

Research on Warehouse Receipt Pledge Financing Model Based on Blockchain Technology

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ABSTRACT. *In recent years, the warehouse receipt pledge financing has developed rapidly in China, and the diversified development of its business model has made the risk more and more prominent, mainly in the aspects of legal risk, market risk, management risk, credit risk and pledge risk. Therefore, after fully demonstrating the necessity and feasibility of introducing the blockchain idea in the warehouse receipt pledge financing, the warehouse receipt pledge financing model based on blockchain technology is constructed from the perspective of risk aversion, and the challenges that may be faced in the implementation process are discussed. With corresponding countermeasures, it provides a certain reference for the application of blockchain in the field of supply chain finance.*

KEYWORDS: *Blockchain; Supply chain finance; Warehouse receipt pledge financing*

1. Development status of warehouse receipt pledge financing mode

With the further development of socialized production methods, the market has been transformed into competition between “supply chain – supply chain”. In the process of competition, in order to reduce the overall management cost of the supply chain and improve the efficiency of capital operation, a unique commercial financing model emerges as the times require - supply chain finance. Through the underlying penetration of industrial data, it can comprehensively control the whole enterprise in the industrial chain, and provide a comprehensive set of financial services to promote smooth and stable flow of corporate capital flow and “production-supply-sale” chain in the supply chain, reducing the operating costs of the entire supply chain, but also transforming the relationship between “enterprise-enterprise” and “enterprise-banking” to form a real economy and promote the symbiotic development of enterprises.

At present, China's supply chain finance benefits from the continuous improvement and expansion of commercial paper, accounts receivable and financial leasing market, and its development is relatively rapid. As a typical representative of supply chain finance, warehouse receipt pledge financing is a new type of financial service business that was put into practice at the earliest, mainly involving banks,

financing companies and third-party logistics enterprises. For banks, warehouse receipt pledge financing on the one hand increases lending opportunities, provides new profit growth points, and on the other hand transfers the regulatory risk of goods to third-party logistics companies [1], to some extent, reduce regulatory costs and reduce loan risk. For financing enterprises, the development of warehouse receipt pledge financing can solve the current situation of financing difficulties, provide financial guarantee for the development of the enterprise itself, and improve the performance of the enterprise. For third-party logistics companies, warehouse receipt pledge financing can not only broaden the scope of business, improve the profit growth space, but also improve its various services, attract more customers, and enhance the core competitiveness of enterprises. However, the development of China's warehouse receipt pledge financing is not mature, and business management and models are still being explored continuously. Therefore, it is necessary to actively combine new technologies to explore and find a more suitable operation mode for enterprise application development.

As a new frontier after big data and intelligent investment, “blockchain” is becoming a new wind outlet for all walks of life to break through and rebuild. As a new financing model combining production and finance, supply chain finance should sharply capture the value of blockchain technology as the underlying architecture, explore its application in the supply chain finance field, and diversify supply chain finance, innovative development. It can be foreseen that when the blockchain changes the traditional industry operation mode, whether it is supply chain finance, logistics, identity authentication, including people using cryptography algorithms to calculate the supply chain, etc., will promote the enterprise and business concept to a new height [2].

2. The main risk of the warehouse receipt pledge financing model

With the continuous development of warehouse receipt pledge financing in the field of supply chain finance, the diversification of business models, and the complex rights, responsibilities, interests and operational links of banks, financing companies and third-party logistics companies, the risk is increasing. [3], its internal and external risks are shown in Figure 1.

