Astra’ s White Paper 3.0
Risk Assessment on RWA Tokens

To equip global investors with an institution-grade, data-driven risk framework for systematically identifying, quantifying, and monitoring the underlying-asset, regulatory, technological, operational and market risks inherent in RWA tokenization.

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Version：v3.0
Date：2026-03-24

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Revision History

Version	Date	Description of Changes	Status
v1.0	Nov 2025	Initial Framework Release. Defined the original five-dimensional risk assessment matrix for RWA tokens.	Archived
v2.0	Dec 2025	Methodology Expansion. Integrated the "Media & Social Sentiment" dimension to the Astra Rating System. Enhanced rating robustness through multi-source public opinion analysis.	Archived
v3.0	Mar 2026	Quantitative Upgrade. Implemented the Option-Implied Credit Stress Module within the Underlying Assets dimension to bolster predictive risk modeling.	Current

Executive Summary

This white paper is designed for the global RWA ecosystem, addressing an industry marked by rapid expansion, high risk, and persistent regulatory uncertainty.

RWAs face structural risks arising from mismatches between off-chain underlying and on-chain tokens, cross-chain and cross-jurisdictional exposures, uneven disclosure standards, and fragile market liquidity. Disruptions in any of these areas can cascade into de-pegging events, valuation discounts, or redemption constraints.

To address these challenges, we introduce **"Astra"**, the world's first six-dimensional RWA risk assessment system covering underlying assets, regulatory and compliance factors, blockchain infrastructure, issuance and operations, market performance, and media and sentiment. Built on verifiable data, Astra delivers high-frequency, event-driven risk updates and produces quantitative scores that are comparable, transparent, and auditable.

Empirically, Astra has conducted chain-by-chain assessments of **1,650 RWA assets worldwide**, including **232 stablecoins**, and provides Top-10 rankings by asset category alongside in-depth profiles of representative projects. Starting from this edition, Astra upgrades the Underlying Assets module with an option-implied credit stress framework to improve tail-risk measurement and cross-category comparability.

Looking ahead, we will deliver periodic global RWA risk reports and, via the Astra platform, provide standardized disclosure and audit tools for regulators, pricing and structural guidance for issuers, and risk monitoring and listing support for investors and exchanges.

By reading this paper, you access to a practical, deployable **"universal risk language"** and actionable metrics that support the scaling, institutionalization, and broad-based adoption of RWAs.

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CHAPTER 1: INTRODUCTION
UNVEILING THE FUTURE OF RWA RISK ASSESSMENT
A GLOBAL PERSPECTIVE ON TOKENIZATION RISKS

1.1“Astra”—— RWA’s “Aladdin” System

A first-of-its-kind global RWA risk assessment system

Delivering a robust evaluation framework for rapidly expanding RWA industry

Facing an industry marked by rapid growth, substantial risk, and pronounced regulatory uncertainty, we develop “Astra”, a comprehensive RWA risk assessment system that delivers standardized, verifiable, and reproducible infrastructure and tools accessible to the broader market.

The objective of Astra is straightforward: to enable retail and institutional investors, issuers, and regulators to interpret risks within a unified analytical framework—to translate complex, cross-domain issues into comparable, explainable, and timely risk indicators.

Astra organizes information and risk-identification signals across six core dimensions: underlying assets, regulation and compliance, blockchain infrastructure, issuance and operations, market and trading, as well as media and sentiment. The system relies exclusively on verifiable evidence, avoiding subjective judgments, and maintains sensitivity and consistency through high-frequency updates and event-driven recalculations.

- For investors, it provides ready-to-use comparative metrics and thresholds;
- For issuers, it offers a transparent foundation for pricing and guidance on improving asset quality;
- For regulators, it reduces the cost of aligning methodologies and conducting reviews.

Our ambition is to position this framework as foundational public infrastructure for the RWA ecosystem—supporting the industry’s transition from institutional pilots toward scaled, institutionalized, and broadly accessible adoption.

1.2 Landscape and Trends in RWA Industry

RWA's rapid expansion and adoption: Industry landscape and trends

Real world assets (RWAs) are expanding rapidly and accelerating their integration into the mainstream financial system. According to projections published by Boston Consulting Group (BCG) and ADDX in 2022, the potential market for tokenizable assets could reach approximately USD 16 trillion by 2030.

Within the current RWA landscape, stablecoins account for approximately USD 301 billion out of a total USD 345 billion, functioning as core payment and settlement infrastructure. As of Mar. 2026, non-stablecoin RWAs reached USD 44 billion, representing year-over-year growth of about 450%. Since 2024, all tokenized assets overall have expanded by approximately 165%, with Ethereum remaining the dominant underlying blockchain (Source: Astra RWA Data Platform, 2026).

In terms of representative projects and sectors, BUIDL, launched in March 2024, has reached approximately USD 2.0 billion in assets. WTGXX offers an SEC-registered tokenized money market fund across multiple chains, with AUM exceeding USD 757 million. BENJI similarly manages around USD 1.0 billion. Tokenized commodities—primarily gold—collectively amount to approximately USD 5.1 billion, with PAXG and XAUT together commanding more than 90% market share (Source: Astra RWA Data Platform, 2026).

Overall, the RWA market is scaling in both market size and growth velocity, underscoring the urgent need for unified data and high-frequency monitoring mechanisms to mitigate systemic uncertainty and risk transmission pathways.

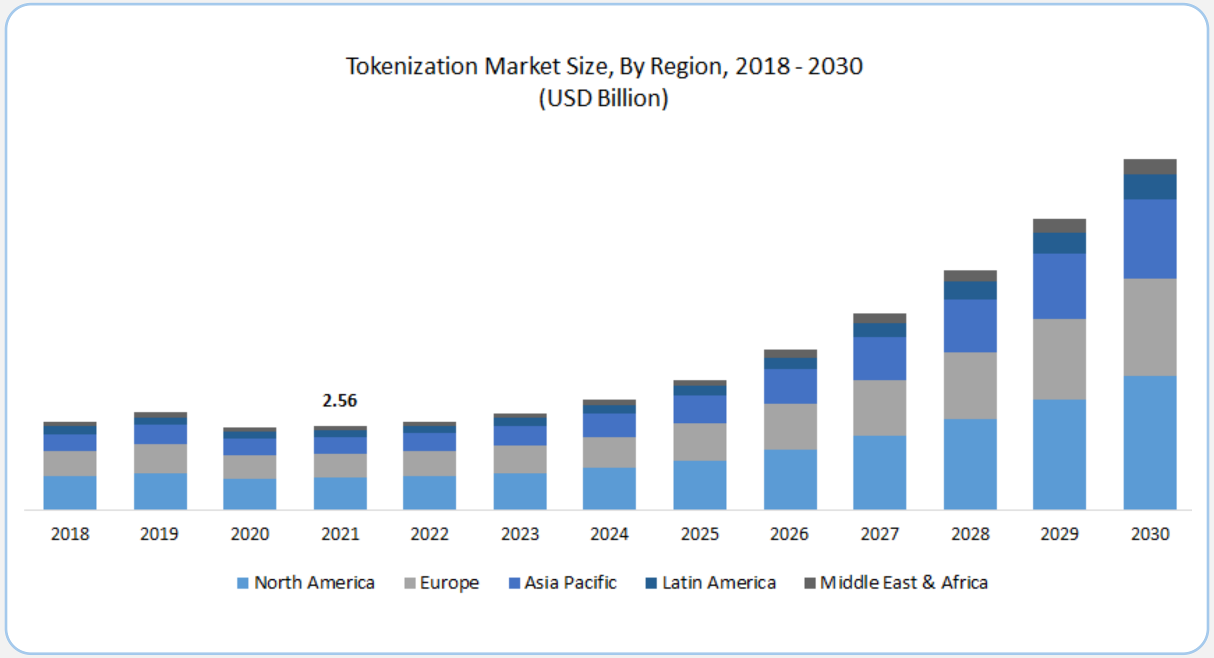


Figure 1-1｜Tokenization Market Size Prediction
（Source：Polaris Market Research Analysis）

Two development pathways: two distinct risk profiles
Both require quantitative identification

RWA development is accelerating along two distinct pathways. The first is the open DeFi pathway, which emphasizes programmability, composability, and capital efficiency, but tends to be weaker in areas such as participant qualification, custodial segregation, and regulatory compliance. Under conditions of market stress or liquidity tightening, risks materialize more rapidly—for example, through temporary de-pegging or constrained redemptions.

The second is the regulated or permissioned pathway, which prioritizes legal robust disclosure and enforceability, often at the expense of open composability and market liquidity, thereby constraining price discovery and capital efficiency. Neither pathway is inherently superior; rather, they embody different risk profiles and risk transmission mechanisms. This divergence underscores the need for a standardized, verifiable, and comparable risk assessment framework that enables objective, cross-pathway evaluation and real-time risk warning.

The “Astra” Six-Dimensional RWA Risk Assessment Framework is built on this logic. It maps both the open and permissioned models into a unified analytical risk coordinate system, ensuring that all assessments remain objective, reproducible, and auditable.

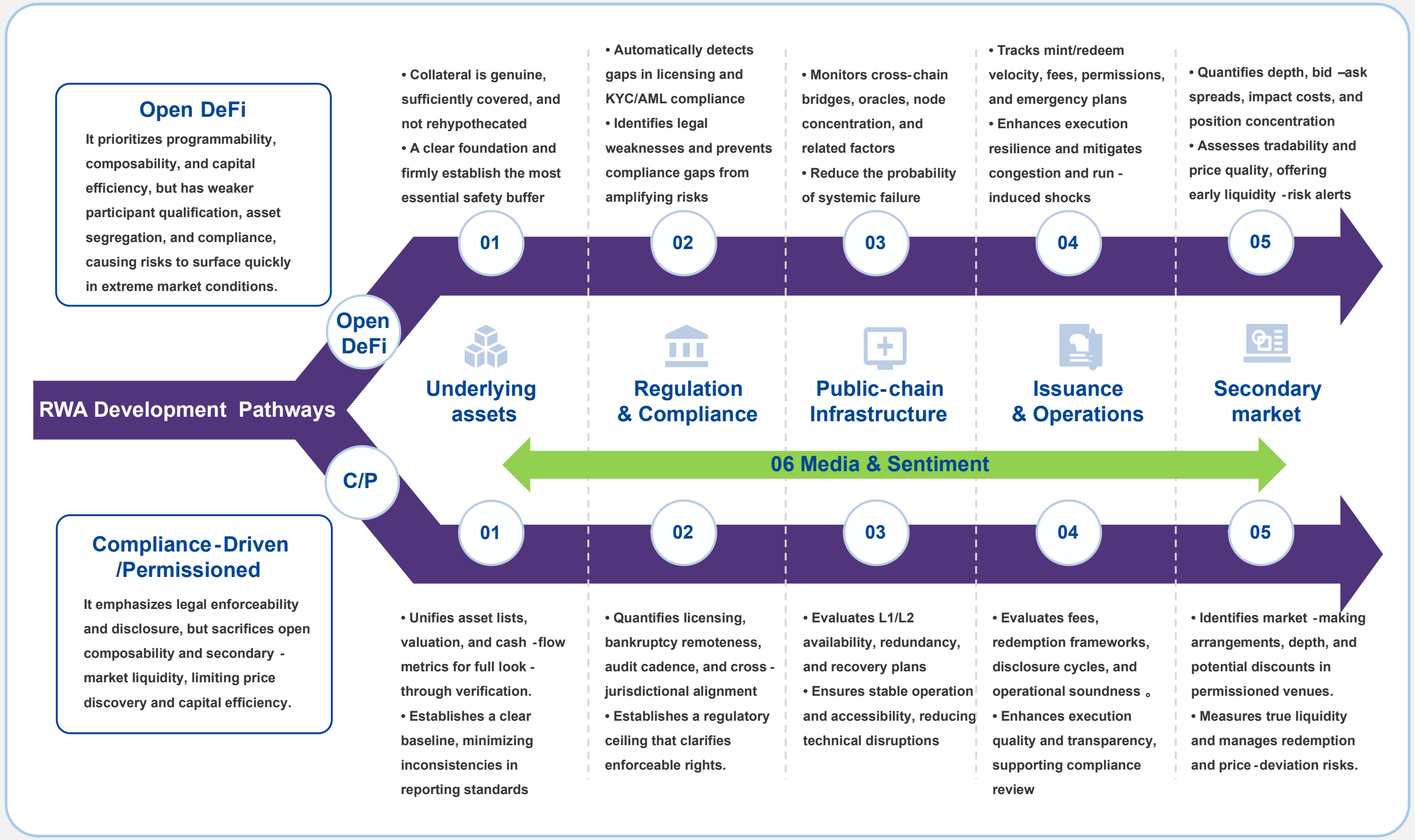


Figure 1-2｜ RWA’s Development Pathway Diverges

High heterogeneity across asset classes

Homogeneous "RWA" do not imply homogeneous risk

Differences across asset classes manifest in several dimensions: the mechanisms used to map real-world claims on-chain, custodial and insurance arrangements, data-refresh frequency, and the tradability of the corresponding secondary markets.

For stablecoins, unclear reserve attestations, redemption mechanisms, or cross-chain infrastructure can lead to de-pegging under conditions of market stress. U.S. Treasuries and Money Market Fund–based tokens exhibit more mature structures in terms of NAV stability, distribution frequency, and multi-chain accessibility, yet their compliance workflows and custodial arrangements tend to be complex. Tokenized equities and fund shares remain in transition between instruction-based settlement models and real-time mint-redeem architectures, with no established cross-platform recognition standards. Tokenized commodities—such as gold—face operational and counterparty risks in custody, auditing, and cross-chain bridging; their market liquidity is concentrated, and extreme scenarios may introduce deviations from spot prices.

