



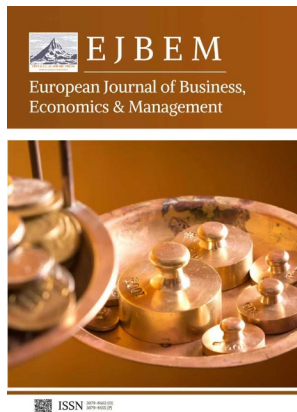
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Analysis of the Impact of off Exchange Derivatives Trading on Capital Market Efficiency Improvement

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Abstract: In the modern financial system, over-the-counter (OTC) derivative trading plays a crucial role, with its flexibility and diversity significantly enhancing the operational efficiency of capital markets. OTC derivative trading improves market efficiency by facilitating information integration, increasing transparency, expanding the variety of trading instruments, and promoting the rational allocation of resources. This article examines the impact of information transparency, innovative trading instruments, and optimized resource allocation on capital market efficiency, alongside the distinct characteristics of OTC derivatives. Emerging technologies, particularly blockchain, offer new technical support for the development of OTC derivative markets, helping to balance efficiency gains with effective risk control. Further advancements in policy frameworks and technological innovation are expected to deepen the contribution of OTC derivative trading to the overall functioning of capital markets.

Keywords: over-the-counter derivative trading; capital market efficiency; information transparency; resource allocation; blockchain technology

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1. Introduction

Amid the continuous development of global financial markets, over-the-counter (OTC) derivative trading has become an essential component of the capital sector due to its high flexibility and innovative nature. Unlike standardized exchange-traded instruments, OTC derivatives offer tailored solutions that meet the specific hedging, investment, and risk management needs of diverse market participants. This flexibility not only broadens the range of available financial tools but also enhances the adaptability of markets to rapidly changing economic conditions.

The operational efficiency of capital markets, which reflects the effectiveness of resource allocation and information transmission, directly influences market stability, liquidity, and overall competitiveness. Efficient markets enable capital to flow to its most productive uses, reduce transaction costs, and facilitate more accurate price discovery. In this context, understanding how OTC derivative trading contributes to market efficiency is crucial for both regulators and participants, as it provides insights into the mechanisms through which financial innovation affects market performance [1].

Furthermore, the development of OTC derivatives is closely linked to technological and regulatory advancements. Innovations in information systems, data processing, and transaction monitoring have enhanced transparency and reduced operational risks in OTC markets. At the same time, regulatory frameworks play a key role in balancing innovation with risk control, ensuring that the growth of OTC trading supports sustainable

market development. A comprehensive analysis of these factors can offer valuable guidance for policy-making, risk management, and the design of market infrastructure, ultimately strengthening the resilience and efficiency of modern financial systems.

2. Theoretical Basis for Over-The-Counter Derivative Trading and Capital Market Efficiency

2.1. Definition and Characteristics of off Exchange Derivatives Trading

Over-the-counter (OTC) derivative trading refers to financial derivative transactions conducted outside centralized exchanges, where the parties involved negotiate and agree on specific terms for the future trading of underlying assets. This form of trading encompasses a variety of instruments, including futures, interest rate swaps, options, and other derivative contracts, distinguished by their high flexibility and customizability. Unlike exchange-traded derivatives, OTC contracts are not constrained by standardized terms; traders can determine the contract's duration, size, and underlying asset types according to their specific needs [2].

The highly customizable nature of OTC derivatives allows for a broader range of asset types to be included, thereby enriching the market's risk hedging and investment tools. This adaptability enables participants to design contracts that precisely match their risk management strategies, investment goals, or hedging requirements. However, OTC trading also presents notable challenges. The lack of a centralized and transparent market system can lead to information asymmetry, elevated counterparty credit risks, and operational complexities. Consequently, market participants must maintain robust compliance procedures, risk management frameworks, and monitoring systems to mitigate potential financial losses and systemic risks.

