

# Analysis on Financial Innovation and Development of Cross-Border e-Commerce Supply Chain Based on Block Chain Background

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**ABSTRACT.** Supply chain finance, as a new fund management mode in the financial industry, has been developing at a faster pace in recent years. Through controlling or mastering the upstream and downstream information flow and logistics of small and medium-sized enterprises, supporting financial services such as capital flow or financing are provided. As an emerging technology, block chain can provide more convenient services for supply chain finance and strengthen the credit innovation mechanism of supply chain structure. Block chain technology, with its characteristics of decentralization, transaction record synchronization and irreversibility, provides better development ideas for businesses under the whole industrial chain such as logistics, bulk commodity trading, supply chain finance, etc. Block chain technology has many advantages in solving the acute problems of cross-border e-commerce supply chain finance. It can mitigate risks, reduce costs and optimize services. Therefore, this paper proposes specific solutions and implementation strategies based on block chain technology.

**KEYWORDS:** Block chain, Cross-border e-commerce, Supply chain finance, Innovation

## 1. Introduction

With the development of e-commerce and the Internet, more and more small and medium-sized foreign trade enterprises have begun to use cross-border e-commerce platforms to carry out foreign trade and realize industrial transformation and upgrading. Block chain technology itself and industries related to block chain have also developed rapidly [1]. Research and application of new technologies such as block chain and artificial intelligence, and the establishment of credit evaluation mechanism based on supply chain can provide efficient and convenient financing channels for small and medium-sized in the upstream and downstream of the supply chain. Through the way of supply chain, the uncontrollable risks of a single enterprise are transformed into the controllable risks of the whole supply chain enterprise. Although the concept of supply chain finance has been put forward for a long time, and the development speed of supply chain finance has been faster than before in recent years, the practical application scope of supply chain finance is still very small, and few enterprises actually use supply chain finance as a way of capital flow [2]. Changing the current financial transaction mode of China's supply chain, exploring new business models, promoting the development of supply chain finance and providing better financing services for small and medium-sized enterprises are the inevitable requirements for improving the quality and speed of China's economic development.

## 2. Matching Analysis of Block Chain Technology and Supply Chain Finance

### 2.1 Establish Transparent Financing Books to Eliminate Information Asymmetry

Block chain technology was first applied to bitcoin's virtual trading market. It is bitcoin's public ledger and supports the disintermediation and decentralized processing of transactions in the global network. The advantage of this model is that financial institutions generally recognize commercial factoring and the market acceptance is relatively high [3]. To control large data finance such as cash flow, orders and running water of upstream and downstream enterprises, and to provide financial services for upstream and downstream enterprises with their own funds or in cooperation with financial institutions. The asymmetry of information will increase the cost of information exchange between the main bodies in the supply chain system, increase the coordination difficulty of the whole supply chain operation, and reduce the operation efficiency of the supply chain. Through intensive effect, the cost can be reduced, and the profit margins of factories and retailers are increasing. It can promote the construction of new urbanization in China, shape Chinese

brands and enhance the new trade competitiveness in the global market. At the same time, with the continuous expansion of the business scope of core enterprises, the number of small and medium-sized enterprises in the upper and lower reaches and their business needs are increasing daily. Through “intelligent contract” block chain technology, programmable finance can be realized in the financial field, which has been paid attention to by people.

## **2.2 Realize the Function of Intelligent Contract and Reduce the Human Cost of Supply Chain Finance**

The main function of supply chain finance is to fully expand various financial services such as financing, financial management, loans and so on in one chain, of which the most important is the bank supply chain, which manages the capital flow and logistics of small and medium-sized enterprises in the upstream and downstream by centering on core enterprises [4]. Therefore, if only relying on manpower management, it will inevitably lead to inefficient operation of the supply chain system, which will not only increase the operating costs of commercial banks, but also raise the financing costs of financing enterprises. Traditional factoring is based on the demand of suppliers' accounts receivable, while reverse factoring is based on the accounts payable of core enterprises, which arrange financing for suppliers in a unified way.

