



Tokenized
Asset
Coalition

January 2024



The State of Asset Tokenization

2024 Outlook

This report is a collaborative effort by member firms of the Tokenized Asset Coalition.

Executive Summary

The Tokenized Asset Coalition (TAC) unites traditional and crypto financial systems with the shared belief that all assets will eventually move onchain. By addressing the opacity, inefficiencies and fragmentation of the current financial infrastructure, the TAC aims to spearhead the next wave of digital transformation.

The State of Asset Tokenization provides a range of insights into real-world assets (RWAs) and tokenization, innovation happening to business models and products, the emergence of institutional investors, large market trends, and more.

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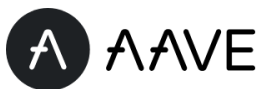
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Setting the Stage



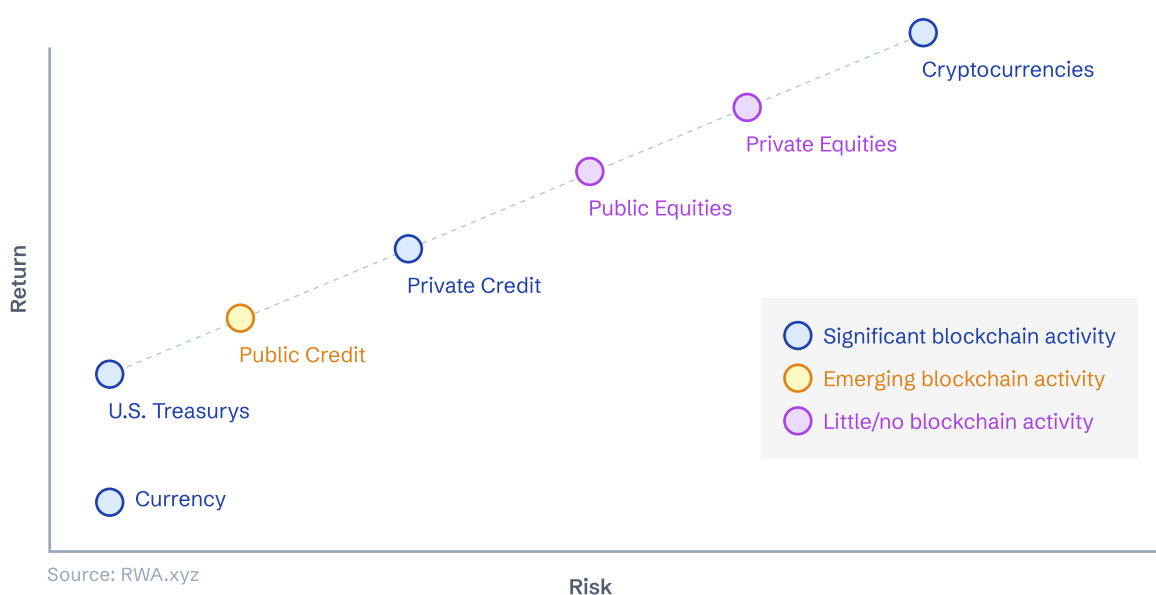
The Birth of a Tokenized Risk Curve

Prior to 2021, assets in cryptomarkets maintained one of two distinct risk-return profiles. At one end of the risk curve, cryptocurrencies offered returns through yield farming, issuing new tokens, and market speculation. On the other side of the risk curve, stablecoins offered capital preservation and a medium of exchange largely at the expense of profit potential. In 2021, tokenized private credit was introduced, filling a gap between these two extremes. The allure: attractive risk-adjusted, non-correlated returns.

Tokenized private credit assets soon became known as “real-world assets” (RWAs). Teams launched to facilitate lending and borrowing activities collateralized by these assets via blockchain and decentralized finance (DeFi).¹ Today, the definition of RWAs has expanded, encompassing a multitude of asset classes.²

What we are witnessing is the emergence of a tokenized investment risk curve, which currently lacks the full range of investable options compared to traditional financial instruments.

Figure 1: The Investment Risk Curve, Adapted for Tokenization



1 Knowingly or unknowingly, these RWA protocols became blockchain-enabled counterparts to fintech lending marketplaces such as Percent and YieldStreet.

2 Paying homage to RWA.xyz’s [The Spectrum of Tokenization](#), we argue RWAs represent any asset which is digitally enabled, but is not digitally native. As such, RWAs would be characterized by financial relationships across ‘Onchain Representation,’ ‘Onchain Integration,’ and ‘Onchain Enforcement’ models of the Spectrum framework.

While RWAs today primarily consist of tokenized representations of currency, money market instruments and private credit assets, we expect all existing asset classes to be tokenized. Further, we anticipate novel assets will emerge resulting from blockchain technology itself.

As a note to onlookers and naysayers alike,³ we offer that tokenization is much less an opportunity than an inevitability. Institutional adoption, regulatory acknowledgment, and heightened media interest signal that tokenization is moving beyond crypto hype. While acknowledging our bias, we maintain that the real-world asset segment of the market contains some of the most loyal contributors across blockchain applications – to that end, we thank you.

Lastly, we encourage our readers to take note of our verbiage, which refrains from industry jargon in favor of terms and phrases we view as accessible for both traditional and crypto-native audiences. For example, as we explore the numerous tokenized asset classes, we refer to stablecoins both in name as well as “currency.” While futile to think we can escape the clutches of crypto’s neverending creativity, we opt to refer to assets as what they truly are; in the case of currency-pegged stablecoins, it is certainly currency.

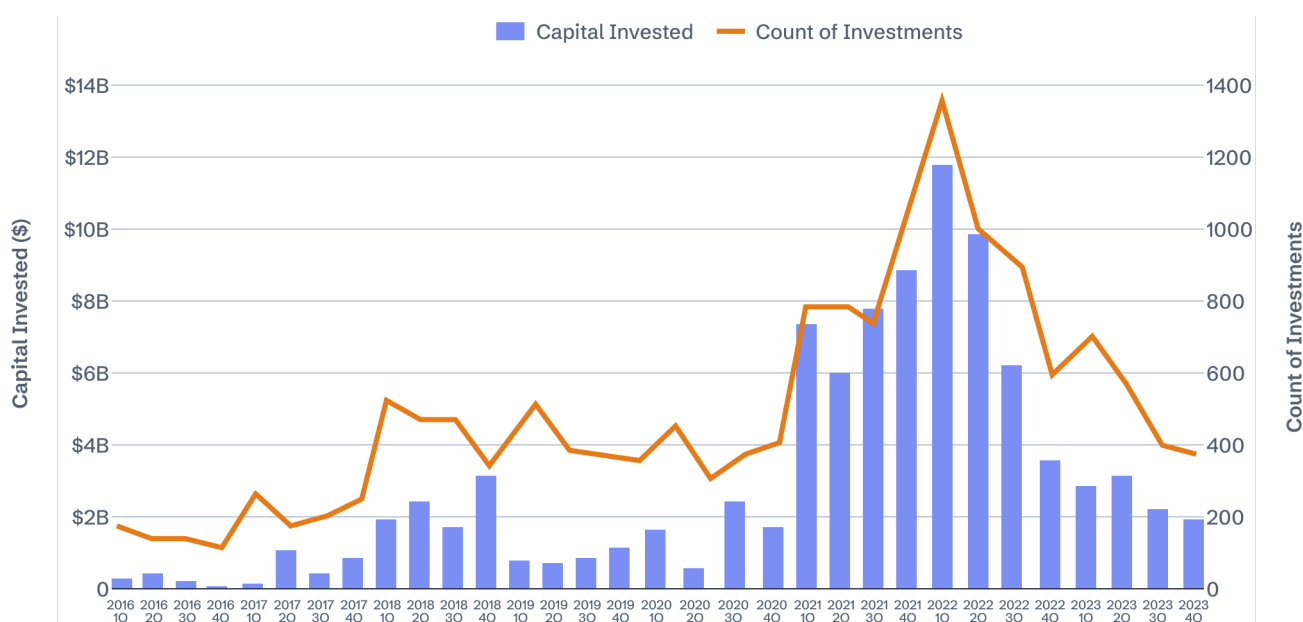
³ We argue that data throughout this piece implies outright naysayers are in decline.

A Challenging Two Years for Crypto & Blockchain Venture Capital

2022 can be characterized by its high-profile crypto blow-ups, including Terra / Luna, Three Arrows Capital (3AC), Celsius, Voyager, BlockFi, and FTX. With the most prolific and most recent being FTX / BlockFi in November 2022, early 2023 felt like a market trough for crypto (e.g., bitcoin (BTC), ether (ETH), stablecoins, etc.) and blockchain (i.e., venture capital, or VC) interest. The data, as we will explore below, appears to reflect as much, with VC investment broadly trailing the downturn in spot crypto performance.

Galaxy Research published [2023: Crypto VC Sees a Bottom](#) on January 11, 2024, which articulates the implications of crypto's fall from grace. In summary, BTC fell from \$48K to \$17K throughout 2022, which has since recovered to \$42K as of December 31, 2023. Meanwhile, blockchain VC funding experienced significant curtailment throughout 2022, falling from a record high of ~\$12B in Q1'2022 to ~\$4B in Q4'2022, and has continued to fall to under \$2B in Q4'2023, representing the lowest quarterly volume since Q4'2020.

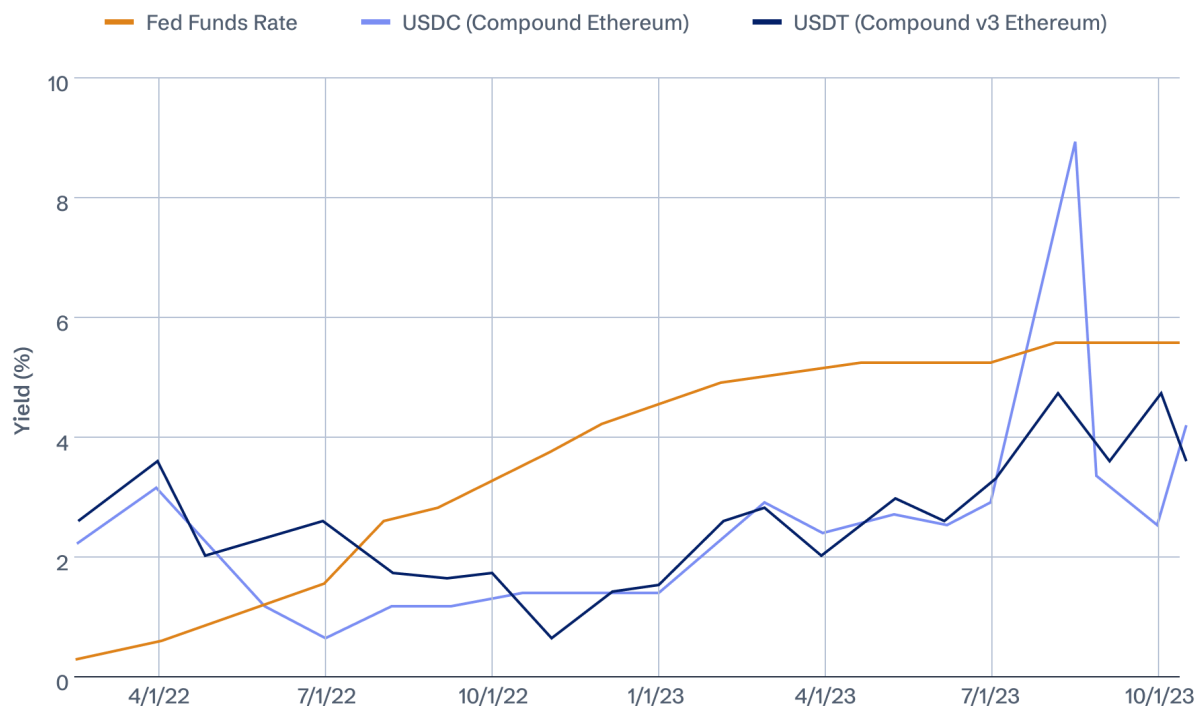
Figure 2: Crypto VC Capital Invested & Bitcoin Price



Source: Pitchbook Data, Inc., CoinMetrics, Galaxy Research

From a macro standpoint, in 2022, the U.S. Federal Reserve began a period of consecutive U.S. Federal Funds rate hikes (a dynamic that perpetuates nearly two years later). This created an interesting dynamic in which U.S. Treasury yields eclipsed those earned by holders of stablecoins across DeFi protocols. **Alongside a broadly depressed crypto market, we view the rate inflection as a key force in driving RWA interest.**

Figure 3: Inflection of Fed Funds Rate Over Crypto Stablecoin Yields



Source: RWA.xyz, DefiLlama

How does this environment impact RWAs in 2024 and beyond?

