DigiFT RESEARCH

HASHKEY Capital

Real World Assets Tokenization, The Next Generation of Capital Markets

December 2023

Recommendation From Industry Leaders

"*The report provides a comprehensive overview of the Real-World Assets / tokenization sector, with insightful deep dives into the technical architectures of major protocols. This will serve as an invaluable guide to navigating the rapidly evolving RWA space, both the opportunities and challenges that lie ahead.*"

Annabelle Huang

Managing Partner

Amber Group

"*While many in the industry are cognizant of the vast potential that tokenized assets hold, we remain in the early stages of broad adoption, facing considerable challenges ahead. DigiFT's research offers a comprehensive analysis of both the industry and regulatory environments, shedding light on critical aspects such as KYC/AML compliance, selling restrictions, asset ownership and investor rights. This insight is crucial for navigating the evolving landscape of digital assets.*"

Joseph Goh

Investor

Superscrypt

"*Real-World Assets (RWAs) represent an evolutionary leap in decentralized finance (DeFi), introducing a novel suite of fundamental primitives. The DigiFT research paper on RWAs offers an in-depth analysis of the dynamic and flourishing RWA marketplace.*"

Sébastien Derivaux

Co-founder and Partner

Steakhouse Financial

"*DigiFT is a rising leader in the RWA space and their report provides an excellent review of the key themes and players. The RWA sector and its associated regulations are in their infancy, so each RWA protocol has a unique approach to the structure of and customers for its products. The report's deep dive on individual protocol structures is the level of detail needed to get a true picture of a small-but-heterogenous sector. The regulatory and first-mover challenges to launch RWA products are short term, but the benefits of on-chain assets relative to traditional finance hold incredible promise long term. The report balances these views, recognizing the innovative models already available, while charting the incremental progress that will be needed for RWAs to redefine how finance works. DigiFT working hand-in-hand with the MAS and the team's depth of knowledge evidenced by the report has me excited for the role they will play in RWA space. There are few players tackling a massive addressable, so a collaborative approach to the sector is important for its success – I hope us at Goldfinch find a way to work together with DigiFT as we build a new financial reality.*"

Aaron Collett

Contributor

Goldfinch

Authors' Foreword

RWA is more than an asset sector, it's the bridge that connects the traditional financial world and the crypto world. For the traditional world, the old systems left by decades have space for tremendous efficiency improvements; for the crypto world, the current trillion-dollar market size is just the beginning. Besides native assets, there are too many types of assets to explore, and there is still a huge amount of funds staying in the traditional world, waiting for explorers from the crypto world.

RWA holds great potential but requires time to mature. There's a long way to go in terms of technology, business, and regulatory aspects. As a prominent participant, DigiFT has obtained a capital market services license from the Monetary Authority of Singapore and accreditation as an approved market operator, marking an important milestone in the RWA race. As the first exchange on a public blockchain to conduct secondary trading using the AMM mechanism, DigiFT will continue to delve deeper into the intersection of finance and blockchain technology, unlocking a vast market for the tokenization of real-world assets. Through responsible innovation, we aim to establish the next generation of capital markets.

Ryan Chen

Head of Research and Innovation, DigiFT

The RWA market, currently dominated by institutional investors and concentrated in US Treasury bill-related products, has immense potential, with a projected market capitalization in the trillions of dollars. While DeFi protocols are making inroads, primarily in fixed-income products, the report offers comprehensive insights into RWA structures, infrastructure, benefits, regulatory landscape, and key participants. Despite the current focus on fixed-income products, evolving legal frameworks could pave the way for a more diverse range of RWA assets, shaping the future of capital markets. Kudos to DigiFT for pioneering the regulated RWA DEX space and contributing valuable insights to the crypto community through reports like this.

Henrique Centieiro

Senior Research Manager, HashKey Capital

About DigiFT

DigiFT is the first regulated exchange for on-chain real-world assets, approved as a Recognised Market Operator with a Capital Markets Services license by the Monetary Authority of Singapore. DigiFT allows asset owners to issue blockchain-based security tokens and investors can trade with continuous liquidity via an AMM.

Established in Singapore in 2021, DigiFT is fully committed to meeting regulatory requirements to operate in the capital markets space in Singapore, while providing innovative financial solutions that push the boundaries of financial services in a responsible manner.

DigiFT's founding team comprises executives who have held positions within the finance and fintech worlds at Citi, Standard Chartered, Morgan Stanley, Shenzhen Stock Exchange and possess deep blockchain technology knowledge, having successfully developed digital asset exchange and products in the past.

Twitter: https://twitter.com/digifttech

Telegram: https://t.me/digifttech

Website: https://digift.sg

LinkedIn: https://linkedin.com/company/digift-tech

About HashKey Capital

Global in influence and crypto-native, HashKey Capital is a digital asset and blockchain leader helping institutions, founders and talents advance the blockchain industries. As one of the largest crypto funds and the earliest institutional investor in Ethereum, HashKey Capital has managed over US$1 billion in client assets since its inception, with over 500 investments in infrastructure, tools, and applications. With our deep knowledge across the blockchain ecosystem, HashKey Capital has built a robust network connecting founders, investors, developers, and regulators.

Twitter: https://twitter.com/HashKey_Capital

Website: https://hashkey.capital/

Linkedin: https://www.linkedin.com/company/hashkeycapital/

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Table of Contents

1. Key Takeaways

- **Limited market size but big potential:** The current market size of Real World Assets (RWA) is small compared to traditional financial markets. The potential market cap of RWA could potentially reach tens of trillions of dollars in the next five years, driven by efficiency and cost advantage of blockchain technologies.

- **Supply side - Fixed income products dominance, the rise of US Treasury bill-related products and the fall of private credit products:** According to data from RWA.xyz and Dune.com, the Total Value Locked (TVL) for major RWAs is concentrated in US treasury bill-related products. It has grown rapidly from $100 million at the beginning of 2023 to the current total value of 784 million during the crypto winter. The TVL in private credit products has declined from its peak of $1.5 billion in mid-2022 to just $500 million currently, mainly due to the collapse of FTX, 3AC and Luna-UST.

- **Demand side - Institution dominance, mainly for short-term treasury management and asset diversification:** By analysing the wallet addresses holding the US treasury bill-related products, we can observe that the primary holders are institutional investors. Currently, the demand for RWAs is mainly concentrated on the short-term treasury management needs for crypto companies or DAOs. Besides, DeFi protocols, such as stablecoin protocols and lending protocols, introduce RWAs to achieve collateral diversification and reduce the overall system risk.

- **RWA regulation complexity:** RWA encounters diverse regulatory landscapes worldwide. The US enforces strict laws with global reach. In contrast, Switzerland, Singapore, and Hong Kong SAR are showing active support, giving more friendly regulation environment for asset tokenization.

- **Innovative models unlock RWA access in DeFi**: Using innovative business models such as lending and token wrapping enables RWA integration into DeFi. But challenges such as AML compliance, sales restrictions, and unresolved asset ownership issues are still not addressed. The adoption of RWA will lead to a more regulatory-compliant way of DeFi.

- **Outlook:** In the short to medium term, the RWA market will be primarily dominated by fixed-income products due to the lack of stable income products in the crypto market, and the demand for risk diversification. In the medium to long term, as the market's understanding of compliant assets deepens and relevant legal framework becomes more robust, we will see a more diverse range of RWA assets, and potentially we can see the next generation of capital markets powered by token and blockchain technologies.

2. Foreword: Crypto-Native And Real-World Assets

The emergence of the concept of "real-world assets", much like the concept of "stablecoin", is a metaphor introduced in the development of blockchain-based crypto assets. **It is not intended to be groundbreaking but rather serves as a way for people with diverse backgrounds and experiences to intuitively understand new phenomena using imagination and symbolism, without the need for extensive background knowledge and context.** In the process of technological innovation, metaphors are a means of communicating management, where individuals consciously or unconsciously create metaphors to initiate communication between explicit and implicit knowledge.

Tangible assets existing in the physical world such as real estate and gold cannot exist in electronic form unlike the current widely used electronic system. To embed them into electronic systems, there are corresponding issuers for tangible assets. For electronic systems, these types of physical, tangible assets also fall under the category of real-world assets. However, their existence is already commonplace, and are not perceived as a particularly novel concept.

The "real-world assets" discussed in the crypto world are, in fact, assets for which tokenized ownership is legally recognized, allowing token holders to have legal ownership of the underlying assets. These "real-world assets" include tokenized equities, bonds, real estate, and other assets that exist outside the crypto world. The categories of "real-world assets" are quite diverse, and there are various implementation methods. If we want to define "real world assets", the simplest way is to define "crypto-native assets" and thus distinguish between these two types of assets.

	Crypto-native Assets	Real-world Assets RWA
Issuance Model	Directly issued on-chain, with related operations and business on-chain. Token economic model aligned with on-chain activities	First issued in real-world, re-issued on-chain by third-party institutions; or actual business and revenue generated off-chain, with on-chain token issuance facilitated by third-party institutions
Ownership	Smart contract	Centralized institutions and legal docs
Example	Bitcoin. Ethereum. DeFi Token. Meme Coin.	Tokenized Government Bonds, Tokenized Stocks, Tokenized Real Estate
Source of Income	Smart Contract-Based Businesses, Such as DEX Trading and Decentralized Lending	Off-chain business

From a technical perspective, "real-world assets" are essentially existing asset types mapped to the blockchain through technological and legal means to enjoy the efficiency and cost-effectiveness offered by the new financial technology.

If the new technology indeed brings breakthrough efficiency improvements, cost reductions, and can solve other related issues without fatal flaws, then this new technology will eventually be adopted. **The medium of financial transactions has evolved from paper-based documents on the counters of the New York Stock Exchange a century ago to today's widely adopted electronic trading systems. Hence, it is highly likely that the trading of financial assets will move towards tokenization through blockchain technology.**

Before bridging the gap between the virtual and the real, the crypto world and the real world were disconnected. Therefore, the concept of "RWA" (Real-World Assets), as a metaphor to facilitate mutual understanding between these two worlds, has been widely discussed.

This research report will concentrate on a crucial aspect of Real-World Assets (RWA), both currently and foreseeably in the future: financial products, with a particular emphasis on securities. It aims to provide an in-depth analysis of the existing on-chain capital markets and to delve into the potential developments of future capital markets.

The concept of RWAs acts as a pivotal transitional phase, bridging native crypto assets with the integration of real-world elements into the realm of cryptocurrency. In this evolving landscape, blockchain emerges as a groundbreaking technological infrastructure, yet the fundamental principles of finance remain constant.

3. Introduction: What Are RWAs And How Do They Work

Cryptocurrency native assets are mostly implemented through smart contracts, and their operational logic and business models are executed through code in smart contracts, example including blockchains and DeFi protocols. In comparison, real world assets (RWA) are more complex and diverse. RWAs can encompass any type of asset, as long as their business and revenue do not originate from on-chain assets. For example, items like wine, cars, traditional financial securities, and precious metals can all be classified as RWAs.

Cryptocurrency native assets define rules through smart contracts, often referred to as "code is law" in the crypto community. However, for "real world assets", the process is accomplished through tokenization. **Since more asset relationships occur in the off-chain real world, tokenization involves more than just issuing tokens representing underlying assets. It involves a series of processes, including the purchase of underlying assets, custody, the legal framework associating underlying assets with tokens, and token issuance, and it also allows token holders to have certain legally enforced claims over the underlying assets.** Therefore, especially for securities, legal and regulations play a more crucial role, and the tokenization of RWAs also relies on the legal framework of the traditional finance world.

How they work: structure of RWAs

To realize tokenized RWA, there's three major components. Each component will have various entities for certain functions according to the need of tokenization.

Real-world: asset originator, custodian, asset broker
Information Bridge: oracle, legal structure, token standard, info disclosure, third-party audit,deposit and withdrawal payment channels
On-chain: RWA token issuer, issuing platform, smart contract

Figure 1: The structure of tokenized RWA

4. Issuance Model: Direct Issuance Model And Asset-Backed Model

Securities are subject to relatively strict legal and regulatory requirements. Starting with securities allows for the coverage of most situations that financial assets might encounter. In this section, we primarily discuss the issuance and trading of security tokens.

