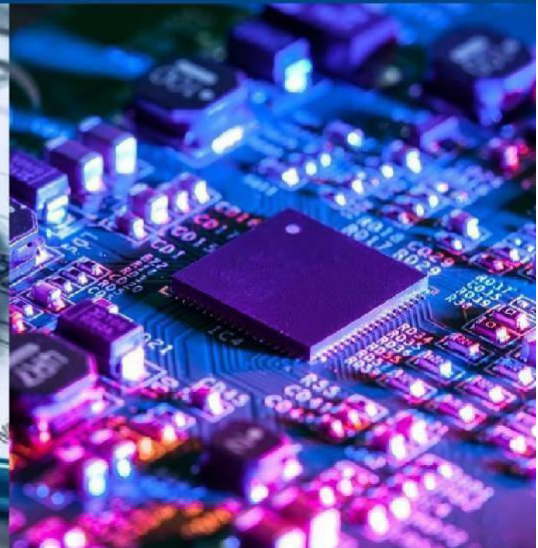
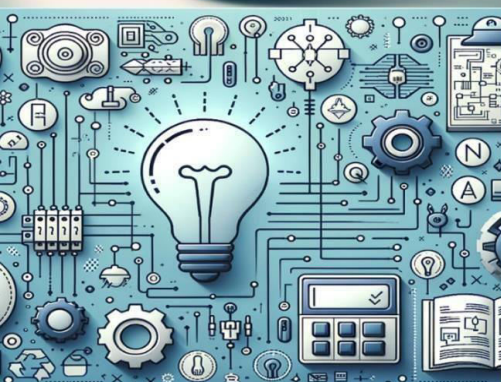




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Regulatory Challenges of AI Adoption in International Finance: A Comparative Study across Major Economies

Dr. Batani Ragavendra Rao¹, Murari Jagadeesh², Nandhini M³, P. Rakshitha⁴, Pragati Jain S⁵,

Rochita Choudhry⁶, Sandhya. N⁷

Assistant Professor Finance, Faculty of Management Studies, CMS Business School Jain (Deemed -To-Be University),
Bangalore, India¹

MBA Finance students, Faculty of Management Studies, CMS Business School Jain (Deemed -To-Be University),
Bangalore, India²⁻⁷

ABSTRACT: Global financial systems are rapidly incorporating artificial intelligence (AI), which has brought with it both complicated governance issues and enormous opportunities. Advanced technologies increase the effectiveness of fraud detection, risk prediction, and cross-border transactions, but they also bring up urgent concerns about data sovereignty, accountability, and ethical use. In order to investigate how varying legislative frameworks and supervisory procedures influence the adoption of AI in finance, this study compares major economies. The study highlights the significance of international discourse in preventing regulatory arbitrage and ensuring stability by recognizing regulatory overlaps, inconsistencies, and growing gaps. The analysis also highlights the necessity of flexible policies that strike a balance between long-term financial stability and technological innovation.

KEYWORDS: Governance, Data Sovereignty, Risk Management, Ethical Standards, Policy Harmonization

