



# Application of Blockchain Technology in the Field of Financial Management

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**Abstract.** Blockchain is a comprehensive information technology that combines modern database technology, modern cryptography and network management incentives. It is highly valued globally for its irreversibility, decentralization and peer-to-peer transactions. Traditional financial management activities are prone to information distortion and high transaction costs. However, the unique advantages of block chain technology can effectively solve the relevant problems. At the same time, blockchain technology still has shortcomings of insufficient capacity and high privacy risks, so future applications need to be upgraded and optimized in current practice.

**Keywords:** Blockchain · zarządzanie finansami · mechanizmy konsensusu · inteligentne kontrakty

## 1 Introduction

With the increasing maturity of database technology and ERP systems, financial management activities are becoming more intelligent, but these technologies themselves bring some inevitable problems. For example, database technology relies on multiple computers for operation and maintenance. Technology alone is not immune to possible conflicts when multiple changes are made simultaneously by different computers. Incorporating blockchain technology can not only avoid such conflicts, but also create self-executing contracts to ensure the security, confidentiality and integrity of the data stored in its general ledger and ledger. Blockchain technology started out as the technical architecture behind Bitcoin, but in recent years it has been making waves in a wide range of industries (1), and its use in financial management should not be underestimated.

## 2 Basic Theory of Blockchain Technology

### 2.1 The Basic Concept of Blockchain

Blockchain is a distributed database system with the participation of different nodes. It consists of a string of blocks generated according to cryptographic methods, and then each block of data information is automatically time-stamped and linked to the current

area from the founding block, thus forming a blockchain (2). Due to the special working principle, blockchain has the characteristics that Internet and ERP systems do not have, such as decentralization, irreversibility and immutability, which has in-depth research and application value in the field of financial management.

## **2.2 Blockchain's Core Technologies**

### **2.2.1 Timestamp Mechanism**

If any node in the blockchain wants to retain an account, it will need to stamp a time stamp on the block header (each block consists of a block header and a block body) to record the entry time of data in the current block. In this process, a time-increasing chain can be formed to enable data tracing and historical reproduction (3).

### **2.2.2 Consensus Mechanisms**

In general, "democracy" and "centralisation" do not go hand in hand. A centralized government can easily reach consensus, but a more decentralized structure makes it difficult to reach unified decisions. Consensus mechanisms allow for a decentralised process of reaching consensus on the flow and legality of transactions between individuals who have no trust in each other, reducing transaction and trust costs. (4).

### **2.2.3 Smart Contracts**

The essence of a smart contract is a code of assets and transactions. Blockchain is valuable only if it is used as a carrier. As an embedded programmatic contract, it can be built into any blockchain transaction, data, tangible or intangible assets to form a software-defined system with programmable control (5).

## **3 Problems Faced in Traditional Financial Management Activities**

Conventional financial management activities include the raising of funds, investment decisions and the management of capital operations within the enterprise. The global accounting talent market, especially in China, is experiencing a shortage of senior managers and an oversupply of ordinary workers at the bottom. Many mechanical manual operations and the existence of a wide range of "intermediaries" have greatly increased the cost of running financial management activities, and there are not many companies that can really do a good job in financial management.

### **3.1 Data Can Be Tampered with, Accounting Information is Prone to Distortion**

Traditional accounting involves a lot of manual processing, and data is easy to be tampered with, resulting in accounting information distortion, misleading investors. Every year, countless listed companies are investigated by the CSRC for financial fraud. For example, in a number of financial fraud cases announced punishment by the CSRC in

2018, Kunming Machine Tools (00300. HK) falsified contracts, shipping orders, transport agreements and other documents to falsify revenue by way of fictitious transactions, falsifying profits for three consecutive years from 2013–2015, allowing the total profit in 2013 to be turned into profit to avoid ST. Similarly, there are also many enterprises in order to avoid ST and inflated profits in the current period, so that the company can turn losses into profits, which seriously affects the decision-making judgment of information users and the normal conduct of financial management activities. The frequent occurrence of fraud is not only related to the lack of professional ethics of accounting staff, but more importantly, the data is not “programmed”. Therefore, if the lack of objective accounting treatment system, fraud can not be pointed out and corrected in time.

### **3.2 Information Asymmetry, High Transaction Costs**

As the market economy is not an open and transparent system, there are great differences in the understanding and mastery of information by all kinds of people from their own point of view and interests, namely “information asymmetry”. In the financial management market with asymmetric information, enterprise managers know all the economic information of the company better than investors. Therefore, enterprise managers are in an advantageous position in the game with investors, while the party with poor information is willing to pay extra costs to achieve their goals, which is the “transaction cost”. In the traditional financial management of investment activities, transaction costs usually include intermediary costs, execution costs, negotiation and decision costs, and information search costs. Clearing and settlement costs for the two largest U.S. stock exchanges are estimated at \$65 billion to \$85 billion a year. The huge transaction costs not only cost extra money, but also make the transaction process more complex and trivial, reducing the efficiency of capital.