2.2. Connotation of Capital Market Efficiency

Capital market efficiency reflects the market's ability to accurately and promptly incorporate all available information into asset prices and serves as a fundamental indicator of financial market health. According to the efficient market hypothesis, capital market efficiency can be categorized into three levels: weak-form efficiency, semi-strong form efficiency, and strong-form efficiency. These levels respectively represent the market's responsiveness to historical price information, publicly available information, and all relevant information, including private or insider knowledge [3].

An efficient capital market facilitates the rapid dissemination of information, ensures rational allocation of resources, and minimizes transaction costs, creating a fair and competitive environment for all investors. Achieving high market efficiency depends on several factors, including well-designed market structures, transparent information disclosure, and technological advancements that enhance data processing and trading capabilities. Within the contemporary financial framework, improving market efficiency is vital for strengthening market competitiveness, attracting domestic and international capital flows, and supporting sustainable financial development. Moreover, it serves as a key metric for evaluating the maturity and resilience of financial markets, guiding policymakers, regulators, and participants in their decision-making processes.

3. The Impact of Over-The-Counter Derivative Trading on Improving Capital Market Efficiency

3.1. Information Integration and Market Transparency

In the capital market, over-the-counter (OTC) derivative trading plays a critical role in facilitating information transmission. Prices and trading volumes generated during OTC transactions reflect the market's expectations for future asset trends, thereby promoting the integration and dissemination of information. This effect is particularly evident in trading activities that span multiple markets and asset classes, where OTC derivatives provide investors with richer and more comprehensive information resources [4].

The flexibility of OTC trading allows it to cover a wide range of non-standardized assets, serving as an important supplement to the information flow within capital markets. Although OTC markets are generally less transparent than centralized exchanges, emerging technologies such as blockchain can effectively enhance the traceability and reliability of transaction data, reducing information asymmetry [5].

For instance, in the foreign exchange market, the exchange rates of OTC swap transactions reflect the market's expectations of future exchange rate volatility, providing enterprises with a critical basis for foreign exchange risk management and hedging decisions. To quantify the impact of OTC derivative trading on market information integration, the following formula can be applied:

$$C_{ij} = \sum_{k=1}^n w_k P_{k,ij} \quad (1)$$

Among them, C_{ij} is the correlation between asset portfolio i and j , $P_{k,ij}$ are the price information of k -class over-the-counter derivative transactions, and w_k is the weight. This formula is used to evaluate the impact of over-the-counter derivative trading on the information correlation between assets, providing numerical references for investors in asset layout and risk control.

3.2. Expand the Diversity of Trading Tools

Customized over-the-counter (OTC) derivatives offer significant advantages in terms of asset class diversity and the variety of trading instruments. Market participants can design trading strategies tailored to their risk preferences, prevailing market conditions, and specific asset characteristics, such as constructing yield-enhancing products or structured risk-hedging schemes. This versatility addresses the investment and risk management needs across different levels of the capital market [6].

Moreover, OTC derivatives can reference unconventional underlying assets, including weather indices, credit events, and other non-traditional benchmarks, thereby expanding the range of tradable instruments and introducing innovative products to the market. This flexibility not only enhances market depth but also fosters financial innovation by allowing participants to design instruments that respond to unique market risks and opportunities.

For example, in energy commodity markets, customized OTC energy swap contracts enable companies to hedge against specific price fluctuations of energy products, substantially mitigating the impact of market volatility on production and operational costs. To evaluate the influence of trading instrument diversity on market value, the following formula can be applied as a reference:

$$D = \sqrt{\frac{1}{N} \sum_{i=1}^N (X_i - \bar{X})^2} \quad (2)$$

Among them, D is the total value of over-the-counter derivative trading, N is the price of the underlying asset, X_i is the trading quantity, and X is the functional weight of the trading instrument. This formula reveals the proportion of different instruments in the total transaction amount, reflecting their potential impact on market efficiency. By providing diversified trading tools, the over-the-counter derivatives market greatly enhances the flexibility of traders' choices, thereby adapting to complex and ever-changing investment and risk control needs.