I. INTRODUCTION

The pace of implementation of Artificial Intelligence (AI) in the banking system all over the world has generated both prospects and regulatory risks. AI is now being more widely applied in financial institutions globally to market surveillance, compliance monitoring, algorithmic trading, fraud detection, and credit risk modeling, becoming more efficient, but raising accountability, explainability, and systemic stability concerns. The report by World Bank (2024) says that more than 65 percent of financial institutions have been using AI, with the highest percentage being the United States (78 percent), European Union (72 percent) and China (69 percent), and India is recording an increasing number of 52 percent because of the governmental support of digitalization and regulatory experimentation. Adoption has however exceeded the creation of standard regulatory frameworks and thus has ended up taking different approaches. The US has a sectoral, fragmented system where agencies such as the Securities and Exchange Commission (SEC), Commodity Futures Trading Commission (CFTC), and Office of the Comptroller of the Currency (OCC) are involved in the control of various spheres. The EU has a single, cautious approach in the form of its EU AI Act (2024), which would see the majority of financial AI as a high-risk category and enforce transparency, bias assessments, and human supervision. China prioritizes the innovation as a state initiative and incorporates AI in the process of its digital yuan initiatives with stringent data regulations such as the Personal Information Protection Law (PIPL). India walks the fine between innovation and consumer protection by regulatory sandboxes and the Digital Personal Data Protection Act (DPDP Act, 2023). This is reflected in investment patterns: in 2023, the US and China had more than two-thirds of the \$40 billion AI investment in financial services, and EU banks had 20-25% more compliance costs than US banks, and India ranks first in sandbox testing. Such differences pose the risk of regulatory arbitrage and undermine financial stability across the globe, and measures should be taken to strike a balance between innovation, ethics, and security by utilizing international policy cooperation.



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II. LITERATURE REVIEW

1. Pallavi.Rai & Shekha Chandra (2025), This paper explains how trading, risk management, and compliance, artificial intelligence is changing the financial markets; nevertheless, it also increases the risks of volatility, opacity, and data bias. While India's SEBI and RBI are currently forming their positions, IOSCO and other studies show how regulators in the US, EU, and UK are tackling similar challenges. In order to strike a balance between innovation and financial stability, the literature highlights regulatory shortcomings and urges India to adopt international best practices.

2. Arunkumar Yadava (2023), This paper explores credit judgments to fraud detection, the expanding application of AI in financial services has increased efficiency but is still in its infancy and needs better regulation. The literature calls for frameworks that link risk management and regulatory monitoring across the AI lifecycle in order to address the ethical and societal issues raised by AI. Research identifies obstacles that must be removed for adoption to be sustained and emphasizes the necessity of responsible governance models that strike a balance between innovation and accountability.

3. Nathalie. A. Smuha (2021), This paper examines how a "race to AI" and a "race to AI regulation" have been sparked by the global competition to be the leader in AI. Scholars point out that although AI promises innovation and efficiency, its risks necessitate reliable, moral, and legal regulation. Stronger legal certainty, increased adoption, and increased global competitiveness are all possible with effective regulation. The literature examines the pros and cons of harmonized approaches as it relates to regulatory competition vs convergence.

4. Ekkehardt Ernst*, Rossana Merola and Daniel Samaan (2019), Research shows that while AI-driven technology progress brings significant productivity increases, particularly for developing economies, it also raises concerns about job loss and rising inequality. AI, in contrast to previous automation, increases efficiency and reduces capital costs for low-skilled industries, but inequality risks are still high. Experts contend that improved regulation of the digital economy, data security, and profit-sharing arrangements are necessary because skill development alone is insufficient. As long as policies adequately address both possibilities and threats, the literature points to a cautiously hopeful outlook.

5. Avi Goldfarb and Daniel Treffler (2018), This research explores on the global economics of artificial intelligence emphasizes how the concepts of scale, competitiveness, and information transmission found in trade theory influence comparative advantage in the digital age. Because of AI's distinctive characteristics, trade models need to be rethought, particularly in regards to data flows, standards, and privacy laws. Research expenditures and "behind-the-border" regulations like data localization and competition laws are the main topics of policy discussions. According to the research, there is still much to learn about AI's long-term effects on international trade.

6. Jelena Vujicic (2024), According to this research, the U.S., EU, China, and other regions are adopting different legal approaches to AI regulations, which is changing how technology companies operate across jurisdictions. Comparative research shows that regulatory heterogeneity affects innovation, market access, and competitiveness by posing risks as well as opportunities. Academics stress that for global scalability, early compliance and strategic alignment are essential. To strike a balance between innovation and regulatory certainty, the literature advocates for interoperable legal standards and cross-border policy convergence.

