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Bridging AI Governance and Financial Regulation

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Abstract

This study examines the applications, benefits, challenges, and ethical considerations of Artificial Intelligence (AI) in the banking and finance sectors. It reviews current AI regulation and governance frameworks to provide insights for stakeholders navigating AI integration. This study identifies key trends and suggests future research directions. The major findings include an overview of AI applications, benefits, challenges, and ethical issues in the banking and finance industries. Recommendations are provided to address these challenges and ethical issues, along with examples of existing regulations and strategies for implementing AI governance frameworks within organizations. This paper highlights innovation, regulation, and ethical issues in relation to AI within the banking and finance sectors. Analyzes the previous literature and suggests strategies for AI governance framework implementation and future research directions. Innovation in the applications of AI integrates with fintech, such as preventing financial crimes, credit risk assessment, customer service, and investment management. These applications improve decision-making and enhance the customer experience, particularly in banks. Existing AI regulations and guidelines include those from the United States. Challenges include data privacy and security, bias and fairness, accountability and transparency, and the skill gap. Therefore, implementing an AI governance framework requires rules and guidelines to address these issues.

Keywords: Artificial Intelligence; Financial Regulation; United State; fintech

1. Introduction

AI can be traced back to the late 1950s, but significant growth in computing power and the availability of data accelerated developments only relatively recently (Lu, 2019). The field of machine learning advanced significantly in the 1990s, while deep learning took off in the 2010s (Pramod *et al*., 2021). While AI has caught the general public's imagination for decades, it was only when ChatGPT – a gen AI application – was launched in late 2022 that AI became more readily and publicly accessible (Lupton and Bailey-Charteris, 2025).

Artificial Intelligence (AI) has revolutionized numerous industries, and its adoption within financial services has been one of the most significant advancements in recent years (Mahalakshmi *et al*., 2022). AI technologies, including machine learning, natural language processing, and neural networks, are being employed across a wide array of financial operations, significantly enhancing efficiencies, decision-making capabilities, and customer experiences (Mahalakshmi et al., 2022). One of the key areas where AI is having a profound impact is risk assessment (Novelli *et al*., 2024). Financial institutions, particularly banks and insurance companies, leverage AI-driven tools to analyze vast datasets for assessing risks, improving underwriting processes, and optimizing credit scoring models (Shittu, 2022). AI algorithms can evaluate risk more accurately and in real time, enabling financial institutions to make more informed decisions ("AI-Driven Risk Assessment Models for Financial Markets: Enhancing Predictive Accuracy and Fraud Detection," 2025a).

Artificial Intelligence (AI) has become instrumental in developing sophisticated trading algorithms that allow for high-frequency trading, pattern recognition, and portfolio management (Olanrewaju, 2025). By utilizing vast amounts of

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historical data and real-time market signals, AI can execute trades at speeds and accuracies that far exceed human capabilities, enhancing returns while minimizing potential losses.

Use of AI by financial institutions preceded the explosion of gen AI applications (Cole, 2024). Since AI applications have been around for a while, they have been used for various purposes. For example, financial institutions take advantage of opportunities to increase their operational efficiency and facilitate improvements in their risk management by using AI. Insurers use AI to facilitate processes such as underwriting, risk assessment, and claims management. The exponential growth in and accessibility of AI technology is accelerating the use of AI by financial institutions. Financial authorities are closely monitoring any potential prudential, conduct, and financial stability implications of a wider use of AI in the financial sector (Truby *et al*., 2020). National authorities in many jurisdictions have introduced cross-sectoral AI-specific policies, but financial authorities have been less active in developing specific regulations (Olanrewaju, 2025). The majority of respondents to an OECD survey do not plan to introduce new regulations on AI use in finance in the near future (Finance, 2023).

1.1. Fintech Innovation

Fintech innovation has catalyzed a paradigm shift in financial services (Utami and Ekaputra, 2021). Digital platforms now enable consumers to execute transactions, manage investments, and access credit in ways that were unimaginable just a decade ago. The advent of mobile banking has expanded financial inclusion, particularly in developing economies where traditional banking infrastructure is limited. Innovations such as blockchain technology have introduced new possibilities for secure, transparent, and decentralized transactions. At the same time, Artificial Intelligence (AI) and machine learning (ML) have revolutionized risk assessment and customer service through advanced data analytics and automated decision-making processes (Ahmed et al., 2025).