3.3. Promote Effective Allocation of Resources

Over-the-counter (OTC) derivative trading provides a flexible price discovery mechanism that plays a vital role in enhancing the efficiency of resource allocation. Investors can use OTC trading platforms to customize risk management and return strategies based on the anticipated future trends of specific assets, enabling a more precise allocation of funds, assets, and risks to meet market demand. Improved capital liquidity further facilitates efficient distribution of resources across different asset classes.

The OTC market accommodates a wide range of participants, including small and medium-sized enterprises and investors holding non-standardized assets, thereby broadening the channels for cross-industry resource allocation [7].

For example, in the agricultural sector, the OTC derivatives market allows farmers to negotiate with financial institutions and design tailored risk-hedging strategies based on expected price fluctuations of crops. By using OTC swap contracts to predefine future grain prices, farmers can stabilize their incomes while attracting investment from financial institutions into sectors with development potential, creating mutually beneficial outcomes. This mechanism effectively enhances the accuracy and efficiency of resource allocation, improves capital utilization across industries, and promotes the overall optimization and flow of economic resources [8].

3.4. Potential Applications of Blockchain Technology

In the field of over-the-counter (OTC) derivatives trading, the application of blockchain technology has transformed traditional trading mechanisms and operational processes, profoundly impacting market efficiency. Leveraging the distributed ledger feature of blockchain, transaction data can be updated in real-time and maintained in a tamper-proof manner, significantly enhancing transparency and ensuring information security. The use of smart contracts enables automated transaction execution, reducing the likelihood of manual errors, shortening clearing times, and lowering transaction costs. Additionally, blockchain's traceability functions provide powerful tools for regulatory oversight, effectively mitigating fraud and further strengthening market confidence.

For example, a financial institution has developed a novel OTC interest rate swap product based on a blockchain platform. In this product, both parties can rely on smart contracts to automate the pairing and clearing processes, eliminating the need for traditional intermediaries. This innovation substantially improves trading efficiency, reduces compliance costs for participants, and generates a continuous, auditable data chain for risk management purposes. The integration of blockchain technology has thus established a more efficient, stable, and reliable operating platform for the OTC derivatives market, providing robust technical support for the modernization of capital markets [9].

4. Policy Recommendations for Improving Capital Market Efficiency through Over-The-Counter Derivative Trading

4.1. Improve the Transparency and Stability of the Trading System

The transparency and stability of over-the-counter (OTC) derivative trading are critical to the healthy development of capital markets. To prevent market fluctuations caused by information asymmetry, it is essential to strengthen the transparency and disclosure systems of trading platforms, ensuring that trading data are complete, accurate, and updated in real time. The adoption of distributed ledger technology can enhance the efficiency of data storage and transmission, reducing market volatility associated with centralized systems. Regulatory agencies should establish unified trading standards and rules to improve participant compliance and mitigate systemic risks through real-time monitoring and auditing.

For example, an energy company has implemented a natural gas swap trading system based on blockchain technology for OTC derivatives. This system enables real-time recording of contract data and multi-node synchronization, effectively reducing disputes caused by delayed or asymmetric information. It also strengthens trust between trading parties and encourages broader participation in the OTC market. As shown in Table 1, the company's OTC derivative trading volumes over the years and the corresponding improvements in market efficiency demonstrate the positive impact of enhanced transparency [10].

Table 1. Comparison of trading volume and market performance before and after disclosure of over-the-counter derivatives information.

	Transaction volume before information disclosure	Transaction volume after information disclosure	Contract quantity	Transaction frequency (times/year)	Number of dispute cases
2018	one thousand and three hundred	one thousand and three hundred	one thousand and five hundred	fifty	twelve
2019	one thousand three hundred and fifty	one thousand four hundred and fifty	one thousand and six hundred	sixty	ten
2020	one thousand and four hundred	one thousand and eight hundred	one thousand seven hundred and fifty	seventy-five	five
2021	one thousand and five hundred	two thousand	one thousand and nine hundred	ninety	three
2022	one thousand and six hundred	two thousand and two hundred	two thousand and one hundred	one hundred and ten	two

As shown in the table, following the implementation of the information disclosure policy, trading volume increased markedly, and trading frequency also rose significantly. At the same time, the occurrence of dispute cases declined substantially, indicating that both market transparency and stability were effectively enhanced.

