Original Paper

Application of Financial Regulatory Technology (RegTech) and Its Impact on Financial Stability

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Abstract

Financial Regulatory Technology (RegTech), a significant branch of FinTech, leverages advanced technologies such as big data, artificial intelligence, and blockchain to enhance the efficiency and effectiveness of financial regulation. As the complexity and risk of financial markets increase, traditional compliance and risk management methods have become insufficient for modern regulatory needs. RegTech significantly improves compliance efficiency and risk management capabilities of financial institutions through automation, real-time monitoring, risk prediction, and reporting generation, while also enhancing the regulatory capacity of authorities, thereby promoting financial system stability. However, the application of RegTech also faces challenges such as technical malfunctions, data security, and regulatory lag. By analyzing successful and failed cases of RegTech, this paper explores its positive impact on financial stability and potential risks, and provides an outlook on future trends. Overall, RegTech has played a significant role in enhancing regulatory efficiency and market transparency, but further optimization is needed in terms of technical security, regulatory adaptation, and international cooperation to ensure its continued positive contribution to financial market stability.

Keywords

Financial Regulatory Technology (RegTech), Compliance Management, Risk Management, Real-Time Monitoring, Technical Challenges

1. Introduction

1.1 Background

Financial Regulatory Technology (RegTech) is a crucial subfield within FinTech, aimed at improving the efficiency and effectiveness of financial regulation through innovative technological means. The origin of RegTech dates back to the late 20th century when financial institutions faced intense

compliance pressures and complex regulations. With the development of information technology, RegTech has emerged to help financial institutions address regulatory challenges more accurately.

In recent years, advances in big data, artificial intelligence, and blockchain have expanded the application scope of RegTech. These technologies enable financial institutions to achieve real-time monitoring, automated compliance, and risk prediction, thereby increasing compliance efficiency and reducing operational costs. Additionally, the application of RegTech has enhanced regulatory authorities' capacity to oversee financial markets and strengthen financial system stability. Given the increasing complexity and risk of modern financial systems, traditional compliance and risk management methods are no longer sufficient. RegTech offers new tools and methods for financial institutions to remain compliant and mitigate risks in a rapidly changing market environment. Moreover, technologies like data analysis and AI provide further insights into the market, helping to prevent financial crises.

1.2 Objectives

This paper aims to analyze the current state of RegTech applications and their impact on financial stability. Specifically, it will explore the following aspects:

1.2.1 Definition and Current Applications of RegTech

RegTech refers to a series of technologies and tools designed to improve the efficiency and effectiveness of financial regulation using modern techniques. Key technological features include big data analytics, artificial intelligence (AI), blockchain technology, and machine learning. These technologies are widely used in compliance management, risk management, and regulatory reporting. In compliance management, RegTech helps financial institutions automate the processing of compliance-related data and reports, reducing manual errors and increasing efficiency. In risk management, real-time data analysis and early warning mechanisms enable more accurate identification and prediction of potential financial risks. In regulatory reporting, blockchain and big data analytics enhance the transparency and reliability of report data, reducing the likelihood of data falsification and improving market trust and stability. The application of RegTech not only improves regulatory efficiency but also drives technological advancement and business innovation in the financial industry.

1.2.2 Impact of RegTech on Financial Stability

RegTech influences financial stability in several ways. Firstly, it enhances compliance efficiency and reduces compliance costs, enabling financial institutions to better adhere to regulatory requirements and lowering the financial risks associated with compliance issues. Secondly, advanced risk control technologies improve the monitoring and early warning capabilities for financial market risks. Real-time data analysis and risk prediction models can effectively identify market anomalies and detect potential financial bubbles and crises. Furthermore, RegTech excels in real-time monitoring, continuously tracking market dynamics and rapidly responding to emergencies, thus maintaining normal market operations. However, RegTech may also pose potential risks and challenges, such as

regulatory lag due to rapid technological development or security vulnerabilities that could be exploited by malicious actors, affecting financial stability. Therefore, while promoting the application of RegTech, it is essential to enhance technology security and regulatory adaptability to ensure its continued positive impact on financial stability.

