# The Application and Challenges of Blockchain Technology in Accounting and Financial Information Systems

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**Abstract.** This article explores the application of blockchain technology in accounting and financial information systems, emphasizing its advantages in transparency, security, and efficiency, and proposing challenges that need to be addressed in widespread adoption. The decentralized nature of blockchain technology can revolutionize traditional accounting practices. Through distributed ledger technology, each transaction information is recorded on an immutable blockchain, ensuring the authenticity and traceability of product information. The article also discusses the application of blockchain in agricultural ecological product supply chain management, how to improve transportation safety and reduce logistics costs by improving the transparency and efficiency of information flow. Finally, the article investigates the impact of blockchain on corporate financial risk, using panel data from listed companies from 2019 to 2023 for empirical analysis, and evaluating corporate financial risk through the Z-Score model.

**Keywords:** Blockchain technology; accounting; financial information systems

## 1 INTRODUCTION

Blockchain technology, as a groundbreaking innovation that underpins cryptocurrencies like Bitcoin, has recently garnered significant attention from various industries, including accounting and financial information systems[1]. The decentralized and immutable nature of blockchain offers unprecedented transparency, security, and efficiency, potentially revolutionizing traditional accounting practices and financial information management. This article aims to explore the application of blockchain technology in accounting and financial information systems, highlighting its benefits and addressing the challenges that need to be addressed for its widespread adoption.


A. Haldorai et al. (eds.), *Proceedings of the 2024 3rd International Conference on Artificial Intelligence, Internet and Digital Economy (ICAID 2024)*, Atlantis Highlights in Intelligent Systems 11,
https://doi.org/10.2991/978-94-6463-490-7_51

# 2 THE BASIC PRINCIPLES AND CHARACTERISTICS OF BLOCKCHAIN TECHNOLOGY

## 2.1 The principles of blockchain technology

Blockchain tech, integral in Agri-ecological supply chains, ensures secure, transparent, & decentralized record-keeping, enhancing authenticity & traceability via consensus-based immutable ledgers. Encryption & smart contracts automate transactions, improving efficiency & management[2]. Customized designs based on product types & traceability needs foster transparency, trust, & cooperation, while protecting data via decentralized storage[3]. In logistics, blockchain boosts safety, reduces costs, & streamlines the supply chain, ensuring secure & private access to authorized participants[4]. Overall, blockchain revolutionizes Agri-ecological supply chains, bolstering product trust & delivering safer, more dependable agriculture products for sustainable development.

## 2.2 The main characteristics of blockchain

Blockchain technology, proposed by Japanese American Satoshi Nakamoto, has four major characteristics: decentralization, data immutability, anonymity, and scalability. Decentralization eliminates the need for reliance on central hardware or management institutions, and nodes collaborate equally to maintain the network; Once the data is verified, it is permanently stored, and changes need to be controlled by most nodes to ensure network stability and reliability; Anonymity effectively solves the trust problem between nodes in complex network environments through technology, without the need for intermediaries to establish trust; Scalability allows users to expand open source technologies according to their needs. These features make blockchain have broad application prospects in multiple fields.

# 3 RESEARCH AND DESIGN ON THE IMPACT OF BLOCKCHAIN ON ENTERPRISE FINANCIAL RISK

## 3.1 Data Sources

This study used panel data of listed companies in the Shanghai and Shenzhen A-share markets from 2019 to 2023 as the initial sample, sourced from the Guo Tai An database, which provides high-quality information resources for academic research and industry analysis. The research began in 2009 when blockchain technology was first applied by domestic enterprises, founded by Zhejiang He Xin Tong Hua Shun Network Information Co., Ltd. Since then, blockchain technology has gradually been adopted by various industries, especially in the financial field. Given the particularity of the financial industry, its accounting methods differ significantly from other industries, posing challenges for empirical research. To ensure the accuracy and impartiality of the research results, financial industry companies were excluded from the data processing process.

### 3.2 Variable Design

This study focuses on corporate financial risk and uses the Z-Score model to measure it. This model constructs a multivariate linear equation by weighting and synthesizing various financial indicators to calculate the financial risk value of the enterprise. This value helps to warn of potential financial crises for enterprises, providing strong support for risk management and decision-making, as shown in **Table 1**.

