

## 블록체인기술이 무역결제방식에 미치는 영향에 관한 연구

조소<sup>1</sup> · 황기식<sup>2\*</sup>

### The Impact of Blockchain Technology on Banks' Conventional Trade Settlements

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#### 요 약

블록체인은 분산 데이터 저장, 점 대 점 전송, 컨센서스 메커니즘, 암호화 알고리즘 등을 핵심으로 하는 컴퓨터 기술을 말한다. 블록체인은 중심화, 신뢰성, 안전성 및 간편, 효율성을 특징으로 하고 있으며 인터넷 시대로 접어든 현 사회에서 혁신적인 응용 모델로서 주목받고 있다. 해당 기술은 여러 분야에서 높은 활용가치를 가지고 있다고 평가 받고 있으며, 특히 금융 분야에서 큰 역할을 할 것으로 전망되고 있다. 이에 2015년을 기점으로 각국 중앙은행 및 정부부처, 시중은행, IT 핵심 기업들을 포함한 다양한 금융 관련 다양한 기관들이 투자, 관심, 연구에 박차를 가하면서 빠른 성장을 지속해오고 있다. 이에 본 연구에서는 새로운 블록체인 기술이 기존의 은행들에서 행해지던 결제 방식에 어떤 영향을 주었는지 분석하고, 해당 기술의 핵심적인 개념 및 장, 단점에 관해 설명하고자 한다. 더불어 송금(remittance), 입출금(collection), 신용장(letter of credit)과 같은 기존의 결제 방식과 결합, 변화된 블록체인 기술의 사례를 연구하여 블록체인 기술이 기존 결제 방식에 미치는 긍정적, 부정적 영향 역시 분석하고자 한다. 최종적으로 본 논문은 해당 분석들과 함께 블록체인 어플리케이션(the block chain application) 사례들을 제시, 분석하여 해당 기술들의 발전 현황 및 현존하는 문제점들에 대해 고찰하고 이를 바탕으로 중국 블록체인 금융 시스템의 발전을 위한 방안 및 대책을 제시하고자 한다.

#### ABSTRACT

Since 2015, Blockchain has experienced rapid development throughout the world, institutions including Central Banks, Government Departments, Commercial Banks, IT Giants are all accelerating their exploration on Blockchain, and investment on Blockchain related R&D departments and start-up companies also shows explosive growth. This paper studies the impact of blockchain technology on banks' conventional trade settlement methods and describes blockchain technology in term of its concepts, advantages, and disadvantages. It also studies the application processes of blockchain technology combined with conventional trade settlement methods (remittance, collection, and L/C), and analyzes the positive and negative impacts of blockchain technology on the conventional trade settlement methods. In addition, this paper lists the blockchain application cases, analyzes the technology development status and existing problems, and puts forward suggestions and measures for the development of blockchain finance in China based on the case analysis and impact research.

**키워드** : 은행, 블록체인, 블록체인 기술, 중국, 무역결제

**Keywords** : Bank, Blockchain, Blockchain technology, China, Trade settlement

Received 24 November 2020, Revised 12 January 2021, Accepted 24 February 2021

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Open Access <http://doi.org/10.6109/jkiice.2021.25.3.346>

print ISSN: 2234-4772 online ISSN: 2288-4165

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## I. Introduction

Payment and settlement is an important link in international trade. As the trade volume increases continuously, the lagging settlement methods have exposed more and more problems, such as low settlement efficiency, high settlement fees, and high settlement risks, which have become major factors restricting the development of trade. In recent years, blockchain technology has become the focus of financial innovation, blockchain settlement solutions have attracted the attention and exploration of financial institutions, and blockchain technology has solved the problems in conventional settlement methods thanks to its characteristics of decentralization, non-tampering, transparent transaction information, and simple processes.[1] The outbreak of novel coronavirus pneumonia epidemic in early 2020 has made it inevitable that financial technology, represented by big data, cloud computing and blockchain technology, will be applied in financial services. In China, emerging technologies represented by blockchain have become an important breakthrough in the innovation and development of the financial sector. Blockchain officially rose to the height of national strategy during the 18th collective study of the Political Bureau of the CPC Central Committee in October 2019.[2] In the future, as the technology becomes sophisticated and the regulatory system improves, blockchain settlement will bring new breakthroughs to the development of China's international trade. According to McKinsey's report Blockchain: Subversion of the Rules of the Banking Industry, blockchain will abandon the role of intermediary banks in cross-border payment and settlement and realize point-to-point fast and low-cost cross-border payment. According to McKinsey's calculation, from a global perspective, the application of blockchain technology in B2B cross-border payment and settlement will reduce the cost of each transaction by about 40%.[3]

