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RWA Liquidity Market Making: Orchestrating Cross-Border Flows

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Abstract

RWA (Real World Assets) are emerging as the most practical nexus between the blockchain ecosystem and traditional finance. Over the past two years, as compliance pathways have clarified, the scale of on-chain RWA has expanded rapidly. However, this growth stands in sharp contrast to the lagging development of secondary market liquidity, creating a structural imbalance characterized by "rapid asset on-chaining but slow liquidity generation."

On the asset side, traditional assets such as financial leasing, infrastructure yield rights, and trade receivables can already achieve ownership confirmation and digital encapsulation through SPV structures and Token Wrapper mechanisms; the on-chaining process itself is no longer the primary hurdle. However, on the trading side, insufficient deep market-making arrangements, inefficient cross-market settlement processes, and the lack of unified compliant oracle standards directly impact the efficiency of capital flow across different markets and chains. This dislocation has led to a distinct stratification within the RWA market: select top-tier assets possess basic liquidity, while a vast number of long-tail assets remain in a state of low turnover and low pricing visibility, with price fragmentation becoming increasingly apparent.

Based on research findings, sustainable liquidity in RWA cannot be measured simply by "transaction existence." More critical factors include the continuity of price formation, the presence of economic incentives for market-making behavior, and the certainty of cross-market settlement. Using representative RWA projects such as Maple, Centrifuge, Ondo Finance, and RealT as case studies, we systematically analyzed on-chain turnover, quotation fluctuations, and asset rotation. We constructed a comprehensive assessment framework covering transaction depth, quote elasticity, and asset velocity to depict the true liquidity state of different RWA types in the secondary market, looking beyond superficial TVL or nominal transaction volumes.

Based on this framework, current liquidity risks in the RWA market are concentrated in the following areas:

First is the issue of superficial liquidity. Some projects rely on protocol subsidies or short-term incentives to maintain trading activity. Once these subsidies are withdrawn, real demand quickly recedes, and liquidity evaporates.

Second is maturity mismatch. The cash recovery cycle of underlying assets is often long, whereas market-making mechanisms favor short-cycle capital flows. This leads to significant liquidity pressure during market volatility or spikes in redemption demand.

Third is uncertainty at the settlement layer. In practice, cross-chain settlement and on-chain liquidation still suffer from time delays and operational friction, making the synchronous circulation of assets and funds difficult.

Finally, there is price continuity risk. Uncertainties in the confirmation, valuation, and disposal of off-chain assets are amplified within the on-chain pricing system, weakening market trust in price signals.

To address these issues, this research proposes a set of improvement strategies balancing institutional and technical aspects. These include liquidity designs layered by asset type, a market-making incentive framework oriented towards long-term participation, and a cross-market Oracle synchronization mechanism to connect on-chain states with off-chain settlement results. The core objective is to shift liquidity dependence away from short-term subsidies, allowing it to form naturally around real asset cash flows and risk structures.

From a longer-term perspective, the evolutionary path of the RWA liquidity system is becoming clear. First, offshore markets like Hong Kong and Singapore are becoming real-world testing grounds for RWA liquidity mechanisms due to their relatively clear regulatory boundaries and flexible cross-border capital arrangements. Second, the combination of institutional market makers and algorithmic market-making mechanisms is expected to enhance quote continuity and market depth while ensuring compliance and risk control. Finally, infrastructure construction centered on compliant oracles and unified cross-chain settlement standards will be the prerequisite for closing the loop between assets, trading, and settlement, providing the underlying support for the large-scale development of the RWA market.

Keywords: **RWA Assets, Liquidity, Market Making Structure, Cross-Border Settlement, Market Mechanism, DeFi**

01 / Theory and Market Background

1.1 The Concept of RWA and the Logical Evolution of Asset Digitization

Real World Assets (RWA) refer to the mapping of tangible or financial assets from the real economy (such as real estate, government bonds, private equity, supply chain receivables, gold, carbon emission rights, etc.) onto the blockchain in tokenized form, thereby creating asset forms that are divisible, transferable, and liquid.

The essence of RWA lies in structurally expressing the ownership credentials, yield distribution rights, and circulation structures of traditional assets as digital interests governed by smart contracts. Its core logic is the "On-chaining of Three Rights": the separation and recombination of ownership (confirmation of rights), yield rights, and transfer rights.

Figure 1: Comparison Table of Core Elements and Value Logic of RWA

Element category	Traditional financial system	Blockchain RWA system	Improvement effect
Asset ownership confirmation	Paper contracts, manual audits	Smart contracts, on chain certificates	Reduce the cost of property rights confirmation and disputes
profit distribution	Custody account, periodic dividends	On chain ledger and real-time allocation	Improve allocation efficiency
Trading circulation	Restricted secondary market and poor liquidity	Fragmented trading in the on chain market	Enhance asset liquidity
Compliance supervision	Relying on intermediary auditing	Programmable Regulatory (RegTech)	Enhance transparency and trust

Source: Pharos Research

Since the rise of the DeFi (Decentralized Finance) wave in 2020, RWA has been regarded as a critical bridge connecting DeFi with traditional finance. Its development path has evolved through three stages:

Stage 1: Asset Mapping Experimentation Phase (2018–2020), represented by MakerDAO's use of real estate collateral, exploring the feasibility of bringing real assets on-chain;

Stage 2: Compliance Structuring Phase (2021–2023), represented by platforms such as Centrifuge, Maple, and Goldfinch, which introduced KYC, SPV structures, and legal custody;

Stage 3: Institutional Liquidity Phase (2024–Present), marked by initiatives like Ondo Finance, Superstate, and BlackRock's BUIDL fund. This phase sees institutional investors entering the RWA market, with a focus shifting towards liquidity management and secondary market trading mechanisms.

1.2 Structure and Scale Evolution of the Global RWA Market

As of December 3, 2025, the Total Value Locked (TVL) on-chain in the global RWA market has surpassed **$16.435 billion** [1], representing a year-over-year increase of 213.9%. Within this total, Tokenized US Treasuries account for the largest share, followed by private credit, tokenized gold, and real estate.

Figure 2: Distribution of Global RWA Market Structure in 2025

Asset Type	Market share	Representative Projects	Average return rate (annualized)	Risk rating (internal estimation)
Treasury bond	55% - 75%	BlackRock BUIDL, Franklin Templeton FOBXX, Ondo Finance (OUSG)	4.8%-5.5%	A+(low)
Private Credit	10% - 30%	Centrifuge, Maple Finance (Credit Pools), Goldfinch	8%-15%	BB - A- (Medium high)
Tokenized Gold	5%- 15%	PAX Gold (PAXG), Tether Gold (XAUT)	0%+asset appreciation	A (low)
Real Estate	2% - 5%	RealT, Lofty, Polymath	3% -8% (rental income)	B+(medium)
Accounts Receivable and Trade Finance/Receivables	< 1%	Centrifuge Tinlake Pools, XDC Network	7% - 12%	B - (Medium High)
Private Equity/Fund Shares	< 1%	Securitize Markets, TZERO	Depends on fund performance	BBB (middle)
Carbon Credits/Commodities	< 1%	Toucan Protocol (TCO2)	Depends on market fluctuations	B - (Middle)

Source: Pharos Research

This structure exhibits a distinct trend toward institutionalization: US Treasury RWA has become the "safe-haven anchor" for on-chain capital, offering institutions low-volatility products with verifiable yields. Conversely, Real Estate and Supply Chain RWA, due to their higher yield potential, are gradually attracting Family Offices and High-Net-Worth Individuals (HNWIs).

Furthermore, the regional concentration of on-chain RWA products is significant:

- **North American Market**: Accounts for approximately 60% of the global RWA TVL, dominated primarily by SEC-compliant products;
- **European Market**: Accounts for approximately 20%, centered on Luxembourg and Switzerland as structured finance hubs;
- **Asian Market**: Rising rapidly, with Hong Kong and Singapore emerging as dual hubs for compliant issuance and secondary circulation of RWA.

1.3 Structural Root Cause Analysis of RWA Liquidity Issues

The liquidity deficit in RWA is not merely a symptom of an immature Web3 market; rather, it is a structural outcome determined by underlying asset attributes, legal and compliance frameworks, and the organizational methods of the secondary market. Unlike crypto-native assets, RWA is essentially an amalgamation of real-world finance and blockchain settlement systems. Consequently, its liquidity constraints stem more from "off-chain structures" than "on-chain technology." Global practice shows that even for tokenized products based on highly liquid assets like US Treasuries or listed equities, on-chain liquidity has failed to replicate the efficiency of traditional markets. This reflects the significant cross-market friction inherent in RWA liquidity. Overall, liquidity constraints are not uniform; they vary significantly across asset types, as do their underlying causes.

