

The Impact of Cross-Border Payment Practices on Supply Chain Operational Efficiency-A Study on the Collaborative Mechanism of Stablecoins, Digital RMB, and Real-World Asset Tokenization (RWA)

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Abstract: Currently, cross-border payment efficiency has long been constrained by the traditional SWIFT system. From a digital finance perspective, this study investigates the collaborative effects of stablecoins, digital renminbi (e-CNY), and real-world asset tokenization (RWA) in the operational efficiency of cross-border e-commerce supply chains. Using literature review, policy analysis, and case comparison methods, we systematically analyze the core mechanisms of these three tools in enhancing transaction efficiency, optimizing costs, adapting to scenarios, and facilitating regulatory coordination. Taking JD Group's compliant practice as an empirical case, we construct a closed-loop model. The findings indicate: (1) stablecoins significantly reduce costs and settlement time for cross-border micro-payments; (2) digital RMB excels in compliance and wholesale trade scenarios; and (3) RWA, as a financing instrument, exhibits strong synergistic potential. While irreplaceable within a regulatory framework, the three tools can be orchestrated scenario-specifically, offering implications for policy formulation, enterprise upgrading, and RMB internationalization.

Keywords: Stablecoin; Cross-Border Payment; Supply Chain Operational Efficiency; Cross-Border E-Commerce

1. Introduction

1.1 Research Background and Significance

Over the past decade, the cross-border e-commerce market has expanded rapidly worldwide. As a key hub in the global supply chain, China's cross-border e-commerce transaction volume increased from RMB 10 trillion in 2015 to RMB 25.2 trillion in 2025,

with an average annual growth rate exceeding 15%. As transaction frequency and value grow, cross-border payment has become a critical determinant of supply chain operational efficiency-directly influencing cash flow timeliness, enterprise profit margins, supply chain stability, and inter-firm coordination. However, traditional cross-border payment systems-exemplified by SWIFT-remain significantly constrained. Payments typically require 3–5 business days to settle, are subject to time-zone delays, and lack real-time settlement capability, exerting pressure on enterprises with tight cash flow requirements [8-9]. Additionally, transaction fees (2%–3% of value) and foreign exchange losses, particularly amid RMB–USD volatility, further erode profitability [8-9]. Moreover, compliance complexity-arising from divergent regulatory, tax, and anti-money laundering (AML) requirements across jurisdictions-increases operational costs and administrative burden.

Against this backdrop, digital finance instruments-including stablecoins, digital RMB (e-CNY), and real-world asset tokenization (RWA)-are emerging as promising alternatives. Stablecoins are blockchain-based payment tools pegged to fiat currencies, reducing intermediary layers and enabling efficient, low-cost small-value cross-border payments [1-2,16]. Digital RMB, issued by the People's Bank of China (PBoC), leverages national credit and central bank infrastructure (e.g., the multi-central bank digital currency bridge, mBridge) to support secure, large-value wholesale settlements [3-4,11,17]. RWA applies blockchain to tokenize real assets (e.g., accounts receivable, rental income), thereby enhancing liquidity and financing access for supply chain participants [5-7,15].

Between 2024 and 2026, mainland China and Hong Kong China have advanced institutional

frameworks for digital finance innovation—for instance, Hong Kong’s Stablecoin Ordinance (2025), PBoC’s e-CNY cross-border pilots, and regulatory guidelines for RWA asset securitization. These developments provide a pragmatic foundation for the collaborative application of stablecoins, e-CNY, and RWA in cross-border e-commerce supply chains. Consequently, understanding how these tools synergize under regulatory compliance holds substantial theoretical and practical value.

Theoretically, existing literature often treats stablecoins, e-CNY, and RWA as isolated tools—focusing separately on payments, currency internationalization, or supply chain finance—while neglecting their integrated mechanism. This study bridges that gap by analyzing their functional differentiation, complementarity, and joint impact on the “payment–settlement–financing” triad within supply chains.

Practically, cross-border e-commerce enterprises face persistent challenges: high payment costs, slow capital turnover, and limited financing channels. By elucidating the collaborative pathways of stablecoins, e-CNY, and RWA, this research offers actionable insights for optimizing payment strategies, reducing operational costs, and strengthening supply chain resilience. Furthermore, the deployment of e-CNY in cross-border contexts supports the broader agenda of RMB internationalization.

1.2 Research Questions

This study addresses the following three core questions:

- (1) Can stablecoins, e-CNY, and RWA form a collaborative mechanism that systematically enhances supply chain operational efficiency in cross-border e-commerce?
- (2) What are the specific application scenarios, efficiency-enhancement mechanisms, and boundary conditions of each digital finance tool?
- (3) How can enterprises build a digital-finance-centric cross-border payment and supply chain financing solution within a compliance framework?