Blockchain technology is applicable for trade settlement. Jiang Lili (2017)[4] pointed out that in conventional international trade settlement, the customs declaration process was delayed, and even some problems such as fraud by criminals through forged

documents appeared due to the inconsistency of logistics and document transmission efficiency and the inconsistency of national policies. Blockchain technology can resolve these problems. Blockchain technology links all enterprises in the upper, middle and lower reaches of the industrial chain together, so that all the enterprises can view the logistics information, coordinate production, reduce inventory and reduce costs. The smart contract monitors the freight transaction process at any time and protects all records from being tampered with. The two parties of the transaction write the agreements into the smart contract to minimize the risk of disagreements in international trade and document fraud.

The research combining the basic technology of blockchain and trade transaction is still in its infancy. There are few research results about the application of blockchain technology in trade transactions and the applicability of blockchain technology in international trade rules.

Blockchain technology is distributed ledger technology and has a different system from the existing centralized trading practices, so if the block chain technology is used for trade transactions, it is expected to have a lot of impact on the current trade transaction process and trading practices. Therefore, this paper studies the basic content of blockchain technology, studies the application processes of blockchain technology combined with conventional trade settlement methods (remittance, collection and L/C), and analyzes the positive and negative impacts of blockchain technology on conventional trade settlement. In addition, it lists the blockchain application cases, analyzes the technology development status and existing problems, and puts forward suggestions and measures for developing blockchain finance in China based on the case analysis and impact research.

## II. Advantages of Blockchain Technology

### 2.1. Decentralization

Because blockchain uses peer-to-peer network technology

that is the computer nodes interconnected in the network are in an equal position, each client can act as a node and a server and enjoy the services provided by other nodes. Therefore, blockchain features decentralization. Each node in the network records all the historical data of blockchain and records the current transaction information, which ensures the integrity of ledgers.[5]

The P2P network features resistance to network attacks and high fault tolerance due to its decentralization. The information is exchanged between nodes because transactions are carried out through decentralized nodes.[6] When some terminals are attacked or the network is destroyed, other terminals are almost unaffected. Because the entire ledger is distributed, it is recorded by each node. Therefore, when some nodes fail, the ledgers of other nodes is unaffected, the entire database system is still intact, and new nodes can download the complete data ledger from the other nodes. The blockchain system runs continuously due to its decentralization, unless the entire system is attacked.[7]

## 2.2. Trustlessness

For any economic activities, information asymmetry is widespread in economic activities. Due to the long-term existence of information asymmetry, the trust between different subjects is the key to the completion of the transaction. In the conventional financial or economic system, it is difficult to establish true credit between different unfamiliar entities. Therefore, it is necessary to rely on a third-party intermediary institution (such as a bank, card organization, and securities company) to establish credit, so as to match transactions and finally complete transactions. Blockchain technology radically solves this problem. Its distributed ledger changes the centralized credit creation method that is based on third-party institutions. It establishes a "trust" network between different computers by using a set of recognized algorithms similar to mathematical axioms. It establishes a trust relationship between different subjects by endorsing credit to different users in the form of technology.

## 2.3. Non-tampering

For conventional transactions, the biggest problem is information tampering. In the daily transaction process, due to information storage and grasp problems, a large amount of information has been tampered with. Therefore, both parties of the transaction often go to court. The blockchain effectively solves the problem of transaction information tampering, because in the blockchain algorithm, a database composed of time stamp is specially designed, which cannot be tampered with or forged. The so-called blockchain is composed of blocks (historical data transactions) and chains (data verification process). When blocks and chains are merged into blockchain, a set of historical data that can be fully traced is formed. Moreover, this set of historical data can be executed. All historical transactions can be found in different distributed computers. Each transaction data supports retrieval and search, which can be traced back to the source and fully verified by its blockchain. Each participant in the blockchain participates in this distributed accounting process. Because each transaction is recorded and stamped with a special time stamp, and then broadcast to all nodes of the entire network, each participant exchanges information and obtains a complete database backup.