From an issuance model perspective, most cryptocurrency assets are issued directly, bypassing any registration or regulatory processes, with no off-chain business or underlying assets. Therefore, it can be challenging to clearly define their asset nature. In general, the issuance of securities requires registration and approval from relevant regulatory authorities. Currently, except for Switzerland's DLT Act, there are no specific laws that explicitly allow for the direct issuance of security tokens on a blockchain. Due to the lack of relevant legal precedents, the current direct issuance model for securities tokens is largely experimental. Examples include the Diners Club 1-month note issued by Diners Club Singapore on DigiFT's platform.

Cryptocurrency assets are known for their relatively high volatility, while RWAs (Real World Assets) typically exhibit lower volatility and weaker correlation with crypto native assets. As a result, there is a demand among cryptocurrency investors for exposure to RWAs. To make the crypto world more receptive to the concept of RWAs, there is a need for widely accepted assets with widespread consensus. The most prominent of these is the US dollar, represented by stable coins. Another important asset category is US treasury bills, which are currently the dominant form of RWAs and fall under the category of security tokens. However, these assets cannot be directly issued on a blockchain unless a sovereign authority, such as the US government, conducts on-chain issuance (for example, CBDC). This has led to the development of another issuance model known as the asset-backed model.

This section primarily focuses on these two models.

Classification of Asset Issuance Model

To understand the RWA token issuance model, let's first look at the traditional asset issuance models. Taking private shares as an example, the following diagram illustrates the typical issuance model for Singaporean company equities:

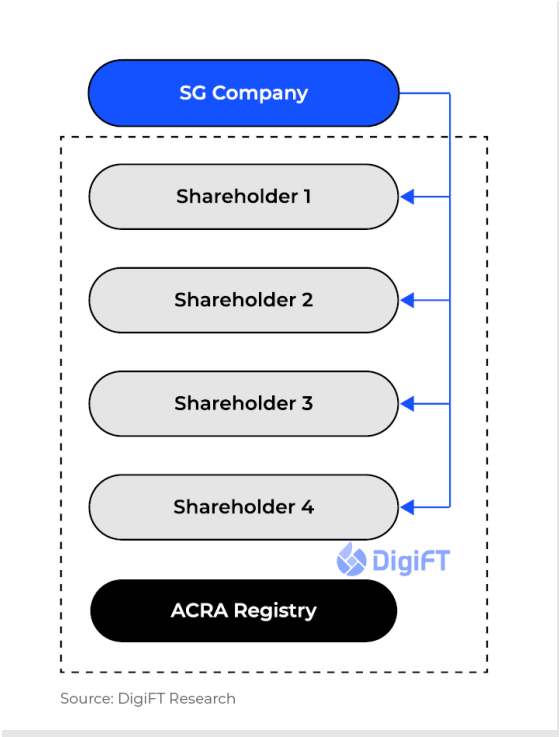


Figure 2: Traditional Private Shares Issuance Model

A company may have multiple shareholders, and the ownership of these shares will be registered with the Singapore Accounting and Corporate Regulatory Authority (ACRA). The transactions and transfers of these shares will also need to be registered with ACRA.

In Singapore, ACRA maintains a register of shareholders for each private company. Some other countries have analogous government agencies or use different mechanisms to deal with shareholder registration, such as the transfer agent concept in the United States.

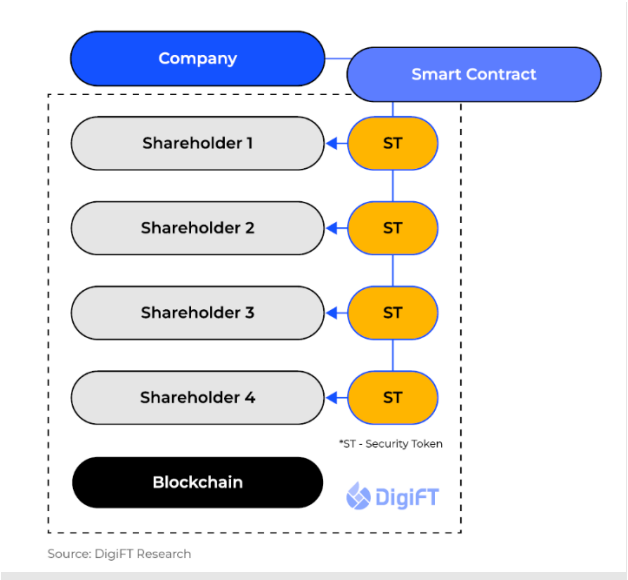


Figure 3: Direct Issuance Model

If you want to issue tokens on the blockchain, it means using the blockchain as a ledger for registering and recording ownership of securities or assets (figure 3), for every transfer process that takes place on the blockchain.

In a few countries and regions, financial innovation is relatively advanced, and they support the direct registration of securities on the blockchain, with relatively comprehensive legal terms. An example of this is Switzerland's Distributed Ledger Technology (DLT) Act. In these areas, securities can be issued directly on the blockchain with the authorization of relevant regulatory authorities, and they accept blockchain as a tool for registration. However, in other major financial markets such as the United States, Singapore, and Hong Kong SAR, the current legal frameworks do not yet support direct registration and recording of securities on the blockchain. As a result, most assets need a “detour” or follow traditional routes for issuance and registration. For example, the Wall Street financial institution Franklin Templeton issues fund on blockchain, but it still relies on centralized registration system, with blockchain serving as a secondary registering tool.

Based on this, the mainstream issuance models in the market can be classified into two categories: the direct issuance model and the asset-backed model. Both issuance models essentially involve issuing relevant assets or securities on the blockchain, but the forms of issuance and corresponding rights are entirely different.

It is essential to note that private securities, if they meet certain conditions, such as limited sale amounts and targeting a restricted category of investors, have a limited impact on the financial market and those securities can be issued with less compliance requirements, and the issuers can use blockchain to record the ownerships, hence the majority of RWA projects are currently restricted to accredited investors only (details in “RWA dilemma: why only for qualified investors”).

Direct Issuance Model

In the direct issuance model, the asset issuer uses the blockchain as a ledger to register and record the assets and then issues corresponding tokens on the blockchain. These tokens represent the underlying assets themselves and require legal recognition of their rights. Investors who purchase and hold such assets directly obtain various related rights associated with those assets, such as voting rights for stocks and repayment rights for bonds.

However, the direct issuance model still faces several limitations in the current market environment. For instance, these tokenized securities may not be compatible with the existing structures of mainstream securities exchanges like Nasdaq or SGX, leading to

frictional costs. Additionally, the relevant legal framework is not yet fully developed, and there are currently limited legal cases that can serve as precedents for the future.

Asset-Backed Model

Due to the current incomplete legal framework and the limited availability of on-chain assets, many projects also choose to use the asset-backed model for issuance. Essentially, these tokens are new securities that seek to replicate a subset of the rights of the underlying assets. In this model, the asset provider registers and issues the assets outside of the blockchain system; a token issuer purchases the assets and mints asset-backed tokens to track those assets. The counterparties' risks are the asset provider and the asset-backed token issuer.

The asset-backed model is a commonly used RWA model currently, which enables the introduction of real world returns onto the blockchain. However, it may introduce additional risks, and the rights associated with the tokenized securities may not be identical to those of the underlying real-world securities.

5. Current Status: Primarily Fixed Income Products, With Institutional Investor Dominance

Currently, securities-type RWAs primarily consist of tokenized private credits and tokenized US Treasuries. RWA-related assets started emerging in 2020 through private credit, initially focusing on unsecured loans. Some of the projects involved in this space include Maple Finance, Clearpool, Centrifuge, and others.

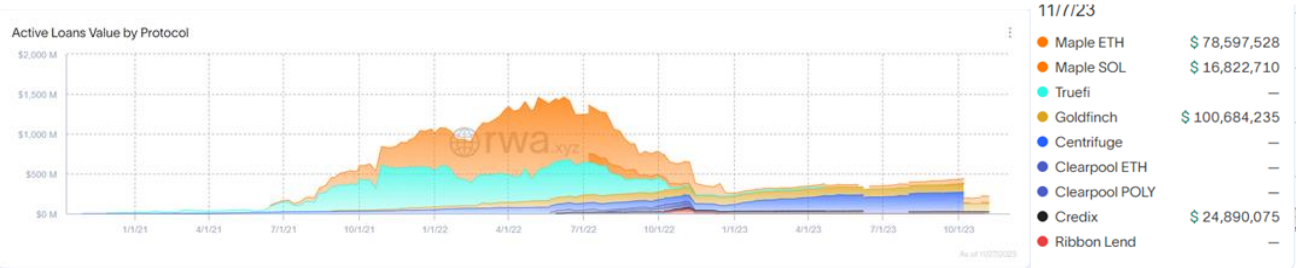


Figure 4: Active Loans Value by Protocol in RWA Private Credit Sector, Source: rwa.xyz, data as of 27 November 2023

The private credit market also experiences cycles. When there is a bull market, borrowers are willing to borrow at relatively high interest rates, and lenders are willing to take the risk of potential default and provide funds as they have strong believe that the market will continue to be good. However, after the collapse of Luna and FTX, several private credit pools in the crypto market were affected, resulting in defaults and a significant decrease in Total Value Locked (TVL), dropped from around USD 1500 million at the mid of 2022 to around USD 500 million now. Currently, the market is in a bottoming phase.

Besides, due to high interest rates in the external macroeconomic market, as well as the lack of yield in the internal crypto asset market, the demand for US treasuries -related tokens have risen in crypto market. According to data from DeFi Llama, US treasuries related RWA projects' Total Value Locked (TVL) continues to grow steadily in a market with clear demand, increases from USD 100 million at the beginning of 2023 to the current TVL of USD 784 million.

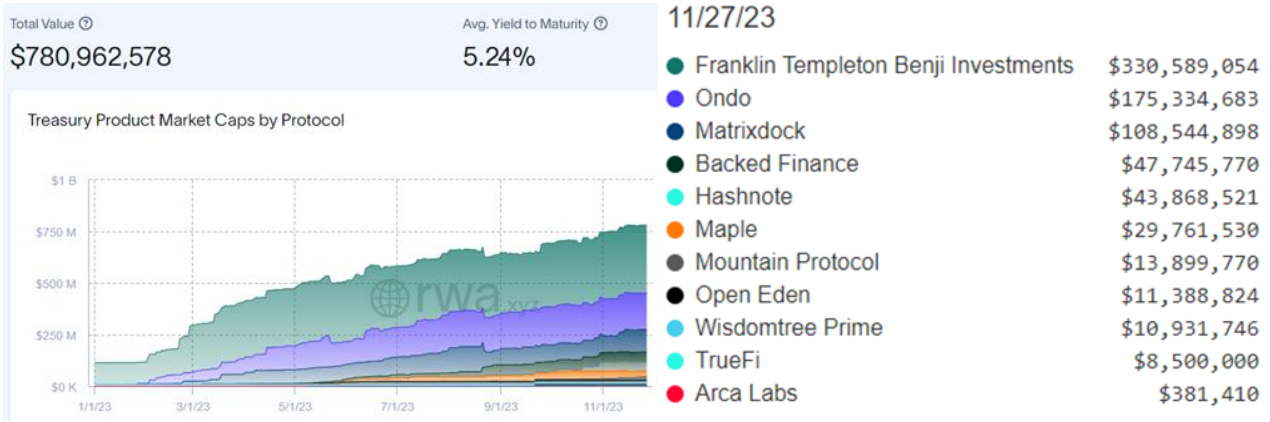


Figure 5: Total Market Cap of Tokenized US Treasuries, Source: rwa.xyz, data as of November 27, 2023

Among them, the tokenization experiment of US treasuries conducted on the Stellar public blockchain by two asset management giants in the United States, Franklin Templeton (the green area in the figure) and Wisdom Tree, has also accumulated several hundred million dollars in Total Value Locked (TVL). However, such projects are primarily centralized and use blockchain as a secondary means of recording token ownership.

Analysis of Wallet Types

Currently, due to their linkage with real-world assets, most RWA have Know-Your-Customer (KYC) and Anti-Money Laundering (AML) requirements on most platforms, especially for securities-type RWAs. If they are categorized as securities, there is usually a requirement for accredited investors, or, at the very least, a KYC requirement. Compared to DeFi assets, RWA assets are considered less attractive in terms of yields. These compliance restrictions and yield factors make it more challenging for RWA assets to reach retail investors.

