Research on the Economic Growth Effects and Risk Governance Mechanisms of Artificial Intelligence Empowering Financial Innovation

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Abstract: With the deep integration of artificial intelligence (AI) technology into the financial sector, financial innovation has shown features of intelligence, digitalisation, and scenario-based application. This has injected new momentum into resource allocation efficiency, financial inclusion, and economic growth. The application of AI in credit risk control, robo-advisory, algorithmic trading, and regulatory technology (RegTech) has significantly improved information processing capabilities and risk identification levels. However, while AI empowers financial innovation, it also brings new challenges such as algorithmic bias, systemic technological risks, ethical dilemmas, and regulatory lag. Based on fintech development theory, endogenous growth theory, and the risk governance framework, this paper systematically explores the economic growth effects, risk generation mechanisms, and governance paths of AI-enabled financial innovation. The study finds that AI promotes economic growth through efficiency improvement, innovation diffusion, and inclusive finance, but its risks are often hidden, cross-domain, and amplifying. Therefore, this paper proposes building a multi-level risk governance system, including intelligent regulation, algorithmic ethics governance, institutional risk management innovation, and international coordinated supervision, aiming to provide theoretical and practical references for fintech policy-making and regulation.

1. Introduction

1.1. Research Background

In recent years, artificial intelligence technology has become an important engine for the transformation of the global digital economy. As a data-intensive and technology-sensitive industry, the financial industry is one of the most active fields of AI application. From Robo-advisor to quantitative investment, from smart credit to regulatory technology, AI is reshaping the function of financial intermediary and market structure. Through machine learning models, natural language processing and knowledge graph technology, financial institutions can carry out risk assessment, product pricing and investment decision-making more efficiently, thus reducing information asymmetry and transaction costs.

However, financial innovation empowered by AI is also accompanied by new uncertainties. Problems such as algorithm deviation, data monopoly and "black box" decision-making weaken market fairness and regulatory transparency; high-frequency algorithm transactions, model homogenization and system linkage effects may amplify financial fluctuations and form technical systemic risks. At present, the academic community has discussed the positive effect of AI in promoting economic growth, but the research on the generation, transmission and governance path of risks is relatively insufficient, which has formed a theoretical gap at the level of policy formulation and supervision practice.

1.2. Research Significance

From a theoretical point of view, this study strives to combine artificial intelligence technology innovation with financial development theory, systematically explain the economic growth effect and risk feedback mechanism of AI-enabled financial innovation, and build a comprehensive

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analysis framework of "technology empowerment-innovation diffusion-economic growth-risk feedback". The framework not only expands the explanatory dimension of technological exovariates in traditional financial innovation theory, but also provides a new analytical perspective for the study of artificial intelligence economics. By introducing the theory of risk society and the theory of complex system supervision, this article further reveals the potential risks and systemic uncertainty caused by AI technology while promoting economic growth, thus enriching the theoretical connotation and governance logic of technology-driven financial innovation in the digital economy era.

At the practical level, this study serves as a reference for financial regulators and institutions to balance innovation and safety. On one hand, systematically analysing the growth effects of AI in financial innovation helps governments better identify technological dividends and economic potential in policy-making, promoting the integration of intelligent finance with the real economy. On the other hand, analysing how AI-related financial risks are generated and transmitted provides scientific support for regulators to improve risk warning, algorithm auditing, and ethical supervision. By constructing a multi-level risk governance system, this paper seeks to offer both theoretical support and practical guidance for building a secure, sustainable, and intelligence-driven modern financial system in China and worldwide, fostering healthy development of the digital economy and financial innovation.

2. Related Concepts and Theoretical Foundations

2.1. Related Concepts

2.1.1. AI Financial Innovation

AI financial innovation refers to the process of reshaping and optimising traditional financial business processes, product design, and service models driven by AI technologies such as machine learning, deep learning, natural language processing, and knowledge graphs [1]. Unlike past innovation methods that relied on experience and rules, AI financial innovation combines data-driven, algorithmic decision-making, and intelligent learning. Its main goal is to achieve more accurate risk identification, more efficient resource allocation, and more flexible business operations through algorithms. For example, in credit assessment, AI models can build dynamic credit profiles based on big data to achieve personalised pricing and precise lending; in investment management, robo-advisors can analyse market fluctuations and investor preferences through algorithms to perform automated portfolio allocation and risk control. As a result, AI not only enhances the intelligence of financial services but also reshapes the operating logic and competitive structure of the financial system.