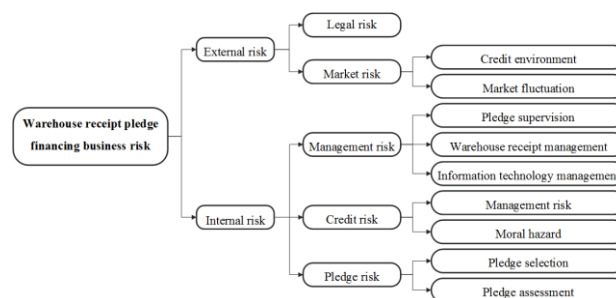


Figure.1 Warehouse receipt pledge financing risk classification

2.1 Legal risks

China's warehouse receipt pledge financing has developed rapidly. In the course of specific business operations, if the financing enterprise fails to return the loan on time or the third-party logistics enterprise fails to perform the warehousing supervision duties as agreed, banks can avoid and recover losses by cashing pledges, and protect their own interests by legal means. However, at present, the construction of relevant laws and regulations in China is very imperfect, and there are no clear regulations on many issues, which has led some enterprises to exploit the loopholes in the law and bring risks to the banks. This is also an important factor restricting the development of warehouse receipt pledge financing in China.

2.2 Market risk

Credit environment risk. Since the late 1980s, credit problems have plagued Chinese people. The phenomenon of “repudiate a debt”, “triangular debts”, “sell seconds at best quality prices” and “For optimal filling of inferior quality” has led to an increase in transaction costs, and problems such as bank reluctance to lend and enterprise precious little cast have disrupted the Chinese market. The economic order has reduced the vitality of the market economy and created a large moral hazard.

Market fluctuation risk. With the improvement of China's market economy, market price changes will become more frequent. In the warehouse receipt pledge financing, the valuation of the pledge is based on the market value over a period of time. Once the market price fluctuates greatly, the pledge value assessment will be distorted, and the pledge value will not be enough to mortgage. The problem of loans has brought certain risks to the pledge financing of warehouse receipts.

2.3 Management risk

Pledge supervision risks. The supervision and management of pledges is an important part of the smooth development of warehouse receipt pledge financing. However, at present, many third-party logistics enterprises in China have backward infrastructure, unregulated management, and cannot realize real-time sharing with banks through Internet platforms in terms of pledge information and management. Therefore, there will be information asymmetry, lag in information communication and information distortion between banks and third-party logistics companies, which will lead to a series of risks such as damaged pledges, shoddy goods, repeated pledges and illegal misappropriation, will eventually bring losses to the three main participants.

Warehouse receipt management risk. The warehouse receipt is the only certificate for pledge loan and delivery in the warehouse receipt pledge financing, so it must be standardized, fair and credible. However, although the State's “Contract Law” has certain norms on the contents that must be recorded on the warehouse

receipts, it does not make it fully capable. Because the current third-party logistics companies use warehouse orders that are designed and arranged by themselves, and even some enterprises directly use the warehouse receipts as pledge documents and use bills of lading to act as delivery documents, so that the pledges are identified and managed. The difficulty is increasing, which brings risks to the entire financing business.

Information management technology risks. With the continuous development of warehouse receipt pledge financing, the requirements for information technology are also getting higher and higher. Having an advanced and good information management platform is an important part of ensuring the smooth development of warehouse receipt pledge financing. As a bank, the information management platform is an important basis for monitoring and controlling loans. As a third-party logistics company, the information management platform is an important channel to understand the name, model, quantity, grade, quality, ownership and other information of the pledge of the financing enterprise. However, the development of information management technology for warehouse receipt pledge financing in China is relatively backward. The informationization started late and the degree is low. Most enterprises also adopt manual operation methods. The acquisition of relevant information is incomplete and the operation is not rigorous, which greatly increases the pledge of warehouse receipts financing risk.

2.4 Credit risk

The construction of enterprise credit system of all parties in China lags behind the development needs of market economy seriously, which leads to fake and inferior commodities in the market, and the phenomenon that enterprises evade taxes and evade debts is repeatedly prohibited [4]. Therefore, credit risk is the biggest risk faced by warehouse receipt pledge financing.

Operational risk. Due to poor management in the production and sales process, the financing enterprise has deteriorated its financial situation, unable to repay the loan on time or unable to repay the loan, so that the bank bears the risk of loss of credit funds.