1.3 Analytical Framework

Drawing on transaction cost theory, supply chain finance theory, and currency internationalization theory, this study constructs a five-dimensional evaluation framework for assessing the impact of digital finance tools on supply chain

efficiency:

- 1) Settlement timeliness: speed of fund arrival and capital turnover cycle;
- 2) Transaction costs: including fees, foreign exchange costs, and compliance overhead;
- 3) Capital turnover efficiency: end-to-end efficiency of fund flow from payer to supply chain nodes;
- 4) Risk management capability: encompassing credit, exchange rate, operational, and compliance risks;
- 5) Supply chain coordination capacity: support for inter-firm collaboration and resource allocation.

Empirical validation is conducted using JD Group’s sandbox practice in cross-border e-commerce supply chains [12-13].

2. Theoretical Foundations

2.1 Transaction Cost Theory

Proposed by Williamson (1979), transaction cost theory explains how economic agents incur costs beyond the price of goods or services—including information search, negotiation, monitoring, and enforcement costs. In cross-border payments, these costs are amplified by multi-layered financial intermediaries, heterogeneous currency systems, and complex regulatory regimes.

Under traditional systems, enterprises traverse bank networks, payment processors, and clearing houses—resulting in prolonged settlement times, inefficient information transmission, and cumulative fees (e.g., bank charges, FX spreads, manual vetting). These directly impair working capital velocity and raise operational pressure.

Stablecoins mitigate several transaction costs:

Information search cost: Blockchain enables peer-to-peer transfers, eliminating intermediary matching layers;

Negotiation cost: Pegging to fiat ensures price transparency, reducing haggling over exchange rates;

Monitoring cost: Distributed ledgers provide immutable, traceable records, enhancing auditability and deterring fraud [1-2,16].

Nevertheless, stablecoins face regulatory uncertainty. Due to fragmented global frameworks—e.g., divergent legal status across jurisdictions—they are best suited for small-value, high-frequency cross-border payments, rather than large-scale wholesale or highly regulated contexts.

2.2 Supply Chain Finance Theory

Supply chain finance theory emphasizes the synergistic interplay of cash flow, logistics, and information flow, highlighting how core enterprise credit can be extended to upstream/downstream SMEs. Traditional supply chains often leave SMEs under-financed due to limited collateral, low credit ratings, and opaque trade documentation [6,10].

RWA-tokenizing real assets such as accounts receivable, order contracts, or rental income-transforms illiquid assets into on-chain, verifiable, tradable instruments. For SMEs, RWA improves financing accessibility and asset liquidity [5,7,15].

RWA's value creation unfolds in three dimensions:

Credit extension: Core enterprises (e.g., JD) endorse SMEs' receivables, enabling them to access financing based on genuine trade background;

Transparency enhancement: On-chain asset registration reduces information asymmetry and lowers lender risk assessment costs;

Process acceleration: Tokenized issuance shortens approval cycles-from 30-45 days to under 15 days-and reduces financing rates [5-7,15].

However, RWA remains constrained by regulatory fragmentation (e.g., securities classification, investor suitability, cross-border transfer rules) and market readiness. Current implementations are largely pilot-based, targeting professional investors. Thus, RWA serves best as a complementary-not substitutive-financing tool.

2.3 Currency Internationalization Theory

Currency internationalization examines how a national currency gains global roles as a unit of account, medium of exchange, store of value, and reserve asset. Its success hinges on credibility, payment convenience, infrastructure, and international acceptance [3-4,11].

Digital RMB, as a legal tender issued by the PBoC, offers a credible, sovereign-backed channel for cross-border payments. Compared to stablecoins, e-CNY's primary advantage lies in its legal tender status and compliance with AML and KYC regimes-making it uniquely suitable for large-value, high-integrity trade settlements [17].

e-CNY's cross-border pilots (e.g., via mBridge) demonstrate:

Reduced settlement time (from 5 days to seconds);

Elimination of multi-bank intermediary costs;

Enhanced traceability and regulatory alignment [3-4,11,17].

Yet, e-CNY's global adoption is still limited to policy-sanctioned corridors. Wider commercial deployment requires coordinated international regulation, technical interoperability, and market acceptance.

2.4 Synthesis and Framework Integration

In summary:

Transaction cost theory explains how stablecoins optimize micro-scale payment efficiency;

Supply chain finance theory clarifies how RWA enhances mid-scale asset liquidity and SME financing;

Currency internationalization theory justifies e-CNY's macro-scale role in cross-border settlement and RMB globalization.