The greater the heterogeneity across asset categories, the more essential it becomes to adopt a dimensional, comparable evaluation framework that minimizes cross-segment assessment errors and avoids "apples-to-oranges" distortions. Such standardization is critical for ensuring scientific rigor and consistency in risk identification and early-warning processes.

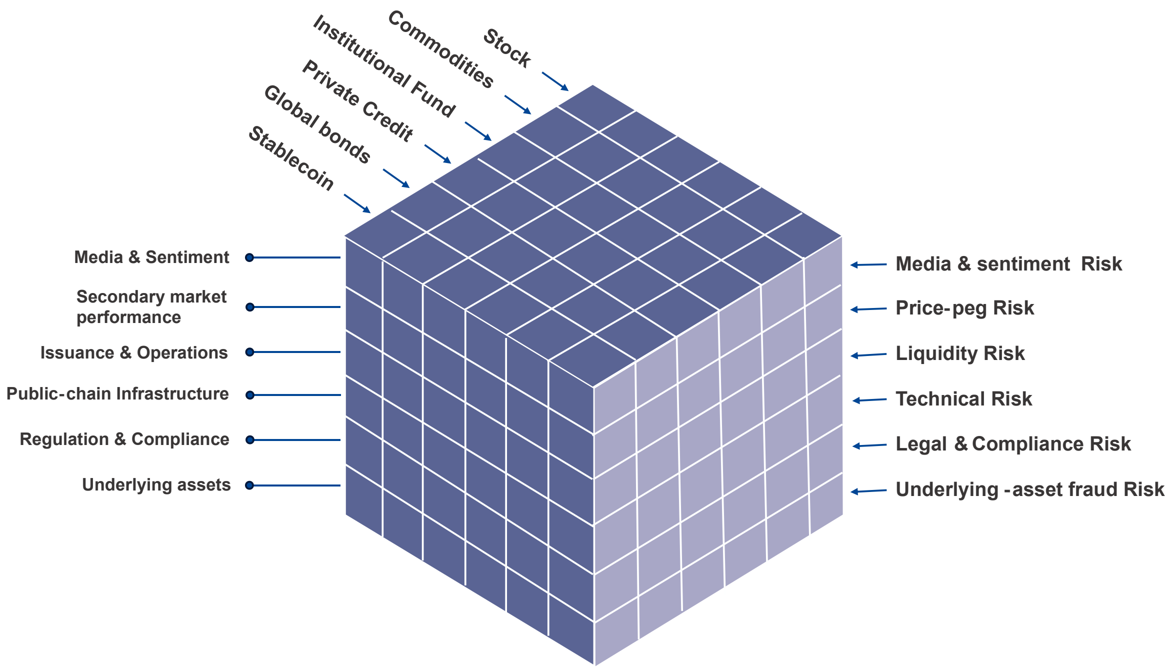


Figure 1-3 | RWA's Risk Cube: Asset Classes × Five Layers × Principle Risks

1.3 Pain Points in RWA Risk Assessment

Rapid expansion along with regulatory grey zones

Accompanied by frequent risk events

Over the past two years, the RWA industry has evolved at an almost continuous pace, with new asset types, contract structures, and reporting standards emerging rapidly. Yet the sector still faces systemic challenges: fragmented standards, inconsistent disclosures, and incomplete data pipelines.

In this phase of non-convergent definitions, grey areas persist across asset classification, reserve attestations, custodial audits, mint–redeem rules, cross-border compliance, and oracle or cross-chain dependencies. These gaps create pricing distortions and risk-control blind spots, leading to recurring issues such as:

- Stablecoin de-pegs triggered by reserve uncertainty or custodial failures (e.g., USDC, TUSD in 2023–2024; USDE in 2025).
- Commodity RWA discounts due to opaque custody and thin liquidity, causing deviations from spot markets (e.g., PAXG/XAUT).
- Delayed recovery in credit RWAs, where on-chain claims cannot fully address off-chain legal processes, resulting in redemption constraints in several 2024 credit pools.

These events have caused sustained investor losses. Meanwhile, the cross-chain, cross-platform, and cross-jurisdictional complexity limits regulators’ ability to respond consistently: data is hard to verify, legal relationships are fragmented, and remediation costs and timelines remain uncertain—distorting price discovery and complicating risk threshold setting.

Figure 1-4｜“USDE” De-Pegs Event（2025-10）
（Source：Trading View）

A complex off-chain to on-chain workflow
Gives rise to hidden risk propagation

An RWA project must traverse multiple critical layers from asset verification to on-chain trading: **asset verification and valuation** (counterparty qualification, collateral structure, valuation methodology, downside impairment under stress) → **regulation and compliance** (custody and audit, licensing and registration, cross-border transfer rules and legal enforceability) → **blockchain infrastructure** (consensus participation, contract architecture, permissions and whitelists, oracle and cross-chain design) → **primary market** (subscription and mint–redeem mechanisms, KYC/AML, disclosure frequency, price calculation, fee and tax treatment) → **secondary market** (liquidity depth, spreads and impact costs, position concentration and whale risk, cross-chain price deviations and potential de-pegging pressure) → **media and sentiment** (market sentiment, positive and negative news, media coverage and transparency).

Ambiguity, inconsistent definitions, delayed disclosure, or operational failures at any stage can cascade into pricing distortions and liquidity stress downstream. For example, inconsistent or stale pricing inputs may trigger structured arbitrage, or redemption runs at the mint–redeem layer; when custody arrangements or legal enforceability are uncertain, defaults often require reverting to off-chain judicial processes, during which secondary market discounts and liquidity spirals may emerge.

Layered on top of this are the heterogeneities across jurisdictions, chains, and asset structures, making it difficult for external participants to form a complete and auditable end-to-end view. Risk control parameters lack standardized reference points, and regulatory review and audit processes often cannot access a unified, objective indicator system.

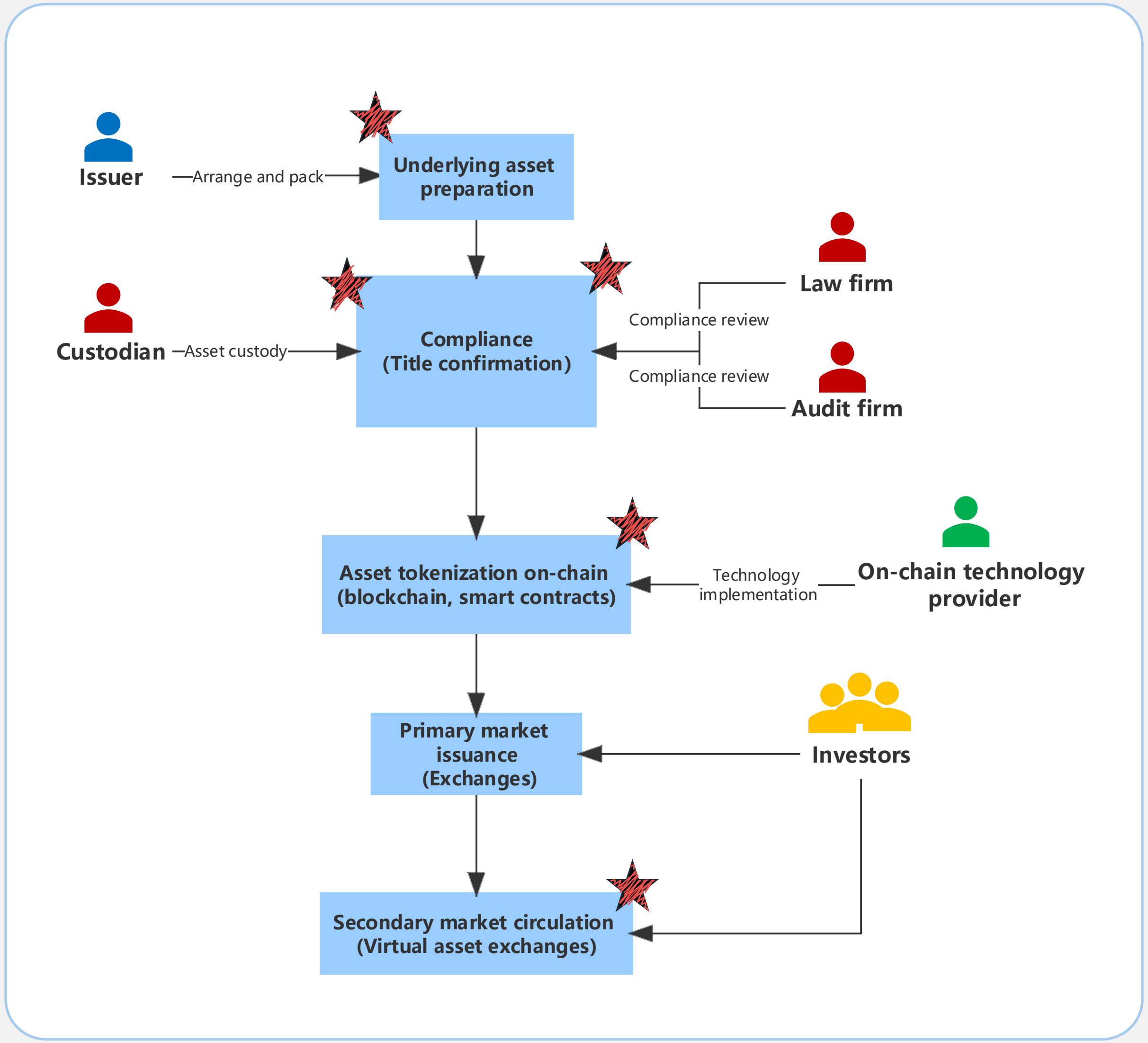


Figure 1-5 | RWA End-to-End Risk Transmission Map (Off-Chain→On-Chain→Primary Market→Secondary Market)

Insufficient data verifiability and lack of standardized metrics

Undermine the practicality of subjective risk scoring

The recent controversy over Figure's reported TVL highlights the need for verifiable, low-intervention data pipelines. The dispute reflected a gap between disclosed RWA issuance and on-chain observable collateral and reserves, raising questions about what qualifies as on-chain assets and verifiable transfer paths (10–16 September 2025). Qualitative factors such as team track record, governance constraints, and operational transparency continue to affect pricing and liquidity.

This incident offers two lessons:

- Verifiable on-chain evidence is essential to validating asset scale;
- Standardized data definitions and ongoing third-party verification must become industry-level infrastructure.

Today, many assessment frameworks still follow a "project-profile" model, which shows four structural flaws: mixing subjective and objective indicators with unclear weightings; lacking evidence chains and auditability; and non-comparable cross-asset risk metrics, especially between stablecoins and non-stablecoin RWAs.

A robust and practical RWA risk assessment framework must therefore adhere to three principles:

- Use exclusively verifiable evidence;
- Standardize and version-control data definitions;
- Incorporate event-driven recalculation and frequent adjustments.

Only under such architecture can market making, collateralization, risk management, and regulatory review be effectively supported.

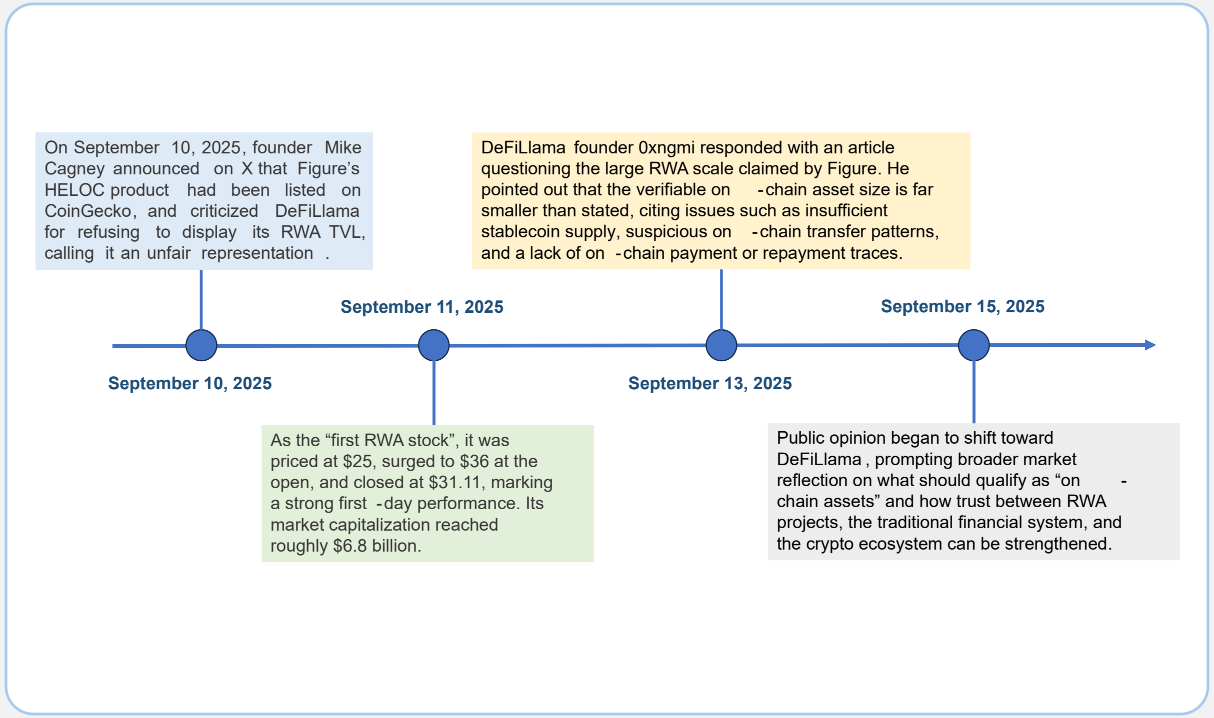


Figure 1-6 | Time-Line of Figure's Risk Event

1.4 Astra's Six-Dimensional Risk Assessment Framework

Our innovation: Six-dimensional RWA risk assessment system (addressing the pain points)

In response to systemic challenges—process complexity, rapid expansion, and limited data verifiability—we introduce Astra, the first global six-dimensional RWA risk assessment framework. Astra decomposes risk into observable, verifiable, and reproducible indicators, enabling unified measurement across asset classes, jurisdictions, and blockchains for cross-country, cross-asset, and cross-chain comparison.