Moral hazard. When applying for a loan, the financing company deliberately conceals the information that is not conducive to its own enterprise to the bank and the third-party logistics enterprise, so that the bank and the third-party logistics enterprise bear the risk of loss of credit funds, and there are false reports on the operation of the enterprise, breach of contract, forgery, and change the warehouse order, the pledge property rights are unknown, the value of the pledge is raised, and the pledge is shoddy.

2.5 Pledge risk

Pledge selection risk. In the warehouse receipt pledge financing, not all pledges meet the requirements. Because the quality, price and other factors of the goods may

change with time. This change will bring certain risks to the warehouse receipt pledge financing. Therefore, the risk of pledge selection has the risk that the pledge's own property is not rigorously examined, the pledge object is misidentified, the market condition of the pledge is improperly evaluated, and whether the pledge is insured.

Pledge assesses risk. Due to the lack of sufficient technology and experience of third-party logistics companies, it is impossible to establish a perfect value evaluation system, resulting in inaccurate value judgment of the pledge and distortion of the market price, so that the value of the pledge is not enough to mortgage, thus giving the warehouse receipt pledge financing brings certain risks.

3. The construction of warehouse receipt pledge financing model based on blockchain technology

As a distributed ledger, the blockchain is not fully mature, but it establishes a low-cost trust mechanism based on mathematical algorithm, which provides a way to improve the related risk issues in the supply chain finance field with kind of new ideas.

3.1 Characteristics of blockchain technology

Decentralized. At present, almost all traditional trading modes are centralized operations, that is, the completion of information gathering, contract formulation, and credit endorsement in the transaction process centered on financial intermediaries, and are specially maintained by specialized organizations and professional technicians. In the blockchain, there is no third-party organization responsible for operation management, that is, each node is jointly responsible for data recording and storage [5].

De-trust. In traditional market economy transactions, credit evaluation is carried out through the guarantee of financial intermediaries. The blockchain relies on decentralized databases and asymmetric encryption to complete credit endorsements, and all contracts, requirements, rules, etc. are expressed in advance through procedures. Thereby achieving consensus, establishing credit and reducing transaction costs [6-7].

De-privilege. In the previous data model, the parties only saw personal transaction information, and only the administrator could see all the transaction information. The blockchain is open to all participants and the data is highly transparent and open. Each party can query and trace each block as the supervisor and view each transaction detail [8-9].

De-risk. Blockchain is an open and transparent distributed accounting system. The transaction information of each node above is verified and backed up by all participating nodes. Therefore, any participating node cannot tamper with the data alone, and the more information nodes on the chain, the less likely the account is to

be lost. Because only all the nodes on the chain are destroyed, they can be lost, thus ensuring the security of the account data [10].

3.2 Analysis of the Necessity and Feasibility of Introducing Blockchain

Through the exploration and analysis of the block model in the supply chain finance field, the warehouse receipt pledge financing model, the blockchain can significantly improve and evade the management risk, credit risk and pledge risk of warehouse receipt pledge financing. [11]

Help rebuild the social credit system. At present, in the process of developing warehouse receipt pledge financing, the credits of financing enterprises and third-party logistics enterprises need to be established through banks. In the process, once the bank's credit evaluation is biased (the evaluation result is higher than the actual credit situation of the enterprise), it is easy to generate credit risk. The blockchain financing mode fundamentally changes this centralized credit creation mode through the decentralization of blockchain. It establishes a "trust" network between "blocks-blocks" through hash algorithm, which greatly reduces the cost of credit creation and helps rebuild the social credit system [12].

Effectively predict market demand and fluctuations. Through the integration and analysis of the flow information of each commodity in the block chain, it can effectively help enterprises make decisions in various links, such as procurement, production, transportation, storage and sales, so as to make decisions more precise and accurate. For example, through the sales data information shared by all parties in the blockchain, third-party logistics companies can analyze the sales trends of pledges and forecast market demand, so as to accurately estimate the pledges and avoid the distortion of pledge value; Financing enterprises can also accurately formulate sales plans through analysis of relevant information, so as to avoid the risk of losing credit funds due to the failure to repay debts as scheduled due to poor management.