**Table 1.** Statistics on the number of blockchain application enterprises

| Statistical Year | Number of blockchain application enterprises |
|---|---|
| 2019 | 106 |
| 2020 | 145 |
| 2021 | 200 |
| 2022 | 288 |
| 2023 | 370 |

The Z-value model, derived from stepwise discriminant analysis, assesses financial risk in listed companies via five interrelated indicators. A lower Z-value implies higher financial risk, while a higher Z-value signifies a more stable company. This model is vital for investors and creditors in evaluating financial security and making informed decisions.

$$Z\text{—score(RISK)}=1.2\times X1+1.4\times X2+0.6\times X3+0.999\times X4+3.3\times X5 \quad (1)$$

In this study, we adopted the measurement method proposed by Yang Deming (2020) and Li Rensi (2021) to determine whether a company has applied blockchain technology based on whether keywords such as "blockchain", "distributed computing", and "smart contracts" are mentioned in the company's annual report. If a company applies blockchain technology between 2019 and 2023, we will set the virtual variable of blockchain to 1, otherwise it will be 0. Meanwhile, if the enterprise is applying blockchain technology in or after the current year, the time dummy variable is set to 1, otherwise it is set to 0. In addition, we also introduced control variables such as corporate profitability, development prospects, cash flow status, and asset liability ratio to enhance the accuracy and reliability of the model. Among them, profitability is measured by the return on total assets (ROA), which reflects the current operating status and investment value of the enterprise; The asset liability ratio (LEV) reflects the stability of a company's capital structure and the degree of protection for the interests of creditors; The financial risk lag term (RISK-l) is used to measure the impact of the previous period's financial risk on the current period's financial risk of the enterprise; The size of the enterprise (SIZE) is expressed as the natural logarithm of the total assets of the current year. Generally, the larger the enterprise size, the smaller its financial risk; Gross Asset Growth Rate (GROWTH) measures a company's growth potential and operational status by measuring its revenue growth rate; Cash flow capability (CASH) is measured by free cash flow, which reflects the source of funds for a company's operating activities; The total asset turnover rate (ATR) reflects the operational capability of a company. In addition, we also introduced the degree of financing constraints as an intermediary

variable and measured it using the KZ index, which combines financial and non-financial indicators of the enterprise and can more comprehensively reflect the degree of financing constraints that the enterprise is subject to. In the model, we also considered fixed effects of years and individuals to control for differences between different years and individuals.

$$KZ_{it} = \frac{-1.002CF_{it}}{ASSET_{it-1}} - \frac{39.368DIV_{it}}{ASSET_{it-1}} - \frac{1.315CASH_{it}}{ASSET_{it-1}} + 3.139LEV_{it} + 0.283Q_{it} \quad (2)$$

Among them, operating cash flow (CF) reflects the cash flow generated by the company's operating activities; Cash dividends (DIV) reflect the company's ability to distribute dividends to shareholders; Cash holdings (CASH) measure a company's liquidity and solvency; The asset liability ratio (LEV) is an important indicator for evaluating a company's financial risk; Tobin's Q value (Q) reflects the relationship between a company's market value and book value; Initial assets (ASSET) are used as a control variable to analyze the impact of a company's asset size on other financial indicators. By conducting in-depth research on these variables, we can gain a more comprehensive understanding of the company's operating and financial health, as shown in **Table 2**.

**Table 2.** Variable definition

| Variable Properties | code | Variable definition |
|---|---|---|
| Variable definition | RISK | Financial risk, measured by Z-Score value |
| Explanatory variables | BLOCK×TIME | The interaction term between blockchain virtual variables and time virtual variables, blockchain The value for the year of application and beyond is 1, otherwise it is 0 |
| | ROA | Return on total assets, net profit/total assets |
| | LEV | Asset liability ratio, total liabilities/total assets |
| | RISK-1 | Financial risk lags by one period |
| control variable | SIZE | Enterprise size, total assets (unit: 100 million yuan) |
| | GROWTH | Total asset growth rate, (total assets at the end of this year - total assets at the end of last year)/cash flow capacity of total assets at the end of last year, free cash flow |
| | CASH | |
| | ATR | Total asset turnover rate, operating income/(1/2 (total assets at the end of this year + total assets at the end of the previous year)) |
| | YEAR | Fixed year |
| | COMPANY | Fixed individual |
| Mediating variables | KZ | Degree of financing constraints |

