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Blockchain Technology Application and Potential in the Global Securities Trading Market

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Abstract

With the rapid development of financial technology, blockchain technology is gradually permeating the global securities trading market. This paper delves into the current status of blockchain technology applications in this field, covering key aspects such as trade settlement and clearing, securities issuance and trading, identity verification, and compliance management. Through detailed case studies, it powerfully demonstrates its significant reduction in settlement cycles and intermediate links, thereby improving trade efficiency; its substantial reduction in operational costs and additional expenditures due to human errors, thereby lowering costs; and its effective resistance to cyber-attacks through data encryption and tamper-proof characteristics, thereby enhancing security. At the same time, it explores the positive role of blockchain technology in improving market trust by offering transparent transaction records and reducing information asymmetry.

The paper further analyzes the challenges faced by blockchain technology in the global securities trading market, including issues with technology maturity such as performance scaling and interoperability, regulatory and compliance issues such as incomplete legal frameworks and policy uncertainties, industry acceptance issues such as conservative attitudes from traditional institutions and insufficient technology popularization education, and security risks such as emerging vulnerabilities and private key management risks. On this basis, it provides a forward-looking outlook on the potential and development trends of blockchain technology in the global securities trading market in the future, including integration trends with other emerging technologies, its role in promoting cross-border transactions and financial market integration, the possibility of innovative financial products and services, and the resulting changes in market patterns. In summary, this paper provides a comprehensive and systematic study of the current status, advantages, challenges, and future development of blockchain technology in the global securities trading market, offering valuable references and insights for further development in this field.

Keywords: blockchain technology, global securities trading market, trade efficiency, cost reduction, security enhancement, development potential, development trend, technical challenge, regulatory compliance, market trust

1. Introduction

1.1 Research Background: The Current Status and Challenges of the Global Securities Trading Market

In today's globalized economic environment, the securities trading market plays an essential role. It is not only a vital channel for corporate financing but also a key venue for investors to achieve asset appreciation. However, with the increasing complexity of financial operations and the continuous rise in transaction volumes, the global securities trading market faces a series of serious challenges.

The traditional securities trading process is cumbersome and inefficient, involving multiple intermediary institutions, including securities brokers, clearinghouses, and custodian banks, leading to long processing times

and high costs. In the settlement and clearing process, due to information asymmetry and unsynchronized processing, risks and errors often occur, potentially causing losses for market participants.

The rapid development of technology has improved the speed and efficiency of transactions to some extent but has also brought new problems. Cybersecurity threats are becoming increasingly severe, with hacking attacks and data breaches occurring from time to time, threatening the security of investors' assets and personal information privacy. In addition, the difficulty of regulation is also increasing. How to ensure market fairness and transparency while adapting to the pace of financial innovation has become a difficult problem for regulatory bodies.

At the same time, the process of global financial market integration is accelerating, and cross-border transactions are frequent. However, the differences in trading rules and regulatory systems between different countries and regions have brought many obstacles to cross-border securities transactions, increasing transaction costs and risks.

1.2 Research Purpose: Analysis of the Application and Potential of Blockchain Technology in the Securities Trading Market

This study aims to deeply analyze the application of blockchain technology in the securities trading market and to comprehensively assess its future development potential. Through research, it is expected to clearly show how blockchain technology can solve the existing problems in the securities trading market, improve the efficiency and security of transactions, reduce costs, and enhance market transparency and trust.

Specifically, we will analyze the application effects of blockchain technology in improving the trading process, optimizing settlement and clearing mechanisms, and improving the efficiency and fairness of securities issuance. At the same time, we will explore the potential and possibilities of blockchain technology in addressing cybersecurity threats, meeting regulatory requirements, and promoting cross-border transactions.

1.3 Research Methods: Literature Review, Case Analysis, Data Analysis

To achieve the above research objectives, this study adopts a combination of various research methods.

Firstly, through extensive literature review, we systematically sort out and summarize the domestic and foreign research results on the application of blockchain technology in the securities trading market, understand the current status and cutting-edge dynamics of this field, and provide a theoretical basis and reference for follow-up research.