At present, the majority of RWA Total Value Locked (TVL) is concentrated in tokenized US treasuries products. As US Treasuries being the most widely accepted, stable, and liquid asset class, US Treasuries tokenization has been adopted by many DeFi and Web3 investors against the backdrop of a macroeconomic bear market. More US Treasuries token holdings are in the hands of institutions, either for short-term liquidity management needs or as underlying financial assets to create structured products (which will be discussed in the "Innovation model" module later).

We obtained insights into the current major holders of tokenized US Treasuries by directly observing on-chain data. The data was sourced from various T-bill tokens, including Ondo Finance's OUSG, Maple Finance's USDC Cash Management, Backed Finance's bIB01/bIBTA, OpenEden's Tbill, and MatrixDock's STBT.

Our findings indicate that 29.1% (measured by USD value) of the tokens are held in multi-signature addresses, likely indicating institutional or corporate ownership. Additionally,

16.9% (measured by USD value) is held in smart contracts, primarily for DeFi applications. Notably, Ondo Finance's OUSG token is integrated into a lending platform called Flux Finance, passing the US Treasuries yields into the DeFi ecosystem using permissionless mechanisms. Furthermore, 53.9% (measured by USD value) is held in Externally Owned Accounts (EOA). Considering that some companies or institutions may hold assets through custodial wallets, MPC wallets or hardware wallets, which still appear as EOA addresses on-chain, the actual institutional ownership may be even higher.

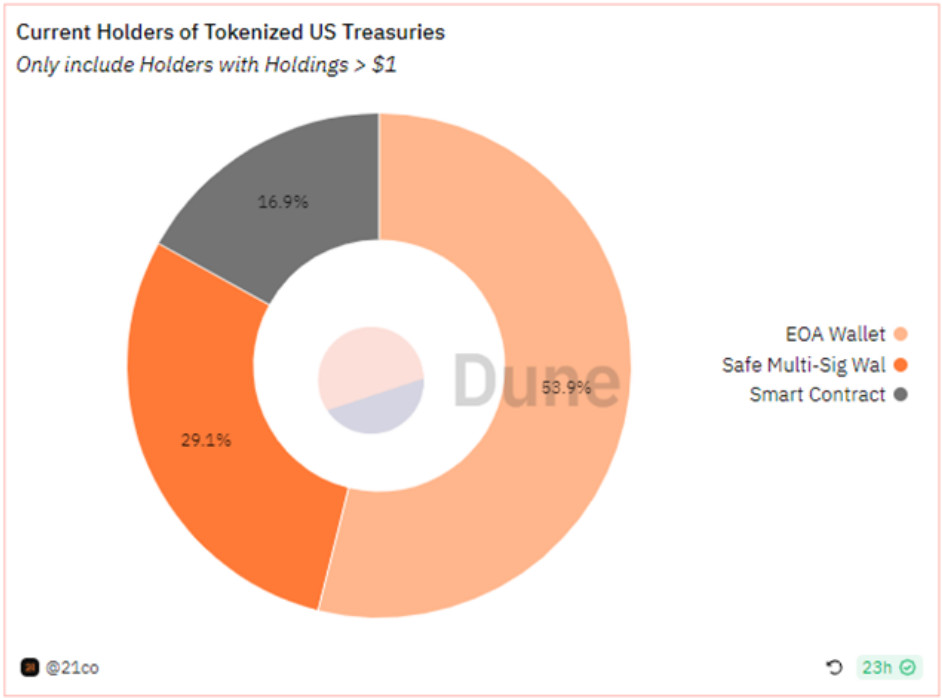
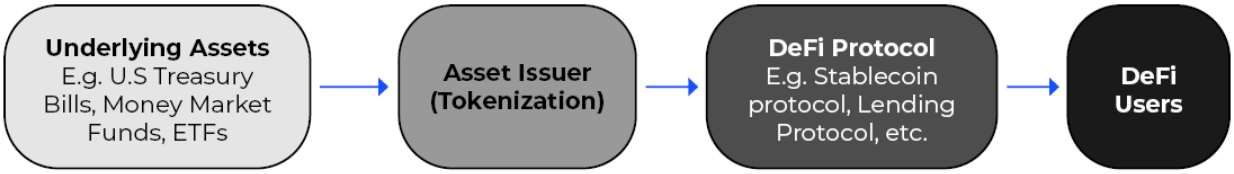


Figure 6: Tokenized US Treasuries Holdings by Wallet Type , Source: dune.com, 21co. Data as of November 27, 2023

Status Summary of RWA

We believe that, in the short term, the primary focus for the sale of RWA assets will remain on the B2B (business-to-business) sector. We can also observe RWA assets being integrated into DeFi to serve as underlying assets for various structured products. Notable examples include Angle Protocol (Backed Finance bC3M as collateral), Spark Protocol (MakerDAO using trust structure to hold tbills for yield source), USDV (MatrixDock STBT as collateral), and Flux Finance (Ondo OUSG as collateral). These integrations, while meeting the current compliance requirements, have the potential to accelerate the adoption RWA assets through a B2B2C (business-to-business-to-consumer) model.



Source: DigiFT Research

Figure 7: Supply Chain from RWA to DeFi Users

6. The RWA Dilemma: Why Only For Qualified Investors?

Except for a few projects that have managed to issue RWAs to retail investors under specific rules of their jurisdiction, through the issuance of special prospectuses and specific securities registration (details of these schemes can be found in the RWA Innovation module), most RWAs in the current crypto market can only be offered to qualified investors or accredited investors. Depending on the regulations in different regions, investors need to demonstrate a certain level of assets to qualify as "qualified investors," such as requiring individuals to have net financial assets of SGD 1 million (about USD 730,000) in Singapore.

The reason why most RWA assets, including tokenized U.S. treasuries, are limited to qualified investors is because selling to retail investors in a regulatory-compliant way is prohibitively expensive.

This cost stems from the gap between the underlying assets and the ultimately issued token. Security laws have onerous requirements on offerings of securities to the public, including the preparation and registration of a comprehensive prospectus. Furthermore, most jurisdictions have laws stipulating that ownership of assets like shares or debentures needs to be recorded in a specific way (for example, in a register maintained by the issuer). This means that ownership of a token cannot, under these laws, directly represent ownership of the underlying asset. Instead, there needs to be a 'bridge' between the underlying asset and the intended RWA token. This 'bridge' can be built by treating the RWA token as an independent security of its own, but this also means that the RWA token needs to independently comply with all relevant securities laws - i.e. the issuer needs to prepare and register a prospectus, etc.

To fully appreciate the cost of issuing securities to retail investors, you may consider the below steps:

1. **Internal company preparation phase:** The company decides on the characteristics of its securities, selects and hires investment banks (underwriters) and other financial professionals, such as lawyers and accountants, to assist with the public offering process.
2. **Selection of underwriters:** The underwriters will help the company prepare and execute the bond offering.
3. **Due diligence, audit, and rating (for bonds):** These steps ensure compliance, review internal controls, governance structures, and assess credit quality for bonds.
4. **Prospectus:** If it's targeted at retail investors, the prospectus must be approved by regulatory authorities to ensure that investors have sufficient information disclosure.
5. **Pricing:** The company, along with the underwriters, determines valuation and offering conditions.
6. **Marketing:** This phase involves roadshows, interactions with potential investors, and explanations about the company's business.

7. **Issuance and listing:** The offering must meet the listing requirements and standards of the security exchange.
8. **Post-trading management:** This includes financial disclosures and announcements.

It's clear that issuing securities to retail investors involves a complex process, and there are two main reasons why most RWAs cannot be directly offered to retail investors:

1. **High costs and insufficient returns:** The entire process of issuing securities to retail investors can cost several million dollars and involves regulatory approvals. Given the relatively small size of the crypto market compared to traditional markets, the high cost of regulatory issuance is prohibitive.
2. **Incomplete infrastructure:** The tokens lack regulatory-compliant securities exchanges to facilitate trading, and securities registration agencies do not yet support tokens as proof of ownership, due to the current state of regulations and rules.

If issuers don't want to incur such high costs and fractions, they can only offer their products to accredited investors or institutional investors. The mainstream RWA assets in the current crypto market are structured as debentures, using a SPV as issuer with underlying assets as U.S treasury bills or notes. When traditional securities such as U.S. treasury bill are used as underlying assets and an asset-backed model is employed for issuance, what investors are essentially purchasing is not the treasury bill itself, but corporate bond issued by the company, with the treasury bill as underlying assets or collateral. This introduces a very high counterparty risk. In fact, a U.S. treasury bills with an original rating of AA+ may be downgraded to a BBB investment-grade corporate bond through this structure. Other directly issued corporate bonds are typically issued by smaller companies that have not undergone the complete process to offer to retail investors.

7. Driving Force Of RWA: From Both Real World And Crypto World

RWA assets bridge the gap between the real world (especially traditional financial sector) and the crypto world, and they are being driven by various factors from both sides of the spectrum.

From the perspective of the traditional world:

- **Overall cost efficiency.** Adoption of new financial infrastructure to reduce costs and increase efficiency, with blockchain consensus mechanisms enabling secure and traceable ledger synchronization, significantly reducing the time and cost of financial transaction settlements.
- **Self-custody.** Traditional finance faced a crisis of trust after several banks and financial institutions collapsed. The transparency and self-custody features of crypto assets have garnered favor from mainstream capital.
- **Asset Flexibility.** Tokenized assets on blockchain exhibit interoperability, seamlessly integrating with blockchain applications to provide users with enhanced experiences, including lending, trading, staking, and even programmable asset functionality through smart contracts.
- **Real-Time Settlement.** Transactions and lending occur via smart contracts on the blockchain, eliminating intermediaries. Assets settle directly on-chain, without the need for complex accounting systems, leading to real-time settlement and significant reductions in time costs.
- **Transparency and traceability.** Transaction records are real-time, open-to-public, transparent, and traceable, enabling real-time analysis and monitoring.
- **Globalization.** Through DeFi infrastructure, investors have the opportunity to easily access global assets.

From the perspective of the crypto world:

- **Demand for on-chain asset management.** On-chain asset management demands stable returns and better liquidity, and real-world assets like US treasuries are widely recognized investment targets.
- **Alternative yield source.** The search for alternative yield sources in the crypto space, as native on-chain earnings primarily come from 1) staking, 2) trading, and 3) lending, which can suffer from decreased on-chain activity during bear markets. Introducing RWA assets with lower correlation to on-chain native assets become necessary.
- **Portfolio diversification.** Investing solely in a limited range of on-chain assets with high correlation and volatility can lead to risks. RWAs with stability and low correlation to on-chain native assets can serve as a hedge, enabling the creation of more diverse and effective investment portfolio strategies.

- **Diversified collateral.** Introduction of diversified collateral assets to mitigate the risks associated with high correlation among on-chain assets, preventing collateral squeezes or large-scale liquidations, and further alleviating market volatility.

In the overall macroeconomic context, DeFi assets lack yield, and compared to traditional financial products, they exhibit higher yield volatility, making it challenging to provide certainty. Traditional financial products, on the other hand, are more diverse and offer better hedging mechanisms, providing more stable returns. Therefore, DeFi protocols and Web3 institutions are shifting their focus towards RWA.

We anticipate a continued demand for RWA assets, especially fixed-income products, in the crypto world before the arrival of bull markets of risky assets. This demand primarily arises from short-term cash management needs. During bull markets, the demand for RWAs is expected to weaken. Additionally, new RWAs with higher risk and returns may emerge to meet the demands of the evolving macroeconomic environment. Also, given the established legal frameworks and product processes for bonds already in place, RWA is expected to primarily take the form of bonds in the short to medium term and enter the next phase of development, as other kinds of securities might require a totally different structure and process.

Building a new generation of capital markets with blockchain and smart contracts at its core is a trend that is unlikely to reverse once established.

8. Global Regulation: US, EU And Asia

Given that the majority of RWA assets are tokenised securities, RWA tokens would be regulated by the relevant securities laws of each jurisdiction.

Because the US is one of the few jurisdictions expressly stating that its securities laws have extraterritorial effect, the crypto industry is likely most aware – and wary – of US securities laws. US securities laws apply to any offer of securities made to, or by, US persons. To address the former point, most, if not all, RWA tokens take pains to note that they are not for purchase by US persons. To address the latter, any RWA tokens launched by US-based companies need to either register their offering with the US Securities Exchange Commission, or (more likely) take advantage of one of the registration exemptions. Some examples of such exemptions include Regulation A / D (small offerings) and Regulation S (offers made outside the US) offerings.

