

Research on Application of Supply Chain Finance Based on Block Chain

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Abstract: Supply chain finance has played a positive role in solving the financing difficulties of small and medium-sized enterprises. However, in the actual implementation process, there are still problems such as information asymmetry, doubts about the authenticity of trade background, and high operational risks, which seriously restrict the development of supply chain finance. However, block chain technology has the characteristics of de-centralization, data transparency, common maintenance and non-tampering. Applying this technology to supply chain finance can effectively solve the existing problems. Based on the research on the development status of traditional supply chain finance, this paper puts forward a new development mode of supply chain finance based on block chain technology, and through the analysis of typical cases, finally gives some policy suggestions for the development of block chain supply chain finance.

Keywords: Block chain; Supply chain finance; Dismantling and melting

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Supply chain finance refers to the financial operation mode in which banks and other financial parties surround relevant core enterprises, control or master the information flow and logistics of upstream and downstream small and medium-sized enterprises, and radiate financial products and services to the upstream and downstream or even the entire industrial chain,

so as to solve the financing problems of enterprise procurement, sales and inventory in the supply chain. Due to the special requirements for information privacy and security in the industry of supply chain finance, the current supply chain finance faces many problems^[1]. At the same time, the current supply chain financial systems are centralized systems, which may have problems such as illegal tampering of system contents by central organizations, disclosure of private information of enterprises in the supply chain and so on, further inhibiting the development of the entire supply chain finance.

Block chain has the characteristics of de-centralization, data transparency, common maintenance and non-tampering. Compared with the application in the field of virtual currency, suppliers, core enterprises, banks, financial institutions and other parties coexist in the supply chain financial process. Multi-agent, non-high frequency trading scenarios are more suitable for block chain scenarios. In view of the financing difficulties, expensive financing, chaotic financing and financing risks faced by small and medium-sized enterprises, block chain technology can be used to digitize assets such as accounts receivable, bills, warehouse receipts, etc., and leave data to store certificates to prevent risks such as bill fraud and repeated pledge, thus opening up the trust transmission mechanism in supply chain finance, improving asset liquidity, reducing the financing costs of small and medium-sized enterprises, deeply activating financial resources and effectively assisting the development of the real economy^[2].

1 Analysis on the Current Situation and Causes of Traditional Supply Chain Finance

1.1 Analysis of the Current Situation

1.1.1 Business model dimension

Supply chain finance is based on the real trade situation from the beginning to the end of the supply chain, with the determinable future cash flow generated by trade as the direct repayment source. Capital flow, information flow, logistics and business flow "four flows in one" become the key to supply chain enterprise financing.

The law stipulates that some business information between enterprises needs to be transmitted in the form of paper bills. Information Internet technology will lead to problems such as data security and untrustworthy, accurate and untrustworthy data when building information systems among enterprises. The lack of a unified business information system among enterprises makes it difficult to combine the four flows, thus forming the difficulties of small and medium-sized enterprises in loans, bank risk control and supervision by relevant departments.

1.1.2 Dimensions of Financing Mode

Due to different business scenarios, various financing modes are facing scenario-based problems other than the integration of four flows. For example, under the inventory financing mode, there are risks of warehouse

receipt fraud and warehouse management's self-theft. In contrast, receivables financing is easier to carry out, but it can only help primary suppliers to carry out supply chain financing, and the shortage of funds for multi-level suppliers is still difficult to solve.

1.1.3 Policy Dimension

Policies such as "lowering the standard and supporting banking financial institutions to issue asset-backed securities for loans to small and micro enterprises" have facilitated the development of supply chain finance on the capital side, but the business side still faces problems such as difficult risk control and credit granting for small and micro enterprises. At present, we need to rely on new technologies to change the traditional business model and reduce the difficulty of wind control. At the same time, we can also use core enterprise credit to help more enterprises to realize supply chain financing.

1.1.4 Dimensions of Supply and Demand Contrast

Due to the lack of perfect management mechanism and nonstandard financial statements for small enterprises, it is difficult for banks to carry out effective risk control through information provided by themselves. However, in the supply chain finance mode, the core enterprise credit can only be transferred to the first-level suppliers, and multi-level suppliers cannot use the core enterprise credit for loan financing, thus their efforts to solve the problem of difficult loans for small enterprises are limited.

