BANK OF AMERICA INSTITUTE

BANK OF AMERICA

Transformation

Beyond Crypto: Tokenization

20 July 2023

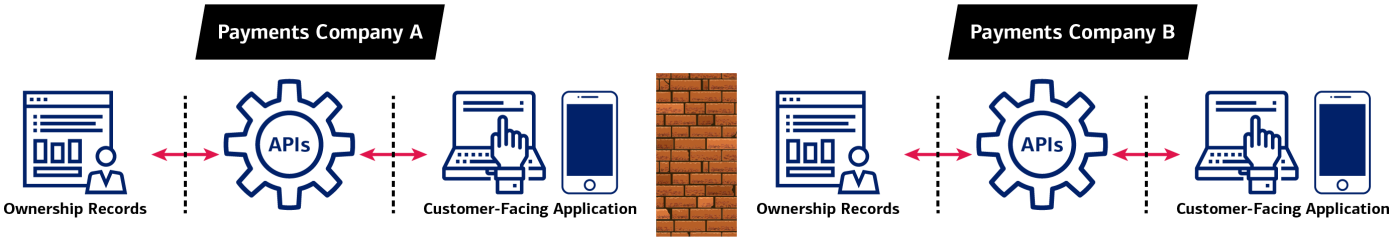
Key takeaways

- Today's financial systems continue to be built on centralized (company-owned) and fragmented infrastructure that requires third-party intermediaries. But distributed ledger technology (DLT) and blockchain technology (BCT) applications like tokenization can help facilitate the transformation of this legacy infrastructure.
- In fact, BofA Global Research expects the tokenization of traditional assets to reshape financial and non-financial infrastructure and public and private financial markets over the next 5 to 15 years. Corporates are leveraging this technology in ways such as reducing credit risk, optimizing supply chains and increasing data transparency.
- But challenges and risks remain. Regulatory and legal risks, in addition to lack of global coordination, may slow the adoption of tokenized assets.

Tokenization – an infrastructure evolution

Today's financial systems continue to be built on centralized (company-owned) and fragmented infrastructure that requires application programming interfaces (APIs) and third-party intermediaries. This limits efficiencies, interoperability, innovation, and functionality, as well as prevents the efficient allocation of capital (Exhibit 1). Though the digitization of financial assets began in 1971 when Nasdaq introduced infrastructure enabling the world's first electronic stock exchange, it wasn't until 2001 that US stock markets fully transitioned to decimalization of asset prices, which drove smaller order sizes and heightened liquidity.[i] And still today, 27% of settlement systems leverage legacy infrastructure that is over 20 years old.[ii]

Exhibit 1: Traditional financial infrastructure
Today's financial systems are built on centralized, fragmented and non-interoperable infrastructure



Source: BofA Global Research

Tokenization refers to the process of creating digital programmable representations of traditional financial and non-financial assets that can be exchanged and tracked on distributed ledgers or blockchains, as well as one of many distributed ledger technology (DLT) and blockchain technology (BCT) solutions. BofA Global Research expects the tokenization of traditional assets to transform financial and non-financial infrastructure and public and private financial markets over the next 5 to 15 years, whereas other disruptive innovations like radio, television and email took 30 years to reach mainstream adoption.

Tokenized traditional assets aren't "crypto"

Blockchains are a type of distributed ledger that remove the need for some intermediaries and allow open access to network data (public) and the network (permissionless). Memecoins receive outsized attention, but blockchains require "crypto" tokens to reward network participants for processing transactions and to secure the network by ensuring participants have "skin in the game." Blockchains record ownership of the 26k+ tokens that exist within the digital asset ecosystem, but BofA Global Research expects 99% of those in existence today to essentially disappear over the next 10 years.

In contrast, distributed ledgers provide customizable infrastructure that facilitates regulated financial institution (FI) and corporate use cases by restricting access to network data (private) and the network (permissioned). Distributed ledgers still remove the need for some intermediaries, but do not require "crypto" tokens to reward network participants, which may be a

consortium of financial institutions or corporates, for processing transactions or to secure the network because participants already have "skin in the game" – their reputations.