Regulation A (Reg A): often refer to as the "mini-IPO"

- Tier1: Allows companies to raise up to $20 million in a 12-month period, with lower ongoing reporting requirements and can be used for offerings to both accredited and non-accredited investors.

- Tier2: Allows companies to raise up to $75 million in a 12-month period, with more stringent ongoing reporting requirements. It can be offered to both accredited and non-accredited investors.

Regulation D (Reg D): providers exemptions from the full SEC registration requirements for certain private offerings of securities.

- Rule 504: Allows companies to raise up to $5 million within a 12-month period. It can be used for offerings to both accredited and non-accredited investors.

- Rule 505: Allows companies to raise up to $5 million within a 12-month period but is typically limited to accredited investors and up to 35 non-accredited investors. Certain financial disclosures are required for non-accredited investors.

- Rule 506(b): Allows for an unlimited amount of capital to be raised from accredited investors and up to 35 non-accredited investors. General solicitation or advertising is prohibited.

- Rule 506(c): Allow general solicitation or advertising but restricts to the offering to accredited investors.

Regulation S (Reg S): It provides an exemption from the registration requirements of the US securities laws for offerings made solely to non-US persons and conducted in compliance with the regulations of the foreign jurisdiction where the offering occurs.

While Reg S offerings primarily target non-US investors, US issuers can participate in Reg S offerings as long as they comply with the relevant rules and restrictions.

Unlike the US, the EU and Asia do not have an overarching securities framework – instead, securities laws will vary by specific jurisdiction. Within the EU, Switzerland is notably supportive of tokenised securities, being one of the few countries to have passed Digital Ledger Technology (DLT) laws recognising and providing for tokens as valid proof of ownership.

Within Asia, Singapore and Hong Kong SAR, historically hubs for traditional finance, are also leading the way, with the Singapore government having repeatedly stated their support for asset tokenisation and with Hong Kong reportedly set to release guidelines for Security Token Offerings sometime in Q4 2023.

9. Major Participants: Issuance Model, Participate Method And Status

MakerDAO

MakerDAO is a stablecoin protocol, using assets as collateral to generate a US dollar pegged stablecoin called Dai. Currently MakerDAO is the largest RWA holder among DeFi protocols, and it uses RWA as collateral to generate the stablecoin Dai. While most of MakerDAO's RWA exposure is acquired through an off-chain mechanism, the discussion of RWA is closely tied to MakerDAO.

MakerDAO started exploring RWA-related assets as collateral as early as 2021, making it one of the earliest projects to combine RWA and DeFi. Initially, MakerDAO collaborated with the lending protocol Centrifuge to bring off-chain assets on-chain as collateral to generate new Dai.

However, because the assets issued by Centrifuge fall under the category of private credit, typically in the form of bonds issued by small companies (large companies have traditional and mature financing models), they often carry a higher default risk. For instance, the lending pool related to cargo and freight forwarding invoices, ConsolFreight, has experienced a default, leaving MakerDAO with a $1.84 million risk exposure.

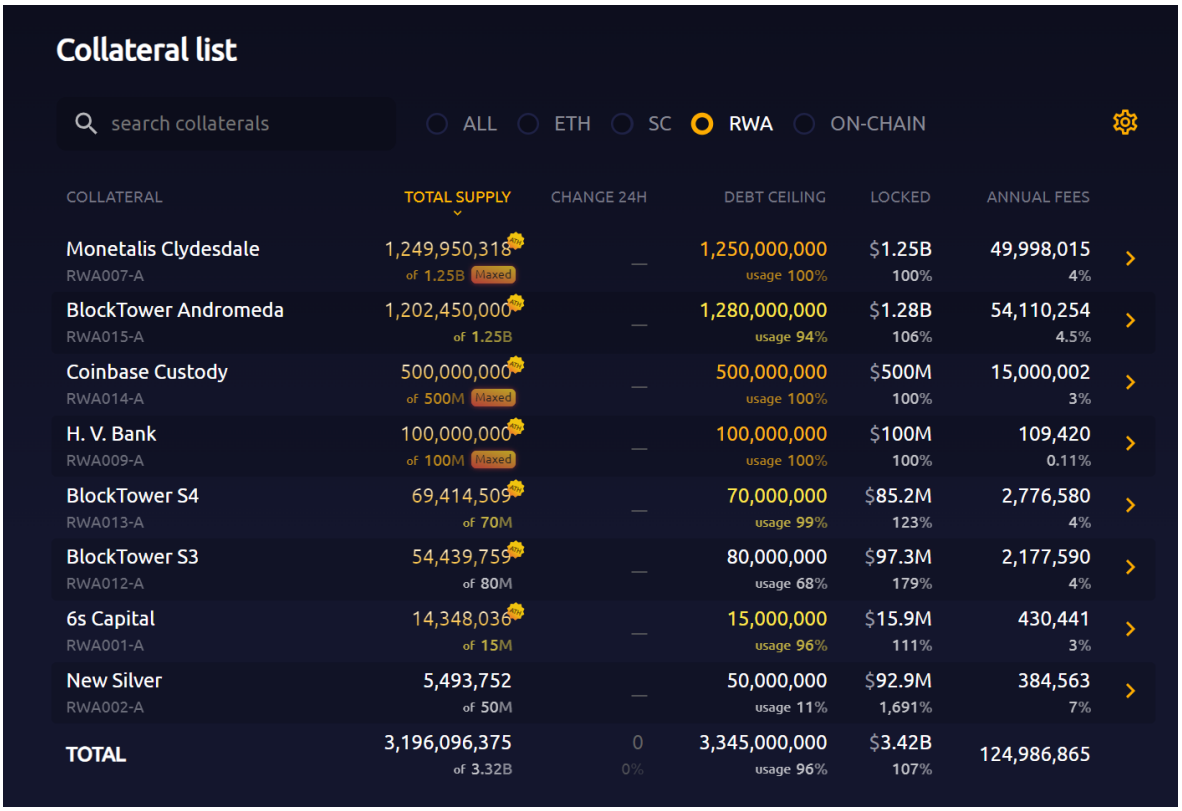
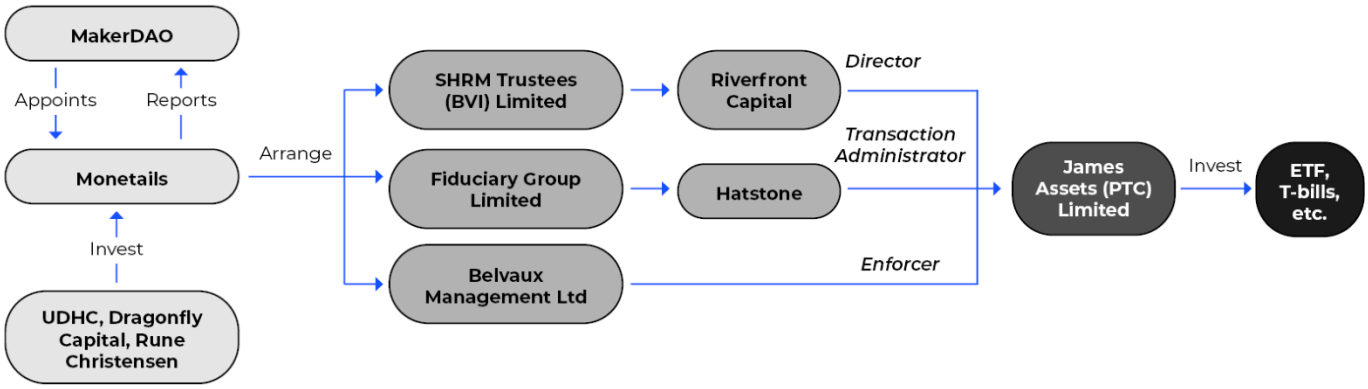


Figure 8: MakerDAO RWA Collaterals, Source: MakerBurn.com, data as of Nov 27, 2023

In early 2022, MakerDAO introduced the idea of purchasing US Treasuries or US Treasuries ETFs as collateral for Dai. The initial purpose was to allow the large amount of USDC in Dai stable module PSM (Peg Stability Module) to generate income for the protocol. This led to the launch of two projects: Monetails Clydesdale in 2022 and BlockTower Andromeda in 2023. Both of these projects use off-chain trust structures with beneficiaries being MakerDAO MKR and DAI holders to purchase money market funds, US T-bills, or US T-bill ETFs. Currently, over $2.3 billion worth of related assets have been purchased, and these US Treasuries related assets are used as collateral to generate Dai. For specific details about the implementation and trust structure of Monetails Clydesdale, please refer to the MakerDAO RWA report previously authored by DigiFT.



Source: Compiled by DigiFT Research

Figure 9: MakerDAO Monetails Clydesdale Trust Structure

Currently, the MakerDAO community is exploring the possibility of adopting tokenized US Treasuries. A proposal has initiated by a strategic consultant, Steakhouse, in the MakerDAO forum and several US Treasuries token issuers have sent their proposals.
Furthermore, MakerDAO passes the yields from US Treasuries to Dai holders through the Spark Protocol's Dai Saving Rate (DSR). Previously, DSR was raised to 8%, maintaining this rate for about a month, attracting a significant amount of assets (primarily USDC) to be minted into Dai and stake in DSR. Currently, the DSR rate has been lowered, with 1.62 billion Dai in the DSR pool.

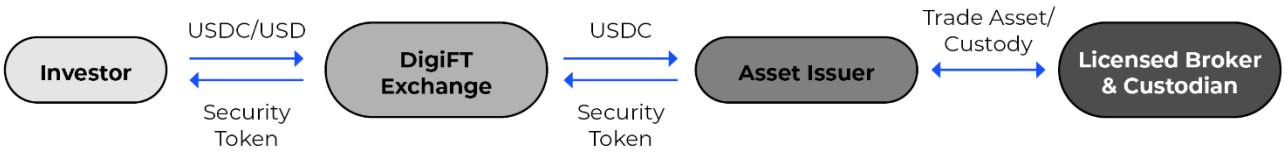
- Jurisdiction: decentralized DAO
- Product：sDai（Dai stable coin in DSR）
- Issuance Model：Off-chain trust model
- Investor Requirements：permissionless
- Integration with DeFi Protocol: Spark Protocol (Lending Protocol)

DigiFT

Established in Singapore in 2021, DigiFT is the first regulated exchange for on-chain real-world assets, approved as a Recognised Market Operator with a Capital Markets Services license by the Monetary Authority of Singapore.

DigiFT allows asset owners to issue blockchain-based security tokens and provides liquidity through various channels, including the innovative Automatic Market Maker (AMM) trading mechanism, over-the-counter (OTC), and peer-to-peer (P2P). Investors can trade with continuous liquidity via an AMM mechanism and retain control over digital asset tokens in their own wallets.

Currently, DigiFT is offering various products including Single US Treasuries DUST(DigiFT US Treasury Token, DUST comprises a series of security tokens, each backed by AA+ rated liquid, investment-grade, short-term U.S. Treasury Notes that generate yield, designed for optimal treasury and cash management.), U.S. Treasury bond funds, bank notes and regulatory-compliant ETH staking product.



