



# Warehouse Receipt Financing Governance Optimization Based on the Blockchain

Xiao-xi Zheng and Cheng-yong Liu<sup>(✉)</sup>

College of Marine Culture and Law, Jimei University, Xiamen 361021, Fujian, China  
chengyong\_liu@yeah.net

**Abstract.** Warehouse receipt financing contributes to settling financing difficulties in middle and small-sized enterprises. Although the Warehouse receipt financing framework is becoming increasingly mature, violations are still inevitable and they may thus undermine the soundness of the financial market. The blockchain has been highlighted in the capital market thanks to its advantages of decentralization, tamper-resistance, high transparency, etc. Moreover, China has launched an online whole-process electronic Warehouse receipt financing business based on the blockchain. From the perspective of combining the blockchain with Warehouse receipt financing, this study probes into how to compensate for defects and legal loopholes in the Warehouse receipt financing process based on new techniques such as the blockchain and the Internet of Things (IoT).

**Keywords:** Blockchain · Pledge by Warehouse Receipts · Supply Chain Finance

Middle and small-sized enterprises in China generally face financing problems, which is mainly attributed to the shortage of an effective mortgage guarantee mechanism. Although the right pledge mechanism stipulated in the Civil Code of the People's Republic of China breaks a new path of financing (e.g., pledge by warehouse receipts) for such enterprises, they are also confronted with new moral hazards due to information asymmetry between the bank and the enterprise. More particularly, these moral hazards cover fake warehouse receipts, loose goods control, and internal corruption. Besides, many serious problems can be thus incurred, including repetitive inventory pledges and illegal transfers after the pledge. Fortunately, with technological progress, blockchain technology has been proven to perform excellently in documentation and traceability in certain key processes of electronic warehouse receipts, such as their generation, circulation, and cancellation. In this way, both the authenticity and validity of the warehouse receipt information can be ensured. On August 17, 2023, the first whole-process online electronic warehouse receipt financing business based on the blockchain was completed in Longwan Harbour District of Wenzhou Port through joint efforts of Zhejiang Seaport and Ningbo Zhoushan Port [1]. This is a breakthrough on the path to digital supply chain service innovation for port and shipping. Therefore, this study focuses on the advantages of blockchain-based Warehouse receipt financing and relevant legalization issues.

# 1 Warehouse Receipt Financing and Practical Predicament

## 1.1 Scientific Principle Orientation of Warehouse Receipt Financing

Warehouse receipts are important vouchers in warehousing. They have multiple characteristics. Generally, they are deemed as a type of negotiable securities.<sup>1</sup> According to essential attributes of negotiable securities, they are used to identify and demonstrate certain property rights; and securities owned are an indispensable condition for exercising such rights. As far as the fundamental ideas of negotiable securities are concerned, some scholars further define the attributes of warehouse receipts; that is, the warehouse receipts are formal, endorsed, inscribed, and abstract securities [2]. As a part of logistics finance, warehouse receipts are more closely correlated with warehousing, a link of the logistics operation chain. This makes warehouse receipts significantly different from the bill of lading. Clearly, warehouse receipts play an important role in confirming the warehousing state of goods and conducting a pledge guarantee. Comparatively, the bill of lading merely emphasizes the transportation stage and it is used to clarify the ownership of goods and various state information during their transportation.

Based on the fact whether the validity of warehouse receipts covers transfer and pledge, different countries adopt different philosophies in their instance of legislation, including “One Receipt Philosophy”, “Double Receipt Philosophy” and “Combination of One Receipt and Double Receipt Philosophies”. In China, the “One Receipt Philosophy” is put into force. More specifically, the depository only **issues one sheet of the warehouse receipt**, and this receipt is provided with transfer and pledge functions. As illustrated in Fig. 1 below, a warehouse receipt pledge involves financing enterprises that use their goods stored in a warehousing enterprise as collateral and apply to a bank for a loan. In this course, warehousing enterprises issue a warehouse receipt in line with the situation of goods storage; and then the financing enterprise may request a bank loan based on this receipt. The bank may evaluate the credit standing of the corresponding financing enterprise at the time of reviewing the value of the pledged property. After comprehensive consideration, the bank determines whether to serve a loan or not [3]. Without a doubt, warehouse receipt financing plays a significant role in the modern trading market. It substantially improves the safety in warehousing. Instead of private warehouses which may lack proper control, goods are stored in a supervised public warehouse. In this way, both the safety and transparency of transactions can be further boosted [4].