Based on this, the five-dimensional framework (timeliness, cost, turnover, risk, coordination) provides a unified lens to evaluate tool-specific and synergistic effects-particularly in JD's closed-loop architecture.

3. JD's Closed-Loop Payment Architecture for Cross-Border E-Commerce Supply Chains

3.1 Case Background Analysis

In recent years, as one of the world's largest cross-border e-commerce enterprises, JD Group has gradually shifted part of its strategic focus toward international markets. Its international business has covered North America, Southeast Asia, Europe, the Middle East and other regions. As a result, the demand for closed-loop operations from the consumer side to the supply chain side has become increasingly prominent. However, due to the limitations of existing payment tools, financing methods and settlement procedures, JD's operational chain is still constrained by the following three major problems.

(1) High cost of payment and settlement:

Under the traditional payment system, each cross-border e-commerce transaction usually needs to go through multiple transmission links, such as "consumer-payment intermediary, such as PayPal-export enterprise-supplier bank". According to JD's data in 2023, the average time from the initiation of a single international order

to the completion of account settlement was 3 to 7 days, and the comprehensive service fee reached 2.5% to 3%. This situation limited the overall profitability of enterprises and reduced capital liquidity [9,12-13].

(2) Limited financing channels:

In the supply chain, JD's small and medium-sized suppliers face financing difficulties. For example, suppliers often only obtain paper contract certificates of trade orders. Due to their small scale and limited risk resistance, they often find it difficult to obtain sufficient credit support, which restricts their business expansion [12-13].

(3) Long capital circulation cycle:

In traditional cross-border payment methods, funds flow from end consumers to core enterprises and then to terminal suppliers. This process usually requires lengthy approval and settlement procedures. As a result, the efficiency of capital circulation is significantly affected [9]. To solve the above problems, JD implemented a "three-in-one" digital financial closed-loop architecture in Hong Kong and the Chinese mainland in 2025, namely the combination of stablecoin, e-CNY and RWA. This architecture aims to improve the operational efficiency of the entire supply chain while meeting international

compliance and regulatory requirements [1-7,11-13,15-17].

3.2 Design of JD's "Three-in-One" Digital Financial Closed-Loop Architecture

The "three-in-one" payment closed-loop framework designed by JD gives full play to the advantages of stablecoin, digital RMB and RWA. It breaks through the problems of low timeliness, high cost and financing difficulties in traditional cross-border payment. The following analysis is carried out from the collaborative paths of the three tools [1-7,9,11-13,15-17].

3.2.1 Design logic of the framework

Design of the closed-loop financing and payment architecture:

Based on the following three aspects, JD has constructed an efficient and coordinated payment closed-loop system. The corresponding physical diagram is shown in Figure 1.

(1) Payment path:

In small-value payment scenarios, JD uses Hong Kong dollar stablecoin to realize peer-to-peer instant payment between users and the e-commerce platform, thereby reducing the settlement cost of international orders [1-2,12-13,16].