Throughout the following sections, member firms of the Tokenized Asset Coalition come together to break down the current state of tokenized asset markets. Specifically, we cover seven different asset classes, offering expert perspectives on future trends and developments along the way.

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Market Commentary



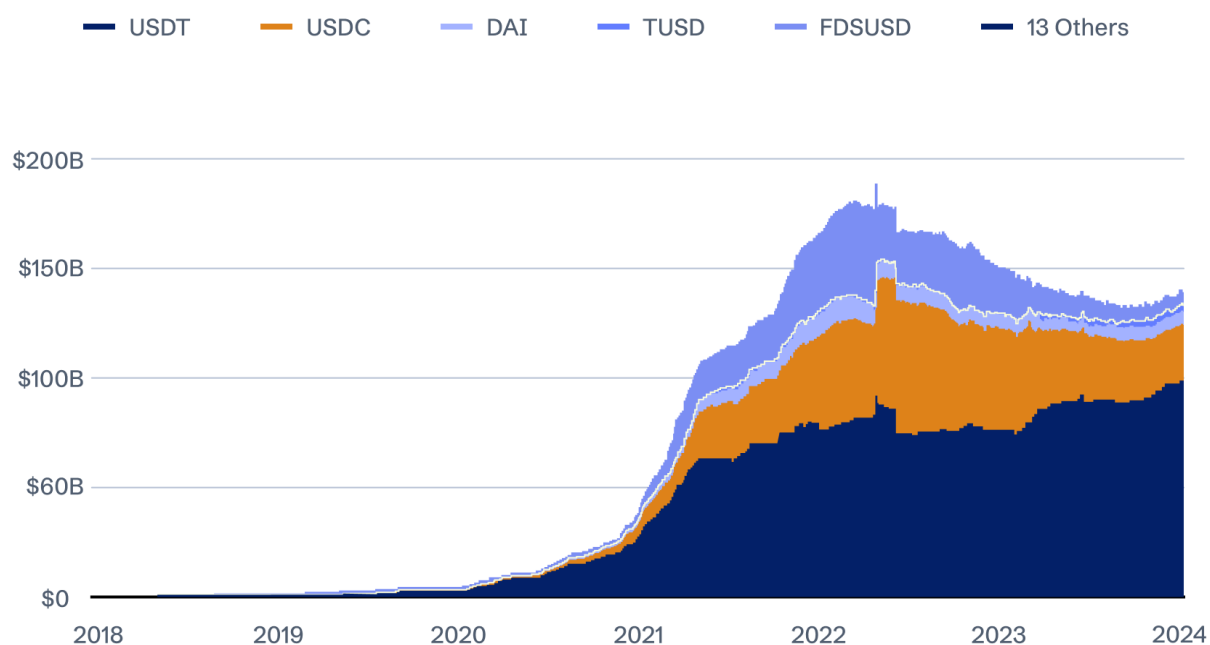
Currency

The silver lining in the RWA space has been stablecoins, which, albeit having come down in total value locked (TVL) over the past two years, were stable relative to crypto and blockchain VC activity. Centralized issuers of U.S. Dollar (USD) pegged stablecoins were particularly resilient to challenging market dynamics.

According to data from [The Block Research](#), 2022 commenced with \$162B of USD-pegged stablecoins, contracting to \$151B by year-end, representing a decline of 7% for the year. The 2022 year-end value of USD-pegged stablecoins was down 17% relative to the all-time high for USD-pegged stablecoins in April 2022 of \$181B.

USD-pegged stablecoins continued to slide throughout 2023, to \$139B by December 31, 2023, representing a decline of 8% on a year-over-year basis, and a decline of 23% relative to the April 2022 all-time high.

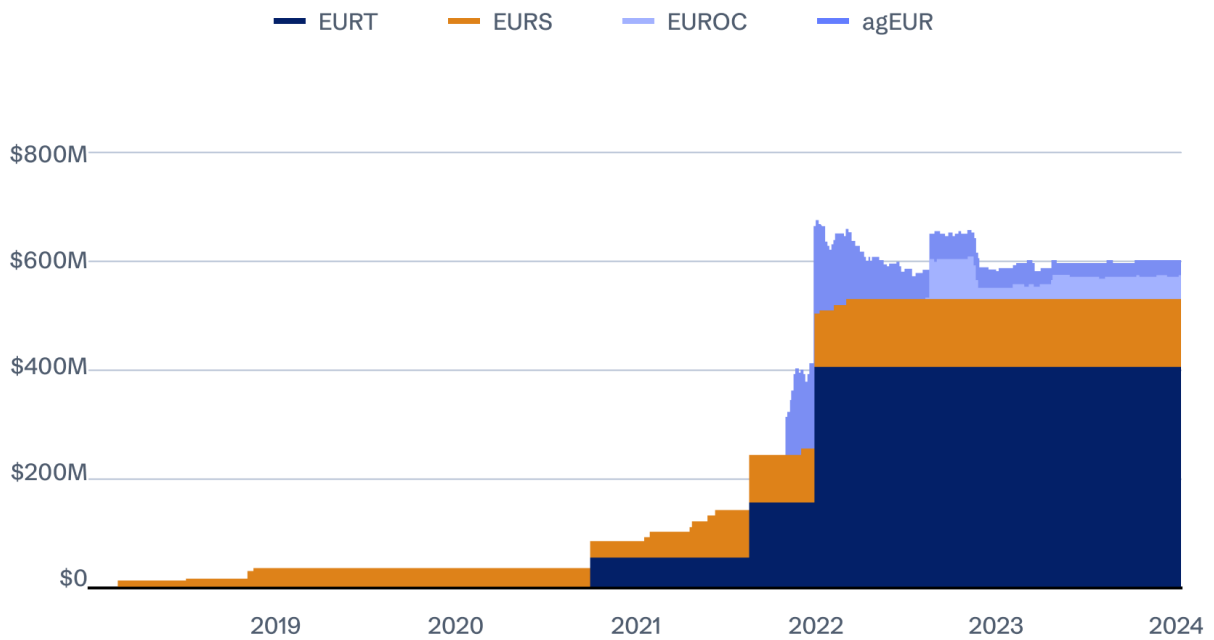
Figure 4: USD-pegged Stablecoin Supply on All Chains



Source: The Block Research

To date, non-USD currencies have yet to attract meaningful scale. Euro (EUR) pegged stablecoins sit at \$600M (versus >\$100B for USD-pegged stablecoins), remaining relatively flat throughout 2023.

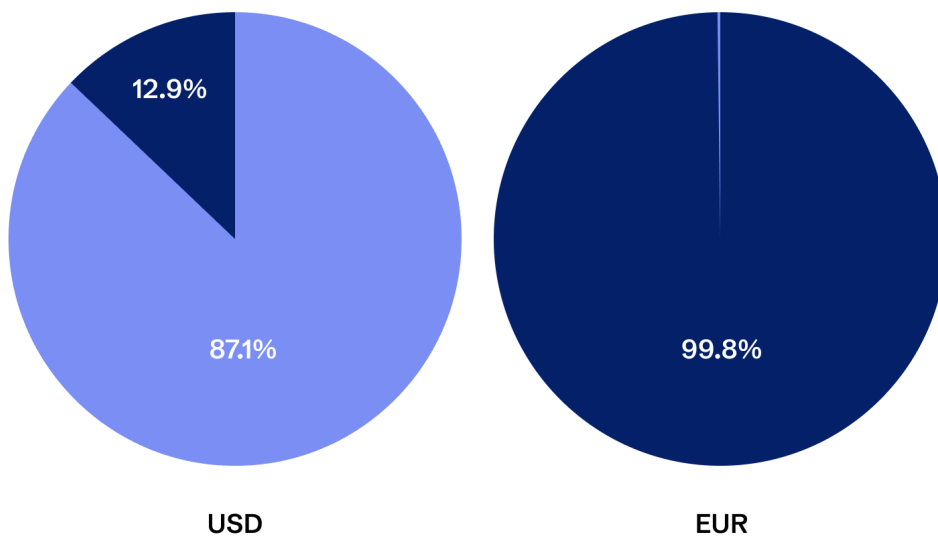
Figure 5: EUR-pegged Stablecoin Supply on Ethereum



Source: The Block Research

The absence of EUR stablecoin trading activity can also be shown in the figure below. When trading in USD pairs, ~87.1% of market participants prefer to use stablecoins. However, when trading in EUR pairs, ~99.8% of market participants are forced to convert back to fiat since there is no prominent EUR stablecoin. Converting from cryptocurrency to fiat involves transaction costs and reduces liquidity access, as most exchanges typically operate with stablecoin trading pairs.

Figure 6: Offramp with Stables or Fiat? USD vs. EUR Offramp Volumes



Source: Kaiko Research

In 2023, [Societe Generale](#), [DWS and Galaxy Digital](#) all launched EUR-pegged stablecoins, seeking to fill the gap and compete for market share in USD-dominated stablecoins markets. **We predict 2024 will be a breakout year for both the Euro and alternative currencies.**

Beyond centralized-issued stablecoins, there has also been notable activity in the decentralized stablecoin space. The MakerDAO treasury, which backs the DAI stablecoin, continued to benefit from its RWA investments. In July, it was reported that 79% of the fee revenue (\$13.5M) was [generated from RWA investments](#) over the past year. Elsewhere, Avara (formerly Aave Companies) [launched its partially-RWA backed \\$GHO stablecoin](#), and Frax [voted to move \\$20M](#) of the collateral backing its stablecoin into U.S. Treasuries.

