

Digital Assets and the Treasury Market

TBAC presentation
October 2024

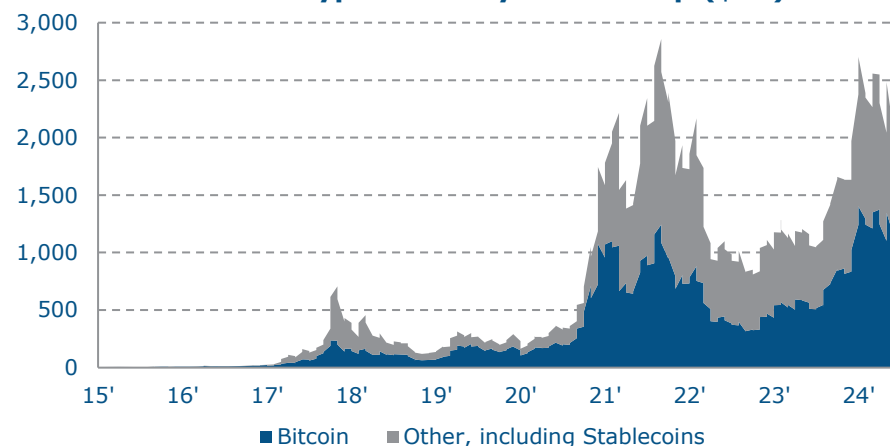
Charge:

- A. Please comment on the effects of the growth in digital assets on the Treasury market*
- B. Please summarize existing efforts at using blockchain technology or tokenization for Treasury market related applications*
- C. How might blockchain technology be used to innovate or improve on Treasury market operations?*
- D. What are the potential benefits and costs of tokenization of Treasuries?*
- E. What effects might these trends have on recommended Treasury issuance or the health of the Treasury secondary market?*

Trends in digit asset growth and usage – rapid growth from very low levels

- Digital assets have witnessed rapid growth albeit from a small base. Growth has come both from native crypto coins like Bitcoin and Ethereum, as well as stablecoins
- To date, household and industry adoption of cryptocurrency has been limited to holding digital assets for investment purposes**
- Digital asset market cap remains low relative to other financial and real assets, and growth thus far does not seem to have cannibalized demand for Treasuries
- The use case of digital assets continues to evolve, but interest has proceeded along two main tracks
- Primary use case for Bitcoin seems to be a store of value aka “digital gold” in a decentralized finance (DeFi) world; speculative interest seems to have played a prominent role in the growth of digital tokens thus far
- Efforts to leverage blockchain and distributed ledger technology (DLT) to develop new applications and improve the legacy financial market clearing and settlement infrastructure

Total Cryptocurrency Market Cap (\$bn)



Size of Digital Assets in Relation to Other Asset Classes*

\$bn	2015	2019	2024
Total Crypto Market Cap	\$7.0	\$197	\$2,385
Bitcoin Market Cap	\$6.4	\$134	\$1,364
Other Coin Market Cap	\$0.6	\$57	\$855
Stablecoins Market Cap	\$0.0	\$5	\$166
Total U.S. Equity Market Cap	\$23,364	\$33,935	\$59,787
Total Marketable Tsy Debt	\$13,207	\$16,682	\$27,728
Treasury Bills	\$1,514	\$2,417	\$6,005
Total Real Estate Market Cap	\$25,990	\$33,479	\$52,319
Money Market Funds AUM	\$2,759	\$3,604	\$6,468
Commercial Bank Deposits	\$10,991	\$13,291	\$17,732
Currency in Circulation	\$1,426	\$1,802	\$2,359

Sources (all charts and tables): Coinmarketcap; BBG; FRB; ICI

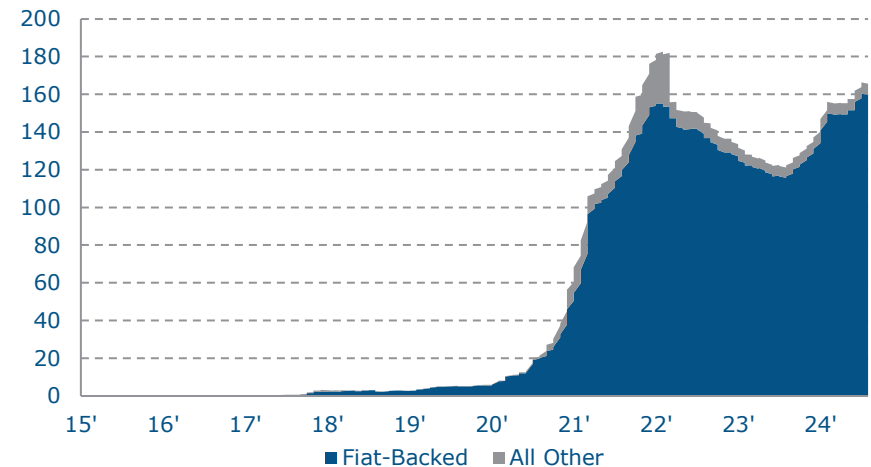
* Year-end values for 2015/2019, latest available for 2024;

** FRB, “Economic Well-Being of U.S. Households in 2023”, May 2023

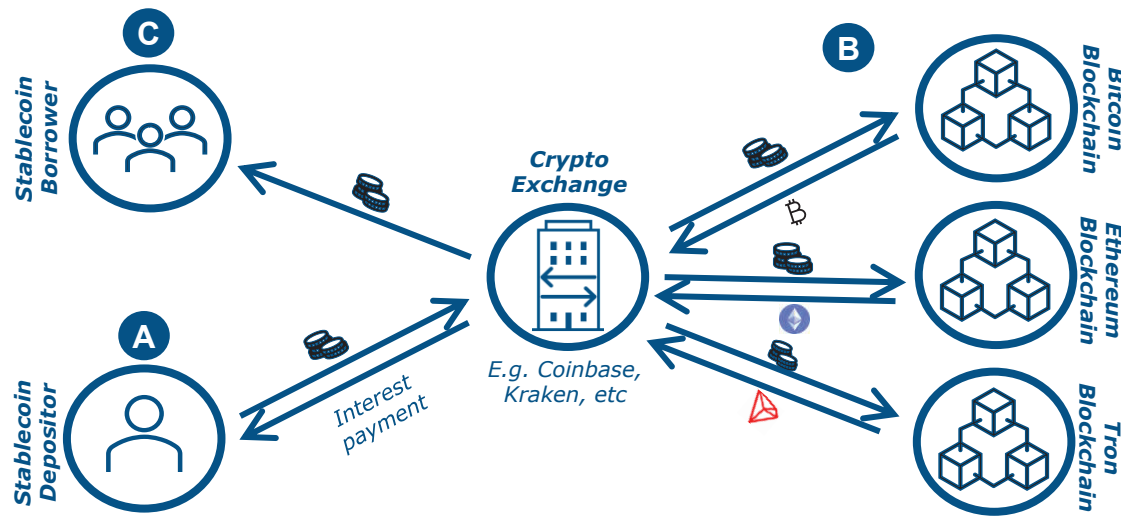
What are stablecoins and why are they growing?