Considering the income of small and medium-sized enterprises in the supply chain and the reality of short-term capital supply for small and medium-sized enterprises by financial institutions, VAR (Vector Autoregressive Model) model is selected to do empirical research on the income of the third party logistics enterprise alliance acting for small and medium-sized enterprises and the short-term capital supply for small and medium-sized enterprises by financial institutions.

All variables in VAR model are endogenous variables, and the explanatory variables do not include any current variables. The dynamic relationship between all endogenous variables is obtained by regression of the lag period of all endogenous variables [5]. The mathematical expression of  $VAR(q)$  model is [6]:

$$z_t = V_1 z_{t-1} + V_2 z_{t-2} + \dots + V_p z_{t-p} + \varepsilon_t \quad (1)$$

In the above formula,  $z_t$  is an n-dimensional endogenous variable vector,  $V_1, \dots, V_p$  is an  $n \times n$ -dimensional matrix,  $\varepsilon_t$  is an n-dimensional convergence vector.

As time series data may be unstable, autocorrelation appears between random error items, resulting in “pseudo regression” phenomenon. Therefore, before establishing VAR mode, unit root test is usually required for judgment. ADF test is mainly used for unit root judgment. Its principle model is:

$$\Delta z_t = \alpha_1 + \alpha_2 t + \sigma_1 z_{t-1} + \sigma_2 t \sum_{i=1}^n W z_{t-1} + \varepsilon_t \quad (2)$$

Where  $\alpha$  is a constant term,  $t$  is a trend term, and  $\sigma$  is a residual term. The ADF test method is to determine whether the parameter  $t$  value is greater than the ADF critical value. The critical value refers to the McKinnon critical value. If the  $t$  value is less than the ADF critical value, the time series is considered stable.

Granger causality test is also widely used in VAR empirical research [7]. The judgment method is whether the condition distribution included by the lag period value is the same as that included only. One of the most commonly used Granger test models is:

$$z_t = \sum_{i=1}^n \alpha_i z_{t-i} + \sum_{i=1}^n \beta_i X_{t-i} + \mu_{it} \quad (3)$$

The zero hypothesis for judging whether Granger causality exists is:  $S_0 : \beta_j = 0, (j = 1, 2, \dots, q)$ , in other words, if all parameters of the lag term are not significant, the zero hypothesis can not be rejected. Therefore, as long as there is a significant lag parameter, Granger causality is considered. The above tests can be completed by  $K$  statistics.

$$K = \frac{(RSS_2 - RSS_1) / n}{RSS_1 / (T - 2n - 1)} \quad (4)$$

Where  $RSS_2$  is the sum of squares of residuals after the constraint condition is applied (zero hypothesis holds),  $RSS_1$  is the sum of squares of residuals without the constraint condition, n is the number of explanatory variables of the

test equation, and  $t$  is the sample size. If the  $K$  value calculated by the sample is less than the critical value, the zero hypothesis is accepted, that is, there is no Granger causality.

In a broad sense, block chain technology is a new distributed framework in the true sense. Its computing paradigm is used by many blocks to verify, store, generate and update data [8]. It can provide their merchants with a more efficient and safer payment platform in cross-border electronic commerce, thus meeting the greater demands of global consumers. At present, the services of financial institutions tend to be homogeneous. From the perspective of financial institutions providing financial services, the supply chain has very limited customer stickiness. The e-commerce supply chain finance, which takes e-commerce providers and e-consumers as the targets, with e-commerce providers and banks as the common subjects.

### 2.3 Innovating the Financial Transaction Mechanism and Constructing the Financial Ecological Environment of the Supply Chain

Block Chain Core Technology Helps Core Enterprises to Free Credit Circulation [9]. At the same time, intelligent contracts that rely entirely on machine language will effectively avoid man-made operational risks and moral risks and enhance the trust between financial entities. According to the service standards of supply chain finance, not all enterprises or financial institutions can participate in a supply chain finance. According to the current bill law, commercial bills cannot be paid separately, but the integrity of bills must be guaranteed, and the contradiction between block chain technology and laws and systems must be guaranteed.