Astra's Six Dimensions

- Underlying Assets
- Regulation and Compliance
- Blockchain Infrastructure
- Issuance and Operations
- Market and Trading
- Media and Sentiment

How Astra Addresses Aforementioned Industry Pain Points

- Market-grounded risk interpretation: Astra translates abstract risks into measurable micro-structure signals—TVL, collateral ratios, spreads, impact costs, and disclosure—making risk visible and comparable for investors and regulators.
- Data-first and standardized: The framework uses only verifiable evidence (on-chain data plus auditable off-chain documents) with no subjective scoring. Indicator libraries and data-alignment rules are centrally versioned, supporting auditability and regulatory use.
- Dynamic and event-driven: High-frequency updates combined with event-driven recalculation ensure timely risk adjustments when regulatory notices, defaults, operational failures, or on-chain anomalies exceed thresholds.
- Comparable and actionable: The same underlying asset issued on different L1/L2 networks is evaluated independently to reflect infrastructure differences. A unified coordinate system enables cross-asset and cross-jurisdiction comparison, while metrics can be directly embedded into market-making, collateral, exposure limits, and listing decisions, delivered via reports, dashboards, and APIs.

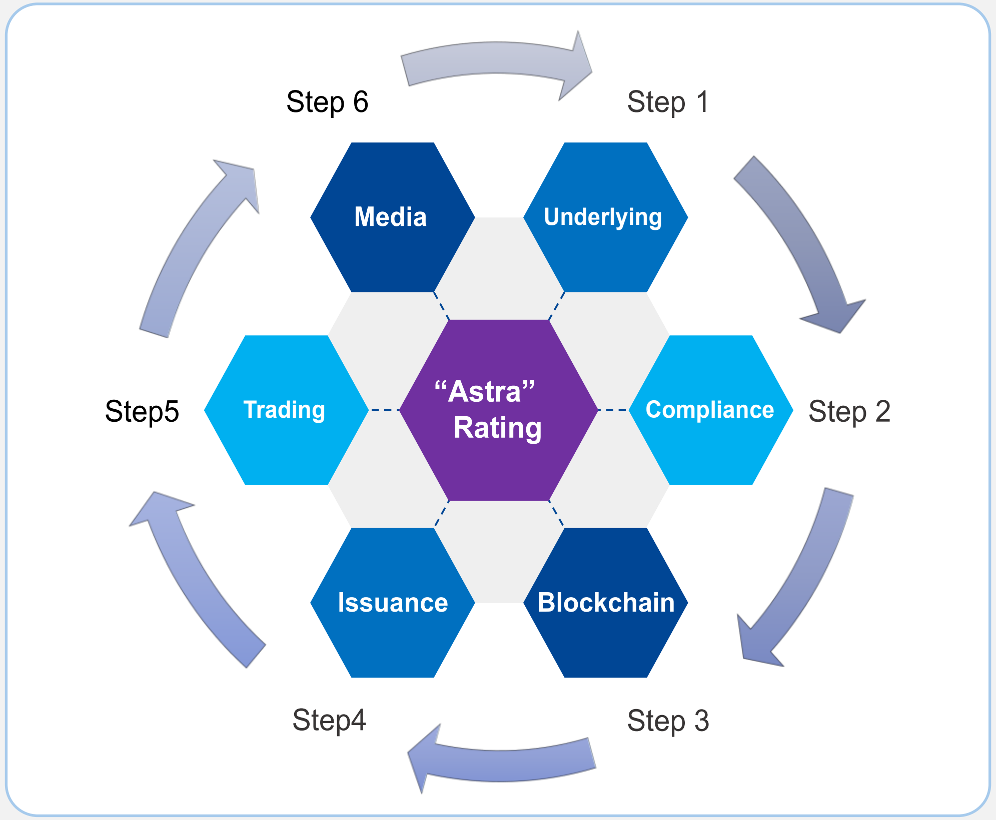


Figure 1-7 | Six-Dimensional Risk Assessment Framework and Illustrated Indicator Mapping

1.5 Astra's Core Features and Advantages

Our core Features: three major system advantages

The core advantages of Astra lies in its broader coverage, more robust methodology, and more complete data foundation—representing a fundamental departure from traditional approaches built on subjective judgment and static scoring. By systematizing, quantifying, and structuring risk factors, Astra enables, for the first time, a true translation of RWA risk into a computable and actionable market language. This allows institutional and retail investors, as well as regulators, to directly adopt the framework, integrating readable and operational quantitative signals into daily workflows spanning market-making, collateralization, exposure limits, listing/delisting decisions, and compliance review.

Broader Coverage

- Unified scope: Astra evaluates both stablecoin and non-stablecoin RWAs—across sovereign bonds/money market funds, commodities, equities, and institutional funds—under a consistent analytical standard.
- Horizontal comparability + vertical benchmarking: The framework supports cross-asset comparisons while also constructing intra-category benchmark curves to identify top- and bottom-performing assets within each class.

More Robust Methodology

- Six dimensions aligned to causal sequencing: Underlying Assets (collateral and real-world markets) →Regulation & Compliance →Chain Infrastructure (consensus-participation layer) →Issuance & Operations (primary market layer) →Market & Trading (secondary market layer) →Media & Sentiment (information market layer).
- Risk expressed in “market language”: Underlying asset is evaluated through collateralization/coverage ratios and cash-flow stability. Chain infrastructure is assessed via TVL, staking ratios, and node/client diversity. Primary market is measured through mint–redeem cadence, price deviations, and fee transparency. Secondary market is analyzed through liquidity depth, spreads, impact costs, and concentration risks.

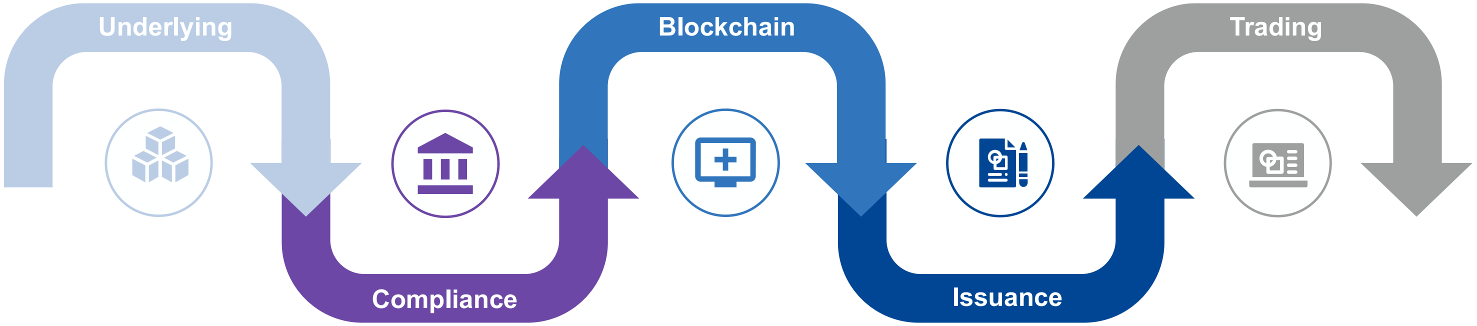


Figure 1-8 | RWA Risk Transmission Pathway

More Complete Data Foundation

- Objective and verifiable: Astra relies exclusively on on-chain observable data and auditable off-chain documents (custody, audit, disclosure). No subjective adjustments are applied, and every score is fully traceable.
- Standardized definitions and harmonization: A proprietary indicator library governs the entire pipeline—from data collection to cleaning, alignment, and metric computation—ensuring consistent time bases, unit normalization, and cross-chain aggregation.
- High-frequency and event-driven updates: Refresh intervals are calibrated by asset class; regulatory notices, defaults, operational incidents, or on-chain anomalies automatically trigger recalculation. Non-verifiable data is excluded.
- Quality and safety controls: Multi-source cross-checking, anomaly detection, and rollback mechanisms strike a balance between speed and accuracy.
- Operational delivery: Dashboards and APIs provide integrated outputs—overall scores, dimension-specific scores, and key metrics—enabling direct workflows.

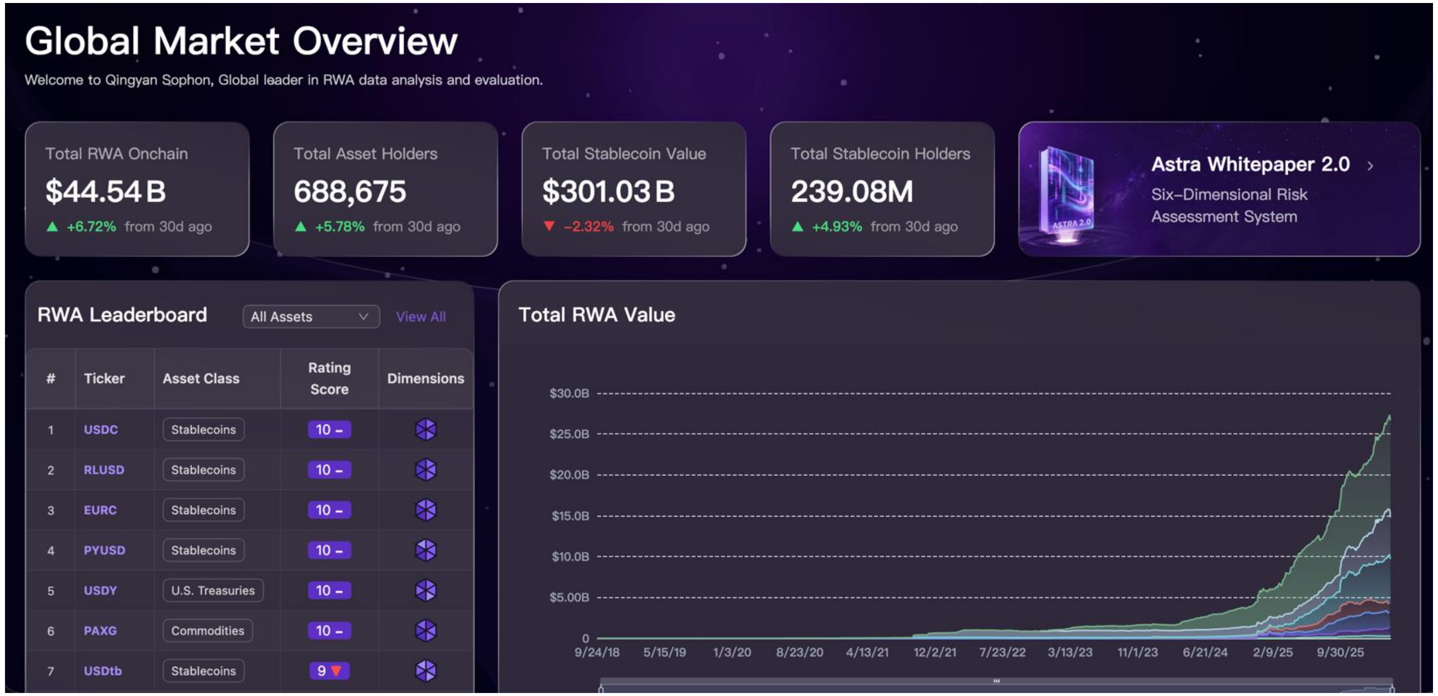


Figure 1-9 | Astra's DaaS (Data as a Service) Dashboards

1.6 Astra's Industry Contributions and Significance

Why it's important: The world's first six-dimensional RWA risk assessment system is an industry "public good".

Core Value: The Three Functions of a Public-Good Infrastructure

- Unification of definitions, standards, and metrics: Astra compresses fragmented information—spread across heterogeneous asset classes, multiple L1/L2 networks, and diverse jurisdictions—into comparable, interpretable, and auditable scores and labels.
- A common coordinate system for all market participants: As an industry public good, Astra enables both institutional and retail investors to read risk within the same analytical frame, improving cross-asset and cross-platform comparability, strengthening pricing efficiency, and reducing misjudgment and losses arising from information asymmetry.
- A high-frequency and event-driven monitoring hub: By linking high-frequency on-chain signals (contract interactions, mint–redeem flows, liquidity structures, oracle/bridge states) with off-chain legal facts (custody, audits, disclosures, registrations), Astra establishes a mechanism of continuous rolling updates + event-driven recalculation.

Industry Outlook

- As ecosystems such as Securitize, Ethena, Ondo Finance, Tether, and Paxos expand across asset categories—and as institutional-grade tokenized products such as Treasury- and index-backed instruments (e.g., BUIDL) gain traction—RWAs are moving toward institutionalization, standardization, and composability.

- The Astra RWA Risk Assessment Framework—together with custody, audit, oracle infrastructure, and settlement networks—will collectively shape the efficiency and safety boundaries of this emerging financial artery.