Due to the blockchain characteristics, such as decentralization, trustlessness, and data unforgeability, that makes it possible to use blockchain for data integration and use it in other fields besides currency. In addition, as blockchain technology becomes sophisticated, transforming conventional trade is becoming easier, and using blockchain is becoming a possibility.

## III. Combining Blockchain Technology with Banks' Conventional Trade Settlement Business

### 3.1. Combining Blockchain Technology with Remittance Methods

The blockchain remittance uses a decentralized

transaction model. In the existing remittance models, only SWIFT member institutions can conduct cross-border payment and transfer transactions. The high transfer fees put a huge burden on both parties of the transaction and commercial banks.[8] Blockchain remittance realizes point-to-point direct transactions between the two parties of the transaction, which eliminates the intermediate steps of the remittance bank, agent bank, and remittance bank. Instead, virtual digital cryptocurrencies such as Bitcoin or Ripple are used as intermediaries for cross-border payment. The operation principle is to use digital currency as an intermediary, convert the remitter's local legal currency into token or digital assets, and then convert the token into the legal currency of the recipient's location at the receiving end to complete cross-border payment. Fig. 1 shows the blockchain remittance process.[9]

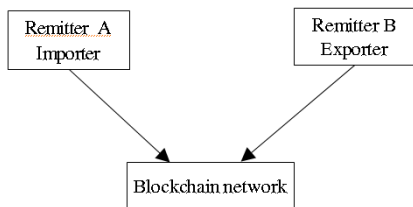


Fig. 1 Blockchain remittance process

In the way of blockchain remittance, the importers and exporters jointly participate in the same blockchain network on the basis of signing the purchase and sales contracts. The remitter purchases the digital currency, signs a contract and creates remittance blockchain, loads the remittance amount, purpose, recipient name and other information into the block for storage, and transfers it to the chain through key signature to form a main remittance chain. By purchasing the services of a blockchain remittance company, the recipient obtains the right to crack the key signature, read the remitter's main chain information, and obtain digital currency, which can be exchanged for local legal currency or saved for the next transaction.

### 3.2. Combining Blockchain Technology with the Collection Method

Blockchain technology can record, manage and store data in a new way. It embeds the commercial documents and financial documents of the buyer and seller into a programmable smart contract, so that the document information cannot be tampered with or forged. This improves the reliability of transaction data. Fig. 2 shows the blockchain collection process.[10]

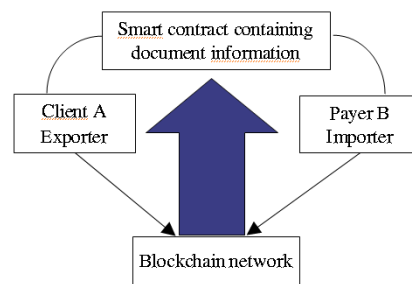


Fig. 2 Blockchain collection process

In blockchain collection mode, importers and exporters participate in the same blockchain network on the basis of signing the purchase and sales contracts. Through purchasing digital currency and smart contracts, the consignor signs and creates collection blockchain, writes the collection amount, purpose, payer name and other information into the block for storage, and converts financial documents and commercial documents into digital assets for transmission. The collection information is written into the main collection chain in the form of a smart contract, and transmitted to the payer over the blockchain network. The payer receives the main chain information, verifies the digital documents, makes digital currency payments, and completes the transaction.

### 3.3. Combining Blockchain Technology with L/C Settlement

The biggest disadvantage of the conventional L/C settlement is the lengthy transaction process and high cost, mainly due to two aspects. First, the L/C involves many parties and links. The general model includes four parties and nine process links; the complex model involves seven to eight beneficiaries and a dozen process

links. The lengthy business processing flow makes business processing inefficient. Secondly, the documents are transferred between transaction parties and banks in different countries in the form of paper documents, resulting in high transfer costs and higher risks of document tampering and loss. Banks are increasingly stringent in controlling the document review process, which extends the processing time limit of the L/C settlement method and results in slower capital circulation and document circulation.