Source: DigiFT, compiled by DigiFT Research

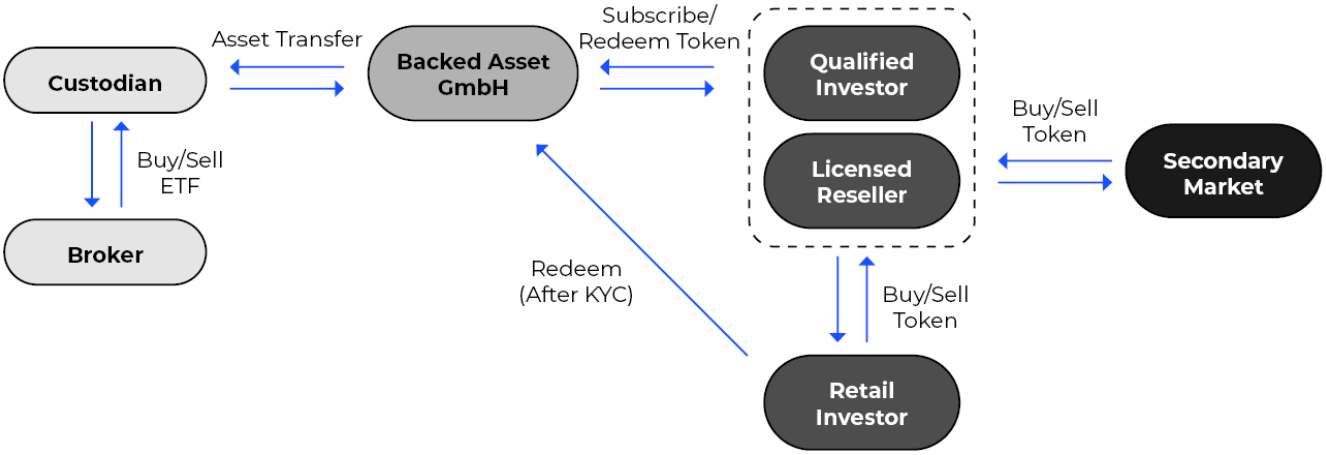
Figure 10: DigiFT product flow chart

- Jurisdiction: Singapore
- Products: Single US Treasuries DUST(DigiFT US Treasury Token), U.S. Treasury bond funds, bank notes and regulatory-compliant ETH staking product
- Supported Currency: USDC, USD
- Issuance Model: Asset-backed model, direct issuance model
- Investor Requirements: Accredited Investors and institutional investors
- Integration with DeFi Protocol: Currently not integrated

Backed Finance

Backed Finance operates as a platform that facilitates the tokenization of real-world assets, such as stocks or ETFs, into freely transferable token. These tokens are 100% backed by the underlying assets they represent. The platform seems to be built with a focus on decentralization, allowing for compatibility with various DeFi protocols and offering multi-chain support.

The token design of Backed Finance is quite unique. Unlike most RWA token designs, it does not have a whitelist mechanism, and users can freely transfer the tokens after purchase. These tokens can be sold on-chain through licensed resellers, and some tokens had previous liquidity on Uniswap. The specific implementation details will be elaborated on in the "Innovation model."



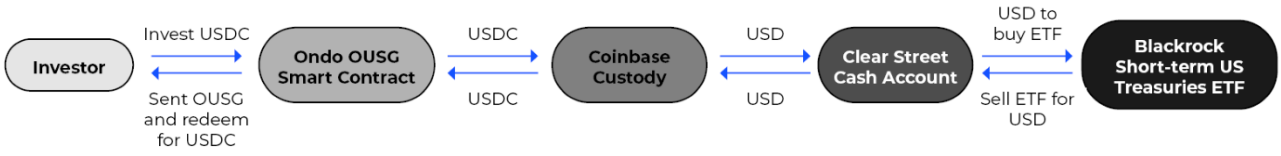
Source: Backed Finance, compiled by DigiFT Research

Figure 11: Backed Finance Product Flow Chart

- Jurisdiction: EU
- Supported Currency: USDC
- Issuance Model: Asset-backed model
- Investor Requirements: Subscription: Qualified Investors; Redemption: KYC required; Secondary Market Purchase: No permission required
- Integration with DeFi Protocol: Integrated with Angle Protocol, using bC3M(Eurozone Treasury bond ETF token) as collateral to mint its Euro stablecoin

Ondo Finance

Ondo Finance offers tokenized ETFs to investors, including bond funds, US Treasuries, and US money market funds, among others. Their primary products are targeted towards accredited investors.



Source: Ondo Finance, compiled by DigiFT Research

Figure 12: Ondo Finance Product Flowchart

Ondo Finance issued USDY on August 2023, with short-term US treasury bills and bank deposit as underlying assets. USDY is registered under SEC Reg S, and can offer to non-US retail investors.

- Jurisdiction: United States
- Products: US Treasury ETF token, US Treasuries and bank deposit-backed token
- Supported Currency: USDC
- Issuance Mode: Asset-backed model
- Investor Requirements: Qualified investors; non-US retail investors (For USDY)
- Integration with DeFi Protocols: Mantle integrates USDY into its decentralized exchange; Ondo integrates with the Flux Finance lending platform to provide liquidity for OUSG holders

Maple Finance

Maple Finance is a lending platform that operates through DAO (Decentralized Autonomous Organization) voting to select pool delegators. These pool delegators are responsible for managing the use of the lending pool and act as intermediaries connecting borrowers and lenders.

Maple Finance's cash management product, which use US Treasuries as underlying assets, is registered under SEC Reg D, allowing the offering to US accredited investors.

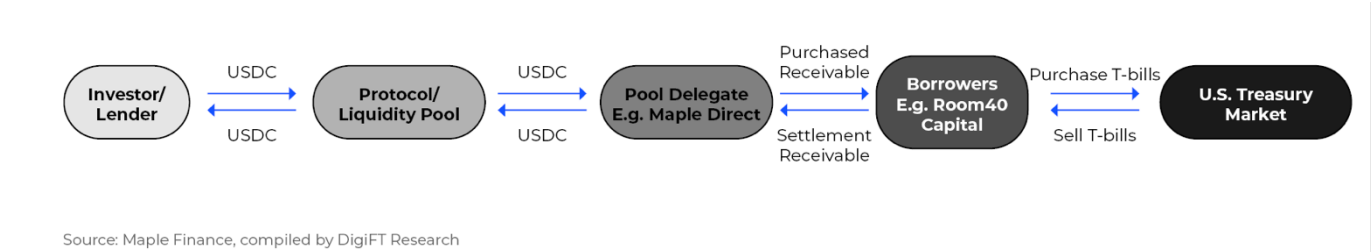
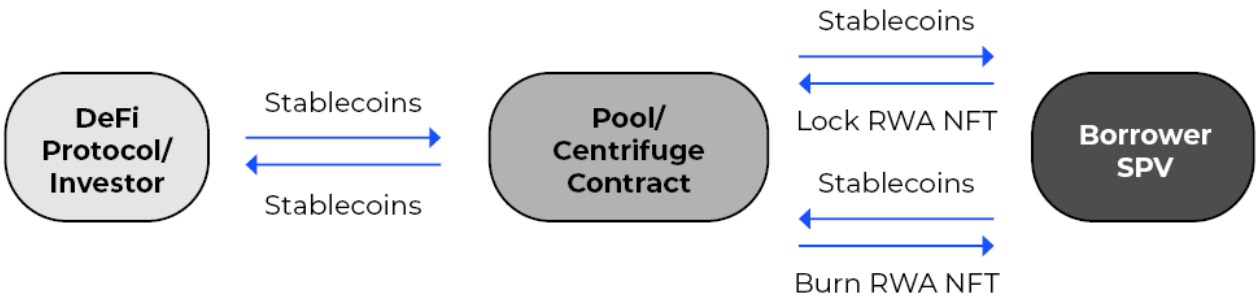


Figure 13: Maple Finance Product Flowchart.

- Jurisdiction: United States
- Products: Various lending products with underlying assets such as US Treasuries and accounts receivable.
- Supported Currencies: USDC
- Issuance Mode: Asset-backed model
- Investor Requirements: Major products (e.g., Cash Management) are targeted at qualified investors and institutional investors; some lending pools may have no investor restrictions
- Integration with DeFi Protocols: UXD Protocol use Maple's Cash Management as collateral for its stablecoin

Centrifuge

Centrifuge is the infrastructure that facilitates the decentralized financing of real-world assets natively on-chain, creating a fully transparent market which allows borrowers and lenders to transact without unnecessary intermediaries. Asset originators establish a special purpose vehicle (SPV) and set up a pool of funds on Centrifuge. They then tokenize RWA assets and lock them into the fund pool as collateral in the form of NFTs (Non-Fungible Tokens). These tokens are made available for purchase by investors. In 2021, Centrifuge collaborated with MakerDAO to introduce RWA assets as collateral into the MakerDAO ecosystem, with MakerDAO being the largest buyer on the Centrifuge platform.



Source: Centrifuge, compiled by DigiFT Research

Figure 14: Centrifuge Process Flowchart

- Jurisdiction: according to the product issuer
- Products: Asset-Backed Securities for Various RWA assets, including accounts receivable, emerging market corporate bonds, etc.
- Supported Currency: Dai
- Issuance Mode: Asset-backed model
- Investor Requirements: Open to individual investors (KYC required), US-based investors must meet accredited investor requirements
- Integration with DeFi Protocols: Multiple RWA assets from Centrifuge serve as collateral in MakerDAO to mint the stablecoin Dai

MatrixDock

MatrixDock is a platform that invests in real-world assets and offers digital asset financial products and services to qualified investors. Its primary product, STBT, provides holders with income from US Treasury bills. The underlying assets consist of a basket of short-term US Treasury bills. STBT is designed with a rebase mechanism, anchoring each STBT token to 1 USD. The token balance is updated daily to reflect its yield. STBT supports Chainlink's proof-of-reserve to ensure that there is ample reserve for the underlying assets, which helps build trust with investors.

Source: MatrixDock, compiled by DigiFT Research

Figure 15: STBT Product Flowchart

- Jurisdiction: Seychelles
- Product: STBT (US Treasury bills as underlying)
- Supported Currencies: USDC
- Issuance Mode: Asset-backed model
- Investor Requirements: Targeted at qualified investors and institutional investors
- Integration with DeFi Protocols: STBT can be traded on Curve, a decentralized exchange on Ethereum; Integration with the DeFi lending protocol T Protocol; Stablecoin project Verified USD issues USDV with STBT as the underlying asset

OpenEden

OpenEden is a platform that builds tokenized US Treasuries using a bankruptcy remote structure. Its current and unique product is TBILL Vault. OpenEden operates and manages its activities through a registered fund in the British Virgin Islands (BVI). This fund invests in short-term US Treasury bills and keeps them in custody with compliant institutions.

Source: OpenEden, compiled by DigiFT Research

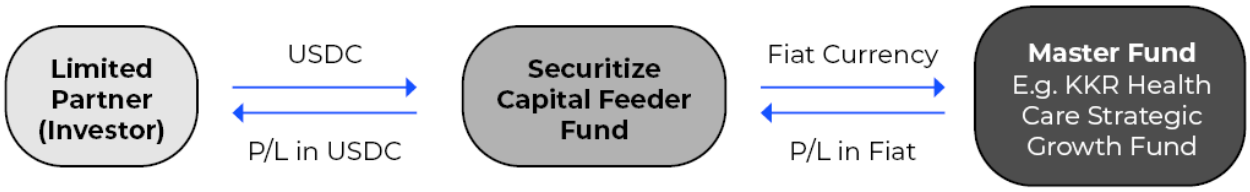
Figure 16: OpenEden Product Flowchart

- Product: TBILL
- Supported Currency: USDC
- Issuance Mode: Asset-backed model
- Investor Requirements: Targeted at qualified investors and institutional investors
- Integration with DeFi Protocols: UXD Protocol uses Tbill token as collateral for its stablecoin.

Securitize

Securitize operates in the private equity fund market and has a somewhat unique structure. Securitize consists of Securitize, Inc and its subsidiaries. One of its subsidiaries, Securitize Markets, is a broker-dealer that is a FINRA member and an SEC-registered ATS (Alternative Trading System) through the acquisition of licenses. This allows them to conduct primary market issuance and secondary market trading.

Another subsidiary, Securitize LLC, is an SEC-registered transfer agent that uses blockchain technology to facilitate the trading and record-keeping of asset ownership. Securitize collaborates with various funds and brokerages to issue tokenized funds primarily targeting qualified investors and institutional investors. Their issuance model is primarily direct issuance.



