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Research on the Establishment of the Mutual Trust Mechanism of the International Trade Alliances for Commodities Based on the Blockchain Technology--A Case Study of Iron Ore

Bo Lyu[1], Boyan Liu[2], Miaomiao Cao[3] and Jian Han[4]
School of Business, Beijing Wuzi University, China

Abstract: Commodity is an important lifeline in a country's economic system, and the mutual trust between international trade alliances of commodities has always been an issue that annoys China. The rise of blockchain technology has revolutionized the mechanism of mutual trust between international trade alliances of commodities. Blockchain technology equalizes the power among international trade alliances with its unique decentralization. The features of consensus mechanism, distributed ledger, and global certification make the international trade alliances of commodities no longer have to worry about the previous mutual trust issues. Taking iron ore as an example, this paper will use blockchain technology to rebuild the mutual trust mechanism between international trade alliances of commodities.

Keywords. Blockchain technology, commodities, international trade alliance, iron ore, the establishment of mutual trust mechanism

1. Introduction

China is a major player in the international trade of commodities. Commodities have affected the political and economic situation in China. Therefore, in order to ensure the country's political and military security, an important measure that China should implement is to maintain the stability of commodities trading [1]. International trade alliances of various countries lack the corresponding trust in China's trade, and due to the emergence of Sino-US trade and the pressure of the US government on China, China is also struggling to move forward on the road of international trade. This poses

1 Bo Lyu, male, professor, doctoral supervisor, dean of the Business School of Beijing Wuzi University, Email:lvbo732021@163.com
2 Boyan Liu, female, master student of the Business School of Beijing Wuzi University, Email: liuboyan998318@163.com,
3 Miaomiao Cao, female, master student of the Business School of Beijing Wuzi University, Email: cmm960221@163.com.
4 Corresponding author: Jian Han, master student of the Business School of Beijing Wuzi University, Email:2816977285@qq.com

a huge threat to the trade security of China's bulk commodities. Therefore, it is urgent to build a mutual trust mechanism for both parties to the transaction, platforms, and other participants [2]. So how to break the existing shackles in China and establish a mutual trust mechanism between international trade alliances of commodities? Blockchain technology has the advantages of improving the security of transactions and data exchange, promoting the expression of goodwill between trading partners, improving the efficiency and quality of communication between trading partners, and increasing the predictability of trading partners to enhance trust relationships. Therefore, it is considered to be an effective solution to the problem of lasting trust between trading partners in trade finance [3].

This article takes iron ore as an example; the main reason is that as a developing country, China's industry occupies an important position in the entire national economic system. Figure 1 shows Australia's iron ore production accounts for 40.4% of the global iron ore production, followed by Brazil and India. China's iron ore production accounts for only 6.5% of the global iron ore production, so China needs to import a large amount of iron ore as raw materials for yearly production.

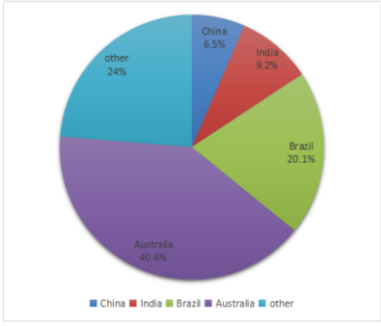

Figure 1: Regional distribution of global iron ore production (unit: %) UN& from *World Steel Statistics*
Note: Prospective Industry Research Institute "Global Iron Ore Industry Market Outlook and Investment Strategic Planning Analysis Report"

From Figure 2, it can be seen that iron ore resources are concentrated in Russia, Australia, Ukraine, and Brazil. Brazil, Russia, Australia, and other countries have high-grade iron ore, and the iron ore grade is more than 50%, so the mining value is large. While Ukraine, China, the United States, and other countries have low-grade iron ore, and some do not have mining value. Therefore, China must import a large amount of iron ore from abroad. In the process of frequent transactions with the international iron ore trade alliances, it is inevitable that the problem of mutual trust between the iron ore international trade alliances will arise.

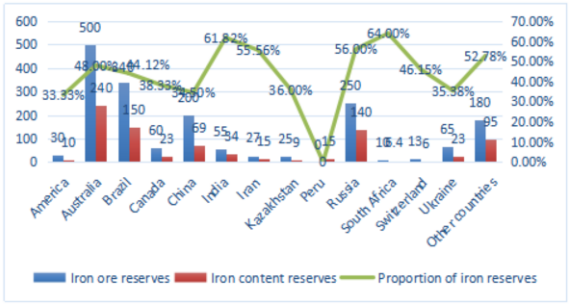

Figure 2: Regional Distribution of Global Iron Ore Reserves in 2020 (Unit: 100 million tons,%)
Note: Prospective Industry Research Institute "Global Iron Ore Industry Market Outlook and Investment Strategic Planning Analysis Report"