Figure 3: Factors constraining RWA asset liquidity (broken down by asset category)

asset class	Main sources of liquidity constraints	specific manifestations	Instructions
Token based listed equity and Pre IPO equity	Compliance and trading venue restrictions	Secondary transactions must be completed on compliant ATS or licensing platforms	The asset itself does not lack demand and pricing benchmarks, but is restricted by Reg D, Reg S, and Transfer Restrictions, making it difficult to form open liquidity
Tokenized bonds and treasury bond (such as OUSG)	Market making depth and settlement friction	The price difference between buying and selling at the secondary level is significantly higher than that of ETFs	The underlying assets are highly liquid, but on chain products lack a market making network equivalent to the traditional main brokerage system
Real Estate RWA	Non standardized assets+long cash flow cycle	Second level trading is discontinuous, with long transaction intervals	Even if tokenized, the underlying assets are still low-frequency trading assets, and tokens are more responsible for share registration rather than instant circulation functions
Accounts receivable and financing lease RWA	Redemption Structure and Asset Term	Redemption cycle is calculated on a weekly or monthly basis	Essentially, it is a private equity credit asset with liquidity derived from structural design rather than market transactions
Commodity and Physical Asset RWA	Pricing and delivery mechanism	Need to rely on off chain settlement and warehousing proof	Without standardized delivery and custody certificates, it is difficult to form a high-frequency secondary market

Source: Pharos Research

Observations from implemented projects reveal highly differentiated liquidity performance across RWA models:

Case 1: Ondo Finance – OUSG

OUSG uses US short-term Treasuries as underlying assets, with assets under management (AUM) once surpassing $500 million. However, its on-chain secondary market depth and trading continuity remain significantly lower than corresponding traditional Treasury ETFs. This gap stems not from asset quality, but from the lack of an on-chain market-making system and high-frequency arbitrage mechanism equivalent to those in traditional markets.

Case 2: RealT – Real Estate Tokens

RealT's property tokens have an average transaction interval exceeding 72 hours in the secondary market, functioning more as share transfers than continuous trading. This indicates that Real Estate RWA Tokenization primarily improves divisibility and transferability, rather than creating instant liquidity.

Case 3: Centrifuge – Credit Pool RWA

Its accounts receivable and financing asset pools generally set a redemption cycle of approximately 30 days. Liquidity is derived not from secondary trading, but from structured redemption and cash flow recovery mechanisms.

Case 4: Franklin Templeton – OnChain U.S. Government Money Fund (BENJI)

Although this product has successfully brought fund shares on-chain, liquidity is still primarily managed through subscription/redemption mechanisms rather than free on-chain trading. This further illustrates that even for top-tier traditional institutions, Tokenization currently assumes a role more focused on settlement and registration.

Synthesizing these structures and cases, it becomes clear that while RWA 1.0 solved the problem of *on-chaining* assets, RWA 2.0 must address the practical challenge of *how assets flow*. In the absence of compliant secondary trading venues, market-making mechanisms, cross-market arbitrage channels, and clear redemption rules, the Token itself cannot automatically generate liquidity. Therefore, liquidity is not merely a technical proposition, but the result of synergy between institutional design, asset structure, and market infrastructure.

If trading mechanisms and liquidity support systems matching asset attributes cannot be established, RWA will struggle to support larger-scale asset integration and sustainable secondary capital circulation. This represents the critical watershed moment for the industry as it moves from concept expansion to structural upgrade.

1.4 Theoretical Framework for Building RWA Liquidity

RWA liquidity can be defined across three dimensions: Asset Tradability, Market Depth, and Redeemability. This classification does not stem from a single regulatory document or a specific project definition; rather, it synthesizes the classic decomposition of asset liquidity in traditional finance—such as the securities market's analytical framework of "tradability — volume — exit mechanism"—and adapts it to the actual operating structures of current RWA projects.

Specifically, in traditional capital markets, liquidity is often measured by the freedom to trade, the depth of trading, and the ability of investors to exit within a reasonable timeframe. In the RWA scenario, however, because assets coexist as off-chain legal structures and on-chain settlement forms, these three elements are further differentiated and crystallized, forming more robust analytical dimensions.

Figure 4: Three dimensional framework of RWA liquidity

dimension	definition	Corresponding mechanism	Example of indicators
Tradeability	Whether the assets are divisible and can be listed	Token standard (ERC-20/1400), compliant whitelist trading	Number of transactions and segmentation rate
Market Depth	Market buying and selling order thickness and price elasticity	Market maker mechanism, liquidity pool	Spread、 Depth Ratio
Redeemability	Investor exit and redemption efficiency	SPV redemption mechanism, secondary circulation path	Average redemption cycle and fund recovery rate

Source: Pharos Research

This framework serves as the foundation for designing RWA trading mechanisms. The focus of liquidity construction varies by RWA type:

- **Treasury RWA** emphasizes secondary market price stability and depth;

- **Real Estate RWA** emphasizes redemption mechanisms and asset valuation transparency;
- **Supply Chain Finance RWA** focuses on risk tranching and the transferability of accounts receivable.

From a trading model perspective, the evolution of RWA liquidity can be categorized into three mechanism types.

Figure 5: Three dimensional trading model of RWA liquidity evolution

Model Type	core features	Representative platform	limitation
Order Book Circulation	Similar to traditional exchange matching mechanisms	Archax、INX	Fragmentation of liquidity and high cost
Liquidity Pool Model (AMM)	Automatic market making and continuous quotation	Curve, Balancing RWA Pool	Price slippage and regulatory ambiguity
Hybrid Market Making (Hybrid MM)	Combining the advantages of matchmaking and AMM	Maple、Clearpool	High technical and compliance costs

Source: Pharos Research

1.5 Trends in the Convergence of RWA and DeFi Liquidity

Entering 2025, the development of RWA liquidity has progressively evolved towards a "DeFi-Integrated Market Structure." RWA assets are achieving interoperability with decentralized stablecoins, Yield Aggregators, and cross-chain liquidity protocols.

Typical cases include:

- **Aave Real World Assets Module**: Supports RWA as collateral for borrowing stablecoins;
- **Maple Finance**: Incorporates RWA into credit pools, establishing on-chain yield curves;
- **MakerDAO Spark Protocol**: Unlocks RWA liquidity through on-chain lending mechanisms.

This implies that capital flows in the future RWA market will gradually form a "Dual-Loop" structure:

1. Primary Market Issuance → Secondary Market Circulation;
2. Secondary Circulating Assets → Collateralization for New Liquidity Generation (e.g., Stablecoins).

The formation of this cycle transforms RWA from merely "tokenized" static assets into critical liquidity infrastructure within the DeFi ecosystem.

1.6 Summary

The core value of RWA lies not merely in migrating traditional assets on-chain, but in the structural design of ownership verification, yield rights, and transfer rights. This design empowers assets with digital circulation capabilities that are composable, settleable, and regulatable. Global practice indicates a clear trend toward institutionalization: low-risk assets, represented by Treasuries, serve as liquidity and credit anchors, while assets such as Private Credit and real estate are utilized primarily for yield enhancement and structural innovation. Furthermore, regional differences in regulatory approaches are reshaping the market's global division of labor.

The liquidity constraints currently facing RWA are not solely on-chain technical issues. Instead, they represent structural frictions resulting from a combination of underlying asset attributes, compliance arrangements, a lack of market-making mechanisms, and imperfect redemption designs. Even for highly liquid traditional assets, tokenization does not automatically replicate their original market depth, underscoring that RWA liquidity is essentially a cross-market engineering challenge.

Consequently, building RWA liquidity requires systematic advancement across three dimensions: Tradability, Market Depth, and Redeemability. It relies on trading mechanisms and institutional arrangements that match asset attributes, rather than the Token form alone. The industry is transitioning from the phase of "Can we bring it on-chain?" to "Can we generate sustainable liquidity?" This shift marks a critical watershed for the large-scale development of RWA.

02 / RWA Trading Mechanism Design and Structuring Path

2.1 Trading Mechanism Design: The Liquidity Chain from Issuance to Secondary Trading

For RWA, from the issuance side to secondary market trading, the key to building liquidity lies in designing a lucid and executable chain: "Issuance - Custody - On-chain Credential - Market Making/Trading - Exit." A bottleneck at any stage in this chain can result in valuation discounts, exit blockages, or even market collapse. According to literature, although on-chain RWA assets exceeded **$16.435 billion** as of December 3, 2025 [2], the majority remain characterized by low trading volume, long holding periods, and sparse investor participation. This chain can be deconstructed into five key nodes:

- Issuance
- Custody & Asset-Proof
- Minting & Tokenization
- Market Making & Secondary Market
- Redemption & Buy-back

Figure 6: Key nodes and responsibility matrix of RWA transaction flow chain

node	key action	responsible party	On chain triggering evidence	main risks	Slow release mechanism
issue	SPV establishment, asset pooling, legal opinion letter	Issuing party/law firm	Hash of SPV registration certificate and asset purchase agreement	Defects in legal property rights confirmation	Independent lawyer's opinion, third-party audit
hosting	Asset custody, receipt on chain	custodial institution	Return hash on chain Proof of Reserve	Negligence in custody and undisclosed changes in assets	Multiple custody and insurance mechanisms
Casting/tokenization	Token issuance and whitelist control	distribution platform	Mint event log, whitelist address hash	Multiple casting and repeated pledging	Contract limit, off chain audit
Market making/trading	Market maker pending orders, AMM pool bidding	Market maker/exchange	Order book snapshot, pool status hash	Liquidity depletion and widening price differentials	Market making margin, repurchase pool equity
Redemption/Exit	Investor redemption and repurchase execution	Issuing party/market maker	Redeem event log, repurchase transaction hash	Large scale redemption shock	Segmented redemption mechanism, priority layer protection

Source: Compiled by Pharos Research

This table serves as a comprehensive process checklist—defining who, what, where, and how—for issuers, project teams, and investors, acting as the core template for designing trading mechanisms.