Expert Perspective #1

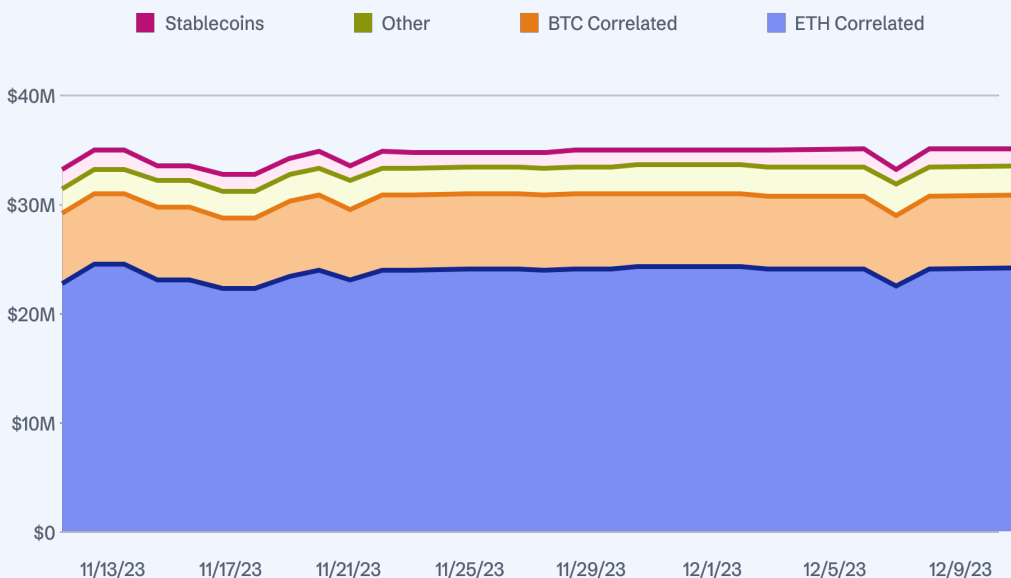
Aave-Native GHO: A Decentralized, Overcollateralized Stablecoin



Stephen Kenny
Avara

Aave Protocol-native stablecoin GHO (pronounced “GO”) launched on Ethereum mainnet in July 2023. Overcollateralized stablecoins like GHO (are backed by excess collateral, which means that the value of the collateral is greater than the value of the outstanding tokens. If collateralized positions drop, a liquidation is triggered to protect GHO from deviating from its peg. This is the key difference between overcollateralized and algorithmic stablecoins, the latter of which are typically under-collateralized.

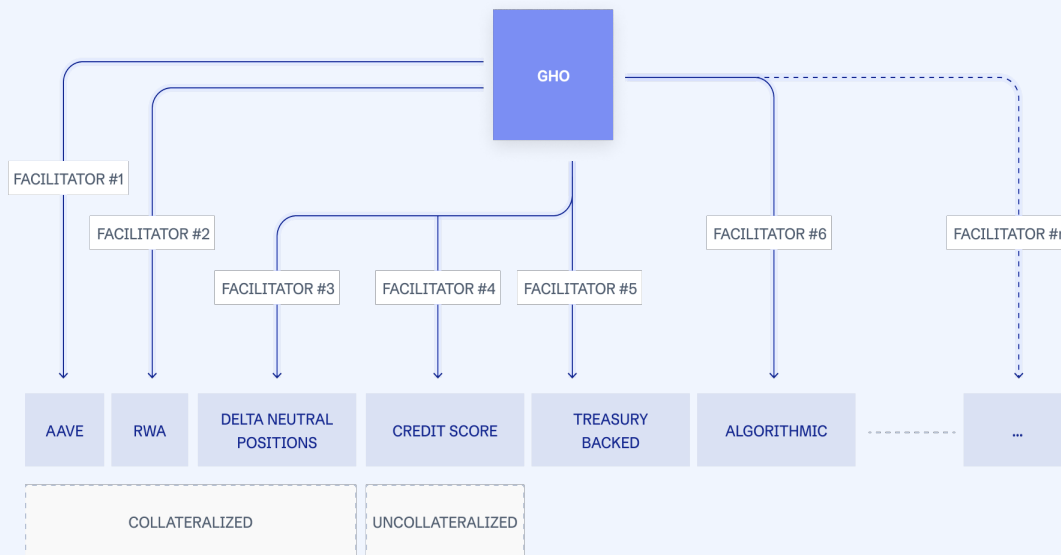
Figure 7: GHO Collateral Breakdown by Category



Source: Aave

GHO is created (“minted”) or liquidated (“burned”) by Facilitators approved by the decentralized autonomous organization (DAO). The first Facilitator of GHO is the Aave v3 Ethereum Pool. As with all borrowing on the Aave Protocol, a user must supply collateral (at a specific collateral ratio determined by the Aave DAO) to enable the minting of GHO. This collateral earns interest for users whilst they borrow. When a user repays their position (or is liquidated), GHO is then returned to the Aave pool, where it is burned.

Figure 8: GHO Facilitator Framework



Source: Aave

GHO’s interest rate is the cornerstone of its stability. GHO smart contracts do not follow the usual supply and demand dynamics that impact the interest rates of other assets within the Aave v3 Ethereum Pool. Rather, interest rates are programmatically set by Aave governance. Other mechanisms for price stability include the ability of GHO borrowers to repay, and liquidate GHO denominated debt at \$1. If GHO starts to trade below peg, borrowers are incentivized to repay their debt, reducing overall supply in the market.

GHO was developed with the same goal as the Aave Protocol: to enable a people-powered financial ecosystem accessible to everyone. In terms of benefits to the Aave ecosystem, 100% of the interest paid on borrows of GHO is sent to the Aave DAO treasury, to strengthen and support ecosystem growth. The implementation of GHO also includes a Discount Strategy mechanism, which allows for Safety Module participants (i.e., stkAAVE holders) to access a discount on the GHO borrow rate.

The Aave DAO is responsible for governing all aspects of GHO, including the control of supply, adjustment of the interest rate and risk parameters, and approval of subsequent Facilitators. Thus far, the DAO has approved a framework for interested parties to apply to be onboarded as GHO Facilitators. Facilitators will be able to apply different strategies to their generation of GHO (see chart below), and will be assigned a bucket that represents the upward limit of GHO that they can generate.

The DAO also recently approved a proposal relating to the implementation of the GHO Stability Module (GSM), drawing inspiration from successful peg stability mechanisms utilized in various stablecoin projects, including Maker's DAI. Peg stability modules are contracts that enable the seamless conversion of two tokens at a predetermined ratio. The GSM builds on this functionality by introducing unique additional features such as:

1. *Pricing strategies* - provide the ability to adjust the pricing ratio between GHO and an exogenous asset, based on different strategies that can be fixed or variable.
2. *Debt ceilings* - limit exposure to specific assets backing GHO through the GSM, giving the DAO the ability to control the maximum exposure to the exogenous asset.
3. *Price bounds and swap freezes* - in case the price of the exogenous asset deviates from the 1:1 ratio, trading can be stopped using price bounds and swap freezes to protect the GHO peg.

Moving forward, the Aave community is focused on the exploration of multi-chain GHO, practical implementation of the GSM to enable conversion of GHO and other widely utilized stablecoins. Additionally, we will work to increase the utility of GHO across decentralized finance (DeFi), such as GHO staking within the Aave Safety Module. These measures should enable governance to increase the supply cap of GHO, which is currently topped at \$35M, to facilitate an increase in the overall circulating supply throughout DeFi and beyond.

As crypto continues to evolve, decentralized stablecoins offer many benefits such as price stability, transparency and censorship resistance. Stablecoins like GHO have the potential to streamline cross-border payments, reduce reliance on traditional banking systems and democratize access to finance. As these benefits become more widely known, we are likely to see greater adoption.

In 2024, decentralized protocols will increasingly collateralize their stablecoins in offchain investments. This could lead to complications settling onchain price stability with less-transparent, less-liquid offchain collateral. We observe new service providers emerging to offer consulting to decentralized protocols with respect to financial and legal matters.

Expert Perspective #2: Asset-Linked Stablecoins: Credible Redemption and Price Stability



Eric Rapp
Next Level Advisors

Asset-linked stablecoins are a key element of onchain finance as they account for over ninety percent of the stablecoin market and the two largest stablecoins, USDC and USDT. The most important feature of a stablecoin is price stability, so the depegging of several asset-linked stablecoins in 2023 has raised serious concerns. We review the USDR depegging and discuss how a credible redemption option (defined below) best prevents an asset linked stablecoin from depegging.

Figure 9: Pricing During USDR Depeg Event



Source: RWA.xyz, Coinmarketcap

We propose the following framework for assessing price stability for asset-linked stablecoins. The stablecoin must be credibly linked to assets that:

- 1 . Fully back the stablecoin on a marked-to-market basis;
- 2 . Are sufficiently liquid to meet large scale redemptions; and
- 3 . Have a clear mechanism for timely redemption.

We define a stablecoin with these three properties as having a Credible Redemption. A failure of any of these three mechanisms can produce price instability.

If a stablecoin has a Credible Redemption, markets quickly arbitrage away price deviations from the peg. Stablecoins lacking Credible Redemptions carry significant risk (Redemption Risk); and their holders are unable to redeem their stablecoins in a timely fashion, requiring that (1) they hold the stablecoin longer than desired and (2) also may incur a capital loss unless they are ultimately redeemed at the price peg.

Redemption failures typically occur when many stablecoin holders attempt to redeem their stablecoins simultaneously (Redemption Run), fearing the stablecoin lacks a Credible Redemption. Stablecoin redemption runs can be caused by rumors, but also can be caused by rational behavior; if the stablecoin lacks a Credible Redemption, early redeemers typically have better recoveries than later redeemers. In this blog, we do not focus on counterparty, structuring, engineering, operational and regulatory risk as they are beyond our current scope.

USDR Example

USDR is a fully backed asset linked stablecoin pegged to USD which is issued by the tangibleDAO. USDR is backed by stablecoins, Other Liquid Assets and illiquid assets (real estate). Other Liquid Assets include TNGBL, a fee sharing token of tangibleDAO, Protocol Liquidity and an insurance fund. USDR is redeemable at will for DAI 1:1: if DAI is unavailable, redeeming users receive promissory DAI until other assets can be converted into DAI to meet redemptions.

USDR displayed price stability through September 2023 and early on October 11th the markets priced the outstanding 70.3M tokens at \$0.997, implicitly assuming a Credible Redemption. The markets, however, appear to have underappreciated USDR's Redemption Risk: its real estate loans were highly illiquid (violating Principle #2) and the Other Liquid Assets were highly correlated with USDR in stressed markets (putting USDR at risk of violating Principle #1) as the Protocol Liquidity was partially backed by USDR and the Insurance Fund held both USDR and TNGBL.

Figure 10: USDR Assets, Liabilities & Market Data

ASSETS (millions \$)	As of 10/11	As of 10/12	Change
Real Estate Loans	34.1	35.9	1.8
DAI*	11.9	0.0	-11.9
Other Liquid Assets*	24.0	32.9	8.9
TOTAL ASSETS	69.9	68.8	-1.1
*provided by tangibleDAO			
LIABILITIES	As of 10/11	As of 10/12	Change
USDR Tokens Outstanding (millions)	70.3	45.6	-24.7
Text			
MARKET DATA	As of 10/11	As of 10/12	Change
USDR Price (\$)	.997	.565	-.432
USDR Capitalization (millions \$)	69.9	31.7	-38.2

Source: Next Level Advisors, RWA.xyz

Large-scale USDR redemptions began early on October 11th, draining all the DAI (\$11.9 million) from the treasury quickly. At this point the remaining holders faced significant Redemption Risk as they could no longer redeem. Some were willing to sell at discounted prices, driving the USDR price into the 50s. By the end of October 11th, 45.6M USDR tokens remained outstanding at a price of \$0.565. USDR prices have remained in the 50s since then implying that the market views USDR to be lacking a Credible Redemption.