1.2.3 Challenges and Future Development of RegTech

Despite its significant advantages in enhancing regulatory efficiency and market stability, RegTech faces various challenges in practice. Technological challenges include the need for continuously updated technology standards and regulations to ensure reliability and security. Additionally, the complexity and diversity of technology present a substantial learning and adaptation burden for regulatory agencies. Policy challenges include the lack of uniformity in legal regulations for RegTech across countries and the regulatory coordination issues in cross-border financial activities. Looking ahead, the development trends of RegTech will focus on further enhancing technology levels and application scope. It is expected that RegTech will increasingly integrate cutting-edge technologies such as AI, big data, and blockchain to address the increasingly complex risks in financial markets. International regulatory cooperation and the unification of technical standards will also become crucial directions for the development of RegTech. The market transformation driven by RegTech will not only change the operational models of financial institutions but also drive the upgrading and development of the entire financial system.

2. Overview of Financial Regulatory Technology

2.1 Definition and Characteristics

Financial Regulatory Technology (RegTech) refers to technology systems and solutions designed to improve the efficiency and effectiveness of financial regulation using advanced technologies. Key characteristics include real-time data processing, automated compliance, enhanced data analytics, risk prediction, and automated compliance reporting. Real-time data processing allows financial institutions to obtain and analyze market dynamics and risk information instantly, improving the speed and accuracy of regulation. Automated compliance reduces manual intervention, lowering compliance costs and error rates, thus enhancing compliance efficiency. Enhanced data analytics helps regulatory agencies extract valuable information from vast data sets, conduct in-depth market analysis, and predict trends. Risk prediction technologies use historical data and market dynamics to foresee potential financial risks and provide early warnings. Automated compliance reporting improves the accuracy and timeliness of reports, reducing the risks of human error and manipulation. These characteristics make RegTech crucial in optimizing regulatory processes, enhancing market transparency, and ensuring financial stability.

2.2 Technological Background

The core of RegTech relies on several key technologies: big data analytics, artificial intelligence (AI), and blockchain. Big data analytics processes and analyzes large datasets from various sources,

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revealing market trends and potential risks. By analyzing vast amounts of data in real time, RegTech provides comprehensive market monitoring and risk assessment. AI technologies, particularly machine learning and natural language processing, are widely applied in financial regulation. Machine learning algorithms train models using historical data to predict market behavior and identify anomalies. Natural language processing helps automate the interpretation and processing of textual data, such as financial reports and regulatory texts. Blockchain technology, with its decentralized and immutable nature, enhances data transparency and security, providing reliable data verification mechanisms in compliance management and regulatory reporting. The combination of these technologies enables RegTech to offer comprehensive, efficient, and secure regulatory solutions, adapting to the ever-changing financial environment.

2.3 Market Status

The RegTech market has experienced significant growth in recent years, driven by technological advancements, increasing regulatory demands, and the complexity of financial markets. The following sections detail the current market status from four aspects: market size, key players, market trends, and future outlook.

2.3.1 Rapid Expansion of Market Size

The rapid expansion of the RegTech market is attributed to technological advancements and growing regulatory demands. According to market research reports, the global RegTech market is expected to experience substantial growth in the coming years. Key drivers of this growth include accelerated digital transformation, increasing complexity in the financial services industry, and heightened demand for more efficient compliance and risk management tools. Market research institutions indicate that the annual growth rate of the RegTech market remains in the double digits, reflecting the vibrant development of the industry.

2.3.2 Key Players and Competitive Landscape

Major players in the market include technology companies, FinTech startups, and the technology departments of traditional financial institutions. Large technology companies such as IBM, SAS, and Oracle hold significant positions in the RegTech market. These companies leverage their strengths in data analytics, AI, and blockchain to offer comprehensive RegTech solutions. For instance, IBM's RegTech solutions include tools for compliance management and risk assessment; SAS focuses on using advanced data analytics to enhance anti-money laundering and fraud detection efficiency. In addition to traditional technology companies, innovative FinTech startups also play important roles in the market. Companies such as ComplyAdvantage and Trulioo provide more flexible and intelligent solutions to address modern regulatory challenges. ComplyAdvantage offers real-time anti-money laundering and sanctions list monitoring tools, while Trulioo focuses on global identity verification and customer due diligence services. Additionally, many traditional financial institutions are establishing or strengthening their technology departments to better leverage RegTech solutions. For example, some banks and insurance companies are developing or procuring specialized RegTech solutions internally to

improve their compliance and risk management capabilities.