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<sup>1</sup> As formal securities, warehouse receipts conform to legal forms and hold recorded items so that their validity can be ensured. As endorsed securities, the rights are transferrable through endorsement, which facilitates cargo movement and transactions. For warehouse receipts as the document of title, their holders are entitled to the ownership of stored goods; and the right transfer and warehouse receipt transfer can be completed synchronously. Warehouse receipts can be also used as the literal instrument; and rights and obligations therein are determined all based on the items recorded. In this case, they are inscribed securities where the information of the depositor should be clearly recorded. Additionally, warehouse receipts are abstract securities, which means that the exercise of rights relating to them are separated from the reason why they are issued. Therefore, both transaction efficiency and safety are guaranteed.

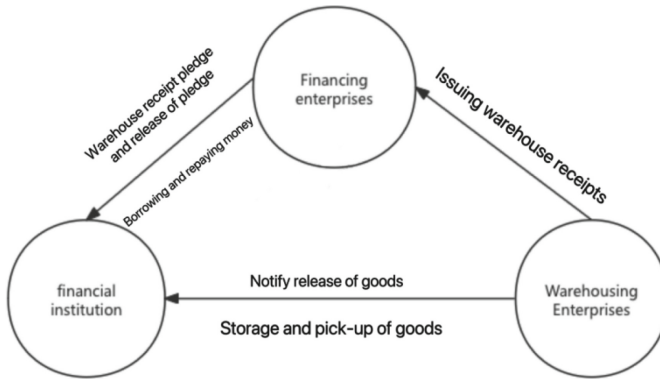


Fig. 1. A Flow Chart of Warehouse Receipt Financing

## 1.2 Law Lagging and Operational Risks

### 1.2.1 Law Lagging of Warehouse Receipt Financing

In the Chinese legal system, the stipulation on warehouse receipt pledge behavior in the *Civil Code* is primarily derived from the preceding *Contract Law* and *Property Law*. However, it is pointed out in the academic circle that China's legal norms relating to warehouse receipts remain principled and general. In the opinions of Zhao Jing and Zhao Lixin (2010), although legal standards have been raised in China for warehouse receipts and the pledge by warehouse receipts, such standards fail to entirely meet practical needs and the construction of the corresponding legal system is relatively backward [5]. For example, provisions on electronic warehouse receipts can be hardly found yet. From the perspective of international law, concrete norms on procedures and contents of electronic warehouse receipts have been creatively strengthened in the Law of Warehouse Receipt Standards (Draft) prepared by the United Nations Commission on International Trade Law. Despite that, specific articles in the Draft are more like framework guiding principles in essence. As for some complicated problems, such as malicious tampering of warehouse receipt information to conceal the truth and repetitive mortgage, there are still no direct detailed evasion and settlement mechanisms. Consequently, these problems may pose real challenges in practice.

### 1.2.2 Operational Risks of Warehouse Receipt Financing

Concerning international trade, the pledge by warehouse receipts often relates to a wide variety of participants, including new transferors and transferees. Consequently, the process of warehouse receipt circulation and ownership confirmation becomes more complex. In line with the traditional warehouse receipt circulation model, the ambiguity of proprietary right ownership caused by secondary pledges can be very significant. Besides, some stakeholders such as borrowers and the depository probably take advantage of the weakness in the corresponding warehouse receipt pledge right protection system to extract credit funds by unlawful means. This may further aggravate market

instability and risks.<sup>2</sup> Specific to the problems described above, a conventional means of public summons may be selected to supervise and control the whole process of warehouse receipts. For example, financing enterprises need to register and publicize cargo and warehouse receipt information on a third-party platform according to the requirements of financial institutions on the one hand; and on the other hand, the financial institutions need to confirm the uniqueness and clarity of the relationship among warehousing enterprises, warehouses, and the warehouse operating platform. However, the involvement of the third-party platform undoubtedly leads to a higher transaction cost and a more cumbersome transaction flow.