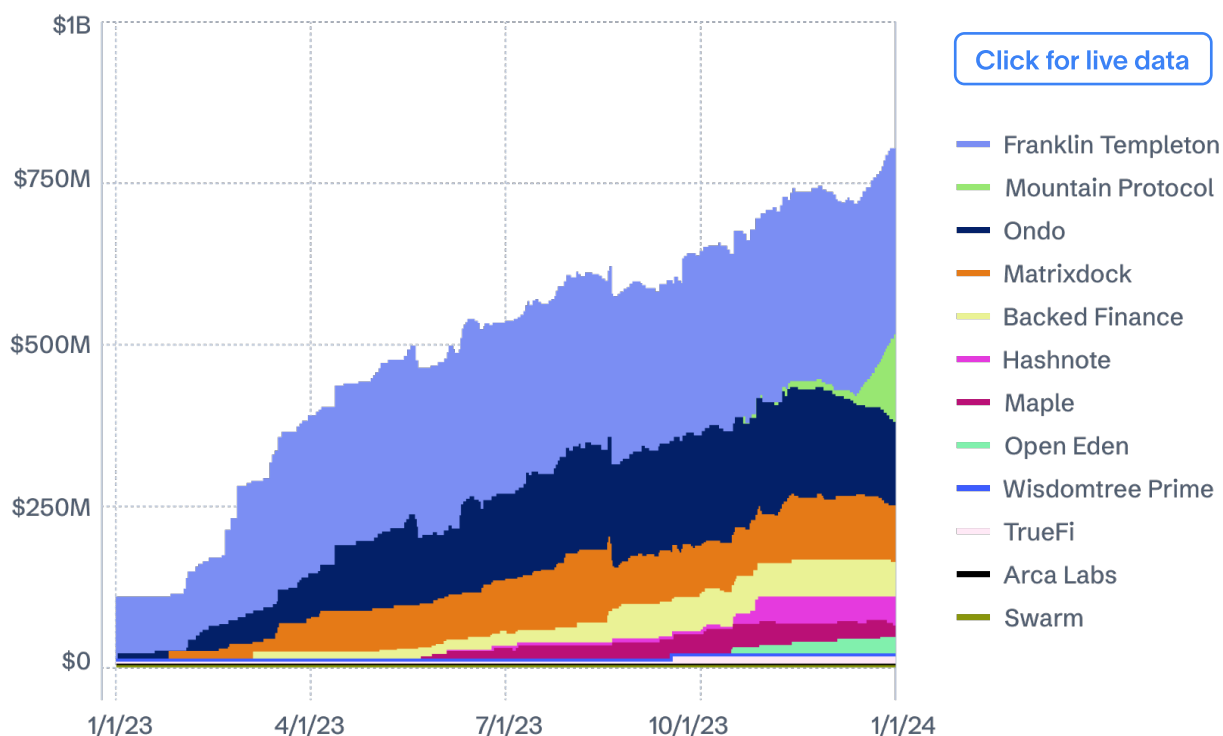
Going forward, investors should carefully evaluate and monitor their stablecoin holdings for Redemption Risk which is best mitigated by the issuer/protocol maintaining a Credible Redemption.

U.S. Treasuries

The prevailing narrative which emerged throughout 2023 is the development of tokenized U.S. Treasury products. While several products technically launched prior to 2023, there was been a flurry of product launches throughout 2023 which offered investors access to U.S. government short-term debt (U.S. Treasuries). RWA.xyz estimates there are in excess of twenty companies (and protocols) offering these products.

As of December 31, 2023, there was in excess of \$831M of capital allocated to tokenized U.S. Treasuries, up from \$114M at the beginning of 2023. In early 2023, virtually all allocations (~90%) to this product were through Franklin Templeton's Benji product, which was first to market with a tokenized U.S. Treasury product. However, Ondo Finance made waves with the issuance of their Ondo Short-Term US Government Bond Fund ([OUSG](#)), which offers investors access to a tokenized version of BlackRock's iShares Short Treasury Bond ETF ([NASDAQ: SHV](#)). OUSG has accumulated in excess of \$138M in assets under management as of December 31st, 2023, representing the market leader from the crypto-native issuers.

Figure 11: Tokenized U.S. Treasuries Product Market Caps



Source: RWA.xyz

The U.S. Federal Reserve's Federal Funds Rate increases throughout 2022 - 2023 were a key contributor to the uptick in tokenized U.S. Treasuries interest. These rate increases, paired with the collapse of outsized yields in crypto (across centralized finance, DeFi, and staking), has made the global-standard risk-free rate (i.e., the U.S. Treasuries) an attractive "low-risk" alternative for crypto holders.⁴

While covered in-depth in RWA.xyz's [An Allocator's Guide to Tokenized Treasuries](#), it is worth noting that each of the tokenized U.S. Treasuries products are differentiated and thus warrant investor consideration of fees, legal structure, eligibility, security and user friendliness, amongst other attributes.

No project has yet to crack the code of a "freely tradable" or otherwise "permissionless" solution for tokenized U.S. Treasuries to mimic the success of USD-pegged stablecoin issuers. This is almost certainly the next frontier, with players including [Mountain Protocol](#) attacking this space for non-U.S. investors - holders of USDM, marketed as a stablecoin, earn yield generated by the token's underlying asset base (i.e., U.S. Treasuries).⁵

For the avoidance of doubt, the obvious "market opportunity" for developers of transferable U.S. Treasuries-backed tokens is the \$139B of USD-pegged stablecoins in circulation as of December 31, 2023.⁶ From a customer perspective, this is logical: holders would benefit from earning yield that is presently retained by centralized issuers and their partners.

The unit economics for issuers of these emerging products are much less favorable than those earned by incumbent stablecoin issuers. First, passing along yield to token holders reduces the issuer's profit margin. Secondly, the robust number of teams pursuing this opportunity suggests there is a high degree of competition and relatively low barriers-to-entry. Thirdly, the investor universe for this product is largely unproven, with the only proven scaled buyer in DeFi being MakerDAO. Lastly, the opportunity has significant exposure to macro conditions, resulting in the relative attractiveness of the U.S. Treasuries products being contingent on the U.S. Federal Reserve's maintenance of the current rate environment.

⁴ We caution using "low risk" in the context of tokenized investment products. While U.S. Treasuries represent the global risk-free rate, providing crypto investors access to the asset class introduces novel, and potentially significant, risks.

⁵ Prohibiting wallet holders in specific jurisdictions from accessing a "permissionless" product challenges my interpretation of the word itself, but we digress.

⁶ It is worth noting there is also a growing market for Euro (EUR) pegged stablecoins, though we focus on USD-pegged stablecoins due to the uptick in interest for tokenized U.S. Treasuries products.

Expert Perspective #3

Tokenized Treasuries: The Unexpected Heroes of Decentralized Finance



Sid Powell

Maple Finance

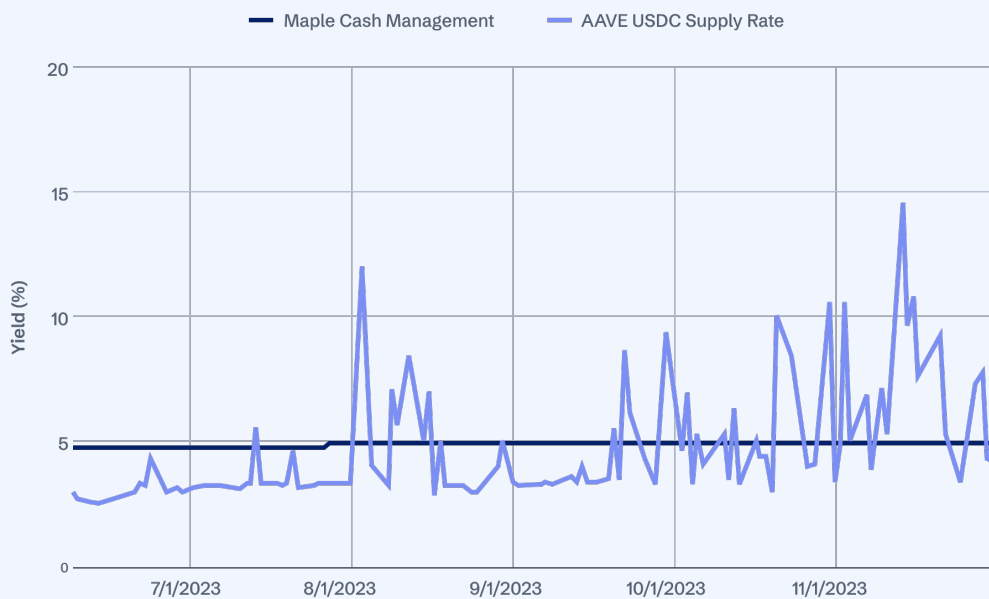
The Rise of Tokenized Treasuries

Spurred by an unforeseen leap in Treasury Bill yields from negligible to a striking 5% in the year 2022, digital Treasuries have emerged as critical players in a market increasingly circumspect of risk. Tokenized Treasury products were launched by Maple, Centrifuge, Backed, Ondo and TrueFi in 2023. Each of these platforms already operated in DeFi but moved to capitalize on the market trend. Tokenized Treasuries offer lucrative yield opportunities where traditional stablecoins remain yieldless, and DeFi yields weren't considered high enough on a risk-adjusted basis. This financial innovation gained momentum against the backdrop of Operation Chokepoint 2.0, which cut off access to essential financial services for crypto startups. Concurrently, the unexpected collapse of Silicon Valley Bank in March 2023 cast doubt over traditional banking's risk management capabilities. By the end of December 2023, Tokenized Treasuries had surged from a modest balance of \$280M to an astonishing \$831M.

Crypto Real Yields

In the dynamic world of decentralized finance, the dance between tokenized Treasuries and the fluctuating yields of DeFi platforms like Aave, Compound, or Maker is a study in contrasts. Crypto real yields have the potential for higher returns, yet with this comes volatility. While DeFi yields like those from Aave, Compound, or Maker periodically eclipsed those of tokenized Treasuries, they often fell short in consistency. The appeal of tokenized Treasuries lies not just in their lower volatility but in their robustness against counterparty risk, a quality highly prized by DAOs and startups in managing their treasuries.

Figure 12: Tokenized Treasury vs. Stablecoin APR Comparison



Source: RWA.xyz, Coinmarketcap

DAO Treasury Management and Tokenization

DAOs are increasingly turning to tokenized Treasuries, not as a one-size-fits-all solution but as part of a mosaic of financial strategies. The decision matrix for DAOs is complex, factoring in not only the potential returns but also the operational intricacies of minting and redemption fees, particularly pertinent for longer time horizons, but also liquidity risk and counterparty credit.

In examining the finer details of DAO treasury management, it's crucial to understand the diversity in product structures and underlying assets. Tokenized Treasuries like Maple Cash and Ondo USDY are structured as collateralized loans, whereas Ondo OUSG and OpenEden adopt fund-based structures. Backed, on the other hand, functions as a structured note.

Regarding underlying assets, while Maple Cash primarily allocates to U.S. Treasury Bills, Ondo USDY and Ondo OUSG engage in overnight reverse repurchase agreements and bank deposits, respectively. OpenEden and Backed diversify by including U.S. Treasury Bills and ETFs such as BlackRock's SHV and IB01, tracking U.S. Treasury portfolios. This variety in structures and assets highlights the adaptability and range of strategies.

