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Research on Enterprise Financial Risk Prevention and Control System Combining Artificial Intelligence and Blockchain Technology

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Abstract. Amid the dual pressures of digital economic development and increasingly stringent global regulatory frameworks, corporate financial risks are undergoing profound transformations. Emerging challenges include information asymmetry in risk identification, inflexible risk control mechanisms, inadequate monitoring standards, and complex regulatory environments in risk assessment. The integration of artificial intelligence (AI) and blockchain technology provides innovative solutions to traditional risk control bottlenecks, which significantly informs this study's methodology. Through systematic analysis employing literature review, case studies, comparative research, and synthesis methods, this paper elucidates the fundamental principles of both technologies, as well as the practical applications of these two technological principles in pre-event risk warning and in-process risk assessment to assist investors in decision-making. It examines current manifestations of corporate financial risks and synthesizes relevant literature around four core dimensions: data credibility, real-time alerts, accountability tracing, and decentralization. To summarize the specific manifestations of risk control in financial risks regarding Homo sapiens artificial intelligence and blockchain technology. The conclusion offers critical evaluations and outlines future research directions.

Keywords: Artificial Intelligence, Blockchain, Financial Risk, Risk Prevention and Control, Smart Contract.

1. Introduction

Global securities markets have witnessed a surge in corporate accounting scandals, with prominent examples including Germany's Wirecard AG and China's Luckin Coffee Inc. These incidents reveal significant deficiencies in conventional financial oversight mechanisms. Beyond eroding market trust, such cases often spark widespread social backlash and regulatory scrutiny. Artificial intelligence demonstrates remarkable proficiency in detecting anomalous patterns within vast, multi-source datasets, whereas distributed ledger technology guarantees information integrity through its decentralized architecture and self-executing contractual protocols. When combined, these

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technologies create powerful synergies that substantially improve organizational capacities for risk detection, mitigation, and accountability tracking. Current academic investigations predominantly examine these innovations in isolation, failing to provide comprehensive analyses of integrated risk management frameworks that leverage both technologies' complementary strengths. The present study addresses this critical research void through systematic examination.

2. Overview of blockchain and artificial intelligence technology

2.1. Core technologies of blockchain

The blockchain technology is mainly elaborated through three aspects: distributed ledger, smart contracts, and chain and privacy computing. Distributed ledger is a chain that is jointly maintained and difficult to tamper with. It can imagine it as a 'super shared ledger', where all 'participants' have the same ledger that cannot be changed, shared, or cheated on. There is also an "automatic approver" on the ledger, a smart contract that writes risk control rules in the form of code on the chain. When there is a problem with the "approval", It will be automatically executed, ultimately enabling the same contract code to run on multiple chains with consistent results [1]. If different ledgers on the market need to exchange information and avoid the leakage of trade secrets to a large extent, it is necessary to use "translators + safes" cross chain technology and privacy computing to securely transport data, while locking sensitive information to solve the problems of multi-party data exchange and trade secret protection [2].

2.2. Key technologies of artificial intelligence

Representative models include machine learning models, large language models, and knowledge graphs. Liu pointed out that 98% of financial anomaly detection is false positives, emphasizing the use of ensemble models (such as XGBoost, random forest, and other machine learning models) to reduce false positive rates and improve prediction accuracy [3]. The big language model is used for risk rule setting and threshold setting. In the past, risk control had to go through thick regulatory documents to formulate rules. The existence of the big model, like a "translator + secretary," turns the cold spring into a form of expression that decision-makers can understand, helping them make decisions. The knowledge graph visualizes the three levels of financial indicators, investment rules, and compliance requirements, as well as the three paths of cash flow, profit, and compliance, and can be continuously updated. The combination of the above three can help the company's finance department detect problems in advance, understand them, and make decisions from a macro perspective.

3. Analysis of traditional enterprise financial risks

In contemporary financial management, risk management is a crucial aspect for the enterprise's sustainable development. However, in the context of the rapid advancement of globalization and digitalization, enterprises face significant and novel challenges in the traditional processes of financial risk identification, control, monitoring, and assessment.