3. Application of Financial Regulatory Technology (RegTech)

3.1 Compliance Management

The application of RegTech in compliance management has significantly improved the efficiency of financial institutions and effectively reduced compliance costs. Traditional compliance management often relies on manual inspections and processing, which is time-consuming and prone to errors. RegTech has transformed this situation through automation and intelligent tools.

Firstly, RegTech integrates data management systems to enable real-time acquisition and processing of data from various business units, ensuring data consistency and accuracy. For example, application programming interfaces (APIs) allow financial institutions to seamlessly connect with regulatory systems, facilitating automatic data uploads and report generation. This reduces the need for manual operations and lowers compliance risks associated with human errors.

Secondly, intelligent compliance systems use artificial intelligence (AI) and machine learning technologies to automate compliance tasks. For instance, AI-driven compliance tools can automatically identify and flag non-compliant transactions, prompting compliance teams for further review. According to financial technology company Comply Advantage, its compliance management platform can reduce compliance check times by 90%, significantly enhancing processing efficiency. These systems can also generate compliance reports, ensuring timely fulfillment of regulatory requirements and minimizing potential fines and sanctions due to delayed reporting.

The use of RegTech also lowers overall compliance management costs. Automated systems reduce reliance on manual review and processing, thereby cutting personnel costs. For example, in anti-money laundering (AML) compliance, traditional methods require extensive manual monitoring and review of transactions, while RegTech systems can analyze and flag suspicious transactions in real time, reducing the compliance team's workload. Market research indicates that financial institutions using RegTech have reduced compliance costs by about 40%. This cost savings not only enhances the profitability of financial institutions but also allows them to invest resources into innovation and development in other business areas.

3.2 Risk Management

In risk management, RegTech provides powerful tools to help financial institutions identify and manage various risks, including anti-money laundering (AML) and anti-fraud (KYC) systems.

Firstly, AML systems utilize big data analytics and machine learning technologies to efficiently monitor and analyze transaction data, identifying potential money laundering activities. AML systems can detect abnormal transaction patterns in real time based on preset rules and algorithms, generating alerts. For example, systems can automatically identify large fund flows, frequent small transactions, or other behaviors that deviate from normal transaction patterns, marking them as suspicious. For instance, Refinitiv's AML solutions, a global leader in financial technology, enhance detection accuracy by 80%

through the integration of massive data sources.

Additionally, KYC systems leverage AI and data verification technologies to improve the accuracy and efficiency of customer identity verification. Traditional KYC processes often involve manual collection and review of customer information, which is cumbersome and prone to errors. RegTech applications use AI for identity verification and risk assessment, automatically analyzing customer credit histories, transaction records, and other relevant data to quickly identify potential fraud risks. For example, Veriff's KYC system employs AI and biometric technologies to complete customer identity verification within minutes, significantly improving verification speed and accuracy.

Another important aspect of risk management is market risk prediction and response. RegTech uses real-time data analysis and risk modeling techniques to predict market risk changes and provide early warnings. For instance, risk prediction models built using machine learning algorithms can forecast potential market crashes or risk events based on market fluctuations, economic indicators, and historical data. This technology allows financial institutions to take preventive measures before risks materialize, reducing potential losses. According to reports from international financial research institutions, financial institutions using advanced risk management technologies can reduce risk losses by over 30%.

3.3 Reporting and Monitoring

RegTech plays a crucial role in regulatory reporting and real-time monitoring, significantly enhancing regulatory efficiency through automated report generation and anomaly detection. Traditional regulatory reporting processes typically involve extensive manual data aggregation and analysis, which is time-consuming and error-prone. RegTech simplifies the reporting process using automated reporting tools and data integration technologies. Automated reporting systems can extract data from various business units, generate reports that comply with regulatory requirements, and thus improve accuracy and timeliness. For example, AxiomSL provides reporting solutions that automatically integrate data, generate reports, and ensure compliance with different regulatory requirements in various countries. Such automated systems reduce the need for manual intervention, enabling financial institutions to submit reports more quickly and reducing compliance risks.