- Stablecoins are a type of cryptocurrency that are designed to maintain a stable value, typically by linking the value of the currency to an underlying pool of collateral¹
- Use has grown rapidly in recent years as the digital asset market matures, including increased demand for crypto assets with stable cash-like characteristics
- Stablecoins have also gained popularity as they have been attractive collateral to lend on DeFi networks
- While there are different types of stablecoins, fiat-backed ones have shown the most significant growth
- Stablecoins play an integral role intermediating transactions in digital asset markets - **over 80% of all crypto transactions now use a stablecoin as one leg of the transaction**²

Total Stablecoin Market Cap (\$bn)



Main Uses of Stablecoins in the Digital Asset Ecosystem



- An investor holds their stablecoins at a Crypto exchange. Most exchanges now pay interest on their stablecoin holdings, effectively making them (unregulated and uninsured) deposits³
- Since stablecoins are issued on multiple chains, they serve as a vital source of liquidity for the exchange to facilitate transactions between and within different chains, allowing for more efficient and user-friendly cross-chain services. Over 80% of all crypto transactions involve Stablecoins¹
- In addition, many exchanges and defi platforms provide some sort of margin trading or direct lending services, of which stablecoins are used as the major source of funds or collateral

 = Stablecoin in the diagram above

Sources (top-right): coinmarketcap.com

¹ A very small subset of Stablecoins do not link to a pool of collateral, but algorithmically create/destroy tokens to maintain their peg

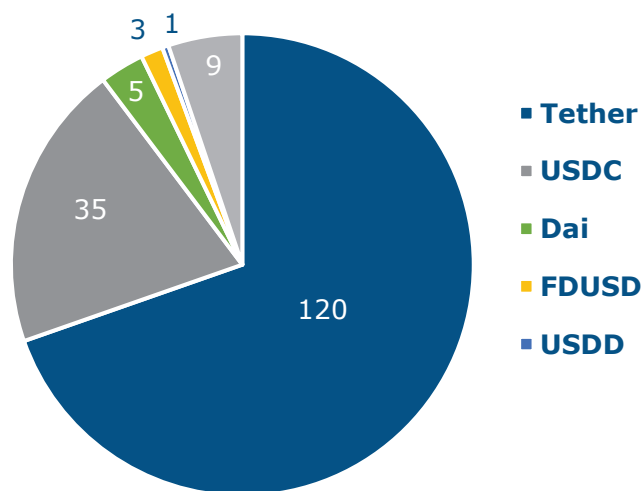
² FRB, "The Stable in Stablecoins", December 2022; See also data on theblock.co

³ This is somewhat of a simplification to make the point that exchanges are playing the economic function of banks in the digital asset ecosystem

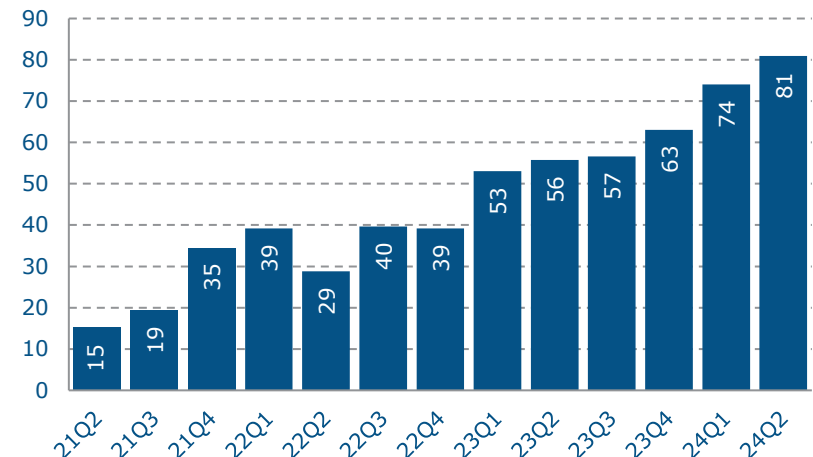
Growth in stablecoins has resulted in a modest increase in demand for short-dated Treasuries

- The most prevalent stablecoins in the market today are fiat-backed stablecoins
- A very significant portion of that collateral is taking the form of T-bills and Treasury-backed repo transactions
 - We estimate that \$120bn in total stablecoin collateral is directly invested in Treasuries
- Over the near term, we expect continued growth in stablecoin markets along with the overall size of the digital asset market
- Medium-term regulatory and policy choices will determine the fate of this “private currency”
- History shows that “private currency” that does not meet NQA requirements leads to financial instability and as such is highly undesirable*

Top Stablecoins by Market Cap (\$bn)



U.S. Treasury Bills Held by Tether (\$bn)



Example of Tether's 24Q2 Collateral Backing

Asset	\$bn	% of Total
Cash & Cash Equivalents	\$99.8bn	84.2%
U.S. Treasury Bills	\$80.9bn	68.3%
Repo	\$12.3bn	10.3%
Money Market Funds	\$6.4bn	5.4%
Cash & Deposits	\$0.1bn	0.1%
Non-U.S. Bills	\$0.1bn	0.1%
Corporate Bonds	\$0.0bn	0.0%
Precious Metals	\$3.8bn	3.2%
Bitcoin	\$4.7bn	4.0%
Other Investments/Loans	\$10.1bn	8.5%
Total	\$118.4bn	100.0%

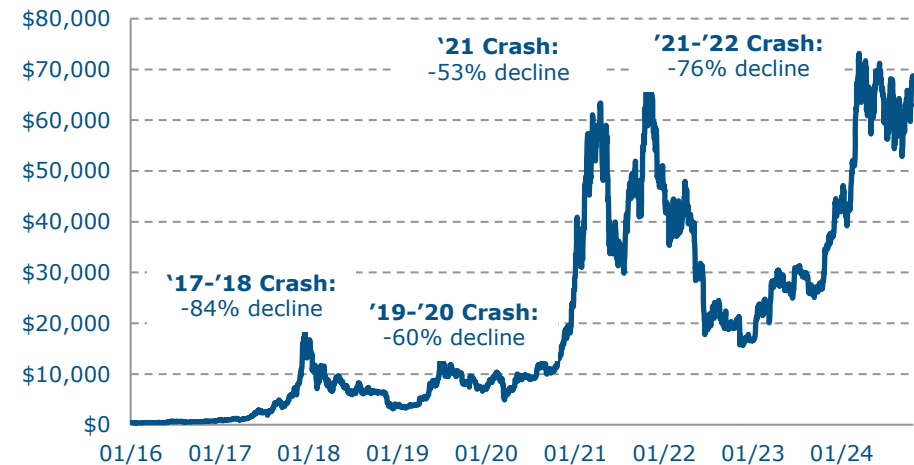
Sources (top-right to bottom-right): Tether disclosures; coinmarketcap.com; Tether disclosures

* NQA = No Questions Asked, see Gorton, Gary B., and Jeffery Zhang. "Taming Wildcat Stablecoins." *The University of Chicago Law Review*, 2021.