2.1.2. Economic Growth Effect

The economic growth effect refers to the comprehensive role of artificial intelligence technology in promoting macroeconomic growth through financial innovation activities [2]. AI technology can promote economic growth from many levels: first, by improving the efficiency of financial intermediaries, reducing transaction costs and information asymmetry, so that capital flows to more productive sectors; second, by supporting technological innovation and entrepreneurship financing, accelerating innovation diffusion and industrial upgrading; third, by promoting the universalization of financial services, Enhance the financing availability of small and medium-sized enterprises and vulnerable groups, and promote inclusive economic growth. In other words, AI not only improves the efficiency and stability of the financial system, but also provides new momentum for high-quality economic development through the chain of "technology empowerment-innovation diffusion-growth transformation".

2.1.3. Risk Governance Mechanism

Risk governance mechanism refers to the supervision and institutional arrangement system established for the multi-level risks that may be caused by artificial intelligence financial innovation

[3]. Unlike traditional risk management, risk governance under the background of AI emphasizes forward-looking, systematic and collaborative. Its core contents include: algorithm audit to ensure the transparency and interpretability of the model; data compliance to ensure information security and privacy protection; ethical supervision to prevent algorithm discrimination and abuse; systematic risk warning to identify potential linkage risks; and cross-border collaborative governance to cope with the regulatory gap brought about by global financial technology. A perfect risk management mechanism is not only a necessary condition for maintaining financial stability, but also an institutional guarantee to promote the sustainable and healthy development of AI financial innovation.

2.2 Theoretical Foundations

2.2.1. Financial Innovation Theory

Based on Joseph A.Schumpeter's innovative theory, financial innovation is regarded as an important driving force for economic growth [4]. The financial system provides necessary support for technological innovation and industrial upgrading by providing financing, payment and risk management functions. The theory of financial deepening further points out that the improvement of financial structure and technological progress can promote the more effective allocation of resources to the high productivity sector, and enhance the innovation capacity and capital accumulation level of the economic system. The introduction of artificial intelligence technology is actually an extension and deepening of financial innovation theory in the digital era: AI has optimized the information processing mechanism, improved market transparency and decision-making efficiency, and significantly expanded the speed and scope of financial innovation, thus strengthening the ability of the financial system to serve the real economy.

2.2.2. Technology Diffusion and Growth Theory

The endous growth model emphasizes that long-term economic growth comes from technological innovation and knowledge accumulation [5]. The technology diffusion mechanism enables the application results of new technologies to surpass single enterprises or industries, and promote the overall productivity improvement through spillover effects. As a General Purpose Technology (GPT), artificial intelligence has a wide range of industrial penetration and self-evolution capabilities. It can not only change the production function of the financial industry, but also promote the diffusion and application of new technologies in the real economy through financial channels. For example, AI-supported investment and financing decision-making, supply chain finance and risk assessment mechanisms help innovative enterprises obtain more sufficient funds, thus accelerating the process of technology commercialization. Therefore, artificial intelligence financial innovation has played a key role in promoting capital formation, knowledge dissemination and innovation diffusion in long-term economic growth.

2.2.3. Risk Society and Governance Theory

U. Beck's risk society theory believes that the development of modern society has entered the stage of "making risks" [6]. Risks show complex, hidden and global characteristics, and the traditional linear regulatory model is difficult to cope with. The autonomy of artificial intelligence and the complexity of algorithms further amplify this characteristic, making the financial system face the new challenge of "technical system risk". On this basis, the theory of complex system supervision proposes that a dynamic, hierarchical and multi-subject supervision system should be built with systematic thinking and collaborative governance as the core, so as to realize real-time perception, evaluation and response to complex risks. Applying this theory to the field of AI finance means that supervision should not only rely on ex-post intervention, but also establish a forward-looking monitoring and feedback mechanism to jointly build a safe, transparent and sustainable intelligent financial ecology through technical supervision (RegTech), ethical constraints and international cooperation.