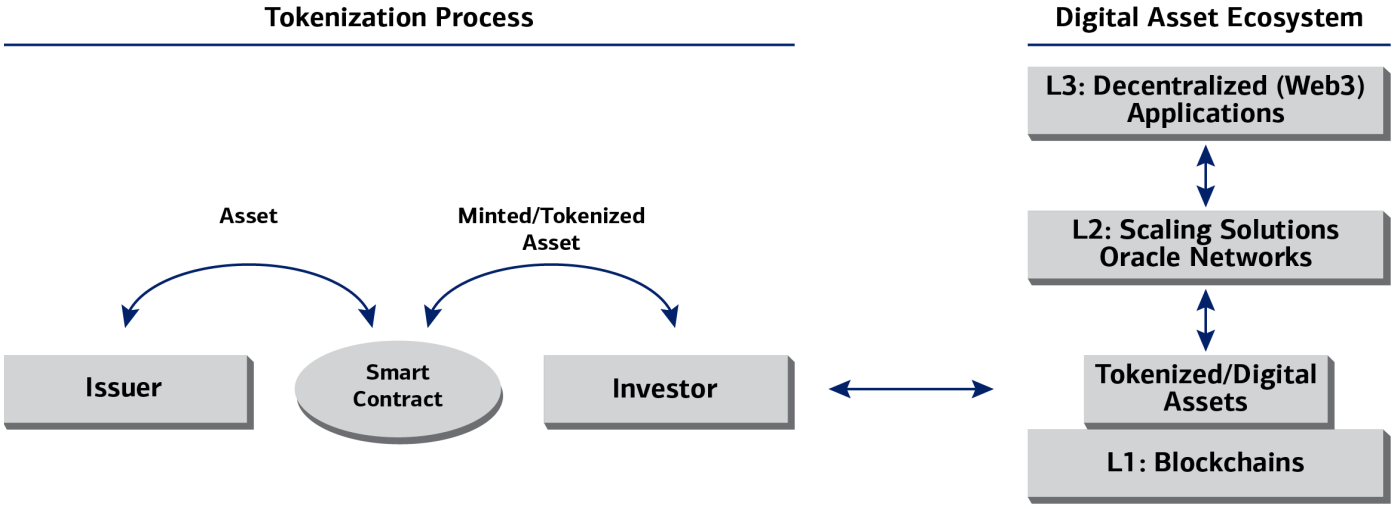
Welcome to the token economy

Despite last year's digital asset market correction, financial institution, central bank and corporate interest remained, and industry development accelerated for private permissioned distributed ledgers and blockchains. In contrast to public permissionless blockchains, private permissioned distributed ledgers and blockchain subnetworks integrate separate systems into one and enable the efficiencies provided by distributed (shared) ledgers, but with enhanced functionality and reduced regulatory and reputational risk. BofA Global Research expects DLT/BCT implementation to accelerate as the opportunity costs of uncaptured efficiencies and reduced costs increase.

In fact, BofA Global Research estimates tokenized assets to become so ubiquitous that "token portfolios" will simply be referred to as "portfolios." Why? Consumers might open an app to check the real-time market value of portfolio holdings, which include tokenized dollars, stocks, corporate bonds and interests in a private equity fund and commercial building that's located on a different continent. Within the same app, they may sell 47.62765% of their private equity interest at 5:15pm to 20 different buyers through a liquid secondary market with 24/7 real-time settlement.

Financial institutions are leveraging this technology to enable customizable settlement times, reduce credit risk, and increase liquidity for previously illiquid assets, to name a few. DLT/BCT may also facilitate increased retail accessibility to alternative assets, as well as the creation of improved financial assets and applications, some of which were not economically viable previously (Exhibit 2).

Exhibit 2: The tokenization process as it relates to the digital asset ecosystem
Tokenized assets and funds enable efficiencies that may drive digital asset adoption to accelerate



Source: BofA Global Research

Corporate DLT/BCT and tokenization use cases are potentially more diverse and expansive than financial institution use cases, according to BofA Global Research. In fact, over half of Fortune 100 companies have launched projects leveraging DLT/BCT since the beginning of 2020.[iii] Corporates across every industry are increasingly leveraging the same underlying technology as financial institutions to generate incremental revenues, lower costs by automating manual processes, optimize supply chains, broaden potential customer pools, increase customer loyalty, offset contributions to climate change, combat counterfeiting and appeal to Environmental, Social and Governance (ESG)-focused customers and investors. Many companies with the greatest risk of disruption, or that fear a loss of market share, are proactively exploring how to enter the digital asset ecosystem and leverage its many use cases.