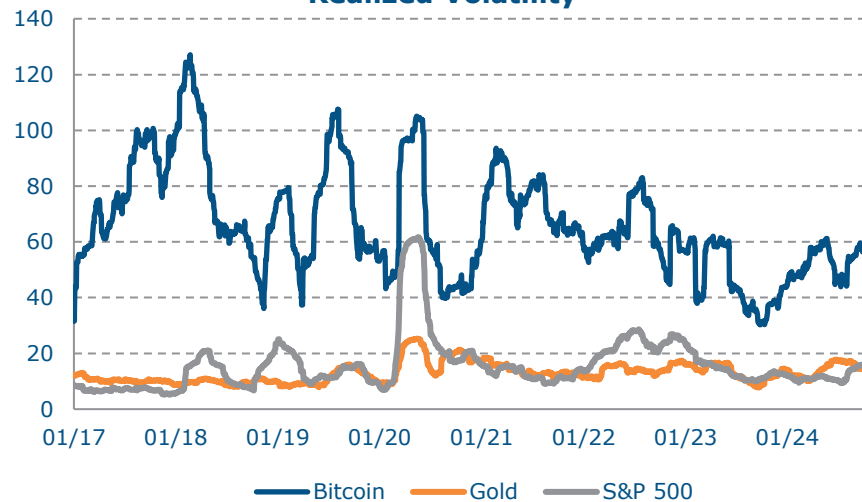
Rapid growth and massive volatility might lead to future hedging needs and flight-to-quality demand for Treasuries

- Native crypto assets like Bitcoin have seen significant price increases in recent years, but volatility remains very high
 - Bitcoin has experienced four large price corrections since 2017
- To date, digital asset markets have limited access to traditional safe-haven or risk hedging instruments like Treasuries
- In recent years, institutional sponsorship of Bitcoin (BlackRock ETF, MicroStrategy) has been growing and crypto assets have behaved like “high beta” assets
- Structural demand for Treasuries may increase as the digital asset market cap grows, both as a hedge against downside price volatility and as an “on-chain” safe-haven asset

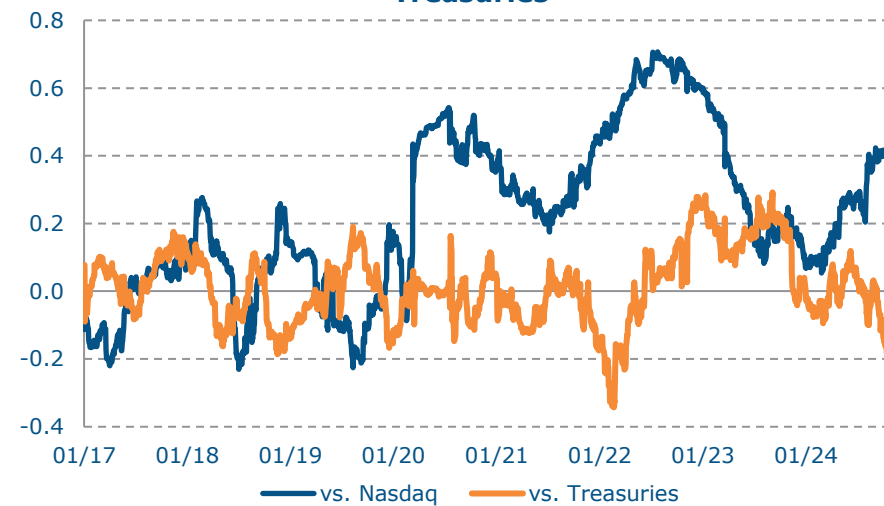
Bitcoin Price



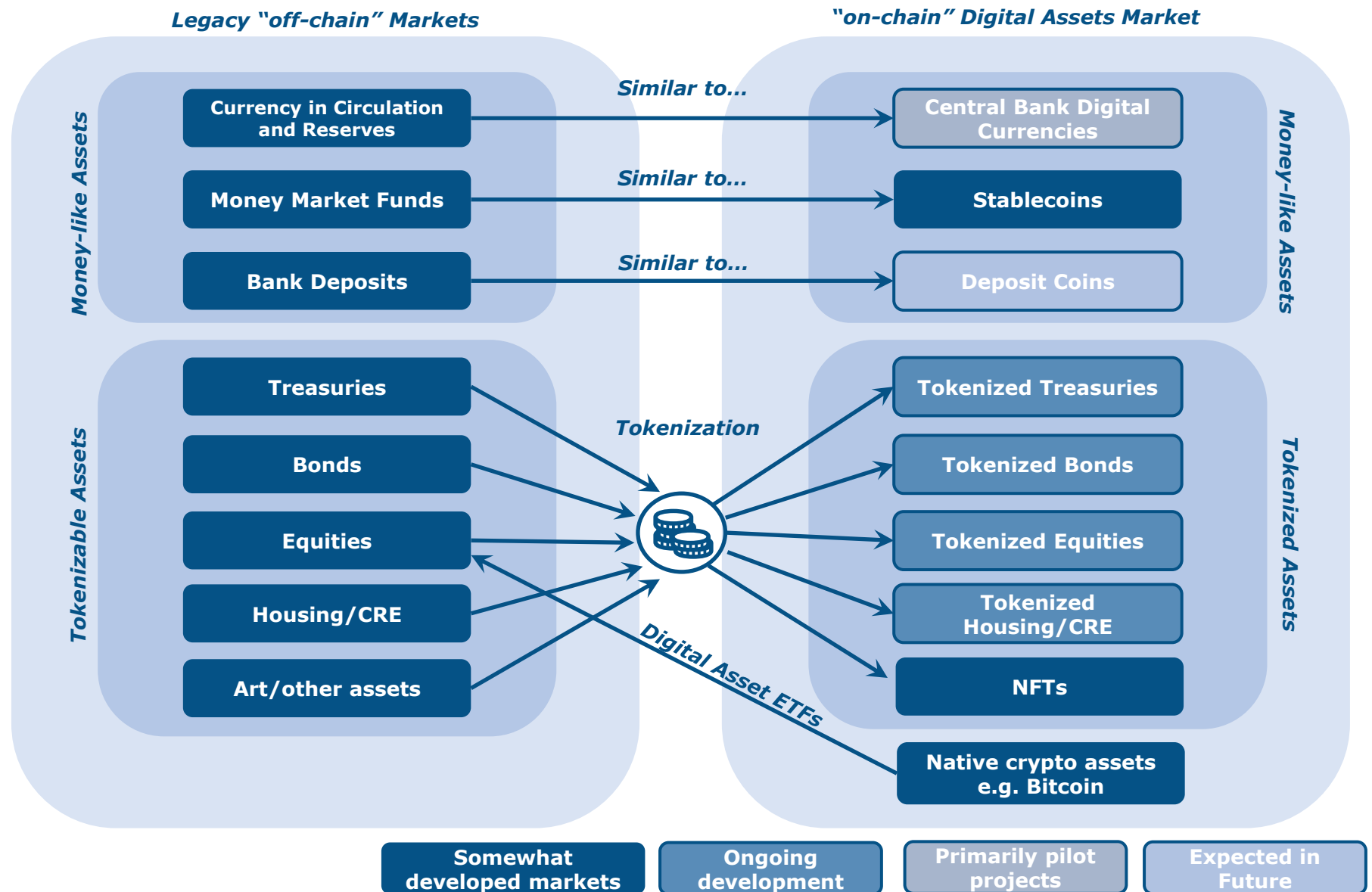
Bitcoin vs. Alternatives: 3M Annualized Realized Volatility