3. Analysis of the Economic Growth Effects of AI-Enabled Financial Innovation

3.1. Mechanism of Improving Resource Allocation Efficiency

Artificial intelligence promotes the transformation of financial services from experience-driven to data-driven through large-scale data mining, machine learning and intelligent prediction models. Its core function is to realize accurate credit, personalized investment and automated risk management, thus significantly reducing information asymmetry and transaction costs. For example, the AI-driven credit scoring system can integrate structured and unstructured data, such as consumption records, social behavior and supply chain information, to dynamically evaluate the credit status of enterprises and individuals. This intelligent risk control mechanism not only optimizes the lending decision-making of financial institutions, but also promotes the efficient flow of funds between different departments and regions.

At the macro level, AI can accurately identify high-potential industries and innovative enterprises, so that capital flows to sectors with higher productivity, thus improving the efficiency of resource allocation and the quality of economic growth. With the in-depth application of AI in the financial system, the transparency and pricing efficiency of the financial market have also been improved, which has further strengthened the supporting role of finance in the real economy.

3.2. Innovation Diffusion and Industrial Upgrading Effect

The application of artificial intelligence in the financial field is speeding up the cross-border diffusion of innovation. This has turned financial innovation into an important link between science and technology as well as the real economy. Based on new models such as intelligent payment system, blockchain clearing, supply chain finance and quantitative investment platform, AI is also advancing the integration of financial business with manufacturing, logistics and retail. This integration not only improves the operational efficiency of the financial system, but also accelerates the digital transformation and value chain restructuring of traditional industries. In the long run, the innovation diffusion effect brought about by artificial intelligence can optimize the industrial structure and promote the transformation of the economy from factor-driven to innovation-driven. As the core medium for the diffusion of innovation, finance enables new technologies to enter the production system faster, thus forming a continuous productivity improvement and economic growth engine.

3.3. Inclusive Finance and Regional Growth Effect

AI-enabled financial innovation is particularly prominent in the field of inclusive finance. With the help of intelligent credit models and automated risk control systems, financial institutions can more accurately identify the credit risks of small and micro enterprises and vulnerable groups, and significantly reduce financing costs and access thresholds [7]. For example, rural financial platforms based on AI algorithms can use satellite images, agricultural product transaction records and other data to evaluate the credit of farmers and provide flexible credit support for remote areas. This mechanism has effectively mitigated the imbalance of financial resources between regions and more co-ordinated the development of regional economies. At the same time, the expansion of inclusive finance has also driven the growth of entrepreneurshio and consumption at the grass-roots level, the resilience and social equity of economic growth, and economic development more sustainable and socially inclusive.

3.4. Boundaries and Stage Characteristics of Growth Effects

Although artificial intelligence financial innovation plays a significant role in promoting economic growth, this impact is not linear or infinite. Over-reliance on technological innovation may lead to problems such as resource mismatch, financial bubbles or algorithmic discrimination. In the early stage of economic development, artificial intelligence mainly promotes growth by improving efficiency and reducing costs; however, when the penetration of technology reaches a certain level, its marginal benefits gradually decrease and may even cause systemic risks. Therefore, artificial intelligence-driven financial innovation must be matched with moderate supervision and

ethical governance. Only by maintaining a dynamic balance between innovation and risk prevention and control can we continue to release the economic growth effect of artificial intelligence and avoid the vulnerability of the financial system caused by technology abuse.

4. Risk Generation and Transmission Mechanisms of AI Financial Innovation

4.1. Algorithmic Bias and Data Risk

The performance of AI models heavily depends on data quality and sample structure [8]. If the training data is biased, incomplete or unevenly distributed, the resulting algorithms may produce systematic errors, resulting in unfair or discriminatory results. For example, when credit score models rely heavily on historical data from limited regions or population groups, they may inadvertently embed biases related to gender, geography or social class, thus exacerbating existing social inequality.