## 2 Blockchain and Warehouse Receipt Financing

### 2.1 The Technical Principle of Blockchain

As a model in a peer-to-peer network (PPN) environment, blockchain can be used based on rules of transparency and credibility to construct unforgeable, tampering-resistant, and traceable linked data structures, thus conducting and managing transaction processing. The earliest study on blockchain should be traced back to an article written by Harber and Stornett in 1991. In that article, they put forward a timestamp record method for digital files [6]. Since Satoshi Nakamoto publishes “Bitcoin: A peer-to-peer electronic cash system” [7], the blockchain has been more profoundly investigated. Although no consensus has been reached on the definition of blockchain, it is interpreted in this study as an innovative data management method in a narrow sense. It is capable of connecting data blocks in series according to time sequence and thus constructing a special data structure. The core strengths of this data structure can be described from the following two aspects. One is the Decentralized Shared Ledger design; and the other is data integrity and authenticity guaranteed based on principles of cryptology. Overall, it effectively and safely stores concise and explicit information that can be verified in the corresponding system and has a definite time sequence. Through such a tampering-resistant and highly decentralized mechanism, blockchain technology succeeds in tremendously enhancing the transparency and traceability of the transaction process, because each transaction leaves a clear and verifiable trace. Therefore, blockchain provides strong technical support for the digital transformation of modern society. Without any doubt, the blockchain technology keeps updating. Ethereum (ETH) initiates an era of Blockchain 2.0 and another era of Blockchain 3.0 will be definitely developed [8]. Generally, it is believed that Blockchain 2.0 shows great potential for development in the financial field. In its development course, ETH systems have played an extremely critical role by virtue of their innovative application of the Smart Contract.

### 2.2 Application of Blockchain Technology in Finance

In the wave of financial technology (Fintech), digital supply chain finance emerges as an innovative credit mode increasingly applied in practice. It combines the essences of

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<sup>2</sup> E.g., “Warehouse Receipt Pledge Out-of-Control: A Repetitive Mortgage Event of Spot Trading of Aluminum Ingot Warehouse Receipts” taking place recently.

blockchain and supply chain finance and initiates a new financing channel for middle and small-sized enterprises through concrete projects such as Ant Double Chain and Tencent WeChain. This mode can be used to achieve deep data mining, including logistics, cash flows, and information flows generated during transactions between core enterprises in a supply chain and their up/downstream partners so that a financial solution can be customized for enterprises along the entire chain. However, the promotion of traditional supply chain finance has encountered the difficulty of information authenticity verification. Especially in scenarios of goods mortgage financing, the banks are limited by their capability of accurately assessing the business background and collateral values in most cases. Due to the complexity of the supply chain and limitations of the bank's oversight capability, confirmation of transaction authenticity is costly and suffers certain blind spots, providing favorable conditions for the occurrence of fraudulent conduct. Besides, risk events such as false mortgages and one item pledged to two or more creditors (e.g., the "Shanghai Steel Trade Case" [9]).

The fusion of supply chain finance and blockchain presents an extremely significant cooperative effect. Characterized by decentralization, blockchain can construct a credit system spontaneously in the system. In this process, it requires no credit endorsement which is necessary for a conventional centralized mechanism. In this way, the process of "Financial Disintermediation" is profoundly facilitated, which constitutes a subversive challenge to business models (e.g., third-party payment and funds trusteeship) that rely on intermediaries. In the vast space of Internet Finance, blockchain shows its unique adaptability. Especially in emerging business modes such as equity-based crowdfunding, P2P Network Lending, and Internet insurance, the application of blockchain not only improves transaction transparency and safety, but also simplifies the transaction process and reduces the cost. As far as securities and banking industries are concerned, blockchain also plays an essential role. Traditional securities trading is concerned with complicated coordination among multiple centralized institutions such as China's central settlement institutions, banks, securities companies, and exchanges. However, blockchain significantly simplifies this process through its automated smart contract and programmability. As a result, not only is the transaction cost reduced, but treatment efficiency is improved. Hence, the trading of financial products becomes more rapid and more convenient [10].