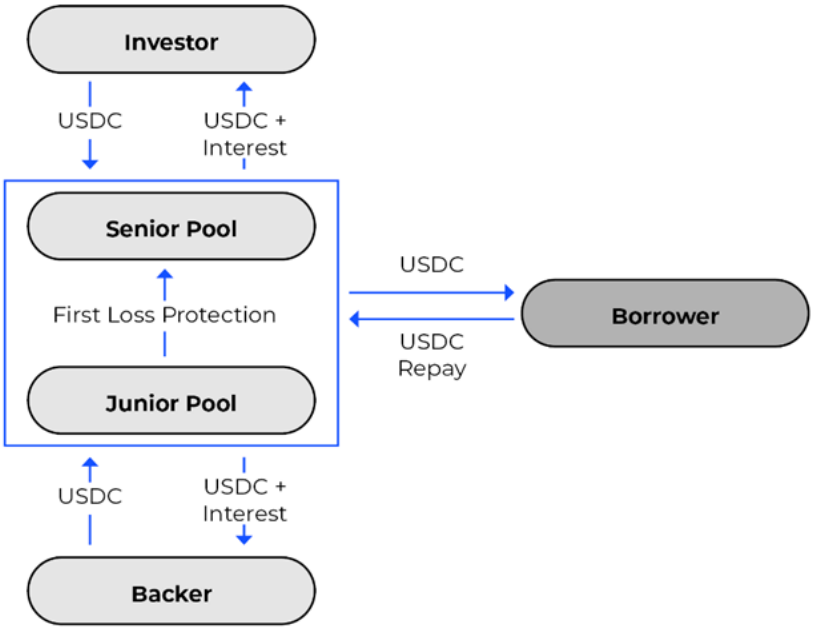
Source: Securitize, compiled by DigiFT Research

Figure 17: Securitize Product Process Flowchart

- Jurisdiction: United States
- Products: Primarily various types of funds
- Supported Currency: USDC
- Issuance Mode: Direct issuance model
- Investor Requirements: Primarily targeted at qualified investors and institutional investors
- Integration with DeFi Protocols: Currently not integrated

Goldfinch

Goldfinch is a decentralized lending protocol that allows borrowers to issue asset-backed securities using off-chain assets as collateral, facilitated by the protocol's technology and legal framework. Funds are borrowed in USDC from the pool. Users, as liquidity providers to the pool, deposit USDC and earn returns, effectively purchasing senior tranches with lower default risk. Additionally, backers purchase junior tranches to take on higher default risk. Goldfinch primarily serves borrowers from third-world countries with significant growth potential.



Source: Goldfinch, compiled by DigiFT Research

Figure 18: Goldfinch Product Process Flowchart

- Jurisdiction: United States
- Products: Asset-Backed Securities
- Supported Currency: USDC
- Issuance Mode: Asset-Backed model
- Investor Requirements: Non-US retail and US accredited investors
- Integration with DeFi Protocols: Currently not integrated

Data Observation

The participants in the RWA sector within the aforementioned crypto market currently have Total Value Locked (TVL) predominantly concentrated in products related to US Treasury bills. Hence, we focus on products related to Treasury bills to observe the involvement of issuers and investors in the market. The data primarily covers US Treasury bill-related products from MatrixDock (STBT), Maple Finance (Cash Management USDC), Openeden (Tbill), Ondo Finance (OUSG), and Backed Finance (bIB01).

All data in this section is as of November 27, 2023. While some tokens are deployed across multiple chains, this report solely examines data on the Ethereum blockchain.

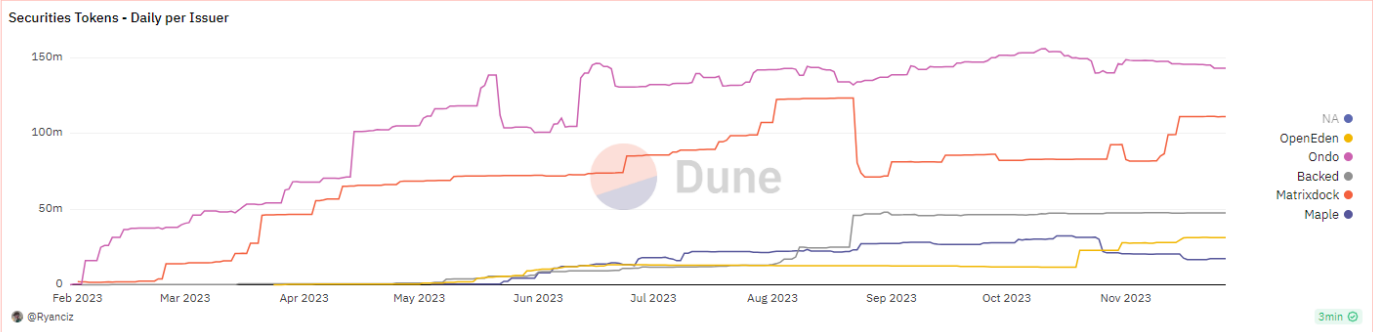


Figure 19: TVL status since inception for MatrixDock (STBT), Maple Finance (Cash Management USDC), Openeden (TBILL), Backed Finance (bIB01), and Ondo Finance (OUSG)

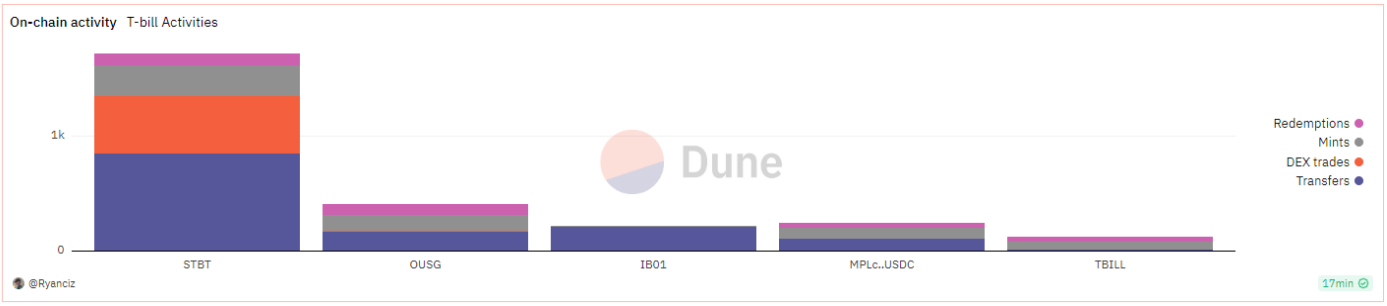


Figure 20: The on-chain activities since inception for MatrixDock (STBT), Maple Finance (Cash Management USDC), Openeden (TBILL), Backed Finance (bIB01), and Ondo Finance (OUSG)

Among them:

MatrixDock STBT (issued in January 2023):

- Total supply: 111.29 million USD
- Number of holding addresses: 163
- Average subscription amount: $836,721 USD
- Average redemption amount: $1,076,914 USD
- Total subscription transactions: 266
- Total redemption transactions: 106

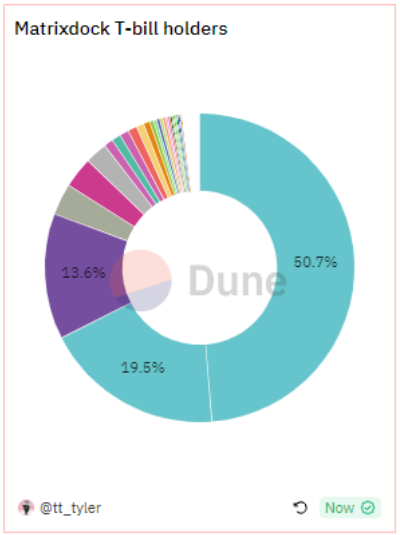


Figure 21: MatrixDock STBT Holding Distribution

Openeden TBILL (issued in March 2023):

- Total supply: 11.64 million USD
- Number of holding addresses: 28
- Average subscription amount: $ 219,186 USD
- Average redemption amount: $ 68,720 USD
- Total subscription transactions: 67
- Total redemption transactions: 43

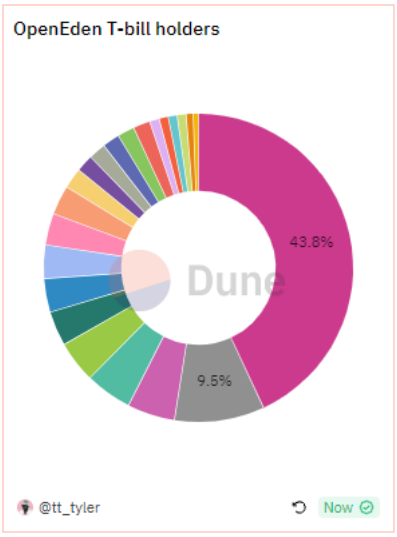


Figure 22: Openeden TBill holding Distribution

Maple Finance Cash Management USDC (issued in May 2023):

- Total supply: 17.23 million USD
- Number of holding addresses: 20
- Average subscription amount: $ 472,312 USD
- Average redemption amount: $ 692,152 USD
- Total subscription transactions: 98
- Total redemption transactions: 42

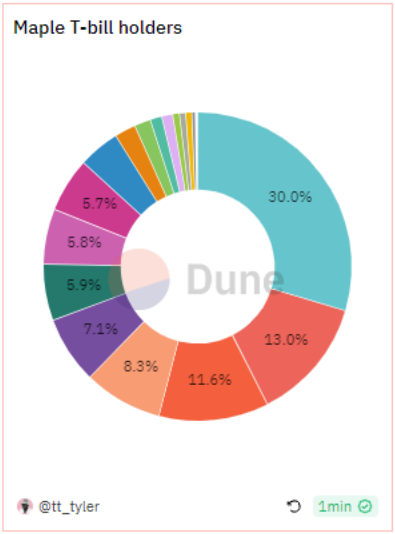


Figure 23: Maple Finance Cash Management USDC Holding

Backed Finance bIB01 (issued in March 2023):

- Total supply: 46.27 million USD
- Number of holding addresses: 27
- Average subscription amount: $ 3,855,531 USD
- Average redemption amount: no redemption yet
- Total subscription transactions: 12
- Total redemption transactions: no redemption yet

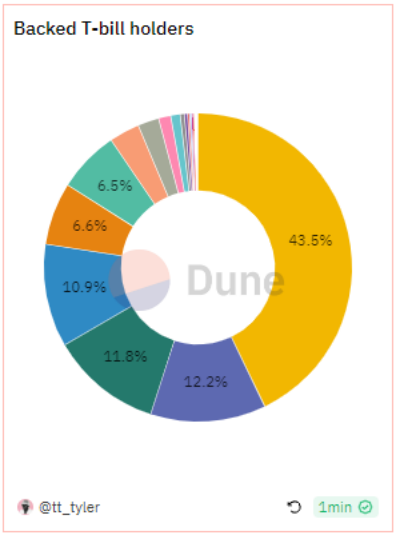


Figure 24: Backed Finance Holding Distribution

Ondo Finance OUSG (issued in January 2023):

- Total supply: 143.43 million USD
- Number of holding addresses: 61
- Average subscription amount: $ 1,424,793 USD
- Average redemption amount: $ 1,494,384 USD
- Total subscription transactions: 191
- Total redemption transactions: 92

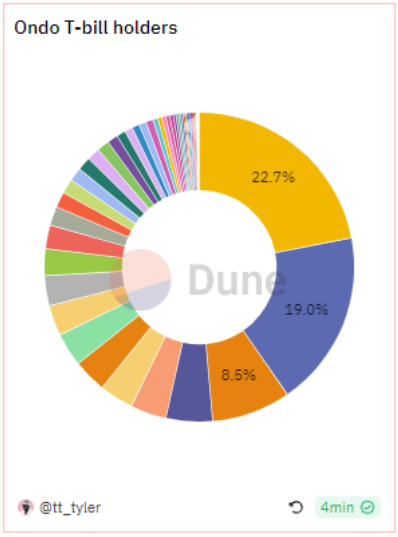


Figure 25: Ondo Finance OUSG Holding Distribution

Among them, MatrixDock's STBT has deployed liquidity on the decentralized exchange Curve, currently holding approximately $4.8 million in liquidity. This amount is sufficient to support transactions of up to $100,000, exchanging STBT for USD stablecoins like DAI, USDC, or USDT.

Pool	Base vAPY	Rewards tAPR (CRV+ Incentives)	↓Volume	TVL
USD Factory **STBT/3CRV** STBT DAI USDC USDT	2.76%	1.76% → 4.40% CRV	**$0**	$4.19m
USD Factory **crvUSD-STBT** crvUSD STBT	2.37%	11.03% → 27.57% CRV	**$0**	$585,157

Figure 26: MatrixDock STBT liquidity on Curve, source: Curve.fi, data as of November 27, 2023

Until November 27, 2023, there have been a total of 514 transactions for STBT on Curve, with a cumulative trading volume of $11,819,420. The average transaction amount stands at $22,995 USD. There is a weekly trading volume in the range of several hundred thousand dollars.

