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Currency-Risk Management of Multinational Enterprises in Hyperinflationary Economies and the Institutional-Substitute Potential of Device-Bound Tokens: A Conceptual Framework and Mechanism Analysis

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Abstract. Against the backdrop of intensifying global macroeconomic volatility, multinational enterprises (MNEs) operating in hyperinflationary economies face extreme currency risks including disordered exchange rates, capital controls, and the effective breakdown of forward markets. Conventional hedging instruments have become ineffective due to illiquidity and institutional constraints, compelling firms to seek structural alternatives. Integrating insights from monetary economics, cross-border operations management, and the institutional design of digital currencies, the paper employs systematic literature review and qualitative theoretical deduction to explore the stability sources and application pathways of "device-bound tokens" (DBTs) under extreme conditions. Hardwired to physical hardware, DBTs derive their value from non-transferability, a transparent value-anchoring mechanism, and a high degree of administrative controllability, positioning them as potential privately-issued stable-value carriers. Instead of pegging to sovereign fiat currency credibility, the purchasing power of DBTs is collateralized by the MNE's global service cash flows, enabling them to fulfill settlement and value-storage functions amid the collapse of the domestic monetary system. The analysis demonstrates that adopting DBTs not only helps firms hedge against the tail risk of local currency collapse but also facilitates the establishment of semi-autonomous value systems and reshapes global value flows. Despite lingering challenges in regulation, technology, and institutions, as a component of international business strategy, DBTs exhibit substantial institutional potential worthy of further scholarly and policy exploration.

Keywords: Multinational enterprises, Hyperinflation, Currency risk management, Digital currencies, device-bound tokens

1. Introduction

A core challenge for multinational enterprises (MNEs) in globalized operations lies in macro-financial risk management. In monetarily stable countries, this challenge can be effectively addressed through conventional financial instruments. However, in hyperinflationary economies

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such as Argentina and Turkey, these tools fail to address extreme currency depreciation and price volatility. It leads to increased uncertainty in revenue conversion and cost control, erodes profits, and disrupts strategic decision-making. Traditional strategies are also constrained by liquidity shortages and regulatory barriers, making it difficult to mitigate revenue volatility. How to ensure revenue stability in environments with underdeveloped institutions and financial markets has become an urgent research and managerial issue. Digital currency and blockchain technology offer a new pathway. Device-bound tokens (DBTs), anchored to the firm's own services or hardware, do not rely on external assets or markets. They can reduce dependence on local currencies, mitigate revenue risks, and serve as an alternative to traditional tools for supporting MNE operations in hyperinflationary economies.

Existing literature, however, focuses on isolated dimensions and lacks systematic analysis integrating currency risk management and token-based value systems, resulting in a theoretical gap for ultra-high inflation scenarios. Through literature review and conceptual research, this paper establishes three core objectives: (1) to construct a conceptual framework for the revenue stabilization mechanism of DBTs and explore its key components; (2) to systematically identify the currency risks faced by MNEs and the limitations of traditional risk management strategies; (3) to assess the institutional feasibility, expected impacts, and constraints of the DBT mechanism, thereby laying the foundation for future research extensions and practical applications.

2. Theoretical feasibility and core design primitives of the device-bound token mechanism

A device-bound token (DBT) is a technology-driven revenue stabilization mechanism that achieves non-transferability by being cryptographically bound to specific hardware. Anchored to the MNE's global service value, it reduces the firm's exposure to the local currency of hyperinflationary economies. To maximize its effectiveness, firms must integrate DBTs with traditional financial instruments to build a multi-layered risk hedging system, aligned with their strategic objectives, user characteristics, and institutional constraints [1]. The perceived value of DBTs relies on users' trust in the firm's service delivery capacity. In hyperinflationary environments, residents' awareness of currency depreciation intensifies, and cash or local currency reserves often lose real purchasing power, leading to stronger demand for mechanisms that offer relatively stable value. Against this backdrop, DBTs' stable value attribute enhances user acceptance, strengthens long-term customer loyalty and ecosystem engagement. Critically, firms must ensure that DBTs circulate exclusively within their internal ecosystem to avoid regulatory and compliance risks associated with being classified as currency or financial assets [2]. The DBT mechanism is most effective in high-frequency, long-term contractual businesses such as subscription services and digital content, but offers limited marginal value in one-time or low-loyalty consumer goods transactions. Therefore, precise alignment with business characteristics and user behavior is essential. By securing revenue value and optimizing operational structures, DBTs overcome the limitations of traditional risk management in hyperinflationary environments and enable firms to maintain strategic flexibility and long-term competitiveness through the dual binding of revenue and customer loyalty [3].