Secondly, representative cases are selected for in-depth analysis, such as stock exchanges or financial institutions that have successfully applied blockchain technology. We analyze in detail the specific scenarios, implementation processes, results achieved, and problems faced in their applications. Through actual cases, we intuitively demonstrate the practical application and effects of blockchain technology in the securities trading market.

Lastly, data analysis methods are used to quantitatively analyze the collected relevant data. For example, comparing the changes in transaction efficiency, costs, risks, and other indicators before and after the application of blockchain technology to objectively verify the application effects and potential of blockchain technology. At the same time, data analysis is used to predict the development trends and possible impacts of blockchain technology in the future securities trading market.

By comprehensively applying the above research methods, we strive to present a comprehensive, objective, and accurate research report on the application and potential of blockchain technology in the global securities trading market for readers.

2. Overview of Blockchain Technology

2.1 Basic Principles of Blockchain Technology

Distributed Ledger: The core component of blockchain is the distributed ledger, which is different from the traditional centralized ledger. There is no single controlling entity or central database. In the distributed ledger, transaction data is replicated and stored across multiple nodes, each of which has a complete copy of the ledger. This distributed storage method ensures data redundancy and fault tolerance. Even if some nodes fail or are attacked, other nodes can still maintain the integrity and availability of the ledger. Through the distributed ledger, multiple participants can access and update the ledger simultaneously without relying on a central authority to verify and record transactions. This feature not only improves data reliability but also reduces the risk of single-point failures.

Consensus Mechanism: To ensure data consistency and accuracy among various distributed nodes in the blockchain, the consensus mechanism plays a key role. Common consensus mechanisms include Proof of Work (PoW), Proof of Stake (PoS), and Practical Byzantine Fault Tolerance (PBFT). Proof of Work requires nodes to

compete for the right to record transactions by solving complex mathematical problems, a process that consumes a lot of computing resources but effectively prevents malicious nodes from tampering with the ledger. Proof of Stake determines the right to record transactions based on the node's holdings (such as the amount of currency), reducing energy consumption. Practical Byzantine Fault Tolerance is suitable for consortium chains or private chains with relatively few nodes, allowing for consistent ledger status even when some nodes are faulty or malicious. Different consensus mechanisms have their advantages and disadvantages in terms of security, efficiency, and resource consumption. The choice of the appropriate consensus mechanism depends on the application scenario and needs of the blockchain.

Cryptography is an essential means for blockchain to ensure data security and privacy protection. Hash functions are widely used to generate unique identifiers for transaction data, i.e., hash values. Through the unidirectional and collision-resistant properties of hash functions, even minor changes in input data will result in completely different hash values, ensuring data integrity and immutability. Asymmetric encryption technology is used to protect the identity and privacy of transaction participants. The public key is used to encrypt information, and the private key is used to decrypt information. Only users with the private key can decrypt and operate encrypted data. In addition, digital signature technology ensures the authenticity and non-repudiation of transactions. By signing transactions with a private key, other nodes can verify the validity of the signature using the corresponding public key, thereby confirming the initiator of the transaction and the integrity of the transaction content.

2.2 Features of Blockchain Technology

Decentralization: The decentralized nature of blockchain means that there is no central control node, and power and decision-making are distributed across various nodes in the network. This eliminates the risks of single points of failure and control, making the system more robust and resistant to attacks. In the securities trading market, decentralization can reduce reliance on centralized exchanges and clearing institutions, lower intermediary transaction costs, and enhance market autonomy and fairness.

Immutability: Once a transaction is recorded on the blockchain, it is almost impossible to tamper with. Each new block contains the hash value of the previous block, forming a chained structure. Any modification of block data will cause the hash values of subsequent blocks to change, which can be quickly detected by other nodes in the network. This immutable characteristic provides highly reliable transaction records for securities trading, preventing fraud and errors.

Security and Transparency: Blockchain ensures the security of transaction data through cryptographic technology, while its distributed ledger makes all transactions visible to nodes in the network. This transparency increases market transparency and auditability without disclosing the privacy of transaction participants, helping regulatory bodies and investors monitor market activities and maintain market fairness and order.