Bridging traditional finance and crypto: Moving rights and cash flows onto a programmable and auditable rail

Implications for RWA Issuers

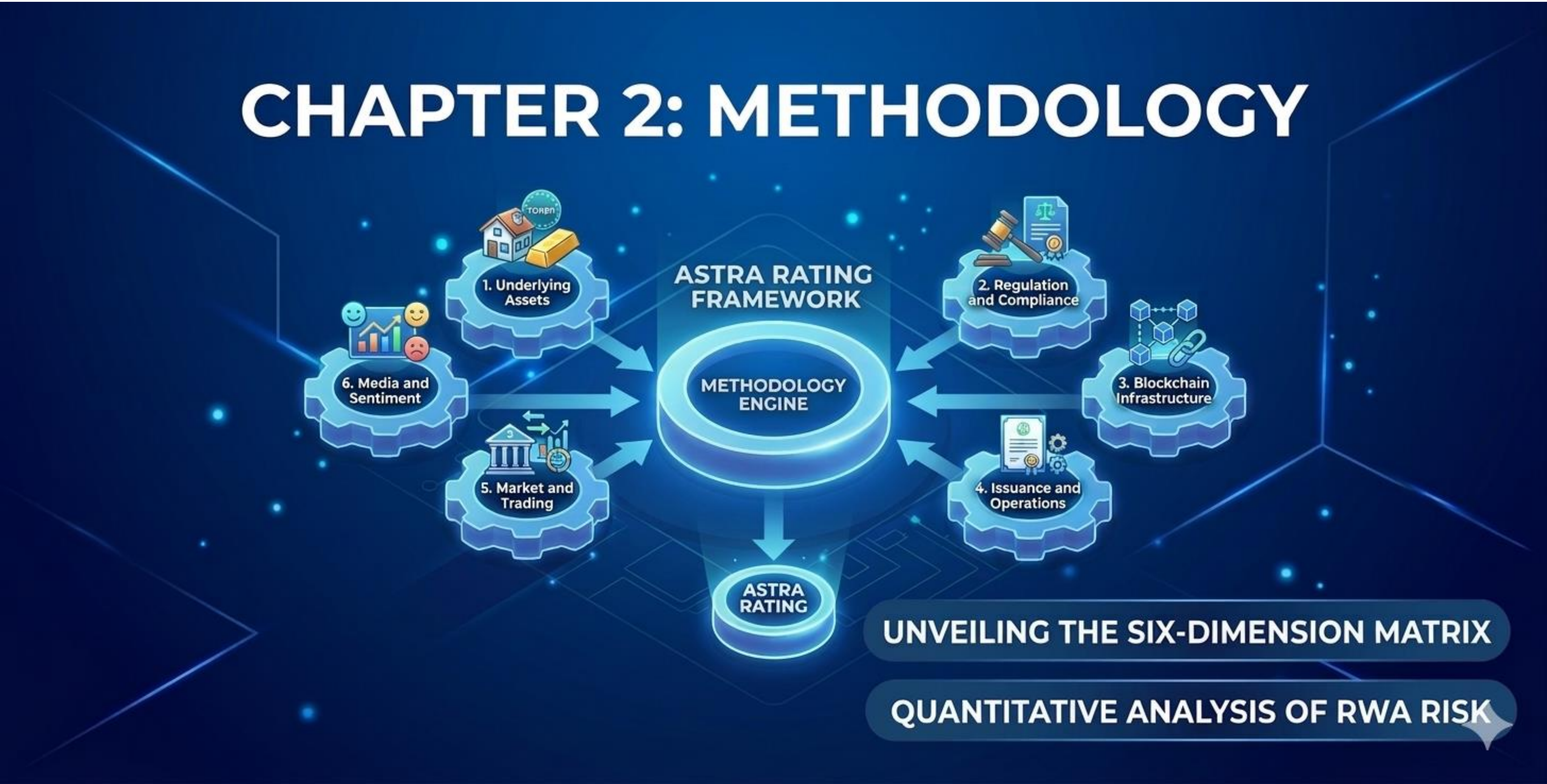
- Pricing and Structural Design: Issuers can use risk-assessment outputs to fine-tune interest rates, fee structures, and redemption terms, achieving an optimized balance across risk, return, and liquidity.
- Enhanced Capital Efficiency: Objective risk scores feed directly into market-making, collateral frameworks, and exposure limits, reducing uncertainty premia and funding frictions, and shortening issuance and refinancing cycles.

Implications for Traditional Financial Institutions

- Banks / Broker-Dealers / Asset Managers: Standardized Astra ratings can be embedded into collateral eligibility, margining practices, limit controls, smart contracts, and risk-model inputs.
- Exchanges / Market Makers: Astra scores can inform listing/delisting decisions, liquidity commitments, spread-target management, reducing procyclical market stress, and supporting higher-frequency liquidity provision, lower financing and transaction costs, and new foundations for indexation, passive strategies, and derivatives.
- Regulators and Self-Regulatory Organizations: A reproducible quantitative “common language” reduces duplicated due diligence and compliance costs, and supports deeper rule- and data-level interoperability with traditional capital markets.

Positive Externalities for the Industry

- Tokenization does not alter the fundamental nature of underlying assets, nor does it eliminate off-chain governance and enforcement challenges. The recent Figure data controversy demonstrates that without verifiable, high-quality data and auditable, explainable evaluation standards, information asymmetry can quickly magnify into systemic risk. As uncertainty rises, compliance costs increase for both regulators and investors, and market trust erodes accordingly.
- A unified standards framework and integrated data architecture can reduce communication and compliance burdens across the industry.
- During periods of high volatility, especially, such a framework provides a stable expectations anchor, mitigating panic-driven redemptions and mispricing, and strengthening the overall resilience of the RWA ecosystem.


CHAPTER 2: METHODOLOGY
TOKEN
1. Underlying Assets
2. Regulation and Compliance
3. Blockchain Infrastructure
4. Issuance and Operations
5. Market and Trading
6. Media and Sentiment
ASTRA RATING FRAMEWORK
METHODOLOGY ENGINE
ASTRA RATING
UNVEILING THE SIX-DIMENSION MATRIX
QUANTITATIVE ANALYSIS OF RWA RISK

2.1 Overview and Assessment Logic of "Astra" System

Methodology Overview: From Assessment Pain Points to an Actionable Six-Dimensional Framework

“Astra” is a fully verifiable, non–human-intervention RWA risk-assessment framework that organizes off-chain rights and cash flows, on-chain infrastructure and transaction behavior, market-level risks and real-time news into a unified, comparable, and auditable indicator system. Its analytical spine is a left-to-right causal chain across six dimensions.

Causal Chain

Underlying Assets (collateral and real-world asset layer) →**Regulation & Compliance** (legal layer) →**Blockchain Infrasturcture**(consensus-participation layer) →**Issuance & Operations** (primary market layer) →**Market & Trading** (secondary market layer) →**Media & Sentiment** (information layer)

Quantitative Methodology Principles

- Sequential soft thresholds: Dimensions are linked through logical transmission—earlier dimensions constrain later ones, but no single dimension acts as a hard veto. Weighted aggregation preserves structural hierarchy while avoiding distortions caused by outliers.
- Evidence first: Only verifiable data and documentary evidence are used. All scores retain data lineage and versioning to ensure full traceability, transparency, and audit reliability.
- Objective market data across all layers: All quantitative scoring relies exclusively on observable, market-available data spanning the underlying-asset market, consensus layer, primary-market issuance, secondary-market trading and real-time media.
- Dynamic responsiveness: A combination of rolling updates and event-driven recalculation ensures real-time—and in many cases forward-looking—risk adjustments in fast-moving markets.

Methodology Upgrade: Option-Implied Credit Stress for Underlying Assets

Core Idea: Adding a Forward-Looking Stress Lens to Collateral Assessment

- The Underlying Assets dimension is upgraded with an option-implied credit stress module. The new module complements static collateral descriptors by quantifying expected downside impairment under stress, liquidation, and redemption pressure, thereby strengthening Astra's assessment of underlying asset quality.

Core Logic

- Economic Intuition: Collateral risk is not defined only by reported asset quality under normal conditions. What matters in stress scenarios is whether liquidation value remains sufficient to cover protected claims, redemption needs, or collateral obligations.
- Analytical Framing: The module evaluates downside impairment through a put-option-like loss structure:

$$Loss = \max(D - MV, 0)$$

where **D** denotes the protected claim or required balance, and **MV** denotes stressed collateral value.

What the Upgrade Improves

- Forward-looking collateral assessment: moves beyond static asset description toward stress-consistent downside evaluation.
- Improved tail-risk detection: focuses on impairment under liquidation and redemption pressure rather than average market conditions.
- Cross-category comparability: provides a common expected-loss lens across stablecoins, tokenized bonds, funds, equities, and commodities.
- Harder-to-game evaluation: relies on observable market inputs and stress logic rather than disclosure quality alone.

Position in Astra Framework

- Embedded in Dimension 1: Underlying Assets.
- Strengthens assessment of collateral robustness under stress.
- Enhances the economic foundation of later dimensions.
- Remains consistent with Astra's principles of evidence first, objective market data, and dynamic responsiveness.

Dimensions 1–6: Objectives and Key Points

Dimension 1: Underlying Assets (Collateral / Real-World Asset Market)
- Objective: Determine whether the asset is authentic, transparent, capable of generating sustainable cash flows, and recoverable under liquidity stress.
- Key Points: Asset authenticity and transparency; cash-flow stability; yield and term structure; option-implied downside impairment under stress.

Dimension 2: Regulation & Compliance
- Objective: Assess whether the rights are legally enforceable in the jurisdiction, whether licensing is complete, and whether asset collateralization is adequate.
- Key Points : Entity qualification; ongoing compliance; audits and disclosures.

Dimension 3: Blockchain Infrastructure (Consensus-Participation Market)
- Objective: Evaluate whether the blockchain has sufficient validator participation and whether the smart-contract layer is secure and auditable.
- Key Points : Choice of L1/L2 network; TVL and staking ratios; smart-contract audits.

Dimension 4: Issuance & Operations (Primary Market)
- Objective: Determine whether KYC/AML, mint–redeem mechanics, distribution, record-keeping, and operational processes function reliably.
- Key Points : Issuer robustness; mint–redeem cadence; pricing consistency; resilience in handling operational anomalies.

Dimension 5: Market & Trading (Secondary Market)
- Objective: Assess whether price discovery is effective, liquidity is sufficient, and de-pegging risks are contained.
- Key Points : Liquidity depth; position concentration; volatility and drawdowns; de-pegging probability.

Dimension 6: Media & Sentiment
- Objective: Assess whether media coverage, market sentiment, and positive vs negative dynamics remain stable, and aligned with asset conditions.
- Key Points : Sentiment stability; media coverage quality and transparency; positive and negative news.

2.2 Data Sources (On-chain/Off-chain/Compliance/Third-parties)

Data source: objective, verifiable, and traceable.

In developing the first version of Astra's risk assessment results, we focused exclusively on verifiable, audit-ready data. Each sample is retained with its source, sampling frequency, and latency to ensure both speed and orderliness. The data architecture incorporates three primary categories, and support the option-implied credit stress module, including reserve composition, collateral pricing inputs, volatility proxies, and liquidation-related liquidity assumptions:

On-Chain Data

- Covers public-chain infrastructure and token-level operational performance, including transaction counts, wallet activity, gas consumption, token liquidity, and smart-contract event logs.

Off-Chain Data

- Captures underlying-asset cash flows, pricing, de-pegging risk, holder qualification, and financial and operational disclosures from issuers and custodians.

Compliance and Third-Party Information

- Includes independent audit reports, custodian qualifications, and jurisdiction-specific regulatory frameworks and requirements.

2.3 Data Processing (Cleaning/Normalization/Feature engineering/Versioning)

Data processing workflow: From full data to auditable metrics

All raw data enters a standardized processing pipeline that produces measurable and auditable indicators, with each release assigned a version number. Feature extraction further converts stress-sensitive collateral information into a standardized expected-loss measure that feeds into the Underlying Assets score.

Data Cleaning and Normalization

- Deduplication, anomaly detection and correction, unit and time-zone harmonization, cross-chain and multi-source alignment, and removal of inconsistent dimensionality across data types.

Feature Extraction and Quantification

- Structuring legal and operational text data; converting asset quality, compliance completeness, and issuance robustness into quantifiable metrics.

Standardization and Weighted Aggregation

- Standardizing indicators within each dimension and feeding them into the causal-weighting framework to generate dimension-level scores, an overall composite score, and a final ranking-based rating.

Versioning and Event Logging

- Each release includes a version number, data snapshot, and event-driven record to support external auditing, academic replication, and longitudinal comparison.

2.4 AI Agents (Event-driven/Explanation/Warning/Decision)

AI collaboration: Explanation, early warning, and strategy support without human intervention

Why AI Agent Is Needed

AI is essential for handling the high frequency and multimodality of data, the complexity and specialization of disclosure materials, and the rapid interpretation of on-chain events. Within Astra, AI models perform three core functions: parsing, linking, and explaining.

Parsing

- Agents extract key information from regulations, disclosures, and news flow, and conduct consistency checks.

Linking

- Semantic analysis is mapped onto the six-dimensional risk framework to generate machine-verifiable risk inferences.

Explanation & Early Warning

- Explainable AI produces natural-language summaries of why risk scores were adjusted up or down, and triggers watchlists and risk alerts.