Conclusion

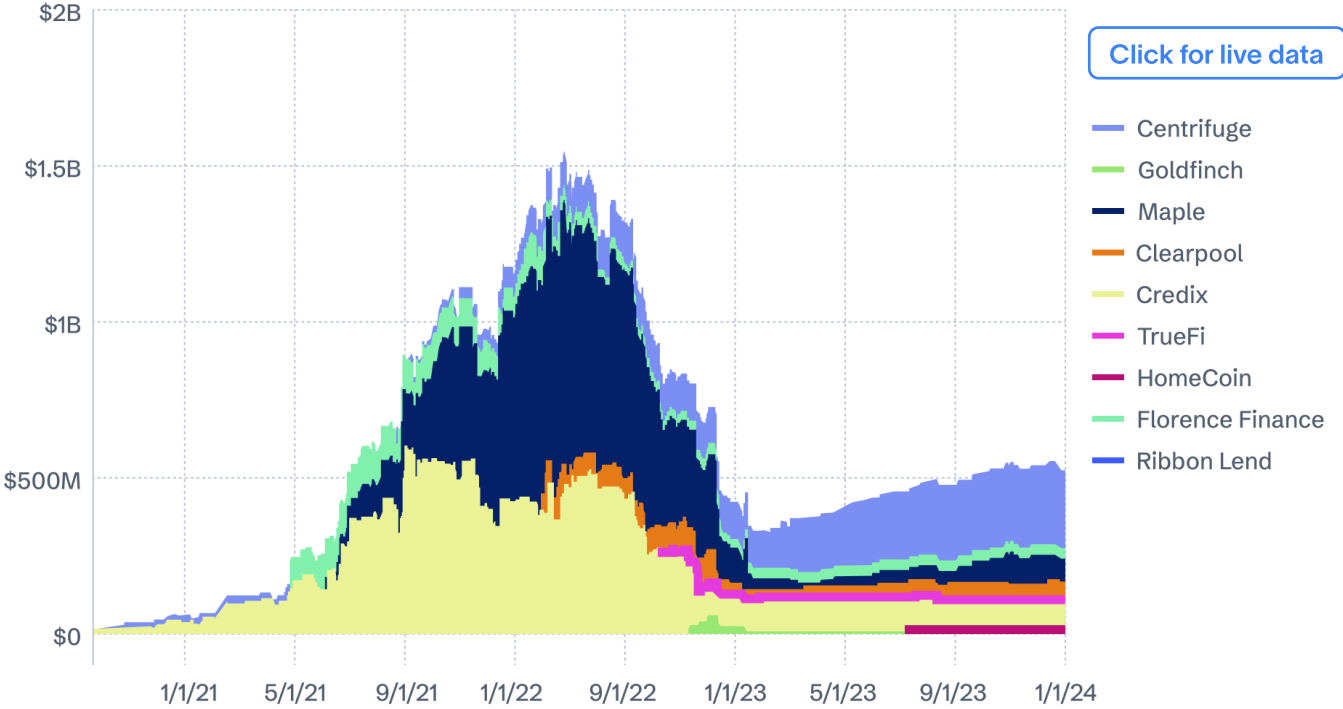
Tokenized Treasuries represent a significant milestone in the evolution of decentralized finance, offering a blend of stability, security, and efficiency that is reshaping the way digital assets are managed. The strategic use of tokenized Treasuries by DAOs indicates a shift towards more sophisticated and risk-aware financial management practices in the blockchain realm. As we look to the future, tokenized Treasuries are poised to play a pivotal role in strengthening businesses and ensuring the sustainable growth of decentralized finance.

Private Credit

Volumes

Across protocols tracked by RWA.xyz, tokenized private credit peaked at \$1.5B in 2022, falling to \$256M at the outset of 2023. As of December 31, 2023, the market recovered to \$485M, representing an 89% increase in TVL since January 1, 2023.

Figure 13: Tokenized Private Credit Assets Under Management

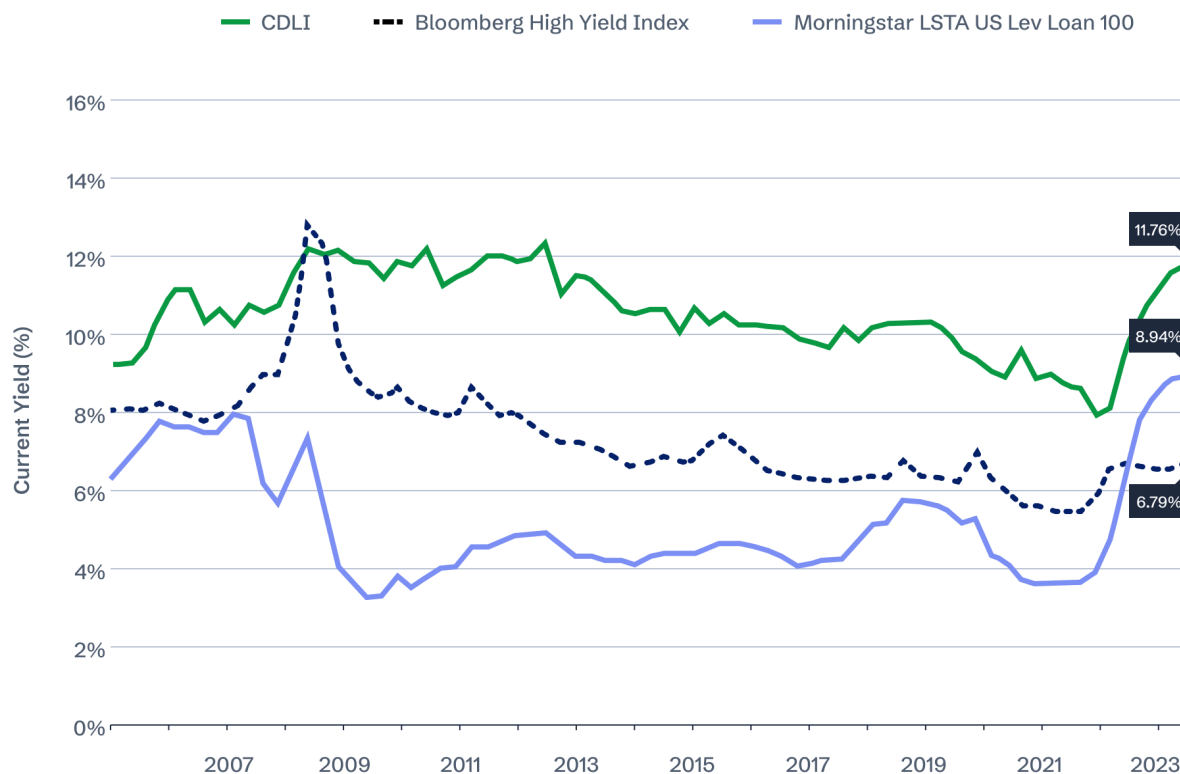


Source: RWA.xyz

Interest Rates

The current yield (i.e., the weighted average interest rate earned by investors, before deducting fees and expenses) of active loans in the tokenized private credit space is 9.6% as of December 2023. By comparison, the current yield on the [Cliffwater Direct Lending Index \(CDLI\)](#), the [Morningstar LSTA US Leveraged Loan 100 Index](#), and the [Bloomberg High Yield Bond Index](#) equaled 11.76%, 8.94%, and 6.79%, respectively, as of Q3'2023.

Figure 14: Yield Comparisons by Common Private Credit Benchmark Indices



Source: Cliffwater

Private credit marketplace comparables not enabled by blockchain technology (e.g., [Yieldstreet](#) and [Percent](#)) do not publish current yield metrics. Yieldstreet, however, does disclose an annualized net yield (i.e., the current yield, less fees and expenses paid by investors) of 8.2% for its private credit segment as of Q1’2023.

Non-Performing Loans

While 2022 was the year of defaults for CeFi lenders and market making shops, 2023 stressed the importance of effective underwriting, structuring, and monitoring alternative private credit transactions.

We count 22 unique loans that registered at least one missed payment during calendar year 2023, relative to 538 active loans as of December 31, 2023. This is a conservative estimate of the number of defaulted loans across tokenized private credit throughout the year, as borrowers can be in default on a credit agreement for reasons aside from missing a payment to its lender(s) (e.g., for failing to provide lender(s) with mutually agreed-upon information on a periodic basis).

The [Proskauer Q3'2023 Private Credit Default Index](#), which includes 990 active loans representing \$146.7B in original principal amount as of Q3'2023, calculates defaults on the basis of “U.S. dollar denominated senior secured and unitranche loans. Default rates are calculated on the last day of the quarter by dividing the number of defaulted loans by the aggregate number of loans in the [analysis].” For borrowers with less than \$25M in earnings before interest, taxes, depreciation and amortization (EBITDA), an EBITDA threshold which we believe is greater than the vast majority of RWA borrowers, Q1'2023 - Q3'2023 quarterly default rate were 2.0%, 2.1%, and 0.7%, respectively.

While a far cry from a perfect comparison (e.g., unique deal structures, collateral sources, seniority, geography, etc.), we believe highlighting tokenized private credit performance relative to key fixed income indices, offchain credit marketplaces, and private credit default rates is a helpful starting point for an analysis of relative risk and return

Expert Perspective #4

Letting Degens Play in Private Credit



Johnny Reinsch

Tradable.xyz

Degens are a critical part of the crypto ecosystem. They iterate quickly, poke holes, battle test protocols, and also make the mundane super fun. Drawing inspiration from the degen playbook, I propose a direction for the near-term evolution of tokenized private credit during its infancy.

Historically, private credit deals from leading managers offer the best risk-adjusted returns. It seems only natural to marry these high-quality assets with the efficiency gains tokenization affords. Yet, according to RWA.xyz as of December 2023, the total value of tokenized private credit assets onchain was approximately \$500M. Even when considering a few billion worth of deals from Figure MBS securitizations, we're merely scratching the surface compared to the estimated \$1.7T in private credit assets. Also a tiny drop in the bucket compared to the global crypto market cap of over \$1.6T as of December 2023.

We've witnessed significant strides in protocols that reduce origination costs — Figure's MBS securitization is exemplary — as well as in structuring deals (Maple, Centrifuge) and making debt accessible to emerging markets (Goldfinch, Credix, Jia). JPM's Onyx has also demonstrated vast efficiency gains in collateral settlements.

These are monumental applications of technology, yet the holy grail of adoption lies not just in improving below the line efficiency, but in enabling revenue expansion for asset holders.

Build for today's crypto users... the degens

Degens are the workhorses of crypto experimentation and innovation. They are not mere investors; they are pioneers of a new financial frontier, employing complex strategies for yield maximization. They keep crypto relevant and entertaining during bear markets and are the tip of the spear for testing out new projects. Accordingly, the most tantalizing near-term prospect within onchain private credit lies in meeting crypto where it is and catering to the degens.

Consider, for instance, granting a trader a position in a private credit RWA they can lever up. They could increase the absolute return on the base RWA position by repeatedly reinvesting loan proceeds or, alternatively, pursue something even more speculative, maximizing absolute returns based on a yield farming strategy. Seeing their behavior, watching what breaks, what they exploit etc. would be an absolute trove of information.

Let's get even more imaginative and allow memecoin enthusiasts to gamify this strategy. Picture a memecoin named SHARPE, an L2-based token with no inherent value, airdropped to wallet holders of prominent RWA protocols monthly. The SHARPE leaderboard would track the best returning wallet strategies for positions underpinned by private credit RWAs. Each airdrop would spark a flurry of cross platform engagement, where discussions on maximizing leverage, reducing fees, and evolving algo trading strategies flourish. \$SHARPE becomes the trophy case for degens transitioning from speculation to risk-adjusted multi-asset trading strategies.