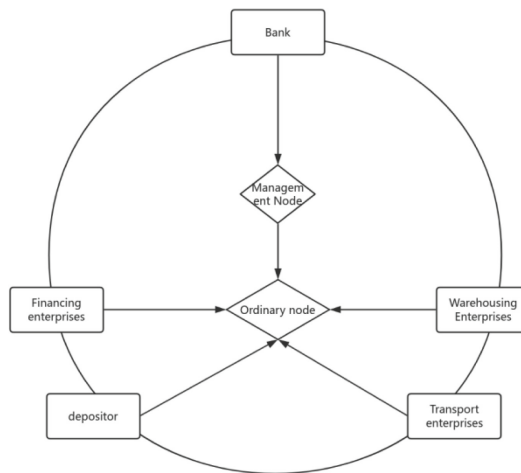
## **2.3 Advantages of Applying the Blockchain in Warehouse Receipt Financing**

### **2.3.1 Blockchain-Based Warehouse Receipt Financing Operation**

As described above, the pledge by warehouse receipts relates to many complicated subjects. The corresponding operational process frequently has some hidden hazards. For example, a lawbreaker may take advantage of loopholes to evade legal restraints. To effectively solve this problem, blockchain technology has been introduced and become a powerful instrument. It is capable of significantly alleviating the above difficulty. According to network characteristics, blockchain technology mainly consists of public blockchain, consortium blockchain, and private blockchain. Among them, the public blockchain is famous for the fact that it is completely open to all users. Due to a high degree of privacy, the private blockchain has been frequently applied in the internal

governance and management of enterprises. Considering the specific demands of the pledge by warehouse receipts, the consortium blockchain mode seems to be greatly suitable [11].

As shown in Fig. 2, participants of the consortium blockchain are limited to consortium members. As for read-write access permission and the permission to participate in bookkeeping, they need to be stipulated according to the provisions of the consortium. Inventory financing administration authority is characterized by gradability. Relevant commercial banks (i.e., financing institutions) not only possess a distributed ledger permission and partial data read-write access permission but also control the corresponding consensus process and participate in the formulation of consortium blockchain rules. Regarding enterprises and any third party mentioned in a warehouse receipt, the consortium blockchain provides a flexible and convenient participation/withdrawal mechanism. Thanks to this mechanism, such entities can effortlessly upload necessary information associated with financing as required, directly take part in the business transaction process, and witness and supervise the transaction process. Under such circumstances, there is no need for them to directly assume responsibility for recording data on the blockchain. Therefore, this mechanism ensures data transparency and transaction traceability on the one hand, and effectively maintains data safety and privacy on the other hand.



**Fig. 2.** A Schematic Diagram of the Pledge by Warehouse Receipts in the Consortium Blockchain

## 2.4 Effects of Applying Blockchain in Warehouse Receipt Financing

First, applying blockchain in warehouse receipt financing has certain effects on financial institutions. When blockchain technology is applied in warehouse receipt financing, fraud risks can be eliminated. A cloud chain platform uses blockchain technology to ensure the authenticity of warehouse receipts, which effectively removes hazards of warehouse receipt forgery and repetitive mortgage, and achieves consistency between

the property in goods and the property right. Additionally, intelligent management after a loan is also realized. With the Internet of Things (IoT), the platform can monitor res pignori datae in a real-time manner. Combining the mark-to-market mechanism, financial institutions can dynamically learn about the particulars of goods, lower the transaction cost, and boost risk management efficiency. Besides, the business scale can be expanded. As the blockchain platform emphasizes the financing logic of “Being Material-Oriented”, financial institutions can make financing decisions based on the quality of goods rather than the identity of the financing party. In this way, more high-quality middle and small-sized enterprises can obtain financial support; and financial institutions can take this opportunity to go deep into the corresponding industry and offer digital financial services. In other words, both business expansion and service mode upgrades are facilitated [12]. In a context where the banks can hardly grasp either ownership or flow direction of the inventory dynamically, blockchain technology is utilized to achieve real-time monitoring and tracing of them thanks to a unique chain structure, the Merkle or hash tree, and the timestamp technique. These technologies ensure both traceability and tampering resistance of data. Banks can use these technologies as a reliable means to realize real-time sharing and flow direction tracing of inventory ownership. Finally, information transparency of the supply chain finance can be substantially boosted [13].