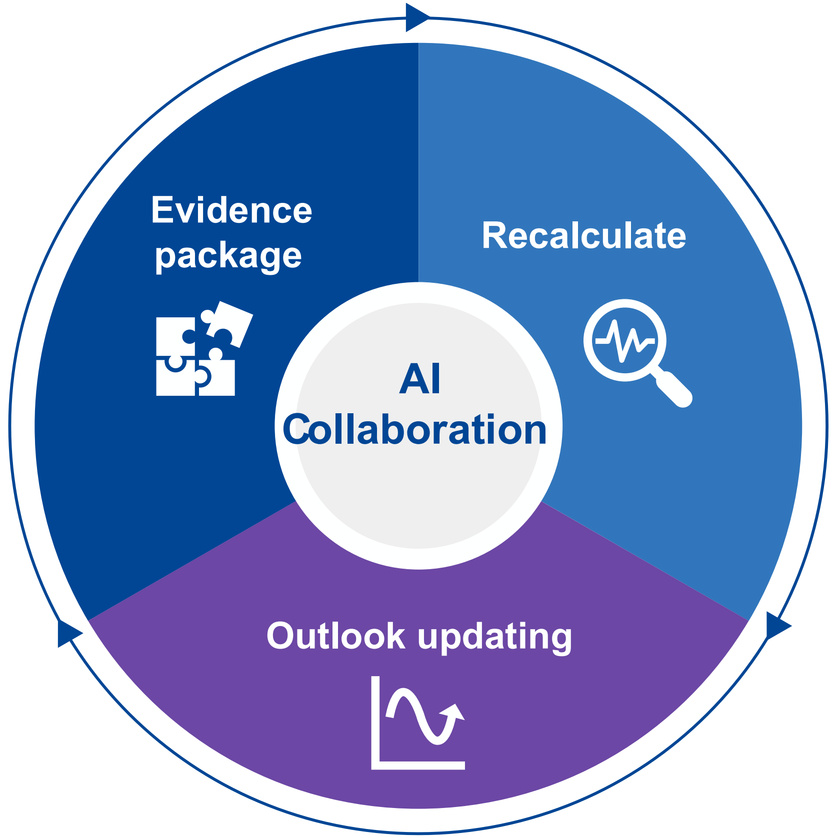


Figure 2-1 | The AI-Driven Closed Loop of "Evidence - Recalculation - Update"

2.5 Delivery and Interfaces

Leave the complexity to the system, and the readability to the user.

Delivery of Assessment Results

- **DaaS (Data as a Service) Dashboard:**
  Overall score, dimension-level sub-scores, and key indicators; chain-by-chain comparisons and time-series replay.

- **Assessment Reports:**
  Periodic or entity-specific digital assessment reports.

- **API and SDK Integration:**
  For market makers and exchanges (listing/delisting decisions, spread targets), asset managers (collateral and exposure limits), and compliance teams (look-through verification).

Use Cases

- **Institutions:**
  Unified risk parameters that reduce duplicated due diligence and communication costs. Clear, intuitive risk radars and verifiable data lineage enabling data-driven decision-making.

- **Issuers:**
  Quantitatively improved pricing efficiency, optimized issuance structures, and lower financing costs.

- **Regulators:**
  A reproducible quantitative common language that lowers market-wide compliance costs.

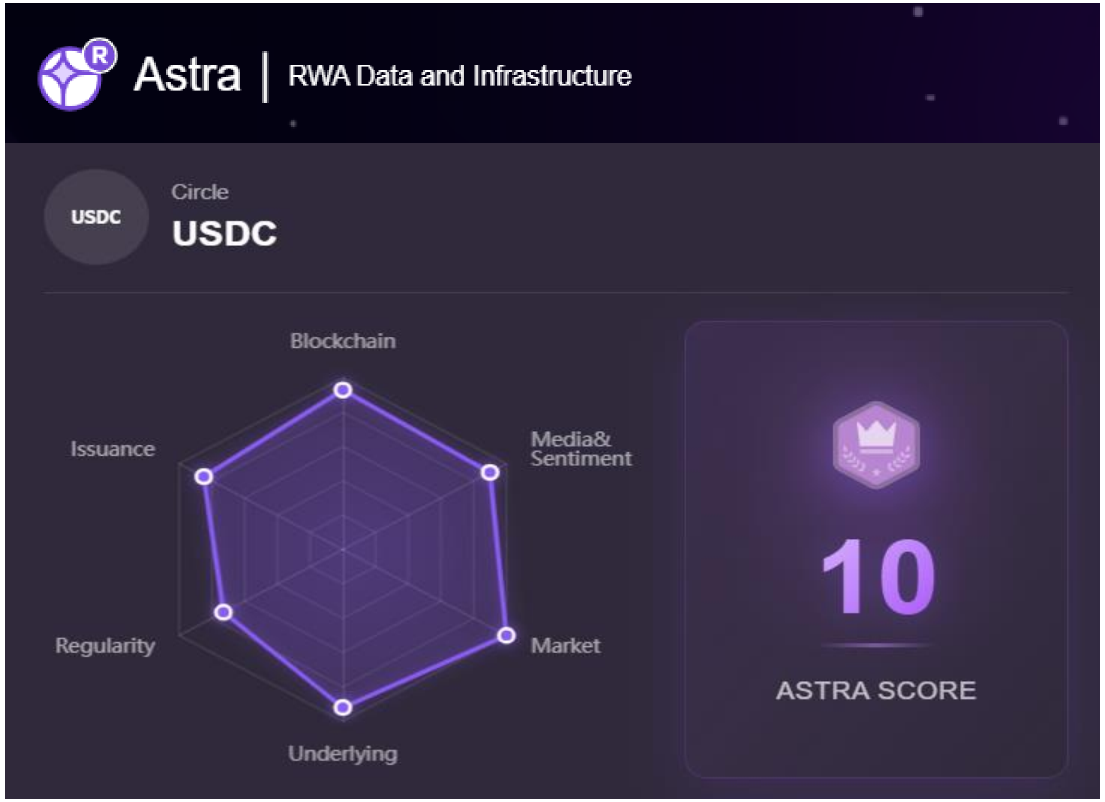


Figure 2-2 | Astra's DaaS (Data as a Service) Dashboard


CHAPTER 3: EMPIRICAL RESULTS
QUANTITATIVE VALIDATION & PREDICTIVE INSIGHTS
BEFORE RATING OPTIMIZATION
A B C D E F
AFTER RATING MODEL OPTIMIZATION
A B C D E F
MODEL VALIDATION
OPTION-IMPLIED CREDIT STRESS MODULE
MARKET SHOCKS
VOLATILITY CONES
CREDIT DEFAULT CURVE
CREDIT
TIME
ASSET POOL PERFORMANCE
QUANTITATIVE VALIDATION & PREDICTIVE INSIGHTS
STRESS TESTING UNDERLYING ASSET ROBUSTNESS

How to Interpret the Assessment Results: Methodology, Standards, and Presentation Format

Leveraging our proprietary data platform, we assessed 1650 RWA projects worldwide, including 232 stablecoins, generating verifiable quantitative scores and producing the **Astra 3.0** results. Starting from this edition, Astra upgrades the Underlying Assets module with an option-implied credit stress framework to improve tail-risk measurement and cross-category comparability. Using a unified analytical standard, the assessment reveals structural risk differences across asset categories. Our scope covers RWAs that have issued tokens on public blockchains; for products deployed on multiple chains, we evaluate the primary issuance or primary liquidity chain. At this stage, off-chain credit pools without on-chain tokens are not included.

For ease of interpretation and comparison, this chapter presents Top 10 rankings by asset category, followed by 1–2 representative projects per category with chain-by-chain deep-dive analyses.

What We Present: A Two-Layer View for Each Asset Class

- Ranking Layer (Cross-Chain Weighted Average): We provide each asset's weighted average score across all relevant blockchains, enabling horizontal comparison among the Top 10 within the category.
- Deep-Dive Layer (Chain-by-Chain Breakdown): For selected representative projects, we display six-dimensional scores and the final rating across major blockchains.

Meaning of Each Dimension Score (for Quick Reference in Subsequent Sections)

- Underlying Score: Assesses the authenticity and robustness of the underlying assets and their cash-flow profile.
- Compliance Score: Evaluates the enforceability of rights, regulatory alignment, and the practicality of compliance within the target jurisdiction.
- Blockchain Score: Measures the security, resilience, and accessibility of the underlying blockchain infrastructure.
- Issuer Score: Captures the execution quality of issuance and ongoing operations, including process stability and operational integrity.
- Market Score: Reflects the quality of secondary-market trading—liquidity depth, pricing efficiency, and market stability.
- Media Score: A dynamic score based on real-time news and sentiment monitoring.
- Final Score: A unified composite score derived from all eligible dimensions, converted into a ranking scale from 1 (low) to 10 (high) for both intra- and cross-category comparison.

Three Notes on Interpreting the Results

- Chain-Specific Perspective: The same asset may operate under materially different environments across blockchains—security, composability, and liquidity structures vary and meaningfully influence outcomes. Therefore, each asset–chain pair is evaluated and presented separately.
- Dynamic and Auditable: Scores update continuously with high-frequency data. Regulatory notices, defaults, operational incidents, or on-chain anomalies trigger expedited recalculation, with all revisions fully versioned and traceable.
- Comparability Only: All assessment results are intended solely for like-for-like comparative analysis under a unified methodology. They do not constitute legal opinions or investment advice.

3.1 Stable Coin —— 3.1.1 Stable Coin Ranking

Stable Coin (Top 10, cross-chain weighted average)

Ranking Analysis

- **The top tier is defined by collateral strength, compliance quality, and disciplined chain deployment.** USDC, EURC, and RLUSD lead the ranking because strong underlying quality is reinforced by solid regulatory footing and deployment on stronger networks.
- **Chain selection remains a material differentiator.** The same token can score at the ceiling on Ethereum yet rank materially lower on weaker chains. USDC stands out because it maintains a near-top profile across a broad multi-chain footprint.
- **The upgraded framework places greater weight on downside robustness of reserves.** With the addition of the option-implied credit stress lens, stablecoins backed by stronger and more defensible collateral structures are more clearly distinguished from peers.
- **Trading strength alone does not secure a top ranking.** Assets with strong market usage but weaker Compliance, Media, or collateral quality remain capped, showing that scalable adoption cannot fully offset weaker fundamentals.

Actionable Recommendations

- **For Issuers:** Strengthen collateral transparency and compliance footing first, as these set the score ceiling. Then optimize chain deployment and operational execution. Better market access cannot fully offset weak Underlying or Compliance fundamentals.
- **For Exchanges and Platforms:** Use Underlying + Compliance + Blockchain as primary listing filters. Treat Trading and Media as monitoring layers rather than substitutes for core asset quality.
- **For Investors:** Screen stablecoins first through collateral robustness, regulatory footing, and chain quality, then refine allocation using Issuance, Trading, and Media. Always assess exposures per chain, not by brand name alone.
- **For Regulators:** A chain-by-chain framework is more informative than token-level averages. Supervisory templates should require reserve transparency, issuance-process disclosures, and chain-specific reporting.

	Token	Rating Score	Examined Chains	Issuer
1	USDC	10.0	19	Circle
2	EURC	9.9	5	Circle
3	RLUSD	9.7	2	Ripple
4	USD1	9.2	6	World Liberty Financial
5	PYUSD	8.9	4	Paxos
6	USDP	8.7	2	Paxos
7	USDtb	8.4	4	Anchorage
8	AUSD	8.2	5	Agora
9	EURØP	8.0	4	Schuman
10	EURQ	8.0	1	Quantoz

Table 3-1. Stable Coin Cross-Chain Top10

3.1.2 Stable Coin Deep-Dive

Stable Coin: Deep-Dive (Chain-by-Chain Breakdown on USDC)

USDC — issued by Circle, USDC maintains consistently strong scores in Underlying quality, Compliance, Issuance, Trading, and Media across chains, with cross-chain differentiation driven primarily by Blockchain conditions. Evaluating USDC across 19 public chains, a clear **"strong chain → strong score"** relationship remains evident.

- Ethereum sets the upper bound. With the highest Blockchain score (10.0) and the strongest overall market infrastructure, Ethereum anchors USDC's top Final Score, reflecting superior security, decentralization, liquidity depth, and ecosystem composability.
- Major L2s and leading ecosystems form the second-high band. Arbitrum, Base, BNB Chain, and Solana cluster just below Ethereum, with Blockchain scores of 8.0–8.3 and Final Scores of 8.7. Polygon also remains strong at 8.6, showing that USDC performs best when deployed on large, liquid, and operationally mature networks.
- Mid-tier chains show a visible but orderly decline. Optimism, Avalanche, and Stellar score 8.5, while Aptos and NEAR score 8.4. These chains still support a solid institutional profile for USDC, but somewhat weaker infrastructure conditions reduce their score ceiling relative to the leading group.
- Long-tail and weaker infrastructure chains pull scores lower. MANTRA (7.7) and Noble (7.6) sit at the bottom of the examined set due to significantly weaker Blockchain scores.