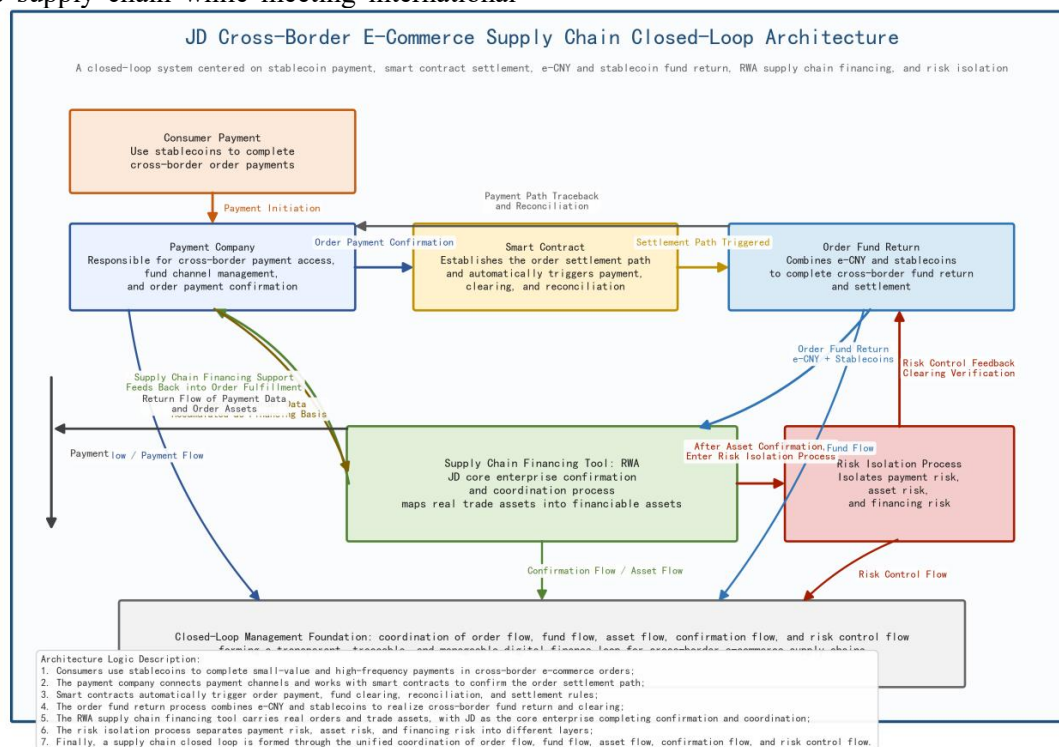


Figure 1. JD Cross-Border E-Commerce Supply Chain Closed-Loop Architecture

(2) Large-value clearing and foreign exchange conversion:

In large-value wholesale trade procurement, JD

uses the mBridge system to directly realize overseas clearing between RMB and foreign currencies, thereby simplifying the international

payment path [3-4,11,17].

(3) Optimization of financing path:

Small and medium-sized suppliers in the supply chain can obtain financing through the Hong Kong RWA market by using accounts receivable. After financing is completed, funds flow back into the supply chain, thus completing the closed-loop operation [5-7,15].

Figure 1 clearly shows the cross-border payment and financing closed-loop module supported by stablecoin, e-CNY and RWA. In this module, each tool is reasonably divided according to payment amount and application scenario, forming a collaborative system with complementary resources and efficient capital flow, which effectively shortens the circulation time of funds [1-7,11,15-17].

3.2.2 Efficiency improvement path of stablecoin payment

(1) Second-level payment and transparent circulation of small-value transactions:

Through the Hong Kong dollar-pegged stablecoin, JD enables overseas customers to pay directly to JD accounts in foreign currencies such as Hong Kong dollars and US dollars. Based on the peer-to-peer transmission path of blockchain, the fund flow can be completed within a few seconds. Meanwhile, all post-transaction procedures can be automated. After funds arrive in JD's account, smart contracts can directly trigger fund allocation. This is a key breakthrough that is difficult to achieve in the traditional banking system [1-2,12-13,16].

Table 1. Efficiency Comparison Between Stablecoin and Traditional Payments

Payment Instrument	Settlement Time	Transaction Cost	FX Process
Stablecoin(Sandbox)	≤3 seconds	<0.3%	None
Traditional Bank	2-5 days	2%-3%	Yes

The comparison shows that stablecoin greatly reduces costs and improves the capital efficiency of enterprises [1-2,16].

(2) Automatic settlement through smart contracts:

After the user completes payment, the on-chain smart contract automatically triggers payment actions according to the order amount and logistics status, thereby reducing payment disputes and back-end operational risks.

3.2.3 Compliance Mechanism of Digital RMB for Large-Value Payment

(1) Optimization of capital clearing costs:

When JD uses mBridge to realize large-scale

cross-border payment, it relies on the legal digital currency positioning of the People's Bank of China to significantly simplify the clearing process of large-value trade payments. From the initiation of payment by the Chinese side to the receipt of funds by suppliers, the time is shortened from 5 days to second-level settlement. This eliminates the complicated multi-level clearing process that traditionally requires transfers through multiple banks [3-4,11-13,17].

(2) Strengthening of compliance and security:

Digital RMB is supported by the national financial network and can achieve anti-money laundering compliance and transparency of the capital chain. Especially in wholesale trade, its advantages are irreplaceable [3-4,11,17].

3.2.4 RWA Financing to Support Small and Medium-Sized Suppliers

(1) Rapid securitization of assets:

JD confirms the rights of unpaid orders and logistics accounts receivable of small and medium-sized enterprises, packages them on-chain into asset-backed tokens, and completes issuance through the professional investor market in Hong Kong China. As a result, the financing interest rate among enterprises has decreased by more than 40% [12-13].

(2) Continuous capital closed loop:

The funds obtained from financing flow to suppliers' accounts in real time through the on-chain payment function of stablecoin. This enhances the efficiency of capital return and strengthens the credit of the entire supply chain [1-2,16].

