify their wallet. • Lower costs to process and manage investments. | <ul style="list-style-type: none"> • Simplified liquidity for small and medium enterprises. • Exposure to a new base of investors, expanding to individual investors. • Removal of intermediaries, resulting in faster and cheaper processes. | <ul style="list-style-type: none"> • Digitalization of the entire process. • Removal of intermediaries, resulting in faster and cheaper processes. |

Source: Roland Berger (adapted)



Ongoing implementations

The implementation of asset tokenization is gaining momentum as corporate players harness this technology for various purposes. In Latin America, major financial institutions are gearing up for the nationwide rollout of blockchain technology, as is the case for the digital Brazilian real, Drex. This initiative is accompanied by a blockchain platform designed to enhance the digital asset market in the region's largest economy. The move reflects a strategic effort by the central bank to embrace the efficiency and innovation offered by blockchain technology.

The appeal of instant settlement on the blockchain is a driving force behind some of these developments. Traditional clearing systems often entail a delay of several days, tying up billions and trillions of dollars for a significant period. The traditional clearing process takes 1-3 days, and that's trillions of dollars locked for days. The blockchain allows for that to be done almost instantly and in a more capital efficient manner.

Multinational corporations are also recognizing the potential benefits of tokenization, particularly in streamlining cross-border transactions. Ryan Rugg, the Global Head of Digital Assets for Citi's Treasury and Trade Solutions business, emphasized the inefficiency of maintaining cash buffers across various regions. The introduction of blockchain-based services enables immediate transactions regardless of time zone, addressing the challenge of managing funds across borders efficiently.

Projections for the future

Examining the broader impact of asset tokenization on the industry, various projections highlight the transformative potential of this technology. Morgan Stanley estimates that total assets under management could witness a substantial growth of \$3 trillion over the next three years as private market investing becomes more accessible to individual investors. This democratization of investment opportunities could reshape the financial landscape, fostering a more inclusive and diverse investment environment.

Applied to illiquid markets alone, tokenization has the potential to be a US\$16 trillion opportunity by 2030, according to BCG research released in 2022, greatly reducing the costs associated with asset issuance and transfer. As we look into the future, it is not hard to imagine a world where both permissioned and permissionless blockchains are used in daily transactions at both the consumer and enterprise level, enabling a more efficient and secure financial system.

Avalanche, among other blockchain platforms, is poised to play a pivotal role in the path towards digital transactions. The potential for platforms like these to become the preferred infrastructure for financial markets is echoed by industry experts. This shift could significantly impact the way FIs operate, representing a step forward in the efficiency and security of the financial system at a global scale.

In terms of global adoption, a vision shared by industry experts anticipates that blockchain will hit billions of users and trillions of dollars in value. The projected success hinges on achieving widespread adoption of blockchain technology, to the point where users unknowingly incorporate it into their daily transactions and activities. Key drivers include the issuance of central bank digital currencies (CBDCs) and the increasing tokenization of assets in gaming and blockchain-based payments on social media.

Projections from various sources indicate a significant growth in the tokenization space. Citi project that, by 2030, up to \$5 trillion of CBDCs could be circulating globally. Tokenization of financial and OCAs is identified as a potential breakthrough for blockchain to the mainstream market, reaching nearly \$4 trillion in value by 2030. This projection aligns with the sentiment that tokenization is on the cusp of realizing its immense potential.

Roland Berger's analysis supports an optimistic outlook, forecasting that asset tokenization will evolve into a market worth at least USD 10 trillion by 2030. This projection represents an increase of 40x in the value of tokenized assets from 2022 to 2030. Expectations are that real estate and financial assets dominate the tokenized market due to their significant size and numerous use cases.

If we expand the scope beyond financial assets, there is a growing interest in tokenizing non-financial assets. Loyalty reward points, for instance, are finding their way onto blockchains, showcasing the expanding scope of tokenization, along with identity solutions (e.g., Crypto CredentialsTM), fan tokens, membership passes, digital art, and many others. This diversification underscores the potential for blockchain technology to revolutionize various industries beyond traditional finance.

These projections collectively paint a picture of a future where asset tokenization becomes a driving force in reshaping the financial landscape, with the potential to unlock trillions of dollars in value across various sectors.