7. A Adewuyi, TJ Oladuji, A Ajuwon, CR Nwangele (2020), This paper shows usage of AI in evaluating creditworthiness using alternative data, such as digital wallets, utility payments, and mobile usage, artificial intelligence is becoming a tool for financial inclusion in developing nations. Examples from Latin America, South Asia, and Africa demonstrate the potential of mobile lending and microfinance. To ensure responsible adoption, literature emphasizes the necessity of data privacy, ethical protections, and regulatory assistance.

8. Fnu Jimmy (2024), Blockchain, which provides transparency, integrity, and secure authentication through decentralized ledgers, is increasingly viewed as a solution to the data security issues facing the financial industry. The literature emphasizes how it helps to increase trust in digital transactions while thwarting fraud, breaches, and unauthorized access. Research also highlights blockchain's potential advantages and disadvantages in terms of protecting private financial information.



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III. OBJECTIVES

- 1.To compare regulatory frameworks in the adoption of Artificial Intelligence in the finance of the United States, European Union, China, and India.
- 2.To discuss the most important regulative issues including transparency, accountability, data protection, systemic risk.
- 3.To recommend policy options that enhance innovativeness, as well as moral and financial sustainability.

IV. RESEARCH METHODOLOGY AND FINDINGS

Research Methodology:

This study adopts a comparative cross-country research design to analyze the role and impact of Artificial Intelligence (AI) in finance across four major economies—United States, European Union, China, and India. It relies on secondary data sources, including recent reports from the World Bank (2024) and Deloitte (2023), as well as various regulatory frameworks such as the EU AI Act, Digital Personal Data Protection Act (DPDP Act), and Personal Information Protection Law (PIPL). The analysis combines comparative methods to examine adoption rates and regulatory approaches with thematic analysis focusing on key dimensions like transparency, innovation, harmonization, and consumer protection. Additionally, quantitative insights are drawn to assess compliance costs, innovation investments, and participation in regulatory sandboxes. A SWOT analysis is also conducted to evaluate the strengths, weaknesses, opportunities, and threats within each region's approach to AI in finance. However, the scope of the study is limited to these four regions and is entirely based on secondary data, which may include reporting gaps or inconsistencies.

Findings:

- **AI Adoption:**

Global adoption rate is 65%. US leads with 78%, followed by EU (72%), China (69%), and India (52%). Emerging economies like India are catching up due to digitalization initiatives.

- **Regulatory Approaches**

US: Sectoral, fragmented regulation; investor protection focus.

EU: AI Act (2024); harmonized, ethics and transparency driven.

China: State-led; innovation encouraged but low transparency.

India: Sandbox-driven, pro-innovation, lacks standalone AI law.

- **Quantitative Insights:**

Compliance Costs: EU banks spend 20–25% more on AI compliance than US banks.

Innovation Investments (2023): China \$15B, US \$13B, EU \$9B, India \$4.5B.

Sandbox Participation: India leads globally with 62 fintech firms in sandboxes.

- **Thematic Findings:**

Transparency vs. Innovation: EU focuses on explainability; China on rapid growth.

Fragmentation vs. Harmonization: US has fragmented oversight; EU unified approach.

Consumer Protection vs. State Control: US/EU emphasize rights; China/India stress systemic expansion.

Global Implication: Different regulations create compliance challenges across countries.

V. DATA ANALYSIS

1. International Finance AI Adoption Overview

Artificial Intelligence has been a penetration of financial services across the world, with uses extending from credit risk modeling and fraud detection to algorithmic trading and regulatory compliance. According to a 2024 World Bank report, over 65% of global financial institutions have incorporated at least one AI-driven solution, with adoption rates highest in the United States (78%), European Union (72%), and China (69%), while India shows a growing adoption rate of 52%. These trends indicate that while advanced economies lead in implementation, emerging economies are rapidly catching up due to government-backed digitalization initiatives.

2. Comparative Regulatory Landscape

a. United States

Regulatory Focus: Sectoral regulation; no unified AI-specific law. Oversight by SEC, CFTC, and OCC.