### **3.3 There are Trust Costs and Long Cross-Border Clearing and Payment Cycles**

With the integration of global economy and the increasingly mature development of international financial management, modern payment methods tend to electronic payment. However, frequent occurrence of cross-border payment fraud is still inevitable, accompanied by cross-border capital risk and other commercial legal risks. Both sides of the transaction often need to spend time and money to gain mutual trust. Therefore, the “trust cost” inevitably arises. Due to the existence of trust costs, cross-border clearing payments often involve multiple settlement entities in order to prevent payment fraud. It is understood that remittances take 3 to 7 days to settle, stock transactions take 2 to 3 days to settle, and bank loan transactions take an average of 23 days to settle, involving a large number of intermediate entities and complex operation, taking cross-border e-commerce trade as an example. Its settlement business not only requires the buyers and sellers to have a solid and reliable cross-border e-commerce service platform as a bridge, but also needs to find their own logistics and transportation intermediary. Meanwhile, the services of cross-border e-commerce platforms are based on the connection between third-party payment institutions and customs, which need to conduct business with cooperative banks. The whole process is complicated, capital flow, information flow, logistics have to go through multiple flows.

## **4 The Current Situation of Blockchain Technology Application in the Field of Financial Management**

So far, the field of financial management has started to integrate with blockchain technology to a certain extent, which solves the financial management problems in the traditional mode mentioned above (6).

### **4.1 Time-Stamping Mechanism - Data Cannot Be Tampered with to Ensure the Authenticity of Financial Data**

In an effective blockchain system, every piece of data is time-stamped and packaged and stored on the blockchain. Every piece of information on the blockchain can be tracked against time stamps and will not be deleted. The application of timestamp mechanism provides an effective data confirmation and traceability mechanism. In 2015, Nasdaq Linq, a private equity blockchain platform launched by the Nasdaq Stock Exchange in the US, attempted to apply blockchain technology to the company's equity registration and completed its first transaction that year. This information is recorded in a network-wide ledger, allowing the investor to observe changes in the information that is "most valuable" to him in real time, without worrying about the authenticity of the data. Blockchain technology now digitally manages all of this, maximising the value of the timestamp mechanism, making it simple to track the management of the share register, ensuring data security and transparency to prevent tampering, and efficiently and securely recording the company's shareholdings and historical changes.

### **4.2 Consensus Mechanism - Decentralised Peer-to-Peer Transactions and Reduced Financial Operation Costs**

The consensus mechanism based on blockchain technology can realize real-time monitoring of data, and every piece of data occurring in enterprise business activities can be transmitted, verified and stored on blockchain in real time. The corporate finance department can set up a real-time accounting system. The standardized data transmission interface is connected with the data processing system of the transaction unit to obtain the relevant data of the transaction unit in real time and realize the point-to-point data transfer. Startup Verisart is currently combining blockchain technology with standard museum metadata to create a public database for art and collections. This world ledger will provide a decentralised peer-to-peer service between artists, collectors, administrators, art appraisers and insurance companies worldwide. Driven by blockchain consensus mechanisms, this public database can facilitate trust formation and increased liquidity. Its founders have publicly stated that "the \$67 billion a year art market is starting to shift towards private sales (peer-to-peer) and online transactions". Auction houses typically receive commissions of around 10 per cent from collectors after successful public bidding. Now, based on blockchain technology, Verisart's drive to move to private peer-to-peer transactions will save nearly US\$7 billion a year in intermediary fees, significantly reducing financial operating costs.

One of the core functions of blockchain is decentralized and distributed accounting. It trades through network nodes, enabling blockchain technology to enable new forms

of P2P financing and investment. It can match different stakeholders, such as investors, business owners and start-ups, at each different stage of business development, thus eliminating the need for high trust costs and contract costs. The consensus mechanism enables both parties to a transaction to reach consensus on the process and legality of the contract, reducing the number of capital flows and enhancing The efficiency of data recording and fund payment in financial management activities.

#### **4.3 Smart Contract Mechanism - De-trusting Costs and Accelerating Cross-Border Settlement**

Smart contracts based on blockchain-based technology do not rely on third parties to automatically enforce the terms of mutual agreement commitments, and have pre-set invariants and encryption security. Therefore, it can better solve the trust problem of participants from the perspective of avoiding default risk and operational risk. The hottest and hottest project supported by blockchain technology recently is Facebook Libra. As a means of payment jointly launched by international Internet giants, The biggest difference between Libra and China's mature mobile payment -- wechat and Alipay is that there is no intermediary settlement agency and less banking system. At the same time, the smart contract mechanism automatically generates procedures to complete the settlement, avoiding payment fraud in the traditional mode, eliminating the need to spend a lot of time and money to gain mutual trust, and eliminating the cost of trust.

Blockchain technology's smart contract mechanism can automatically enforce the terms of the contract without default, reducing disputes arising from malicious acts or accidents and reducing reliance on trusted third-party intermediaries. Moreover, settlement can occur in real time. Through the blockchain ledger connected to the Web interface, the payee and the remitter can be directly connected to complete the cross-border settlement workload that takes dozens of working days under the electronic payment mode in a few minutes (5). As a result, the monitoring, execution and settlement costs that must be incurred during the execution of the contract will be significantly reduced.