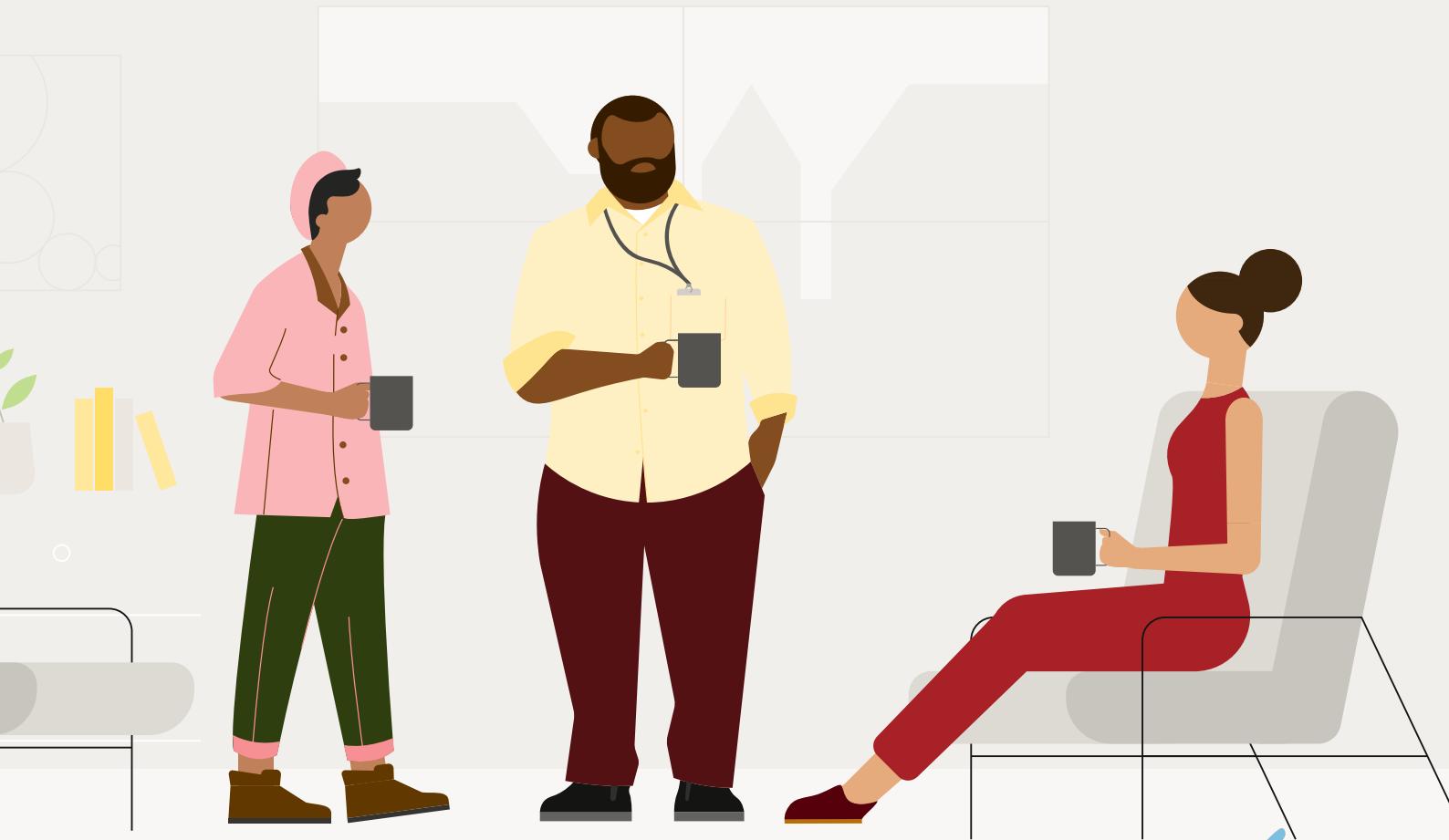
Conclusion

In conclusion, our exploration into the potential of blockchain technology in asset tokenization has presented a set of advantages linked to blockchain, such as an increased efficiency in financial transactions, cost reduction, and subsequent economic growth. By delving in on tokenization of financial instruments, which harbor the largest potential and are highly applicable in the existing digital financial system, our examination has illuminated the significant role that asset tokenization can play in reshaping the financial landscape.

Turning our attention to Latin America and the Caribbean, our dedicated section has provided a nuanced understanding of how asset tokenization can be applied in the region to address the specific pain points. Shaped by a unique socio-economic landscape with unbanked populations in some countries and a growing demand for financial innovation, the area presents challenges and opportunities.