Ticker#Chain	Underlying	Compliance	Blockchain	Issuance	Market	Media	Final Score
USDC#Aptos	9.2	7.3	6.3	8.5	10.0	9.0	8.4
USDC#Arbitrum	9.2	7.3	8.0	8.5	10.0	9.0	8.7
USDC#Avalanche C-Chain	9.2	7.3	6.7	8.5	10.0	9.0	8.5
USDC#Base	9.2	7.3	8.0	8.5	10.0	9.0	8.7
USDC#BNB Chain	9.2	7.3	8.0	8.5	10.0	9.0	8.7
USDC#Celo	9.2	7.3	5.0	8.5	10.0	9.0	8.2
USDC#Ethereum	9.2	7.3	10.0	8.5	10.0	9.0	9.0
USDC#MANTRA	9.2	7.3	2.3	8.5	10.0	9.0	7.7
USDC#NEAR	9.2	7.3	6.3	8.5	10.0	9.0	8.4
USDC#Noble	9.2	7.3	1.7	8.5	10.0	9.0	7.6
USDC#Optimism	9.2	7.3	7.0	8.5	10.0	9.0	8.5
USDC#Plume	9.2	7.3	5.7	8.5	10.0	9.0	8.3
USDC#Polygon	9.2	7.3	7.7	8.5	10.0	9.0	8.6
USDC#Solana	9.2	7.3	8.3	8.5	10.0	9.0	8.7
USDC#Stellar	9.2	7.3	7.0	8.5	10.0	9.0	8.5
USDC#TRON	9.2	7.3	5.7	8.5	10.0	9.0	8.3
USDC#XDC	9.2	7.3	5.0	8.5	10.0	9.0	8.2
USDC#XRP Ledger	9.2	7.3	5.0	8.5	10.0	9.0	8.2
USDC#ZKsync Era	9.2	7.3	5.3	8.5	10.0	9.0	8.2

Table 3-2. USDC – Chain-by-Chain Score

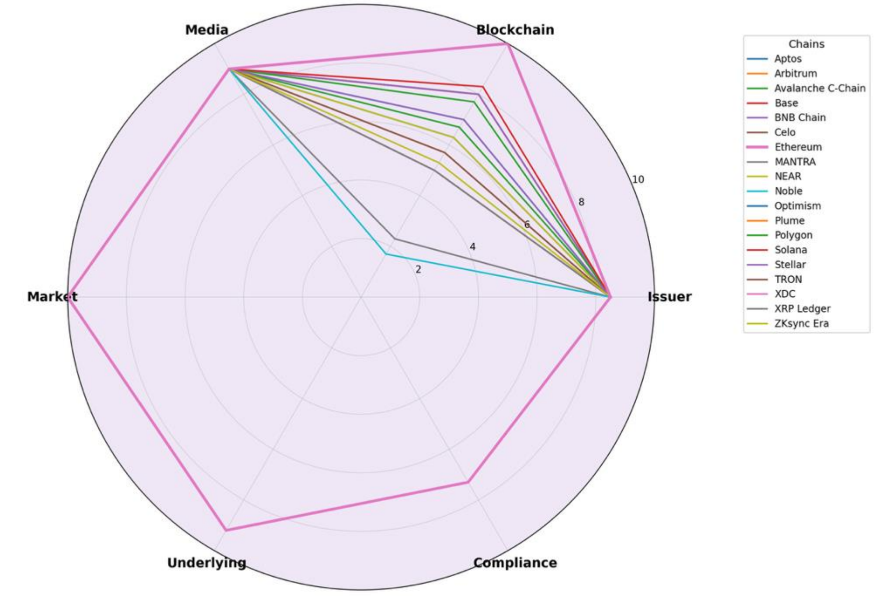


Figure 3-1. USDC – Chain-by-Chain Radar Chart

Stable Coin: Deep-Dive (Chain-by-Chain Breakdown on USDE)

USDe — Ethena's synthetic dollar, backed by crypto collateral and delta-neutral hedging strategies, is structurally different from fiat-reserve stablecoins. This difference is clearly reflected in Astra's scores across Ethereum, Solana, and Avalanche C-Chain.

- Compliance is the defining constraint. Across all examined chains, USDe receives a Compliance score of 0.0, which materially caps its Final Score regardless of deployment quality. In Astra's framework, the absence of a regulatory foundation is not a marginal weakness but a structural ceiling.

- Chain quality still matters, but only within a narrow band. Ethereum ranks highest with a Blockchain score of 10.0 and a Final Score of 6.3, followed by Solana at 8.3 / 6.0, and Avalanche C-Chain at 6.7 / 5.8. This confirms that stronger infrastructure can improve execution conditions, but only incrementally when the core compliance layer remains absent.

- The rest of the profile is relatively stable across chains. Underlying (7.5), Issuance (7.2), Trading (9.3), and Media (4.0) remain unchanged across deployments. This indicates that USDe's cross-chain differentiation is driven almost entirely by Blockchain quality, while its broader risk profile is anchored by a structurally weak compliance position.

- USDe therefore represents a case where market functionality exceeds regulatory readiness. Its strong Trading score shows meaningful market usage and liquidity, but this does not translate into top-tier risk performance because Astra distinguishes operational strength from institutional acceptability. For exchanges, allocators, and regulators, USDe illustrates why chain deployment alone cannot compensate for foundational gaps in compliance and legal clarity.

Ticker#Chain	Underlying	Compliance	Blockchain	Issuance	Market	Media	Final Score
USDe#Avalanche C-Chain	7.5	0.0	6.7	7.2	9.3	4.0	5.8
USDe#Ethereum	7.5	0.0	10.0	7.2	9.3	4.0	6.3
USDe#Solana	7.5	0.0	8.3	7.2	9.3	4.0	6.0

Table 3-3. USDE – Chain-by-Chain Score

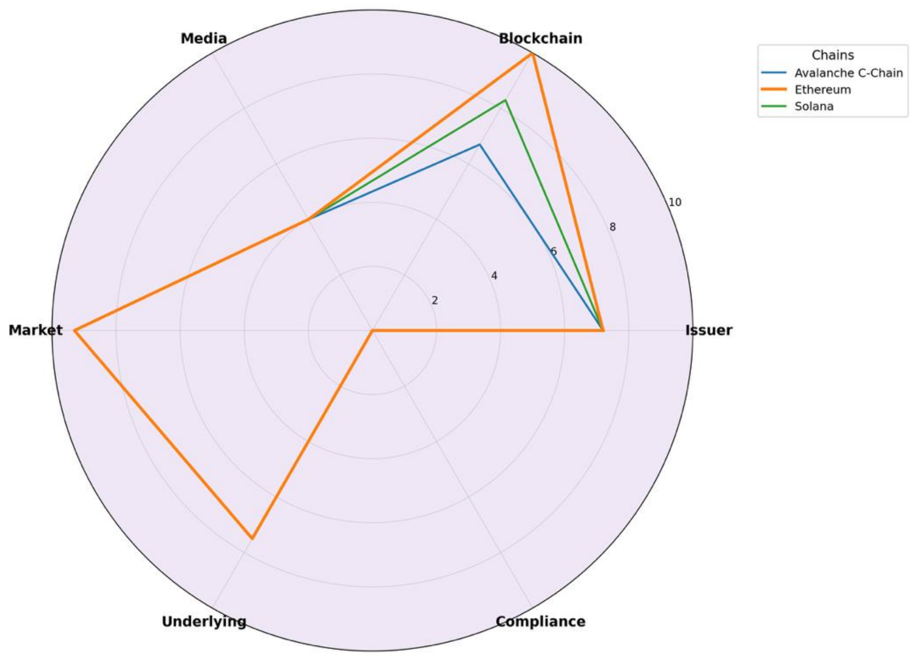


Figure 3-2. USDE – Chain-by-Chain Radar Chart

3.2 US Treasury Bond —— 3.2.1 US Treasury Bond Ranking

US Treasury Bond (Top 10, cross-chain weighted average)

Ranking Analysis

- **The top tier is dominated by tokenized U.S. Treasury products with strong underlying quality and relatively complete operational structure.** USDY, BUIDL, WTGXX, BENJI, and USYC lead the ranking, showing that bond products still derive most of their score advantage from high-quality underlying assets and credible issuance architecture.
- **Underlying strength is necessary, but not sufficient, for top ranking.** Most leading products score very highly on the Underlying dimension, yet final differentiation comes from Regularity, Issuance, and chain-weighted deployment quality. Products with strong asset backing but weaker legal or structural clarity remain capped.
- **The leading group is institution-oriented rather than purely market-driven.** Compared with stablecoins, bond products generally show lower Market and Media scores, meaning that top rankings are driven less by trading intensity or sentiment and more by reserve quality, product structure, and regulatory robustness.

Actionable Recommendations

- **For Issuers:** Strengthen legal regularity, disclosure standards, and issuance structure. In bond products, high-quality collateral alone does not secure a top-tier position if documentation, compliance clarity, or issuance robustness is weaker.
- **For Exchanges and Platforms:** Use Underlying + Regularity + Issuance as primary onboarding filters for tokenized bond products. Trading activity should be treated as a secondary indicator, not a substitute for institutional quality.
- **For Investors:** Focus first on collateral quality, legal enforceability, and issuance design, then use market and media indicators for refinement. Bond tokens should be assessed as structured fixed-income instruments, not as pure liquidity products.
- **For Regulators:** Treasury and bond tokenization requires clearer standards for disclosure, legal packaging, and investor protections. A standardized framework can help distinguish institution-grade products from structurally weaker wrappers.

	Token	Rating Score	Examined Chains	Issuer
1	USDY	8.7	11	Ondo
2	BUIDL	8.3	8	Securitize
3	WTGXX	8.0	7	WisdomTree
4	BENJI	7.9	8	Franklin Templeton
5	USYC	7.8	4	Circle
6	OUSG	7.7	4	Ondo
7	mTBILL	7.6	1	Midas
8	USFR.d	7.3	4	Dinari
9	USTB	7.3	3	Victory Capital
10	USTBL	7.3	5	NexBridge Digital Financial Solutions

Table 3-4. US Treasury Bond Cross-Chain Top10

3.2.2 US Treasury Bond Deep-Dive

US Treasury Bond: Deep-Dive (Chain-by-Chain Breakdown on BUIDL)

BUIDL — issued by BlackRock and Securitize, BUIDL is a tokenized money market fund backed primarily by U.S. Treasury bills and cash equivalents. Its profile is characterized by strong Underlying quality, solid Compliance, and exceptionally strong Media stability, while cross-chain differentiation is driven mainly by Blockchain Infrastructure.

- Across all eight supported chains—Ethereum, Solana, Arbitrum, Polygon, BNB Chain, Optimism, Avalanche C-Chain, and Aptos—the variation in Final Scores is relatively contained, clustering between 7.0 and 7.7. This indicates that BUIDL maintains a stable institutional profile across deployments, with chain quality acting as the main source of dispersion rather than changes in core product structure.

- Ethereum sets the upper bound. With the highest Blockchain score of 10.0, Ethereum gives BUIDL its strongest Final Score, establishing the top anchor for the product's cross-chain ranking.

- Solana, Arbitrum, Polygon, and BNB Chain form the second tier. Solana scores 7.4, supported by a Blockchain score of 8.3, while Arbitrum, Polygon, and BNB Chain cluster at 7.3 with Blockchain scores of 8.0, 7.7, and 8.0, respectively. These networks preserve most of BUIDL's institutional quality, though at a slightly lower level than Ethereum.

- Aptos, Avalanche C-Chain, and Optimism form the lower end of the examined set. Their Final Scores range from 7.0 to 7.2, reflecting weaker Blockchain conditions rather than deterioration in Underlying, Compliance, Issuance, Trading, or Media. Because those dimensions remain effectively constant across all deployments, Blockchain quality is the dominant driver of BUIDL's cross-chain score dispersion.

Ticker#Chain	Underlying	Compliance	Blockchain	Issuance	Market	Media	Final Score
BUIDL#Aptos	9.2	6.3	6.3	5.5	5.0	10.0	7.0
BUIDL#Arbitrum	9.2	6.3	8.0	5.5	5.0	10.0	7.3
BUIDL#Avalanche C-Chain	9.2	6.3	6.7	5.5	5.0	10.0	7.1
BUIDL#BNB Chain	9.2	6.3	8.0	5.5	5.0	10.0	7.3
BUIDL#Ethereum	9.2	6.3	10.0	5.5	5.0	10.0	7.7
BUIDL#Optimism	9.2	6.3	7.0	5.5	5.0	10.0	7.2
BUIDL#Polygon	9.2	6.3	7.7	5.5	5.0	10.0	7.3
BUIDL#Solana	9.2	6.3	8.3	5.5	5.0	10.0	7.4

Table 3-5. BUIDL - Chain-by-Chain Score

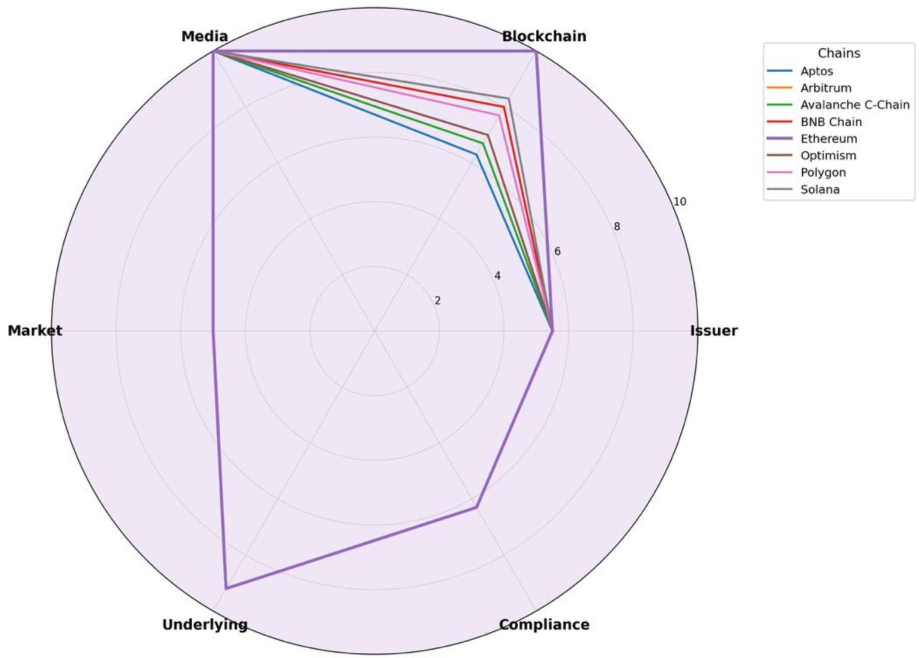


Figure 3-3. BUIDL - Chain-by-Chain Radar Chart

3.3 Institutional Fund —— 3.3.1 Institutional Fund Ranking

Institutional Fund (Top 10, cross-chain weighted average)

Institutional funds in the RWA ecosystem are typically issued by licensed asset managers through regulated fund or trust vehicles, with on-chain tokens representing fund shares or investor claims. Underlying portfolios span private credit, securitized assets, short-duration notes, and diversified yield strategies, and are valued based on NAV.