2.2 Structural Path Design: Token Standards + Tranching

To enhance the configurable liquidity of RWA, structured layering (tranching) has become one of the most critical levers in financial engineering. By introducing two-tier or three-tier token structures—namely Senior, Mezzanine, and Equity—issuers can unbundle the cash flows and risk exposures of the same underlying asset. This enables capital with varying risk appetites to access differentiated exposure within the same asset pool, while also providing structural space to embed buy-back, backstop, or compensation clauses for market makers, custodians, or liquidity providers.

In practice, this tiered structure appeared earliest and is most mature within the on-chain Private Credit RWA sector. It is particularly prevalent in asset pools backed by accounts receivable, trade finance, and corporate credit loans. By attracting low-risk capital through the Senior tranche while assigning first-loss risk to the Junior tranche, a relatively stable risk-sharing and pricing paradigm has been established. In contrast, Treasury RWA relies more on a singular senior structure and redemption mechanisms. Meanwhile, Real Estate RWA has begun experimenting with tiered designs, but due to the non-standard nature of the assets and insufficient secondary demand, its application remains in the exploratory stage.

Therefore, the tiered token structure is not universally applicable to all RWA assets. Rather, it is a liquidity enhancement tool that has been fully validated in private credit and is gradually expanding to other asset types.

Figure 7: RWA structured product path design parameters

parameter dimension	Priority layer definition	Secondary layer definition	Definition of equity layer	Applicable scenarios	Liquidity advantage
Minimum investment amount	⩾ $500k	⩾ $100k	⩾ $10k	Large fixed income pool	Increase institutional participation
annualized rate of return	4 – 6%	6 – 9%	10%+	Treasury bond/real estate	Risk return stratification
Redemption cycle	30 days	60 days	90 days	Full pool redemption mechanism	Priority layer exits earlier
Market making support	There is a market making contract	Market making margin support	No margin	Market making mechanism participation hierarchy	Enhance overall depth
buyback clause	Priority repurchase	Secondary repurchase	No repurchase clause	Liquidity event buffer	Reduce discount risk

Source: Compiled by Pharos Research

This structural design allows issuers to embed "market-making support" and "buy-back commitments," offering higher predictability for Senior Tranche investors and thereby attracting market makers and custodians to participate.

2.3 Market Making Strategies: Hedging, Margin, and Buy-back Pools

Market making strategy is the core driver of secondary market liquidity for RWA. The absence of robust market-making mechanisms is a primary root cause of the poor liquidity observed in most current RWA products [3]. Key components of these strategies include:

- **Inventory Cost Management**: Market makers must hold a portion of the assets or their Tokens, thereby assuming price volatility risk and financing costs (inventory carrying costs).
- **Order Depth and Spread Control**: Liquidity is attracted by enforcing minimum order depth and maximum spread requirements; common benchmarks are Depth ≥ 10× Typical Order Size, and Spread ≤ 50 bps.
- **Buy-back Pool Support**: Issuers establish a reserve fund (buy-back pool) to inject liquidity and repurchase Tokens during emergencies. The scale is typically set at 1–2% of the total asset pool.
- **Compensation Mechanism Design**: To compensate for the risks borne, market makers receive maker rebates, a share of transaction fees, or buy-back incentives.

Figure 8: RWA Market Making Economic Parameter Template

parameter	meaning	recommended value	Instructions
D (depth of pending orders)	Total ratio of pending orders for buying and selling	⩾ 10 x typical order quantity	Adequate liquidity standard
S (maximum price difference)	Bid ask price difference	⩽ 50 bps	Control transaction costs
C_inv (inventory cost)	Market maker's capital occupation cost	2-4% per year	The issuer needs to subsidize or promise to repurchase
B (repurchase pool size)	Reserve fund pool	1-2% * A (asset pool size)	Avoid the impact of redemption wave
F_fee (market making fee)	Market maker fee ratio	0.1-0.2% per transaction	Supporting market makers' willingness to participate

Source: Compiled by Pharos Research

Using this parameter model, issuers can preliminarily estimate the necessary budget for market-making support, design investor liquidity compensation mechanisms, and assess the overall level of risk mitigation.

2.4 Structured Path Model Design: Issuer to Investor Workflow

Taking the issuance of Treasury RWA as an example, the specific workflow can be designed as follows:

1. The Issuer establishes an SPV, purchases US Treasuries, and sets up a trust structure.

2. The Custodian takes possession of the assets and publishes a Proof of Reserve receipt on-chain.
3. Tokens are minted for different tranches (Senior, Mezzanine, Equity). The Offering Memorandum must **detail** the market-making mechanism, buy-back clauses, and redemption process.
4. Market-making contracts or SLAs are signed with contracted market makers, and the issuer establishes a buy-back pool.
5. The secondary market launches on an ATS or on-chain AMM pool, allowing investor participation.
6. Investors redeem based on Senior Tranche terms, or Equity Tranches exit upon specific events (e.g., fund liquidation, asset disposal).

Figure 9: Key nodes and responsible parties in the template process

node	perform action	responsible party	On chain triggering evidence	Estimated time required
SPV establishment	Registered Asset Pool SPV	Law firm/issuer	Register Hash	2-3 weeks
Asset purchase	Purchase and custody of treasury bond	trustee bank	Custody receipt hash	1 week
Casting Token	Priority/Secondary/Equity Token Issuance	issuer	Mint log	1-2 days
Market making contract signing	Market making SLA, margin injection	Market maker/issuer	SLA Hash	1-2 weeks
Listing/Trading	ATS or AMM pool online	Exchange/Platform	Online transaction hash	3-5 days
Redemption/Exit	Redemption of priority layer or exit of equity layer	Publisher/Custodian	Redeem event hash	30-90 days

Source: Pharos Research

2.5 Common Challenges in Trading Mechanisms and Mitigation Strategies

While the mechanism designs described above appear structurally comprehensive, they face several critical pain points in practice:

- **Investor Concentration and Risk of Market Maker Absence**: If market makers withdraw or inventory runs low, liquidity suffers an immediate impact.
- **Valuation Latency and Weak Price Signals**: For instance, low trading volumes and slow NAV updates in Real Estate RWA often lead to valuation discounts in the secondary market.
- **High Cross-Chain and Channel Costs**: Infrastructure for migrating assets between chains or establishing cross-border corridors remains immature.

- **Regulatory and Compliance Friction**: Different jurisdictions impose high compliance costs on tokenization, secondary trading, and custody [4].

To address these challenges, the following strategies are recommended:

- Establish **Market-Making Redundancy Mechanisms**: Engage multiple market makers and multi-channel protocols, and define "market maker exit triggers" to prevent abrupt withdrawals.
- Introduce **Price Discovery Mechanisms**: Implement regular on-chain NAV updates, oracle feeds, and price propagation mechanisms.
- Build **Cross-Chain Hub Channels**: Prioritize implementation in compliant hub jurisdictions (e.g., Hong Kong, Singapore) before replicating to other regions.
- Optimize **Exit Mechanism Design**: Manage concentration risk in redemptions through buy-back pools, Senior Tranche redemption priority, and staggered exits.

2.6 Summary

RWA liquidity does not emerge naturally; it is a systems engineering endeavor heavily reliant on trading mechanisms and structured design. Any imbalance across the chain—from issuance to secondary trading—amplifies valuation discounts and exit risks. Practice demonstrates that merely bringing assets on-chain is insufficient to create an effective market. A lucid and executable chain of "Issuance—Custody—Tokenization—Market Making—Redemption" is the prerequisite for building liquidity.

Building on this, structured tranching has become a critical tool for enhancing the configurable liquidity of RWA. By unbundling a single asset pool into Senior, Mezzanine, and Equity tranches, capital with varying risk appetites can coexist within a unified structure. This also reserves structural capacity for market-making support, buy-back arrangements, and risk mitigation. While this model has been fully validated in Private Credit RWA, establishing a relatively mature risk-sharing and pricing paradigm, it manifests through differentiated application paths for assets like Treasuries and Real Estate.

At the secondary market level, market-making mechanisms determine whether RWA possesses continuous trading capability. Order depth, spread control, inventory cost compensation, and buy-back pool arrangements form the core elements of the market-making system. The absence of clear incentives and exit buffers is the root cause of the liquidity deficit in most current RWA products.

Overall, RWA is transitioning from the phase of "can assets be compliantly on-chained" to "can liquidity be engineered." Trading mechanisms, structural tranching, and market-making arrangements have become the core considerations determining whether RWA can achieve scalability and institutional participation.

03 / Secondary Market and Market Making Strategies

3.1 The Decisive Role of the Secondary Market for RWA

The key to transforming the locked value of RWA into liquid value lies in the structure and market-making mechanisms of the secondary market. Whether for Treasury-backed assets like OUSG, Real Estate assets like RealT, or supply chain pools like DROP/TIN, the depth of the secondary market, the sustainability of market making, and the efficiency of price discovery determine the liquidity premium (or discount) investors are willing to assign to such assets. Experience demonstrates that RWA lacking stable market makers often suffer severe discounts under stress; conversely, RWA equipped with structured market making and buy-back pools can maintain spreads within a manageable range even during redemption waves. In the following sections, we analyze the constituent elements and market-making strategies of the secondary market.