The blockchain L/C settlement method solves the two problems. Fig. 3 shows the blockchain L/C process.

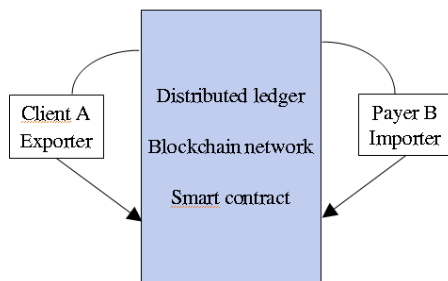


Fig. 3 Blockchain L/C process

To sum up, blockchain technology simplifies the tedious and lengthy process of conventional trade settlement, improves efficiency, reduces costs, and ensures safety. Moreover, it makes commercial banks pay more attention to financial technology, increase R&D investment, and improve the level of informatization. In the long run, blockchain technology will enhance the comprehensive competitiveness of commercial banks, which has a positive impact on promoting the healthy and long-term development of China's financial industry. However, the blockchain technology is still in the initial stage of development, the technology is not yet sophisticated, there is no mature large-scale application case in the world, and there is no definite conclusion on legal supervision issues and industry standards formulation. Therefore, blockchain technology has negative impact on the conventional trade settlement of commercial banks.

#### IV. Blockchain Technology Case Analysis and Development Measures

##### 4.1. Russia's Alpha-Bank

PJSC Siberia Airlines and Russia's Alfa-Bank carried out service payment for the first time through L/C by using Ethereum blockchain smart contract in December 2016. Alfa-Bank is a famous financial institution in Russia. It has participated in the Ethereum-based development of Masterchain, a financial information prototype product. The shared ledger jointly developed by the Central Bank of Russia and the Bank of Russia provided real-time confirmation of the authenticity of information while ensuring the security of financial transactions.

The transaction was conducted between the airline and Alfa-Bank's counterparty by using a L/C. The L/C serves as a bank guarantee for the seller to pay the buyer. If the buyer fails to make the payment, the issuing bank of the L/C makes the payment. In the transaction, the blockchain smart contract helps record the bank's operation of issuing and executing the L/C on the blockchain. The blockchain record includes the hash values (encrypted results) of the following information: agreement identifier (taxpayer identification number INN and work types of the customer and contracting party) and commercial terms (L/C value, and L/C issuance and closing dates). The customer applies for the L/C by using Alpha-Bank's online system, and the contracting party provides bank documents. When the L/C is issued, some special funds will be deducted from the customer's account. After the documents are submitted to confirm the transaction, these funds will be sent to the contracting party's account. The transaction uses two smart contracts at the same time: one is to issue a L/C and the other is to close the L/C. The two smart contracts based on Ethereum interaction improve the transaction transparency, reduce any potential code errors, optimize business processes, and improve the efficiency of document processing. Service giant Deloitte is the airline's blockchain technology consultant,

providing legal support for the project. Artem Tolkahev, head of Deloitte's legal department, said: "From a legal perspective, this transaction meets all the L/C requirements for bank clearing, and the application of smart contracts proves to be within the Russian legislative framework."

#### 4.2. Barclays Bank

In September 2016, Barclays Bank took the lead in carrying out the first L/C transaction on the blockchain platform developed by its subordinate Wave Company. It was also the world's first trade settled with blockchain technology. The settlement process took less than 4 hours. The Seychelles branch of Barclays Bank issued a L/C, and the shipping company sent the electronic bill of lading to the seller, and the seller sent them along with other electronic documents to the designated bank. After the designated bank passed the documents to the issuing bank, the issuing bank verified that the documents were consistent, and then paid to the seller. The transaction did not deviate from the large framework of the L/C business according to the basic principle. But the difference is that in the entire transaction process, the transmission of electronic documents is carried out through the Wave platform, and the registration of digital assets is encrypted and recorded by blockchain technology. The digital assets are transferred over the blockchain network under the supervision of each node, which effectively prevents malicious tampering or forging of paper documents. The function of ownership transfer on Wave's blockchain trade settlement platform upgrades the delivery method from the conventional delivery of goods upon order to QR code identification. It solves the problems of long transmission process, multiple links, slow speed, easy loss and forgery of paper documents in the conventional trade settlement process, and shortens the settlement process that originally took half a month to four hours, which greatly improves the efficiency of trade settlement.