Intelligence reduces manual error. In the current process of warehouse receipt pledge financing, as the only proof of mortgage loan and delivery of goods, warehouse receipt is disordered in form, irregular in operation, and even empty and false warehouse receipt, which brings great risks and hidden dangers to the development of financing business. In addition, in the process of the development of warehouse receipt pledge financing, it is necessary to sign a number of agreements, which are also retained by manual processing and paper materials, which is not only error-prone but also increases transaction costs. However, with the blockchain, the value transfer between the "blocks and blocks" can be directly completed, and no specified bills and manual verification are required, which not only speeds up the operation rate of the business, but also avoids many human losses caused by operational errors and can reduce labor costs. The blockchain records all the information of any item from the source in real time on the blockchain, and makes the identity of the item completely transparent based on consensus mechanisms and non-tamperable features. When the third-party logistics enterprises and banks

inspect and supervise the pledges, they can grasp the properties, legality and other real situations of the pledges in the first time through the blockchain, so as to avoid the pledges and credit risks caused by the financing enterprises' counterfeiting of the pledges.

Improve supply chain efficiency. The existing financing mode of warehouse receipt pledge is based on the contract signed by the financing enterprise and the bank to conduct transactions. However, in the specific implementation process, if the financing enterprise intentionally conceals the information of capital investment projects and situations, the bank has no way to verify, which brings hidden dangers to the bank's credit funds. The blockchain is added to the smart contract, and after the implementation of the agreed matters of the contract parties reaches the consensus, the pre-set data program, when the financing enterprise meets the requirements, the smart contract automatically triggers the completion of the payment, signing, etc., greatly improving the efficiency of pledge management and the substantial reduction of labor costs [13].

3.3 Construction of blockchain financing mode

The basic operation flow of the warehouse receipt pledge financing model based on blockchain technology (referred to as "blockchain financing mode") is shown in Figure 2.

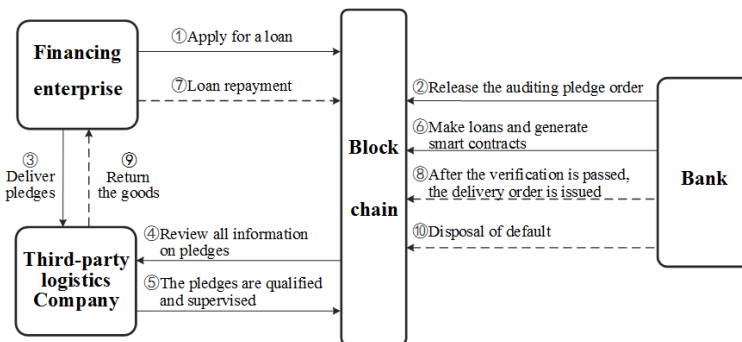


Figure.2 Basic operation flow of blockchain financing mode

The specific operation process is described as follows:

(1) If the financing enterprise wants to lend to the bank, the information that it tends to lend to the bank is stored in block 1, and block 1 is broadcast to the bank.

(2) After the bank receives the broadcast of block 1, if it wants to lend to the financing enterprise, the block 1 with the financing company applying for the loan information is time stamped and added to the blockchain; At the same time, the bank will need to review the requirements of the pledge and the information required by the financing enterprise to deliver the pledge to the designated warehouse of the

third-party logistics enterprise, and block 2 will broadcast the information to the financing enterprise; The bank will store information on the pledge of the financing enterprise in block 3, and block 3 will broadcast to the third-party logistics company.