I'd bet the broader cryptoverse of degens would come up with even more interesting things. Throw RWAs into the sandbox, let degens play, and see what castles they create.

Noncompliance is lava

While catering to degens is crucial, we must not overlook the imperative of strict compliance to maintain high asset quality and scale. To attract institutional-grade issuers, the onchain experience must be fully compliant. Traditional degens may resist KYC and disregard securities laws and while valuable to DeFi's experimentation, they might be left behind. While this likely presents near term challenges given "compliant DeFi" is a tough Venn diagram, anyone that can wed degens and RWAs will be rewarded handsomely.

I believe balancing investment opportunity, innovative experimentation, and degen-like fun can sustain onchain private credit during its infancy. Whether through memecoins or enabling audacious yield farming strategies, we can make onchain private credit more engaging than its real-world counterpart without sacrificing regulatory compliance. Ultimately, my bet is the degens would discover the strategies supporting the next leg of adoption.

Digital Bonds & Institutional Activity

Over the past year, a flurry of headlines have depicted how various institutions are experimenting with tokenized deposits, central bank digital currencies (CBDCs), sovereign debt, and more.

Expert Perspective #5

Institutional Products, Pilots Signal Growing Interest



Morgan Krupetsky

Ava Labs

This Time Is Different

Heading into 2023, the macro backdrop for the crypto industry was bleak. And yet, behind the scenes, major traditional finance (TradFi) firms continued executing on their blockchain and digital asset strategies. This time felt different from past cycles. Unlike in previous years...

- enterprise grade infrastructure became more prevalent;
- increasing rates globally combined with diminished DeFi yields and growing adoption of non-yield bearing stablecoins put a focus on bringing “real-world assets” or “real yield” on chain;
- Wall Street executives finally bought into the tech, touting tokenization as the next generation for markets; and
- continued maturation of DeFi showed how tokenized assets could have novel utility.

Ultimately, this year’s institutional efforts signified a collective endeavor in growing onchain finance (OnFi) - or, using blockchain + tokenization + smart contract logic to upgrade legacy infrastructure, institutional workflows, and global finance.

Thematically, these efforts fell into three general categories: (1) tokenization of cash and cash equivalents, (2) tokenization of alternative assets, and (3) native onchain asset issuance.

Tokenization of Cash & Cash Equivalents

Overall, tokenized cash initiatives focused on CBDCs (e.g., HKMA’s [Project mBridge](#), BIS’ [Project Mariana](#)), tokenized deposits (e.g., from [ANZ](#) and [Citi](#)), and enterprise stablecoins (e.g., PayPal’s [PYUSD](#)) for a range of use cases, including cross-border transactions and currency conversions, remittances, peer-to-peer transfers, and tokenized asset payments. Meanwhile, both crypto native teams (like [Backed](#), [Ondo](#), and [Maple](#)) and TradFi incumbents (like [Franklin Templeton](#), [WisdomTree](#), and [Abrdn](#)) propagated tokenized US money market funds and Treasury bills as a means of reserve diversification, yield generation, collateral utility, and even B2B payments.

Tokenization of Alternative Assets

The thesis in focusing on tokenized alternatives, or alts, has been twofold: (1) alts have marked a massively growing asset class over the years and are generally the least standardized and most operationally intensive to administer, and therefore stand to benefit most from this technology; and (2) at the same time, the growing mass affluent and accredited investor markets in the US and abroad are underallocated to alts.

This year saw several institutionally led tokenized alts endeavors. Global investment manager [Hamilton Lane](#) leveraged Securitize to offer expanded private equity and credit opportunities through tokenized feeder funds. Further, [Apollo Global and J.P. Morgan](#) debuted a blockchain-based pilot platform under the Monetary Authority of Singapore's Project Guardian demonstrating the possibility of including tokenized alts alongside liquid assets in discretionary client portfolios en masse—a possible \$400B revenue opportunity for alternative fund managers and distributors. Also under Project Guardian, UK-based asset manager [Schroders](#) and global funds network Calastone explored the capabilities of tokenized investment vehicles to improve client portfolio personalization, allocation, and operational processing.

Native Onchain Asset Issuance

Rather than tokens representing digital twins of offchain asset or fund ownership, assets natively issued on a blockchain introduce the possibility of recognizing legal ownership and other rights, benefits, and obligations in the token itself.

Bringing issuance onchain has the potential to automate historically manual and siloed components of the process, including the coordination or removal of certain third-party intermediaries and service providers. A recent [HKMA report](#) suggests, “[Tokenised bond issuance benefits] from reductions in underwriting fees by an average of 0.22 percentage point (ppt) of the bond's par value and in borrowing costs by an average of 0.78 ppt compared to similar conventional bonds issued by the same issuers.” To that end, realizing a [lower cost of capital and administrative fees](#) becomes a compelling value proposition for companies considering blockchain-native issuance.

2023 was punctuated by notable institutional examples. The European Investment Bank leveraged [Goldman Sachs's DAP](#) to issue a 100M EUR, two-year digital bond and [HSBC's Orion](#) to issue a 50M British Pound Sterling (GBP), three-year floating-rate note. Germany-based technology company [Siemens](#) issued a 60M EUR, one-year bond—particularly notable given it was sold directly to investors. Finally, but not exhaustively, [UBS, SBI and DBS](#) completed the first cross-border repo with a natively-issued digital bond.

So What?

Undoubtedly, various blockers preclude immediate and broad based institutional adoption and commercialization. These vary from technological challenges related to interoperability to regulatory challenges related to lack of clarity and jurisdictional standardization.

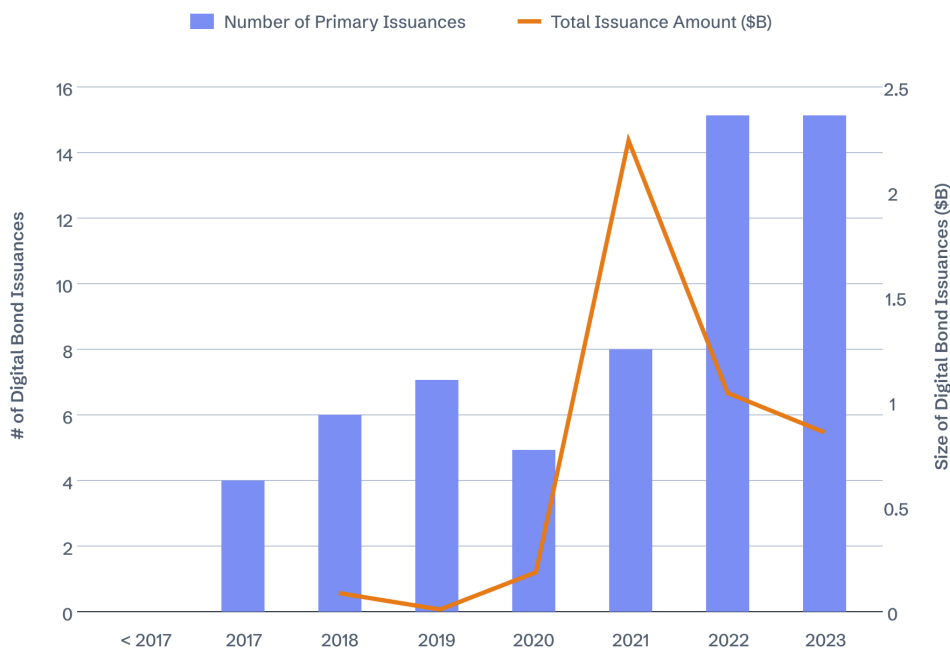
But the industry is moving forward. **And while ten years, five years, or even one year seem like a lifetime among crypto-native communities, rearchitecting legacy infrastructure and institutional workflows will take time. Consider, it took [25+ years for U.S.-listed ETFs to hit \\$4 trillion in AUM and global bond ETF AUM to hit \\$1 trillion.](#)**

Looking ahead, pay attention to financial institutions taking a business-first approach to their blockchain efforts—those solving for real pain points or building new blockchain-enabled products and services. These teams tend to be integrated with and have buy-in from their relevant in-business stakeholders and are focused on bringing tangible utility and value to their clients and financial services at large.

Considering that the majority of these initiatives have been conducted on private, permissioned blockchains,⁷ the true scale and characteristics of these tokenization efforts are relatively unknown. However, recent data from the [International Capital Market Association](#) (ICMA) and the [Hong Kong Monetary Authority](#) (HKMA) provide some insights into the growing institutional interest in tokenization.

Since 2017, there have been over 60 primary digital bond issuances totaling over \$3.9B. The number of digital bond issuances has grown YoY. Data on total issuance amounts was last updated in March of 2023. However, at the time, it was on pace to surpass the highs witnessed in 2021.

Figure 15: Primary Digital Bond Issuances⁸



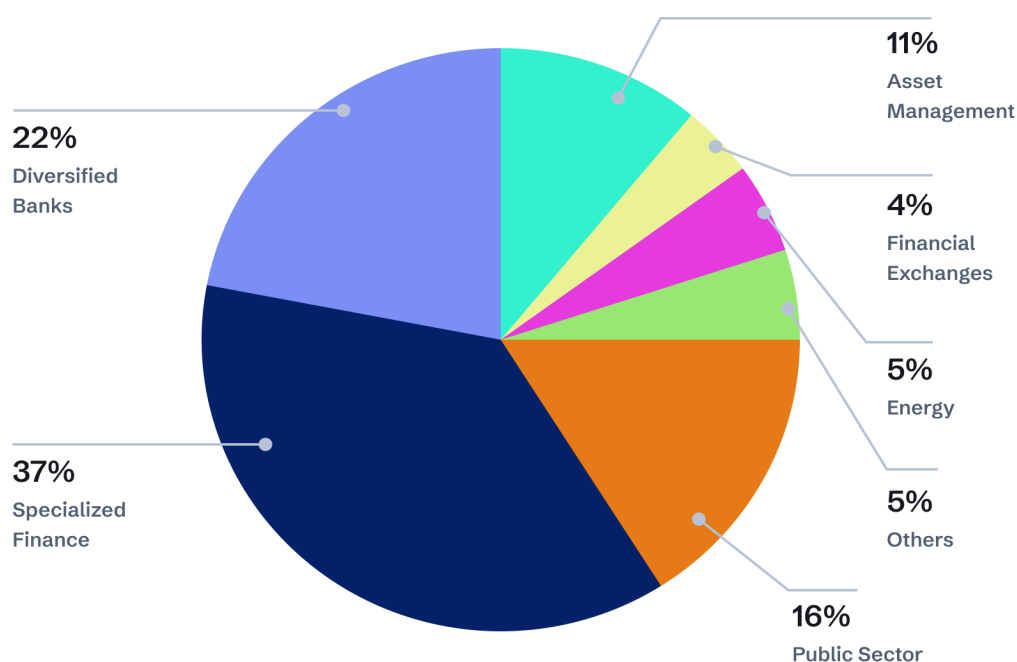
Source: RWA.xyz, HKMA, ICMA

⁷ Discussed further in Expert Perspective #6: Tokenization, redux by Anthony, Bassili from Coinbase

⁸ Total issuance amount data is only up to March 2023

The largest share of total digital bond issuances were issued by traditional financial institutions (Specialized Finance, Diversified Banks, Asset Management, Financial Exchange arms). Trailing financial institutions were public sector issuers. Non-financial institutions' accounted for only around 10% of total issuance. The size of these issuances justifies that corporate and public digital bonds have been the asset class of choice for institutional tokenization. This stands in contrast to more DeFi-oriented tokenization protocols, which have largely focused on the private credit sector.