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Key Features:

- Focus on investor protection and market integrity.
- Risk-based supervision of algorithmic trading and robo-advisory services.
- Employment of NIST AI Risk Management Framework as voluntary guidance.

Challenge: Fragmented oversight; lack of a single federal AI law enhances compliance complexity for multinational companies.

b. European Union

Regulatory Focus: Harmonized and integrated approach under the AI Act (2024).

Key Features:

- Classifies financial AI applications as "high risk".
- Needs explainability, human supervision, and bias audits.
- Alignment with GDPR guarantees rigorous data protection.

Challenge: High compliance costs; smaller fintechs are excluded.

c. China

Regulatory Focus: Strong state-led with an innovation drive.

Key Features:

- Personal Information Protection Law (PIPL) regulates data usage.
- State-owned banks and digital yuan projects encouraged to use AI.
- Provisions on Deep Synthesis of Internet Information Services (2023) regulate algorithms.

Challenge: Lack of transparency in regulatory enforcement; fears of state-driven bias.

d. India

Regulatory Focus: Emerging, with innovation-first policy approach.

Key Features:

- Digital Personal Data Protection Act (2023) regulates data privacy.
- RBI promotes regulatory sandboxes for AI-based fintech innovation.
- SEBI investigating AI for market surveillance and detection of fraud.

Challenge: Lack of a standalone AI law; siloed oversight amongst regulators.

3. Cross-Country Comparative Table

<i>Dimension</i>	<i>US</i>	<i>EU</i>	<i>China</i>	<i>India</i>
<i>AI-Specific Regulation</i>	None (sectoral laws)	EU AI Act (2024)	Algorithm Regulation (2023)	None (sandbox-driven)
<i>Data Protection Law</i>	CCPA, HIPAA (state-based)	GDPR	PIPL	DPDP Act (2023)
<i>Regulatory Approach</i>	Risk-based, fragmented	Harmonized, precautionary	Innovation-led, state-controlled	Flexible, pro-innovation
<i>Focus Area</i>	Investor protection, stability	Ethics, explainability, consumer rights	Fintech expansion, state integration	Financial inclusion, innovation
<i>Key Challenge</i>	Fragmentation	Compliance burden for SMEs	Lack of transparency, state bias	Weak enforcement, regulatory gaps



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4. Quantitative Insights

Compliance Costs: According to a Deloitte 2023 report, EU banks allocate 20–25% more on AI compliance than their US counterparts due to rigorous auditing and documentation under the AI Act.

Innovation Index: China is at the top with \$15 billion AI-finance investments in 2023, followed by the US (\$13 billion), EU (\$9 billion), and India (\$4.5 billion).

Regulatory Sandbox Participation: The highest sandbox adoption rate (62 fintech players in 2023) is in India, which is indicative of its pro-innovation approach.

5. Thematic Findings

Transparency vs. Innovation: EU stresses explainability, while China focuses on speedy innovation.

Fragmentation vs. Harmonization: US is plagued by fragmented supervision, while the EU provides harmonized arrangements.

Consumer Protection vs. State Control: EU and US focus on consumer protection; China and India focus on systemic development.

Global Implications: Divergent rules create cross-border compliance challenges for global financial institutions.

6. SWOT Analysis by Region:

Region	Strengths	Weaknesses	Opportunities	Threats
US	Mature fintech, risk-based regulation	Fragmented oversight	AI in capital markets	Regulatory arbitrage
EU	Harmonized, ethical AI laws	High compliance burden	Standard-setting leadership	Innovation slowdown
China	State-backed innovation	Low transparency	Fintech dominance in Asia	International distrust
India	Pro-innovation sandbox	Weak enforcement	Fintech-driven financial inclusion	Data misuse risks