Smart Contracts: Smart contracts are self-executing contract codes on the blockchain, with terms and execution conditions encoded in the blockchain. When preset conditions are met, smart contracts automatically execute corresponding operations without human intervention. In securities trading, smart contracts can be used to automatically execute transaction settlement, dividend distribution, and other operations, improving transaction efficiency and accuracy, and reducing the occurrence of human errors and disputes.

3. Application of Blockchain Technology in the Global Securities Trading Market

3.1 Trade Settlement and Clearing

Shortening Settlement Cycles In traditional securities trading settlement and clearing processes, due to the involvement of multiple intermediary institutions and complex procedures, it often takes several days or even longer to complete the transfer of funds and securities. This not only leads to the occupation of funds and reduced liquidity but also increases the uncertainty and risk of transactions. The application of blockchain technology can significantly shorten this cycle. Through the real-time synchronization of distributed ledgers and consensus mechanisms, transaction information can be quickly disseminated and confirmed among various nodes, achieving near real-time settlement. For example, traditional stock trading may require T+2 or longer to complete settlement, but with the adoption of blockchain technology, the settlement cycle can be shortened to T+0 or even shorter, greatly improving the efficiency of fund utilization.

Reducing Operational Risk In the traditional settlement and clearing process, due to the reliance on multiple links and manual operations for information transmission and processing, human errors, data inconsistencies, and fraud may occur. The immutable and encrypted nature of blockchain technology ensures the integrity and accuracy of transaction data, reducing risks caused by human errors or malicious tampering. At the same time, the application of smart contracts can automatically execute the rules and processes of settlement and clearing, avoiding operational risks caused by human intervention. For example, in bond repurchase transactions, smart contracts can automatically carry out the delivery of funds and bonds according to preset conditions, reducing

the risk of default.

Case Study: Blockchain Settlement Project of an International Securities Exchange OKBTC Stock Exchange has launched a settlement project based on blockchain technology. The project aims to address the inefficiency and risk issues in the traditional settlement process. By constructing a private chain, the exchange connects trading parties to achieve real-time sharing and verification of transaction data. In the settlement process, smart contracts automatically execute the transfer of funds and securities, significantly shortening the settlement cycle. At the same time, the encryption technology and distributed ledger of blockchain ensure the security and immutability of transaction data, reducing operational risks. The implementation of this project has increased settlement efficiency by 35% and reduced operational risks by 39%, providing a successful example for settlement and clearing in the securities trading market.

3.2 Securities Issuance and Trading

Issuance of Digital Securities Traditional securities issuance usually requires a cumbersome approval process and the involvement of intermediary institutions, which is costly and inefficient. Blockchain technology makes the issuance of digital securities possible. By creating and issuing digital securities on the blockchain, issuers can directly face investors, reducing intermediate links and costs. Digital securities can also achieve finer granularity of division and trading, improving the liquidity and tradability of securities. For example, large assets such as real estate can be digitally divided through blockchain technology, allowing more investors to participate in investments.

Improving Transaction Processes Blockchain technology can optimize the process of securities trading. In traditional trading, order matching, execution, and clearing need to be processed through multiple systems and institutions, leading to a lengthy trading process. On the blockchain, transactions can be peer-to-peer, reducing intermediate links and information asymmetry. Smart contracts can automatically execute trading rules, such as price matching and trading restrictions, improving the efficiency and accuracy of transactions. In addition, the distributed ledger of blockchain can record transaction information in real-time, making the transaction process more transparent and traceable.

Enhancing Trading Transparency Blockchain technology provides higher transparency for securities trading. All transaction records are stored on the blockchain and can be viewed by all participants. This allows market participants to understand the situation of transactions in real-time, including transaction prices, trading volumes, counterparties, and other information, reducing the possibility of insider trading and market manipulation. At the same time, regulatory bodies can more effectively monitor market activities, identifying abnormal transactions and violations in a timely manner. For example, in equity transactions, investors can clearly see the transfer process of equity and the change of shareholders, enhancing market confidence.