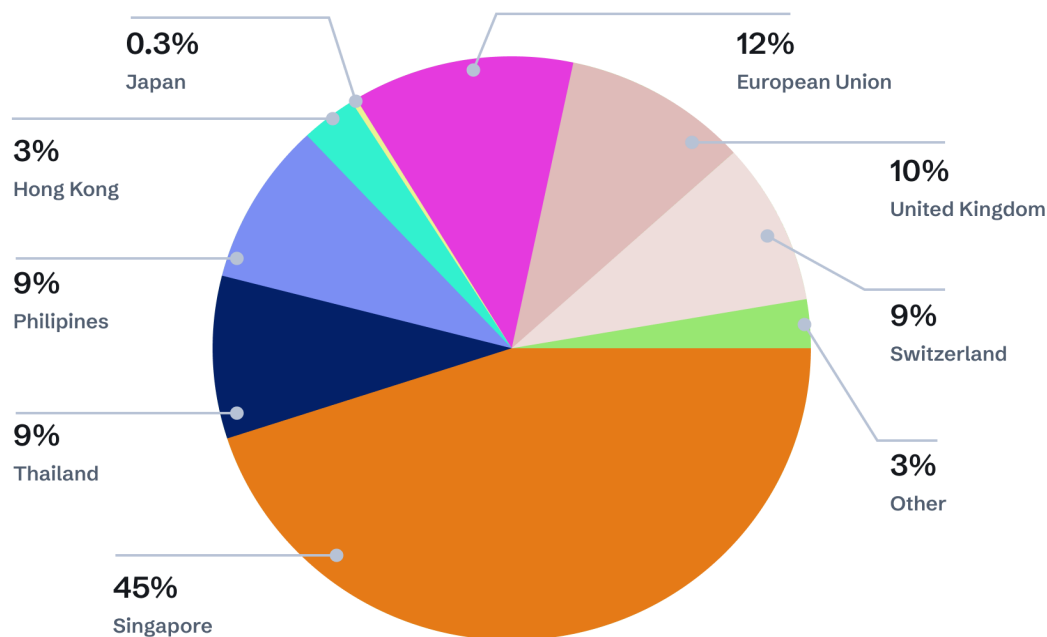
Figure 16: Share of Digital Bond Issuance in Terms of Issuance Amount



Source: HKMA, ICMA

When analyzing the geographic distribution of digital bond issuance, a [majority](#) (around 70%) were issued by Asian institutions, while European issuers accounted for most of the rest.

Figure 17: Share of Digital Bond Issuance in Terms of Issuance Amount by Issuer Domicile

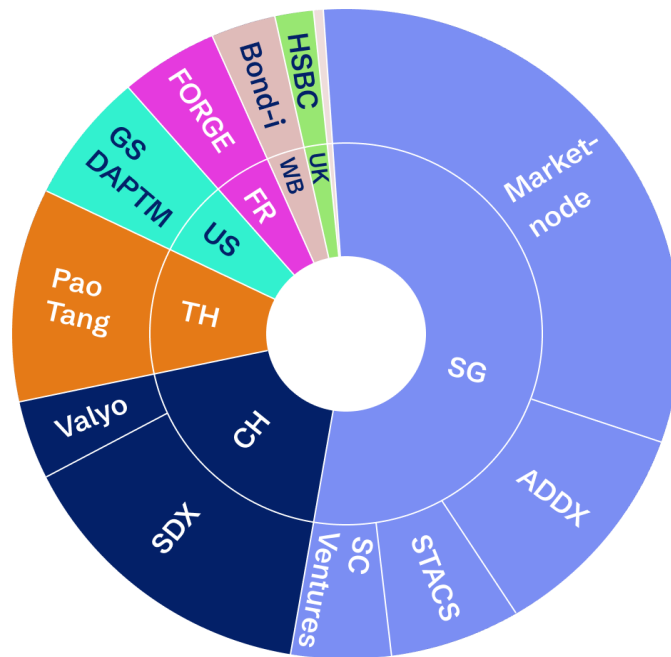


Source: HKMA, ICMA

Digital platforms for bond tokenization have also [emerged](#) in Asia and Europe in recent years with many of them backed by traditional financial institutions.

As highlighted by the HKMA, “the footprint of financial exchanges is widely seen in these digital platforms. For instance, Singapore Exchange Group is one of the [co-owners](#) of Marketnode and [financed ADDX](#) in a series A round in early 2021. ADDX also received investment from the [Stock Exchange of Thailand](#) in a series B round in 2022. Japan Exchange Group also embraced the trend by [investing in Nomura-affiliated Boostry](#) in early 2023. In addition, some banks have also launched their own digital platforms.”

Figure 18: Share of Digital Bonds by Digital Platform and Domicile⁹



Source: HKMA, ICMA

Expert Perspective #6 Tokenization, Redux



Anthony Bassili
Coinbase Institutional

Tokens are the next financial “share class” and allowing them to operate on global, permissionless, public ledgers will be paramount to their success. Benefits of utilizing a tokenized share class are as nuanced as they are many, but we expect the validation to become louder as more market participants integrate the tech stack and begin using tokenized assets in their daily workflows. For example, the current high yield environment makes the capital efficiency offered by tokenization much more relevant than it was even two years ago. That is, for institutions, tying up capital for even a few days in higher interest rate environments is much costlier than doing so in lower rate environments. We expect tokenization will dramatically change the spectrum of liquidity, composability, and cost of managing risk across traditional assets.

Over the course of 2023, we witnessed dozens of new entrants on public permissionless networks begin to offer access to tokenized US Treasury exposure directly onchain. We have also seen a dramatic rise in the number of new companies building new primitives in the RWA space. In 2024, we expect to see tokenization expand to other market instruments including equities, private funds, insurance, and carbon credits, given the client demand for higher yielding products and the need for diversified sources of return.

⁹ The outer circle denotes the digital platforms in our sample and the inner circle denotes where they are based. SG stands for Singapore; CH stands for Switzerland; TH stands for Thailand; US stands for the United States; FR stands for France; WB stands for the World Bank; and UK stands for the United Kingdom.

Over time, we believe that even more business and financial sectors will incorporate aspects of tokenization, though **regulatory ambiguity and the complexities of managing different jurisdictions continue to pose significant challenges for market participants - alongside the integration of new technologies into legacy processes.** These challenges have kept most of the largest regulated institutional players on the sidelines or forced to rely on private blockchains. While private blockchains may continue to grow alongside public permissionless chains, this can potentially fragment liquidity due to interoperability hurdles, which would make it harder to realize the full benefits of tokenization for a sound and robust financial system.

An important theme to watch around tokenization is the regulatory progress being made in jurisdictions like Singapore, the EU, and the UK. The Monetary Authority of Singapore has sponsored “Project Guardian” which has produced dozens of proof-of-concept tokenized projects on public and private blockchains from tier 1 global financial institutions. The EU DLT Pilot regime has developed a framework for enabling multilateral trading facilities to utilize a blockchain for both trade execution and settlement, rather than through a Central Securities Depository. The UK has also launched a pilot regime seeking an even more advanced framework for issuing tokenized assets on public networks. We are encouraged by the progress and forward thinking by our international regulators and certainly expect to see more friendly competition as jurisdictions position themselves on the chess board.

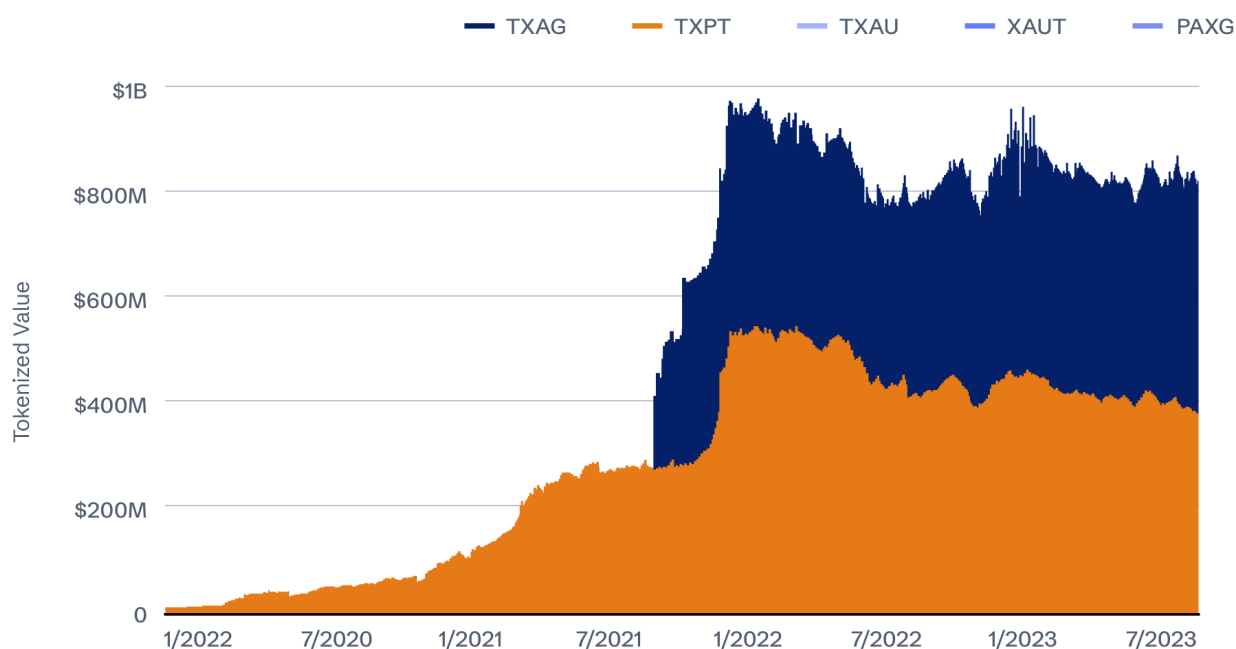
Tokenization is ready to move past “proof-of-concepts” and into commercialization. What’s at stake are billions of dollars of fees saved, fees earned, more transparency into the financial system, democratization of investment options to many who have never had access, and possibly most importantly, accountability for the institutions and regulators that oversee them.

Other Areas of Interest

Commodities

Across protocols tracked, tokenized commodities peaked at \$1.2B in 2022, at a time when the focus was on rising inflation and upward trajectory of interest rates. As of December 31, 2023, the tokenized commodity market leveled off at approximately \$956M, representing a 1.4% increase in TVL since the beginning of the year.