Propensity score matching (PSM) is a statistical method used in observational studies to mitigate data bias and confounding variables. It calculates the probability of a company adopting blockchain by constructing a logarithmic logistic model, and solves the problem of self-selection using proximity matching. The multi time point double

difference (DID) model is used to evaluate the effectiveness of projects or policies, taking into account unmeasurable factors such as sample heterogeneity and time changes, in order to obtain more accurate predictions and analysis results. When studying the impact of enterprise blockchain applications on financial risk, due to inconsistent application times, using the DID model to evaluate can effectively solve endogeneity problems and draw reliable conclusions.

$$RISKjt = \alpha o + \alpha_1 * BLOCK \times TIMEit + \alpha_2 * Xit + Hi + \lambda + Eit \quad (3)$$

### 3.3 Descriptive Statistics

The total sample size is 8418, and the data shows that the mean of RISK variables is 3.113, with a median of 2.247, indicating that the RISK distribution is biased to the left, indicating that some companies have lower financial risk, which helps to reduce overall risk. The maximum standard deviation is 2.978, indicating high volatility in RISK. A financial risk less than 1.67 may indicate that the company is in financial distress, with a high-risk gray area between 1.67 and 2.81, and a risk greater than 2.81 indicating relatively low risk, as shown in **Table 3**. In addition, the mean of BLOCK x TIME is 0.005, with a median of 0.000, indicating that most enterprises have not yet applied blockchain technology, which is consistent with the current situation of blockchain technology application in China. Although the Chinese government vigorously promotes the development of blockchain technology and introduces policies to encourage enterprises to transform and apply it, further promotion is still needed for enterprises to apply blockchain technology.

**Table 3.** Descriptive Statistics

| Variable | Sample value | Mean value | Standard deviation | Median |
|---|---|---|---|---|
| RISK | 8418 | 3.113 | 2.978 | 2.247 |
| KZ | 8418 | 2.144 | 1.303 | 2.401 |
| BLOCK×TIME | 8418 | 0.050 | 0.217 | 0.000 |
| ROA | 8418 | 0.027 | 0.069 | 0.030 |
| LEV | 8418 | 0.499 | 0.179 | 0.499 |
| SIZE | 8418 | 0.024 | 0.056 | 0.007 |
| ATR | 8418 | 0.610 | 0.416 | 0.524 |
| RISK-1 | 8418 | 3.15S | 2.917 | 2.292 |
| CASH | 8418 | 2.662 | 25.585 | 0.718 |

### 3.4 Analysis of multi time point double difference results

The correlation analysis aims to assess variable relationships and impacts, aiding in hypothesis evaluation, model suitability, and research viability. Table 4 reveals a significant positive correlation (0.035) between the Risk Index (RISK) and the Blockchain Block Size-Time Interaction (BLOCK x TIME) at the 1% level, supporting H1 that blockchain may reduce corporate risk. Additionally, ROA, LEV, RISK-1, SIZE,

GROWTH, CASH, and ATR display significant correlations with RISK, validating control variable choices. Low correlation coefficients among explanatory variables except for RISK-1 suggest minimal multicollinearity issues, enhancing regression reliability, as shown in **Table 4**.

**Table 4.** Correlation Analysis

| | RISK | BLOCK× | KZ | ROA | LEV | RISK-1 | SIZE | GROWT | CASH | ATR |
|---|---|---|---|---|---|---|---|---|---|---|
| RISK | 1 | | | | | | | | | |
| BLOCK× | 0.035*** | 1 | | | | | | | | |
| KZ | -0.251*** | 0.012 | 1 | | | | | | | |
| ROA | 0.428*** | -0.034*** | -0.379*** | 1 | | | | | | |
| LEV | -0.645*** | -0.008 | -.603*** | -0.323*** | 1 | | | | | |
| RISK-1 | 0.819*** | 0.029*** | 0.088*** | 0.035*** | 0.287*** | 1 | | | | |
| SIZE | -0.177*** | 0.013 | -0.064*** | 0.206*** | 0.067*** | -0.185*** | 1 | | | |
| GROWT | 0.123*** | -0.017 | -0.237*** | 0.288*** | -0.603*** | 0.209*** | 0.053*** | 1 | | |
| CASH | -0.031*** | -0.001 | -0.053*** | 0.103*** | 0.029*** | -0.030*** | 0.204*** | -0.093*** | 1 | |
| ATR | 0.125*** | 0.003 | -0.069*** | 0.414*** | 0.002 | 0.090*** | -0.001 | 0.119*** | 0.024** | |