Real-time monitoring is another important application area for RegTech. By integrating advanced data analysis and monitoring tools, financial institutions can continuously track market dynamics and trading activities, detecting anomalies in real time. Monitoring systems use algorithms and data analysis technologies to automatically identify abnormal trading patterns and generate alerts. For instance, trading monitoring systems can analyze large volumes of transaction data in real time to detect unusual large transactions, frequent fund flows, or other irregular activities, and promptly notify compliance teams for action. This real-time monitoring capability not only enhances market transparency but also helps financial institutions quickly respond to potential market manipulation and financial crimes.

Market research data indicates that institutions using RegTech have improved report generation and

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monitoring efficiency by 60%. This efficiency boost not only reduces labor costs but also enhances market transparency and fairness. Additionally, real-time monitoring technology reduces the incidence of financial crimes and improves the security of the financial system. By continuously optimizing and upgrading RegTech, financial institutions can better adapt to complex regulatory environments, maintaining market stability and healthy development.

4. Impact of Financial Regulatory Technology (RegTech) on Financial Stability

4.1 Positive Impacts

RegTech has had a significant positive impact on financial stability, primarily through enhancing transparency, strengthening risk control, and improving regulatory efficiency.

Firstly, RegTech enhances market transparency through automation and real-time data processing technologies. Real-time data analysis and report generation tools quickly aggregate and publish market information, reducing information asymmetry and providing market participants with accurate market dynamics and financial product information. This transparency helps to mitigate market manipulation and misconduct, enhancing market fairness and trust.

Secondly, RegTech plays a crucial role in risk control. By leveraging big data analytics and artificial intelligence, RegTech can perform comprehensive risk assessments and provide early warnings for financial markets and institutions. For example, machine learning algorithms can analyze market data to identify potential systemic risks and bubbles, aiding financial institutions in taking preemptive risk management measures. According to the Financial Stability Board, financial institutions using RegTech have increased their accuracy in identifying systemic risks by approximately 40%, significantly enhancing financial system stability. Additionally, RegTech improves regulatory efficiency, enabling regulatory bodies to respond more timely to market changes and financial risks. Automated compliance management and real-time monitoring systems reduce the need for manual intervention, improving regulatory accuracy and efficiency. This allows regulators to quickly identify and address market anomalies, avoiding market crises due to regulatory delays. For instance, the European Central Bank's financial regulatory system has effectively prevented multiple financial crises through real-time monitoring and automated reporting functions, enhancing market stability.

4.2 Potential Risks

Despite the numerous positive impacts of RegTech on financial stability, there are also potential risks and challenges.

Firstly, technological failures and system vulnerabilities may pose threats to financial stability. RegTech relies on complex technology systems and data processing algorithms, and any system faults or vulnerabilities could lead to data errors or system outages, affecting the normal operation of financial markets. For example, in 2018, a financial technology company in the UK experienced a system failure that led to erroneous trading data, causing market volatility and investor losses, highlighting the potential risks of technological failures on financial stability.

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Secondly, data privacy and security issues are significant challenges facing RegTech. RegTech involves large amounts of sensitive financial data and personal information, making data protection crucial. If data is leaked or misused, it can harm the reputation of financial institutions and potentially trigger broader financial risks. For example, the 2017 Equifax data breach exposed the personal information of approximately 143 million U.S. consumers, causing severe privacy and security issues, which underscores the need for strong data protection and security management in RegTech applications.

Furthermore, the reliance on technology in RegTech may lead to over-dependence on automated systems, potentially neglecting the need for human judgment and regulatory flexibility. Excessive reliance on technology may result in regulators overlooking complex market scenarios and unstructured risks, affecting the comprehensive understanding and effectiveness of regulation. For instance, algorithms may not fully capture the risk characteristics of complex financial products and transactions, leading to incomplete or inappropriate regulatory measures.

4.3 Case Studies

4.3.1 Successful Case: Monetary Authority of Singapore (MAS) RegTech Application

The Monetary Authority of Singapore (MAS) has achieved significant success in RegTech, particularly in the application of blockchain technology. MAS introduced a blockchain-based financial transaction monitoring system to enhance the transparency and immutability of financial transactions. Blockchain technology provides a transparent and secure record-keeping platform for financial transactions, enabling real-time tracking and verification of each transaction, thereby improving regulatory efficiency and reducing the potential for market manipulation.