3.2 Classification and Feature Comparison of Secondary Trading Venues

Secondary trading venues for RWA are broadly categorized into four types: Centralized Exchanges/ATS (CEX/ATS), Decentralized Exchanges (DEX/AMM), Restricted or Permissioned Decentralized Exchanges (Permissioned DEX / Whitelisted AMM), and Market Making Protocols (Hybrid Market Making). Each venue exhibits distinct differences in compliance profiles, latency, costs, and liquidity depth.

Figure 10: Comparison of Secondary Trading Scenarios (CEX/ATS/DEX/Permitted DEX)

scene	Typical platform	Compliance attributes	Transaction delay	transaction cost	Depth of liquidity	advantage	limitation
CEX / ATS	Securitize Markets, tZERO, Coinbase Custody docking	High - Can be KYC/restricted for sale	Low (matching)	Medium (matching fee+fiat currency channel cost)	High (if there is market making)	Fiat currency clearing and compliance	High online approval and hosting costs
Decentralized DEX (public)	Uniswap, Curve (RWA pool)	Low (anonymous)	low	Low (on chain gas)	Low medium (according to LP)	24/7 casting/redemption, without license	KYC/compliance risks, regulatory frictions
Restricted/Licensed DEX	Private AMM, Permitted Market	High (White List)	low	Chinese	Chinese	Compliance and on chain mobility coexist	High docking threshold, requiring trusted nodes
Hybrid (market making contract+institution)	Ondo+Nexus, etc	high	low	Chinese	High (market making contracts+institutional pending orders)	Combining automation and manual market making	The contract is complex and requires market maker incentives

Source: Pharos Research

Notes:

- **ATS / CEX** is best suited for secondary circulation requiring high compliance (e.g., Treasuries, Pre-IPO Equity), but entails high startup costs and strict compliance thresholds for issuers and exchanges. Refer to practices by Securitize and tZERO (see Securitize report).
- **Public DEX** offers convenience but poses compliance risks for securities-type RWA (regulated by the SEC), and suffers from high price slippage when LP liquidity is insufficient.
- **Permissioned / Hybrid Mode** represents the most common compromise in current practice—it retains on-chain transparency and settlement efficiency while introducing institutional market making within compliance boundaries [5].

3.3 Types of Market Making Entities, Contractual Arrangements, and Liquidity Restructuring Logic

3.3.1 Market Making Division of Labor in Traditional Finance: Liquidity is Not "Naturally Formed"

In the traditional financial system, liquidity is never a phenomenon that occurs spontaneously; rather, it is orchestrated by specific market-making entities, contractual arrangements, and regulatory constraints. Whether for Treasuries, corporate bonds, or REITs and Asset-Backed Securities (ABS), secondary market liquidity is built upon three foundations:

1. **Professional Market Making Institutions** acting as long-term liquidity providers, bearing inventory and hedging risks;
2. **Clear Contracts and Incentive Mechanisms**, such as requirements for minimum quote size, maximum bid-ask spread, and continuous quoting obligations;
3. **Institutional Constraints** from regulators or trading venues, including information disclosure, trading logs, emergency trading halts, and default handling procedures.

Taking the US Treasury market as an example, the Primary Dealer system ensures a stable liquidity supply through qualification requirements, market-making obligations, and central bank operations. Similarly, in corporate bond and ETF markets, Authorized Participants (APs) and market makers maintain price anchoring through creation/redemption mechanisms and inventory management. Liquidity is not a free resource; it is a financial service produced through institutional design.

3.3.2 The Core Disconnect in the RWA Market: Asset Compliance ≠ Liquidity Availability

In the RWA sector, many projects focus heavily on asset compliance, ownership verification, and custody structures during design, yet lack systematic arrangements for "who will make markets long-term and under what obligations." This leads to a structural problem: **RWA assets are legally valid and verified in accounting, yet they lack a sustainable supply of liquidity at the transactional level.**

This is not a problem unique to Web3, but rather a "liquidity vacuum" created by detaching from traditional market-making systems. Relying solely on AMM or short-term incentives often creates only superficial depth during the initial issuance. Once subsidies are withdrawn or market volatility increases, secondary liquidity evaporates rapidly.

Therefore, the RWA liquidity issue is essentially not about "whether to go on-chain," but about whether the market-making division of labor and contractual systems can be reconstructed.

3.3.3 Types of Market Making Entities: From Traditional Roles to On-Chain Mapping

In current practice, the RWA market has gradually developed several identifiable types of market-making entities, all of which have prototypes in traditional finance.

(1) Professional Institutional Market Makers (Principal Market Makers)

Positioning and Characteristics

These entities participate in the market using their own balance sheets. They possess off-chain rails for fiat, bonds, or notes, and are capable of managing duration, interest rate, or credit hedging.

Contractual Logic (Highly Traditional)

Obligations are usually defined through a Market Making Service Level Agreement (SLA), including:

- Minimum continuous quote size
- Maximum bid-ask spread
- Mandatory trading hours
- Margin or risk reserves
- Default and exit clauses
- Obligations for disclosing quote and transaction logs

Applicable Scenarios

- Treasury and Money Market RWA
- Large-scale, stable cash flow Real Estate asset pools

This model is essentially a direct transposition of the traditional bond market-making system into an on-chain environment.

(2) Market Making Funds and Liquidity Backers

Positioning and Characteristics

These entities primarily assume the role of "bootstrapping liquidity providers," offering phased capital injection in exchange for fee sharing, fixed returns, or equity-based incentives.

Contract Key Points

- Defined term for capital usage
- Exit or buy-back mechanisms
- Incentive structures linked to trading volume or spread performance

Applicable Scenarios

- Newly issued RWA products
- Asset pools not yet ready for institutional market making

This structure is analogous to **Cornerstone Investors + Liquidity Support Arrangements** in traditional finance.

(3) Protocol-Based Market Making (AMM / LP)

Positioning and Characteristics

Provides passive quoting via smart contracts, suitable for scenarios with fragmented assets and lower trading frequency.

Major Risks

- High slippage
- Rapid liquidity withdrawal during stress periods
- Deviation from the asset's true value

Therefore, this model is better suited as an **auxiliary liquidity tool** rather than a core mechanism.

(4) Hybrid Market Making Mode

In more mature RWA projects, a hybrid structure is emerging: Contract mechanisms provide baseline liquidity, while institutional market makers supplement depth within key spread intervals.

This model combines the certainty and automation of smart contracts with the judgment, risk absorption capability, and continuity of institutions.

Its logic is highly consistent with the "electronic quoting + Primary Market Maker backstop" model in traditional markets and is regarded as **the landmark structure marking the evolution of RWA liquidity from 1.0 to 2.0**.

Figure 11: Comparison Table of Market Making Entities, Contract Points, and Adaptive Asset Types in RWA Market

Market making entity	Core elements of the contract	Main risk assumption	Incentive structure	Adapt to asset types
Institutional market makers	Minimum pending order, upper limit of price difference, margin, default clause	Holding and hedging risks	Fee sharing/market making subsidy	Treasury bond, pooled real estate
Market making fund	Funding term, return distribution, and exit mechanism	Liquidity and Time Risk	Fixed return/performance sharing	Newly launched RWA products
AMM / LP	Locking period, rate mechanism, extraction rules	Slippers and Withdrawal Risks	transaction fee	Small and fragmented assets
hybrid mode	Contract parameters+SLA	Contract risk+institutional relocation risk	Contract rewards+market making subsidies	Medium to large and long-term asset pools

Source: Pharos Research

3.4 Market Making Economics: Costs, Compensation, and Inventory Management

Market making is not an act of charity; while providing liquidity, market makers incur inventory costs, hedging costs, and compliance costs. The central challenge of market making economics is how to sustain the attractiveness of the activity for market makers, given the constraints of finite capital and the cost of capital.

3.4.1 Inventory Costs and Hedging Costs

- **Inventory Carry Cost** = Cost of Funding + Cost of Risk Capital + Capital Premium. For market makers, this typically represents an annualized implicit cost of 1–5% (depending on asset volatility and borrowing rates).
- **Hedging Cost**: If hedging exposure requires taking opposite positions in other markets (e.g., hedging the interest rate risk of RWA Tokens via interest rate futures or Treasury futures), hedging friction costs arise. [5] Reports from Ondo and WisdomTree note that institutional hedging infrastructure for RWA is still under construction, leading to higher costs during the initial phase of market making.

3.4.2 Market Making Compensation Structure

Common compensation structures include:

- **Direct Fee Sharing**: Allocation of a portion of transaction fees to market makers;
- **Market Making Subsidy**: Liquidity subsidies provided by the issuer or platform during the bootstrapping phase, distributed based on trading volume or market making quality (QQS);
- **Buy-back/Insurance Incentives**: The buy-back pool provides liquidity support to market makers during specific events, or third-party insurance covers a portion of market making losses.

3.4.3 Market Making Risk Budget and Capital Requirements

The market maker's risk budget should be quantified in the SLA, including: maximum exposure, mandatory margin call mechanisms, and default handling procedures. It is recommended that issuers specify the **minimum capital threshold for market making**, **margin ratios**, and **liquidation trigger conditions** in the product prospectus.

