Exploring the Path to Resolving the Real Estate Industry' s Predicament: Token Market Design and Regulation

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Abstract

A substantial number of real estate enterprises are currently encountering difficulties due to insufficient capital liquidity, thereby impacting the stable development of the broader socio-economy. This paper proposes utilizing blockchain-based tokens to establish novel markets for the real estate industry, thereby facilitating capital circulation. It further analyzes the feasibility and design considerations of such token markets from the perspective of diverse stakeholder demands within the real estate sector. Finally, the paper evaluates potential risks that may arise in token markets and proposes corresponding regulatory and control measures.

Full Text

Exploration of Solutions for the Real Estate Industry' s Predicament: Token Market Design and Regulation

Abstract

A large number of real estate enterprises in China currently face severe difficulties due to insufficient liquidity, which in turn threatens the stable development of the broader socio-economy. This paper proposes leveraging blockchain-based tokens to create new markets for the real estate sector that would facilitate capital circulation. It analyzes the feasibility and design considerations of such token markets from the perspective of stakeholder demands within the real estate ecosystem. Finally, the paper assesses potential risks associated with token markets and proposes corresponding regulatory and control measures.

Keywords: Token economy, Asset-backed physical tokens, Partial decoupling of housing' s residential and financial attributes, Classification: F49

1. Introduction

In June 2021, Evergrande, China' s leading real estate developer, was exposed for defaulting on its commercial bills. By July, Guangfa Bank had requested the freezing of 132 million yuan of Evergrande' s assets, and in September, Evergrande announced the suspension of all wealth management product redemptions. Following Evergrande' s debt crisis, numerous employees who had invested their life savings in Evergrande' s wealth management products, along with individual investors who trusted the Evergrande brand, suffered devastating losses. In response to Evergrande' s debt default, the central government intensified oversight of real estate enterprises'debt levels and froze bank accounts of developers with excessive risk exposure, rapidly deteriorating the operating conditions of many property firms. A cascade of negative news followed from companies like Kaisa, Fantasia, Yango, Tahoe, and Zhenro. This widespread distress has cast a shadow over the entire real estate market. According to the China Index Academy, the transaction area of commercial housing in 50 major cities reached only 24.26 million square meters in January, a year-on-year decrease of 34.1%, with multiple institutions forecasting a 10% decline in new residential sales for 2022. Since 2009, the real estate sector has consistently accounted for over 5% of China' s GDP, and its total impact—including related industries—makes it a cornerstone of the national economy. Given this significance, neither overheating nor excessive contraction in the sector aligns with China' s long-term macroeconomic goals of steady, stable development.

On February 24, 2022, at the press conference on "Promoting High-Quality Development of Housing and Urban-Rural Construction," the Ministry of Housing and Urban-Rural Development reaffirmed its commitment to the principle that "housing is for living, not speculation," explicitly stating that real estate would not be used as a short-term stimulus tool. Simultaneously, regarding the risk of delayed deliveries triggered by debt defaults, the Ministry emphasized the "Three Guarantees" policy: guaranteeing project completion, protecting people' s livelihoods, and ensuring social stability. Evidently, a stable real estate market remains a government priority. However, the problems arising from developers' debt defaults inevitably threaten market and economic stability. Successful implementation of the "Three Guarantees" requires addressing the challenges faced by defaulting developers, creditors, employees, and construction workers. The key to resolving these issues lies in tackling their shared root cause: insufficient liquidity among real estate enterprises.

China' s prolonged real estate boom led many developers to aggressively borrow for land acquisition and development, amassing vast land reserves alongside enormous debts. When enterprises with substantial land and pre-sold property assets face crisis or bankruptcy due to debt maturities, the consequences are detrimental to all stakeholders and the national economy. Historical policy responses to sluggish real estate markets have primarily involved credit easing to encourage home purchases through increased borrowing. Multiple cities have already reduced down payment requirements to 20% of property value, with

Zhengzhou notably abolishing its "recognize both property and loan" policy for first-home purchases in March 2022, reclassifying second-home purchases as first-home purchases if buyers meet purchase restrictions and have no outstanding mortgages. These measures demonstrate local governments' determination to revitalize their property markets. However, China' s household debt ratio reached 62.2% in 2021, and coupled with pandemic impacts, credit loosening may not successfully reactivate the market. Beyond credit easing, what other mechanisms could stimulate real estate transactions? In today' s increasingly digital economy, new technologies can create novel markets for real estate transactions to energize the entire property sector.

