

Research Summary on the Real-World Dilemmas Facing Rare Earth Stablecoins

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Abstract:

Against the backdrop of global digitalization, commodity-backed stablecoins, represented by rare earth resources, are seen as an innovative pathway of significant strategic importance. However, in the process of transitioning from theoretical conception to practical implementation, rare earth stablecoins face multiple structural dilemmas, including opaque anchoring mechanisms, regulatory conflicts, insufficient liquidity, and a lack of investor protection. This article systematically reviews the development status and real-world challenges of rare earth stablecoins and attempts to propose systematic development pathways across three dimensions: mechanism design, regulatory coordination, and technological application. The aim is to provide theoretical reference and practical guidance for building a safe, efficient, and trustworthy new monetary system.

Keywords: Rare Earth Resources, Real-world Dilemmas, Commodity-backed Stablecoin, Internationalization of the Renminbi

I. Introduction: The Transition from Theoretical Potential to Real-World Challenges

As global competition in digital currencies intensifies, stablecoins, serving as a crucial bridge between traditional finance and the crypto market, have become a focal point in the strategic rivalry among major powers. Particularly, stablecoins pegged to sovereign currencies or physical assets are not only related to the restructuring of the monetary system but also impact the redistribution of international settlement and resource discourse power. Rare earth resources, due to their scarcity, strategic significance, and China's dominant position in the global supply

chain, are considered a potential value anchor, to assist the internationalization of the Renminbi and reshape the bulk commodity settlement system.

Despite the broad theoretical prospects, rare earth stablecoins face multiple structural dilemmas in practice, urgently requiring systematic review and countermeasure development. These include the inherent contradiction between rare earth price volatility and currency value stability, sovereignty conflicts triggered by resource nationalism and international intervention, systemic vulnerability caused by geopolitical shocks, and market trust issues arising from the lack of sovereign credit endorsement. These challenges involve not only monetary mechanism design but also touch upon the deep structures of international political economy and resource governance.

Therefore, systematically analyzing the practical difficulties faced by rare earth stablecoins and exploring feasible paths and institutional frameworks hold significant theoretical value for the development of digital currencies and provide a critical reference for China to seize the strategic high ground in the new monetary war.

II. Current Development and Classification of Stablecoins

Stablecoins, as crypto-assets designed to maintain value stability by being pegged to specific assets, have the core mission of solving the high volatility problem of traditional cryptocurrencies, thereby providing a reliable unit of account and medium of exchange for the crypto ecosystem. Based on issuance mechanisms and pegging methods, stablecoins can be mainly categorized into: Fiat-collateralized stablecoins, which rely on sufficient fiat currency reserves and maintain price stability through market arbitrage mechanisms, offering high liquidity and compliance but facing custody risks and regulatory dependence; Crypto-collateralized stablecoins, which achieve autonomous operation through over-collateralization with crypto assets and algorithmic adjustments, featuring decentralization but being susceptible to market volatility and oracle attacks; Algorithmic stablecoins, which rely on supply-demand adjustment mechanisms to maintain price stability, lack substantial collateral, and are extremely prone to collapse; Commodity-collateralized stablecoins, such as rare earth stablecoins, which use physical assets as value backing, attempting to introduce resource value into the digital currency system, are the key focus of this research. Additionally, hybrid-model stablecoins attempt to balance efficiency and risk by combining centralized reserves with decentralized governance.

Domestic and international research generally points out that stablecoins face the challenge of an “impossible trinity,” i.e., the difficulty in simultaneously achieving value stability, decentralization, and capital efficiency. Centralized models, while offering high liquidity, entail custody and regulatory risks; decentralized models achieve a degree of autonomy but are vulnerable to market fluctuations and external attacks; algorithmic stablecoins are highly fragile due to the lack of substantial collateral. These design trade-offs reveal that the stability of stablecoins is not an intrinsic attribute but relies on a dynamic balance of market confidence and continuous liquidity. Regarding risk structure, stablecoin risks mainly include market risk, smart contract vulnerabilities, governance attacks, and liquidity risk. Research indicates that code vulnerabilities and market volatility are the primary causes of risk, especially for algorithmic stablecoins and models highly dependent on external DeFi protocols, which are more sus-

ceptible to liquidity crises and cascading liquidations. The dual mission of stablecoins is also becoming increasingly prominent: they must maintain currency value stability while providing competitive returns, which forces many projects to engage in high-risk financial engineering, further exacerbating systemic risks.

Globally, diverse regulatory frameworks for stablecoins are taking shape. The United States, through the GENIUS Act, mandates that stablecoins be pegged to the US dollar or US Treasury bonds, reinforcing the dollar’s hegemony in the digital age. The EU’s MiCA framework adopts a defensive strategy, limiting the transaction scale of non-euro stablecoins to protect monetary sovereignty. The stablecoin regulations introduced by Hong Kong, China, pioneer a multi-currency pegging model, providing institutional space for offshore Renminbi stablecoins, reflecting an exploration of regional financial autonomy. China’s dual-track strategy of “onshore control + offshore experimentation” aims to balance innovation with risk prevention and control. The onshore market strictly adheres to the bottom lines of resource security and financial stability, while the offshore market serves as an institutional testing ground, exploring cross-border settlement and multi-currency pegging models, providing important references for the construction of the digital Renminbi ecosystem.