3.3 Comparison with Other Projects

Compared with other similar cross-border payment projects, such as PayPal, WeChat Pay and the traditional SWIFT model, the main differences of the JD case are as follows.

(1) Complete closed-loop design:

Other projects usually focus on a single payment or financing function, while JD's closed loop integrates payment, financing and asset tokenization functions [5-7,12-13,15].

(2) Difference in compliance:

JD's RWA and e-CNY fully meet the strict regulatory requirements of both Hong Kong and the Chinese mainland. By contrast, most international payment solutions, such as stablecoin applications in other countries, may find it difficult to achieve full compliance [1-7,11-13,15-17].

3.4 Analysis of Tool Collaboration and Benefits Under JD's Closed-Loop Architecture

JD's closed-loop architecture of "stablecoin + e-CNY + RWA" not only solves the problems of high cost and low efficiency in traditional cross-border payment, but also achieves strong collaborative benefits by making full use of the respective advantages of the three tools in payment, clearing and financing [1-7,9,11-13,15-17].

3.4.1 Analysis of the Collaborative Effects of the Three Tools

Stablecoin: solving the demand for small-value payment [1-2,16]

The direct function of stablecoin lies in

Table 2. Comparison of JD's Stablecoin Closed-Loop Payment Path

Payment Path	Payment Process	Time Delay	Cost	Foreign Exchange Loss
Traditional Payment Path	Consumer-third-party payment institution-interbank clearing-e-commerce platform	3 to 7 days	2.0% to 3.0%	Yes
Optimized Stablecoin Payment Path	Consumer-JD on-chain wallet-JD merchant account	Second-level settlement	0.2% to 0.3%	No

The data show in Table 2 that in high-frequency small-value payment scenarios, stablecoin is significantly superior to traditional payment methods [1-2,16].

(4) Digital RMB: covering large-value wholesale settlement and capital flow [3-4,11,17]

The advantage of digital RMB, or e-CNY, is mainly reflected in the compliant payment of large-value funds and the regulatory control of deeper capital chains. After JD applies e-CNY to international wholesale trade payment, both payment efficiency and risk control capability are greatly improved.

1) It reduces the complex approval chain in large-value payment.

2) It reduces the risk of credit default in international trade payment through national credit guarantees.

3) It provides RMB-based cross-border clearing capability in multiple countries, substantially improving the international applicability of RMB.

Case data show that the large-value procurement completed by JD through e-CNY, such as batch payment from key regions of the global manufacturing supply chain, saves about 40% of time costs and 30% of clearing costs compared with the SWIFT system in actual operation [3-4,9,11-13,17].

(5) RWA, real-world asset tokenization: solving the financing difficulties of the supply chain [5-7,10,15]

eliminating the complicated clearing procedures and high service fees of traditional banks in high-frequency small-value payment scenarios. For example, more than 90% of JD Hong Kong's cross-border e-commerce orders are high-frequency transactions with a single transaction amount of less than USD 10,000. After applying the "peer-to-peer + smart contract" payment method of stablecoin, the payment path is optimized as follows:

(1) It no longer depends on third-party clearing.

(2) Transaction privacy and transparency are enhanced.

(3) It provides a real-time payment experience, especially suitable for the consumer market.

RWA provides convenient financial support for small and medium-sized enterprises in JD's supply chain. Through asset tokenization, it helps enterprises activate idle funds, such as unpaid contracts and accounts receivable [5-7,12-13,15].

The specific operation path of JD's RWA financing is as follows:

Enterprises submit accounts receivable or order details and complete on-chain confirmation of rights [5-7,15].

JD, as the core enterprise, provides credit support for RWA issuance [5-7,12-13,15].

Tokens are issued in the RWA trading market, and investors provide financial support through market transactions [5-7,15].

After financing is completed, funds are injected into enterprise accounts in real time, forming a compliant closed loop.

Data support shows in Figure 2 that in JD's sandbox test, the RWA solution significantly shortened the financing cycle from the traditional 30 to 45 days to 10 to 15 days, while the average financing interest rate decreased by 2.5 percentage points [5-7,12-13,15].

3.4.2 Supplementary analysis of functional division and differences

In order to more clearly demonstrate the implementation effect of JD's three-in-one solution, in Table 3 benchmark analysis compares it with other common payment tools or platforms.

Analysis results:

JD's solution not only meets the demand for high efficiency in various payment dimensions, but also integrates supply chain finance functions, which are lacking in potential competitors [12-13].