(3) After receiving the broadcast of Block 2, the financing enterprise shall, if it agrees to the bank's request for review of the pledge, deliver the pledge to the designated warehouse of the third-party logistics enterprise, and the financing enterprise shall accept the bank's request for the examination of the pledge and Block 2, which requires the financing enterprise to deliver the pledge to the designated warehouse information of the third-party logistics enterprise, is time stamped and added to the blockchain; The financing company stores the storage agreement information in block 4, and the block 4 broadcasts the broadcast to the third-party logistics enterprise.

(4) After receiving the broadcasts of block 3 and block 4, if the third-party logistics enterprises agree to review the pledges they receive, block 3 with the information of pledges of financing enterprises that need to be reviewed and block 4 with the information of warehousing agreement stamped with a time stamp will be added to the block chain; At the same time, third-party logistics enterprises can extract the chains with the information of pledges through block chain and review the pledges.

(5) After passing the examination, the third-party logistics enterprise stores the supervision information in the chain where the information of the pledges is stored, and stores the information of the pledges being qualified and assisting the bank to execute the pledge guarantee certificate in block 5, which is released and broadcast to the bank.

(6) After the bank receives the broadcast of block 5, if it agrees to the supervision of the third-party logistics enterprise, the block 5 with the information to assist the bank to execute the pledge certificate is stamped with the time stamp and added to the blockchain; At the same time, the bank will store the information on the account supervision agreement and the smart contract (the behavior of completing the payment, signing, etc. when the financing enterprise invests and sells in accordance with the requirements of the bank), and the block 6 publishes the broadcast to the financing enterprise; After the financing company accepts the broadcast of Block 6, if it agrees to the terms of the account supervision agreement and the smart contract, the block 6 with the consent to issue the loan and the smart contract information is time stamped and added to the blockchain. The bank stores the warehouse receipt pledge three-party cooperation agreement information in block 7, and block 7 broadcasts to the financing enterprise and the third-party logistics enterprise. After receiving the broadcast of block 7, if both the financing enterprise and the third-party logistics enterprise agree to the tripartite cooperation agreement of warehouse receipt pledge, block 7 with the information of warehouse receipt pledge tripartite cooperation agreement stamped with the time stamp will be added to the block chain.

(7) The financing company will repay the loan item to the bank's designated account, and store the loan repayment and application for picking up or replacing the

goods in block 8, and block 8 will broadcast to the bank.

(8) After the bank receives the broadcast of block 8 and verifies the return of the funds, if it agrees to the requirements of the financing enterprise to apply for picking up or replacing the goods, block 8 with the information of loan repayment and application for picking up or replacing the goods is stamped with a time stamp and added to the block chain. The bank stores the release information in block 9, which is released and broadcast to third-party logistics enterprises. The bank stores the transaction ending information in block 10, which publishes and broadcasts to the financing enterprise.

(9) After receiving the broadcast of block 9, the third-party logistics enterprise shall return the goods to the financing enterprise, and block 9 with release information shall be stamped and added to the block chain. After the financing enterprise receives the broadcast of block 10, if it receives the goods returned by the third-party logistics enterprise and the audit is correct, block 10 with transaction completion information will be stamped and added to the block chain.

(10) if the financing enterprise fails to repay the loan within the specified time limit, it will be deemed as a breach of contract. The bank may store the order (auction or repurchase) information on the disposal of the pledges in block 11, which will be broadcast to the third-party logistics enterprise. After receiving the broadcast of block 11, the third-party logistics enterprise disposes of the pledges in accordance with the instructions. In addition, block 11, which contains the instructions (auction or repurchase) for the disposal of the pledges, is stamped with a time stamp and added to the block chain. At this point, the transaction is complete.

4. Challenges and countermeasures faced by block chain financing

The research and application of block chain technology is at the initial stage at present. Although it has broad opportunities and development prospects, it also faces many problems and challenges.