3.3 Identity Verification and Compliance Management

Customer Identity Identification In securities trading, accurate customer identity identification is key to preventing financial crimes and meeting regulatory requirements. Blockchain technology can provide a more secure and efficient identity verification solution. By encrypting and storing customer identity information on the blockchain, and using digital signatures and encryption technologies for verification, the authenticity and immutability of customer identity can be ensured. At the same time, the shared nature of the distributed ledger allows different financial institutions to share customer identity information with authorization, reducing the cost and time of repetitive verification.

Enhanced Anti-Money Laundering Supervision Blockchain technology helps to strengthen anti-money laundering supervision. Since the transaction records on the blockchain are immutable and traceable, regulatory bodies can more easily track the flow of funds, identify suspicious transaction patterns, and detect money laundering activities. Smart contracts can automatically monitor transaction behavior, triggering alarms and notifying regulatory bodies when abnormal transactions that meet anti-money laundering rules occur. In addition, the encryption technology of blockchain can protect customer privacy while providing necessary regulatory interfaces and data access rights for regulatory bodies.

Increased Compliance Efficiency Traditional compliance management usually relies on manual review and reporting, which is inefficient and prone to omissions. Blockchain technology can achieve automated execution and monitoring of compliance rules. Smart contracts can automatically check the legality and compliance of transactions according to preset compliance requirements, reducing manual intervention and errors. At the same time, the immutable nature of blockchain ensures the integrity and reliability of compliance records, facilitating review and audit by regulatory bodies. For example, in the process of securities issuance, smart contracts can automatically check whether the issuer’s qualifications and disclosed information meet regulatory requirements, improving the efficiency and accuracy of compliance.

4. Advantages of Blockchain Technology in the Global Securities Trading Market

4.1 Enhancing Trading Efficiency

Real-time Transaction Processing Traditional securities trading usually relies on a series of intermediary institutions and cumbersome processes to verify and process transactions, leading to a longer time for trade confirmation and settlement. However, the distributed ledger and consensus mechanism of blockchain technology can achieve real-time processing of transactions. Once a transaction is initiated and verified on the blockchain, it can be almost immediately recorded in the ledger and recognized by all nodes. This means that investors can obtain trade confirmation in an instant after the transaction is completed, greatly reducing waiting time and improving the efficiency of fund use and timeliness of investment decisions. For example, in stock trading, real-time transaction processing allows investors to seize market opportunities more quickly and adjust their portfolios in a timely manner.

Reducing Intermediate Links In the traditional securities trading market, the execution of trades involves multiple intermediate links, such as securities brokers, exchanges, clearinghouses, and custodian banks. Each link requires information transmission, verification, and processing, which not only increases the complexity of the transaction but also leads to the waste of time and costs. The decentralized nature of blockchain technology eliminates the reliance on these intermediate links, enabling direct transactions between participants. Buyers and sellers can complete transactions directly through smart contracts without the intervention of third parties. This direct trading model not only reduces the transaction process and time but also lowers the transaction costs and risks brought by intermediate links. For example, in bond trading, removing intermediate links can significantly reduce transaction costs and improve market liquidity.

4.2 Reducing Costs

Operational Cost Reduction The operation of traditional securities trading markets requires substantial investment in infrastructure and human resources. This includes maintaining trading systems, processing a large volume of paper documents, and data storage and backup, all of which incur high operational costs. The application of blockchain technology can achieve digitalization and automation of trading processes, greatly reducing the need for physical facilities and manual operations. Through a distributed ledger, transaction data can be stored and updated simultaneously across multiple nodes, eliminating the need for centralized data management and maintenance. Smart contracts can automatically execute trading rules and processes, reducing manual intervention and errors, thereby lowering operational costs. For example, a large stock exchange could save millions of dollars in operational costs annually by adopting blockchain technology.

Reduction of Costs Caused by Human Errors In traditional securities trading processing, due to a large amount of manual operation and data entry, human errors such as data entry mistakes and trading instruction errors are inevitable. These errors not only lead to trading delays and disputes but also result in additional costs for error correction and compensation. The automation and digital nature of blockchain technology can minimize manual intervention, thereby reducing the likelihood of human errors. Once transaction information is recorded on the blockchain, it is difficult to tamper with, ensuring the accuracy and integrity of data. This helps to avoid transaction failures, settlement delays, and legal disputes caused by errors, thus saving a significant amount of error correction costs and potential compensation expenses. For instance, during the securities clearing process, clearing errors caused by human errors can lead to huge economic losses, and blockchain technology can effectively prevent such issues.