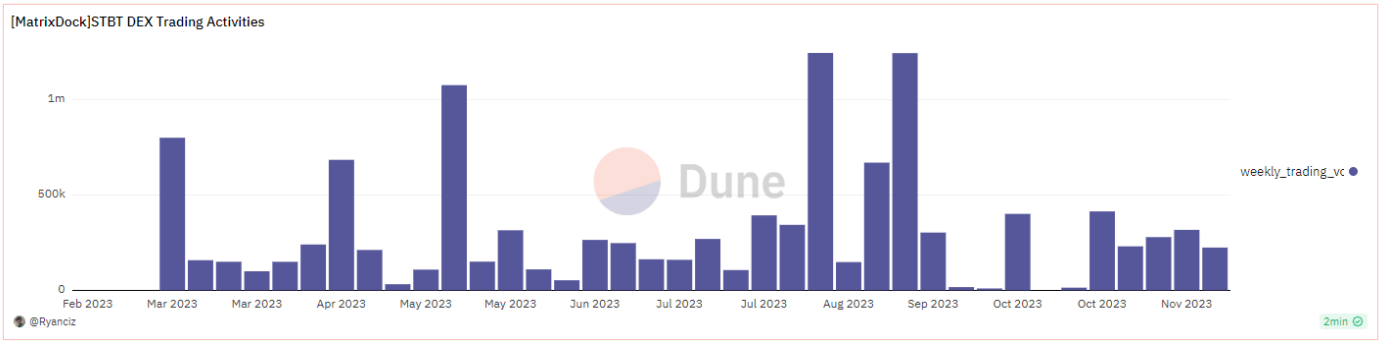


Figure 27: Weekly Transaction Volume Data for MatrixDock STBT, Source: Dune.com, Compiled by DigiFT, Data as of November 28, 2023

Backed Finance issues its US treasury bill ETF token, bIB01, using a bearer instrument structure. The token lacks a whitelist design, allowing for permissionless transfers during circulation (please refer to the RWA innovation model section for details). Consequently, its on-chain transfers are relatively active, totalling 207 transactions.

From the above data, we can observe that:

- **U.S. Treasury bill-related tokens are generally high in value and held for extended periods**, with infrequent and substantial subscription/redemption frequencies.
- **There exists a demand for secondary market trading**. Most tbill-related tokens require more than T+2 days for subscription/redemption and lack on-chain secondary market trading scenarios tailored for security-type tokens. Currently, only STBT exhibits liquidity on Curve, requiring whitelisted addresses for interaction. Looking at STBT's trading situation, compared to subscription/redemption activities, individual transaction volumes in the secondary market are smaller but more frequent.
- **Holdings of tbill-related tokens are relatively concentrated.** Among the five mentioned projects, the sum of the top three addresses' holdings for each project exceeds 50% of the total supply.

10. RWA Innovative Models: Innovative Models Unlock RWA Access In DeFi

Due to the fact that most security-type RWAs are limited to qualified investors, the market is highly restricted. Many RWA protocols are exploring innovative business models from legal and operational perspectives to bring RWAs into the realm of DeFi. This allows for permissionless access to the yield from US Treasuries, creating infrastructure similar to an on-chain money market fund.

Lending Model: Ondo OUSG – Flux Finance

Ondo Finance has designed a lending protocol called Flux Finance for its Ondo Short-Term US treasury bills fund token, OUSG. Flux Finance is a fork of a lending protocol called Compound V2 but has undergone several modifications to support whitelisted assets as collateral and to adapt its interest rate curve and collateral ratio to suit OUSG's characteristics. Currently, the only collateral accepted on Flux Finance is OUSG, with a collateral ratio of 92%.

On the other end of the lending protocol, it is permissionless, and any DeFi user can participate. Users can deposit stablecoins into Flux Finance's lending pool and earn interest from lending interest rates. Flux Finance currently supports four stablecoins: Frax, USDC, USDT, and Dai, with a utilization cap of 90%. OUSG holders can collateralize their OUSG to access liquidity from Flux Finance and borrow stablecoins. Flux Finance keeps the borrowing interest rate below the yield on OUSG, ensuring that OUSG's yield is passed on to stablecoin providers, enabling a permissionless way to integrate US Treasury bill yield to DeFi.

Token Wrapping and Lending Model: MatrixDock - TProtocol

Recently, TProtocol announced a collaboration with MatrixDock. As part of this partnership, TProtocol V2's lending protocol will provide a lending pool for MatrixDock. In this way, TProtocol will assist MatrixDock in transmitting the yields generated from its US Treasury bill token, STBT, to DeFi applications and users.

TProtocol v1

In the previous TProtocol version, they achieved the sale of MatrixDock's US treasury bill token (STBT) in a permissionless way. TProtocol would purchase STBT and use it as collateral to mint corresponding tokens called wTBT. The supply of TBT would follow the rebase of STBT daily. Importantly, TBT token didn't have whitelist restrictions, making it easier to integrate with various DeFi applications and interact with different blockchains through cross-chain bridges. This approach allowed for a more seamless interaction

between traditional financial assets represented by STBT and the DeFi ecosystem. The wrapped version of TBT, wTBT, now still has 3.7 million tokens in circulation.

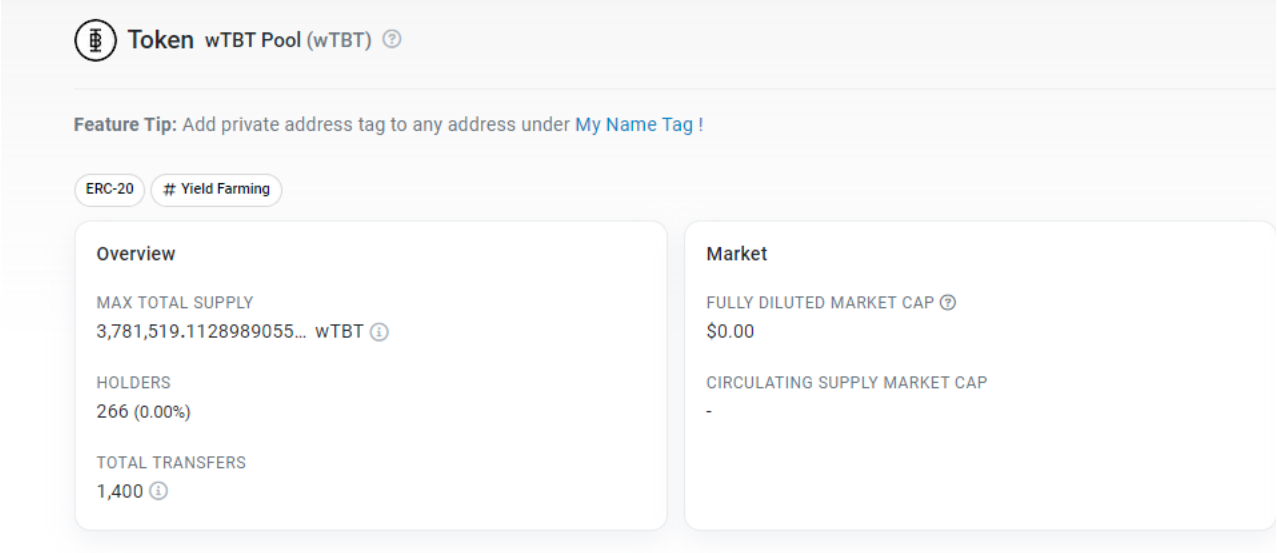
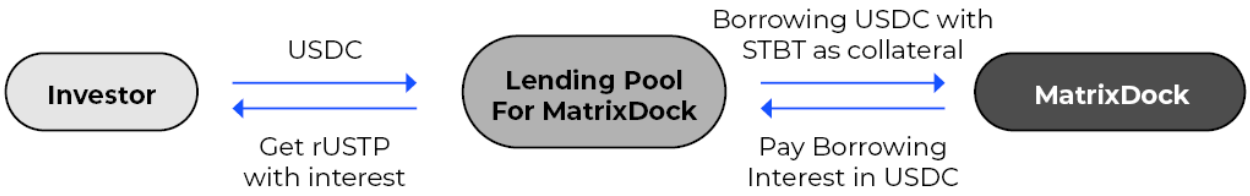


Figure 28: wTBT Token of T protocol V1, Source: Etherscan, data as of November 27, 2023

TProtocol v2

In September 2023, TProtocol entered into a partnership with MatrixDock to provide a lending pool for MatrixDock's STBT. MatrixDock STBT is a dynamicly adjusted rebasing token pegged to 1 USD. It is backed by a basket of short-term US treasury bonds and money market funds. The yield is reflected through a rebasing mechanism, adjusting the token quantity daily based on the underlying asset amount.



Source: T Protocol, compiled by DigiFT Research

Figure 29: T Protocol V2 Lending Flowchart

TProtocol will open lending pools for institutional partners in the future, with MatrixDock STBT as the initial supported asset. Users can deposit USDC into this lending pool and receive an equivalent amount of rUSTP tokens. STBT holders will use STBT as collateral and borrow USDC with a loan-to-value (LTV) ratio of 99%.

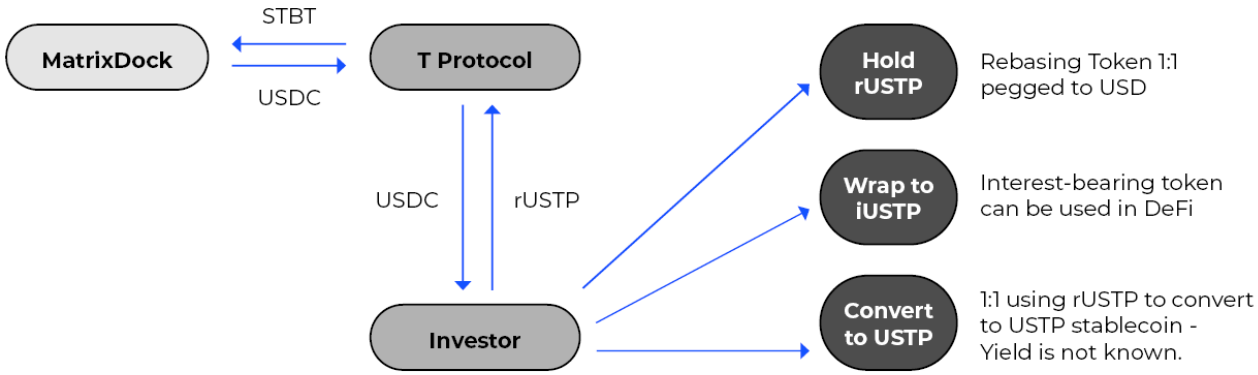
The interest rate provided to USDC users in the lending pool is variable and will not exceed STBT's own interest rate. The protocol design aims to pass on as much interest as possible to those who deposit USDC.

The rUSTP tokens received when depositing USDC follow a rebasing mechanism, with each rUSTP pegged to 1 USD. Interest is reflected through rebase. Theoretically, based on the design of the lending rate, the yield of rUSTP will follow the yield provided by STBT.

MatrixDock currently holds a certain amount of USDC in its lending pool. If users wish to withdraw their USDC, it will first prioritize using these USDC for redemptions. If the redemption amount exceeds what's available in USDC or if the quantity is relatively small, it will sold STBT on Curve(a decentralized exchange) to USDC for withdraw. For larger redemption volumes, the redemption process will be facilitated by STBT redemption through MatrixDock, and according to the current design, it will take T+3 to complete the redemption.

rUSTP can be converted into USTP, which is a stablecoin without interest. The remaining interest income does not specify its destination (possibly to the TProtocol itself). Users can also convert it for iUSTP, an interest-bearing token, which can be easily integrated with various DeFi protocols.

The overall process is as follows:



Source: T Protocol, compiled by DigiFT Research

Figure 30: TProtocol V2 Product Flowchart

TProtocol V2 adopts a lending approach to avoid potential compliance issues associated with the direct introduction of security tokens, the structure is similar to that of Ondo Finance and Flux Finance. According to TProtocol documentation, users will be able to deposit USDC into pools managed by different institutions and earn income from RWA assets. This is part of a plan to create a stablecoin supported by RWA tokens.