Private sector expertise needed to implement DLT/BCT

Commercial, investment and central banks; institutional investors; corporates; and governments can't build new financial systems based on DLT/BCT alone and have indicated that they will leverage the private sector to drive digital asset innovation, build new financial and non-financial systems and integrate the underlying technology into their processes. BofA Global Research expects DLT/BCT and tokenization beneficiaries to include both traditional and digital asset companies, the majority of which are currently private. However, the largest and stickiest revenue opportunities are likely to exist for infrastructure providers that offer customizable distributed ledger platforms and blockchain subnetworks, mature and audited smart contracts, cybersecurity, digital asset custody/wallets, oracle networks, management systems and cloud storage.

Drivers of adoption

Operational efficiencies and lower costs

Corporates may incorporate DLT/BCT, smart contracts and tokenization to automate manual processes related to supply chain management and to decrease the time required to trace the provenance of goods. In the future, DLT/BCT may also enable the automation of corporate actions, such as coupon and dividend payments and voting, enabling reduced operational costs. Payments may be linked to the delivery or Global Positioning System (GPS) location of tokenized goods, restocking of inventory automatically using Internet of Things (IoT) devices and events that trigger insurance payouts. Indirect taxes like sales tax may be sent directly to governments at the point of sale.

DLT/BCT-powered infrastructure may also enable the creation of new and more efficient products and applications that were too expensive or impractical to create on today's financial systems.

Real-time settlement

Tokenization and smart contracts enable atomic (simultaneous) settlement for tokenized assets by automating much of the clearing and settlement process, including financial institutions' payment messages, which provide routing information and payer/payee identification, compliance with anti-money laundering (AML) and know your client (KYC) requirements and the crediting and debiting of customer accounts. BofA Global Research expects real-time settlement to drive lower credit risk; decreased financing, settlement and operational costs; capital allocation efficiencies and retail accessibility.

Decreasing time to settlement or enabling real-time settlement by transitioning to a real-time gross settlement (RTGS) process from a deferred net settlement (DNS) process provides counterparties with benefits like decreased credit risk, but at the cost of increased liquidity risk. According to BofA Global Research, settlement costs are rising ~14% each year and 5-10% of trades fail each day, driven largely by human error and the seven non-interoperable systems for which the average trade is routed, indicating the significant implications that a distributed (shared) ledger enabling real-time, or customizable, settlement provides.

Fractionalization

Electronic trading and decimalization have driven lower average order sizes over the last five decades, resulting in heightened liquidity. Tokenization, which enables fractionalization up to 18 decimal places, is expected to transform illiquid assets into liquid ones, increase retail and institutional exposure to alternative investments like private equity, real estate, and blue-chip art and carbon credits, as well as drive the formation of more efficient and liquid primary and secondary markets. Fractionalization may also enable banks and investors to reallocate capital and rebalance portfolios more quickly.

Accessibility

Tokenization, fractionalization and heightened secondary market liquidity may also increase exposure by retail investors, as well as institutional investors, to previously illiquid or inefficiently priced alternative assets like commercial real estate, blue-chip art, carbon credits and royalty streams. Tokenization of these assets lowers the barriers to entry, enhancing liquidity and enabling the efficient reallocation of capital if an investor wishes to diversify or exit an investment. It can take years to fully exit investments in private funds.