Globally, large financial institutions test and implement blockchain technology. While the need for clearer regulatory definitions remains, experts point to a proactive approach from FIs in exploring its potential in accordance to current compliance and regulatory restrictions for other asset classes to remain competitive in a rapidly evolving market.

Looking ahead, financial institutions should continue exploring and researching blockchain and asset tokenization capabilities. In closing, this paper envisions a future where institutions, armed with a deep understanding of blockchain dynamics and regional specificities, can foster a more efficient, inclusive, and resilient financial landscape.



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Glossary

Financial:

- **Custody & Settlement Process:** The custody and settlement processes involve the safekeeping and transfer of financial assets. Custody refers to the holding of assets on behalf of clients, while settlement involves the completion of a financial transaction.
- **Clearance:** Clearance is the process of reconciling and finalizing transactions, ensuring that the terms of the trade are met, and the financial instruments are transferred between parties.
- **Securities:** Securities are financial instruments that represent ownership in a company or the right to receive future payments. Common types include stocks, bonds, and derivatives.
- **Bonds:** Bonds are debt securities that represent a loan made by an investor to a borrower, typically a government or corporation. The borrower agrees to pay interest and return the principal amount at a specified future date.
- **Wholesale Funding Markets:** Wholesale funding markets are financial markets where large institutions, such as banks and financial firms, obtain funding. These markets play a crucial role in providing capital for various financial activities.
- **Money Market Funds:** Money market funds are investment funds that invest in short-term, low-risk securities, such as Treasury bills and commercial paper. They aim to provide investors with a stable value and liquidity.
- **Liquidity Pools:** Liquidity pools are platforms or arrangements that facilitate the trading of financial assets by providing a pool of funds for immediate transactions. They enhance market liquidity and efficiency.

Basic terms:

- **DLT (Distributed Ledger Technology):** DLT is a broader term encompassing various forms of decentralized databases that are shared and synchronized across multiple locations or participants. Blockchain is a specific type of DLT.
- **Blockchain:** Blockchain is a decentralized and distributed digital ledger technology that records transactions across multiple computers in a secure and transparent manner. It forms the underlying technology for cryptocurrencies like Bitcoin.

- **Smart contract:** A fixed piece of code in the application layer of a blockchain that self-executes an agreement between parties when certain events happen, such as the initial creation of a token or its transfer to a new owner.
- **Decentralized application (Dapp):** An application that runs on the application layer of a blockchain.

Ava Labs and Avalanche

- **Ava Labs:** Ava Labs makes it simple to deploy high-performance solutions for Web3, led by innovations on Avalanche. The company was founded by Cornell computer scientists, who partnered with Wall Street veterans and early Web3 leaders to execute a promising vision for redefining the way people build and use open, permissionless networks. Ava Labs is redefining the way people create value with Web3.
- **Avalanche:** Avalanche is a smart contracts platform built to scale infinitely and finalize transactions in under a second. Its novel consensus protocol, interoperable L1 infrastructure, and HyperSDK toolkit enable businesses to easily launch powerful, custom blockchain solutions. Build anything you want, any way you want, on the eco-friendly blockchain designed for both Web3 devs and businesses.
- **AvaCloud:** AvaCloud is a managed blockchain service enabling teams to rapidly build, deploy, and scale decentralized networks—customized for any use case. In minutes, launch robust blockchain networks with 50k+ transactions per second, sub-second transaction finality, and net-zero carbon impact. The service features a no-code portal, automated infrastructure, network monitoring, and 24/7 customer support.
- **Evergreen:** Avalanche Evergreen L1s offer a suite of blockchain deployments and tooling designed to address company-specific and industry-wide considerations. Evergreen L1s maintain the benefits of public network development, including interoperability and composability, while enabling partic chain-level features only possible in enterprise blockchains.



Mastercard digital currencies and innovative payments practice

Mastercard Advisors features more than 3,000 consultants spanning 53 countries, bringing unparalleled expertise to the world's largest payments-focused consulting organization, a range of experience and expertise to our clients each day. Our Digital Currencies and Innovative Payments Practice (DC&IP), aimed to support our partners in developing strategies, growing their business, and staying competitive in an ever-changing environment. Our services cover everything from strategy definition to the execution of multiple initiatives.

- **Understand the landscape:** Identify opportunities, partners and use cases.
- **Strategy:** Share understanding of the market context and assess opportunity.
- **Design:** Design and refresh value proposition to target audience.
- **Launch:** Develop new solutions and get ready to deliver the value proposition to clients.
- **Optimize:** Define and monitor processes to ensure product adoption.

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