From a consumer behavior perspective, the perceived value of DBTs hinges on trust in the firm's ability to deliver promised services. In hyperinflationary contexts, households' subjective expectation of currency depreciation intensifies, undermining the value-storage function of local currency holdings and increasing the willingness to shift payments toward instruments that guarantee future service fulfillment. Consequently, consumers are more willing to shift their payment behavior to instruments that ensure future service fulfillment and DBTs precisely meet this demand. Their unique non-transferability and service-value anchoring align consumers'

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psychological expectations with the stable value provided by the firm—a congruence critical to the formation of an effective value-storage function. Additionally, since DBT value is directly tied to the MNE's global service delivery rather than a single national currency, this mechanism inherently resists volatility during periods of severe local inflation. Theoretically, it provides MNEs with a more predictable revenue stream compared to traditional fiat currencies [4].

From an institutional environment perspective, the legality and feasibility of DBTs require full consideration of local regulatory frameworks. While the non-transferability of DBTs mitigates their impact on capital controls and foreign exchange policies, regulators may still impose requirements related to cross-border value transfers, consumer protection, and financial stability. Therefore, when designing and implementing DBT mechanisms, firms must ensure closed-ecosystem circulation and clearly define their legal status as payment instruments rather than investment vehicles. Several countries have permitted pilot projects for similar innovative instruments through regulatory sandboxes. However, in most hyperinflationary economies, policy uncertainty remains a key factor for firms to incorporate into strategic planning [5]. Consequently, firms need not only technically feasible solutions but also proactive communication with policymakers and the design of compliant operational processes to ensure the safe operation of DBT mechanisms within existing legal frameworks. The interaction between corporate strategy, consumer behavior, and institutional environments defines the practical application boundaries of DBTs. Theoretical deductions indicate that if firms can maintain long-term stable service provision, ensure tight alignment between DBT value and their global pricing system, and comply with regulatory requirements, then DBTs can serve as effective revenue stabilization tools [6]. To achieve this, firms may need to adjust their internal financial and operational structures, including establishing dedicated DBT management departments, developing service value tracking mechanisms, designing user incentive programs, and building technical infrastructure to support DBT issuance and usage. These adjustments aim to anchor revenue value through DBTs in hyperinflationary environments while enhancing user loyalty and engagement within the firm's ecosystem [7].

Table 1. Comparison of traditional currency risk management tools and Device-Bound Tokens (DBTs) in hyperinflationary economies

Risk Type	Typical Manifestation	Traditional Tool	Effectiveness of Traditional Tools	DBT Suitability	Main Stabilization Logic	Suitable Business Types
Exchange rate collapse	Rapid local currency depreciation	FX forwards	Low	High	Revenue denominated in global service value	Subscription services
High inflation	Purchasing power erosion	Indexed pricing	Medium	High	Pre-locked service purchasing power	SaaS, digital content
Capital controls	Restricted profit repatriation	Offshore financing	Low	High	Closed-loop internal settlement	Platform-based firms
Distorted FX markets	Multiple exchange rates	Hedging contracts	Low	High	Avoids fiat currency conversion	Cross-border digital services
Currency credibility loss	Local currency loses store-of-value function	USD cash settlement	Medium	High	Firm-backed value anchor	Brand-driven businesses

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Table 1. (continued)

Revenue volatility	Unstable cash flow	Local currency reserves	Low	High	Advance revenue locking	Long-term contracts
Customer churn	Frequent price changes	Discounts	Medium	High	Loyalty and switching-cost effect	Ecosystem platforms
Regulatory risk	Potential classification as currency	N/A	N/A	Medium	Non-transferable service voucher design	Closed ecosystems

Theoretical analysis has constructed an adaptive, integrated risk management framework for MNEs operating in hyperinflationary countries. This framework combines the advantages of traditional financial instruments and DBT mechanisms: retaining conventional tools such as local currency financing and price indexation for cash flow and short-term transactions, while embedding DBTs into selected revenue streams and critical service scenarios to hedge inflation risks. This forms a multi-layered risk diversification system [8]. Beyond locking in user value and stabilizing revenue streams, DBTs strengthen strategic commitment to local markets and demonstrate strong applicability in long-term contractual businesses such as subscription services and digital content service. They can promote a moderate decoupling of corporate revenue from local currencies. This enables firm to build strategic competitive advantages in hyperinflationary environments [9].