2. Tokenization as a Solution

2.1 Stakeholder Demands

Before exploring new market creation, it is essential to understand stakeholder demands and balance them with regulatory requirements. The specific demands are outlined below:

Real Estate Developers' Demands: Developers seek to accelerate product turnover and quickly monetize both completed properties and land under development. Debt-defaulting enterprises urgently need to convert assets into cash to settle obligations.

Homebuyers' Demands: Purchasers hope to acquire suitable properties at appropriate prices while minimizing loan amounts.

Regulatory Requirements: Regulators must uphold the "housing is for living, not speculation" principle, preventing real estate from becoming purely a financial instrument. They must maintain price stability to avoid shocking domestic and international investor confidence through sharp asset declines, while ensuring individual buyers can take possession of purchased properties.

Creditors' Demands: Given the massive scale of developer debt defaults and the numerous affected creditors—many facing financial ruin—creditor demands must also be considered. For creditors unable to recover cash, a credible alternative solution with strong guarantees is essential.

Balancing these demands through traditional transaction models and policy measures is extremely difficult, requiring simultaneous resolution of four key issues: (1) stimulating individual purchase enthusiasm while maintaining stable prices and unchanged credit policies; (2) enabling developers to obtain new cash flow legally and compliantly without borrowing, despite pre-sale funds being under regulatory escrow, thereby alleviating debt pressure and completing construction; (3) ensuring fair compensation for individual creditors regardless of claim amount; and (4) allowing regulators to monitor transactions and levy taxes in real time without increasing administrative costs. Under current circumstances—with strict regulation and weak market confidence—simultaneously

satisfying these four conditions is exceptionally challenging. Creating an alternative path through real estate tokenization could potentially inject new vitality into the sector.

2.2 Tokenization Solution

(1) What is Token Economy?

The term "token economy" emerged in 2018 as a transliteration of the English "Token Economy," originally referring to a psychological therapy method that uses reward systems to reinforce positive patient behaviors through immediate incentives [2]. In this context, tokens serve as symbolic rewards like point cards or chips. The core principle—timely incentive mechanisms—also contributed to the rapid popularity of blockchain-based currencies. After China imposed comprehensive restrictions on blockchain currencies, they became tokens unable to function as general equivalents. However, Chinese blockchain experts quickly identified the true value of tokens: they can represent any rights and interests. Generally, tokens have three essential elements: digital proof of rights, encryption, and circulation [5, 6].

These attributes enable tokens to digitally represent real-world assets and circulate online under secure conditions. This digital connectivity can significantly enhance asset liquidity and invigorate the overall real estate market. Moreover, blockchain' s timestamped distributed ledger ensures every token is traceable, with each transaction faithfully recorded in the chain. Even if malicious actors compromise a single token account, their alterations cannot pass verification. Blockchain-based asset tokens thus guarantee digital security for holders while facilitating comprehensive regulatory oversight. Furthermore, digital token assets can be deeply integrated with China' s digital yuan, and digital transactions can incorporate smart contracts to effectively reduce management and time costs, achieving the goal of further activating the property market.

(2) Feasibility of Token Economy as a Solution

While tokenizing real estate assets could theoretically improve the sluggish market, its practical viability depends on whether it satisfies the stakeholder demands outlined above. The analysis below examines feasibility from four perspectives.

For Real Estate Developers: Tokenizing physical assets after notarized valuation and issuing equivalent tokens can significantly alleviate cash flow pressure. Real estate development relies heavily on rapid capital turnover. After central authorities tightened fund supervision, pre-existing high debts severely impacted developers. Although struggling enterprises actively sought solutions, insufficient liquidity and slow conversion of large assets hampered debt resolution, affecting normal operations and causing widespread unemployment that pressured socio-economic stability. Accessing new funding markets without bank loans is crucial for recovery. Tokenization offers such a market: devel-

opers can tokenize properties under construction and land holdings, using asset tokens to settle debts while selling remaining tokens for cash to ensure continued construction, thereby fulfilling the "guaranteed completion" mandate. Additionally, already-launched properties can enter the token market through the same mechanism, effectively improving turnover when trading rules are properly designed.

For Homebuyers: Buyers can be categorized as investment-driven or residential. For investors, housing attributes matter less than expected returns. Developer debt disputes have dampened market expectations and drastically reduced property resale velocity, increasing holding costs. Asset tokens' divisibility allows investors to purchase or sell portions, significantly improving turnover rates while controlling holding costs.