Bitcoin 90-day Correlation vs. Nasdaq and Treasuries



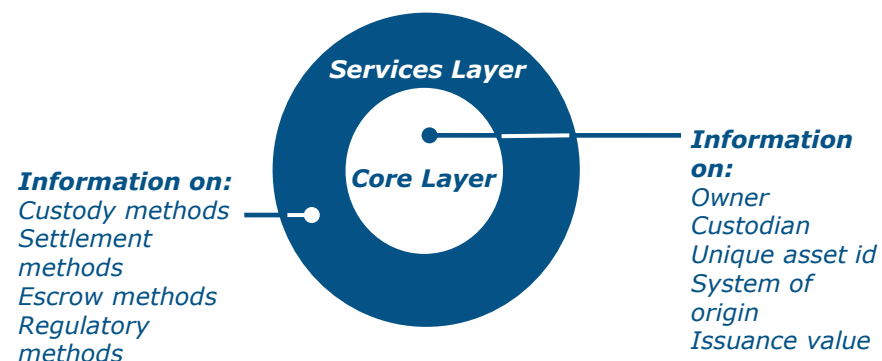
Parallels between the digital asset ecosphere and existing financial markets



What is tokenization? A broad overview

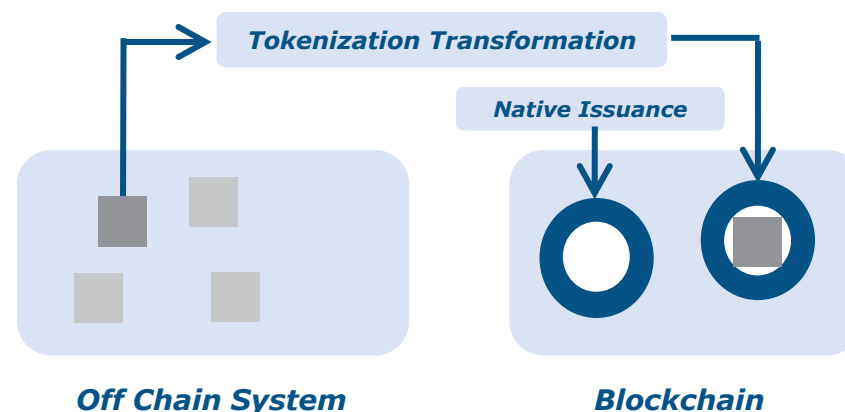
- Tokenization is the process of representing claims digitally in the form of tokens on a programmable platform like a distributed ledger/blockchain¹
 - Tokens can be issued in “native form” on the DLT platform, or they can be digital representations of existing assets
- Tokenization has the potential to unlock the benefits of programmable, interoperable ledgers to a wider array of legacy financial assets
- Key characteristics and benefits of tokenization²:
 - Core and Service Layers: Tokenized assets integrate both a “core layer” containing information about the asset and ownership with a “service layer” governing rules on transfer and settlement
 - Smart Contracts: Tokenization enables automation through smart contracts, which execute transactions automatically when predefined conditions are met, allowing for contingent transfers of assets and claims
 - Atomic Settlement: Settlement can be streamlined by ensuring all parts of a transaction occur simultaneously across all parties involved, reducing the risk of settlement failure and improving the reliability
 - Composability: Different tokenized assets can be bundled together to create more complex and new financial products, allowing for highly customizable solutions for asset management and transfer
 - Fractional Ownership: Tokenized assets can be divided into smaller, more accessible portions

Anatomy of a Token: Core and Services Layer



e.g. For a U.S. Treasury, the “core layer” would have information on the specific CUSIP, the owner, where it is held in custody, etc, and the “service layer” would contain specific instructions settlement, where the coupon payments are to be sent, etc

Example of Tokenization



¹ BIS, “Blueprint for the future monetary system: improving the old, enabling the new”, 2023

² For more discussion see FRB, “Tokenization: Overview and Financial Stability Implications”, 2023, and Hilary J. Allen, “Hearing on Next Generation Infrastructure: How Tokenization of Real-World Assets will Facilitate Efficient Markets”, 2024

Promise of a tokenized financial market infrastructure

- The benefits of tokenization extend far beyond and are independent of native crypto assets like Bitcoin as well as the public, permissionless blockchain technology those assets have popularized
 - Tokenization of a variety of financial and real-world assets across interoperable ledger systems promises to unleash new economic arrangements and enhance efficiencies
- Some markets – like international payments or repo – stand to gain immediate and large potential benefits from tokenization, while the gains for other markets will be more incremental
 - The Treasury market is already highly efficient, so gains from tokenization are likely to be incremental
 - Still, even small incremental improvements in a very large market like the Treasuries market can be impactful at scale
- To fulfill this potential though, there is a need for a unified ledger, or at least a highly interoperable set of integrated ledgers that work together seamlessly¹
 - Legacy systems are built from individually maintained ledgers that are often “siloe”, with a need for complex messaging protocols between the institutions maintaining these ledgers
 - This creates significant inefficiencies and settlement fail risk for a variety of transactions which tokenization on a unified ledger could help streamline
- These ledgers will also need to be developed under the auspices of Central Banks and the foundation of trust they provide
 - The full potential of tokenization requires some monetary unit of account that denominates transactions, accompanies the means of payment, and is accepted without question by market participants
 - In a similar manner to how privately-issued “wildcat” currencies were replaced by government-backed central currencies in the late-1800s, Central Bank Digital Currencies (CBDC) will likely need to replace stablecoins as the primary form of digital currency underpinning tokenized transactions²

¹ BIS, “Blueprint for the future monetary system: improving the old, enabling the new”, 2023

² Gordon et al, “Taming Wildcat Stablecoins”, 2021

Key ongoing projects in tokenizing U.S. Treasuries

- The tokenization of U.S. Treasuries is a relatively new trend, and most projects have yet to scale; some of the notable public and private initiatives underway are as follows:
- Tokenized Treasury Funds: Provides investors access to “tokenized” forms of Treasuries on blockchains that behave in many ways like Treasury ETFs or government MMFs
 - The largest of these funds are BlackRock's BUIDL Fund and Franklin Templeton's OnChain U.S. Government Money Fund
 - Other notable funds or projects include Ondo Financial, Hashnote, and CoinShares
 - The total tokenized Treasury fund market is estimated to have a market cap of ~\$2bn¹
- Tokenized Treasury Repo Projects: Tokenized Treasuries allow for instantaneous, 24/7 settlement and trading, potentially paving the way for timelier intraday repo transactions
 - JPM's Onyx platform uses tokenized Treasuries to provide intraday, Treasury-backed repo solutions
 - Smart Contracts can be programmed directly into the tokenized Treasury that simplify and automate the transfer of Treasuries as collateral over several different transactions
- Ongoing pilot projects from DTCC and others: Several private and public market participants are running pilots using tokenization to streamline payment and securities settlement
 - DTCC/Digital Asset Treasury Tokenization Pilot²: Collaboration with many different financial market agents, including banks and custody agents, to use tokenized Treasuries in different applications ranging from posting/return collateral for a margin trade and hypothecating a tokenized Treasury in case of a default
 - There are also many pilot projects underway from SIFMA, the BIS, and numerous central banks around using tokenized assets to improve payments and settlement processes