A transparent and traceable supply chain finance loop centered on on-chain confirmation of receivables, core enterprise endorsement, RWA market financing, and fund return

Compared with the SWIFT system, JD's solution significantly reduces time and cost. Compared with PayPal, it is more suitable for large-value payment scenarios and has on-chain financing extensibility [9].

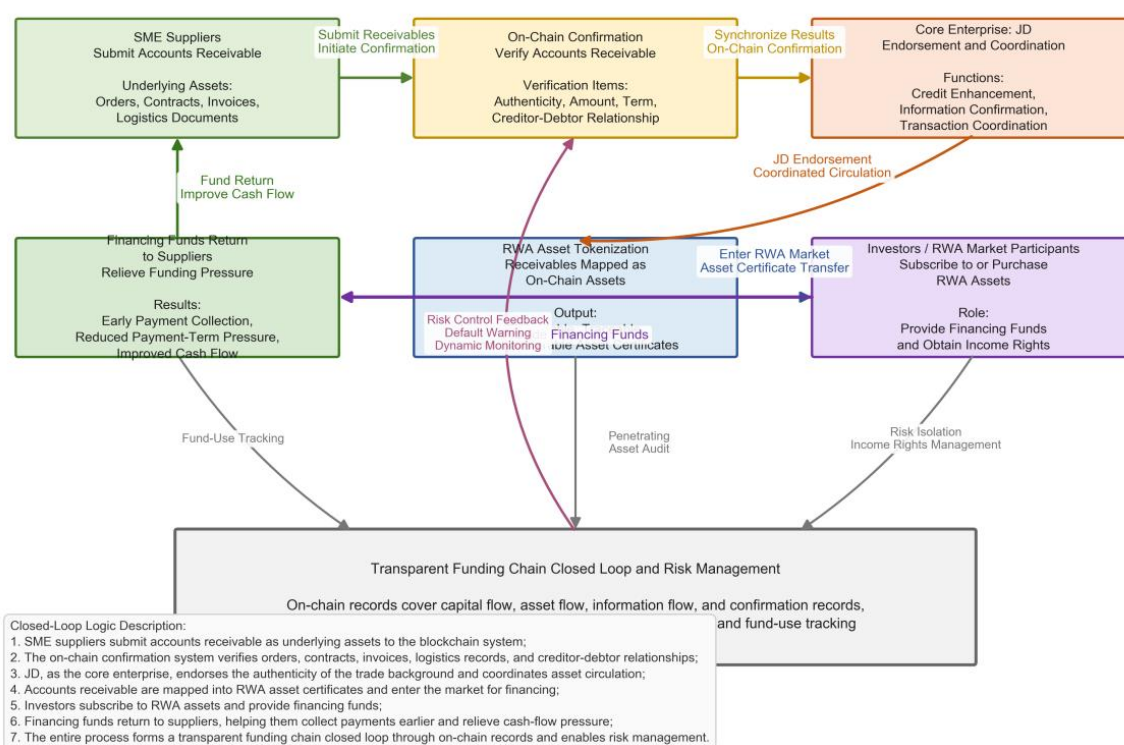


Figure 2. JD RWA Supply Chain Financing Closed-Loop Architecture

Table 3. Comparison Between JD's Digital Financial Closed-Loop System, SWIFT and PayPal

Comparison Dimension	JD·Stablecoin +e-CNY +RWA	Traditional SWIFT Payment System	Online Payment Platforms Such as PayPal
Payment time	Second-level settlement, stablecoin, tiered settlement, e-CNY	2 to 7 days	About half an hour, depending on the region
Cost	0.2%-0.6%	2%-5%	1%-3%, depending on the payment method
Foreign exchange mechanism	Embedded stable anchoring mechanism, no additional loss	Yes, foreign exchange costs occur through banks	Yes, with relatively high foreign exchange fees
Cross-border applicability	Full-chain use combined with a compliant path	Restricted by capital controls among countries	Suitable for small-value payments, but large-value payments are limited by transaction number and amount
Compatibility with financing function	Supports asset tokenization financing scenarios	No financing function	Additional financing function

3.5 Comprehensive Efficiency Evaluation of the JD Case

Based on JD's practical data in the sandbox test, the value of the closed-loop architecture is reflected in the following evaluation dimensions. Payment efficiency, including time and cost:

The efficiency of the payment process has increased by more than 90%, and the average cost of large-value cross-border payment has

decreased by more than 30%.

Improvement of financing opportunities:

It provides financing support for small and medium-sized suppliers, releases more than RMB 1 billion in liquidity, and alleviates the financial pressure on the upstream industrial chain.

