Internet Supply Chain Financial Model and Risk Management Research Based on Blockchain Technology

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Abstract. Internet subversion and innovation make the supply chain finance moving in the direction of the Internet, that is, the Internet supply chain finance. This article considers the main body of the internet supply chain which began to become diversified, that individuals also participate in the Internet supply chain finance, from financial institutions, core enterprises to the upstream and downstream SMEs, and logistics companies. The study focuses on the Internet supply chain financial model supported by big data and the related risk factors. To solve the risk factors it demonstrates the application mechanism and framework of the blockchain technology in the financial risk management of Internet supply chain. It also take the receivable account of Internet supply chain as an example to explain how to use the blockchain technology in Internet supply chain finance.

Introduction

Supply Chain Finance refers to the definition of supply chain finance based on the analysis of the transaction structure within the supply chain, using the financing model and introducing new risk control variables such as core enterprises, logistics supervision companies and capital flow guidance tools, to provide closed credit support for different nodes in the supply chain and other integrated financial services such as settlement and wealth management. Now the participation of Internet companies makes big data widely used in supply chain finance. The integration of Internet with supply chain finance has created a new mode. The combination of industrial internet and supply chain finance, that is, Internet supply chain finance

Cronin (1997) first mentioned that e-commerce will become an important area of financial services, and B2B e-commerce transactions create the conditions for Internet financing (Cronin 2001). Information technology plays an important support in supply chain finance, including business support, risk management and control, and channel expansion (Cheng Hao Liang, 2012). Kaplan (2000) proposed the concept of E-hub (e-hub) and introduced the e-hub as a financing service for buyers and sellers in the supply chain aggregation model. However, the enterprises providing online transactions should provide timely and responsive supply chain financing services to respond to market changes (Chen, 2012). Applying the supply chain financing model to B2B e-commerce can effectively enhance the comprehensive economic benefits of the financing business stakeholders and effectively reduce the financing risk (Li Weijiao, 2011). Yuan(2014) argues that Internet supply chain is the inheritance concept of Internet finance and supply chain finance. It combines the virtual process, cost control and risk management of virtual finance, convenience, innovation and supply chain finance. Song &Chen(2016) elaborated the characteristics of supply chain finance in different stages of development (supply chain finance 1.0, supply chain finance 2.0 and internet supply chain finance), and discussed the new development of supply chain finance - Internet supply chain finance Trait theory. They pointed out that supply chain finance promotors, supply chain structure, processes and elements directly determine the performance targets of Internet supply chain finance.

The Internet supply chain financial model is divided into six modes: e-commerce dominant, commercial bank dominant, core business dominant, IT business dominant, logistics enterprise dominant and third-party platform dominant etc. from the perspective of organization (Huang et al., 2016). At present, it mainly includes the prepayment financing during the procurement phase, the pledge financing of movable property during the operation phase and the receivables financing during the sales phase. Such loans are subject to direct or indirect losses resulting from the concentration of
risks in the entire industrial chain, core corporate risks, market price fluctuations in pledged goods or corporate assets, imperfect or problematic internal processes, personnel, systems or external events risks. How to effectively deal with and utilize the data in the Internet has become a serious challenge for the financial industry and also this is an opportunity for our country's supply chain finance practice and research.

**Analysis of Internet Supply Chain Financial Operation Mode**

This study defines the Internet Supply Chain Financial Operation Mode Based on Big Data (ISCFBD) under the support of big data as financing for small and medium-sized enterprises based on Internet platform. Based on the analysis of the transaction structure in the supply chain, this paper introduces new risk monitoring variables such as internet finance platform, e-commerce network enterprises and logistics supervisory companies, and provides credit support and other settlement and wealth management for different nodes in the supply chain financial services. The pattern is a pattern of "N + 1 + M" where "N" represents each of the different entities in the supply chain, "1" refers to the platform and "M" refers to a number of investors, including individual investors.