Ranking Analysis

- **The leading group is defined by balanced institutional structure rather than market activity alone.** ONyc, JAAA, and USCC rank at the top because they combine relatively strong chain-weighted deployment, credible product structure, and solid underlying quality, rather than relying on trading intensity or sentiment.
- **Chain-weighted strength is important, but not sufficient on its own.** Products such as STAC and MG999 benefit from very strong chain-weighted scores, yet their final rankings are still constrained by weaker Issuance, Regularity, or Underlying dimensions. Strong deployment quality supports the score, but does not fully determine it.
- **Institutional funds are more structurally heterogeneous than stablecoins or Treasury products.** The spread in Regularity, Issuance, and Underlying scores is wider, indicating that this category contains products with materially different legal structures, portfolio quality, and operational maturity.

Actionable Recommendations

- **For Issuers:** Improve legal regularity, product disclosure, and issuance design. In institutional funds, weak structural clarity is often a more binding constraint than market visibility.
- **For Exchanges and Platforms:** Use Underlying + Regularity + Issuance as the primary onboarding filter. Chain deployment quality can enhance accessibility, but it should not substitute for institutional robustness.
- **For Investors:** Evaluate institutional fund tokens as structured investment products rather than as liquidity instruments. Priority should be given to underlying asset quality, legal packaging, and operational architecture before considering market activity.
- **For Regulators:** This category would benefit from clearer disclosure standards on portfolio composition, redemption rights, legal wrappers, and investor protections, given the broader structural dispersion across products.

	Token	Rating Score	Examined Chains	Issuer
1	ONyc	7.6	1	OnRe
2	JAAA	7.3	3	Janus Henderson
3	USCC	7.2	3	Superstate
4	STAC	7.0	1	CoinStarter
5	SPKCC	6.9	5	Spiko
6	nELIXIR	6.8	2	Nest Credit
7	MG999	6.8	3	FundBridge
8	ACRED	6.8	7	Apollo Global
9	eurSPKCC	6.7	5	Spiko
10	CRDT	6.6	3	WisdomTree

Table 3-6. Institutional Fund Cross-Chain Top10

3.3.2 Institutional Fund Deep-Dive

Institutional Fund: Deep-Dive (Chain-by-Chain Breakdown on USCC)

USCC — a tokenized market-neutral fund built on a cash-and-carry arbitrage strategy, with primary exposure to BTC/ETH spot–futures basis spreads and a supplementary allocation to U.S. Treasuries for risk hedging — targets stable, uncorrelated yield for qualified investors. In Astra's framework, USCC shows relatively strong Compliance but more moderate Underlying, Issuance, Trading, and Media performance, with cross-chain differentiation driven mainly by Blockchain quality.

- Ethereum sets the upper bound. With the highest Blockchain score of 10.0, Ethereum supports USCC's strongest Final Score, serving as the product's primary anchor in the current deployment set.
- Solana forms the secondary tier. Its Blockchain score of 8.3 supports a Final Score of 6.2, preserving much of USCC's institutional profile but at a lower level than Ethereum.
- Plume materially lags behind. With a Blockchain score of 5.7, it pulls USCC's Final Score down to 5.7, showing that weaker infrastructure can meaningfully reduce the effective quality of the same product across deployments.
- The rest of the profile remains stable across chains. Underlying (6.5), Compliance (7.7), Issuance (5.0), Trading (5.0), and Media (4.5) are unchanged across Ethereum, Solana, and Plume. This means that Blockchain Infrastructure is the dominant driver of USCC's cross-chain dispersion, while the product's broader institutional profile is defined by strong legal/compliance structure but only moderate underlying and market depth.

Ticker#Chain	Underlying	Compliance	Blockchain	Issuance	Market	Media	Final Score
USCC#Ethereum	6.5	7.7	10.0	5.0	5.0	4.5	6.5
USCC#Plume	6.5	7.7	5.7	5.0	5.0	4.5	5.7
USCC#Solana	6.5	7.7	8.3	5.0	5.0	4.5	6.2

Table 3-7. USCC – Chain-by-Chain Score

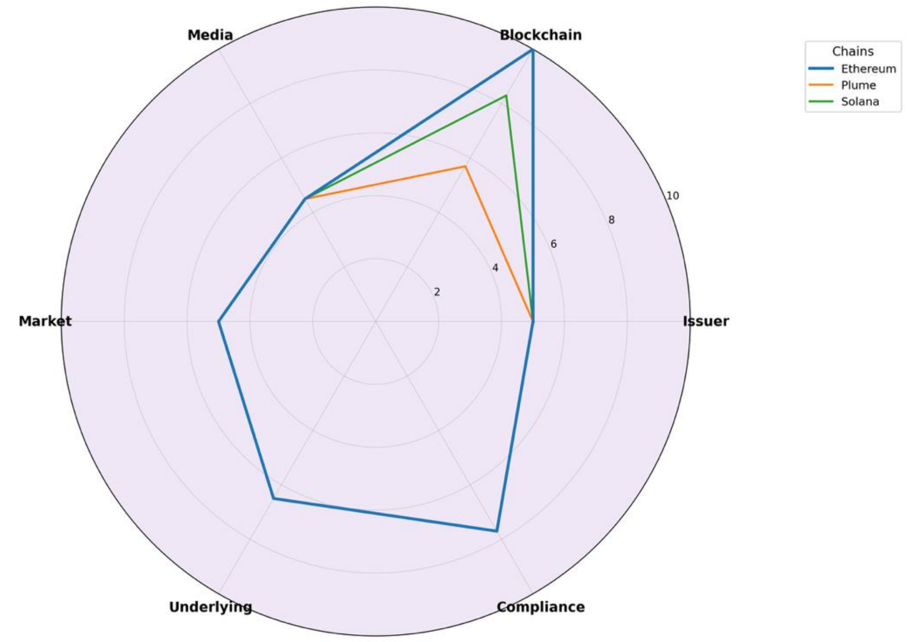


Figure 3-4. USCC – Chain-by-Chain Radar Chart

3.4 Stock —— 3.4.1 Stock Ranking

Stock (Top 10, cross-chain weighted average)

Ranking Analysis

- **The leading cohort is defined by strong market robustness and relatively solid issuance quality.** TSLAx sits at the top because it combines high market-risk resilience with comparatively strong issuance structure and good chain deployment.
- **Underlying equity quality matters, but execution-layer variables drive most of the separation.** Across the top group, differences in market-risk performance, chain-weighted deployment, and issuance design explain more of the rank dispersion than the equity exposure itself.
- **Regularity remains a structural constraint across the category.** Even high-scoring names still show only moderate regularity scores, which means that compliance/disclosure cadence continues to cap the attainable upper bound for tokenized equities.
- **The top names are relatively tightly clustered.** Unlike commodities or some lower-tier fund products, the stock category shows less extreme dispersion at the top. The main differentiators are issuance quality, liquidity/market robustness, and chain/infrastructure reach rather than dramatic differences in underlying asset quality

Actionable Recommendations

- **For Issuers:** Improve disclosure cadence, custody attestations, and issuance standardization. In tokenized equities, stronger issuance mechanics and regularity are still the cleanest way to raise the rating ceiling.
- **For Exchanges and Platforms:** Use Regularity + Issuance + Chain/Infrastructure as the primary onboarding filter, then refine with market-risk performance and media stability.
- **For Investors:** Treat tokenized equities as wrapper-dependent products rather than pure stock proxies. Compare issuer structure, chain deployment, and liquidity conditions before relying on ticker familiarity alone.
- **For Regulators:** Prioritize standardized reporting on custody, redemption mechanics, and cross-chain disclosure consistency, since operational packaging remains the main source of structural differentiation in this category.

	Token	Rating Score	Examined Chains	Underlying Asset	Issuer
1	TSLAx	8.1	5	Tesla Corp.	xStocks
2	WMTx	7.9	5	Walmart Corp.	xStocks
3	GOOGLx	7.8	5	Google Corp.	xStocks
4	QQQx	7.8	5	Invesco QQQ Trust	xStocks
5	AMZNx	7.8	4	Amazon Corp.	xStocks
6	QQQon	7.8	3	Invesco QQQ ETF	Ondo
7	IEFAon	7.7	3	MSCI EAFE ETF	Ondo
8	MAon	7.7	3	Mastercard Corp.	Ondo
9	BAon	7.7	3	Boeing Corp.	Ondo
10	FUTUon	7.7	3	Futu Holding Corp.	Ondo

Table 3-8. Stock Cross-Chain Top10

3.4.2 Stock Deep-Dive

Stock: Deep-Dive (Chain-by-Chain Breakdown on MSFT)

TSLAx represents a tokenized equity-linked exposure to Tesla, delivered through a structured issuance framework and deployed across multiple public chains. Using the six-dimension Astra framework, we compare TSLAx across Arbitrum, BNB Chain, Ethereum, Mantle, and Solana to show how chain quality shapes the final risk tier despite otherwise stable issuer-, compliance-, and underlying-level baselines.

- Ethereum anchors the highest tier. With the strongest Blockchain score (10.0) and stable Issuance, Underlying, Market, and Media metrics, Ethereum provides the most secure and composable settlement environment. This lifts TSLAx's Final Score to the top of the observed range .

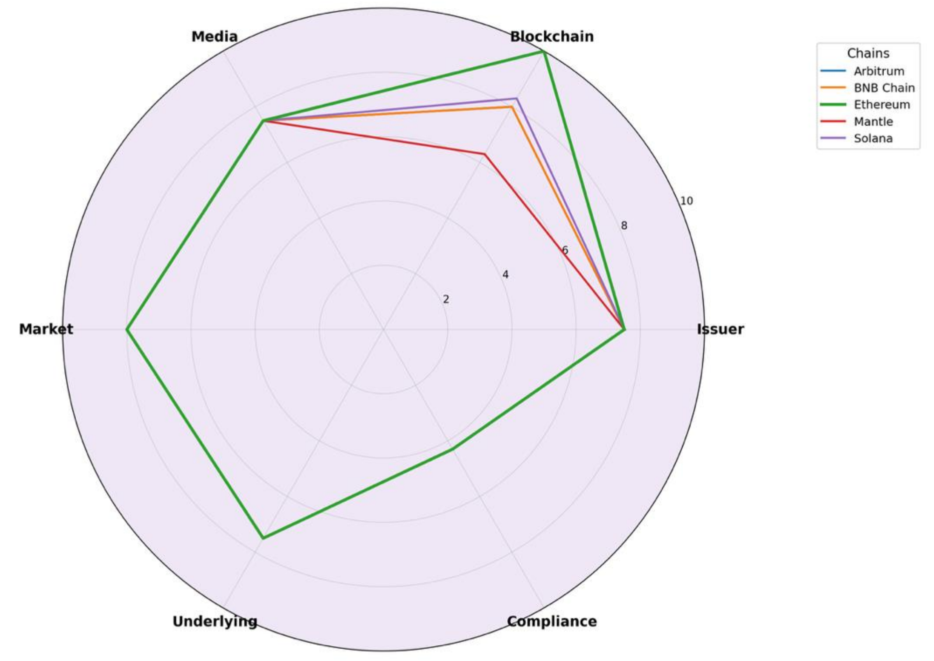
- Solana, Arbitrum, and BNB Chain form a secondary band. Their Blockchain scores are 8.3, 8.0, and 8.0, respectively. These chains preserve most of the product's institutional profile, though still below Ethereum's infrastructure benchmark.

- Mantle sits in a weaker tier. Its lower Blockchain score (6.3) places TSLAx at a materially lower Final Score, showing that weaker infrastructure can directly reduce the effective quality of the same equity wrapper.

- Because Underlying (7.5), Compliance (4.3), Issuance (7.5), Market (8.0), and Media (7.5) remain constant across all deployments, Blockchain Infrastructure is the dominant driver of TSLAx's cross-chain dispersion.

Ticker#Chain	Underlying	Compliance	Blockchain	Issuance	Market	Media	Final Score
TSLAx#Arbitrum	7.5	4.3	8.0	7.5	8.0	7.5	7.1
TSLAx#BNB Chain	7.5	4.3	8.0	7.5	8.0	7.5	7.1
TSLAx#Ethereum	7.5	4.3	10.0	7.5	8.0	7.5	7.5
TSLAx#Mantle	7.5	4.3	6.3	7.5	8.0	7.5	6.9
TSLAx#Solana	7.5	4.3	8.3	7.5	8.0	7.5	7.2

Table 3-9. TSLAx – Chain-by-Chain Score



3-5. TSLAx – Chain-by-Chain Radar Chart

3.5 Commodity —— 3.5.1 Commodity Ranking

Commodity (Top 5, cross-chain weighted average)

Ranking Analysis

- **The top tier is dominated by gold-backed products with strong market acceptance and clear collateral backing.** PAXG and XAUT lead the category, reflecting the advantage of well-recognized gold-linked products with strong chain deployment and relatively mature market positioning.
- **Regularity is the main source of separation within the top group.** Although PAXG and XAUT both benefit from high chain-weighted scores and strong market performance, PAXG ranks higher because its regularity profile is materially stronger, giving it a more balanced institutional-quality structure
- **The category remains highly concentrated at the top.** After PAXG and XAUT, scores drop more visibly to XAUm and VNXAU, indicating that secondary products still face weaker issuance quality, legal structure, or market robustness despite reasonably solid underlying commodity exposure
- **Commodity token rankings are driven more by wrapper quality than by the commodity itself.** Since gold and similar hard-asset exposures are relatively straightforward at the underlying level, final differentiation comes mainly from issuance design, legal regularity, market depth, and media stability.