3.1. Asymmetry in risk identification

Information asymmetry is the crucial problem in traditional financial management. Information asymmetry of interior and exterior in enterprise can easily lead to inaccurate and delayed

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identification of financial risks. Causing a continuous negative impact on the enterprise. Zhang Pointed out the problem that it led to the aggravation of information asymmetry [3], and at the same time suggested the establishment of interpretable algorithms and cross-platform regulatory mechanisms, thus providing a direction for addressing traditional financial risk issues [3].

3.2. Inflexibility in risk controlling

Traditional financial risk assessment usually relies on Financial Ratio Metrics and Complementary Quantitative Techniques, and fails to adequately consider complex risk factors or have a dynamic response to the risk factors' changes. Zhou said that traditional financial risk assessment model cannot deal with massive structured and unstructured data. Furthermore, it is difficult to incorporate qualitative factors that are difficult to quantify or cannot be quantified [3].

3.3. Imperfections in risk monitoring standards

In traditional definition of production safety, complex and the functional safety of interrelated technologies and systems is ambiguous. The background of the emergence of regulatory technology mentions that traditional regulatory measures cannot meet the needs of the rapid development of financial innovation and electronic business. The current financial regulatory system has a single function, lacks full-process monitoring, and has low levels of automation, integration, and technological content in supervision. It will be very difficult to trace back if a series of liability issues arise later [4].

3.4. Regulatory complexity in risk assessment frameworks

Multi-Tiered Regulatory Overlays (e.g. compliance requirements from industry supervision and local financial bureaus) when conducting overseas business, enterprises must comply with the legal requirements of both the data-exporting country and the data-importing country. The differences and conflicts in various countries' regulations, as well as issues related to data sovereignty and national security disputes, have made the compliance process for enterprises more complicated and challenging [5].

4. Research on strengthening enterprise financial risk management through AI and blockchain technologies

The combination of artificial intelligence (AI) and blockchain strengthens financial risk control by using its trustworthy data, real-time alerts, blockchain traceability, cost reduction, and efficiency improvement. First, the data is guaranteed to be true through the immutable ledger on the blockchain. Based on this, AI can quickly identify risks, keep a complete record to clarify responsibilities and rights, adopt a decentralized architecture, further reduce costs and increase efficiency, and achieve a trustworthy and cost-effective upgrade in risk control.

4.1. Functional mechanism 1: improve the data credibility and reduce financial risks

The combination of AI and blockchain comprehensively reshapes a reliable and efficient financial risk control system with the "unalterable ledger + intelligent prediction" dual engines [6]. Through the Ethereum simulation experiment reveals that the blockchain distributed ledger can reduce the probability of financial record tampering by 99.8%, thereby eliminating the risk of single-point

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tampering. Chan demonstrated that deep learning has an accuracy improvement of 27% over traditional Vector Autoregression (VAR) methods in predicting extreme market events [7]. Based on this, the AI-driven risk management system of Goldman has reduced operational risks by 37% and increased trading efficiency by 42% [8]. JPMorgan Chase further developed this idea, integrating machine learning and AI real-time credit assessment for borrowers on Quorum blockchain platform. At the same time, she ensured data security, accuracy, and verifiability through blockchain, achieving more efficient credit risk management. HSBC also utilized the AI trading monitoring system to significantly reduce false alarms in anti-money laundering efforts. Combined with the immutable and transparent ledgers provided by IBM Blockchain, it met the KYC requirements and further reduced the risk of fraud.

4.2. Functional mechanism 2: real-time monitoring & control loop

The combination of AI and blockchain collaboratively drives a substantial advancement in the real-time performance, accuracy, and auditability of risk management. Chan pointed out that the Transformer model processes unstructured financial report text, the speed of capturing risk signals is 300 times faster than manual analysis [7]. In the supply chain finance scenario, Zhang discovered that blockchain increased the accuracy rate of identifying false invoices by 47%, and shortened the audit tracking time by 80% [9]. Also, The AI-driven risk model can handle data volumes that are 100 times greater than those of traditional methods, and it will further increase the accuracy of risk predictions by 40% [10].