Figure 12: Template for Market Making Economics Parameters (Reference for Issuers)

parameter	meaning	Suggested initial value	Instructions
(H)	Average holdings of market makers	0.5% -2% total pool AUM	Depending on the size of the pool
(C_{inv})	Annualized inventory cost	2% – 6%	Cost of capital+cost of capital
(I_{fee})	Transaction fee income (annualized)	0.5% – 1.5%	Estimate based on trading volume
(S)	Platform market making subsidy	dynamic	The guidance period can be high (monthly)
(R_m)	Market maker's profit target	6% – 12%	Institutions and family run businesses are different

Source: Pharos Research

3.5 Hybrid Implementation of AMM and Order Book: Design and Trade-offs

For different categories of RWA, AMM (Automated Market Maker) and Order Book models each possess distinct advantages and disadvantages. In practice, the most effective strategy is often a **Hybrid Mode**: AMMs provide continuous baseline liquidity, while Order Books handle large-volume trades and provide competitive pricing depth.

3.5.1 AMM: Advantages and Optimization Strategies

- **Advantages**: Counterparty-agnostic trading, 24/7 availability, and ease of use. Suitable for small or fragmented assets.
- **Disadvantages**: Difficulties in pricing non-fungible RWA (e.g., heterogeneous properties); LPs face impermanent loss; challenges in meeting compliant KYC requirements (requires whitelisting).
- **Optimization Strategies**: Permissioned AMM (Whitelisted LPs), Credit-weighted curves (incorporating asset credit scores into pool weights), and Dynamic fee mechanisms (raising fees during periods of volatility).

3.5.2 Order Book: Advantages and Limitations

- **Advantages**: Price discovery mechanisms comparable to traditional exchanges; suitable for block trade matching. Easier to satisfy ATS compliance requirements.
- **Limitations**: Requires continuous market maker support to maintain depth; unfriendly to fragmented, small-ticket trades.

3.5.3 Practical Architecture for Hybrid Deployment

- **Foundation Layer**: Permissioned AMM provides baseline liquidity for smaller trades, with LPs primarily being Accredited Investors.
- **Matching Layer**: Order Book (ATS / CEX) handles block trades and high-frequency matching.
- **Bridge Layer**: Contracted market making (or arbitrage bots) provides price calibration and arbitrage between the two layers.

Figure 13: Comparison of AMM/Order Book/Hybrid Characteristics

dimension	AMM（Permissioned）	Order book (ATS/CEX)	Mixed (recommended)
Adapt assets	Small/homogeneous asset pool	Large/standardized assets	Mixed asset pool
compliance	Realizable (whitelist)	easy to achieve	Feasible but complex
price discovery	Based on curve model	market making	Curve+matching correction
block trade	Sliding point high	Low slip point	Resolve through the matchmaking layer
Implementation cost	Chinese	high	Highest (Technology+Compliance)

Source: Pharos Research

Case Reference: In its liquidity design, **Ondo Finance** opted against traditional AMMs or continuous two-sided market making. Instead, it introduced an **RFQ (Request for Quote)** mechanism based on institutional participation. Its product line utilizes a dual-track liquidity framework: on one hand, a contractual minting and redemption mechanism ensures accredited investors can enter and exit the primary market at the underlying asset's NAV; on the other hand, for secondary circulation, an RFQ system connects investors with invited institutional liquidity providers. This allows investors to request quotes and execute trades with specific market makers, providing limited but predictable liquidity support without compromising compliance or price control. In contrast, **RealT** adopts a permissioned secondary market structure for real estate tokens, supplemented by issuer-led subsidies or matching arrangements to maintain basic tradability. However, its liquidity depth and frequency remain significantly constrained by the idiosyncratic nature of the assets and the investor structure.

3.6 Buy-back Pools, Staggered Redemptions, and Emergency Liquidity Mechanisms

In stress events (such as redemption waves or market panic), buy-back pools and staggered redemption mechanisms serve as the most direct buffers. While previous chapters provided basic formulas, this section supplements the discussion with emergency execution logic and key points for legal design.

3.6.1 Buy-back Pool Sources and Governance

Funding Sources: Issuer's proprietary capital reserves, accumulated excess yield from the Senior Tranche, third-party liquidity providers (market making funds), and guarantees from insurance institutions.

Governance Recommendations: The buy-back pool should be managed by an independent custodian (segregated from asset custody), with Proof of Reserve (PoR) published regularly on-chain. The usage of buy-back funds should be subject to multi-sig or smart contract constraints to mitigate moral hazard.

3.6.2 Execution Template for Staggered Redemptions

- **Stage A (Normal)**: Immediate redemption. Satisfies small redemption requests (≤ threshold) via AMM or market maker matching.
- **Stage B (Stress)**: Staggered processing. Large redemptions are processed in installments (e.g., paid in N batches over 7 days), with the buy-back pool activated to supplement liquidity.
- **Stage C (Crisis)**: Emergency liquidity plan. If thresholds are exceeded for consecutive days, mandatory market maker intervention is triggered, insurance proceeds are utilized, and redemption deferrals are reported to regulators (if compliance permits).

Legal Design: To ensure a solid legal basis for execution, the offering prospectus and SPV contracts should clarify the following mechanisms:

- **Redemption Hierarchy**: Drawing from disclosure standards in traditional ABS or REITs, this defines the priority of fund distribution during early redemption, maturity, and abnormal liquidity events.

- **Buy-back Pool Usage**: Similar arrangements appear in cross-border structured note prospectuses. This recommendation adapts such structures for RWA and does not constitute a mandatory regulatory requirement.
- **Emergency Suspension Triggers**: Referencing protocol clauses from trading platforms regarding token freeze procedures, this outlines safety mechanisms suitable for future RWA product adoption.
- **Redemption Deferral Mechanism**: Currently utilized in private credit pool protocols, this serves as a reference model adapted for tokenized structures.

Figure 14: Redemption Segmentation Trigger Matrix (Example)

trigger condition	phase	Implementation measures	source of funds	Notification requirements
Daily redemption ⩽ 1% pool size	A (normal)	Instant redemption	Market maker/AMM	Regular report
Daily redemption of 1% -3%	B (Buffer)	Installment redemption+repurchase pool	Repurchase pool+market maker	Announcement+Reporting
Daily redemption>3%	C (Crisis)	Activate emergency liquidity and regulatory communication	Repurchase pool+insurance+market maker	Regulatory declaration, temporary restrictions

Source: Pharos Research

Practical Case: In certain Centrifuge pools, to protect LPs, the issuer established a "Staggered Redemption + MakerDAO Collateral Top-up" responsive mechanism. This significantly mitigated the price impact on the pool during redemption waves [6].

3.7 Secondary Market Pricing Models and Market Microstructure

Secondary market prices are influenced by both **fundamentals** (underlying asset cash flows, valuations) and **market microstructure** (depth, order book, slippage). Pricing models for RWA must account for both aspects simultaneously:

3.7.1 Fundamental Layer: Discounted Cash Flow (DCF) and NAV

For yield-generating RWA (e.g., rental or interest-based), the standard pricing methods remain Discounted Cash Flow (DCF) or Net Asset Value (NAV). The challenge lies in data latency and valuation frequency: if NAV updates lag, the secondary market will apply a discount to compensate for the uncertainty. It is recommended that issuers establish a minimum NAV update frequency (weekly/monthly) and publish hash signatures on-chain to enhance trust.

3.7.2 Market Microstructure Layer: Limit/Market Orders and Slippage Models

Microstructure models typically utilize LOB (Limit Order Book) or AMM curves. For RWA, a common approximation for estimating slippage is (simplified):

![AIMATH_FORMULA::v1:: [\text{Slippage} \sim \frac{\text{Trade Size}}{\text{Depth}} \times \lambda]][image6]

Where **Depth** is measured by the "total volume of orders within ±x bps," and **\lambda** is the Market Elasticity Coefficient (empirical values range from 0.5 to 2, depending on the asset class).

3.7.3 Measurement and Monitoring of Secondary Market Premium/Discount

It is recommended to establish routine monitoring indicators and publish them on-chain:

- **Spread** (Bid-Ask Spread, averaged over a time window)
- **Depth Ratio** (Ratio of order depth to liquidity pool size)
- **Market Resilience** (Speed of price recovery following large trades)

If the Spread or Depth Ratio breaches preset thresholds (e.g., Spread > 100 bps or Depth Ratio < 0.5), mechanisms such as market-making subsidies or temporary AMM fee hikes should be triggered.

3.8 Case Study: Comparison of Secondary Strategies – Ondo (Treasuries) vs. RealT (Real Estate)

3.8.1 Ondo (Treasuries)

Ondo's products, such as OUSG / USG, utilize a combination of **contractual minting/redemption + institutional market making + buy-back pools**. The objective is to convert the high credit quality of Treasuries into low-friction on-chain liquid assets. According to their documentation, collaboration with custodians (e.g., Coinbase Custody) and auditors ensures a 1:1 backing between assets and Tokens, thereby reducing the credit assurance costs for market makers [5].

Key Points of Secondary Strategy: Prioritize attracting qualified institutional market makers and setting lower transaction fees to drive high trading volume. Additionally, the issuer or platform provides short-term liquidity subsidies to bootstrap initial market making.

3.8.2 RealT (Real Estate)

RealT's real estate tokens exhibit higher heterogeneity (significant differences between individual properties), so its secondary strategy relies more on **Permissioned Markets + market making subsidies**. Although NAV updates and rent distributions are frequent (weekly dividends for some projects), secondary market depth remains constrained by holder concentration and the complexity of cross-border KYC. To address this, RealT employs a "Pooling + Localized Market Making" strategy: properties within the same city or group are aggregated into pools, where local market makers maintain baseline depth.