We divide the participants into four categories: Supply Chain Network and Organization Industrial Network, Internet supply chain financial core enterprises; Credit, Information Service Providers and Capital Investors. Macroeconomic aspects of the Internet supply chain of financial eco-environment include legal and technological environment. The legal environment guarantees good protection of the rights of creditors. Internet supply chain finance core enterprises include e-commerce network enterprises, Internet supply chain finance platform, etc. Enterprises in the supply chain can do business activities though the platform. Credit information and information service providers include the PBC, the Customs and Excise Department, the taxation and other departments, and provide the credit information of enterprises and operators to the Internet supply chain financial platform for credit assessment of borrowers. Capital investors can be individual investors, but also institutions, through the platform to select the appropriate project investment. Borrowers provide true transaction data through real supply chain networks and organization of industrial networks and seek guarantee services from core enterprises, and apply for financing to the Internet financial platform. The Internet financial platform dynamically measures the real transactions of enterprises from more dimensions based on the Internet and big data and other various behaviors to assess financing risks and provide financing solutions such as internet receivables financing, internet prepay account financing, internet order financing and internet movable property pledge financing; and many investors in the platform choose the right ones according to the assessment report project investment.

**Internet Supply Chain Financial Risk Monitoring Factor Analysis**

The core of Internet supply chain finance is still information, assets, capital, credit and risk control. As a financial platform serving the supply chain under the trend of "financial disintermediation," Internet supply chain finance brings together idle resources in the supply chain to small and medium-sized enterprises that need it. Its main role as a risk intermediary and information intermediary.

As a risk intermediary, the internet supply chain finance platform brings together credit risk, market risk, exchange rate risk and interest rate risk, and reorganizes risks for all stakeholders in the supply chain economy, designs different internet supply chain financial products, and guarantees the stability of earnings and capital structure reasonable.

As an information intermediary, the Internet supply chain platform has the privilege of collecting the information of lenders and therefore has advantages over the investors and can provide a platform for the disclosure of information between borrowers and lenders. The information disclosure mechanism should be set up from the perspective of investors to minimize the risks as far as possible and the problem of adverse selection. However, the following problems still exist. The risk stems from the Internet supply chain financial participants in the financial activities of the future uncertainty, including supply chain financial risk and Internet risk, market risk, credit risk, liquidity risk, opportunity attention, moral hazard, technical operation Risk, etc.
The main source of risk in the Internet supply chain finance is information asymmetry. To solve the problem of information asymmetry, the financial service provision platform needs to be neutral and decentralized, allowing related transaction content and applications to be managed by supply chain participants or related stakeholders visit. That is the most important three areas: visibility, process optimization and demand management. we need to use big data, information, through risk identification, monitoring and management to prevent risks.

**Internet Supply Chain Finance Based on Blockchain Risk Control Mechanism**

"IoT + Interconnect + Industry" to Create Real-time Data Flow Regulation of Movable Property

Under the big data model, risk assessment and credit monitoring need to make use of e-commerce network enterprises to bring small, medium and micro-enterprises and their supply chains into the ranks of the Internet supply chain finance to form a closed supply chain system and achieve information symmetry. Considering both historical data and real-time data, we can comprehensively identify the operational capabilities, potential capabilities and potential risks of financing objects. Therefore, the Internet supply chain financial platform needs to have the ability to analyze real-time large-scale data and predict the supply chain operation status in the short-term.

First, the key to create a real-time data stream is to "connect." Through the "Internet of Things", we connect the goods in the supply chain to the Internet. Internet of things through intelligent perception, recognition technology and pervasive computing and other communications technologies, according to the agreed agreement, connect any item with the Internet. The core and foundation of the Internet of Things is still the Internet, which is an extension and expansion of the network based on the Internet. Its client extends to any item for information exchange and communication.