In the financial field, data is mainly in the hands of a few institutions. This concentration increases the risk of privacy leakage, data abuse, and potential network attacks or system attacks. If the most important data is leaked or disclosed, it can be trusted and the stability of the financial system may be seriously damaged. In addition, in the absence of sound data governance, the algorithm model of continuous development and self-learning may encounter "data drift", resulting in its predictions deviating from actual economic development and may cause systemic risks.

4.2. Systemic Technological Risk

The widespread application of artificial intelligence in the financial system has improved operational efficiency, but it has also led to new forms of systemic risk. Due to model analogy and unified decision-making logic, financial institutions can respond to market changes in a similar way, thus increasing the risk of the whole system [9]. For instance, in high-frequency trading or quantitative investment scenarios, multiple algorithms simultaneously triggering sell orders may lead to short-term liquidity shortages and trigger “flash crash” events. In addition, the complexity and opacity of artificial intelligence systems make it difficult to manage in extreme situations. When the model parameters become unstable or the input data deviates from the normal pattern, price fluctuations, asset misallocation or credit chain interruptions may occur in milliseconds. These forms of "technical resonance" risks tend to appear suddenly and may be rapidly amplified. Therefore, traditional regulatory tools are often difficult to respond in time, increasing the uncertainty and potential severity of systemic risks.

4.3. Ethical and Responsibility Risks

The increasing independence and transparency of artificial intelligence has brought new moral and legal challenges to the financial industry. In the fields of automatic credit assessment, investment decision-making and risk assessment, artificial intelligence systems often lack a clear accountability framework. When there is a systemic error or economic loss, it becomes more and more complicated to identify the culprit. The opaque design of the algorithm model also makes it difficult for financial institutions to decide their decision-making results. Lack of transparency can weaken customer trust and create difficulties in regulatory activities and compliance management. In addition, implicit biases or inconsistent incentives in the decision-making process of artificial intelligence may undermine financial equity and ethical principles. In the absence of effective ethical monitoring and accountability mechanisms, public trust is compromised and increases the likelihood of legal conflicts and reputational damage. To reduce these risks, financial institutions should incorporate interpretation norms and ethical audit systems in the conceptual stage of their algorithms to ensure that technical efficiency is synchronized with broader social responsibility.

4.4. Cross-Border Regulation and Technology Monopoly Risk

As artificial intelligence accelerates the globalization and integration of financial activities, the challenges of cross-border supervision are increasing. Manually managed transactions and data flows have crossed traditional regulatory boundaries, making it difficult for countries to reconcile

their regulations, technical standards and data protection systems. Regulatory differences may trigger arbitration and endanger Australia, and undermine global financial stability. International technology giants have established a dominant position in the aik financial ecosystem with a wide range of data resources and algorithms. The continuous boycott of these brands limits competition from small companies, increases market concentration, and reduces the diversity and flexibility of the financial system. Growing concerns about data sovereignty have further increased complexity. A few transnational platforms that can control core financial data pose a potential threat to national security and political autonomy. The increasing use of algorithms in cross-border capital flows is accelerating and covering up the risk transfer. During periods of market fluctuations or policy changes, the artificial intelligence system can automatically adjust existing portfolios or exchange rate changes to amplify external shocks and spread financial risks globally.

5. Risk Governance Mechanisms and Policy Recommendations

5.1. Intelligent Regulatory System Based on RegTech

The introduction of regulatory measures has opened up new developments for financial risk management. Regulators have artificial intelligence, large data networks and real-time intervention in financial activities. Record and track transactions throughout the process to ensure the reliability and stability of the data. Machine learning is an algorithm for detecting transaction patterns and predicting risks. These tools help to detect abnormal situations early and improve the accuracy and predictability of regulatory activities.

On this basis, an intelligent regulatory loop centred on "smart sensing—rapid response—continuous improvement" should be established. Government departments should accelerate the construction of data-sharing platforms, promoting information exchange between financial institutions and regulators to form a regulatory ecosystem with information symmetry and collaborative governance. At the same time, innovative regulatory models, such as Regulatory Sandbox, can be explored to pilot and test AI financial products under controllable risk, achieving a positive interaction between regulation and innovation [10].