¹ RWA.xyz

² DTCC, “Digital Dollar Project and DTCC: Security Settlement Pilot”, 2022

Projects leveraging blockchain and tokenization

Project	Public/ Private	Description
SIFMA Multi-Asset Ledger Settlement Pilot (2024)	Private	Pilot uses shared ledger technology to explore how blockchain can streamline and enhance post-trade processes across various asset classes using a shared immutable ledger
DTCC/Digital Asset Treasury Tokenization Project (2024)	Private	Collaboration between several private-market agents to simulate four key transactions using tokenized Treasuries, including posting/returning tokenized Treasuries as collateral and seizing collateral during defaults
DTCC Project Ion (2022-)	Private	Project Ion is a blockchain-based platform launched by DTCC designed to modernize and accelerate securities settlement, offering near real-time capabilities using blockchain technology.
JPM Onyx Platform (2020-)	Private	Provides real-time, intraday repo solutions using tokenized Treasuries as collateral
Numerous Tokenization Projects	Private	Several funds now provide “on-chain” access to tokenized Treasuries with over \$2bn in total market cap outstanding, including BlackRock’s BUIDL and Franklin Templeton’s FOBXX fund. Other platforms include RSN/RSL
Project Agorá (2024)	Public/Private	Consortium of 40 private sector financial firms, the BIS, and a group of central banks aiming to explore how tokenization can enhance wholesale cross-border transactions
Project Cedar (2024)	Public	Collaboration between the NYFRB and the Monetary Authority of Singapore to examine the use of DLT to facility cross-border payments for trade, commerce, and finance
European Investment Bank (2023)	Public	The EIB issued £50bn in digital bonds directly onto a private blockchain in 2023, the first major government entity to issue bonds directly onto a blockchain to date
Numerous CBDC Pilot Projects	Public	A 2021 BIS survey of central banks found that 86% were actively researching the potential for CBDCs, 60% were experimenting with the technology, and 14% were deploying pilot projects

Key potential benefits of tokenizing U.S. Treasuries

- Improvements in clearing and settlement
 - Tokenized Treasuries allow for more streamlined, “atomic settlement”, where all parts of a transaction involving Treasuries settle simultaneously across all parties, reducing the risk of settlement failure
- Improved collateral management
 - Smart contracts programmed directly into the tokenized Treasury allow for more efficient collateral management, including pre-programmed collateral transfers once pre-set conditions are met
- Improved transparency and accountability
 - Immutable ledgers could allow for greater transparency in Treasury market operations, reducing opacity, and providing regulators, issuers, and investors with more real-time insight into trading activities
- Composability and innovation
 - The ability to bundle different tokenized assets could lead to the creation of new and highly customizable financial products and services based on U.S. Treasury securities, such as derivatives and structured products
- Increased inclusion and demand?
 - Tokenization can make Treasuries more accessible to a wider range of investors, including smaller retail investors through fractionalization and those in emerging markets
- Increased liquidity?
 - Tokenization could potentially create new investment and trading strategies through seamless integrations and programmable logic; tokenized Treasuries may trade 24/7 on blockchain networks, though the impact of this could work in two ways

Tokenization of the Treasury market holds promise but needs further study; caution is warranted as the Treasury market is already highly liquid and efficient

Potential risks and challenges in tokenizing U.S. Treasuries

Although the tokenization of U.S. Treasuries has potential benefits, design choices can present certain risks and challenges that need to be carefully considered

- **Technological Risks:**

- Tokenized infrastructure will be difficult to develop in parallel in a cost-effective manner and is unlikely to be as efficient as the legacy market until it achieves sufficient scale (“incumbent advantage”)
- It is unclear if DLT platforms offer a compelling technological advantage versus legacy systems and transition costs are also likely to be high given a large and growing installed base of Treasuries
- Cybersecurity Threats: Certain types of DLT solutions (public, permissionless blockchains) are vulnerable to hacking and other cybersecurity attacks, which could pose risks to the security of tokenized Treasuries

- **Operational Risks:**

- Counterparty Risk: Investors may be exposed to counterparty risk, which is the risk that the issuer or custodian of the tokenized securities may default on their obligations
- Custody Risks: Ensuring the safekeeping of tokenized Treasuries requires robust custody solutions, and there may be challenges associated with the custody of digital assets
- Privacy Issues: Some participants will view the increased transparency of public blockchains as a downside

- **Regulatory and Legal Uncertainty:**

- Evolving Regulations: Legal requirements/compliance obligations regarding tokenized assets remain unclear
- Jurisdictional Challenges: Varying regulatory frameworks across jurisdictions can complicate cross-border transactions and create legal complexities

- **Financial Stability and Market Risks if the tokenized markets grows significantly:**

- Contagion Risk
- Complexity and Interconnectedness
- Banking/Payment Disintermediation
- “Basis Risks”
- 24/7 Trading: Could make it more vulnerable to market manipulation and higher volatility

Financial stability risks in a future state when the tokenized market is significantly bigger

- **Contagion and Interconnectedness Risk:**
 - Tokenization provides a bridge by which “on-chain” asset volatility could spill over into the broader financial markets as the size of tokenized assets become more significant
 - In times of stress, seamless ledgers can become a negative as deleveraging and fire sales can rapidly spread across assets
- **Liquidity and Maturity Mismatch Risk:**
 - Potential to have liquidity and maturity mismatches between non-native tokens and the underlying assets, with these mismatches setting-up potential deleveraging driven price volatility; similar to issues witnessed in ETFs, MMFs, and Treasury futures
 - Can lead to liquidity pressures from smart contracts driven automated margin liquidation and, also a need to meet fast settlement goals
- **Increased Leverage:**
 - Tokenization can directly increase financial system leverage. For example, the underlying asset to a token could be rehypothecated, or the token itself can be structured to be a derivative
 - Potential to create marketable securities out of illiquid or physical assets which might potentially be used as collateral
- **Increased Complexity and Opacity:**
 - Tokenization leads to more composability, which could significantly add complexity and opacity to the financial system from new and non-traditional assets being added to the digital financial ecosystem
 - Improperly coded smart contracts can rapidly trigger unwanted financial transactions with unintended consequences
- **Banking Disintermediation:**
 - Tokenized short-dated Treasuries could prove to be an attractive alternative to bank deposits and potentially disrupt the banking system which could negatively impact core banking activities of deposit gathering and lending
- **Stablecoin Run Risk:**
 - Even with better collateral backing, unlikely stablecoins will satisfy NQA principle needed to underpin tokenization
 - Runs on stablecoins have been a common occurrence in recent years, and a collapse of a major stablecoin like Tether could lead to a fire sale of short-dated Treasuries