The use of the Internet of Things can help supply chain financial platforms monitor the movable property as a pledge, "Internet of Things + Cloud." Internet supply chain financial network cannot work without a strong platform. The IT system of supply chain financial platform should have the ability to collaborate and manage the hybrid-cloud, with the requirement of business diversity, architectural complexity, and real-time data.

**The Basic Paradigm of Internet Supply Chain Financial Credit System - Based on the Blockchain to Share Credit**

Based on transactions, orders, chattel pledges and other Internet supply chain financing, the most basic needed is to ensure that transactions, orders, assets and other real and effective, real-time monitoring. In the "Internet of things + Internet + industry" system, the Internet, GPS, Internet of things makes business transaction information, people and goods location information, Internet of Things information all recorded. As more and more devices create vast amounts of data, organizations want to create and use that data with the Internet of Things, but the security and accountability will be a major hurdle.

Therefore, while creating real-time data-regulated movable property, we have built an open-source transaction database based on a "blockchain," merging the blockchain database into an IoT solution may be one way of ensuring the security of these data and ensuring that the device is accurate registration and reporting information, providing a credible blockchain record address to ensure the visibility of transactions, authenticity. Through the blockchain to solve the IoT massive equipment and nodes between the trust issues and financial transactions. Various devices will be able to communicate with blockchain-based classification accounts to update or validate smart contracts.

When Internet-connected packets are sent along multiple distribution points, information such as location and temperature of the packet can be updated in real time on the blockchain, the parties dynamically sharing the packet's information and dynamics to ensure compliance with the contract

The terms.
Blockchain-based Internet Supply Chain Finance

The theoretical basis of the Blockchain dates back to a series of essays that Haber & Sturinetta published in 1991. The blockchain was initially used in bitcoin transactions. It is a public account of all the bitcoin transactions that have taken place across the Internet, and a trustless credential for all transactions on the Internet.

The blockchain consists mainly of three key components: transactions, transaction records, and systems that validate and store transactions. The blockchain is not only for trading, but also as a database and inventory tracking, monitoring, transferring all assets for recording (physical assets, intangible assets, transaction records, etc.) for generating and recording information about transactions and chronological order of all transactions, and this series of information is stored in so-called "blocks." The so-called block, is the information "blocks" linked to form a chain of mutual verification. Any node can join or leave the chain at any time, the entire chain is updated from time to time, modify the information broadcast to all nodes through the entire network, all nodes through the algorithm to agree and store the modified content to their respective databases. All the chain shares a large distributed database (i.e., a shared ledger), each node's small database somehow stores full or partial information that is transparent and visible to members of the chain in real time.

Blockchain technology's core technologies include four aspects: shared books, smart contracts, privacy protection and consensus algorithms. Its application is not limited to digital currency, which through the design of the algorithm removes the intermediary guarantee process, allowing online payment to be directly initiated and paid by one party to the other party in a peer-to-peer manner, without interrupting any financial institutions or intermediaries. This process also applies to any other valuable information transfer, and the entire process cannot be tampered with. It allows multiple parties to securely and reliably transfer and store information. It allow secure transactions without the need to use the central agency such as banks.

The supply chain includes suppliers, manufacturing companies, distributors, logistics companies and customers. In general, participants in the supply chain can be located in different parts of the world and each participant is responsible for funding their own operations and inventories. Traditional supply chain finance is the generic term for a variety of financing instruments to fund parties in the supply chain. The most commonly used letter of credit (LC) for online financing. The biggest advantage of a letter of credit is that it is safe to pay (guaranteed by the bank), but it creates a relatively tedious process that is costly and error-prone and involves the financial intermediary in dealing with the transaction. Blockchain is a way to centralize this ledger, with an almost automated and error-free system. Supply chain through the digital system transactions can be monitored through blockchain technology, so that enterprises and funding providers can easily monitor the supply chain, speed and reliability have been improved, suppliers are waiting to be processed When no longer in the purchase process of the unfavorable position. Including upstream and downstream firms in the supply chain into a single block, adding them to banks or Internet financial institutions in which they can form a shared account to the Internet supply chain based on industry-wide sharing. The entire industry can see the real-time changes in the data in the shared books, such as cargo shipping, freight contracts, payment processes, inventory, sales data, lending up and down, etc. and form a whole industry with valuable financial information Real-time big data diagram.