III. Analysis of Real-World Dilemmas Facing Rare Earth Stablecoins

In their development, rare earth stablecoins face challenges not only at the technical level but also multiple constraints from the real-world attributes of the asset, regulatory environment, and market mechanisms. Regarding the anchoring mechanism, due to the variety of rare earth resources and the lack of a unified valuation system, the authenticity of their value backing is widely questioned. Some projects merely claim pegged value based on vague reserve proofs, or even use forward agreements instead of physical reserves. Consequently, once faced with price fluctuations or agreement defaults, the entire stabilization mechanism risks collapse. More seriously, such projects generally lack third-party auditing and continuous verification mechanisms, leading to a severe lack of transparency, further shaking market confidence. Simultaneously, rare earths, as strategic resources, are subject to strict controls globally. For instance, China implements mining and export quota systems, posing severe sovereign risks for projects attempting to circumvent regulation through offshore structures. Precisely for this reason, the EU has included such non-compliant physically-backed stablecoins on its watchlist, reflecting the intensification of international regulatory conflicts. Rare earth stablecoins also face the dilemma of insufficient liquidity and failed price

transmission. On one hand, rare earths, as industrial raw materials, have long transaction chains, high storage costs, and poor liquidity, making it difficult for project parties to quickly liquidate assets during concentrated market redemptions, sometimes even forcing fire sales of inventory at discounted prices, thereby triggering sharp currency price fluctuations. On the other hand, rare earth prices themselves are susceptible to geopolitical and industrial policy influences. For example, changes in Sino-US trade policies have caused their prices to fluctuate by up to 8% in a single week. Such volatility is directly transmitted to the stablecoin's price, severely undermining its intended function of value stability. The aforementioned issues collectively lead to a serious lack of investor protection mechanisms. As most projects lack risk reserve arrangements, coupled with the high professional threshold of the rare earth industry being beyond the understanding of ordinary investors, there have been multiple cases of investors suffering losses due to believing of "rare earth value preservation + stablecoin low risk." This fully illustrates that current rare earth stablecoins still have systemic institutional gaps in risk mitigation, legal remedies, and investor education.

IV. Systemic Development Pathways for Rare Earth Stablecoins

1. Construct a Tiered Pegging and Over-Collateralization Mechanism:

A tiered pegging and over-collateralization system should be established. Drawing on RWA tokenization and hybrid collateral models, introduce on-chain verifiable proof of reserves and dynamic liquidation mechanisms to enhance the credibility of value stability and risk resilience. Specifically, core categories could implement over-collateralization, e.g., a 1:1.2 reserve ratio, general categories could have dynamic price thresholds, and third-party audits should be introduced to continuously verify reserve authenticity, improving transparency and market trust.

2. Establish a Dual-Cycle Settlement System of "Offshore + Onshore":

Actively explore a two-tier governance model of "onshore control + offshore experimentation." Onshore, state-owned enterprises lead physical custody and quota matching, ensuring resource security and regulatory compliance. Offshore platforms connect with international clearing systems, conducting compliant issuance and cross-border settlement experiments for rare earth stablecoins. This balances regulatory compliance with liquidity enhancement, using the dual-cycle structure to balance innovative exploration with risk prevention and control.

3. Empower Regulation and Investor Protection with Smart Contracts:

Deepen the application of smart contracts in risk prevention and control, information disclosure, and automatic liquidation to enhance system transparency and robustness. Through codified regulatory rules, automatic disclosure mechanisms, run-triggered protection, and investor suitability management, strengthen risk warnings and access thresholds, building a foundation of trust from the technical and effectively protecting investor rights.

V. Conclusion and Outlook

Rare earth stablecoins, as a new type of digital currency backed by strategic resources, possess theoretical potential in promoting the internationalization of the Renminbi and restructuring the bulk commodity settlement system. However, their practical path still faces multiple real-world dilemmas, including opaque anchoring mechanisms, regulatory compliance conflicts, insufficient liquidity, and weak investor protection. These challenges stem not only from the physical and market characteristics of rare earth resources themselves but are also closely related to the complexity of the current international political and economic structure and regulatory system.

Looking ahead, the development of rare earth stablecoins requires systematic breakthroughs in three aspects: mechanism design, regulatory coordination, and technological application. On this basis, if China's dominant advantage in the rare earth industry chain can be effectively integrated with the institutional innovation capacity of digital finance, rare earth stablecoins are expected to become an important carrier for the internationalization of the Renminbi in the digital age and occupy a place in the global process of resource financialization. Future research can further focus on key issues such as the legal framework for rare earth asset tokenization, the construction of cross-chain settlement systems, the linkage mechanism between international rare earth pricing power and stablecoin value, providing continuous support for building a safe, efficient, and trustworthy new monetary system.

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