VI. RESULTS

The paper indicates that the overall rate of global uptake in Artificial intelligence in the financial sector has hit approximately 65 percent, with the United States (78 percent), European Union (72 percent) and China (69 percent) leading, and India (52 percent) fast following with government-funded digitalization programs and regulatory sandboxes. It is evident in the analysis that regulatory approaches in the US are very diverse, taking a sectoral model whereby various agencies such as the Securities and Exchange Commission, Commodity Futures Trading Commission, and Office of the Comptroller of the Currency are in charge, thus protecting investors but complicating compliance by lack of a single law governing AI. As a contrast, the EU has embraced a more harmonized and ethics-oriented system with the EU AI Act (2024), which defines the majority of financial AI systems as high risk and subjects them to transparency, bias audits, and human oversight, however, at the expense of increased compliance costs. China encourages innovation being state-led by adopting AI in its fintech, digital yuan initiatives and imposing strict data laws, such as the Personal Information Protection Law (PIPL), but there is also the problem of regulatory secrecy. India is a pro-innovation, sandbox-based strategy based on the Digital Personal Data Protection Act (DPDP Act, 2023), which promotes gains in the field of fintech but does not provide a specific law on AI. In the quantitative analysis, EU banks use 20-25% more on compliance in comparison to US banks, and in 2023 China made the biggest investments in AI finance with 15B followed by the US (13B), EU (9B) and India (4.5B). India is another global leader in the use of the sandbox with 62 fintech companies. Thematically, the EU is transparent and explainable, China is fast-innovative, the US is fractures its reins and the EU is uniform, and the US/EU is consumer protection oriented and China/India is systemic expansion oriented. Such conflicting practices pose international compliance costs, and threaten regulatory arbitrage.



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VII. CONCLUSION

The paper finds that even though the trend towards the adoption of AI in the international finance context is increasing at a rapid pace, the regulation systems in major economies are still inconsistent and disjointed. The US is based on sectoral regulation, the EU uses a harmonized, but expensive, ethical structure, China supports the idea of innovation supported by the state with little transparency, and India supports experimentation by using sandboxes, but without a cohesive legal structure. These opposing models have led to disparity in compliance costs, innovation investment and financial inclusion outcomes. Nevertheless, some of the challenges that they bring include higher compliance costs and risks of regulatory arbitrage and hindering cross-border financial activities. Hence, it is important to establish a balance between innovation and ethical, secure and stable financial ecosystems. More needs to be done to align policies and enhance international cooperation to come up with adaptable but balanced global standards that may assist in responsible AI implementation, improve the confidence of consumers and financial stability across the world.

REFERENCES

1. Pallavi.Rai & Shekha Chandra (2025). Artificial Intelligence in Financial Markets: Global Trends, Regulatory Challenges, and Comparative Analysis with India. pp 5503-5516.
2. Yadava, A. (2023). Ethical and regulatory challenges of AI adoption in the financial services sector: A global perspective. International Journal of Science and Research Archive, 10(13), 10-30574.
3. Smuha, N. A. (2021). From a 'race to AI' to a 'race to AI regulation': regulatory competition for artificial intelligence. Law, Innovation and Technology, 13(1), 57-84.
4. Ernst, E., Merola, R., & Samaan, D. (2019). Economics of artificial intelligence: Implications for the future of work. IZA Journal of Labor Policy, 9(1), 1-35.
5. Goldfarb, A., & Trefler, D. (2018). AI and international trade (No. w24254). National Bureau of Economic Research.
6. Jelena Vujicic. (2024). AI in the financial sector: The line between innovation, regulation and ethical responsibility. Information, 15(8), 432.
7. Adewuyi, A. D. E. M. O. L. A., Oladuji, T. J., Ajuwon, A. Y. O. D. E. J. I., & Nwangele, C. R. (2020). A conceptual framework for financial inclusion in emerging economies: leveraging AI to expand access to credit. IRE Journals, 4(1), 222-236.
8. Jimmy, F. (2024). Enhancing data security in financial institutions with blockchain technology. Journal of Artificial Intelligence General science (JAIGS) ISSN: 3006-4023, 5(1), 424-437.



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