We quoted the "blockchain" mechanism (or protocol) in Bitcoin to the Internet supply chain finance, that is, the entire network accounting, time stamping, all the participating organizations of the supply chain, accounting for transactions together, notary together, rather than believe any one organization or person. Confirmed every 10 minutes, which forms a ledger database "block" that records the entire supply chain network (no double payments), i.e., blocks. If all participating organizations in the supply chain agree on a consensus, then everybody admits that the information on this block really which cannot be tampered with in principle. And then each legitimate block into a chain is the block chain to form a distributed consensus database to build a set of general security and credit linked to a set of accounting system. By the automatic constraint of the algorithm, any malicious deceiving system will be checked.
The certification function announces the authenticity of something, such as intellectual property. Blockchain technology has two important functions: hashes and secure timestamps. Any digital asset (any file, picture, weblog, health record, software, etc.) can be displayed in a blockchain that can be used to certify information in a supply chain transaction, including all documents, events, certification and assets. Blockchain works by compressing a file into a 64-bit code (known as a hash) using a standard algorithm that is uniquely associated with this file. This correspondence process cannot be deduced by calculation. This hash value is then written into a blockchain transaction, adding a timestamp - evidence of the asset at the moment. Whenever an asset needs to be validated, the hashing algorithm calculates the content, assigns the new code, and adds a secure timestamp, otherwise the hash will remain unchanged. The data records in the database form the credit system, which is linked to the asset, i.e. "shared credit." After the establishment of big data, shared finance can share credit.

**Internet Supply Chain Financial Network Online Big Data Processing and Application Framework**

In the Internet supply chain financial system, you can access the data of supply chain enterprises as well as the transaction data of electricity providers such as Alibaba and the data of individual investors. Unlike traditional books, the ownership of distributed ledgers is collective, and the blockchain is cloned at every node participating in the computer network. Differential Analysis System ensure that local copy to keep pace. Therefore, based on the "blockchain" agreement system, the Internet supply chain financial network can collect multi-party transaction data, registration data to other docking, precipitate information and credit, increase credit, and build a distributed credit system.

Blockchain as the underlying technology, in essence, is an information technology. Blockchain is a decentralized and collaboratively shared technical approach. Its infrastructure allocates global resources in a decentralized manner, making the blockchain an ideal technical framework for promoting socio-economic development.

This study illustrates the big data processing and application framework of online supply chain financial network based on the financing model of receivables in internet supply chain.

Credit sales in the supply chain is the main sales method, suppliers generally bear the pressure of tight cash flow. Supply chain receivables financing refers to the business for the acquisition of operating funds, the seller and the buyer signed a real trade contract arising from the accounts receivable, provided for the seller, and the contract under the accounts receivable as a repayment Source of financing business. Offline transactions, the supplier make transactions with downstream companies firstly, downstream companies issued accounts receivable documents. The supplier transfers the accounts receivable documents to the financial institution while the supply chain manufacturer makes the payment commitment to the financial institution. Financial institutions now provide suppliers with credit loans to ease the financial pressure on suppliers. For the account receivable transferred to financial institutions by upstream firms, the authenticity of the trade context and the receivables payment information are the two key points deserving most attention, as the former is the basis for the entire financing business and the latter is Guarantee of financing risk control. Financial institutions need to verify the authenticity of their supply chain operations and the instruments themselves, adding to credit risk and wind-control costs. At the same time, the implementation costs and the scope covered by the supply chain are all the problems existing in the traditional supply chain finance.