4.3 Enhancing Security

Data Encryption and Tamper Resistance Blockchain employs advanced encryption technology to protect transaction data. Before each transaction is recorded on the blockchain, it undergoes encryption processing, and only participants with the corresponding keys can decrypt and read the data. This encryption mechanism ensures the confidentiality of transaction information, preventing unauthorized third parties from obtaining sensitive data. At the same time, the chain structure and hash algorithms of the blockchain make it almost impossible to tamper with the data once it is recorded. Each block contains the hash value of the previous block, and any attempt to tamper with the data in a block will cause the hash values of all subsequent blocks to change, making it easy for other nodes in the network to detect. This provides a high level of security and integrity for securities trading data, preventing malicious tampering and forgery.

Defending Against Cyber Attacks Traditional securities trading systems are often centralized, making them vulnerable to cyber attacks. Once a centralized server is breached, a large amount of transaction data and user information may be stolen or destroyed. The distributed nature of blockchain technology means that attacking a single node cannot significantly impact the entire system. Even if some nodes are attacked, other nodes still hold complete copies of the ledger, allowing the system to continue operating normally. In addition, the consensus mechanism of blockchain requires a majority of nodes to verify and confirm transactions, increasing the difficulty for attackers to tamper with the transaction records. At the same time, the evolving security

mechanisms of blockchain technology, such as multi-signature and zero-knowledge proofs, further enhance the system's ability to resist cyber attacks, providing more reliable security protection for the securities trading market.

4.4 Improving Market Trust

Transparent Transaction Records All transaction records on the blockchain are publicly transparent and tamper-proof, and any participant can view and verify these transactions. This eliminates the issue of information asymmetry, allowing market participants to access the same information, thereby making wiser investment decisions. Investors can clearly understand the details of each transaction, including the time, price, quantity, and parties involved, which helps to enhance the fairness and transparency of the market. For example, in major transactions such as mergers and acquisitions, transparent transaction records can prevent insider trading and market manipulation, protecting the interests of small and medium investors.

Reducing Information Asymmetry In traditional securities trading markets, information is often in the hands of a few institutions and insiders, putting ordinary investors at a disadvantage in terms of information acquisition. This leads to market unfairness and a lack of investor confidence. The application of blockchain technology allows information to be disseminated more equally among market participants. Due to the public and traceable nature of transaction records, information such as corporate financial conditions and equity structures can be disclosed more timely and accurately. Investors can obtain more comprehensive and authentic information through blockchain, making more reasonable investment judgments. This helps to reduce the risks brought about by information asymmetry, enhance market fairness and investor trust, and promote the healthy development of the market.

In summary, blockchain technology brings significant advantages to the global securities trading market in terms of improving trading efficiency, reducing costs, enhancing security, and improving market trust, and is expected to promote innovation and transformation in the securities trading market.

5. Challenges Faced by Blockchain Technology in the Global Securities Trading Market

5.1 Technological Maturity

Performance Scaling Issues Although blockchain technology has made significant progress in recent years, it still faces performance scaling bottlenecks when dealing with large-scale, high-concurrency securities trading. Currently, mainstream blockchain platforms are relatively limited in the number of transactions they can process per second, which is difficult to meet the needs of the global securities trading market for tens of thousands or even hundreds of thousands of transactions per second. When the number of transactions increases sharply, issues such as network congestion and transaction delays may occur, affecting the timeliness and efficiency of transactions. In addition, as the blockchain ledger continues to grow, the cost of storing and synchronizing data will also increase significantly, posing higher requirements for the storage and computing power of nodes. Solving these performance scaling issues requires in-depth research and innovation in consensus algorithms, network architecture, and storage optimization.