2. The industry's conundrum: The issue of mutual trust in international trade of iron ore alliances

2.1. The lack of mutual trust within the domestic iron ore alliances

China's iron ore alliance is always at a disadvantage in the game with foreign iron ore giants. First of all, in the past, the market decisions of China's import and export enterprises were mostly decentralized and lack of coordination. Chinese enterprises will fight independently when facing relatively coordinated foreign enterprises, which will inevitably lead to the loss of pricing power. Secondly, When the China Iron and Steel Association negotiated with the foreign iron ore alliance, China's domestic small and medium-sized steel mills "defected" and directly purchased the iron ore spot peddled by the foreign alliance, and the China Iron and Steel Association even gave up resistance in 2010. When China's iron ore alliance cooperates with the foreign iron ore alliance, the internal disunity of the domestic alliance causes its interests to tilt toward the foreign alliance [4]. This series of actions makes it difficult for international alliances to trust each other. The serious lack of mutual trust mechanism between international trade alliances makes it difficult to achieve win-win cooperation between iron ore international alliances.

2.2. The power between the domestic iron ore alliance and the international iron ore alliance is not equal

The unequal relationship between the iron ore international trade alliances is an important factor in the issue of mutual trust. The international iron ore alliance firmly grasps the weakness of the China's iron ore alliance, that is, China's iron ore production is extremely disproportionate to its demand. As long as foreign iron ore alliances unite to put pressure on China, it will be difficult for China to buy iron ore [5]. The study found that iron ore suppliers are more inclined to form pricing alliances, while China's demand is scattered and China's enterprises fight separately in the face of external pressure. Therefore, the international iron ore market has always been an oligopoly market of sellers, leading to Chinese enterprises being at a disadvantage in negotiations [6]. Whether it is from the total trade volume or trade structure, China is in the relatively weak side. From the iron ore trade perspective, Australia is the most suitable

seller in the Chinese market, and its substitutability is weak. Therefore, China's dependence on Australian iron ore is sensitive and fragile, and China is in a passive position in the import trade of iron ore [7]. This makes it difficult for China's iron ore alliance and the international iron ore alliance to achieve mutual trust in trade. Fortunately, the gap between the buyer countervailing power of the China iron ore alliance and the seller monopoly power of the Australian iron ore alliance is gradually narrowing, which provides favorable conditions for the formation of equal negotiations and mutual trust between the two sides [8].

2.3. The problem of contract tampering in the international trade of the iron ore alliance

In order to prevent fraud, the iron ore international trade alliance has formed a way to use paper to form vouchers for important data and contracts, and the amount of these data and contracts is huge and cannot be lost. These important documents are kept manually, and the transactions, financing, and logistics are verified through a manual risk control audit. However, the manual storage of documents will bring about the problem of artificial document forgery and data tampering. Another problem arising from the circulation of documents is preventing and controlling credit risk. Although the current electronic documents have effectively solved the risk of passive human error in the process of circulation and entry, they are still weak for active credit fraud. For example, the problem of a repeated pledge of warehouse receipts and the problem of false invoices, etc. in the system of forced liquidation incident caused by the repeated pledge of warehouse receipts in Qingdao Port in 2014 is still vivid. The essence of this kind of "double-spend" problem lies in the information asymmetry between banks and warehouses, banks and banks. This has created loopholes such as collusion between trading enterprises and warehouses to forge duplicate warehouse receipts.

2.4. The identification of iron ore and the problem of deception during the transportation of iron ore

Before determining the price of iron ore, it is necessary to identify the grade of iron ore. However, commodity providers may take out the iron ore with higher quality to obtain higher pricing during identification and mix the iron ore with lower quality to obtain higher profits during delivery, and commodity transporters will also receive corresponding collision fees. At the same time, there are many unknown situations during transportation, such as the exchange and delay of iron ore during the transportation. These situations will cause huge losses to China's iron ore alliance and also seriously affect the mutual trust of the international trade between iron ore alliances.