Robust t-statistics in parentheses***p< 0.01, **p<0.05, *p<0.1

After propensity score matching, the sample deviation between the treatment group and the control group was controlled. The regression analysis results in Table 5 showed that the coefficient of BLOCK x TIME was significantly positive regardless of whether propensity score matching was performed or not. After matching, the t-value of BLOCK x TIME increased from 1.91 to 2.58, and the significance level increased from 10% to 5%. Processing propensity score matching data can improve the significance of the explanatory variable BLOCK x TIME. In terms of controlling variables, the coefficients of ROA and ATR are significantly positive, indicating that companies with higher net asset profit margins and faster asset turnover can better control financial risks, while universities with stronger profitability and operational capabilities are also the same. The coefficient of LEV is significantly negative, indicating that the debt ratio in a company's capital structure significantly affects its financial risk in the production and operation process. That is, the larger the debt ratio, the higher the financial risk. Except for cash (CASH), there was no significant difference in the significance of other control variables compared to the overall sample. From this, it can be seen that the application of blockchain technology can significantly help enterprises reduce financial risks by reducing information asymmetry, obtaining more accurate financial information, adjusting capital structure, and other means, supporting hypothesis H1, as shown in **Table 5**.

**Table 5.** Regression Analysis

| VARIABLES | RISK (1-3) | | |
|---|---|---|---|
| BLOCK×TIME | 0.317* | 0.286* | 1.517** |
| | (1.91) | (1.65 | (2.58) |
| ROA | 5.956*** | 5.881*** | 8.094*** |
| | (13.42) | (11.42) | (6.30) |

| | | | |
|---|---|---|---|
| LEV | -7.339*** | -7.289*** | -4.653*** |
| | (-17.83) | (-15.51) | (-5.80 |
| SIZE | -3.112** | -3.243** | -1.015 |
| | (-2.18) | (-1.99 | (-0.38) |
| ATR | 1.263*** | 1.143*** | 1.414*** |
| | (10.84) | (10.65) | (4.43) |
| RISK-1 | 0.162*** | 0.201*** | 0.127** |
| | (6.06) | (6.75) | (2.04 |
| CASH | -12.070** | -12.171*** | -13.399 |
| | (-3.29) | (-2.58) | (-1.02) |
| GROWTH | -0.659*** | -0.759*** | -1.038*** |
| | (-6.00) | (-5.14) | (-3.47) |
| Constant | 5.423*** | 5.260*** | 3.568*** |
| | (20.98) | (17.92) | (5.70) |
| Observations | 8,058 | 7,149 | 744 |
| R-squared | 0.899 | 0.893 | 0.920 |
| Company FE | YES | YES | YFS |
| Year FF | YES | YES | YES |
| r2 a | 0.864 | 0.852 | 0.865 |
| F | 181.7 | 178.8 | 23.91 |

The research results show that the application of blockchain technology has a significant positive effect on reducing financial risks for enterprises. Information asymmetry and financial data distortion have always been important factors affecting the financial health of enterprises, and blockchain technology effectively solves these problems through its open, transparent, and tamper proof characteristics. On the one hand, blockchain technology promotes real-time sharing of enterprise financial data, reduces the information gap between owners and management, and helps alleviate agency conflicts. On the other hand, blockchain technology provides comprehensive monitoring tools for enterprise management on the production and operation process, and technically guarantees the accuracy of data, thereby reducing the risk of making decisions based on false data. The application of blockchain technology has also been proven to alleviate financing constraints for enterprises[5]. Usually, small businesses and emerging industries face more severe financing restrictions, and the introduction of blockchain technology, by reducing the agency costs between creditors and owners, helps enterprises obtain a wider range of financing channels and lower financing costs, improving their capital operation efficiency. The hypothesis that financing constraints play an intermediary role in the impact of blockchain technology on corporate financial risk is supported by research findings. Blockchain technology improves the transparency of enterprise information, improves the problem of information asymmetry between enterprises and external financing institutions, and helps enterprises more easily obtain external loans, reduce financing costs, alleviate financing constraints, thereby enhancing their cash flow management capabilities, enabling enterprises to better invest in production and operation activities, and effectively reducing financial risks caused by financing constraints.