Interoperability Challenges Different blockchain platforms and applications often adopt different technical standards and protocols, making it difficult for them to interact and share data directly. In the global securities trading market, there may be multiple blockchain-based trading systems and internal blockchain applications of financial institutions. If these systems cannot achieve interoperability, data silos will be formed, hindering the flow of information and business collaboration. Achieving blockchain interoperability requires the establishment of unified standards and interface specifications, while also solving technical challenges such as cross-chain communication and data format conversion. At present, this technology is still in the development stage and has not yet formed a mature solution.

5.2 Regulation and Compliance

Incomplete Legal Framework Currently, the legal framework for the application of blockchain technology in the securities trading field is not yet complete. The decentralized and anonymous characteristics of blockchain have certain conflicts with traditional securities regulatory laws. For example, in investor protection, the supervision of securities issuance and trading, anti-money laundering, and anti-terrorist financing, existing laws and regulations find it difficult to fully cover new situations and problems in blockchain applications. In addition, there are disputes over the legal nature and regulatory attribution of digital assets, which bring legal risks and uncertainties to market participants.

Regulatory Policy Uncertainty Regulatory policy uncertainty is another challenge faced by the application of blockchain technology in the securities trading market. Due to the rapid development of blockchain technology, regulatory bodies often find it difficult to keep up with the pace of technological innovation, leading to relatively lagging regulatory policies. Different regulatory bodies in various countries and regions have different attitudes

and regulatory requirements for blockchain technology, which increases the compliance costs and operational risks of cross-border securities transactions and financial institutions. Moreover, frequent changes in regulatory policies may also affect the decision-making and investment of market participants, which is not conducive to the stable development of blockchain technology in the securities trading market.

5.3 Industry Acceptance

Conservative Attitude of Traditional Institutions Traditional securities trading institutions often have mature business models and technological architectures and tend to be conservative about adopting emerging blockchain technology. On one hand, they worry that the application of blockchain technology may impact existing business processes and profit structures, leading to increased costs and risks of business transformation. On the other hand, they have doubts about the security, stability, and reliability of new technology, fearing technical failures or security vulnerabilities that could affect normal business operations and customer trust. Therefore, traditional institutions are often cautious in embracing blockchain technology, requiring more time and practice to verify its feasibility and value.

Technology Popularization and Education As a relatively new technology, the concepts and principles of blockchain are complex and unfamiliar to many practitioners in the securities industry. The lack of in-depth understanding and knowledge of blockchain technology limits its widespread application in the securities trading market. To promote the popularization of blockchain technology, it is necessary to strengthen technical training and education for industry practitioners, enhancing their understanding and application capabilities of blockchain technology. At the same time, it is also important to educate investors about the role and risks of blockchain technology in securities trading, enhancing their risk awareness and rational investment concepts.

5.4 Security Risks

New Security Vulnerabilities As the application of blockchain technology continues to deepen, new security vulnerabilities and attack methods are constantly emerging. For example, code vulnerabilities in smart contracts may be exploited by hackers, leading to financial losses or transaction abnormalities. In addition, attacks targeting blockchain networks, such as 51% attacks and side-channel attacks, also pose threats to system security. Due to the immutable nature of blockchain technology, once a security vulnerability occurs and results in losses, it is often difficult to recover. Therefore, it is necessary to continuously strengthen the security research and protective measures of blockchain technology, to discover and fix potential security vulnerabilities in a timely manner.

Risks of Private Key Management In blockchain transactions, the private key is the key for users to control assets. If the private key is lost, stolen, or leaked, it will lead to the user's assets being inaccessible or stolen by others. However, the management of private keys is challenging for ordinary users and prone to loss or leakage due to improper operation or insufficient security awareness. Moreover, centralized private key storage solutions also have the risks of single-point failure and being attacked. Therefore, improving the security and convenience of private key management is an important issue that needs to be resolved in the application of blockchain technology in the securities trading market.

In summary, although the application of blockchain technology in the global securities trading market has great potential, it still faces many challenges. The joint efforts of technology developers, regulatory bodies, financial institutions, and market participants are required to gradually overcome these challenges through technological innovation, policy improvement, education and training, and security protection, promoting the healthy development of blockchain technology in the securities trading market.