#### 4.3. Union Bank of Switzerland

The Union Bank of Switzerland Group (UBS) launched a Hyperledger blockchain prototype in September 2016, which reduces international trade L/C processing from 7 days to 1 hour by using smart contracts. The Hyperledger blockchain prototype launched by UBS aims to replicate the entire cycle of international trade transactions onto the Fabric blockchain of Hyperledger. The prototype is designed to "integrate" with payment transactions, integrating trade and financial transactions, foreign exchange payments, etc. into an elaborate smart contract, as shown in Fig. 4.

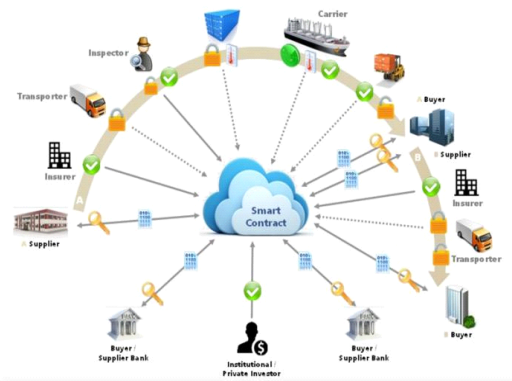


Fig. 4 Each part of the international trade deal converges in smart contracts

#### 4.4. China CITIC Bank

China CITIC Bank launched the blockchain-based L/C System (BCLC) (Phase I) in China in July 2017, which is the first time that China's domestic banking industry has applied blockchain technology to L/C settlement. As of July 21, China CITIC Bank has used BCLC to carry out domestic L/C business, with a transaction volume of more than 100 million yuan.

BCLC has changed the bank's conventional L/C business model. The L/C issuance, notification, presentation, acceptance message, and payment message are all implemented through the system, which shortens the transmission time of the L/C and documents, and the message transmission time can reach the second level, which greatly improves the efficiency of L/C business

processing. Moreover, the anti-tamper feature of blockchain improves the security of L/C business. Specifically, BCLC uses blockchain technology combined with international business systems to establish an electronic transmission system for L/C information and trade documents based on blockchain technology, and realizes the transformation of domestic L/C from conventional paper L/C to electronic L/C. BCLC connects banks and buyers and sellers into a network, making the process of L/C opening, notification, presentation, acceptance, and payment more transparent and traceable. All nodes (including buyers and sellers) can view the entire processing process and main information of the L/C business, which is more transparent and efficient than the electronic L/C business, and avoids errors and fraud. It protects the customers' interests, greatly improves user experience, and enhances the bank's ability to acquire customers.

Currently, China CITIC Bank has cooperated with Minsheng Bank to launch the first domestic L/C blockchain application in the banking industry. The two parties have agreed on cooperation principles, defined blockchain-related technical terms and standards, clarified the blockchain cooperation mechanism and the process of domestic L/C business, and agreed on confidentiality and legal terms. The cooperation abides by the essence of blockchain decentralization, openness, and equality, and provides a model for further expanding the cooperation and application of inter-bank blockchain.

According to the preceding blockchain application cases, blockchain L/C settlement may experience either of the following changes:

(1) Mild optimization. Blockchain technology with the characteristics of decentralization, non-tampering, and trustlessness makes the L/C business "reborn". It not only shortens the business process and reduces the time cost, but also improves the business transparency and reduces the risk. In addition, it is convenient for supervisory departments to collect all business data for real-time supervision. More

importantly, this technological change benefits many enterprises. While enjoying cheaper and more efficient banking services, the enterprises accelerate the speed of capital turnover and the level of capital utilization. According to the cases of Siberian Airlines and Russia's Alfa-Bank using the Ethereum blockchain smart contract for service payment transaction through L/C, UBS Group L/C using the smart contract, and CITIC Bank L/C information transmission system BCLC, under the current regulatory requirements of various countries, blockchain technology enables the L/C settlement method to eliminate disadvantages, give full play to its advantages, and promote the transformation of L/C from conventional paper L/C to electronic L/C, without intending to replace the L/C in one step. It is expected that in a long time to come, the relationship between L/C and blockchain will be a strategic relationship of mutual complement and win-win cooperation.