4.2. Preventing Systemic Risks in Derivative Trading

The over-the-counter (OTC) derivatives market, due to its decentralized and highly customized nature, carries significant systemic risks that can negatively affect financial market stability. To effectively manage these risks, a comprehensive risk management system should be established, encompassing four key aspects: risk identification, monitoring, mitigation, and response [5].

During the risk identification stage, data analysis and model design are crucial for detecting potential risk sources, including credit, liquidity, and operational risks. Risk monitoring requires a dynamic market surveillance system that tracks changes in highly leveraged trades and large contracts to ensure risks remain controllable. Risk mitigation involves implementing margin requirements, position limits, and hedging strategies, with regular updates to these parameters to adapt to market fluctuations. Institutional measures, such as setting participant qualification criteria and capital adequacy standards, further constrain high-risk trading behaviors. At the risk response level, multi-tiered contingency plans should be developed, including market intervention and liquidity support strategies, to quickly restore normal operations under extreme market conditions.

As illustrated in Figure 1, the process of preventing systemic risks in derivative trading integrates these four stages to maintain market stability and resilience.

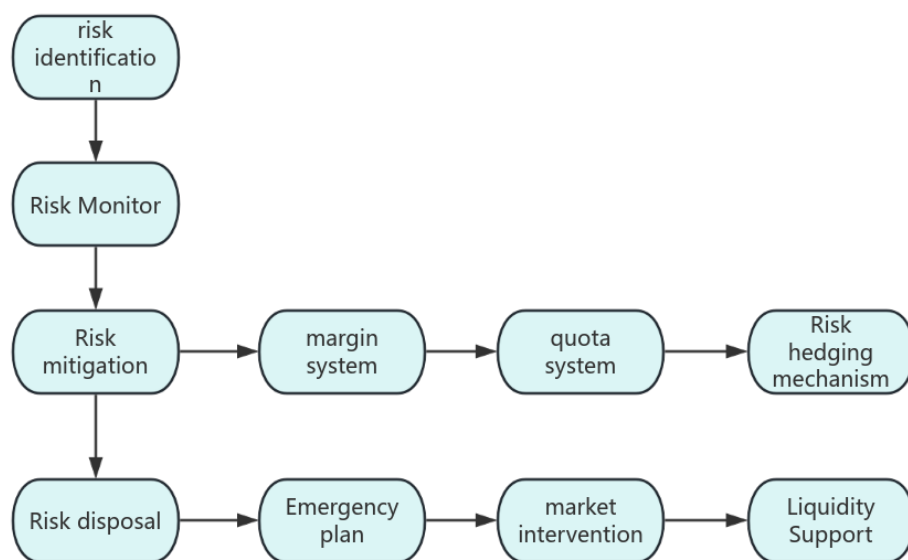


Figure 1. Systematic risk prevention process for derivative trading.

4.3. Encourage Product Innovation and Market Openness

To foster the development of the over-the-counter (OTC) derivatives market in terms of product innovation and open growth, a comprehensive strategic framework is needed, encompassing policy guidance, technological advancement, and market optimization. At the policy level, regulatory agencies should establish efficient approval processes for new products, providing a streamlined pathway for innovative instruments to enter the market. Incentives such as dedicated funds or tax reduction policies can encourage enterprises to develop novel tools for specific industries and asset types, including derivatives based on cultural industry copyright income or financial products linked to social welfare indices, thereby addressing unique risk management challenges in targeted markets.

Regarding market openness, cross-border participation should be introduced in an orderly manner to create a fair and transparent trading environment for international investors. Cross-border transaction procedures can be simplified through bilateral or multilateral agreements. Additionally, strengthening infrastructure, such as promoting electronic trading platforms with standardized features and multilingual capabilities, can attract investors from diverse regions and industries [6].