3.9 Regulation and Contractual Compliance: Key Design Points for Secondary Market Compliance

In most mature jurisdictions (USA, Hong Kong, Singapore), secondary market compliance requirements directly dictate the choice of trading venue. If an asset is classified as a "security," trading on a public DEX faces significant legal risks; conversely, an ATS or Permissioned DEX can operate within a compliant framework. Key compliance considerations include:

1. **Investor Eligibility Verification (KYC / Accredited)**: Combining on-chain whitelist mechanisms with off-chain KYC records.

2. **Lock-up Periods and Transfer Restrictions**: Clearly defining lock-up terms, permissible transfer paths, and necessary reporting obligations within the Offering Memorandum.
3. **Information Disclosure Obligations**: Publishing on-chain hashes for regular NAV updates, Proof of Custody, and audit reports.
4. **Market Maker Qualifications**: Establishing compliance thresholds for market makers (e.g., capital requirements, audit standards, and reporting capabilities).

It is recommended to embed **Compliance Triggers** within Market Making SLAs and issuance smart contracts. If regulators issue new rules regarding a specific asset class, the contract should automatically trigger disclosure obligations and enable temporary trading restrictions (subject to written notice and records of regulatory communication).

3.10 Operations and Monitoring: Indicator Systems and Daily Governance

To maintain the health of the secondary market, issuers and platforms should deploy real-time monitoring and governance protocols. Key metrics include, but are not limited to:

1. Real-time Spread, 7-Day Average Spread
2. Depth (Aggregate order volume within ±50 bps)
3. Volume / TVL Ratio (Liquidity Turnover Rate)
4. Daily Redemption Rate
5. Market Maker Performance Rate (SLA Compliance Rate)

If any metric shows anomalies (breaches thresholds), the platform must immediately activate emergency protocols: issuing public announcements, triggering market-making subsidies, deploying buy-back pools, and initiating regulatory communication. Governance procedures should be documented, with announcement hashes and action logs recorded on-chain to ensure post-event auditability.

3.11 Summary: The Engineering Path for Secondary Market Construction

Whether RWA can transform from merely "on-chainable assets" into "allocatable assets" fundamentally depends on the structural design of the secondary market and the arrangement of market-making mechanisms. Practice demonstrates that RWA products lacking continuous market-making support often suffer significant valuation discounts under market volatility or redemption pressure. Conversely, products equipped with clear market-making responsibilities, buy-back buffers, and price constraint mechanisms exhibit greater liquidity resilience and are more likely to attract long-term institutional capital.

From the perspective of trading venues, Centralized ATS, Public DEX, Permissioned DEX, and Hybrid Market Making models each present trade-offs regarding compliance costs, transaction efficiency, and liquidity depth. Currently, the most viable path involves introducing institutional market making within a compliant framework. Through permissioned or hybrid structures, a balance is struck between on-chain settlement efficiency and regulatory control.

The sustainability of liquidity is determined by the market-making entities and their contractual arrangements. Whether utilizing professional institutional market makers, market-making funds, or AMM and hybrid models, the core issue is not the form, but the substance: ensuring that market-making behavior is transformed from temporary support into predictable, binding long-term commitments through SLAs, subsidy mechanisms, and risk budgets.

Furthermore, buy-back pools, staggered redemptions, and emergency liquidity mechanisms provide systemic buffers for RWA during extreme scenarios. Meanwhile, hybrid architectures combining AMM and Order Books offer optimized price discovery pathways for trades of varying scales and frequencies. Overall, the engineering design of the secondary market is becoming the foundational basis for RWA to command stable liquidity premiums.

04 / Liquidity Stress Testing and Risk Mitigation

4.1 Theoretical Framework and Practical Significance of Liquidity Stress Testing

The core of RWA liquidity stress testing lies in assessing the asset pool's ability to fulfill obligations, honor redemptions, and maintain price stability under extreme but plausible market scenarios. Unlike the "high volatility and instant settlement" characteristic of crypto-native assets, RWA liquidity is heavily dependent on off-chain asset settlement cycles, legal ownership verification protocols, and the execution efficiency of custodians and service providers. Once there is a mismatch between the rhythm of redemptions and the capability to monetize assets, risks will precipitate as a "liquidity crisis."

According to the IMF's *Liquidity Stress Testing for Investment Funds 2024* report [7], the objective of liquidity stress testing is not to predict precise losses, but to identify the time windows and trigger conditions under which a capital "breaking point" occurs amidst multiple shocks. In RWA scenarios, this tool is particularly critical because most assets cannot be instantly sold to recover cash.

In practice, RWA liquidity stress testing typically focuses on three scenarios:

1. **Asset Shock**: For instance, a rapid rise in short-term interest rates causes valuation drops in Treasuries, ABS, or notes. While the Net Asset Value (NAV) of the pool declines, redemption requests are still initiated at or near par value.
2. **Liability Run**: Simulating a concentration of redemptions by institutional investors within the same window (e.g., 20%, 30%, or higher), testing whether the asset pool possesses sufficient cash buffers and liquid assets.
3. **Market Freeze**: Assuming a sudden drop in secondary market volume, the disappearance of RFQ quotes, or the suspension of market maker participation, forcing assets to be monetized solely through contract redemption or off-chain liquidation.

Case 1: Maple Finance's "Post-Mortem" Lesson

Between 2022 and 2023, Maple Finance experienced successive defaults in its uncollateralized institutional lending pools. A post-mortem analysis revealed that the issue was not merely single-borrower credit failure, but the lack of sufficient liquidity buffers during high-redemption scenarios. Had a stress test assumption of "30% concentrated institutional redemption + secondary market freeze" been introduced during the design phase, the protocol could have proactively lowered borrowing caps or increased cash ratios. Consequently, when Maple reconstructed its products in 2024, it introduced dynamic limit mechanisms based on VaR (Value at Risk) + LCR (Liquidity Coverage Ratio) to curb risk exposure early during the accumulation phase.

Case 2: Redemption Pacing in Centrifuge Pools

In Centrifuge's RWA pools for accounts receivable and private credit, the average asset recovery cycle often ranges from 60 to 120 days. Through liquidity stress testing, the protocol explicitly defines which assets are immediately liquid and which require deferred payment under a "consecutive two-week 25% redemption request" scenario. This inversely determines the parameters for redemption windows, lock-up periods, and early redemption penalties. Here, stress testing is not merely for retail optics; it directly dictates how product terms are written and how redemption rights are gated.

Case 3: The "Surface Liquidity Trap" of Treasury RWA

Even for Treasury RWA, stress testing is indispensable. Taking products like Ondo's OUSG and Hashnote as examples, while the underlying assets are highly liquid, constraints exist within the on-chain structure regarding minting/redemption frequency, custody operation timing, and RFQ availability. The function of stress testing is to answer a critical question: If the secondary market freezes and a mass of investors simultaneously opt for contract redemption, will a short-term "on-chain payment delay"—a technical liquidity risk—occur?

Based on this logic, protocols such as Aave, Maple, and Centrifuge have successively integrated on-chain stress test modules since 2024. By combining VaR and LCR indicators, these modules continuously monitor the ratio of high-risk to liquid assets, dynamically adjusting borrowing caps, haircuts, and redemption rules.

From industry practice, the true value of liquidity stress testing is not in predicting crises, but in encoding the "worst-case scenario" into contract parameters beforehand. This ensures risks are released gradually through "liquidity gating" rather than resulting in a catastrophic systemic failure.

4.2 Structured Model and Parameter Configuration for Stress Testing

The table below outlines the elements of a typical RWA liquidity stress testing model.

Figure 15: Typical RWA liquidity pressure test parameter system

Model dimension	key metrics	Parameter Settings	Instructions
Asset volatility	σa	2% – 5%	Based on the standard deviation of asset prices in the past 12 months
Redemption Rates	R	10% – 60%	Simulate redemption pressure scenarios for different institutions
Market depth coefficient	Md	0.2 – 0.8	Characterize the depth of market making in the secondary market
Discount rate adjustment	H	3% – 15%	Dynamically adjust based on asset ratings
Liquidation time	T	1-30 days	Off chain asset realization cycle

Source: Pharos Research

The core concept of the model is to project Asset Net Asset Value (NAV) volatility, liquidity gaps, and refinancing needs under extreme assumptions via multi-parameter Monte Carlo simulations. For instance, when the redemption ratio exceeds 40% and the market depth coefficient falls below 0.3, the Liquidity Coverage Ratio (LCR) of the asset pool drops below 70%, triggering automatic liquidation and redemption suspension mechanisms.

4.3 Case Study: Liquidity Assessment of Ondo Finance Treasury RWA Pool

Taking Ondo Finance's "USDY Tokenized UST Bonds Vault" as an example, the portfolio is composed of T-Bills and overnight Repurchase Agreements (Repo).

In May 2025, amidst rising expectations of Federal Reserve interest rate hikes, the yield of Treasuries within the USDY pool climbed to 5.15%, while asset valuation experienced a slight dip of 0.4%. However, due to the short duration of the assets (approximately 40 days) and the availability of immediate redemption windows, stress test results indicated:

1. Under a 30% redemption pressure scenario, LCR = 123%;
2. Under a 60% redemption scenario, LCR = 91%, maintaining positive cash flow;
3. Under an extreme scenario (90% redemption), the system automatically triggers redemption queues and tiered liquidation mechanisms.