Compliance and risk control:

Based on transparent on-chain payment flows and direct clearing by the central bank, the

compliance and security level of payment have been significantly improved.

Closed-Loop Payment System

Figure 3 provides a panoramic view of JD's three-in-one closed-loop payment system.

3.6 Panoramic View of JD's Three-in-One

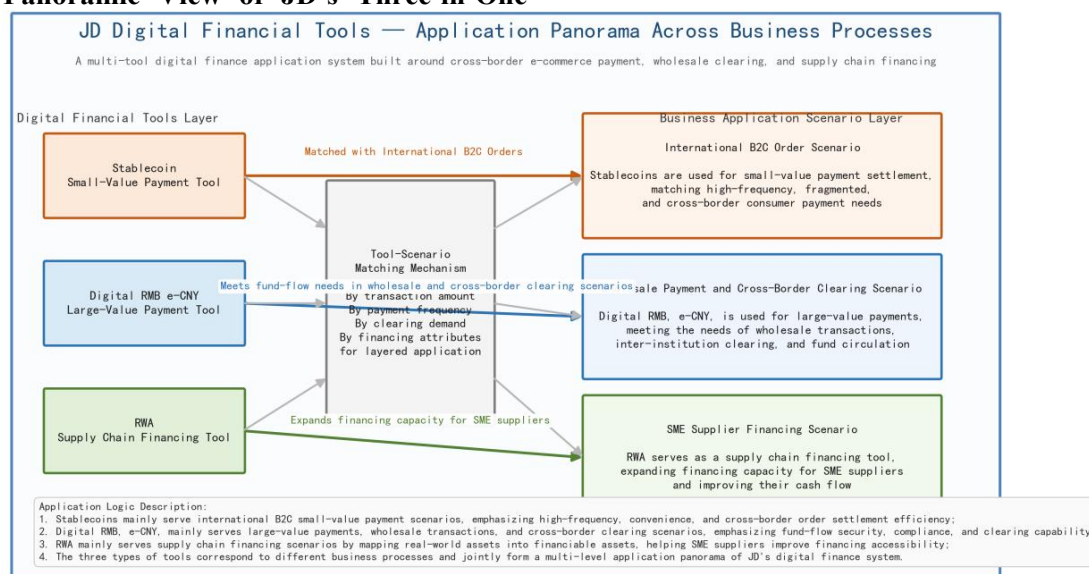


Figure 3. JD Digital Financial Tools-Application Panorama Across Business Processes

4. Conclusions and Prospects

4.1 Research Conclusions

Taking JD's cross-border e-commerce supply chain practice as a case, this paper analyzes the application mechanisms of three types of digital financial tools, namely stablecoin, digital RMB and RWA, in cross-border payment and supply chain operations. The study finds that the three types of tools are not simply substitutes for one another. Instead, they form differentiated functional divisions in different scenarios and jointly improve supply chain operational efficiency through a collaborative mechanism.

First, stablecoin has obvious advantages in small-value and high-frequency cross-border payment scenarios. Since it relies on the blockchain-based peer-to-peer payment mechanism, it can reduce the intermediary links of traditional banks, shorten the payment arrival time from several days to second-level settlement, and reduce service fees and foreign exchange costs at the same time. Therefore, stablecoin is suitable for scenarios such as consumer payment in cross-border e-commerce, platform fund allocation, and small-value order settlement [1-2,16].

Second, digital RMB has strong applicability in large-value trade clearing and strongly regulated payment scenarios. Digital RMB has national credit endorsement and legal currency attributes,

and can rely on the central bank clearing network to achieve safer, more compliant and more efficient cross-border settlement. Compared with stablecoin, digital RMB has higher reliability in anti-money laundering, fund traceability and policy compliance. Therefore, it is more suitable for wholesale trade settlement, large-value procurement payment and cross-border capital return scenarios [3-4,11,17]. Third, RWA plays an important role in the supply chain financing process. By conducting on-chain confirmation and tokenization of real-world assets such as accounts receivable and order income rights, RWA can enhance asset liquidity and improve the financing capacity of small and medium-sized suppliers. In the JD case, the combination of RWA and the credit of the core enterprise helps alleviate the problems of financing difficulty and high financing cost faced by upstream enterprises in the supply chain, thereby strengthening the stability and resilience of the entire supply chain [5-7,15].

Overall, the collaborative framework of "stablecoin + digital RMB + RWA" forms an integrated closed loop of "payment, clearing and financing". Stablecoin improves payment efficiency on the consumer side, digital RMB ensures compliance and security in large-value clearing, and RWA improves supply chain financing capacity. The three types of tools complement one another in function and focus

on different scenarios, jointly promoting cost reduction, efficiency improvement and credit enhancement in cross-border e-commerce supply chains.