# 4 APPLICATION OF FUND SETTLEMENT METHODS UNDER BLOCKCHAIN TECHNOLOGY

Blockchain technology has revolutionized global payment systems, providing fast and secure currency trading solutions through decentralized architecture, reducing transaction costs and credit risks between enterprises. This technology allows both parties to verify their identities through digital signatures in cryptography and directly make peer-to-peer digital currency payments without the involvement of traditional financial intermediaries[6]. In addition, blockchain payment has optimized the cross-border payment process, eliminating the reliance on centralized institutions such as banks for settlement and transaction recording, achieving efficient peer-to-peer fund settlement, reducing credit risk, and reducing information asymmetry between banks and intermediaries by synchronizing accounting information from different financial institutions. This payment mechanism completes currency settlement during transactions, promotes the unity of commodity logistics and value flow, improves the efficiency of fund utilization, ensures transaction integrity, and eliminates fraud concerns.

## 4.1 Comparison between settlement methods under blockchain technology and traditional settlement methods

The traditional enterprise payment system mainly relies on the connection between enterprises and banks, and realizes the flow of funds between both parties through the settlement system. All transaction data will be stored in the database of the payment settlement system. Although this payment method is relatively mature, it has limitations such as high transaction costs and long settlement cycles. With the development of blockchain technology, enterprises can establish direct connections through blockchain payment systems, eliminate intermediary participation, and achieve efficient and low-cost peer-to-peer payments. Utilize blockchain networks to integrate traditional financial institutions, enterprises, and other intermediaries into the payment system and build payment blocks[7]. This not only unifies the flow of digital assets on the blockchain and the value flow of currency transactions between enterprises, but also reduces transaction costs and improves payment efficiency. In addition, through blockchain payment systems, enterprises can convert legal tender into digital assets on the blockchain, further achieving convenient and fast payments. This not only improves the payment efficiency of enterprises and reduces transaction risks, but also provides strong support for the sustainable development of enterprises.

The main function of a blockchain payment settlement system is to convert real-world currencies into digital currencies and make payments on the blockchain. The system is based on the Internet, not controlled by a single authority, and enterprises can participate. Through a payment system centered around blockchain payment systems, any trading company can purchase goods and services using blockchain network native digital currency payments[8]. In international trade, by establishing payment gateways for both parties, this payment model can directly import funds into the database of enterprises providing goods or services. Its data processing method is different from

traditional payment processing methods. It uses blockchain payment technology to send real currency in digital form, without the need to send data request processing to the central database. Enterprises that provide payment services through their own nodes can reduce costs, store big data information, and provide deeper customer service. The company directly processes relevant data, and customers and other companies jointly pay fees to the central settlement system, thereby increasing the company's revenue and benefiting all parties. However, traditional centralized payment systems completely control their payment channels, and information security cannot be guaranteed. Participants in digital currency transactions in blockchain payments need to understand the payment verification program. Once verified, it will be bound to a fixed address, greatly reducing the friction of duplicate compliance checks[9]. Both parties must follow unique network addresses for operation. In an open blockchain network, users do not need to provide their primary payment address, they only need to create new payment nodes that can transact with specific enterprises and maintain relatively independent transactions. The account verification system provides compliance proof for payments that are usually unable to pay large amounts of funds, opening up barriers to integrity for cooperation between enterprises.

### 4.2 Promote the development of blockchain technology, improve regulations and supervision

As a revolutionary innovation, blockchain technology has shown great potential in data processing speed and efficiency, but it still needs continuous improvement and innovation to optimize performance[10]. In order to reduce transaction latency and improve system security and stability, continuous iteration and upgrading of technology are crucial. At the same time, the government and relevant departments must strengthen in-depth research and understanding of blockchain technology, including understanding its working principle, potential applications, and the transformative impact it brings. On this basis, formulating appropriate laws, regulations, and regulatory policies is the key to ensuring the healthy development of technology. In addition, clear guidance and standards should be provided for the application of blockchain technology in the fields of accounting and financial information. This can not only promote the compliant use of new technologies, but also provide clear compliance paths for enterprises and institutions, thereby promoting the development of the entire industry towards a more transparent and efficient direction.

## 5 CONCLUSIONS

The application of blockchain technology in agricultural ecological product supply chain, accounting and financial information systems, and fund settlement methods has demonstrated its potential to change traditional business processes. By improving information transparency, security, traceability, and automation, blockchain is expected to optimize supply chain management, enhance the reliability and timeliness of accounting information, and reduce the cost and time of cross-border payments. Although

blockchain technology is still in its developmental stage and faces challenges such as technology, regulations, and market acceptance, its revolutionary changes in improving the quality of agricultural ecological products and supply chain efficiency, as well as for corporate financial management and global capital flow, deserve our continuous attention and active exploration.

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