4.1 Challenges faced by block chain financing

The legal and regulatory aspects of the blockchain are not perfect. The decentralization of blockchain has weakened the powers and responsibilities of China's judicial system and financial regulatory institutions, and the characteristics of traceability and anonymity have also brought tremendous impact on China's existing financial regulatory system and model. Therefore, China is still cautious about the development of blockchain.

The blockchain industry lacks elite talent. In the past two years, the gradual rise and development of the blockchain has made the call for education in the blockchain industry more and more high. Many enthusiasts are very enthusiastic about the study of blockchain technology, but most of them stay at the basic stage, and both cross-border talents who understand blockchain technology and supply chain

finance are rare. Therefore, the lack of talents undoubtedly restricts the application and development of block chain technology in the field of supply chain finance [14].

Blockchain performance problems remain to be broken through. Blockchain is an innovation in Internet finance technology, but its own technology is in the initial stage of development. The blockchain throughput is small, with at least 10 minutes of transaction delay per transaction confirmation, and only 7 transactions per second, which is very slow compared to any current trading platform. Moreover, as the blockchain needs to carry all the information of financing transactions, the information written in the block will increase infinitely as the transactions continue to be transmitted, thus the problems of verification, information storage and capacity brought about are expected to be solved [15]. In addition, all transactions of blockchain are automated, and the risk of technical and operational errors is inevitable. If the system continues to execute according to the wrong program without timely detection of errors, the impact will be magnified [16].

Blockchain technology has not been standardized. Block chain technology has not been completely standardized and unified in China. When enterprises introduce blockchain technology, some only partially adopt the idea of blockchain, while others develop their own independent private block chain. Some of them even directly adopt the recognized bitcoin blockchain technology, which brings great difficulty to the overall operation and supervision of blockchain. Moreover, if the participants adopt their own technology and methods, there will be coexistence and competition of various blockchain application architectures and standards, resulting in greater division.

Blockchain docking centralized platform is more difficult. The application of blockchain in the field of supply chain finance needs to go through the process of self-innovation of centralized financial institutions, gradual social recognition of decentralized financial institutions, and mutual penetration and reference. For Banks, breaking the inherent centralized basic supervision system and building a new decentralized system will face great resistance and cost a lot of human, material and financial resources [17].

4.2 Solutions to blockchain financing

The government and regulatory authorities have increased their support. The decentralization of the blockchain can fundamentally circumvent the risks of the traditional supply chain financial model, but if it is to be fully implemented, it must have a good management mechanism to protect and supervise. The state and relevant financial regulatory authorities shall, within the premise of fully understanding the characteristics, potential uses, and cost benefits of blockchain technology, incorporate blockchain technology into appropriate regulatory systems, invest extensively in resource research and trial, and actively support the reform of the warehouse receipt pledge financing model.

Strengthen the training of talents in the blockchain industry. Major domestic universities should gradually introduce blockchain courses and related majors, and

train relevant talents to lay the foundation for the future development of China's blockchain and its application in the supply chain.

Deepen the research and development of blockchain technology. The relevant departments of our country should actively participate in various international blockchain organizations and participate in the formulation of international rules and standards.

At the same time, as soon as possible, the association of academic circles and industry will form a domestic blockchain research organization. Then strengthen the research and development of China's blockchain technology and industry standards, grasp the new trends in the field of blockchain technology, promote the research and development and innovation of the core technology of blockchain, and strive to take the initiative and win the right to speak in future applications. At the same time, it should increase the investment in network infrastructure, including blockchain system, fiber optics, etc., to build a strong backbone information network [16], and form an infrastructure platform suitable for China's supply chain financial market.

Actively try the use of blockchain. In the initial introduction of blockchain in China's supply chain finance sector, the participating entities should be the research object, and actively adopt the habits and needs of the participating entities to improve the blockchain financing model. The first step is to encourage enterprises to adopt a centralized or multi-centered blockchain financing model, to involve participating entities and regulatory authorities as the main nodes, and to explore the benefits and improvements of the model, and lay the foundation for the further application and development of the blockchain financing model.

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