Two variables of supply chain finance collaborative research are selected: the income of the third party logistics enterprise alliance acting for small and medium-sized enterprises, and the short-term fund supply to small and medium-sized enterprises by banks and other financial institutions, which are expressed by ER and HJ respectively. The logarithm of the original variable is expressed as LNER and LNHJ. The time series of LNER and LNHJ are tested for unit root. If the time series is not stable, the difference is further tested until the time series becomes stable. The ADF test results of these two variable sequences and their first-order difference sequences containing intercept terms and trend terms are shown in Table 1.

Table 1 Adf Test Results of Original Variable Sequence and Difference Sequence

Sequence	ADF test statistics	1% threshold	Probability value p
LNER	-3.0145	-3.9107	0.1752
LNHJ	-2.4801	-4.2273	0.1267

The results calculated by EViews software can be listed in Table 2. According to the displayed results, it is concluded that the income of third-party logistics enterprises is influenced by the loans of financial institutions to small and medium-sized enterprises, while the income of third-party logistics has little influence on the loans of financial institutions. Therefore, in the equation with the return of the third-party logistics enterprise as the dependent variable, the lending of financial institutions to small and medium-sized enterprises can be used as an exogenous variable.

Table 2 Granger Test Results Table

Original hypothesis	Sample number	F statistics	Prob.
LNHJ is not Granger cause of LNER change	40	18.3107	0.0131
LNER is not Granger cause of LNHJ change	40	0.2741	0.6087

Due to the limitations of traditional banking rules, lack of collateral, lack of financial knowledge, high transaction costs and unsustainable business, the development of cross-border e-commerce has been troubled. Cross-border e-commerce credit reporting has become a short board, and the financing difficulties of small and medium-sized micro-enterprises have become the constraints affecting its development [10]. The block chain technology based on point-to-point strategy can effectively solve this problem. Its widely distributed point-to-point network can quickly realize the direct flow of capital, cash and information between the two entities. The trend of supply chain finance internet is obvious. Therefore, the operation efficiency of supply chain finance is also higher, and supply chain finance also needs the implantation of block chain and other technologies.

## 3. Innovative Application of Block Chain Technology in Cross-Border e-Commerce Supply Chain Finance

### 3.1 Energy Supply Chain Finance Based on Alliance Block Chain

We will create an open platform to allow more investors to participate and truly support the financing of small, medium and micro enterprises. In the whole supply chain finance based on block chain technology, energy equipment suppliers, various financial institutions, enterprises undertaking projects, and regulatory authorities all participate in the whole energy supply process in the form of a node in the supply chain finance. As the core enterprise is located at the core of the supply chain system, it has the function of connecting upstream and downstream enterprises. Therefore, building a block chain system based on core enterprises will have multiple advantages. Valuable information is distributed to each node. After all participating nodes compare records and pass unanimously, the recorded data will be written into the block. At the same time, trust mathematical algorithm is used to build mutual trust. We will build an ecosystem system for the sustainable development of cross-border e-commerce operators, solve the financing difficulties of small, medium and micro enterprises, and accelerate the transformation and upgrading of traditional trade. In the financial field, technological innovations such as block chain are of great significance to the financial industry. It is expected to accelerate the process of “credible digitalization” and continue to drive the financial industry to “move from virtual to real” and promote the upgrading of the entire financial industry. In addition, the de-hierarchical and point-to-point characteristics of block chain technology enable real, direct and complete transaction background to provide information resources for financial institutions to further tap the diversified needs of small and medium-sized enterprises and develop a variety of financial services.