5.2. Algorithm Governance Framework Based on Ethics and Compliance

The application of artificial intelligence in the financial field must be based on ethics and compliance. First, establish an algorithm transparency review mechanism, requiring financial institutions to regularly disclose model logic, data sources and decision-making basis to ensure that algorithm decision-making is interpretable and traceable. Secondly, it is necessary for policymakers and relevant organizations to enhance the standards of data protection and ethical evaluation, clearly define the boundaries of data collection and use, and prevent algorithmic deviations, misuse of information, and violations of privacy. At the same time, independent third-party institutions should be encouraged to participate in algorithm audits and ethical evaluations, and form external constraints and social supervision mechanisms. For high-risk algorithms that affect public interests, a mandatory review and filing system should be established to ensure that their decision-making process meets legal and ethical requirements. The institutionalization of algorithm governance can achieve a balance between innovation efficiency and social responsibility.

5.3. Risk Management Innovation at Financial Institutions

Financial institutions are the first line of defense in risk prevention in AI-enabled financial innovation. Institutions should build a "human-machine collaborative" decision-making system that combines AI's computational capabilities with human experience to improve decision robustness and flexibility [11]. A comprehensive model risk management system should be established, including model validation, sensitivity testing, and continuous monitoring mechanisms to prevent systemic risks from algorithm errors or data drift. Financial institutions should also improve technical fault tolerance and emergency response mechanisms so that in the event of algorithm failure or system anomaly, operations can quickly switch to human intervention or backup plans,

ensuring business continuity. In addition, strengthening internal technical audits and compliance training, improving employees' understanding of algorithms and risk awareness, is a key step in building organisational resilience. Through coordination of systems, technology, and talent, financial institutions can innovate while maintaining stability.

5.4. Government and International Coordinated Regulatory Mechanisms

The global characteristics of artificial intelligence financial innovation make transnational regulatory coordination particularly important. Different countries have differences in data security, algorithm review and ethical standards. If there is a lack of coordination, it is easy to form regulatory arbitrage and risk transmission. Therefore, it is necessary to promote the establishment of internationally unified data governance and AI financial supervision standards, and build a cross-border risk monitoring and information sharing mechanism. Rely on international organizations such as the G20, IMF and FSB to establish a global AI financial risk monitoring network and strengthen regulatory technology cooperation and standard docking.

At the same time, governments should encourage the sharing of algorithmic security standards and risk intelligence at the regional level, explore cooperation models such as "multilateral regulatory sandboxes", and form an open, coordinated and mutually trusted global financial governance system. Only through international cooperation can achieve a long-term balance between technological innovation and system security and promote the stability and sustainable development of the global financial ecosystem.

6. Conclusion

This article systematically discusses the economic growth effect and risk management mechanism of artificial intelligence empowering financial innovation. Research shows that AI technology has significantly promoted economic growth and injected new momentum into industrial upgrading and inclusive development by improving the efficiency of financial resource allocation, promoting innovation diffusion and inclusive finance. However, AI financial innovation is accompanied by multiple risks such as algorithmic deviation, data security, systematic fluctuations and ethical dilemmas. These risks are hidden, complex and cross-domain, which may weaken the stability and fairness of the financial system. In order to balance innovation and security, it is urgent to build a multi-level and collaborative risk governance system: on the one hand, regulatory technology (RegTech) should be used to improve the intelligence and forward-looking of supervision, and improve the algorithm transparency and ethical review mechanism; on the other hand, it is necessary to strengthen the internal risk control and technical fault tolerance of financial institutions. , and promote international data governance and regulatory collaboration. In general, artificial intelligence is reshaping the dynamic mechanism and risk structure of financial innovation. Its development potential is huge, but the improvement of the governance system will determine whether it can truly become the core force to promote high-quality and sustainable economic growth. Future research can combine empirical data and transnational comparisons to deeply analyze the long-term effects of AI financial innovation on the growth quality and risk spillover of different economies, and provide theoretical basis and policy reference for building a safe, transparent and intelligently driven modern financial system.

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