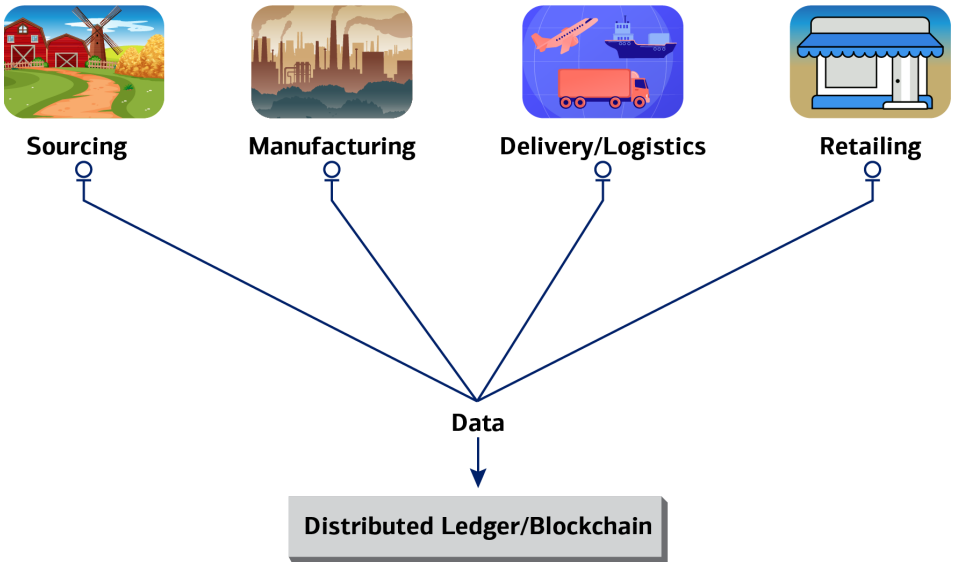
The centralized, fragmented and non-interoperable financial systems of today also create high barriers to entry for companies planning to build financial applications. However, interoperable applications can be built on top of distributed ledgers and blockchains, enabling the development of applications that would be too expensive or impractical to create on today's financial systems.

Transparency

Blockchain transactions are immutably recorded and transparent to those with the proper data science and quant tools, which enables the analysis of millions of transactions between millions of addresses and across dozens of blockchains. Data transparency can drive reduced information asymmetries and, combined with heightened liquidity, lead to more efficient price discovery, particularly for previously illiquid assets.

Additionally, the transparency provided by blockchains may also provide law enforcement agencies with the ability to effectively track stolen tokens and illicit fund flows years after the crime occurred. The transparency provided by distributed ledgers may also provide governments and central banks with the ability to track consumer behavior and inflation in real time, instead of using lagged data, as well as enable corporates to tokenize their supply chains, producing efficiencies and decreased costs (Exhibit 3).

Exhibit 3: Potential future state of supply chains – participants maintain distributed (shared) infrastructure
Tokenized goods enable supply chain transparency, efficiencies and optimization



Source: BofA Global Research

Challenges and risks

Despite the forward momentum, key challenges and risks could slow the adoption of DLT/BCT and tokenized assets. BofA Global Research considers regulatory and legal - the risk that regulatory and legal frameworks inhibit broad adoption of tokenized assets – as primary risks, and security, lack of global coordination and inadequate liquidity as secondary risks.

Regulatory Risk

The lack of comprehensive and coordinated regulatory frameworks globally is the largest near-term headwind to mainstream digital asset adoption according to BofA Global Research. Jurisdictions with comprehensive regulatory frameworks may incentivize digital asset companies to relocate, but these companies will still need to navigate complexities driven by regional differences and inconsistences in digital asset regulations. For example, a token regulated in the EU under the newly implemented Markets in Crypto Assets (MiCA) regulatory framework may not be regulatory compliant in the US. And compliance with existing regulation for distributed ledgers and blockchains must balance data storage auditability with privacy and the right to be forgotten included in the EU's General Data Protection Regulation (GDPR).

Plus, regulatory complexity could produce headwinds for the tokenization of traditional assets. Different asset classes are subject to different regulatory requirements regionally and globally, but how tokens are classified (security or commodity) remains unclear. Bank and institutional focus on compliance may slow DLT/BCT integration and the expansion of tokenization to additional asset classes that are relatively more efficient unless the benefits provided by DLT/BCT significantly outweigh regulatory risks. However, the lack of clarity regarding token classification is expected to be less of an adoption headwind for tokenized traditional assets, given that regulatory classification and requirements are already established.