For example, a cultural industry park has partnered with a technology company to develop an OTC derivative trading platform based on film and television copyright revenue. In this system, copyright holders can use the expected box office revenue of a film as a trading asset, design customized risk management plans, and allow creators and investors to share potential revenue fluctuations. Regulatory authorities support the development of such products through dedicated policies and promote the establishment of consistent contract standards within the industry, ensuring legal compliance and stable operation of trading platforms.

This strategic approach aims to cultivate a diversified and international market environment, stimulate the creation of innovative products and cross-industry collaboration, and effectively enhance capital market efficiency in terms of both resource allocation and operational performance.

4.4. Strengthen the Integration of Technology and Risk Management

To effectively address the diverse risks inherent in the over-the-counter (OTC) derivatives market, it is essential to strengthen the integration of advanced technology with

risk management practices. At the regulatory level, agencies should develop technical application standards that incentivize market participants to adopt cutting-edge technologies such as artificial intelligence, big data analytics, and blockchain to improve the efficiency of risk identification and management. Establishing industry-wide technology platforms can facilitate cross-industry data exchange and connectivity, providing comprehensive information support for risk assessment. Simultaneously, compliance requirements should be enforced, and a regulatory framework covering data confidentiality and algorithmic transparency should be implemented to ensure that the application of technology in risk management remains secure and reliable [9].

At the market operation level, participants should undertake digital upgrades to core trading processes. This includes streamlining complex transactions through smart contracts and employing real-time monitoring mechanisms to detect potential credit and liquidity risks.

For example, an agricultural technology enterprise has partnered with research institutions to develop a weather derivatives trading platform utilizing satellite remote sensing data. By monitoring and analyzing climate information in real time, the platform provides crop growers with hedging tools against climate-related risks. Distributed ledger technology is used to record all transaction data, ensuring transparency and security, while integrated artificial intelligence algorithms forecast climate evolution, assisting both parties in designing more effective contracts. Regulatory agencies have developed specialized technical specifications for the platform and conducted qualitative reviews of algorithm transparency, ensuring the system operates legally and reliably.

This approach promotes the integration of technological innovation and risk management, effectively addressing the increasing complexity of the OTC derivatives market and laying a solid foundation for its sustainable development.

5. Conclusion

Over-the-counter (OTC) derivatives play a crucial role in capital markets, distinguished by their flexibility, customization, and innovative capacity, all of which contribute to enhancing market efficiency. These instruments facilitate information integration, expand the diversity of trading tools, optimize resource allocation, and enable advanced technological applications, making them a vital component of the modern financial system. By providing tailored risk management solutions, OTC derivatives allow investors and enterprises to better align their portfolios with market opportunities and potential risks, thereby improving the overall allocation of capital and operational efficiency.

However, the OTC market also faces challenges, including limited transparency, information asymmetry, high credit and liquidity risks, and difficulties in regulatory oversight. These challenges highlight the necessity of combining policy innovation, technological advancement, and market openness to foster a safer and more efficient trading environment. The integration of technologies such as blockchain, artificial intelligence, and big data analytics can enhance transaction traceability, automate clearing processes, improve real-time monitoring, and strengthen risk management. At the same time, establishing standardized trading procedures, unified compliance rules, and effective disclosure systems can further mitigate systemic risks and increase market confidence.

Looking ahead, the development of OTC derivatives will rely on a synergistic approach that combines regulatory improvements, technological adoption, and active participation from market entities. Strengthening cross-border cooperation and promoting the creation of innovative derivative products will expand market access, stimulate investor engagement, and support capital market diversification. With these measures, OTC derivative trading is poised to play an even greater role in enhancing capital market efficiency, supporting risk management strategies, and contributing to the sustainable and stable development of global financial markets.

Ultimately, the future success of the OTC derivatives market depends on coordinated efforts among regulatory agencies, financial institutions, and market participants to establish a comprehensive ecosystem that balances innovation, efficiency, and risk control, ensuring long-term stability and resilience in increasingly complex financial environments.

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