For residential buyers, financial attributes are secondary to acquiring affordable, suitable housing. The primary obstacle is high prices requiring substantial down payments and decades of mortgage payments, which severely limits purchase enthusiasm. Asset tokens enable buyers to purchase corresponding property shares within their financial capacity, unlocking purchasing power among 刚需 (first-time) buyers. Since residential rights are typically indivisible, mechanisms must ensure partial token holders can ultimately occupy the property. This requires further token design, discussed in subsequent sections.

For Regulators: While real estate' s rapid growth has driven economic development, excessive growth has created imbalances. Rising asset prices have pressured all sectors, necessitating government intervention. However, real estate prosperity also reflects domestic and foreign investor confidence in national development—economically stable countries attract real estate investment. Allowing developers to raise cash through token issuance under strict market control offers an excellent solution. Token issuance transforms properties and undeveloped land into digital certificates for market trading, activating market liquidity. Moreover, token markets can be intelligently managed electronically, enabling convenient risk prediction and illegal account management, allowing regulators to achieve precise control for balanced, stable economic growth.

For Creditors: A major cause of the debt crisis was creditors demanding early repayment due to lost confidence in developers' ability to perform, creating a vicious cycle. Breaking this cycle requires both creditor patience and credible corporate commitments. Current debt settlement schemes using physical assets, debt-to-equity swaps, or debt-to-trust conversions suffer from defects like arbitrary asset valuation, poor liquidity, and lack of exit mechanisms, making them unacceptable to creditors. From creditors' perspective, if cash and fairly valued physical assets are unavailable, tokens—backed by strong credit and offering high liquidity—provide a more attractive alternative. Tokens held by creditors themselves are market-tradable with far greater liquidity than physical assets. Additionally, tokens can fractionalize physical assets into any denomination, solving mismatches between claim amounts and asset values that previously required additional cash or left residual claims.

This analysis demonstrates that tokenizing real estate assets can effectively align stakeholder demands with regulatory requirements. However, for token markets to function effectively, further design of token attributes and trading mechanisms is necessary.

3. Asset Token Design

The real estate industry' s predicament stems partly from the abuse of its financial attributes. The sector' s rapid expansion relied heavily on financial leverage, with developers universally adopting large-scale borrowing strategies. However, amplifying financial attributes severely impacted housing's fundamental residential function, leaving many citizens unable to afford basic housing needs despite asset appreciation benefits. The "housing is for living, not speculation" principle emphasizes restoring residential attributes, yet financial attributes are an inevitable market derivative that cannot and need not be forcibly stripped away. To design an effective tokenization scheme addressing the sector' s urgent needs, we establish the following design objectives: low entry barriers, broad market coverage, rapid transactions, convenient regulation, and partial decoupling of housing' s financial and residential attributes.

3.1 Token Form Design

Before designing the token market, we must clarify the relationship between circulating tokens and physical assets. Tokens are digital proofs of assets, and due to their digital ledger characteristics, they need not maintain one-to-one correspondence with physical properties like property deeds. We discuss two token types with different correspondences: equity tokens and asset-backed physical tokens.

(1) Equity Tokens

Equity tokens are unrelated to physical assets and correspond to real estate enterprises' operational capacity and credit. Developers issue tokens similar to stock offerings, with face values and issuance quantities determined by third-party regulators according to national regulations and corporate qualifications. Token prices are market-determined, and holders possess residual claim and control rights, tradable in the market. While this model draws on mature securities issuance experience and offers a viable financing channel, its securities-like nature makes it ineffective for attracting capital and activating markets when confidence in real estate is universally low.

(2) Asset-Backed Physical Tokens

Form of Asset-Backed Physical Tokens: These tokens bind specific properties to tokens. Each completed property unit is filed with relevant authorities. From the filing moment, blockchain technology timestamps the property and generates the chain' s genesis node—the "Complete Token"—which records filing information. All subsequent transactions record corresponding information on

derived chains. For incomplete properties, corresponding Complete Tokens can be issued after regulatory filing through pre-sale registration or construction plans. Complete Tokens can be divided according to buyer needs: for instance, a buyer unable to pay the full price can purchase a portion initially and complete the remainder later. Tokens split from Complete Tokens are called Fractional Tokens, representing a percentage of the filed property and capable of further division or merging with other Fractional Tokens of the same property. Complete and Fractional Tokens share identical technical implementations and trading attributes but differ in rights: Complete Token holders can exchange tokens for property deeds, while Fractional Token holders must collect all other Fractional Tokens to convert into a Complete Token.