Actionable Recommendations

- **For Issuers:** Improve legal regularity, disclosure frequency, and issuance structure. In commodity tokens, strong underlying asset backing alone is not enough to secure a top-tier position.
- **For Exchanges and Platforms:** Use Underlying + Regularity + Issuance as the main onboarding filters, then refine with market-risk and media indicators. Do not rely on commodity type alone as a quality signal.
- **For Investors:** Treat tokenized commodities as structured wrappers around real assets, not as simple commodity substitutes. The wrapper's legal and operational quality remains the key determinant of risk tier.
- **For Regulators:** Commodity tokenization would benefit from clearer standards on custody, reserve verification, redemption mechanics, and disclosure consistency across issuers.

	Token	Rating Score	Examined Chains	Underlying Asset	Issuer
1	PAXG	8.9	1	Physical Gold	Paxos
2	XAUT	8.6	2	Physical Gold	Tether Holdings
3	XAUm	7.7	4	LBMA Gold	Matrixdock
4	VNXAU	7.3	1	LBMA Gold	VNX
5	TXAG	6.3	1	Physical Silver	Aurus

Table 3-10. Commodity Cross-Chain Top5

3.5.2 Commodity Deep-Dive

Commodity: Deep-Dive (Chain-by-Chain Breakdown on PAXG)

PAXG — issued by Paxos Trust Company, is a fully reserved tokenized gold product in which each token is backed 1:1 by LBMA-certified physical gold held in London vaults. In Astra's framework, PAXG stands at the top of the commodities category, supported by strong underlying asset quality, regulated issuance, and deployment on a top-tier blockchain.

- Ethereum provides the strongest execution environment. With a Blockchain score of 10.0, PAXG benefits from the highest-tier settlement, security, and composability conditions in the current framework.
- PAXG's core strengths are balanced rather than one-dimensional. It combines strong Underlying quality (8.0), solid Compliance (6.7), credible Issuance (6.5), and very strong Market performance (9.3). This indicates that PAXG's leading position is driven not only by gold backing itself, but also by the quality of its institutional wrapper and market usability.
- Media performance is supportive but not the key driver. With a Media score of 7.0, PAXG benefits from relatively stable market perception, though its ranking advantage comes primarily from collateral quality, chain infrastructure, and market robustness rather than narrative strength alone.
- The remaining headroom is mainly institutional, not technological. Since Blockchain Infrastructure already sits at the maximum level in the current set, further improvement would need to come from deeper compliance transparency, stronger operational disclosure, and tighter audit/readability standards rather than from chain selection.

Ticker#Chain	Underlying	Compliance	Blockchain	Issuance	Market	Media	Final Score
PAXG#Ethereum	8.0	6.7	10.0	6.5	9.3	7.0	7.9

Table 3-11. PAXG – Chain-by-Chain Score

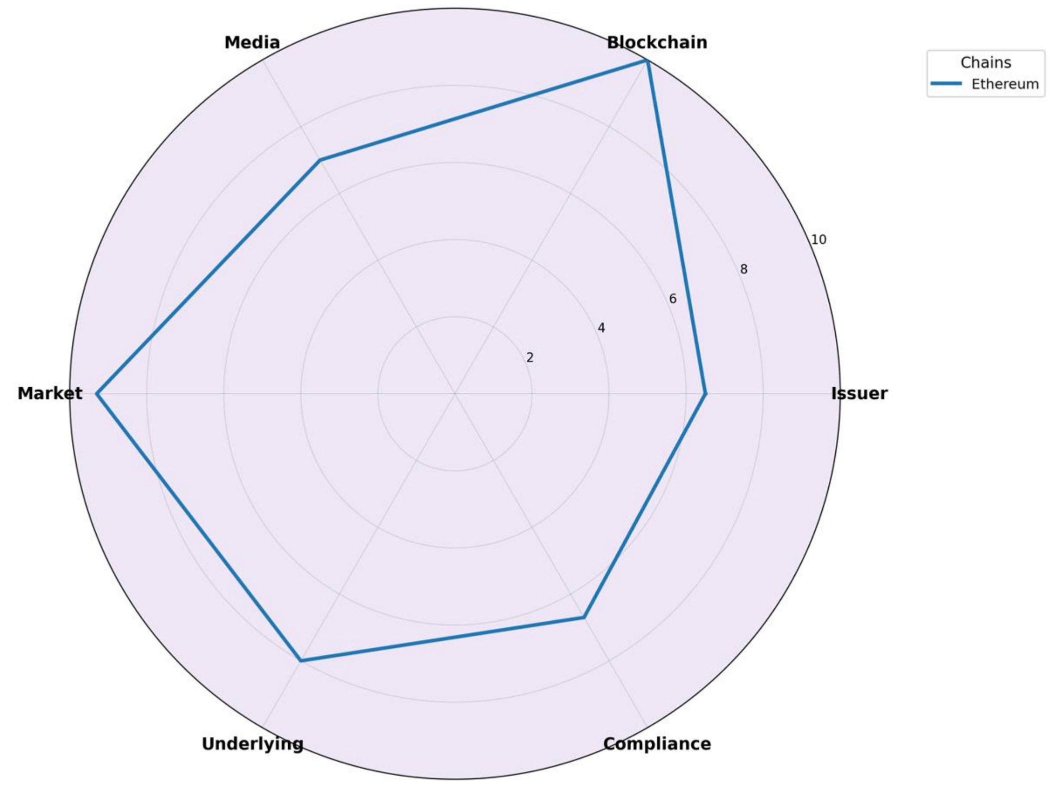


Figure 3-6. PAXG – Chain-by-Chain Radar Chart


CHAPTER 4: CONCLUDING REMARKS
ECOSYSTEM INTEGRATION
CONTINUOUS INNOVATION
ADOPTION PATH
SYNTHESIZING INSIGHTS & FUTURE OUTLOOK
BUILDING A SECURE, TRANSPARENT RWA ECOSYSTEM

Conclusion: Transforming RWA's risk through Astra's six-dimensional framework

We develop and empirically validate "Astra," a risk-assessment framework for RWA built across six dimensions: Underlying Assets, Regulatory & Compliance, Blockchain Infrastructure, Issuance & Operations, Market and Trading, and Media & Sentiment. Astra outputs comparable risk scores and categorical labels under a unified methodology and chain-specific perspective. The framework currently covers 1,650 real RWA projects (including 232 stablecoins), restricting its scope to tokenized real-world assets that have already been issued on public blockchains. The resulting assessments clearly reveal differentiated risk characteristics across key asset classes such as stablecoins, Treasury bonds, stocks, commodities, and institutional funds.

Key Findings

- **The Foundational Role of Risk Assessment.** Risk assessment is not merely an aggregation of information. It constitutes foundational market infrastructure that organizes expectations, strengthens early-warning mechanisms, improves price-discovery efficiency, and reduces compliance and transaction costs.

- **Option-Implied Credit Stress Enhances the Foundation of RWA Evaluation.** Starting from this edition, Astra incorporates an option-implied credit stress framework into the Underlying Assets module. This upgrade shifts collateral assessment from static description toward forward-looking downside-loss measurement, improving tail-risk sensitivity, cross-category comparability, and the robustness of underlying asset evaluation.

- **Chain-Specific Evaluation Reveals Structural Divergence.** Assessing risks on a chain-by-chain basis eliminates the masking effect of averages. A clear "chain → score" relationship emerges. These quantifiable patterns provide a new technical pathway for cross-chain comparison and standardized supervisory practices.

- **RWA is reshaping the boundaries and trust architecture of the global financial system.** We believe risk assessment should not remain a passive repository of information. It should evolve into the foundational order and public infrastructure upon which markets operate—where data is verifiable, behaviors are explainable, and standards are shareable.

Grounded in verifiability, transparency, and inclusiveness, Astra establishes a unified indicator system and automated assessment process through which RWAs across asset classes, jurisdictions, and blockchain ecosystems can be objectively measured within a single analytical coordinate system. Looking Ahead, We will continue advancing data standardization, model openness, and regulatory coordination. Together with industry partners, we aim to build a global RWA risk infrastructure that is trusted, reviewable, and reusable.

Engineering implementation: An automated, end-to-end, and auditable pipeline from data to risk scores

We have completed a full lifecycle pipeline from raw data ingestion to the delivery of assessment outputs. On-chain observable events, off-chain financial and compliance documentation, and authoritative public disclosures are ingested into a standardized computational workflow. Through a dual-track integration of rule-based computation and intelligent analytical techniques, the system generates multi-layer indicator scores and final composite ratings. An event-driven mechanism enables expedited recalculation and outlook updates in response to material developments.

Usability and Credibility

- Unified definitions: Consistent definitions and indicator frameworks are applied across asset classes, jurisdictions, and public blockchains.
- Verifiability: Only auditable on-chain and off-chain data sources are incorporated. Full data lineage and versioning are retained to ensure reproducibility and reviewability.
- High-frequency and event-driven updates: Scores are updated on a rolling basis under normal conditions, with accelerated recalculation triggered by regulatory notices, operational incidents, or anomalous events.
- Chain-specific delivery: The same asset is assessed and presented on a per-chain basis.

For Issuers

- Pricing and financing efficiency: Composite risk scores and peer benchmark curves are used to determine interest rates, fees, and discount or premium ranges. The marginal pricing impact of specific risk improvements can be quantitatively evaluated.

For Investors

- Risk monitoring and intervention: Threshold-based alerts are established for reserve deviations, price dislocations, permission changes, and de-pegging events. These triggers activate watchlists and outlook adjustments, assisting trading platforms in listing, delisting, and position management decisions.
- Portfolio Construction and Liquidity Management: Asset universes are first screened through a “compliance + blockchain” filter, then ranked using “issuance + market” dimensions. Secondary-market metrics are subsequently employed to define target depth and spread parameters and to monitor deviations in real time.

For Regulators

- Actionable supervisory interfaces: A per-chain reporting mechanism combined with a six-dimensional minimum indicator set enables regulators to directly access core risk signals, supporting high-frequency, low-intrusion monitoring across asset categories.
- Tiered and categorized regulation: By applying risk scores and threshold settings across dimensions, regulators can construct a categorized and tiered supervisory framework that clearly defines market entry standards and ongoing compliance requirements, forming a closed regulatory loop from registration and monitoring to intervention and resolution.

Outlook: A new paradigm for AI-native and Agent-driven RWA's risk assessment based on DaaS foundation

The next stage in the evolution of RWA risk assessment will extend beyond AI-assisted analytics toward a fully AI-native and agent-driven paradigm, underpinned by a robust Data-as-a-Service (DaaS) foundation. In this paradigm, data functions not merely as an input, but as the core infrastructural substrate upon which intelligent agents generate compounding analytical and economic value. At scale, RWA markets cannot mature through fragmented disclosures, static models, or manually curated assessments. Sustainable growth requires a system in which data is continuously structured, verified, and serviced, and in which AI operates as an adaptive layer that transforms this data into decision-grade intelligence for issuers, investors, and regulators alike.

- **AI Agents as Continuous Risk Interpreters:** Rather than treating AI as a discrete modeling tool, future RWA systems will increasingly rely on AI agents that operate persistently across data ingestion, interpretation, and response cycles. These agents will monitor on-chain activity, regulatory updates, operational disclosures, and market signals in real time, translating heterogeneous inputs into structured risk representations. Within this architecture, AI agents do not replace governance or human judgment; instead, they function as continuous risk interpreters, capable of detecting regime shifts, signaling emerging risks, and coordinating recalculation or escalation processes across the system. This agent-based approach enables risk assessment to evolve from periodic evaluation into an always-on, reflexive infrastructure.

- **DaaS as the Foundational Layer:** The effectiveness of AI-driven risk assessment is ultimately bounded by the quality, consistency, and availability of data. As such, DaaS emerges as the foundational layer of the entire system. Through standardized schemas, auditable provenance, and version-controlled data pipelines, DaaS provides clean, interoperable, and reusable data products that can be directly consumed by AI models, agents, and downstream market participants. Importantly, this data layer is asset-agnostic, chain-agnostic, and jurisdiction-aware, enabling cross-market comparability while preserving regulatory specificity. In this structure, AI does not substitute for data; it derives its value from data. The incremental intelligence generated by AI—risk forecasts, scenario analysis, early-warning signals, and pricing implications—constitutes an added-value layer built atop a trusted data substrate.

- **From Data Intelligence to Market Maturity:** As DaaS and AI agents jointly reduce information asymmetry, improve risk transparency, and standardize market expectations, the RWA ecosystem moves toward a higher degree of structural maturity. Pricing becomes more continuous, liquidity more resilient, and capital allocation more discriminating. Over time, this maturation process compounds into a broader wealth effect. Lower uncertainty premiums, more efficient financing structures, and clearer regulatory signaling expand the addressable investor base and deepen secondary-market participation. Risk assessment, once treated as a cost center, becomes a value-generating public good that supports sustainable market expansion.

In the long run, the convergence of DaaS, AI agents, and risk governance will redefine how RWAs are issued, priced, traded, and supervised. Risk assessment will no longer sit at the periphery of market activity; it will function as embedded infrastructure, continuously aligning data integrity, model intelligence, and institutional oversight. We believe this convergence represents a critical step toward a more transparent, resilient, and globally scalable RWA market—one in which data is trusted, intelligence is adaptive, and value creation is both measurable and enduring.

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