Designing DLT/blockchain for tokenized Treasuries: framework elements

- Establishing a framework that encourages trust and industry-wide buy-in will be necessary for digital assets and distributed ledger technology to scale
- Fraud, scams, and theft have grown proportionately with the digital asset market, eroding trust in the underlying technology

DTCC Principles to Building a Secure Digital Asset Settlement Ecosystem¹



Legal Certainty

Ensure operations comply with existing laws and regulations to maintain market integrity and investor confidence



Regulatory Compliance

Encourage alignment with regulatory frameworks to build a foundation of trust and safety in digital asset markets



Resiliency and Security

Develop robust infrastructure capable of resisting disruptions, while protecting sensitive data and ensuring the continuous operation of digital asset services



Safeguarding Customer Assets

Implement governance over smart contracts to manage and protect assets within the digital asset ecosystem securely



Connectivity and Interoperability

Facilitating transactions and flexible settlements across diverse networks to enable seamless transfer and settlement



Operational Scalability

Gaining efficiency and cost-effectiveness through standardized roles and smart contract functions to accommodate market growth.

¹DTCC, "Building the Digital Asset Securities Ecosystem Whitepaper", 2024





Designing a DLT platform for tokenized Treasuries: architecture elements

- Most of the major crypto projects to date have been developed on public and permissionless blockchains, which has been heralded as one of its major appeals
- We argue that this architecture will not be suitable for more widespread adoption of tokenized Treasuries¹:
 - Technology choices: Public, permissionless blockchains use complex consensus mechanisms (e.g., proof-of-work, proof-of-stake), making it difficult for them to process large transaction volumes efficiently
 - Operational Fragility: These blockchains rely on decentralized nodes with no centralized authority, which leads to vulnerabilities
 - Governance Gaps: Public blockchains lack clear governance structures, which increases the risks of system failures or bad actors taking advantage
 - Security Risks: The decentralized nature and lack of vetting in public blockchains increase the risk of bugs, exploits, and attacks, as seen in historical cases of vulnerabilities being exploited in Bitcoin and Ethereum
 - Money Laundering and Compliance Issues: Public, permissionless blockchains allow for anonymity, which can facilitate illegal activities such as money laundering and sanctions evasion
- Tokenization in the Treasury market will likely require the development of a privately controlled and permissioned blockchain managed by one or more trusted private or public authorities

Public vs. Private Blockchain: A **public** blockchain is an open network where anyone can participate without permission, while a **private** blockchain is a restricted network where only authorized participants can validate transactions and access the ledger

Permissioned vs. Permissionless Blockchain: A **permissioned** blockchain restricts who can participate in the network and validate transactions, while a **permissionless** blockchain allows anyone to join and participate in consensus without needing prior approval

Optimal Blockchain Design

	Permissionless	Permissioned
Public	 <i>E.g. Bitcoin, Ethereum</i>	
Private		 <i>Ideally managed by trusted govt. authority</i>

¹ For more discussion see Hilary J. Allen, "Hearing on Next Generation Infrastructure: How Tokenization of Real-World Assets will Facilitate Efficient Markets", 2024

Designing a DLT platform for tokenized Treasuries: regulatory elements

- Efforts to regulate digital assets and cryptocurrencies have intensified globally in recent years, but remain highly fragmented and porous
- United States: Regulation in the U.S. remains fragmented, with oversight split between multiple agencies like the SEC, CFTC, and FinCEN
 - Ensuring Responsible Development of Digital Assets (2022): executive order signed in 2022 outlining a government-wide strategy to address the opportunities and risks of digital assets. The order called for the development of a regulatory framework for digital assets
 - Financial Innovation and Technology for the 21st Century Act (FIT21) passed the house in 2024, and would be the most significant and comprehensive effort to regulate digital assets, stablecoins, and cryptocurrencies
- European Union: Markets in Crypto-Assets Regulation (MiCA) went into effect in 2024
 - MiCA is the EU's first comprehensive regulatory framework to cryptocurrencies and digital assets
 - It establishes rules for issuing crypto assets, stablecoins, and utility tokens, and regulates service providers like exchanges and custodians
 - Focuses on consumer protection, stablecoin oversight, AML measures, and environmental impact transparency
 - Licensed entities under MiCA can operate across the EU with a “passport” model, allowing them to serve all member states under a unified framework

What effects might these trends have on recommended Treasury issuance or the health of the Treasury secondary market?

- Continued growth in stablecoins, assuming the current trend in stablecoin collateral choices continues (or is forced by a regulator), will create structural demand for short-dated U.S. Treasuries
 - Recommended issuance should on the margin lean to a higher proportion of T-bills
- While stablecoins currently represent a marginal segment of the T-bills market, growth over time may expose the T-bills market to increased risk of fire sales due to runs in the stablecoin market
- Different redemption and settlement characteristics can lead to liquidity and maturity mismatches between tokens and the underlying assets which in turn can create potential for heightened financial instability in the Treasury market
- Tokenized “derivative” Treasury products could create a basis market between digital and native markets (like futures or total return swaps) – this can both create additional demand and lead to heightened volatility during deleveraging episodes
- Growth in, and institutionalization of, crypto markets (Bitcoin) could create additional hedging and flight-to-quality demand for tokenized Treasuries in periods of heightened downside volatility
 - Flight-to-quality demand can be hard to predict. Hedging demand could be structural, but depends on how well Treasuries continue to hedge downside crypto-volatility
- Tokenization might create additional access to Treasuries from both domestic and global pools of savings, particularly from households and smaller financial institutions, which can lead to incremental demand for U.S. Treasuries
- Tokenization can potentially improve liquidity in the trading of Treasuries by reducing operational and settlement frictions

Conclusions

- Though the overall market for digital assets remains quite small in comparison to traditional financial assets like equities or bonds, interest has grown substantially over the past decade
- To date, growth in digital assets has created marginal incremental demand for short-dated Treasuries
 - This has so far come primarily through increased use and prevalence of stablecoins
 - Institutional adoption of “high-beta” bitcoin and crypto might lead to increased future hedging demand for Treasuries
- Advances in DLT and blockchain offer the promise of a new financial market infrastructure with “unified ledgers” leading to enhanced operational and economic efficiencies
 - There are several ongoing projects and pilots from both private- and public-sector actors to leverage blockchain technology in the legacy financial market ecosystem, particularly by DTCC and the BIS
 - Will likely require the central bank and tokenized USD (CBDC) to play a pivotal role in a future tokenized payments and settlements infrastructure
- Legal and regulatory landscape will need to evolve alongside advances in tokenization of legacy assets
- Operational, legal, and technology risks need to be considered carefully in making design choices around the technology infrastructure and tokenization
 - Projects of study should include the design, nature, and concerns around Treasury tokenization, introduction of sovereign CBDCs, technology and financial architecture choices, and financial stability considerations
- Currently, financial stability risks remain low given the relatively small size of the tokenized asset market; however, strong growth in tokenized assets could lead to a myriad of financial instability risks
- The way forward should involve a cautious approach spearheaded by a trusted central authority, with widespread buy-in from private sector participants

