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Blockchain-Based Innovations in Credit and Financing Enhancement for Cross-Border Trade

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Abstract: With the continuous expansion of cross-border trade in recent years, emerging challenges such as trust erosion, data silos, and operational inefficiencies have become increasingly prominent. To address these issues, blockchain technology can be strategically leveraged to enhance creditworthiness and financing capabilities in cross-border trade, aligning with the transformation needs of global enterprises. By harnessing digital technologies, this study explores innovative pathways for blockchain-powered credit enhancement and financing solutions. The research begins by analyzing current challenges in cross-border trade, then examines the value proposition of blockchain applications. Through theoretical frameworks and empirical analyses, it proposes novel implementation strategies that integrate blockchain technology into the credit enhancement ecosystem of international commerce.

1. Introduction

In the context of global economic integration, cross-border trade enterprises are facing growing financing demands. Challenges such as the data gap, information barriers, and data asymmetry all contribute to default risks in international trade, leading to significant difficulties and high costs in securing financing. By leveraging blockchain technology, these enterprises can streamline their trade processes while establishing transparent credit traceability systems. This technological advancement not only facilitates comprehensive development of cross-border trade but also provides robust financial support for businesses operating in this sector.

2. The value connotation of blockchain technology enabling cross-border trade financing

Blockchain technology, as a representative of modern information technology in the new era, can be analyzed into two components: blocks and chains. Blocks primarily record transaction data within specific timeframes, while chains document information changes, forming a chronological sequence through interconnected blocks. The combination of these elements enables the construction of distributed databases. From a technical perspective, blockchain technology fundamentally operates as a database system maintained and trusted by multiple nodes, effectively

preventing malicious data tampering. In practical applications, blockchain technology facilitates effective data labeling through collective node participation in ledger recording, enabling secure data storage and backup. Currently, blockchain technology is predominantly used for distributed encryption processing and data storage/transaction recording. By leveraging robust encryption methods, it ensures secure data transmission and access, demonstrating significant practical value. The application of blockchain technology in cross-border trade financing carries the following value implications:

2.1 Enrich cross-border trade financing channels

Blockchain technology can effectively enhance transaction efficiency in cross-border trade, which typically involves multiple countries and regions and often suffers from complex processes and time-consuming procedures [1]. By leveraging blockchain technology, cross-border trade enterprises can achieve peer-to-peer transactions, significantly simplifying the process. Through smart contracts enabling automated execution, it eliminates the cumbersome and error-prone nature of manual operations, thereby substantially improving trade efficiency. Furthermore, utilizing blockchain's distributed ledger system allows real-time data sharing, enabling all parties involved in financing to monitor trade status and progress in real time. This establishes effective credit enhancement mechanisms, helping enterprises meet higher credit requirements from banks and financial institutions while diversifying their financing channels.

2.2 Enhancing cross-border financial transparency

In cross-border trade financing, trust issues often arise due to opaque and hard-to-track transaction behaviors and information. Blockchain technology effectively addresses these challenges by storing transaction data as digital records while enabling real-time tracking and verification. This significantly enhances transparency and traceability in cross-border trade, allowing financial institutions to assess the credibility of trading partners. The technology's inherent authenticity helps prevent fraudulent practices during financing processes, reduces risks of data tampering or forgery, and ensures the authenticity of financial instruments. By creating comprehensive records of critical stages including production, processing, and transportation, it establishes a complete traceability chain that facilitates compliance verification and authenticity checks for banks and regulatory bodies.