3. Blockchain technology: a disruptor of the mutual trust mechanism of the international trade alliance of iron ore

3.1. Consensus mechanism: Strengthen mutual trust within the domestic iron ore alliance

The blockchain has proposed various consensus mechanisms for different application scenarios to achieve a balance between efficiency and security. The consensus mechanism can constrain each decentralized node in the decentralized network and maintain the operation of the entire system so that each irrelevant node can verify and confirm the transaction data so as to trust each other and further reach a consensus. [9]. The consensus mechanism of the blockchain has the characteristics of "minority obeys the majority" and "node equality". Among them, "minority obeys majority" does not simply depend on the number of nodes; it can also be the computing power or other characteristic quantities that can be compared by computers. "Node equality" means that when nodes meet the conditions, all nodes have the right to first submit the consensus result, and it may become the final consensus result after being directly verified by other nodes. Just like the China iron ore alliance on the issue of iron ore pricing, one node first proposes the pricing of iron ore, and then after being verified and agreed by other nodes on the blockchain, this pricing can finally be used as the unified pricing of iron ore. The consensus mechanism is how to reach a consensus among all accounting nodes to determine a record's validity. This is both a means of identification and a means of preventing the bill from being tampered with by others. This will not only avoid insider trading but also strengthen the unity within China's iron ore alliance.

3.2. Decentralization: China's iron ore alliance and the international iron ore alliance are equal in power

Structurally, the blockchain is based on the peer-to-peer network, so its whole architecture is decentralized. From the perspective of governance, through the loading of consensus algorithms, the blockchain makes it difficult for a few people to control the entire system, so its governance is also decentralized. The decentralized feature of the blockchain makes it natural for the iron ore international trade alliances to trust each other, enabling international trade between a single iron ore alliance and a single iron ore alliance to be carried out. This trust does not need to be established through an intermediary but comes from everyone notarizing every piece of information together, which is also called a trust agreement. There is no absolute central node on the blockchain, which shows that the status between the China iron ore alliance and the international iron ore alliance is equal, which forms the premise of mutual trust.

3.3. Distributed ledger: Contract tampering and forgery are not hidden

The transaction accounting process of the blockchain is jointly completed by multiple nodes distributed in different places. In addition, each node has a complete account, so each node can monitor transaction legitimacy and work together as a notary. The distributed ledger of the distributed blockchain is unique in two ways. First, each blockchain node records complete data according to the blockchain structure. Second,

the account records of each node in the blockchain are independent, and these records rely on the consensus mechanism that ensures the consistency of account data. No node in the blockchain can record data in the ledger alone, which eliminates the possibility that a single accountant will be controlled or bribed to falsify the ledger. This not only "leaves traces" for the international trade records between iron ore alliances but also provides technical support for establishing the mutual trust mechanism of the international trade alliance.

3.4. Global notarization: "Discard the false and retain the true" of goods exchange and quality fraud

The smart contract is based on reliable and immutable data in the distributed ledger. This data can be automatically verified and executed under some predefined rules and conditions. Smart contracts allow reliable, traceable, and irreversible transactions without a third party. Once established, the contract will have the role of global notarization in the blockchain and have corresponding legal effects. The core advantage of blockchain technology is that any node in the blockchain can create transactions. After the identification and authentication of the blockchain, it can be confirmed whether the transaction is valid, and the transaction records will be stored permanently. The cost of modifying blockchain records is very high. The blockchain records (transactions and blocks) are created by two disparate groups, which not only ensures the fairness and unforgeable of records, but also tracks the exchange of goods during transportation. The credit risk has been controlled since the beginning of international trade of iron ore, which increases the buyer's trust in the seller and makes the prototype of the mutual trust mechanism between international trade alliances emerge.

4. Solutions: Construction of mutual trust mechanism for commodity trading based on blockchain technology

4.1. Transaction information is shared on the blockchain

All information registered on the blockchain is open to all network members in real-time, including regulators at all levels. This fundamentally solves the problem of opaque transaction data. Due to the data transparency of the blockchain, as long as the warehouse receipt is registered on the blockchain, whether it has been mortgaged, all members can see through the block chain at a glance. And the mortgaged warehouse receipt can be frozen in the blockchain system in the form of computer code (i.e., smart contract) so that it no longer has the conditions for circulation. For the problem that the goods do not match the invoice, since the warehouse receipt is centrally registered on the blockchain, the quantity and type of stored goods need to match the aggregated information on the blockchain in real-time. The supervisor can conduct a surprise inspection of the warehouse at any time without having to summarize warehouse receipt information from the exchange or a third-party registration agency in advance. Blockchain technology facilitates real-time regulation of transactions, which can greatly improve the efficiency and flexibility of supervision.