Legal Risk

Legal questions related to asset ownership remain unresolved and untested in the courts, creating ambiguity for consumer protections as well. And legal implications for smart contracts remain unclear. Smart contracts may enable the transfer of asset ownership without legal permission.

Additionally, decentralized oracle networks enable smart contracts to verifiably and securely access real-world data like market prices and the weather. If an oracle providing pricing data malfunctioned or if the market price input into a smart contract is manipulated, are the affected parties entitled to damages? These issues are likely to play out in the courts, but the unclear legal status of smart contracts raises concerns around enforceability, as well as consumer and investor protections.

Security

Hacks, theft and illicit activity more broadly represent less than 1% of digital asset transactions, but a significant hack resulting from an exploited software bug in a smart contract could pressure financial institutions and corporates to reconsider DLT/BCT implementation risks. Smart contracts are software and software can include bugs, leading to vulnerabilities. Bug bounties, audits and insurance may mitigate the risk of theft, but an exploited vulnerability in a private permissioned distributed ledger optimized for institutional use would be a major blow to the industry's credibility.

Global Coordination

Lack of global coordination related to common standards could lead to tokenized assets and platforms that are not interoperable with each other. Risks that could arise from a lack of global coordination include the potential inability to realize efficiencies and decreased costs related to settlement, liquidity, credit/liquidity risk, financing costs and cross-border payments/transfers. Distributed ledgers that are interoperable with some platforms but not others, or which prevent entry to some financial institutions but not others, could inhibit new market entrants and economic competition, increase banking system concentration, and solidify trading partners between countries, while excluding emerging economies from the global financial system.

Liquidity

The tokenization of traditional assets could drive the formation of secondary markets for previously illiquid assets like interests in private equity funds or commercial buildings, royalty streams, carbon credits and blue-chip art. But BofA Global Research believes that tokenization for the sake of tokenization is a waste of resources and the formation of a secondary market without adequate liquidity provides limited benefit as efficiencies and cost benefits are unlikely to be captured. Similarly, corporates may issue tokenized bonds, but without adequate liquidity, investors are likely worse off than if they had purchased the bond through a traditional issuance. However, concerns around liquidity are likely to decrease as adoption accelerates.

Efficient allocation of capital

DLT/BCT and tokenization can drive a more efficient allocation of capital at both a macro and micro level and across markets, both financial and non-financial. Increased transparency and accessibility, as well as real-time settlement and reduced need for intermediaries, may drive increased competition across industries, resulting in better products and lower prices. For example, DLT/BCT, smart contracts, tokenization and fractionalization enable emerging artists to access capital markets by issuing tokens to source capital. Thousands of fans may purchase the tokens, providing the artist with capital, in exchange for future recordings or even a share of future revenue generated from the album, enabling musicians to self-finance projects and individual investors to invest in the future success of individual artists.

Self-custody

The inability to self-custody assets makes transferring them a time-intensive process that likely requires a small mountain of paperwork. Pledging equity holdings or other assets as collateral for a loan is also time-consuming and requires intermediaries. But pledging tokenized assets as collateral without the need for intermediaries like banks may reduce counterparty risk and interest rates for traditional lenders and borrowers over the longer term.

What's the future?

Tokenization is just one of many DLT/BCT applications but could lead to new, and more efficient, primary and secondary markets for financial and non-financial products. In the not-too-distant future, portfolio holdings may also include interest in a diversified blue-chip art fund, carbon credits, or tokens that provide holders with a call on cash flows and power smart contract-enabled blockchain operating systems. And though we are only in the first innings of a major change in infrastructure and applications, tokenization can reshape how value is transferred, settled and stored.

Contributors

Taylor Bowley

Economist, Bank of America Institute

Vanessa Cook

Content Strategist, Bank of America Institute

Sources

Alkesh Shah

Crypto and Digital Assets Strategist

Andrew Moss

Crypto and Digital Assets Strategist

Disclosures

---

[i] *SEC: Commission Notice: Decimals Implementation Plan for the Equities and Options Markets*

[ii] *Digital Asset and The ValueExchange: Doing Tokenisation Right*

[iii] *Coinbase: The State of Crypto: Corporate Adoption*