3. Current difficulties in cross-border trade

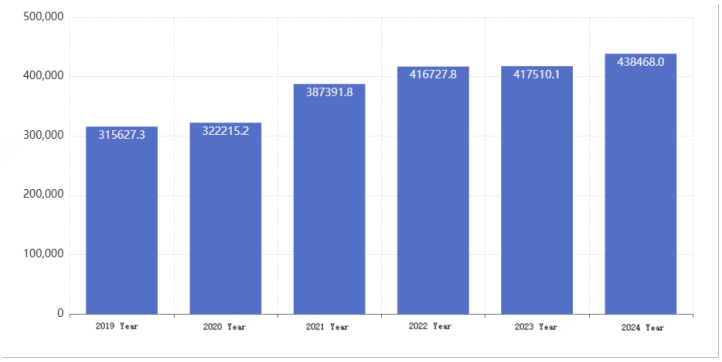

Figure 1: Total import and export of cross-border trade (2019-2024) (Source: National Bureau of Statistics)

According to the analysis of the total import and export statistics from 2019 to 2024 (Figure 1), the overall development attitude of cross-border trade is good, which is inseparable from China's current industrial chain and supply chain system, policy dividends and cost advantages.

An analysis of cross-border trade dynamics in the first half of 2025 reveals China's ongoing efforts to streamline foreign exchange procedures for high-quality enterprises nationwide. The policy framework demonstrates enhanced accessibility and broader coverage for SMEs in cross-border trade, with companies benefiting from macro-prudential measures that facilitate foreign debt utilization. While these initiatives have improved financing efficiency and effectiveness to some extent, critical financing constraints persist among cross-border trade entities when examined through a financial lens.

3.1 Cross-border trade enterprises have huge financing needs

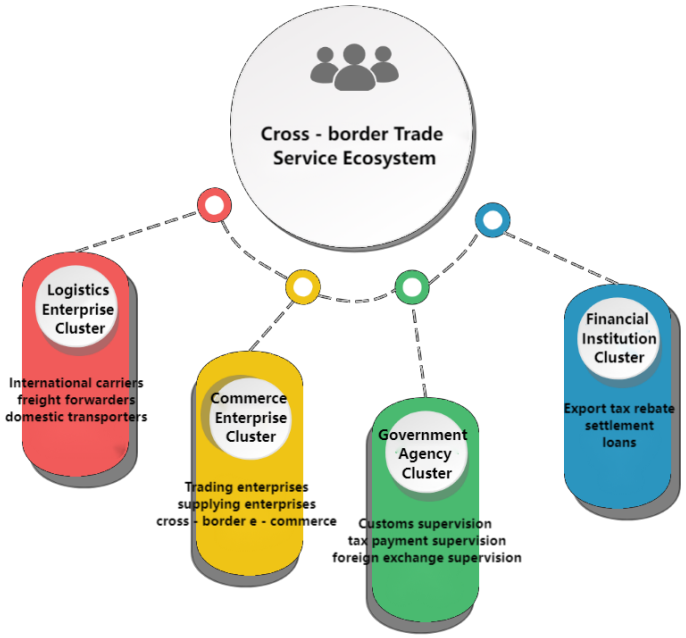

Figure 2: Schematic diagram of cross-border trade service ecosystem

Table 1: Analysis of the blockage points of financing difficulties for cross-border trade enterprises

order number	concrete content
1	Due to the lack of light assets and collateral, some small and medium-sized foreign trade enterprises cannot obtain loans and have to rely on high-cost third-party funds
2	In the process of credit granting, it is difficult for banks to verify the authenticity of trade background due to data loss, which leads to increased difficulty in credit granting
3	The cargo rights data such as bills of lading and warehouse receipts of logistics enterprises are not effectively used and cannot be transformed into financing credit

China's well-established cross-border trade system enables seamless global commodity circulation and optimized resource allocation, delivering efficient supply chain services. The integration of commodity trading, logistics services, and financial transactions [2] has forged a high-quality cross-border trade ecosystem (Figure 2). Particularly in the context of booming cross-border e-commerce, China has established new markets in Southeast Asia, Europe, and Latin America while developing innovative shipping routes and overseas warehouses. Customs data indicates that cross-border e-commerce imports and exports reached approximately 1.32 trillion

yuan in the first half of 2025, marking a 5.7% year-on-year increase. During the first quarter alone, 5,080 new cross-border e-commerce enterprises were registered, representing a staggering 173.24% year-on-year surge. This rapid expansion signals growing financing demands among cross-border trade companies, though multiple systemic bottlenecks (Table 1) currently hinder successful fundraising efforts.