Ondo employs a dual-layer architecture:

1. On-chain issuance of USDY as a redeemable receipt;

Off-chain management of Treasury positions by a US-compliant custodian.

2. This structure significantly enhances the asset pool's resilience against short-term liquidity shocks, serving as a representative case for RWA asset liquidity design.

4.4 Risk Mitigation Mechanism Design: Multi-Layered Liquidity Firewalls

Liquidity risks in the RWA market primarily stem from dual factors: "on-chain valuation uncertainty + off-chain redemption delays." To mitigate these risks, major global platforms typically establish a three-tiered defense system:

Figure 16: Comparison of RWA protocol liquidity risk mitigation mechanisms

platform	First level defense line (on chain)	Second level defense line (off chain)	Third level defense line (insurance/emergency)
Aave RWA	Discount rate adjustment+real-time Oracle monitoring	Cash flow matching of custodian institutions	Insurance Fund Safety Module
Centrifuge Tinlake	Tranche structure layering	SPV Position Isolation	MakerDAO liquidity support
Ondo Finance	Treasury bond short-lived	Management of US custodial accounts	Multiple insurance and repurchase funds
Maple Finance	Borrower credit monitoring	Legal recovery and disposal of collateral	Insurance Pool Cover Protocol

Source: Pharos Research

The logic of these three lines of defense can be summarized as: **"Price Buffer — Redemption Buffer — Insurance Buffer."**

- **Layer 1**: Primarily addresses on-chain price volatility, controlling risk through dynamic haircuts and real-time oracle verification.

- **Layer 2**: Focuses on cash flow matching and SPV segregation (or tranching) to reduce off-chain settlement delays.
- **Layer 3**: Relies on insurance funds or emergency redemption mechanisms to sustain market confidence.

4.5 Cross-Market Liquidity Shocks and Systemic Contagion Risks

Since the second half of 2024, the RWA and stablecoin markets have exhibited **deep coupling**, triggering significant "cross-market liquidity transmission" effects. Given that current RWA assets rely heavily on mainstream stablecoins for pricing and settlement, any de-pegging event involving core stablecoins would cause the collateral value of asset pools to face severe depreciation.

Real-time monitoring analysis by RWA.xyz [8] reveals that nearly half of the RWA Total Value Locked (TVL) exhibits an extremely high positive correlation with USDC. This structural linkage implies that even slight deviations in the price of the settlement medium can cause significant correlated volatility in the book value of RWA asset pools. This value transmission effect is further amplified in leveraged trading, often triggering liquidation thresholds for high-leverage positions and exacerbating market volatility.

To mitigate this systemic contagion risk, the industry has begun exploring "moats" against liquidity shocks by re-engineering underlying asset structures. Leading protocols, represented by the Aave RWA module, officially implemented the **Multi-Asset Reserve** mechanism in early 2025.

The core innovation of this mechanism lies in breaking the limitations of single-asset pricing. By incorporating heterogeneous assets—such as Treasuries, Gold, and Commercial Paper—into the reserve, it constructs a multi-dimensional liquidity support system. This strategy not only diversifies risk exposure to single-stablecoin price fluctuations but also achieves a fundamental diversification of the asset pool's liquidity sources.

4.6 Regulatory Pressure and Compliance Strategies

As the RWA markets in Hong Kong and Singapore continue to expand, regulators are increasingly scrutinizing the compliance and risk management of tokenized assets. The Securities and Futures Commission (SFC) of Hong Kong has established a foundational regulatory framework for tokenized securities and Virtual Asset Trading Platforms (VATP), primarily through three key official documents [9]:

1. ***Frequently Asked Questions on Tokenized Securities and Tokenized Investment Products***: Clarifies the definition, issuance, transfer, compliant custody, and eligible investor requirements for tokenized assets classified as securities.
2. ***Joint Circular on Intermediaries Engaging in Virtual Asset-related Activities (2023)***: Standardizes the distribution, suitability assessment, disclosure obligations, and operational compliance for virtual asset products.
3. ***Guidelines for Virtual Asset Trading Platform Operators***: Stipulates requirements for trading platforms (including secondary markets) regarding licensing, custody, asset segregation, and internal controls.

However, these official documents do not yet mandate high-level risk control measures—such as "annual liquidity stress testing, regular information disclosure, independent third-party audits, and complete segregation of market making and custody accounts"—for *all* tokenized RWA projects. In other words, the SFC has not yet codified these advanced risk controls into a unified mandatory standard.

Consequently, where such requirements exist in the current market, they typically stem from market best practices or the internal control standards of custodian banks and exchanges, rather than explicit SFC regulations.

In light of this, we recommend that compliance pathways and market norms evolve in the following directions:

1. **Establish Industry Best Practices**: Adopt "annual stress testing, liquidity disclosure, third-party audits, and strict segregation of market making and custody" as industry best practices and self-regulatory standards. These should be voluntarily adopted by issuers, platforms, custodians, and market makers.
2. **Enhance Transparency and Trust**: Clearly disclose the adoption of these self-regulatory standards in investor communications, regulatory filings, and Offering Memorandums. This will effectively bolster market confidence and mitigate potential legal and liquidity risks.
3. **Drive Institutionalization**: As the RWA market matures, the industry should advocate for the SFC to incorporate these self-regulatory standards into formal guidance or regulatory recommendations, ultimately establishing a unified compliance framework.

4.7 Summary: From Liquidity Defense to System Resilience

The liquidity challenge in RWA is fundamentally a matter of systemic coordination among legal attributes, trading systems, and technical implementations. Within a compliant framework, liquidity does not spontaneously emerge from on-chain trading frequency; rather, it relies on clear ownership delineation, executable redemption arrangements, and auditable trading paths. Without clear institutional design, even on-chain mappings of assets that are highly liquid in traditional markets may risk periodic freezes or price distortion.

From a regulatory perspective, the structure of the secondary market directly impacts risk spillover and investor protection. Centralized or permissioned trading venues offer greater control over information disclosure, transaction monitoring, and participant suitability. In contrast, decentralized trading mechanisms must bridge compliance gaps through whitelists, limits, and smart contract constraints. Contractualizing market-making behavior—specifically by defining responsibilities, compensation mechanisms, and risk caps—serves as a critical institutional tool to prevent liquidity evaporation.

Regarding risk mitigation, buy-back pools, staggered redemptions, and emergency liquidity mechanisms provide operational buffers for market stability during extreme scenarios. Their design must align with custody arrangements, settlement cycles, and regulatory requirements. Overall, the construction of RWA liquidity has evolved from a question of technical feasibility to a comprehensive test of institutional clarity and sustainable compliance. This shift will become a primary criterion for regulatory assessment and market access.

05 / Cross-Market Liquidity Interoperability and Future Trends

5.1 The Core Proposition of Cross-Market Liquidity

One of the central challenges facing the RWA market is the **liquidity fragmentation between on-chain and off-chain environments, as well as across different blockchain ecosystems**. [1] As of December 3, 2025, the Total Value Locked (TVL) in RWAs has surpassed **$16.435 billion** [10]. While over 50% of this capital is concentrated on the Ethereum mainnet, the remainder is dispersed across multi-chain ecosystems such as Polygon, Avalanche, and Base. However, significant friction remains in asset circulation across these chains, characterized by:

1. **Lack of Settlement Interoperability**: Independent ledgers and consensus mechanisms across chains result in high costs and extended delays for cross-chain asset transfers.
2. **Fragmented Valuation Systems**: The same RWA asset often exhibits price discrepancies across different chains, impeding the formation of a unified pricing framework.
3. **Divergent Regulatory Perspectives**: Varying definitions of RWA asset classification and custody responsibilities across jurisdictions add layers of compliance complexity.

Consequently, establishing mechanisms for cross-market liquidity interoperability is not only a prerequisite for scaling the RWA market but also a critical vector for the upgrade of financial market infrastructure.

5.2 Multi-Layered Interoperability Architecture: From Cross-Chain Bridges to Liquidity Hubs

Current cross-market liquidity interoperability can be categorized into three architectural models:

1. **Bridge-based**: Achieves asset representation via "Lock-and-Mint" mechanisms (e.g., LayerZero, Axelar).
2. **Liquidity Hub-based**: Centralizes liquidity via middleware protocols to facilitate cross-chain swaps (e.g., Wormhole, Circle CCTP).
3. **Settlement Interlink-based**: Achieves cross-chain account interoperability through a unified settlement layer (e.g., Polkadot XCM, Cosmos IBC, Chainlink CCIP).

Figure 17: Comparison of mainstream architectures for RWA cross market interoperability (Q4 2025)				
Architecture type	Representative Agreement	Technical mechanism	advantage	limitation
Cross chain Bridge Mode	LayerZero / Axelar	Lock+Casting/Message Verification	Low cost, fast deployment	There is a risk of single point of custody
Liquidity center	Circle CCTP / Wormhole	Unified liquidity reserve pool	High liquidity, fast settlement	High centralization risk
Clearing the Internet Layer	Chainlink CCIP / Polkadot XCM	Smart Contract Messaging	High security, native interoperability	Complex and costly construction
Source: Pharos Research				

In the RWA ecosystem, Circle's **CCTP (Cross-Chain Transfer Protocol)** has emerged as the liquidity bridge with the highest practical utility. Its mechanism allows USDC to undergo "Native Burn-and-Mint" across different chains without requiring intermediate assets (wrapped tokens), thereby ensuring liquidity and settlement consistency.