4.3. Functional mechanism 3: dynamic duty delineation and audit trail provenance

The combination of the non-tamperable shared ledger of blockchain and AI credit insights can solidify the positive cycle of "one set of authentic data =cross-organizational mutual trust" in any multi-party collaboration scenario. This not only reduces risks but also improves efficiency.R. Thatikonda said that in a typical supply chain, stakeholders such as suppliers, manufacturers, distributors, retailers, and customers share data through real-time interaction [11]. The immutable ledger of blockchain enables all parties to access the same set of real-time, transparent, and unalterable transaction records, thereby establishing cross-organizational trust. This principle is also reflected in the financial services industry. Upstart, as an AI-powered lending platform, combines machine learning credit assessment with blockchain ledgers. This approach not only secures better terms for borrowers but also enables lenders to access complete and trustworthy records, thereby reducing risks. The blockchain platform of Ant Group also uses AI risk control models to analyze borrower data, and ensures the verifiability, compliance and security of credit information through immutable on-chain certificates. While LenddoEFL, which focuses on inclusive finance, uses machine learning to extract non-traditional data sources to assess creditworthiness, and then uses blockchain to lock each transaction into a transparent and secure ledger, significantly reducing fraud. This article only lists three representative enterprises. There are many more like this.

4.4. Functional mechanism 4: synergistic blockchain-AI operation: decentralization, cost efficiency, and quality enhancement

Current research indicates that when blockchain and artificial intelligence work together, they can achieve significant synergy effects in the three dimensions of "cost, efficiency, and quality".JP Morgan Chase found that in the digital banking scenario, it was found that simply introducing

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blockchain could reduce the transaction settlement time by 96% and lower the related operational costs by 41% [12]. Ghobakhloo pointed out that the immutable nature of blockchain provides a highly reliable data foundation for AI, making the insights generated by AI more actionable, thereby significantly improving the quality of decision-making [13]. Sembiring further verified this mechanism in the supply chain field the AI algorithm predicts disruption risks based on real data on the blockchain. The risks include delays and shortages, etc. The blockchain simultaneously ensures transparency and security across the entire chain. "Blockchain + AI" can effectively build a decentralized architecture, directly reducing operational and time costs. Moreover, through data integrity and intelligent prediction, it elevates risk management and service quality to new heights, serving as a model for cost reduction and efficiency improvement.

5. Conclusion

The existing literature has comprehensively demonstrated the beneficial effects of "AI + blockchain" in financial risk control from multiple perspectives, including technical feasibility, literature citation, case verification, and benefit evaluation. Although existing research has recognized the potential of artificial intelligence and blockchain technology in addressing the four pain points of "data trustworthiness, real-time warning, responsibility traceability decentralization", there are still three limitations. Firstly, most discussions are still limited to feasibility verification at the technical level, and there is a lack of sufficient attention to deep institutional issues such as ethical controversies caused by "algorithmic black boxes", new legal liabilities arising from vulnerabilities in smart contracts, and cross-border regulatory conflicts. Secondly, although chain data has the characteristic of being "proof", it cannot guarantee the authenticity and reliability of the initial reference values. Furthermore, there is currently no unified standard system established globally for issues such as transparency in AI decision-making, responsible parties for smart contracts, bankruptcy liquidation of decentralized autonomous organizations (DAOs), and tax obligations. This article believes that future research needs to be upgraded synchronously in the three dimensions of "technology regulation scenario". At the technical level, efforts should be made to promote the implementation and application of interpretable AI, knowledge proofs, chain and chain collaborative oracle, and privacy computing integrated frameworks. At the regulatory level, it is necessary to explore the establishment of a cross-border mutual recognition legal template for smart contracts. At the scenario level, a new generation of enterprise financial risk prevention and control system that is both trustworthy, efficient, low-cost, and in line with global compliance trends should be constructed.

Authors contribution

All the authors contributed equally and their names were listed in alphabetical order.

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