3.2 Lack of trust among cross-border trade financing entities

In cross-border trade financing, trust gaps among stakeholders often significantly impact both the success rate and efficiency of financing. Traditional cross-border transactions predominantly rely on paper documents and handwritten signatures, resulting in time-consuming and verification-challenging processes that complicate financial review procedures. Moreover, the multi-party nature and geographical dispersion of cross-border trade operations make it difficult to verify the authenticity of transaction data, which often involves extensive verification. Data distortion frequently occurs during multi-layered information transmission, exacerbating the "data silo" issue that severely undermines financing effectiveness. The dynamic nature of cross-border trade data structures further complicates real-time updates, creating additional trust barriers in financing processes. Additionally, centralized management models prevalent in some cross-border transactions significantly reduce operational transparency.

3.3 It is difficult to build a credit investigation system for cross-border trade enterprises

The centralized and proprietary nature of traditional cross-border payment systems, characterized by centralized billing management, often results in opaque trade information and hinders transparent regulatory oversight. When third-party entities handle transaction execution, documentation, and compliance monitoring, risks such as malicious data tampering or cyberattacks become prevalent, compromising transaction accuracy and impeding credit system development. In China's current financing landscape, reliance on credit reporting as the primary benchmark creates significant challenges: [3] Financing risks stem from uncontrolled fund flows in cross-border transactions and fragmented corporate data records, which frequently lead to multiple financing applications for a single transaction, exacerbating post-loan risks. The lack of flexible financing options further manifests in non-securitizable credit limits per transaction, resulting in inefficient utilization of credit quotas and limiting enterprises' access to large-scale financing opportunities.

4. Innovative ways to empower cross-border trade credit enhancement and financing with blockchain technology

4.1 Blockchain technology enables cross-border trade financing to overcome capital constraints

In leveraging blockchain technology to empower cross-border trade financing, banks can optimize their financing strategies through blockchain trust mechanisms, effectively addressing funding constraints in global trade. Research on two operational models—e-commerce consignment sales and direct sales—has established game theory models and blockchain trust mechanisms that enable effective risk mitigation [4]. These mechanisms influence banks 'financing strategies through measures like guarantee interest rates and enhanced information verification. The implementation of blockchain trust systems significantly improves trade enterprises' financing efficiency, with efficiency decreasing as risk aversion increases, thereby boosting financing credibility and ensuring sufficient cash flow for cross-border businesses. Taking blockchain-powered green financing in

cross-border trade as an example, studies demonstrate that blockchain technology enhances project transparency and fund traceability. Through rigorous test-driven processes, it streamlines financing procedures to prevent fraud while strengthening stakeholder accountability. This integration of blockchain technology with green finance not only boosts corporate financing efficiency but also reduces transaction delays and fraud risks, further elevating the integrity of green finance practices in global trade [5].

4.2 Using Blockchain Technology to Address the Challenges of Cross-border Trade Financing

Since the global financial crisis began in 2008, cross-border trade worldwide has faced significant challenges. International studies indicate that the financial crisis has made cross-border trade financing more difficult, with credit availability decreasing by approximately 6% compared to pre-crisis levels, particularly affecting less developed countries. Analysis of the declining cross-border trade credit financing rate primarily attributes it to information asymmetry and trust crises, as some enterprises often require 30-90 days for credit financing [6]. To address current challenges in cross-border trade financing, blockchain technology offers new opportunities. Foreign research highlights its potential to revolutionize global supply chain management across industries. A study team from the University of Houston and Texas A&M University conducted experimental research on blockchain applications in global cross-border trade finance, concluding that blockchain enables real-time privacy monitoring of cross-border goods supply chains and enhances supply chain security through blockchain and smart contracts [7]. According to IGI Global journal reports, integrating blockchain technology with simulated neural networks allows intelligent risk management decisions for cross-border trade supply chains, facilitates SME credit risk assessments, and improves transparency in online financial institutions' credit reporting [8]. Blockchain technology has been gradually widely used in financial services. Its data storage, transmission and unique characteristics of imtamability have solved the problems of information asymmetry and data authenticity between banks and customers [9].