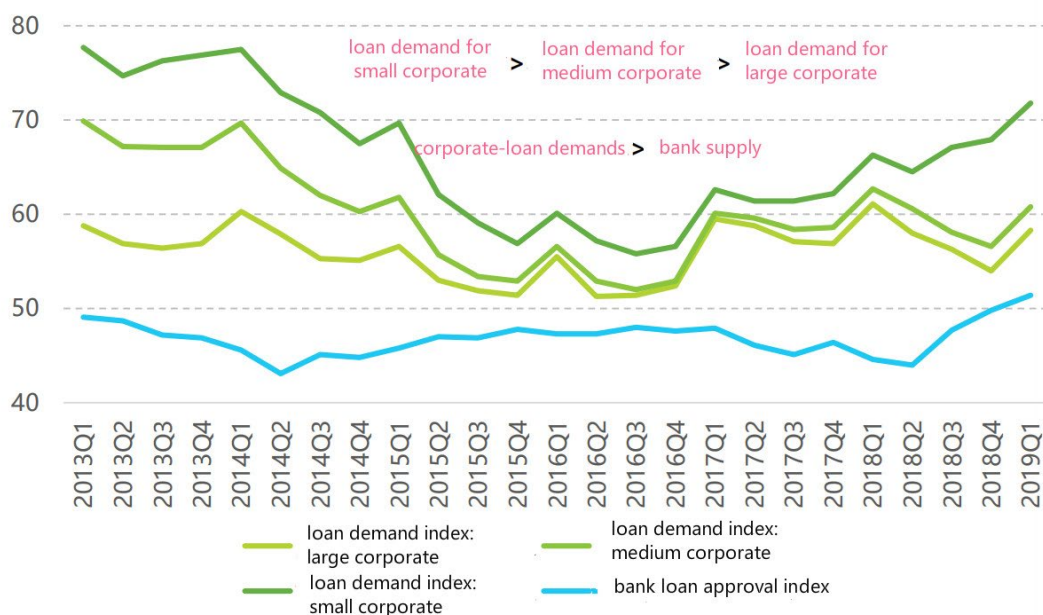


Figure 1. Enterprise Loan Demand Index and Bank Loan Approval Index for 2013Q1-2019Q1

It can be clearly seen from the data in the figure 1.: first, the more small enterprises, the stronger the demand for loans, the higher the corresponding repayment risk, the greater the difficulty of bank lending and the prominent contradiction in supply; Second, the demand for loans from large and medium-sized enterprises has shown a downward trend recently, but the supply side still fails to meet the demand side. This shows that the problem of difficult loans for large and medium-sized enterprises still exists.

1.1.5 Market Scale Dimension

According to the banker's questionnaire, the penetration rate of China's supply chain financial market has been maintained at 21.5% ~ 22.7% from 2013 to 2018 (Figure 2). At present, the innovative means of small and medium-sized enterprise financing business model have been used in every way, but the improvement of business efficiency still cannot be realized^[2]. It can

be seen that the current financial service capability cannot meet the needs of the industry. "Need loan" and "Can loan" are two factors that affect the scale of supply chain financial market. However, enterprises that "need to borrow" will face the problem of "not being able to borrow". Under such circumstances, science and technology will become the key driving force for business growth. Take consumer finance as an example. With the outbreak of China's financial science and technology in 2017, the penetration rate of China's narrow consumer credit has increased from 18.3% to 32.4% in a short period of two years from 2016 to 2018 (Figure 3), greatly reducing the gap between China and the United States in the process of inclusive finance. It can be seen that the upgrading of financial science and technology will effectively promote the capability of financial services, enable more "non-loanable" enterprises to realize "loanable" and release the market scale.