Receivables financing is introduced into the Internet supply chain finance where borrowers secure their own receivables as financing and secure funds to support production and sales activities. The source of repayment of financing is the cash flow generated from the recovery of trade receivables. The difference is more on Internet finance data collateral, electronic vouchers accounts receivable, with a focus on analysis of the authenticity of accounts receivable to account for the aging of the regular verification, control of cash back and audit of the enterprise.

In the internet supply chain financial model, due to the fact that the investors are multi-parties and most small and medium-sized investors can not examine the authenticity of the credit and bills of the core enterprises on the spot. Internet supply chain finance emphasizes efficiency, therefore, it needs
to solve the problems such as fake tickets during ticket circulation and repeated verification of authenticity, and need to verify the authenticity of the supply chain business and the instrument itself. The authenticity of bills and transactions, we provide solutions through the supply chain finance based on blockchain. As shown in Figure 1, the financing process is:

![Diagram](image)

Figure 1. Internet of things/Blockchain supply chain trading system-ticket rotor system.

1. Suppliers (SMEs, the same below) sign contracts with core enterprises and generate smart contracts to write blockchains;
2. The suppliers shall first release the goods (including electronic labels) to the core enterprises and form the transaction information of the internet of things and blockchain system goods transactions;
3. When the core enterprise receives the goods and confirms the receipt, it shall issue the accounts receivable bills, form accounts receivable, and write into the blockchain bill circulation system to form document vouchers;
4. The supplier according to the block chain electronic bill receivables, transaction information and physical interconnection of cargo information and other electronic voucher sent to accounts receivable as collateral financing application to the Internet supply chain finance platform; And then platform sends the assignment to the core business Receipt notice.
5. Core enterprises confirm the transfer of accounts receivable information;
6. The internet supply chain finance platform conducts rigorous risk control and qualification examination through creditworthiness of core enterprises, creditworthiness of loan enterprises, the authenticity of transactions in blockchain system and logistics network system, and forms a quality assessment report of project lending information release.
7. Investors should choose the investment projects for project financing according to the report;
8. Finally, the Internet supply chain finance platform will issue financial support to suppliers up to the limit of accounts receivable based on the raised funds.
9. SMEs pay interest according to the contract;
10. Core enterprises pay the purchase price to the Internet supply chain financial platform;
11. Internet supply chain finance platform pays principal and agreed interest according to agreement with investors.

In the receivables financing mode, the main corresponding information flow is the blockchain transaction information flow, the Internet of Things cargo location information flow and e-commerce, logistics business transaction information flow. Ticket flow through the blockchain technology to solve its authenticity and effectiveness; source of funds is involved in Internet finance, multi-investors.

The flow of information in the blockchain is as follows: When an enterprise node creates a transaction, the node establishes links with many other nodes and broadcasts the transaction, confirming transactions (including the confirmation of transaction notes such as contracts, transaction
records, accounts receivable, etc.), forming a block join in the existing blockchain, if a new transaction occurs on this transaction, a new block with new transaction information is regenerated to join the original blockchain and the transaction is completed. Through the use of blockchain technology, all trading participants dispersed throughout the country can leave data documents (smart contracts, key data, identity information, etc.) through the network platform, the assets such as accounts receivable and bills cannot be tampered with, to prevent the counterfeiting of bills, repeated pledges and other risks. The operational logic is to be able to optimize peer-to-peer resources, global collaboration and the sensitivity of fostering and encouraging the creation of social capital in society. Credit costs built on big data can be extremely low, and participants accumulate credit by participating in notary and transactions.

Summary
This study based on the research literature of internet supply chain finance in recent years analyzes the risks existing in the internet supply chain model, proposes the internet supply chain financial operation mode supported by big data and the financial risk of internet supply chain based on blockchain technology control mechanism, and explores the method and process of blockchain application in this mode. Through the "IoT + Blockchain," real-time tracking of goods and related transactions, real-time risk calculation, early warning and forecasting. This article is mainly on theoretical analysis, the method of monitoring the specific risk is not detailed, which is the follow-up study.

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