## **5 Current Challenges in the Application of Blockchain Technology**

The unique decentralized distributed accounting function of blockchain caters to the trend of financial management reform, which can ensure the authenticity of data and eliminate transaction costs, trust costs and other advantages. However, as a technology that is not well known before the project, blockchain has been well applied in many fields and played its core advantages, but there are still many disadvantages. Combining the new technology with traditional infrastructure is a daunting task and faces many challenges (7).

### **5.1 Limited Space to Accommodate**

The blockchain itself is a decentralized, distributed shared ledger, where data in its default state is stored all the time and not easily deleted. As transactions expand in size, data will keep piling up extending to the rafters of the roof, meaning blockchain technology must

continue to mature and deepen to store unlimited data. For example, the application of blockchain technology in the field of equity registration and management, the continuous accumulation of information has put forward more stringent requirements for blockchain technology. Only blockchain technology with unlimited storage space can meet the full convergence of equity-based crowdfunding. Thus, blockchain will face great technical pressure and challenges.

## **5.2 Increased Security and Privacy Risks**

Generally speaking, when data is decentralized and chaotic, there are few security and privacy issues. This is because everyone has equal access and there is no privacy or disclosure. The more powerful the data processing capability is, the more security and privacy risks will increase. At the same time, compared with traditional payment methods, the advantage of blockchain lies in the lower transaction cost, which is essentially the marginal cost of transaction verification. If the underlying block technology miners lack incentive transaction fees, then network computing power will decline, and so will network security. Currently, most businesses or individuals with bank accounts are not used to keeping assets on other devices. When it comes to account errors, lost wallets or checkbooks, they rely more on their banks or credit card companies. If blockchain technology does not give a greater degree of freedom - better privacy, stronger security, and independence from third-party cost structures and system corruption - it is not a superior alternative for most enterprises that are accustomed to relying on intermediaries such as banks. Thus, how blockchain technology can be applied in practice to address security and privacy issues is one of the challenges in its development journey.

## **5.3 Lack of “Fault-Tolerance Mechanism”**

Fault tolerance refers to a mechanism that allows or accommodates the occurrence of mistakes within a certain range. Blockchain technology brings us into a world of immutable transactions and irrevocable smart contracts, and once a contractual decision has been made, no one can deviate from these rules. Regardless of the wishes of the parties during automatic execution, there is no recourse afterwards, meaning there is no artificial space and no “fault tolerance”. This means that there is no room for human beings and no “tolerance for error”. Libra, for example, is so fast and easy to pay that it leaves no possibility of withdrawal and, once paid, the contract is “automatically enforced and you have no option to break it”. In this mode, the risk of financial managers making decisions is increasing. At the same time, the irrevocable nature of contracts has increasingly strict requirements on the ability of managers, leading to the weakening of the applicability of blockchain technology to financial management activities, and the practical application in the field of financial management is still facing great challenges.

## **6 Blockchain Technology Application Outlook**

The application of blockchain technology still faces certain challenges and limitations, and its positive significance and future development potential need time to consider.

However, its unique characteristics of decentralization, distributed accounting, consensus mechanism and intelligent contract can solve many problems faced by financial management activities in the traditional mode, and will be applied to more aspects of financial management in the future.

### **6.1 Application of Blockchain Technology in the Forecasting Market**

In traditional prediction markets, the outcome of events is often determined by the ultimate decision-maker, so forecasts can be biased or even deliberately manipulated. Creating a completely decentralized and open source predictive market platform is a major trend in the development of predictive markets, which coincides with the basic idea of blockchain. The decentralization of blockchain technology can break the traditional prediction team model. In this model, all participants are on an equal footing and can publish reports of event outcomes and publish them on the blockchain. Any participant can express an opinion independently and is no longer dependent on the approval of the decision maker. More participants in the forecasting market means more collective intelligence is pooled, which ultimately leads to more accurate forecasts.

### **6.2 Application of Blockchain Technology in Non-asset-Based Transactions**

Through the analysis of the existing blockchain technology, the non-asset transaction field in the current banking business is worth exploring. Taking pledge management as an example, blockchain technology can distribute and record the ownership and transaction records of pledge across institutions, solving the cost and efficiency problems in the existing pledge management and ownership conversion. The introduction of blockchain technology eliminates the need for a special credit agency to collect and maintain credit information, as the blockchain distributed credit system is open, fair and untamperable. Thus, in the future, blockchain technology will unleash more wisdom in non-asset transactions in the future, leading to an explosion of innovation potential.

## **7 Conclusions**

Blockchain's technical features are in line with the trend of change in financial management activities. It is "programmed" to secure the validity and dependability of data, distributed to produce a peer-to-peer, multi-centre organisational structure, and digitised to establish a business model that is unmediated and automatically fulfilled. Although most of the application cases of blockchain technology are still in the testing stage, and blockchain itself faces many challenges, it will take time to solve these problems, and the specific application in the field of financial management needs to be discussed and optimized in practice. We believe that blockchain technology can unleash more wisdom and revolutionize the industry in the future.

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