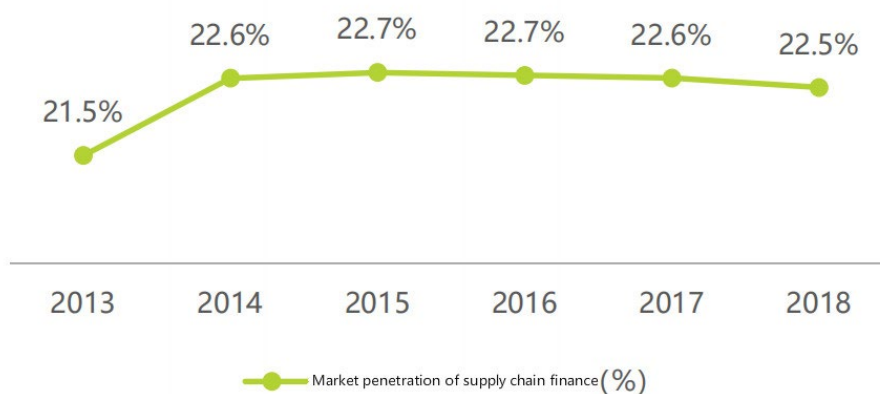


Figure 2. Financial Market Penetration Rate of China's Supply Chain from 2013 to 2018

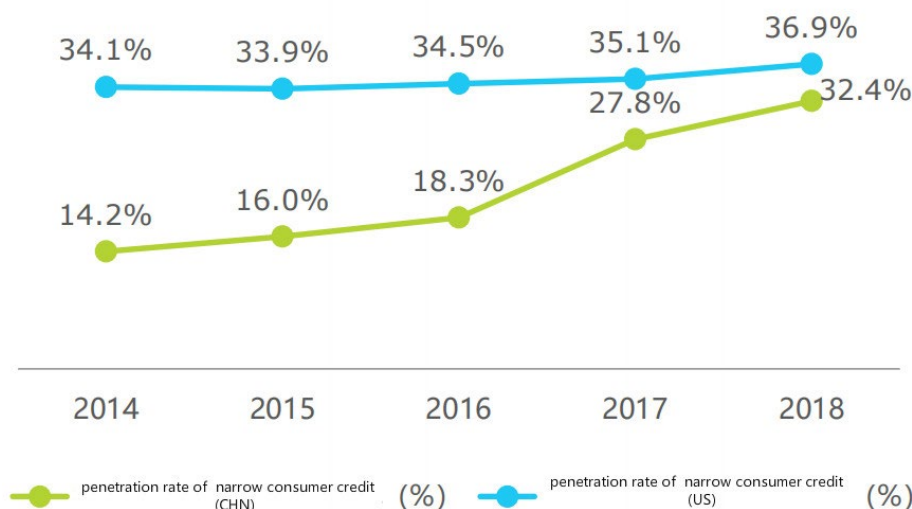


Figure 3. Penetration of narrow consumer credit between China and the United States from 2014 to 2018

1.2 Cause Analysis

1.2.1 Information asymmetry

During the operation of the supply chain, all kinds of information are stored in various links, the supplier's goods information is stored in the supplier's warehouse information, the delivery information is controlled by the logistics company, the capital information is distributed in the banking system, and the information flow information is controlled by the core enterprise. The information in the whole supply chain is opaque and unsmooth. It is difficult for each participant to understand the progress of transaction matters. The high asymmetry of information affects the efficiency of the whole chain and eventually leads to the difficulty in establishing the credit system of the whole supply chain. The financial services provided against the background of supply chain trade are also difficult to carry out efficiently due to information asymmetry. Financial institutions are often more cautious for the sake of wind control.

1.2.2 The authenticity of trade background

In supply chain financing, commercial banks provide financing services for upstream and downstream enterprises in the supply chain on the basis of the real transaction relationship between the parties in the supply chain in the real economy, using accounts receivable, prepayments and inventories generated in the transaction process as pledges/mortgages. In the financing process, the inventory, accounts receivable and core enterprise supplement guarantee behind the real transaction are the fundamental guarantee for credit financing to realize self-compensation. Once the authenticity of the transaction background does not exist, there will be forged trade contracts, or problems in the existence and legality of the accounts receivable corresponding to the financing, or defects in the ownership and quality of the pledge real right, or malicious arbitrage of bank funds by the buyer and the seller in the fictitious transaction. Banks will face huge risks if they blindly grant credit to borrowers without a real trade background.

1.2.3 Business operation risks

Supply chain finance constructs the first repayment source independent of enterprise credit risk through self-compensation transaction structure design, professional operation process arrangement and independent third-party supervision introduction. However, there is no

doubt that this puts forward high requirements for the rigor and standardization of the operation links, which is prone to operational risks. Therefore, the perfection of the operation system, the rigor of the operation links and the execution of the operation requirements will be directly related to the first

The effectiveness of the source of repayment will determine whether credit risks can be effectively shielded.