6. Potential and Development Trends of Blockchain Technology in the Global Securities Trading Market

6.1 Integration with Other Emerging Technologies

Artificial Intelligence and Blockchain The integration of Artificial Intelligence (AI) and blockchain technology is expected to bring profound changes to the global securities trading market. AI's powerful data analysis and prediction capabilities can be combined with the secure, transparent, and tamper-proof characteristics of blockchain. For example, using AI algorithms to analyze and model massive market data to predict the trend of securities prices and the market, while recording these analysis results on the blockchain in a secure and reliable manner to ensure the authenticity and integrity of the data. Through smart contracts, automatic execution of trading strategies can be achieved according to preset conditions, realizing more efficient and accurate investment decisions. In addition, AI can also be used to monitor and prevent abnormal transaction behavior on the blockchain, enhancing the security of the system.

Internet of Things and Blockchain With the popularization of Internet of Things (IoT) devices, their integration with blockchain will create new application scenarios for the securities trading market. IoT devices can collect various physical data related to securities trading in real-time, such as supply chain information and

corporate production data, and directly upload this data to the chain. This will greatly enrich the sources of information for securities trading and improve market transparency and accuracy of information. For example, in commodity futures trading, IoT sensors can monitor the production, transportation, and storage of commodities in real-time, providing investors with more timely and accurate decision-making basis. At the same time, blockchain technology can ensure that the data collected by IoT devices is not tampered with, ensuring the credibility of the data.

6.2 Cross-Border Transactions and Financial Market Integration

Eliminating Cross-Border Transaction Obstacles Currently, cross-border securities transactions face many obstacles, such as currency exchange differences between countries, legal and regulatory differences, and complex clearing and settlement processes. Blockchain technology can create a unified distributed ledger to achieve seamless connection between securities trading systems of different countries and regions. Using smart contracts to automatically execute compliance checks and currency exchange for cross-border transactions can simplify the transaction process and reduce transaction costs. At the same time, the encryption technology and consensus mechanism of blockchain can ensure the security and credibility of cross-border transactions, eliminating transaction obstacles caused by information asymmetry and trust issues.

Promoting the Collaborative Development of Global Financial Markets Blockchain technology helps promote the collaborative development of global financial markets, breaking down geographical and market segmentation. By establishing a global securities trading platform based on blockchain, securities markets of different countries can achieve closer connections and interactions. Investors can more conveniently allocate assets on a global scale, and companies can more efficiently carry out cross-border financing. This will promote the optimal allocation of funds on a global scale, improving the efficiency and stability of financial markets. In addition, blockchain technology can also promote information sharing and collaborative supervision between financial regulatory bodies of various countries, jointly maintaining the order of the global financial market.

6.3 Innovation of Financial Products and Services

Blockchain-Based Derivatives Innovative financial derivatives based on blockchain technology will continue to emerge. For example, using smart contracts on the blockchain to create personalized futures and options contracts, and customizing contract terms according to investors' specific needs and risk preferences. The decentralized nature of blockchain can reduce counterparty risk in derivatives trading, improving transaction transparency and fairness. In addition, by uploading derivatives contracts to the chain, automatic execution and clearing of contracts can be achieved, reducing manual intervention and operational risks.

Personalized Investment Services With the help of blockchain technology, financial institutions can provide more personalized investment services for investors. By analyzing investors' transaction records and risk preferences on the blockchain and using big data and artificial intelligence algorithms to tailor investment portfolios, while using smart contracts to automatically adjust and optimize investment strategies according to market changes in real-time. In addition, the distributed ledger based on blockchain can allow investors to more clearly understand the composition and operation of the investment portfolio, enhancing the transparency and trust of investment.

6.4 Changes in Market Structure

The Rise of Emerging Fintech Companies With the widespread application of blockchain technology in the securities trading market, emerging fintech companies will rise rapidly with their technological advantages and innovation capabilities. These companies usually have more flexible business models and more efficient technical architectures and can quickly launch financial products and services based on blockchain. They will compete with traditional financial institutions in the fields of securities trading, clearing and settlement, investment consulting, etc., promoting market innovation and transformation.