5.3 Technical Bottlenecks in Cross-Market Circulation of Real Assets

Despite the maturing of cross-chain interoperability technology, the cross-market flow of RWA assets still faces three profound technical bottlenecks:

1. **Asynchrony of Asset Title Verification**: The on-chain transfer of RWAs must be accompanied by an off-chain change in legal ownership. For instance, when a tokenized debt instrument is transferred across chains, the transferee's information must be re-registered and synchronized with the custody system.
2. **Stratification of Oracle Trustworthiness**: Different chains rely on different oracles for price and state data, leading to latency and discrepancies in the "state consensus" of the same asset.
3. **Fragmentation of Cross-Chain Compliance Domains**: Jurisdictions such as Hong Kong, Singapore, and the EU maintain differing definitions of "tokenized securities." Cross-chain circulation inevitably involves cross-jurisdictional legal issues, and there is currently a lack of unified standards for registration and identification.

Together, these issues constitute an "Infrastructure Gap" in RWA cross-market mobility: while technology can transmit value, the legal and compliance layers have yet to achieve synchronized alignment.

5.4 Case Study: Cross-Market Liquidity Collaboration among Circle, Chainlink, and Avalanche

Based on a comprehensive synthesis of pilot projects, partnership announcements, and technical implementations by Circle, Chainlink, and Avalanche [11], we have constructed a feasibility framework for cross-chain RWA settlement and trading. This framework achieves, for the first time, real-time mutual recognition and settlement verification of off-chain asset credentials across multiple chains. Its core innovations include:

1. **Unified RWA Identity (RWA DID)**: Each asset is assigned a unique identifier upon registration, with Chainlink CCIP responsible for synchronizing state across chains.
2. **Off-chain Cash Flow Verification via Signatures**: A "Proof of Settlement" is issued by Circle's bank custody accounts, prompting on-chain smart contracts to update asset holding states accordingly.
3. **Multi-chain Synchronous Settlement**: Settlement matching is executed on the Avalanche mainnet, while holdings are simultaneously updated on Ethereum sidechains, enabling seamless cross-market asset circulation.

This case demonstrates that cross-market liquidity interoperability is no longer merely a technical challenge, but the result of synergy between on-chain settlement, custody proofs, and regulatory recognition.

5.5 Convergence Trends in the Financial Infrastructure Layer

Based on global regulatory and market evolution trends in 2025, the interoperability of RWA cross-market liquidity is expected to follow three distinct trends:

Figure 18: Framework of Three Major Trends in RWA Infrastructure

Trend direction	core content	Driving force	case
Standardization	Unified Asset Identification (RWA ID) and Settlement Interface	International Organization for Standardization (ISO), FMI Alliance	BIS + ISO 20022 Tokenized Asset Standard
Modularization	Modular deployment of settlement, market making, valuation, and custody layers	Ethereum L2, Avalanche Subnet	Superchain / Subnet RWA Framework
Regulatory Integration	Cross border regulatory sandbox interoperability and record sharing	Hong Kong SFC+Singapore MAS Regulatory Mutual Recognition Pilot	HK-SG RWA Pilot 2025

Source: Pharos Research

Regarding **Regulatory Integration**, the Hong Kong Monetary Authority (HKMA) and the Monetary Authority of Singapore (MAS) jointly announced the launch of the "Mutual Recognition Framework for Cross-Border Tokenized Asset Circulation" in September 2025. [This initiative aims to allow RWA projects recognized by both jurisdictions to trade interoperably. This mechanism marks a gradual shift in cross-market liquidity from "technical bridging" to "regulatory interconnectivity".]

5.6 Future Outlook: The Global Liquidity Network of RWA

From an evolutionary perspective, cross-market liquidity in the RWA market will ultimately coalesce into a "**Distributed Financial Network (DFN)**," characterized by:

1. **Unified Clearing Account System**: Achieving mutual ledger recognition and balance synchronization across different chains and markets;
2. **Real-Time Cross-Chain Market Making**: Enabling Algorithmic Market Makers (AMMs) to automatically rebalance assets based on cross-chain oracles;
3. **On-Chain Regulatory Interface (Regulatory Node)**: Allowing regulatory nodes to access compliance data streams in real-time to ensure the legality of circulation;
4. **Global Settlement Layer**: A foundational blockchain layer approved by multi-jurisdictional regulators to undertake RWA settlement functions, akin to the role of SWIFT in the traditional financial system.

The Bank for International Settlements (BIS) noted in its *BIS Annual Economic Report* [12]: "The long-term value of RWA lies not in the tokenization of individual assets, but in the unification of global settlement and liquidity networks."

Consequently, the future of RWA cross-market interoperability will be a comprehensive system defined by "**Standardized Settlement + Multi-Layer Market Making + Regulatory Synchronization + Technological Neutrality**." This signifies not only the free circulation of assets on-chain but, more importantly, the true interconnection and mutual trust between the real financial system and the blockchain world.

5.7 Summary: The RWA Liquidity Landscape from Silos to Interconnection

The scaling of RWA is increasingly constrained by liquidity fragmentation—between on-chain and off-chain environments, across diverse blockchain ecosystems, and among different jurisdictions. Although multi-chain deployment has significantly expanded asset reach, the lack of settlement interoperability, fragmented valuation systems, and divergent regulatory classifications continue to restrict the continuous circulation and unified pricing of RWA in cross-market environments. Against this backdrop, cross-market liquidity interoperability has evolved from an issue of efficiency optimization into a systemic coordination imperative at the financial infrastructure level.

Regarding implementation paths, cross-chain bridges, liquidity hubs, and settlement interlink layers represent technical choices and risk trade-offs suitable for different stages of development. Among these, stablecoin cross-chain solutions centered on "Native Burn-and-Mint" mechanisms are emerging as the practical anchor for RWA capital flows, owing to their settlement consistency and operational controllability. However, technical interoperability alone cannot resolve issues regarding physical asset title synchronization, status recognition, and compliance adaptation. These constraints dictate that the cross-market circulation of RWA must rely on the synergistic advancement of both institutional frameworks and technology.

Practical cases demonstrate that cross-market liquidity can only be established when asset identity, cash flow verification, and settlement results achieve verifiable consistency across multiple chains. As asset identity standardization, infrastructure modularization, and regulatory mutual recognition mechanisms take root, RWA cross-market liquidity is transitioning from "technical bridging" toward a more institutionally stable networked form. This evolution provides a viable pathway for the synergistic operation of the real financial system and the on-chain market.

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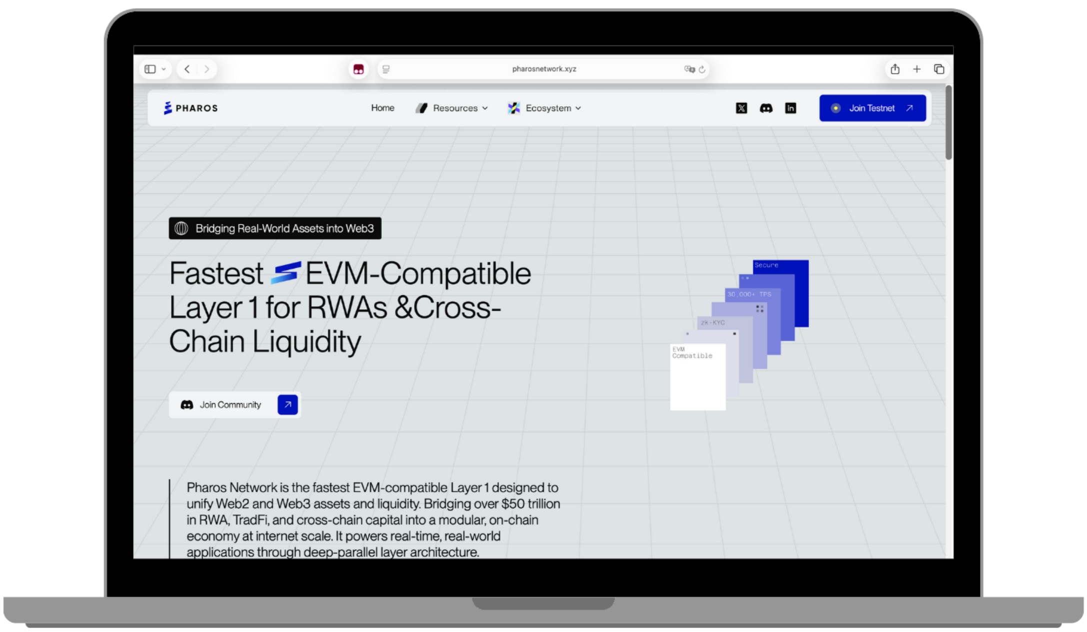
Pharos' Official Website: https://www.pharosnetwork.xyz/



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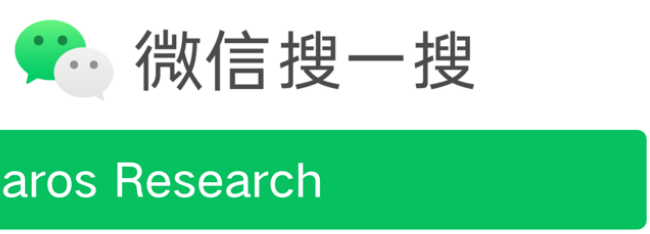

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