2 A New Supply Chain Finance Model Based on Block Chain

Block chain technology has the characteristics of distributed data storage, point-to-point transmission, consensus mechanism, encryption algorithm and so on. It provides convenience for the fast confirmation of accounts payable of core enterprises, while reducing intermediate links. Transaction data can be used as certificates. The intermediate links cannot be tampered with and forged, and can be traced back to the source. The upgrading of Internet information technology enables most information and data transmission to be electronic and paperless^[3]. Biometrics can improve the efficiency and accuracy of the identification of business owners and financing representatives. Big Data modeling can screen and accurately picture borrowers' qualifications in advance. All these provide technical preparation and support for the supply chain financial innovation with the block chain as the core.

In the solution based on the block chain, a network of alliance chains can be established in a node-controllable way, covering the trade financing participants such as upstream and downstream enterprises, finance companies, financial institutions, banks, etc. Then, link up the trade data of each node, and record the trade subject qualification, multi-frequency transactions, commodity circulation and other information through the block chain. The purpose of link-up is to keep each node synchronized, and financial institutions can obtain the real trade situation of secondary and tertiary small and medium-sized enterprises. Enterprises with financing needs can register contracts, creditor's rights and other certificates online, which can ensure that the rights and interests of these assets cannot be tampered with or copied after digitalization. Finally, these asset equity certificates will be circulated among the alliances to realize point-to-point connectivity and further enhance the liquidity of digital asset certificates. The supply chain finance solution based on the block

chain can deeply integrate logistics, capital flow and information flow, build a unified method for verifying the authenticity of industry data services, alleviate the

problem of information asymmetry, and enable the supply chain finance services to smoothly carry out based on the intelligent contract attribute.

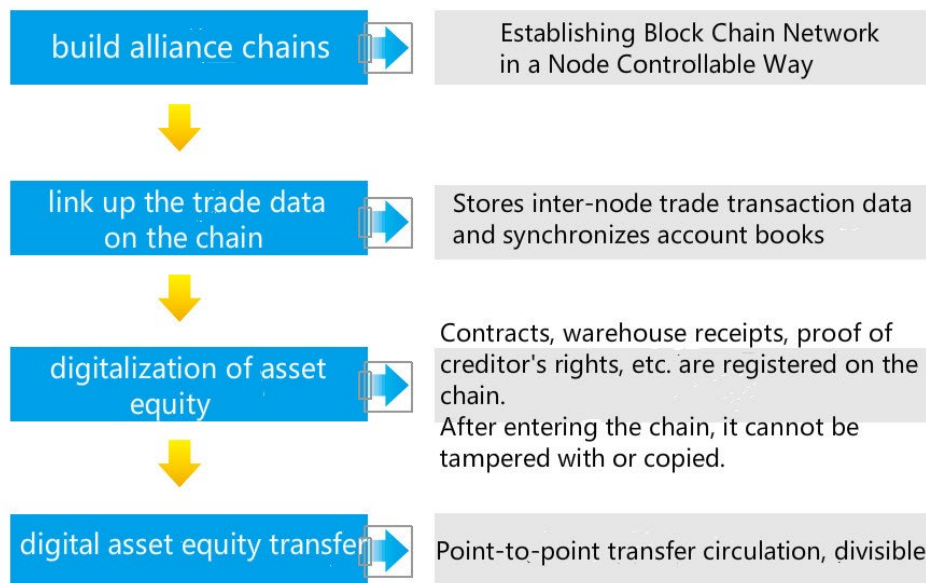


Figure 4. Flow of Supply Chain Finance Solution Based on Block Chain

2.1 The timestamp and data of block chain technology are not tamperable, which can solve the problem of authenticity of trade background to a certain extent. From suppliers, core enterprises and distributors to logistics enterprises, warehousing supervision companies, financial institutions and other participants, all can use block chain technology to form and share various transactions in each link of the supply chain—each transaction forms a network node, the node information is identified through the whole network, the logistics information is reflected through the geographical location information of the goods, and the fund information is timely notified to the payee and financial institutions through the update of the payment information. Accounts receivable information and accounts payable information are timely and accurately updated to both parties to the transaction and financial institutions. Warehouse supervision information is provided to enterprises and financial institutions providing chattel pledge financing in a timely manner through digital information. All parties have obtained first-hand real and effective data from the source and constructed a brand-new and reliable supply chain credit system, thus easing the credit risk problem in supply chain financial services^[4].