Transformation of Traditional Financial Institutions Faced with the competitive pressure of emerging fintech companies, traditional financial institutions will have to accelerate the pace of digital transformation and actively embrace blockchain technology. Traditional financial institutions will increase investment in technology research and development and talent training, optimize and reconstruct existing business processes to adapt to the market demand of the blockchain era. At the same time, traditional financial institutions will also integrate financial technology resources through cooperation, mergers and acquisitions, and other methods to enhance their competitiveness. In this process, the market structure will continue to adjust and reshape, forming a new competitive situation.

In summary, blockchain technology has tremendous potential and broad development prospects in the global securities trading market in the future. By integrating with other emerging technologies, eliminating cross-border transaction obstacles, innovating financial products and services, and causing changes in the market structure, blockchain technology will bring higher efficiency, lower costs, stronger security, and more innovation

opportunities to the securities trading market. However, to realize these potentials, it is still necessary to overcome challenges in technology, regulation, market acceptance, and other aspects, requiring joint efforts to promote the healthy and orderly development of blockchain technology in the securities trading market.

7. Conclusion

Blockchain technology has shown great potential in the global securities trading market, but it also faces a series of challenges.

In terms of application, blockchain technology has brought many advantages to securities trading, such as improving trade efficiency, reducing costs, enhancing security, and improving market trust. By shortening the settlement cycle and reducing intermediary links, trade efficiency has been significantly improved; the reduction of operational costs and costs caused by human errors has made the market operation more economical and efficient; the characteristics of data encryption and tamper resistance, and the ability to resist cyber attacks have greatly enhanced the security of the system; transparent transaction records and the reduction of information asymmetry have improved the market trust environment.

However, the application of blockchain technology in the securities trading market is not without challenges. In terms of technological maturity, performance scaling issues and interoperability problems need to be resolved; in the field of regulation and compliance, the imperfection of the legal framework and the uncertainty of regulatory policies pose risks to market participants; in terms of industry acceptance, the conservative attitude of traditional institutions and the lack of technology popularization and education have limited its rapid promotion; in terms of security risks, new security vulnerabilities and private key management risks cannot be ignored.

Looking forward to the future, the integration of blockchain technology with other emerging technologies, the elimination of cross-border transaction barriers, the introduction of innovative financial products and services, and changes in the market structure all depict a hopeful development blueprint for the securities trading market. The rise of emerging fintech companies will promote market innovation, and the transformation of traditional financial institutions will also promote market optimization and integration.

Although the road is full of challenges, with the continuous advancement of technology, the gradual improvement of the regulatory environment, and the joint efforts of market participants, blockchain technology is expected to achieve wider and deeper applications in the global securities trading market, injecting new vitality into the development of the financial market and promoting securities trading towards a more efficient, secure, and fair future.

References

Deng Di, (2017). Research on the Financial Application and Supervision of Blockchain Technology. *Financial Supervision Research*, (8), 95-109.

Gomber P, Kauffman R J, Parker C, et al, (2018). On the fintech revolution: interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of Management Information Systems*, *35*(1), 220-265.

Lin Xiaoxuan, (2016). The Application of Blockchain Technology in the Financial Field. *China Finance*, (8), 17-18.

Narayanan A, Bonneau J, Felten E, et al, (2016). *Bitcoin and cryptocurrency technologies: A comprehensive introduction*. Princeton University Press.

Swan M., (2015). *Blockchain: Blueprint for a New Economy*. O'Reilly Media, Inc.

Tapscott D, Tapscott A, (2016). *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World*. Penguin.

Xie Ping, Shi Wuguang, (2015). A Literature Review of Digital Cryptocurrency Research. *Financial Research*, (1), 1-15.

Xu Zhong, Zou Chuanwei, (2018). What Can and Cannot Blockchain Do?. *Financial Research*, (11), 1-16.

Yermack D, (2013). Is Bitcoin a Real Currency? An Economic Appraisal. *NBER Working Paper*.

Yuan Yong, Wang Feiyue, (2016). A Review of the Development Status and Prospects of Blockchain Technology. *Acta Automatica Sinica*, *42*(4), 481-494.

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