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Implications for financial stability

- Azar, Pablo D, et al. "The Financial Stability Implications of Digital Assets." Federal Reserve Bank of New York, September 2022. ([Link](#))
- "Building the Digital Asset Securities Ecosystem." Boston Consulting Group, May 2024. ([Link](#))
- "The Financial Stability Implication of Tokenisation." Financial Stability Board, October 2024. ([Link](#))

Regulatory efforts

- The White House. "FACT SHEET: White House Releases First-Ever Comprehensive Framework for Responsible Development of Digital Assets." The White House, 16 Sept. 2022, ([Link](#))

Appendix

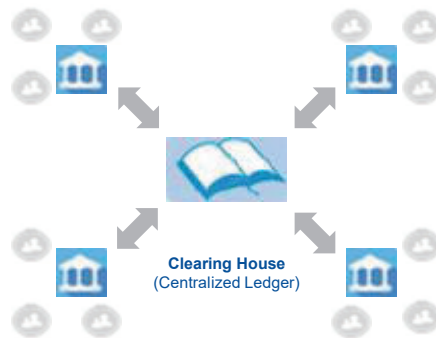
Cryptocurrency and blockchain

- **Cryptocurrency** is an internet-based medium of exchange which uses cryptographical functions and distributed database technology to conduct financial transactions
- Cryptocurrencies leverage **distributed ledger technology (DLT)** technology to gain decentralization, transparency, and immutability
 - Bitcoin is a one example of such a cryptocurrency or digital cash system; the history of every Bitcoin is known and kept in a blockchain, a distributed ledger in cyberspace using a cryptographic network to provide a single and verifiable source of truth
 - One challenge of decentralized networks for payments is that it is more difficult to exercise government/regulatory oversight compared to a centralized ledger; this is especially true for cryptocurrencies where access is permissionless
- **Blockchain** is a subset of DLT and allows untrusting parties with common interests to co-create a permanent, unchangeable, and transparent record of exchange, and processing without relying on a central authority

The Blockchain Distributed Ledger Model has the Potential to Improve Speed and Efficiency of Financial Flows

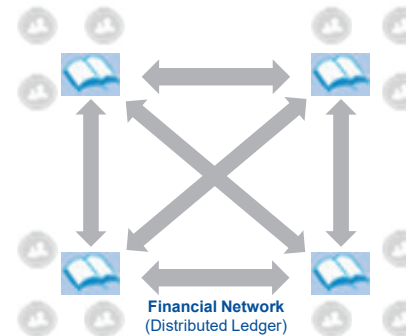
Financial Intermediaries (Today)

- + Requires trusted, centralized intermediaries
- + Batch clearing and settlement
- + Higher fees and costly infrastructure



Financial Protocol (Emerging)

- + No (or fewer) intermediaries required
- + Near real-time processing and management
- + Lower fees and reduced infrastructure



Key features of DLT/blockchain

- **Distributed ledger technology (DLT)** is an evolving technology with many designs and configurations, but generally includes four key features

1. Distributed Nature of the Ledger

- Perhaps the most important innovation of DLT is the elimination of reliance on a single centralized record keeper; instead, control over the ledger lies with the network participants
- At any point in time, there exists only one version of the ledger with each network participant owning a full and up-to-date copy of the ledger

2. Consensus Mechanism

- No single entity can amend or approve new additions to the ledger; instead, a predefined consensus mechanism is used to validate all new entries to the ledger
- The consensus mechanism is specified in the design of the DLT and creates a set of rules or protocol for determining the legitimacy of new entries

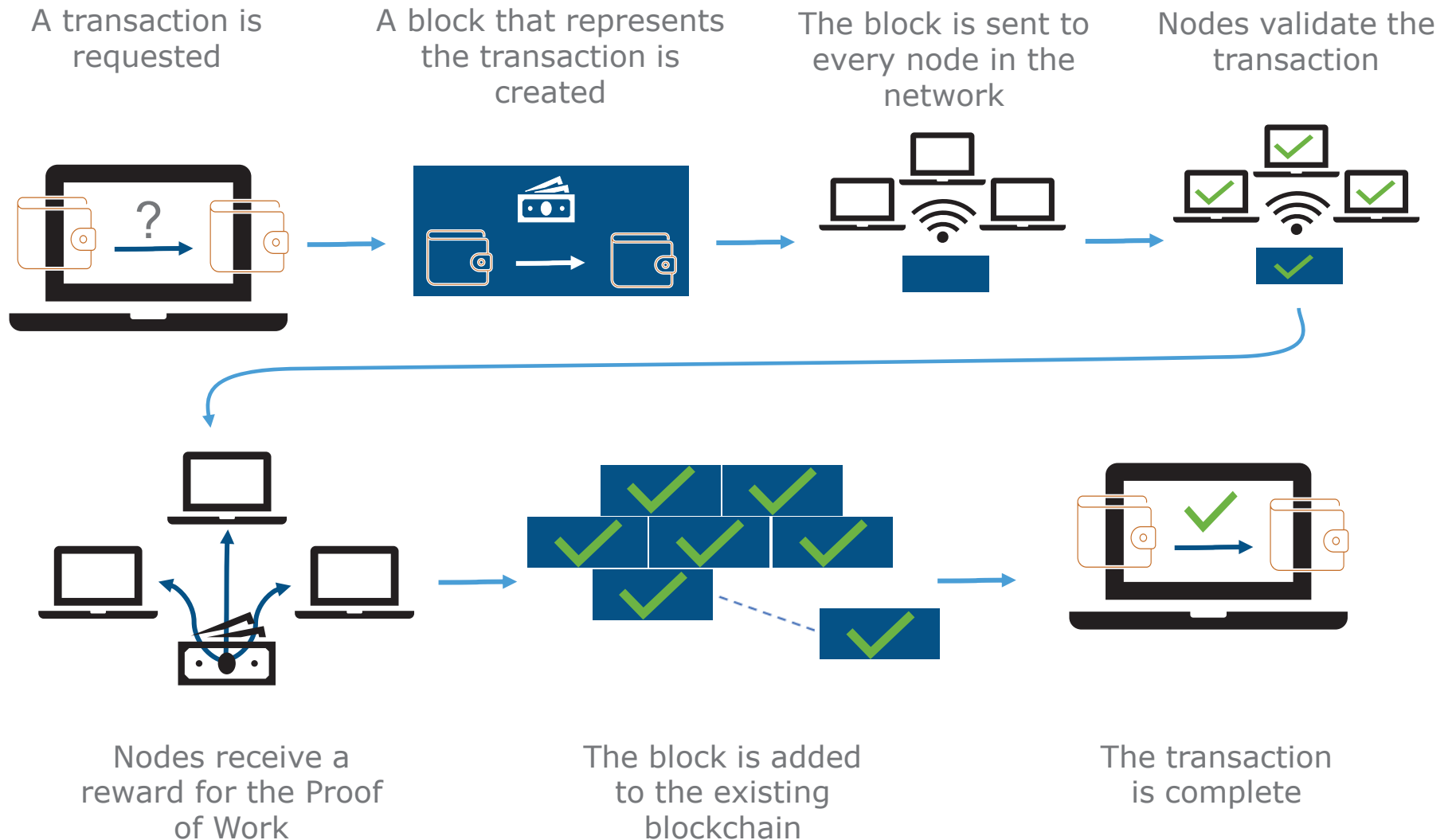
3. Cryptographic Mechanism

- Each transaction entry into a ledger is encrypted and includes a timestamp and digital signature; this allows for detection of tampering with past transaction data