2.2 Block chain technology can improve the credit qualification of various entities in the supply chain financial business and reshape the credit system. In the

traditional supply chain finance mode, there is always the dependence on the core enterprise, which is the centralized mode. However, the block chain technology has the remarkable feature of decentralization, which can ensure the integrity and smoothness of information among all subjects in the chain, enhance the credit qualification of all subjects, and establish a distributed credit system. Through the block chain technology, it is expected to extend the traditional supply chain finance of 1+N mode to the supply chain finance of M+N mode. Let the core enterprises do not need to do supply chain finance specifically for supply chain finance, but naturally obtain supply chain financial services in the supply chain business through block chain technology.

2.3 The intelligent contract attribute of the block chain can be integrated into the supply chain finance business to improve the operation efficiency and wind control level of the whole chain. Smart contracts can provide application services for the whole process of factoring such as project initiation, due diligence, business approval, factoring agreement/contract signing, account registration and transfer, trade financing (loan issuance), post-loan management, account settlement and other factoring services, and help factoring enterprises to construct and perfect the operation mode of “internet plus” finance, thus more effectively improving their ability to acquire customers, carry out business, identify and control risks, and provide better financial services

for upstream and downstream enterprises in the supply chain, thus forming a complete supply chain financial ecosystem.

3 A typical case of supply chain finance application based on block chain-accounts receivable voucher “splitting, circulation and financing”

Compared with IT system, block chain can realize multi-party cooperation under the condition of ensuring the data security of all parties. Trade data authorization is visible, thus realizing offline business chain uplink operation, thus improving execution efficiency and reducing execution cost. By virtue of the characteristic that the block chain is difficult to tamper with, the electronic warehouse receipt on the chain avoids the risk of counterfeiting paper warehouse receipts, “IoT+block chain+warehouse receipt pledge” mode can reduce the risk of inventory management and improve the management efficiency^[5]. What is more important is that the circulation of accounts receivable documents not only avoids the risk of paper accounts receivable documents being counterfeited, but also solves the problem of suppliers’ shortage of funds by means of core enterprise credit through “splitting, circulation and financing”, thus greatly improving the penetration rate of the supply chain financial market. The dismantling and conversion of receivable vouchers has become the core value of block chain supply chain finance, and is also the main application mode of block chain technology landing supply chain finance in the industry at present.

At this stage, the main problem faced by the block

chain in the supply chain finance landing is the inefficient transfer of vouchers. The main scenarios faced can be classified into four categories: first, suppliers at all levels in the core enterprise industry chain have little knowledge of the core enterprise, lack trust and doubt the validity of vouchers; The second is the issue of the accounting period of the voucher. For example, the voucher is a non-factoring (or reverse factoring) receivable that needs to be cashed when it expires. The recipient is in urgent need of cash flow and is unwilling to factoring by itself, so it refuses to accept it. Third, enterprises lack initiative in using vouchers under the circumstances that suppliers are not willing to accept vouchers and do not lack working capital. Fourth, disputes between enterprises affect the circulation of vouchers. For example, if a primary supplier in the industrial chain of a core enterprise has an economic dispute with other enterprises, the competent authority requires the financial department of the core enterprise to stop payment and pay the payables under the voucher to other accounts after the voucher expires.

Solution 1 and 2 of the problem: The block chain system records the issuance and redemption of each voucher of the core enterprise, and integrates the notarization records of the central bank and the ticket exchange to solve the problem that the voucher receiver has doubts about the validity of the voucher. At the same time, bills of different account periods can be replaced by constructing a bill pool to solve the problem of blocked voucher circulation caused by different account periods.