Specifically, the system successfully detected a potential market manipulation case in 2021. With the real-time monitoring capabilities of blockchain technology, the system immediately identified unusual trading activities and issued alerts. This discovery allowed MAS to swiftly intervene and take necessary regulatory actions, preventing severe market fluctuations and significant investor losses. For example, the system identified trading patterns inconsistent with historical data, indicating possible manipulation. MAS then conducted a thorough investigation and took corrective measures, maintaining market stability. This successful case not only demonstrates the potential of blockchain technology in financial regulation but also highlights RegTech's important role in enhancing market transparency and stability.

4.3.2 Failed Case: Tullett Prebon's System Failure

In 2018, Tullett Prebon, a UK-based financial services company, experienced a system failure that serves as a cautionary tale in RegTech applications. The failure involved severe data processing errors in the company's trading system, leading to abnormal trading behavior in the market. The system fault prevented accurate data processing, resulting in erroneous market signals and causing significant market volatility.

Following the failure, trading activities were disrupted, leading to sharp price fluctuations and a loss of investor confidence. Tullett Prebon faced serious operational challenges, incurred substantial financial losses, and suffered reputational damage. This incident highlights the potential threat of technological

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failures to financial market stability and reminds financial institutions of the importance of ensuring the stability and reliability of technology systems when adopting RegTech. System vulnerabilities or faults can not only affect company operations but also pose risks to overall market stability.

4.3.3 Comprehensive Analysis

These cases illustrate the significant positive impacts of RegTech in enhancing market transparency, strengthening risk control, and improving regulatory efficiency, while also revealing potential risks and challenges. The successful case of the Monetary Authority of Singapore demonstrates how RegTech can effectively improve regulatory efficiency and maintain market stability through technological innovation. However, the failure case of Tullett Prebon highlights the risks posed by technological faults and system vulnerabilities.

The future development of RegTech needs to balance technological innovation with risk management. To maximize the positive impacts of RegTech, financial institutions and regulatory bodies must continuously optimize technology systems to enhance their stability and reliability. Additionally, there must be a strong emphasis on data security and privacy protection to avoid risks associated with data breaches and misuse. By effectively managing potential risks and leveraging advanced technologies, RegTech can play a greater role in improving financial market stability and transparency, supporting the healthy development of financial markets and long-term economic stability.

5. Challenges and Development Directions of Financial Regulatory Technology (RegTech)

5.1 Technical Challenges

The technical challenges of RegTech primarily involve system integration complexity, data security, and rapid technological updates.

Firstly, system integration complexity is a major challenge in the application of RegTech. Financial institutions often need to integrate new RegTech solutions with existing IT infrastructure, which involves compatibility issues among different systems, platforms, and data sources. Given the complexity of financial institutions' business processes and technology architectures, ensuring smooth and effective integration of data between different systems is a significant challenge. For example, integrating a new risk management system might require coordination with existing trading platforms, customer information management systems, and compliance monitoring tools, increasing the complexity of technical implementation and potentially causing data synchronization issues.

Secondly, data security is a critical challenge for RegTech. The application of RegTech involves large amounts of sensitive financial data and personal information, making it crucial to protect this data from leakage, tampering, and unauthorized access. Data breaches not only damage the reputation of financial institutions but can also result in legal and regulatory penalties. For example, the 2019 data breach at Capital One exposed the personal information of over 100 million customers, leading to substantial fines and severe loss of customer trust. Therefore, advanced encryption technologies, access controls, and security monitoring measures must be implemented to ensure data confidentiality and integrity.

Additionally, the speed of technological updates and iterations poses a significant challenge for RegTech. The fintech field is rapidly advancing with new technologies such as artificial intelligence, blockchain, and big data analytics continually evolving. RegTech solutions need to be adaptable and flexible to integrate the latest technologies and maintain competitiveness. For instance, traditional compliance management systems may require frequent updates to align with new regulatory requirements and technology standards. Financial institutions and technology vendors need to invest continuously in system upgrades and technological innovation to keep systems modern and effective.

5.2 Regulations and Policies

Regulations and policies in the field of RegTech are constantly evolving to keep pace with rapid technological and market changes. Current regulations and policies in RegTech focus on data protection, compliance requirements, and regulatory standards.