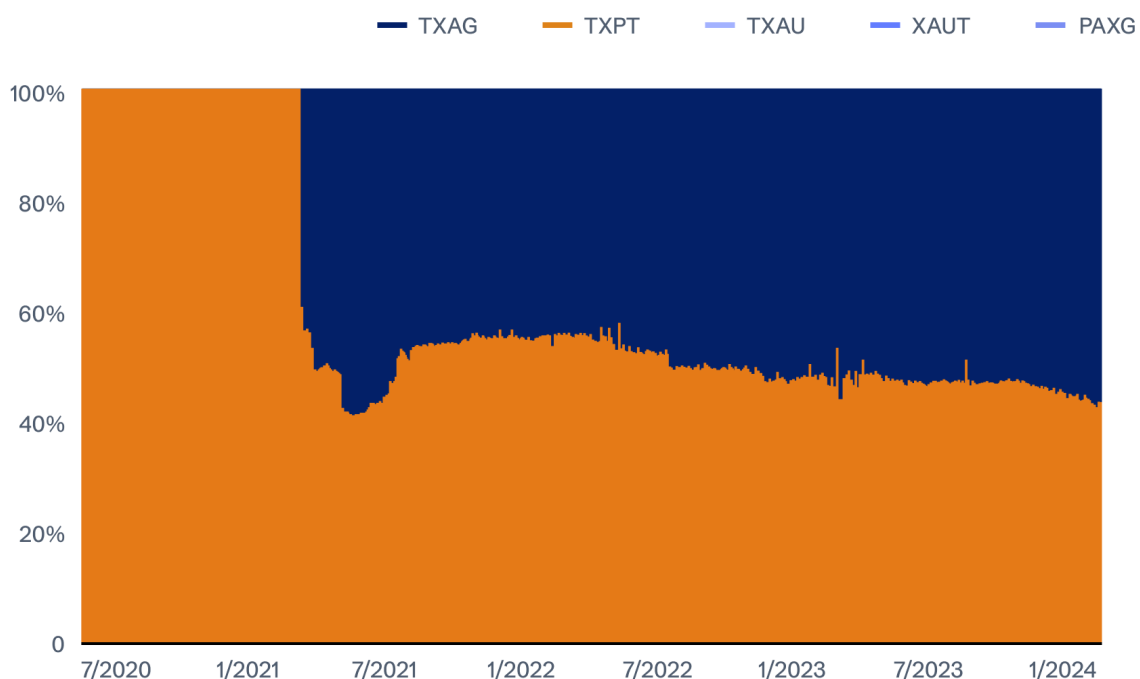
Figure 19: TVL of Tokenized Commodities



Source: 21Shares

To date, tokenized commodities have primarily consisted of gold. On public blockchains, there are five tokenized commodity products with tangible AUM, with three exclusively focused on gold. Paxos and Tether are the issuers of the most notable tokenized gold (and commodities more broadly), accounting for \$942M in market capitalization and around 99% of total market share.

Figure 20: Market Share of Tokenized Commodities



Source: 21shares

With regard to private blockchain activity, institutions have similarly focused on tokenizing physical gold reserves. In November 2023, HSBC [announced](#) the first trades of gold tokens, where the physical gold was stored in HSBC’s London vault.

While insignificant in scale, we note there have been instances in which institutions have explored tokenizing other commodities throughout 2023, such as Visa announcing the [tokenization of agricultural products](#).

Real Estate

Throughout 2022 and 2023, the real estate sector has been targeted as being ripe for improvement via blockchain; however, we have observed varied levels of success over this period.

On public blockchains, real estate-backed stablecoins from Tangible and Homecoin suffered liquidity-driven de-pegs, whilst protocols, such as RoofStock and RealT, have continued to add new residential properties to their tokenized offerings.

In November 2023, it was [announced](#) that Figure Technologies is working with Goldman Sachs, J.P. Morgan, and Jefferies Financial Group on an initial public offering (IPO) for its lending arm. Figure maintains a digital asset arm, which uses a blockchain-based backend to originate Homeowners Lines of Credit (HELOCs). In 2022, Figure Technologies was the United States' [top non-bank HELOC originator](#), originating over \$1.6B in HELOC volume over the year. Figure's HELOC product inception-to-date origination volume represented \$5.3B as of April 2023, according to DBRS Morningstar.

Elsewhere in 2023, top exchanges and banks issued tokenized real estate products including a [Deutsche Boerse affiliate](#), [Moscow Exchange](#), and [Mitsui & Co. Digital Management](#).

Carbon Credits

Infrastructure and markets related to tokenized carbon credits received significant attention in 2023.

On public blockchains, Toucan, Flowcarbon, Thallo, Earthchain, and Bitgreen [partnered](#) with Gold Standard, one of the largest carbon credits registries, to explore the tokenization of its registered assets.

Beyond public blockchain protocols, Nasdaq [launched](#) smart contract tech supporting credit issuance, settlement, and custody. Northern Trust unveiled a distributed ledger technology (DLT) platform to connect institutions directly with carbon credit products, and the InterWork Alliance, including firms like Accenture, Chainlink, Microsoft, and others, began collaborating to [create](#) a standard for tokenized assets.

03

The Road Ahead & Concluding Thoughts



The Road Ahead

While tokenized asset markets have shown some signs of maturation, there remain unanswered questions that must be addressed to fully realize digitized markets. How will regulations develop to accommodate tokenized assets? What types of infrastructure are required to enable efficient access to these markets? Do existing supply and demand dynamics support capital formation?

Expert Perspective #7

Bringing Crypto to the World with Improved Wallet UX



Carter Appleton
Goldfinch Protocol

Many individuals and organizations are exploring the tokenization of RWAs, yet there's an equally important track of work developing: onboarding the world to crypto.

Accessing crypto networks has traditionally been a high-touch, technical process. Newcomers have to learn novel concepts, decide which wallet to use, and learn how to back everything up before catastrophe strikes. Modern hardware wallets, generally considered one of the safest ways to store private keys, are still challenging to use and understand.

Two key aspects have to change to bring crypto to the world: First, wallets need to be easy to acquire and use. Second, assets need to be protected and recoverable. Almost two years ago, Apple and Google inadvertently solved the first issue: they put a hardware wallet in everyone's pocket. All modern smartphones now support Passkeys, which are secure signing mechanisms built directly into the phone. Passkeys can sign messages just like a crypto hardware wallet. However, unlike hardware wallets, they are:

1. Deeply integrated into iOS and Android ecosystems, and therefore available to everyone with a smartphone
2. Associated with Apple and Google accounts; they are recoverable if you lose your device or switch to a new one
3. Tied to specific websites, so you can't accidentally be phished. Every interaction is only allowed with the website or app associated with the Passkey.

With Amazon, PayPal, and Microsoft adopting Passkeys, the technology is rapidly becoming the new standard for securely signing into services. Now, everyone with a smartphone has a recoverable and secure hardware wallet – the only issue being that often can't submit crypto transactions!

Most blockchains only support a single type of signature – one that Passkeys don't currently implement. Luckily, another new development emerged over the past year to solve this: Account Abstraction.

Account Abstraction distinguishes between the concepts of signers and accounts. With this, accounts are managed onchain by owner-controlled, upgradeable code. Signers, like Passkeys or hardware wallets, are still offchain and act as the keys to the account. The account itself holds all tokens and interacts with smart contracts on the Signer's behalf. These accounts are just code on the blockchain, allowing anyone to write extensions and expand the capabilities of abstract accounts.

One critical extension being researched is how to support Passkey signing. This allows anyone with a smartphone to sign a transaction with a Passkey, pass it to a relay to send onchain, and then have their Abstract Account verify the Passkey signature to perform the transaction. Another extension enables social recovery for abstract accounts. Even if the account's Signer is lost, social recovery can help recover the account, just like keeping a spare key with friends.

All of this infrastructure is still in its infancy, but is evolving quickly. Early adopters like [Farcaster](#) (a decentralized social media protocol) and [Heron Finance](#) (an onchain robo-advisor built on the Goldfinch protocol), are already rolling out this seamless experience to customers.

The continued adoption of Passkeys and Account Abstraction will provide compounding benefits to consumers and help bring crypto to the world.

Expert Perspective #8: Matching Supply and Demand



Colin Cunningham
Tokenized Asset Coalition

On the heels of 2023's momentum, there are three "institutional" buckets that will improve substantially in 2024 and begin to close the gap between the onchain and offchain worlds:

1. Investors
2. Infrastructure
3. Investments

The institutional investor increasingly will have a reason to participate in tokenized assets. Despite having the existing infrastructure, operations, and their pick of the entire breadth of offchain investments - the efficiency gains of investing into tokenized assets is improving rapidly, while the utility and leverage on tokenized assets continues to show some meaningful initial traction. As the crypto native investors continue to experiment with different investment theses, leveraging tokenized assets in their trades, the institutional investor will quietly but consistently wait, watch, and learn. Couple this activity with an election year in the US, and falling rates, the appetite and interest to experiment could improve within the institutional ranks.

The onchain infrastructure of today is being proven out time and time again from the JPM / Apollo paper, to the Bain paper, to the Hong Kong Monetary Authority Paper citing economic benefits and the benefits to wealth management.

The infrastructure efficiencies are being proven, and as more blockchains, DAO treasuries, and other large sources of crypto-native capital continue to allocate to RWAs, the infrastructure will continue to move more money, manage more assets, and provide greater security and certainty of execution - closing the risk premium between onchain and offchain investments.

With tokenized US Treasuries available now and scaling onchain, the baseline has been set. That has enabled the crypto native set to become more comfortable with tokenized assets as a class, and has helped the vision of tokenized assets be more broadly understood and relatable. technology and the decentralized services available via the nascent and rapidly growing onchain financial ecosystem.

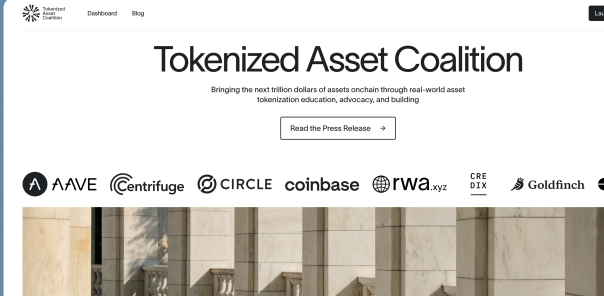
As with the adoption of any disruptive technology, growing pains are expected. However, obstacles and uncertainty seem to be diminishing with each additional year.

In 2024, we expect to see continued adoption of tokenized asset markets. Stablecoins will evolve to represent a greater breadth of assets. U.S. Treasury products will find even greater product market fit. Asset managers will further explore tokenized private credit as a means of accessing alternative sources of liquidity. Digital bonds will increasingly be used by financial institutions and governments alike to explore new issuance mechanisms.

The TAC will continue to support the adoption of tokenized asset markets with collaborative innovation, deep research, advocacy, and discourse. With the recent addition of 15 new member firms, the TAC is one step closer to dramatically altering the way capital is formed, invested and managed onchain, paving the way for a more open, fair and transparent system for investors.

Resources

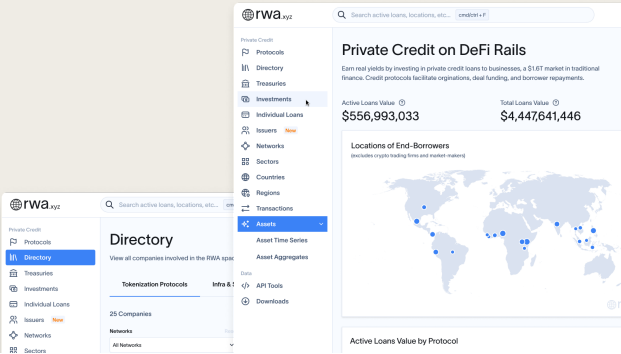
Bringing the next trillion dollars of assets onchain through real-world asset tokenization education, advocacy, and building



The Tokenized Asset Coalition mission lives at the intersection of traditional and crypto finance.

[Read the Press Release](#)

Institutions, asset managers, and researchers, use the [RWA.xyz](https://rwa.xyz) Platform to analyze tokenized assets.



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