4.2. The establishment of autonomy and smart contract in the blockchain

Through the autonomous system of the blockchain, each alliance can continuously improve the links and processes in trade and make them real and effective, which also facilitates the supervision of third-party regulators. The blockchain is used to build programmatic smart contracts, which are multi-party transaction agreements that cannot be changed at the computer level. Unlike traditional contracts, they are usually executed automatically only after certain conditions are met. At the same time, because the parties signing the smart contract do not need to know or trust each other, as long as the code is fair and impartial, even hackers cannot use vulnerabilities to manipulate the results. Therefore, through the method of a smart contract supported by blockchain technology, security and trust in the transaction ecosystem are ensured [10]. In the process of trade, once the conditions for signing the contract are met, the bank will automatically send the letter of credit information. When the price information is triggered, the transaction will be automatically negotiated and accepted by the bank, and the bank will automatically deduct and transfer the money on the payment date. This prevents malicious breaches and interests in contract execution. In this way, contract execution is bound to be more concise and efficient, which reduces the time costs and potential risks of transactions. Since the number of nodes in the blockchain is large enough, it is theoretically that transaction data cannot be lost unless all nodes are compromised. This ensures the security of the document data. For both buyers and sellers, transactions on the blockchain platform are monitored and recorded in real-time. Data changes and losses are almost impossible during this process, which protects information security and increases the transparency of transactions.

4.3. Migrate the letter of credit and settlement system to the blockchain

The first application of blockchain in international trade and commercial finance is in the letter of credit project. The letter of credit mechanism provides a situation where two parties can enter transactions freely without needing a trusted third party to act as an intermediary [11]. This is the first time that the interbank has created an interbank alliance chain through the use of blockchain technology. Establishing a registered settlement system using blockchain technology is also suitable for the clearing system of exchanges. Due to the high-security nature of the blockchain and the permanent preservation of data, it is very suitable for registration and confirmation. If the transaction also occurs on the blockchain, then the transaction and liquidation are completed synchronously and cleared in real-time. As a result, it completely eliminates counterparty risk due to delayed liquidation. This is also one of the main reasons why today's domestic and foreign exchanges try to use the blockchain trading system [12]. The intelligent characteristics of the blockchain itself make the transaction process greatly improve efficiency and reduce cost. In the process of credit investigation, commercial banks can store and retrieve customers' credit information through encrypted methods, and this process can realize data sharing between various banks. Agencies can also access data directly without going through the central bank's credit investigation institutions, making the process easier.

Before the new wave of revolution, the Chinese government and domestic international trade alliances should seize the opportunity for blockchain reform. The government should actively play the role of blockchain technology in the fields of

international trade and international finance [13]. And the government should also use blockchain to integrate the flow of information, capital, and credit in the international trade alliance of commodities [14]. At the same time, the government should take advantage of the efficient characteristics of the alliance chain and the chain effect of changing the block hash value to greatly enhance the tamper resistance of the data [15]. In this way, the mutual trust between the international trade alliances of commodities is strengthened.

5. Conclusion

Blockchain technology is one of the hottest emerging technologies at present. It is a distributed ledger, a potential encryption technology, and a technical solution to de-trust and decentralization by creating and maintaining a reliable database for all members. The unique "no credit required" feature of blockchain technology helps to solve the problem of mutual trust between international trade alliances.

First, the "consensus mechanism" in blockchain technology has made China's international trade alliance of iron ore unite, so that the internal worries of the alliance can be solved before solving the problem of mutual trust between the alliances. The joint participation of members within the alliance in this process is not only conducive to forming the awareness of internal unity but also conducive to strengthening the information sharing between domestic iron ore alliances. This will not lead to the dishonesty of the domestic iron ore alliance due to the wavering of the international alliance. At the same time, when negotiating with foreign alliances, the consensus mechanism of the blockchain can also strive for the greatest interests of China's iron ore alliance and help form a good reputation image for China's iron ore alliance.

Second, the "bookkeeping" technology of the blockchain not only makes the transactions between the international trade alliances of iron ore more transparent but also makes false trade, insider trading, and commercial fraud visible, and it is also conducive to the tracking of regulators. The "bookkeeping" technology of the blockchain avoids the uncontrollable factors in the mutual trust of the international trade alliances brought by heavy paper documents. It also eliminates irregular transactions such as the repeated pledge of bills of lading and data tampering.

Third, the "decentralization" technology of the blockchain makes the status of various iron ore alliances equal. All alliances have an equal voice in trade, which is conducive to creating an environment of mutual trust. Nodes have equal status in the blockchain. When a node in the blockchain makes unreasonable demands on iron ore trade, it will be jointly attacked by the rest of the nodes. This is conducive to eliminating the phenomenon that iron ore alliances form factions to jointly suppress an alliance, and it has played a great role in creating a mutual trust environment for international trade alliances.

Blockchain technology also faces a major challenge in solving the problem of mutual trust in international trade alliances. Many traders are very cautious about uploading all their trading information because they fear that their private information can be stolen by those with ulterior motives. And this can lead to a series of chain effects. The alliance's information will not be shared on the blockchain, inevitably making the rest of the alliances suspicious. The international trade alliances of commodities need to be migrated to the blockchain because only when all members are in the blockchain at the same time can the mutual trust system of the international trade

alliance be complete. This poses a great test to the construction of the underlying architecture.

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