3. Multinational strategy and deployment logic

The currency risks faced by MNEs in hyperinflationary economies such as Argentina, Turkey, Egypt, and Nigeria exhibit significant cross-country heterogeneity. Argentina grapples with triple-digit inflation coupled with ad hoc capital controls, trapping corporate cash flows and disrupting revenue repatriation and conversion. Turkey faces accelerating lira depreciation but retains relative flexibility in its foreign exchange market. Egypt's combination of exchange rate reforms and capital controls demands greater flexibility in MNE foreign exchange risk management. Nigeria's dual exchange rate system and structural inflation force firms to seek a dynamic balance between revenue settlement and supply chain costs [10]. Despite these idiosyncrasies, all these economies share common macro-financial characteristics: extreme local currency volatility, underdeveloped derivative markets, and high policy implementation uncertainty. These common factors further amplify corporate currency risks, driving MNEs to explore innovative internal value stabilization mechanisms. In this context, the DBT mechanism can decouple a portion of revenue and core service value from direct exposure to local currencies by linking them to the MNE's global service pricing system. This effectively reduces dependence on local financial systems, enhances revenue predictability, and strengthens customer loyalty and ecosystem engagement. The effective application of DBTs requires a systematic strategy encompassing service fulfillment guarantees, incentive design, technical support, and compliance management, tailored to the firm's business model, user behavior characteristics, and institutional environment. Notably, the utility of DBTs varies across business scenarios: they significantly reduce operational risks in high-frequency, high-loyalty businesses such as long-term subscription services, digital content, software, and cloud services. Their marginal utility is limited in low-loyalty or one-time transactions. Furthermore, the theoretical framework of DBTs interacts with corporate internal strategy, consumer behavior, and the institutional and policy risks of cross-border operations [9]. Successful implementation depends on

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multiple pillars, including service stability, technical reliability, and regulatory compliance [1]. It must be integrated with traditional financial tools and operational adjustments to form a multi-dimensional risk management system. Ultimately, this integrated approach enables firms to mitigate exchange rate and inflation shocks, enhancing strategic flexibility and core competitiveness in highly volatile markets.

When designing a DBT program, firms must comprehensively consider strategic objectives, user behavior characteristics, and institutional constraints. At the strategic level, firms must clarify the proportion of DBTs in their revenue structure and their combination with traditional financial instruments to build a multi-layered risk hedging system [3]. At the user level, a transparent value-anchoring mechanism must be established to maintain user trust through consistent service fulfillment. At the institutional level, DBTs must be contractually positioned as service vouchers to avoid policy risks arising from being deemed a form of currency. Case analysis shows that DBTs are highly compatible with high-frequency, long-term businesses such as subscription models and digital content, where they can strengthen revenue stability and customer loyalty. In one-time transactions or low-loyalty businesses, however, their marginal utility is limited. They are primarily used for marketing rather than core risk control. Thus, precise matching between business models and user behavior is imperative.

4. Expected impact and limitations

Theoretical deductions suggest that the DBT mechanism can exert profound impacts on firms' strategic decision-making and market competition dynamics. In hyperinflationary scenarios, traditional competitive and risk control levers, such as price adjustments and financial hedging, are increasingly constrained by capital controls, illiquid forward markets, and regulatory uncertainty. The DBT mechanism offers a new pathway to revenue stabilization through technological empowerment and service-value anchoring. Beyond effectively mitigating exchange rate and inflation shocks, this pathway can help firms lock in core customer groups, boost user activity within the ecosystem, and smooth revenue streams within a certain range. This allows firms to maintain core competitiveness in highly volatile market environments. For MNEs, DBTs are not merely tactical risk management tools but also long-term strategic assets that enable the construction of a relatively controllable operational foundation amid uncertainty [6].

Nevertheless, the practical implementation of DBTs entails considerable risks and limitations. Firstly, the stability of DBT value is entirely dependent on the firm's continuous ability to fulfill its service obligations. Any service disruption or failure to fulfill value redemption commitments could lead to a rapid collapse in DBT value, undermining user trust and damaging the firm's reputation. Secondly, the effective operation of DBTs relies on robust technical infrastructure, including account management, transaction traceability, security protection, and system stability guarantees. Potential technical vulnerabilities pose non-negligible risks. Thirdly, regulatory and compliance risks are particularly critical. Firms must explicitly define DBTs as service vouchers to avoid their classification as currency substitutes or financial instruments, which could trigger capital control restrictions and compliance penalties [2]. To address these challenges, firms implementing DBTs must establish transparent operational processes and regular risk monitoring systems to manage the dual uncertainties of technology and institutional environments.

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5. Conclusion

In summary, the currency risks faced by MNEs in hyperinflationary economies are structural and institutional. Conventional financial instruments have significant limitations in extreme environments. This finding is consistent with existing research on the market characteristics and traditional strategic bottlenecks of hyperinflationary economies. The DBT mechanism provides a theoretically viable revenue stabilization tool. By linking a portion of revenue to the firm's global service value system, it internally mitigates local currency depreciation and inflation risks. Its technical logic and value-anchoring principles align with the core theories of blockchain economics. Beyond enhancing revenue predictability, DBTs also deepen customer loyalty and ecosystem engagement, endowing firms with strategic flexibility and long-term competitive advantages. This outcome aligns with emerging research on the strategic implications of cryptocurrency applications for MNEs [4].

By integrating research on MNE currency risk management, digital service economics, and technology-based token mechanisms, this study offers a new theoretical perspective. It addresses the existing research gap in analyzing the integration of digital currencies with MNE risk control systems and responds to the practical demand for innovative corporate strategies in hyperinflationary environments.

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