Advantages of Asset-Backed Physical Tokens:
1) **Divisibility:** Investors or buyers can purchase tokens matching their financial capacity without excessive pressure. Developers can pre-sell fractionalized high-value properties to raise funds.
2) **Speculation Prevention:** Physical tokens uniquely correspond to specific properties and are dispersed among multiple holders, making large-scale price manipulation difficult. Compared to equity tokens, asset-backed physical tokens offer tangible asset backing and small, fast, flexible characteristics that can effectively boost real estate transaction activity.

3.2 Asset-Backed Physical Token Trading Design

(1) Trading Process

Developers apply to regulators for token issuance approval. Upon approval, tokens enter the market—some for debt settlement, others for public sale. The trading process for publicly listed tokens is as follows:

[Figure 1: see original paper]

Complete Token holders have three market options besides direct property deed exchange: (1) selling the token whole without division, (2) holding for future opportunities, or (3) splitting into Fractional Tokens for sale. Fractional Token holders have these same three options plus the ability to continuously collect other Fractional Tokens of the same property to achieve Complete Token conversion. Notably, exchanging Complete Tokens for property deeds is one-way: once converted, the deed cannot re-enter the token market.

(2) Trading Standards

Digital Yuan Integration: Both tokens and "cryptocurrencies" are blockchain-based, but tokens are inherently rights certificates that don' t require proof-of-work or other mechanisms to incentivize block-packaging nodes. Therefore, token trading must integrate with sovereign currency to enable cash flow transfers. Binding token transactions with China' s digital yuan enhances security, accelerates transaction speed, and supports digital

yuan adoption. After identifying desired property tokens, buyers must convert cash to digital currency for purchase.

Smart Contract Integration: Smart contracts are computer protocols that digitally disseminate, verify, or execute agreements, enabling trusted transactions without third parties and accelerating transaction speed. Asset-backed physical token trading with attached smart contracts can rapidly evaluate transaction conditions and automatically transfer rights certificates and funds. When homebuyers need to acquire tokens for residential rights, smart contract rules can protect their interests.

3.3 Token Holder Rights Design

As designed, Fractional Tokens function primarily as tradable financial assets. To enable homebuyers who cannot afford full payment to achieve homeownership, Fractional Token holders must be granted specific rights.

(1) Priority Lease and Rental Rights

Token design aims to help buyers achieve homeownership despite insufficient funds. Residential buyers can purchase Fractional Tokens and initiate smart lease contracts with other holders to obtain tenancy rights, with priority when multiple parties are interested. Lessees must pay rent to other holders per the smart contract and may receive rent reductions for fulfilling maintenance obligations. To enable this, token holders must possess rental rights. Both Complete and Fractional Token holders can lease properties through smart contracts, receiving rent while assuming obligations like tax payments and tenant management. To prevent disputes among multiple Fractional Token holders over rent distribution and obligations, holders can pre-agree on revenue sharing and responsibilities via smart contract. Since token holders may be geographically distant from properties, token information can be integrated with property management systems for cloud-based management.

(2) Preemptive Purchase Rights

Fractional Token holders should also have preemptive purchase rights for corresponding properties. While partial token design lowers purchase thresholds, it increases transaction costs (potentially requiring negotiation with multiple holders). To reduce negotiation and management costs, holders can pre-establish smart contract agreements specifying minimum transfer percentages and prices. When a buyer' s offer meets these terms, the smart contract automatically transfers all holders' tokens proportionally and processes digital yuan payment. To prevent speculators from maliciously inflating token prices, genuine homebuyers must be granted preemptive rights. Buyers with preemptive rights can freeze all property tokens in the market upon making an offer above the smart contract price; holders cannot sell during the freeze. To prevent abuse, buyers must register purchase intentions with housing authorities and deposit a security bond. Preemptive buyers must secure full funds within a specified period, or risk bond

forfeiture for delays or defaults.

Asset-backed physical token forms enable more flexible, rapid transactions, lowering market entry barriers and attracting numerous buyers and investors. Blockchain and smart contracts help regulators better supervise markets while reducing costs. Granting token holders rental and preemptive rights essentially achieves the goal of protecting homebuyers' residential needs. The design prohibiting converted property deeds from re-entering token markets anchors new token prices to secondary market prices, partially decoupling housing' s financial and residential attributes. In summary, asset-backed physical token design and trading standards largely achieve the established market objectives.

4. Risks and Regulation of Asset-Backed Physical Token Markets

Due to their digital nature, token markets far exceed traditional real estate markets in transaction speed and volume, but larger markets entail greater risks. It is necessary to investigate potential risks and design corresponding control measures.