4.2 Practical Limitations and Challenges

Although stablecoin, digital RMB and RWA have great potential in cross-border payment and supply chain finance, their promotion and application still face certain limitations.

First, cross-border regulatory coordination remains insufficient. The legal status, issuance requirements and scope of use of stablecoin vary across different countries and regions, and a unified global regulatory framework has not yet been formed. Although digital RMB has strong compliance attributes, its cross-border application is still mainly concentrated in specific pilot scenarios and has not yet formed large-scale international commercial application. RWA involves issues such as securities regulation, asset confirmation and investor suitability management, which places higher requirements on regulatory coordination.

Second, the level of technical standardization still needs to be improved. Stablecoin payment, digital RMB cross-border clearing and RWA asset tokenization all rely on technical infrastructures such as blockchain, smart contracts and cross-chain interoperability. At present, technical standards among different platforms are not yet unified. Problems such as cross-chain data interoperability, asset valuation standards, smart contract security and privacy protection still need to be further solved.

Third, market acceptance still needs to be improved. For ordinary consumers and small and medium-sized enterprises, stablecoin, digital RMB cross-border payment and RWA financing are still relatively emerging financial tools. Users' insufficient understanding of their security, convenience and compliance may affect their actual willingness to use them. Therefore, it is still necessary to strengthen market education, application scenario construction and enterprise-side promotion in the future.

4.3 Future Development Directions and Suggestions

In order to further give play to the role of digital financial tools in cross-border payment and supply chain operations, this paper puts forward the following suggestions.

First, cross-border regulatory coordination should be promoted. Countries and regions should strengthen institutional coordination in stablecoin issuance, anti-money laundering of cross-border payment, RWA asset confirmation and digital currency clearing. Platforms such as the Asia-Pacific Economic Cooperation and the Belt and Road financial cooperation mechanism can be used to explore the establishment of common rules for cross-border digital payment and asset tokenization, so as to reduce compliance uncertainty for enterprises.

Second, technical infrastructure should be improved. Enterprises and financial institutions should strengthen the construction of smart contracts, cross-chain interoperability, privacy protection and data security technologies, so as to improve the stability and security of digital payment tools. At the same time, the compatibility of standards among different payment networks and blockchain platforms should be promoted, providing technical support for the collaborative application of stablecoin, digital RMB and RWA.

Third, practical application scenarios should be deepened. On the consumer side, cross-border e-commerce platforms can improve users' acceptance of stablecoin payment through payment discounts, points rewards and other methods. On the supply chain side, core enterprises can rely on their own credit advantages to help upstream and downstream small and medium-sized enterprises access the RWA financing model. On the international trade side, digital RMB payment pilots should be expanded first in countries and regions along the Belt and Road, so as to gradually increase the proportion of RMB used in cross-border trade settlement.

Fourth, enterprises' digital management capabilities should be enhanced. The application of digital financial tools is not only a change in payment methods, but also requires enterprises to improve their order management, fund management, risk control management and supply chain coordination capabilities. Cross-border e-commerce enterprises should strengthen the construction of internal digital systems and integrate payment, clearing, financing and logistics information, so as to form a more efficient supply chain operation system.

4.4 Summary and Prospects

This paper shows that the collaborative application of stablecoin, digital RMB and RWA provides a new solution for reducing costs and improving efficiency in cross-border e-commerce supply chains. The three types of tools improve the deficiencies of the traditional cross-border payment system from the three aspects of payment efficiency, clearing compliance and financing capacity respectively, and form a complementary digital financial closed loop through scenario-based division of functions.

In the future, with the gradual improvement of regulatory systems, the continuous maturity of blockchain technology and the continuous increase in market acceptance, the collaborative model of “stablecoin + digital RMB + RWA” is expected to be promoted and applied in more cross-border e-commerce and international trade scenarios. This model will not only help improve the operational efficiency of enterprise supply chains, but also promote RMB internationalization, asset digitization and the upgrading of global trade financial infrastructure.

Overall, digital financial tools are reshaping the cross-border payment and supply chain finance system. For enterprises, how to choose payment and financing tools suitable for their own business scenarios under the premise of compliance will become an important factor in enhancing international competitiveness. For regulators, how to strike a balance between encouraging innovation and controlling risks will also determine the breadth and depth of the future development of digital financial tools. As policy, technology and market conditions continue to mature, the cross-border payment system is expected to develop toward a more efficient, secure and intelligent direction.

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