### ***3.2 Integration of Block Chain Technology and Logistics Industry***

Supply chain finance is a strong guarantee for supply chain development. However, the current situation of China's logistics industry is that enterprises are scattered in small disorder, the industry has great potential, credit is lacking, and it is difficult to obtain standardized financial services. Financial services that obtain all kinds of information in three dimensions to control risks at the lowest point. Supply chain finance can help small and medium-sized enterprises reduce the difficulty of financing and improve the speed of capital transfer. It will also extend valuable information downstream to help more end supply chain participants obtain financing services. When the business needs of the core enterprises accumulate to a certain amount, they can integrate the major core enterprises and give mutual assistance schemes to thoroughly solve the problems. This has solved the problems of asymmetric information, non-transmission of core enterprise credit and non-efficient transmission of information in traditional supply chain finance. The block chain will keep a complete and continuous record of the transaction process of the corresponding supply chain financial assets, and better connect the asset end of the core enterprise with the fund end of the financial institution. The attenuation and deviation of information in transmission are reduced, especially the speed of information exchange is improved while avoiding manual operation errors. It improves the efficiency of the whole logistics industry, really promotes the healthy development of the supply chain, and is conducive to the improvement of the overall efficiency and competitiveness of Chinese enterprises.

### ***3.3 Relying on Block Chain Thinking to Build Cloud Platform and Ecological Circle***

Different from the traditional mode of screening and obtaining customers for financial services, cross-border e-commerce supply chain financial services relying on block chain technology must be based on the establishment of a platform and a financial ecosystem, and all transaction and information subjects must be “chained”. We will build a smart financial cloud platform, rely on e-commerce finance, and build a four-pronged platform of “financing, financing, integrating intelligence, and integrating business” to promote the development of cross-border e-commerce and achieve new growth in economic innovation and development. When upstream suppliers initiate financing requirements, they can package the loan amount, repayment time, mortgage collateral, etc. into the contract to obtain credit on the block financial platform. Supply chain financial assets can better realize asset securitization, and also help small and medium-sized micro-enterprises in the supply chain to raise funds from financial institutions. On the intelligent contract platform, downstream small and medium-sized enterprises and block chain technology development companies can establish their own intelligent contracts in the web pages through the LAAS interface of the public block chain. Through the one-click deployment function of the public chain, the cost of online block chain application for enterprises can be reduced. In the construction of block chain, block chain technology can be embedded in the supply chain system, and all financial data and transaction data can be recorded and saved by using digital certificates. The platform should also have the function of a financial supermarket, with financial attributes such as product release and promotion of supply chain finance, credit management, loan granting and repayment tracking management functions.

### ***3.4 Apply Block Chain Technology to Optimize and Expand Cross-Border e-Commerce Supply Chain Financial Services***

The extensibility and durability of block chain technology have certain application value in expanding the scope of financial services. Innovation lies in the need to use new technologies and new technologies to realize operation mode

and product upgrading, and to realize better risk management and higher profit margin. Users can also directly use smart contract templates according to the requirements of public-chain financial partners to quickly modify and define smart contracts that meet customer requirements. The new “block chain+supply chain finance” is formed by integrating block chain technology into core enterprises and further driving the development of upstream and downstream enterprises. On the demand for funds, the amount of funds required is relatively small and the lending speed is required to be fast. Each participant in the supply chain ecosystem can check the progress of goods in the supply chain and know where the containers have been transported. The ability to control risks has been improved. From the point of view of the whole chain, each subject can form direct information exchange, reducing the information attenuation and loss in the intermediate links. To strengthen the legislative research work of the block chain in various application scenarios, to solve the adverse impact of the lagging regulatory system on the development of the financial industry, to use technological innovation to promote the development of the financial industry, and to reduce the risk of financial innovation.

#### **4. Conclusion**

In general, the supply chain finance model established around cross-border e-commerce will play a good role in promoting the development of cross-border e-commerce enterprises. However, this model needs to be more rigorous, conform to the requirements of financial supervision, and use capital in industry. In-depth development of supply chain financial services to promote the development of cross-border e-commerce, its development has become a new growth point for economic innovation and development, building a smart financial cloud platform, relying on e-commerce finance to build a “financing, financing operation, financial intelligence, financial business” four financial platforms. Using the infrastructure of block chain to connect intelligent contracts can improve the efficiency of supply chain finance and reduce the risks of manual operation. Therefore, new information technology has a basis for wide application in the financial field, which needs information technology to realize innovation. Based on the advantages of block chain technology, this paper puts forward the development idea of cross-border e-commerce supply chain finance relying on block chain technology, which helps cross-border e-commerce supply chain finance to further support the development of real economy through finance funding support among supply chain partners.

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