4. Smart contracts

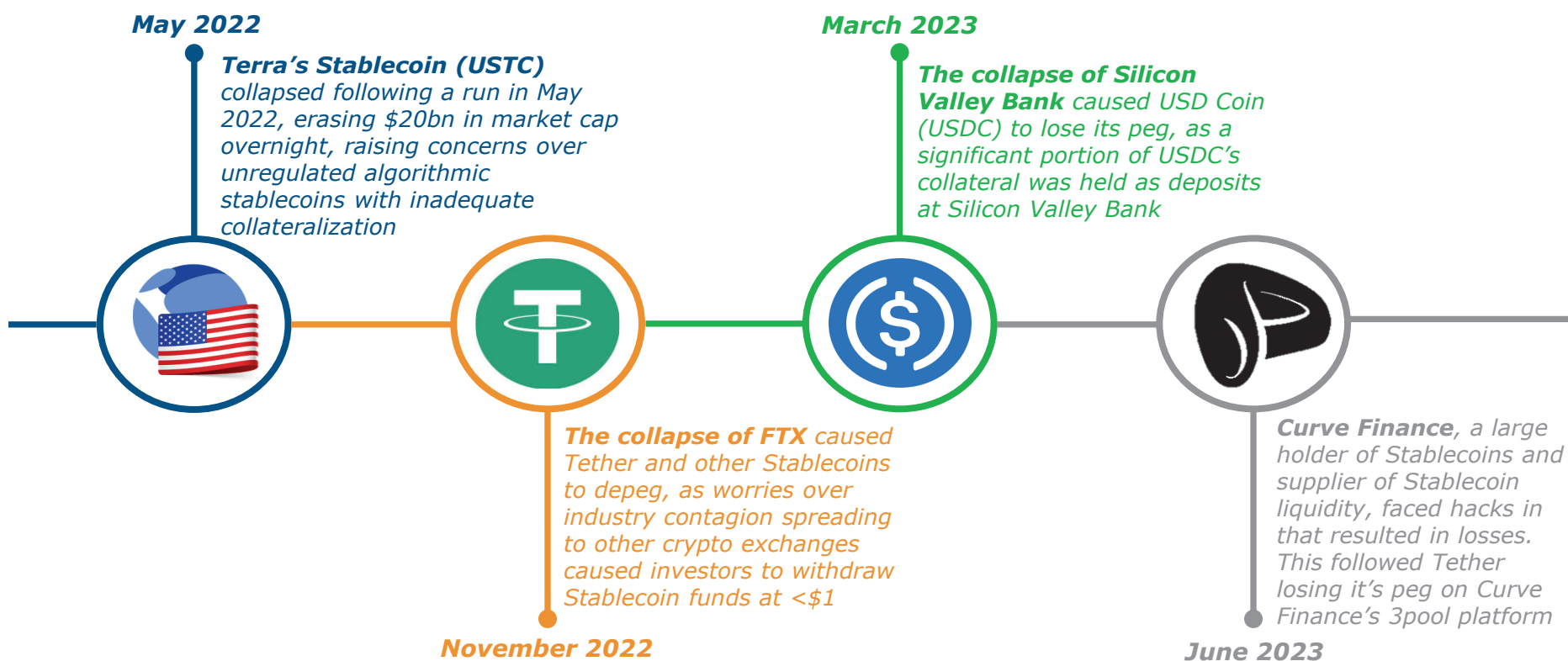
- Blockchain improves automation by allowing for the execution of rules-based transactions with the aim of improving speed, security, and innovation

How do blockchains work?



Financial stability considerations: risk of runs on stablecoins

- Stablecoins have increasingly elected to hold significant short-dated US Treasury collateral, and we expect regulatory efforts in the years to come to encourage this trend
- Despite the improved collateral backing of stablecoins, significant risks remain. Runs on stablecoins have been a common occurrence in recent years, with stablecoins losing their peg to the U.S. dollar or collapsing entirely^{1,2,3}
- A collapse of a major stablecoin like Tether could result in a “fire-sale” of their U.S. Treasuries holdings
- **If history serves as any guide, stablecoins will need to be regulated like narrow banks or money market funds to prevent contagion of stress in stablecoin markets to broader financial markets and the Treasury market**



¹ Moody's, "Stablecoins have been unstable, Why?", 2023

² BIS, "Public information and stablecoin runs", 2024

³ NYFRB, "Runs on Stablecoins", 2023

If history serves as any guide, stablecoins will need to be regulated like narrow banks or money market funds

- While stablecoins currently elect to hold significant short-dated U.S. Treasury collateral, **it is not required**
- Stablecoins are also currently functioning like a form of private, “on-chain” money
- “Private money” during the wildcat banking era in the 1800s was regularly subject to panics, collapses in value, and ultimately required the government to step and issue a single unified form of money (Greenbacks)
- Prime money market funds holding collateral other than short-dated US Treasuries experienced runs during 2008 and 2020
- History indicates that stablecoins cannot function as private money, and will ultimately need to be strictly regulated like government money market funds are today to hold risk-free collateral

Lessons learned from the “Wild Cat” Era of Banking¹:

Prior to a centralized monetary authority, banks in the U.S. used to issue their own individual banknotes that were poorly collateralized, prone to runs, and regularly traded at a discount in secondary markets. In response to these issues, most state governments began requiring these notes be backed one-for-one with government bonds. Ultimately, difficulty interchanging numerous forms of paper currency paved the way to the National Bank Act of 1963 and ultimately the creation of the U.S. dollar as the only national-level currency in circulation

Lessons learned from the runs on MMFs in '08:

Despite holding shares in what had been traditionally considered a “risk free investment”, prime money market funds experienced significant runs during the 2008 crisis as a drop in prices on short-dated financial commercial paper tanked confidence in the solvency of the money market funds that held them. Despite the addition of gate fees to discourage runs, prime money market funds again experienced runs in 2020 when prices on commercial paper again plummeted. **The lesson, repeated, is that a “risk-free” investment vehicle will only behave as such when backed by actual risk-free collateral - which is short dated U.S. Treasuries**

¹ Gary Gorden et al, “Taming Wildcat Stablecoins”, 2021