4.1 Potential Risks

(1) Unreasonable Smart Contract Design: While some risk isolation measures have been incorporated, such as preemptive rights and one-way exchange, smart contracts are designed to reduce negotiation and management costs by enabling conditional automatic execution. However, because smart contracts operate solely on preset rules, they may be exploited for price speculation. For example, if a contract sets transaction prices at the average token price of the property' s neighborhood, manipulators could rapidly inflate prices through repeated wash trading, creating obstacles for genuine buyers.

(2) Hacking Attacks: Tokens face hacking vulnerabilities. Although blockchain employs timestamps, asymmetric encryption, and distributed ledgers to secure transactions, internet-based technologies remain attackable. Smart contracts, as blockchain derivatives, are particularly vulnerable. Statistics show over 60 DeFi attacks in 2020 causing approximately $250 million in losses. On August 10, 2021, hackers stole approximately $610 million in tokens by attacking Poly Network' s Ethereum cross-chain contract within 34 minutes. These cases demonstrate that tokens and smart contracts are susceptible to attacks causing massive losses and potentially triggering offline property price volatility.

(3) Token Credit Risk: The design permits developers to issue tokens backed by properties not yet built or delivered, potentially undermining market confidence and liquidity. We term these "pre-sale physical tokens," whose market performance depends heavily on the issuing developer' s scale and reputation. Smaller or less reputable developers' tokens would face liquidity issues as buyers

and investors hesitate over credit concerns. Additionally, the overall health of the real estate sector significantly impacts token markets, which would suffer during national economic crises or widespread pessimism about property.

4.2 Regulatory Measures for Asset-Backed Physical Token Markets

(1) Simple, Unified Smart Contracts: Smart contracts aim to reduce management costs and accelerate transactions. Simple rules enhance judgment speed and reduce vulnerabilities. To prevent developers from inserting self-serving rules, regulators should establish unified trading standards. We recommend regulators attach standardized smart contracts when approving token issuance, specifying a transaction price above which offers are automatically executed. This price can be set by developers or based on city average property prices, anchoring token markets to physical property prices and preventing malicious manipulation. Prices can be adjusted during trading based on market conditions through holder-initiated regulatory filings. Rental and preemptive rights can be handled through additional smart contracts when needed, reducing vulnerability entry points. Under simple rules, tax authorities can embed tax collection mechanisms into smart contracts for automatic deduction, lowering administrative costs.

(2) Transaction Alerts, Early Warnings, and Anomaly Handling: Blockchain' s inherent characteristics make direct token hacking unlikely. However, since smart contracts execute automatically, hackers can attack the contracts themselves. To prevent rule tampering or abuse, a three-step approach is recommended: (1) Enable real-time SMS notifications for all token sellers, transmitting transaction details immediately upon execution; (2) Define anomalous behaviors like frequent trading or ultra-low-price transactions, issuing alerts when detected; (3) Handle anomalies by freezing corresponding digital yuan accounts and notifying token holders to suspend listings.

Since only Complete Tokens can be exchanged for property deeds that cannot re-enter the market, property issuance departments serve as a final safeguard against smart contract attacks. In extreme cases where hacking causes massive losses, regulators can technically enforce transaction chain rollbacks.

(3) Regulatory Security Deposits: Token market credit is supported as long as Complete Tokens are guaranteed exchangeable for property deeds. Therefore, "guaranteed project completion" is the most powerful credit support tool. For pre-sale or undelivered property tokens, regulators can deduct a portion of token sales as security deposits. These deposits serve two purposes: (1) They can be returned to developers in phases based on construction progress, ensuring continuous funding for project development; (2) If developers cannot continue construction, deposits can maintain project progress and help successor developers resume work quickly. For debt-offsetting tokens, since funds are already used or escrowed, regulators can increase security deposit ratios for normal token sales to safeguard construction funding.

5. Conclusion

In fact, local governments have already implemented various stimulus policies, including mortgage rate reductions and lifting purchase restrictions, with Xinyang City pioneering "housing vouchers" for demolition compensation. Asset-backed physical tokens share some similarities with securities but extend beyond equity proof, as holders can obtain actual rights. The token design presented above simultaneously satisfies multiple stakeholder demands, offering a powerful solution to the current real estate crisis beyond conventional stimulus measures. However, any emerging market harbors significant risks. Although this paper has analyzed risks and proposed control measures, limitations in perspective and expertise may have led to insufficient risk assessment. Moreover, beyond asset proof, tokens can be applied to many scenarios requiring circulation and credit guarantees, potentially becoming mainstream in the Web 3.0 era.

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Note: Figure translations are in progress. See original paper for figures.