In 2020, China's State Administration of Foreign Exchange (SAFE) actively responded to national initiatives by developing a cross-border financial blockchain platform utilizing blockchain technology. This platform effectively addresses financing challenges faced by small and medium-sized enterprises (SMEs). Research on the platform's application outcomes shows that the first-phase implementation of export accounts receivable pledge financing has achieved notable success nationwide. It significantly resolves issues such as verifying the authenticity of logistics documentation and preventing duplicate use of certificates that commercial banks encounter when processing cross-border trade financing applications.

This paper analyzes the blockchain-based export accounts receivable pledge financing application scenario. The architecture employs a decentralized multi-node network (Figure 3), ensuring secure and confidential business processes while safeguarding user data integrity. Through distributed networks and cryptographic algorithms, smart contracts enable real-time updates to transaction records, preventing unauthorized access to sensitive corporate information. This framework facilitates effective collaboration among banks, enterprises, and regulatory bodies, establishing a robust multi-party financing consortium. Cross-border trade enterprises can submit customs declarations, trade contracts, and commercial invoices through the platform as collateral for financing applications. Banks and regulators verify corporate identity and creditworthiness on the platform, detecting duplicate financing activities and authenticating financial documents to enhance approval efficiency. The system automatically determines financing amounts and repayment schedules in compliance with cross-border trade regulations, enabling comprehensive transaction verification to ensure financing authenticity and effectiveness. However, this business

module also presents several shortcomings. For instance, it requires high computer storage capacity and faces significant challenges in data security. There's a mismatch between operational costs and business volume, and risk management needs improvement. These issues highlight the urgent need for specialized foreign exchange professionals to deliver targeted financial services and effectively utilize blockchain technology to optimize financing activities.

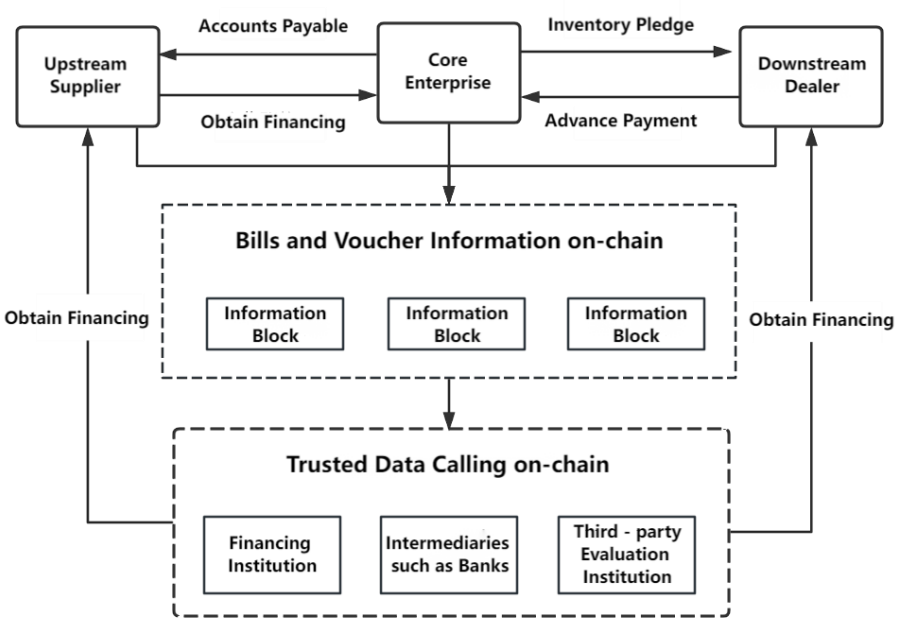

Figure 3: Schematic diagram of application scenarios of export accounts receivable pledge financing blockchain business