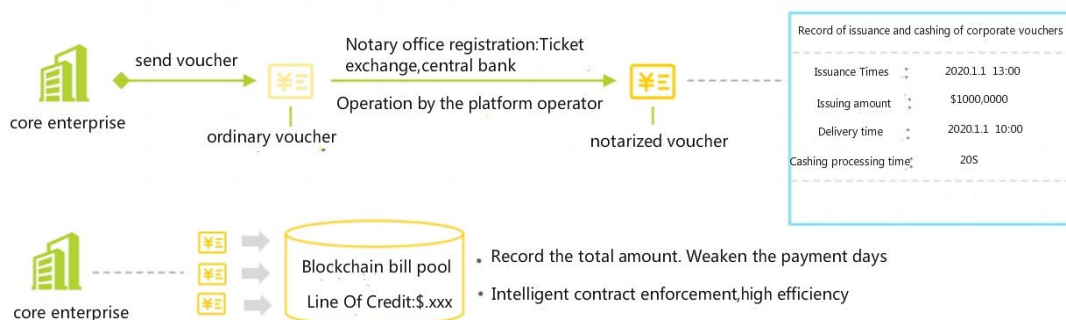


Figure 5. Strategies for dealing with the risks of economic disputes

Solution to Question 3: During the product construction period, a convenient and simplified process operation can be adopted, and the services of the mobile terminal and the PC terminal can be used to ensure that there are no obstacles to the user’s operation experience.

At the beginning of the operation, incentives can be adopted, for example, vouchers can be used to record points, points can be exchanged for low-cost financing opportunities, platforms can recommend high-quality suppliers or business opportunities, etc.

Strategies for dealing with the risks of economic disputes in question 4: The first step is to scan the original documents and send them to the system background, freeze all the vouchers, and all the unfunded fragments of the vouchers will not be able to be circulated and financed; The second step is to export the evidence of the voucher splitting, circulation and financing, as well as all certification documents and hash numbers, led by the funder, and the core enterprise and the operator jointly issue an objection letter; The third step is to unfreeze part of the voucher after receiving the court's feedback document and the notice of termination of execution. Other payments under the voucher are changed to end-to-end payment. Core enterprises complete point-to-point payment based on account books. In the fourth step, if the certificate expires but the core enterprise has not yet received the exemption notice, it is suggested that the platform construct a bridge fund as a temporary emergency strategy for the shortage of funds.

4 Suggestions for Supply Chain Finance Development Based on Block Chain

4.1 Strengthen the research on block chain technology and attach importance to the construction of talent team

We will promote innovations in key technologies in the block chain, such as consensus mechanism, cryptographic algorithms, cross-link technology and privacy protection. At the same time, it is oriented by the demand for talents, trains and attracts a number of specialized talents in the block chain, and provides intellectual support and talent support for the development of the block chain.

4.2 Explore the Essence of Supply Chain Finance and Pay Attention to Business Innovation

Before applying the block chain technology to supply

chain finance, it is necessary to fully understand the essence and logic of various services of supply chain finance. Instead of looking for nails everywhere with a hammer, it is necessary to have an essential understanding of various services in order to find the correct practical path. Supply chain finance also needs to innovate with the blessing of block chain technology and mature technology to create new business models and promote another qualitative leap in the supply chain finance industry.

4.3 Building a Perfect Financial Ecology of Block Chain Supply Chain

At present, the application of block chain in supply chain finance does not have a perfect ecological system. Apart from designing a reasonable incentive mechanism to attract participants, the practice of block chain technology in supply chain finance needs a comprehensive layout, including technical research, business model exploration, landing scene, standardization work, supporting facilities, financial supervision and regulations, etc.

References

- [1] Tang JB. Thinking on the Application of Block Chain Technology in Supply Chain Finance[J]. *Regional Finance Research*, 2018, (08): 24-26.
- [2] Wang WJ. Research on the Bottleneck of Supply Chain Finance and SME Financing Based on Block Chain Technology[J]. *Journal of Changchun Normal University*, 2018, 37(07): 58-62.
- [3] Chu XJ, Gao B. Research on Supply Chain Financial Innovation Driven by Block Chain[J]. *Financial Development Research*, 2018, (08): 68-7.
- [4] A Dasgupta, R Nagaraj, K Nagamani. Block chain platform for industrial internet of things[J]. *Journal of software Engineering and Applications*, 2016, (9): 533-546.
- [5] Francisco K, Swanson D. The Supply Chain Has No Clothes: Technology Adoption of Block Chain for Supply Chain Transparency[M]. *Logistics*, Springer International Publishing, 2018, 2(1).