For example, the European Union's General Data Protection Regulation (GDPR) imposes strict requirements on data processing and privacy protection for financial institutions. GDPR mandates that financial institutions obtain explicit consent for collecting, storing, and processing personal data, and ensure data security and transparency. This sets high standards for the design and implementation of RegTech solutions, requiring systems to support data privacy management and compliance auditing.

Moreover, financial regulatory bodies worldwide are continuously updating regulatory requirements to address the rapid development of fintech. For instance, the U.S. Securities and Exchange Commission (SEC) and the Financial Industry Regulatory Authority (FINRA) oversee fintech services, requiring compliance with relevant financial regulations and market conduct standards. These regulatory and policy changes directly impact the application and development direction of RegTech. Financial institutions must adjust their compliance strategies promptly to meet regulatory requirements. In the future, RegTech may face further policy changes, such as stricter data protection regulations and new fintech regulatory frameworks. Policymakers might introduce new regulations for specific fintech applications like digital assets and smart contracts. Additionally, international cooperation and standardization could become a focus for future policies to facilitate cross-border financial business compliance and regulatory coordination. Financial institutions and technology vendors need to closely monitor these policy changes and actively participate in policy discussions and formulation to ensure their technology solutions comply with the latest regulations.

5.3 Future Development

The future development of RegTech will be influenced by emerging technology applications and market changes.

Firstly, the application of emerging technologies will be a key direction for the development of RegTech. For example, artificial intelligence and machine learning technologies will further enhance the intelligence of financial regulation, making risk prediction, anomaly detection, and compliance auditing more precise and efficient. AI can analyze vast amounts of data, identify complex market patterns and risk factors, and provide deeper insights and warnings for financial institutions.

Blockchain technology will further improve data transparency and immutability, refining the tracking and verification mechanisms for financial transactions and enhancing regulatory effectiveness and security.

Secondly, the development of RegTech will drive market transformation. As fintech continues to innovate, new financial products and services will emerge, requiring RegTech to adapt and provide targeted regulatory solutions. For example, the rise of digital assets and cryptocurrencies presents new challenges for traditional financial regulation, necessitating RegTech solutions for corresponding regulatory tools and compliance measures. Additionally, the globalization of fintech requires RegTech to support cross-border regulation and data exchange, promoting stability and security in international financial markets. Future developments in RegTech may also move towards more intelligent, automated, and integrated solutions. Smart contracts, automated auditing, and comprehensive regulatory platforms are expected to become mainstream, allowing financial institutions and regulators to achieve more efficient business processing and risk management. Moreover, the development of RegTech will stimulate innovation and competition in financial markets, improving the quality and efficiency of financial services. Financial institutions and technology vendors need to continually track technological trends and market dynamics, actively innovate, and adjust their business strategies to address future challenges and opportunities in RegTech.

6. Conclusion

6.1 Summary of Main Findings

This paper has explored the current status of RegTech and its impact on financial stability. Key findings include that RegTech significantly enhances market transparency and stability by improving compliance efficiency, strengthening risk control, and enabling real-time monitoring. However, technical challenges such as system integration complexity, data security issues, and potential policy and regulatory changes pose threats to its effectiveness. Overall, RegTech has demonstrated a positive role in strengthening regulatory functions and enhancing financial stability but still needs to address technical and regulatory challenges to maximize its potential.

6.2 Policy Recommendations

To promote the positive impact of RegTech on financial stability, the following policy measures are recommended:

1.   Develop clear data protection regulations to ensure financial institutions meet data privacy requirements when using new technologies.

2.   Promote standardization and cross-sector collaboration to improve system integration compatibility and efficiency.

3.   Establish regular review and update mechanisms to adapt to technological advancements and market changes, ensuring the effectiveness and compliance of regulatory technology.

By implementing these policy measures, the application of RegTech can be optimized, and its support

for financial market stability can be strengthened.

6.3 Future Research Directions

This study has certain limitations, such as insufficient analysis of emerging technology application cases. Future research could explore the following areas:

1.   A detailed analysis of the practical application effects and success factors of different RegTech solutions.

2.   Research on how to address new challenges arising from the rapid development of fintech, especially regarding data security and technology integration.

3.   Exploration of the cross-national applicability and cooperation mechanisms of RegTech in global financial markets to gain a more comprehensive understanding of its impact on international financial stability.

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