Second, applying blockchain in warehouse receipt financing has certain effects on the three parties of a pledge. Since the introduction of blockchain, operational procedures of the pledge by warehouse receipts have been simplified and the efficiency of the pledge by warehouse receipts is also enormously improved. Because of information transparency, the clear and standardized operational procedure wins more trust among the three parties of the pledge, which lowers the trust cost. As an electronic warehouse receipt system is combined with blockchain technology, the entire operational process has been covered, including warehouse receipt application, examination and approval, generation, transfer, financing, delivery, and cancellation. After registration, a depositor may apply for a warehouse receipt accordingly. Once this application is checked and approved by the warehousing enterprise, it indicates that system examination and approval have been completed. The warehouse receipt for which the depositor applies can be immediately generated and publicized. This receipt is available for transfer, which requires confirmation by the transferee and the warehousing enterprise and also the completion of ownership transfer in the system. If financing is needed, the depositor may contact a financial institution through the smart contract to fulfill the operational procedures of the pledge and make a loan. The holder of the warehouse receipt is allowed to apply for taking delivery of goods; and the depositor is permitted to apply for warehouse receipt cancellation. In this process, all parties may check the real-time state and circulation information of the warehouse receipt on a warehouse receipt registration and publicity platform, thus ensuring the receipt is authentic and effective. In this way, not only do up/downstream enterprises along the industrial chain face fewer risks, but it may assist the funding party in improving the fund security.

### 3 The Route of Rule of Law for Blockchain-Based Finance

Eventually, the blockchain-based electronic warehouse receipt financing business is carried out. Its implementation is ascribed to the maturity of blockchain technology and also needs to be comprehensively evaluated in combination with operational procedures, cost-income ratios, regulatory requirements, etc. [14] To be concrete, the application of blockchain is still confronted with many problems, such as the “Chain-level Isolated Island”. As an increasingly prominent phenomenon, it means that blockchain systems in different institutions and different applications fail to achieve effective interconnection, which leads to the formation of an information-isolated island and hinders the comprehensive development of supply chain finance. In addition, information authenticity verification before the information is exported into a blockchain is still a great challenge; and the absence of a definite legal regulatory framework and compliance guidelines also limits the extensive application of blockchain in supply chain finance. However, the application of blockchain technology in the financial field has a significantly promising prospect thanks to the refinement of relevant operational procedures and the improvement of relevant supervision legal systems.

There always exist two opposite attitudes towards blockchain technology regulation. On the one hand, blockchain technology is highly praised. In this viewpoint, blockchain is believed to generate a new model of human governance, which is impossible for any country or government to realize [15]. On the other hand, blockchain technology is deemed as a mere technique that needs to be regulated by the government. In this study, it is pointed out that blockchain technology at present requires proper regulation at least. To overcome the above problems, and promote the sound development of blockchain in supply chain finance, the following measures are suggested: (1) To boost Inter-Blockchain Technology research and application, build interconnected consortium blockchain, break the “Chain-level Isolated Island”, and realize effective intercommunication and information sharing of different blockchain systems; (2) to strictly select and verify the information before it is inputted into the blockchain with the help of advanced technologies (e.g., IoT and big data), and thus ensure the authenticity of information sources; (3) to reinforce data governance and privacy protection, and guarantee both safety and compliance of data; and (4) to strengthen the regulation of compliance system building, improve relevant laws and regulations, and policy guidance, and further provide the application of blockchain in supply chain finance with a definite legal framework and clear compliance guidance.

Through the implementation of the above measures, blockchain will be more widely and more deeply applied in the field of supply chain finance, provide more convenient, more efficient, and safer financing support for middle and small-sized enterprises, and promote the sound development of the supply chain finance industry.

### 4 Conclusions

Blockchain technology can be used to construct an open, transparent, and tampering-resistant transaction environment, suppress the pursuit of selfish interests or gains, and facilitate arm’s length transactions of different institutions. Through this technology,

mutual supervision among multiple institutions is achieved, which can alleviate underhand collusion and obtain good standing of the credit system. However, legal construction matching rapid development and extensive application in more than a decade of blockchain technology still lags. Under circumstances that blockchain technology keeps upgrading and its application scenarios keep expanding, the existing legal system is already not enough for regulation, protection of the rights and interests, data security guarantee, etc. Considering this, further improving legal measures of blockchain technology is a general direction of legal construction in the future.

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