(2) Impact of being replaced. Because blockchain does not rely on centralized control, functions such as calculation, verification, and protection, which were originally provided by banks, are provided by technology. The distributed ledger model has technically replaced almost of all the roles played by banks, including L/C insurance, negotiation, payment, and reimbursement. Blockchain technology can be used for the transactions between importers and exporters and between export and import banks and the transactions between exporters and transportation companies, quality inspection departments, and export licensing departments; transportation documents are electronically processed and encrypted so that the export certification documents cannot be forged, the transportation records cannot be tampered with, and the goods supply can be tracked continuously. All of these measures will greatly facilitate the efficient operation of international trade in the trust mechanism. When a high level of trust ecology is achieved through blockchain technology in the

whole transaction process, the functions of bank credit intermediaries in the conventional settlement methods will gradually weaken, and the L/C settlement methods based on bank credit will gradually disappear. British Barclays Bank's using blockchain technology to replace L/C settlement is a typical case of such an impact.

## V. Conclusion

This paper studies the impact of blockchain technology on banks' conventional trade settlement methods. According to demonstration, the impact has both positive and negative aspects. In the positive aspect, blockchain technology realizes point-to-point blockchain trade settlement without the participation of third parties, which improves the business processing efficiency, reduces transaction costs, and ensures transaction security. In the negative aspect, blockchain technology is facing technical bottlenecks, legal supervision, and industry standard formulation problems. In the short term, it requires extensive investment of time and resources, but the comprehensive benefits may be small. Sophisticated technology and mature supervision are required for large-scale commercial applications, but the development trend is unstoppable.

Amid the rapid development of blockchain technology, Chinese governments and banks should take active measures in the following aspects:

- (1) Strengthen the theoretical research and application exploration of blockchain technology. As a rising financial power, China is expected to respond to new opportunities and challenges with an open and active attitude, and speed up the research and application of blockchain technology in the financial industry. In particular, China's large commercial banks, as the main force in the field of trade settlement, should recognize the impact of blockchain technology on conventional trade settlement, invest human, material and financial resources, actively pay attention to the development status of domestic and foreign technology fields, study the way, speed and depth of blockchain finance in the field of trade settlement, make good technical reserves, and strive for the opportunities and the right to speak in standards formulation in the reform period.
- (2) Promote the construction of blockchain technology infrastructure in the financial market as soon as possible. Although China has established a modern payment system and bill settlement system, it still requires continuous innovation to adapt to China's fast-developing and changing financial economy and keep up with the international advanced level. Blockchain technology has huge development potential, which is worthy of great attention. As a feasible construction path, blockchain technology can improve and innovate China's financial infrastructure construction and create a good financial market environment.
- (3) Government departments should promote the financial supervision of blockchain technology and accelerate system construction, while commercial banks should closely follow the international pace and actively participate in the formulation of industry standards. By exploring legal and technical supervision, we should give full play to the positive impact of blockchain technology, pay attention to its negative impact and potential problems, and take timely response measures to create an ecological environment for the healthy development of blockchain finance in China.
- (4) Promote the application simulation of blockchain scenarios, and facilitate the implementation of business models. For example, form the commercial operation mode through the technical design, process transformation and application simulation of blockchain trade settlement, so as to promote blockchain application effectively.
- (5) Strengthen the risk control and policy supervision of blockchain technology to ensure the healthy development of blockchain technology. Government departments



should learn from foreign development experience and formulate regulatory measures for the development of blockchain technology as soon as possible, so that the technology can develop safely and steadily. In addition, financial institutions and start-ups should pay close attention to risk control in the development of blockchain technology.

In conclusion, blockchain technology is a huge technological innovation on the internet, which promotes business innovation in all sectors in the technology-driven manner and has broad application prospects. Banks should proactively carry out theoretical and applied research on blockchain technology, and put particular emphasis on the synchronization of information transfer and value transfer (the core of transforming information networks to value networks), so as to seize the technological advantage in advance. In addition, banks should optimize and adjust the blockchain technology when putting it into specific use, so that application innovation meets expected requirements.

### ACKNOWLEDGEMENT

This work was supported by Dong-A University Research Fund.

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