RWA-Based Stablecoin：MatrixDock - USDV

The stablecoin project USDV (Verified USD) issues the RWA-based stablecoin USDV, using STBT as its underlying asset. Compared to centralized stablecoin issuers like Circle and Tether, RWA-based stablecoins backed by on-chain assets offer increased transparency in their underlying assets, providing a more stable credit foundation for the stablecoin.

Typically, stablecoin issuers receive dollars, mint an equivalent amount of stablecoins, and invest the dollars in U.S. Treasury bills or highly-rated bank bonds as one of their revenue streams. Some stablecoin issuers, like Circle, distribute a certain percentage of their revenue to ecosystem partners. USDV follows a similar approach, directly sharing the underlying asset's revenue with ecosystem participants through smart contracts to foster the stablecoin ecosystem, including minters, liquidity providers, and market makers.

STBT holders, after undergoing KYC verification, can become USDV minters by depositing STBT into the contract to mint new USDV. USDV, with a unique coloring design akin to Bitcoin's UTXO mechanism, can identify the minters of these stablecoins on-chain. The dynamically adjusted earnings generated from the corresponding quantity of underlying asset STBT will remain in the contract. Among these earnings, 50% are distributed to the minters of these stablecoins, while the other 50% goes to market operators and liquidity providers. Participants in the USDV market can benefit from these earnings or use them as incentives to further stimulate ecosystem development.

Bearer Instrument: Backed Finance

The aforementioned approaches involve transferring profits through wrapping and lending to DeFi protocols via another associated party, allowing the transfer of profits in a permissionless manner while retaining the compliance requirements of the original entities. Backed Finance and subsequent models like Ondo Finance USDY represent more of a breakthrough at the legal and compliance level.

Before delving into the implementation method of Backed Finance, it's essential to understand registered instruments and bearer instruments:

Registered instruments: Generally, circulating securities and other financial assets in the market are registered instruments. The issuer or an authorized registrar must record every transaction and transfer of ownership.

Bearer instruments: These instruments require the issuer or registrar to know the holder's identity only when necessary, such as during subscription/redemption/trading. Real-time tracking of the holder during circulation is not necessary.

Backed Finance issues "tracker certificates", which are derivatives designed to track the prices of underlying real-world assets. Each token represents a "tracker certificate", and token holders have related rights to the value of the underlying assets as specified in the contract.

Backed Finance has registered the "base prospectus" for "tracker certificates" with the Financial Market Authority (FMA) in Liechtenstein. Since Backed Finance is a Swiss-based company, under Swiss law, it can only promote its products to qualified investors and institutional investors. "Authorized Participants", which include licensed banks, securities firms, and non-Swiss-regulated financial institutions, can purchase Backed Finance's products from Backed Finance and subsequently offer them to retail customers. In other words, on the Backed Finance platform, token subscriptions are only available to qualified investors. However, retail investors who acquire Backed Finance-related products elsewhere (i.e., "authorized participants") can redeem them after undergoing KYC on the Backed Finance platform.

In the prospectus, the tokens issued by Backed Finance are bearer instruments, and the token contract design only incorporates a blacklist mechanism. As a result, after issuance, these tokens can be transferred without permission and can directly interact with various DeFi protocols. That's why some of the products issued by Backed Finance have liquidity on Uniswap and anyone can trade the token.

0xdd8b2c9f3db8aa266...	Swap	181 days 23 hrs ago	KyberSwap: Meta Aggr...	sebventures.eth	4.269009050194411058
0xdd8b2c9f3db8aa266...	Swap	181 days 23 hrs ago	0x555B6e...4C7a1fd1	KyberSwap: Meta Aggr...	4.269009050194411058
0xdd8b2c9f3db8aa266...	Swap	181 days 23 hrs ago	Uniswap V3: bCSPX-US...	0x555B6e...4C7a1fd1	4.269009050194411058
0x050a835f20be72568...	Swap	187 days 5 hrs ago	0x74de5d...94016631	0x87F4fE...756402ee	0.380800001745441389

Figure 31: Backed Finance Transaction Record on Ethereum, with Trades on Uniswap, Source: Etherscan, data as of November 27, 2023

Looking at the subscription and redemption scenarios, for the short-term US treasury bill ETF token bIB01 by Backed Finance, there are only two subscription addresses, 0x43 and 0x5f, and no redemption transaction yet. After subscription, the tokens are transferred to other investors via token transfers. Therefore, these two addresses might be authorized participants who transfer Backed's tokens to DeFi protocols or users, bypassing potential restrictions faced by end-users regarding accredited or institutional investor status.

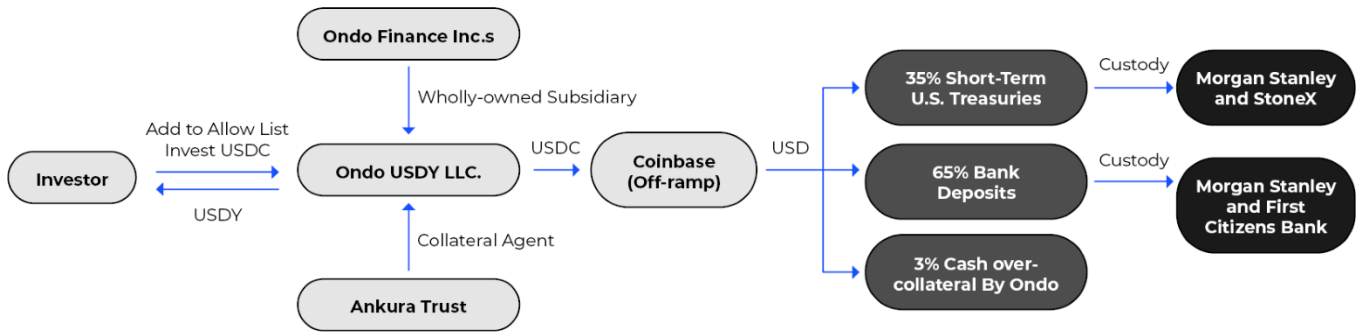
Yield bearing stable coin: Ondo USDY - Mantle

Ondo Finance's newly launched USDY is available on the Layer 2 network Mantle. Users of the Mantle network will be able to purchase USDY directly on decentralized exchanges (DEXs).

USDY is issued by Ondo USDY LLC, a bankruptcy-remote, US-domiciled specialty purpose vehicle, a wholly owned subsidiary of Ondo Finance Inc., a Delaware corporation.

USDY is a tokenized note secured by short-term US Treasury bills and bank demand deposits. It is registered under Regulation S, allowing it to be sold to non-US retail investors with certain restrictions. Currently, there is a 40~50 day lock-up period after purchase, meaning users can only access their tokens on-chain after this period.

The USDY token contract features whitelist and blacklist mechanisms. Unlike other RWA token designs, USDY's whitelist is unique, allowing anyone to add their address to the whitelist through an authorization transaction. The official USDY website offers a feature to send this transaction, and after checking the user's IP address, it assists users in adding their address to the whitelist without the need for KYC. Additionally, the USDY token contract references a legal document stored on IPFS, which may imply that users, by adding their address to the whitelist, are implicitly agreeing to the terms of this legal document.



Source: Product structure of USDY, Compiled by DigiFT Research

Figure 32: Product Structure of USDY

Currently, USDY is an interest-bearing token that accumulates yield over time. In November, Ondo Finance released a rebasing version of USDY, mUSD, on Mantle blockchain. mUSD does not have a whitelist restriction, and it's a rebasing token pegged 1:1 to the value of US dollar, and rebase to update token balance to represent the yield automatically.

The five aforementioned models address the challenge of ensuring compliance with qualified investor requirements for RWA assets, allowing them to be introduced into DeFi and made accessible to a wider audience. For RWA project teams, this can boost their platform's sales volume, while for DeFi, it provides more diverse financial products and a stable source of underlying income through asset diversification.

However, these models face several challenges:

1. **AML restrictions:** DeFi protocols cannot prevent non-compliant assets, such as tainted stablecoins, from entering their protocols. In contrast, RWA protocols typically require KYC and AML checks, as well as rigorous scrutiny of the source of funds when converting stablecoins to fiat for purchasing real-world assets. This misalignment may impact some DeFi protocols in terms of enhancing the compliance of their fund sources. If more RWAs enter the DeFi space, the compliance of DeFi fund sources may need to be strengthened.

2. **Timing mismatch:** Traditional financial asset markets are only open for five working days a week, with a limited number of hours each day. Due to operations, RWAs normally require at least T+1 for settlement. On the other side, DeFi protocols operate 24/7. In cases where there is a need for liquidity, such as market volatility during holidays, DeFi protocols may require asset liquidation, while RWA may involve longer processing times. Protocols that incorporate RWA need to carefully consider liquidity.

3. **Sales restrictions:** Many RWA projects require investors not to be residents of certain countries or regions. Reasons for this restriction may include tax considerations (such as the complexity of the US tax system for US residents), AML regulations (for regions under sanctions), or the complex financial systems of some countries and regions. Through DeFi protocols, it is possible to inadvertently sell assets to residents of regions or countries where it is not allowed. Since most RWA assets are defined as securities and are subject to strict legal restrictions, this could result in sanctions against the RWA project by the local laws of that region or country.

4. **Asset ownership issues:** Questions about what kind of entities DeFi protocols used for onboarding RWA projects, how assets are held, and what is the legal ownership of assets purchased with user-deposited stablecoins remain unresolved. Typically, DeFi protocols open accounts using their foundation entities or establish an SPV to purchase relevant assets from the RWA projects using user-deposited assets. From a legal perspective, ownership of the RWAs lies with the foundation entities or SPVs, with the ultimate beneficiaries being the shareholders behind the foundation entities or SPVs, rather than the users of the DeFi protocol. However, DeFi users are generally anonymous, thus safeguarding user asset rights remains a challenge.

11. Conclusion And Future Outlook: Limited Market Size But Big Potential

The overall market size of Real-World Assets (RWA) is still relatively small. If blockchain technology is expected to serve as the infrastructure for the next generation of capital markets, the current market capitalization of one hundred billion US dollars for stablecoins and two billion US dollars for US government bonds remains a tiny fraction compared to traditional financial markets. However, the efficiency and cost advantages demonstrated by blockchain have led traditional financial giants to explore the RWA space continuously. For instance, Franklin Templeton and WisdomTree have attempted US treasury bill ETF tokenization on Stellar. While relatively centralized, this approach still leverages blockchain as a record-keeping system, and the issuance in the hundreds of millions is noteworthy.

We anticipate RWA to grow slowly albeit steadily, with key factors including:

- From the perspective of asset classes, **in the future, we can expect to see more exploration and experimentation in tokenizing financial assets, further expanding the domain of RWA. In the medium term, RWA assets will likely remain primarily focused on financial assets, with fixed-income products that are relatively scarce in the blockchain space being at the core.**
- From the perspective of market supply and demand, **RWAs will compete with native crypto assets. In a macroeconomic environment characterized by high-interest rates, US Treasuries products, known for their strong consensus and being perceived as risk-free assets denominated in US dollars, will continue to be essential. During a rate-cut cycle, markets tend to favor risk assets, consequently reducing the attractiveness of fixed-income type RWAs. However, as the crypto space further comprehends compliance, we can expect an increase in compliantly issued on-chain assets, competing with native crypto assets.**
- From the perspective of issuance model, **the prevalent RWA issuance models primarily revolve around asset-backed structures, effectively adding an extra layer of counterparty risk, which diminishes efficiency. In the future, we anticipate the emergence of more direct issuance models for RWA assets to further showcase the efficiency and cost advantages of the on-chain financial system.**

An increasing number of financial institutions is exploring direct issuance models on the blockchain, accumulating practical cases and regulatory frameworks through iterative experiments. However, opportunities and risks coexist. A recent tokenization research report published by the Federal Reserve also highlights the potential risks of asset

tokenization. It argued that as more financial assets are tokenized and integrated with the risky and volatile cryptocurrency space, it remains to be seen whether, during extreme market conditions when the underlying assets of those tokens might be fire-sold, the risk could spill over into traditional financial markets, causing unpredictable consequences.

Overall, we are still looking forward for the future of RWA. The financial sector, known for its sensitivity to costs and efficiency, is gradually entering a new era of capital markets driven by blockchain technology, giving rise to new ecosystems and market structures.

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