4.3 Use blockchain technology to develop innovative channels for financing guarantee and credit enhancement

To further support the growth of small and medium-sized cross-border trade enterprises, national and local governments have introduced incentive policies for cross-border trade financing, driving the development of the financing guarantee industry. Financing guarantee institutions need to fully leverage blockchain technology to achieve decentralization, identify and control guarantee risks, thereby establishing new credit guarantee mechanisms. This approach better leverages the functional role of guarantees [10], effectively addressing the challenges of difficult and expensive financing for cross-border trade enterprises.

4.3.1 Customer survey

Blockchain technology can be utilized for customer due diligence in facilitating cross-border trade credit enhancement financing. Given that many small and medium-sized cross-border enterprises face challenges such as extensive geographical dispersion, collateral shortages, and irregular financial management, conducting thorough due diligence poses significant difficulties. Current practices predominantly rely on on-site inspections to analyze operational activities, financial management, asset status, and organizational structures of these enterprises. Banks 'credit reporting systems, public security and judicial authorities, and third-party credit agencies are also employed to investigate shareholder backgrounds and the asset-liability status of controlling shareholders, thereby identifying potential operational and financial risks. However, this traditional

approach often suffers from low information sharing efficiency and poor data quality, compromising the authenticity and accuracy of investigation results. Blockchain-based automated data recording enables precise collection and analysis of cross-border trade enterprise information. Leveraging blockchain's consensus mechanism, it accurately identifies operational details, effectively detects fraudulent activities, enhances transparency and credibility of corporate data, ensures authentic customer investigations, and significantly improves both the efficiency and quality of due diligence processes.

4.3.2 Evaluation of counter-guarantee

Blockchain technology also plays a vital role in counter-guarantee evaluation, enabling comprehensive assessment of collateral's market value and liquidity while swiftly identifying potential issues like duplicate pledges or overlapping guarantees. The technology rapidly verifies collateral authenticity through data analysis with anti-counterfeiting mechanisms. By leveraging hash algorithms and timestamps, it ensures transactional integrity and confidentiality, providing verifiable timestamps for trade documentation. Particularly for enterprises using land use rights, mining rights, or similar assets as collateral, blockchain facilitates digital transformation to activate dormant assets, unlock their latent value, and dynamically assess collateral worthiness. This process generates scientifically validated credit-backed instruments that effectively secure financial transactions.

4.3.3 Project review

Blockchain technology is frequently employed in project evaluation processes to identify risks, design risk control measures, and optimize current financing plans. By leveraging blockchain and big data technologies, financial projects can undergo scientific analysis and risk identification. Through precise processing of blockchain data, valuable information can be maximized to provide accurate data references for financing decisions. Additionally, historical credit records and product quality assessments of enterprises can be accurately accessed and analyzed using blockchain, enabling quantitative evaluations of financing project feasibility. Utilizing blockchain's robust financial analytical capabilities, the technology helps minimize financing risks to the greatest extent possible.

5. Conclusion

In summary, China's current strategic decisions on foreign exchange trade, with a fundamental commitment to serving the real economy and continuously improving cross-border trade and investment facilitation, have enabled substantial growth for numerous domestic cross-border trading enterprises. This progress has further propelled the vigorous development of China's cross-border trade sector. Building on this foundation, it is crucial to fully leverage blockchain technology to enhance creditworthiness and financing capabilities in cross-border trade, thereby improving both efficiency and quality of financing while truly harnessing the transformative potential of digital technologies.

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