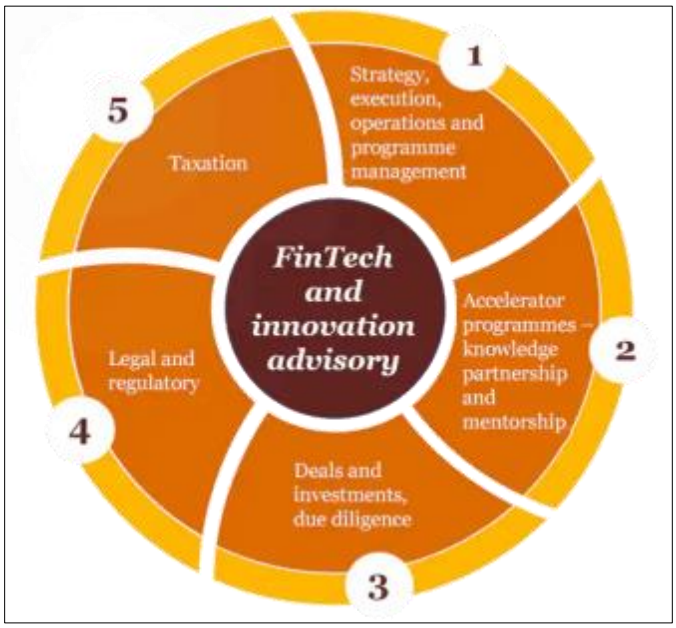

Figure 1 Fintech and innovation advisory

Opportunities exist across the advisory space, including specific consultations with FinTechs and financial institutions to spearhead their innovation journey (Gomber et al., 2018), as shown in Figure 1. These technological advancements have not only enhanced operational efficiency but also increased competition within the financial services sector. Conventional banks face pressure from nimble fintech startups that are unburdened by legacy systems and outdated regulatory processes (Raviteja, n.d.). As a result, incumbents are forced to innovate or collaborate with fintech firms to remain relevant. This competitive landscape has spurred a wave of strategic partnerships, with banks and fintech companies pooling resources and expertise to create hybrid models that blend the strengths of both sectors. The impact of fintech innovation is far-reaching, driving economic growth, enhancing consumer empowerment, and catalyzing a broader digital transformation in the financial industry (Yoganandham, 2024).

However, the rapid pace of innovation also presents significant challenges for regulators. The speed at which new fintech products are developed often outstrips the capacity of traditional regulatory frameworks to adapt. Many fintech

solutions operate at the intersection of multiple domains: technology, finance, data privacy, and cybersecurity—each with its own set of regulatory concerns. This convergence has led to regulatory uncertainty, as existing laws may not adequately address the risks associated with novel financial technologies (Yang and Li, 2018). Moreover, the borderless nature of fintech means that regulatory arbitrage can occur when companies exploit differences in national legal frameworks, thereby complicating efforts to ensure consistent oversight and consumer protection.

1.2. Convergence and Divergence of the Global Regulatory Landscape

Regulatory responses to fintech innovation vary widely across different regions, reflecting divergent legal traditions, cultural norms, and economic priorities (Christopher, 2024). In mature financial markets, such as those in the United States and the European Union, regulators have taken a proactive stance, seeking to balance the need for innovation with robust consumer protection measures. The European Union's approach, exemplified by initiatives like the Revised Payment Services Directive (PSD2), has aimed to open up financial services to competition while enforcing stringent security and data protection standards (Gounari et al., 2024). Similarly, U.S. regulators have engaged in ongoing dialogue with fintech stakeholders, seeking to create a regulatory environment that encourages responsible innovation while safeguarding market stability (Christopher, 2024).

In contrast, emerging economies have often adopted a more flexible regulatory approach to attract fintech investment and drive financial inclusion (Ediagbonya and Tioluwani, 2023). Countries in Africa and Asia, for example, have recognized the transformative potential of fintech to address long-standing challenges such as access to financial services and unbanked populations. Regulators in these regions have sometimes opted for lighter-touch frameworks, using regulatory sandboxes and pilot programs to test new fintech models in a controlled environment (Novelli et al., 2025). While this flexibility can spur innovation and economic growth, it also raises concerns about the adequacy of consumer protections and the risk of systemic vulnerabilities in rapidly evolving markets.

Table 1 Equilibrium Spectrum Across Market Strategies (Niyato and Hossain, 2008)

Strategy Type	Convergent Dynamics (Stationary Equilibrium)	Divergent Dynamics (Shifting Equilibrium)
Equity Strategy	Pair Trading Statistical Arbitrary Market Neural Approach	Directional Long/Short Thematic Investing Momentum Strategies
Event driven	Merger Arbitrary Capital Structure Arbitrary	Activist Investing Catalyst-Driven Distressed
Global Macro	Relative value of sovereign debt Interest rate convergence Trade	Directional Macro Trend Following Policy Divergence Trades
Relative Value	Fixed Income Arbitrary Convertible bond Arbitrary Yield Curve Trade	Structural Credit Trade Regulatory Arbitrary
Quantitative	Mean Reversion Algorithm Statistical Arbitrary	ML-base momentum Quantamental

Table 1 presents a conceptual framework for categorizing hedge fund strategies based on their underlying market assumptions. Rather than relying solely on traditional industry classifications, this table organizes strategies according to whether they exploit convergent or divergent market dynamics. This framework demonstrates that beneath the apparent complexity of hedge fund strategies lies an elegant but basic duality of market assumptions, whether prices gravitate toward established equilibria or transition to new equilibrium states that shape investment approaches across asset classes and implementation techniques.

Many jurisdictions are moving towards more principles-based, risk-focused regulatory approaches that emphasize continuous monitoring and adaptive oversight (Newbury and Carlos Izaguirre, 2019). This shift is driven by the understanding that fintech innovations are inherently dynamic, requiring a regulatory framework that can accommodate rapid technological change without stifling progress. Collaborative efforts among regulators, industry

participants, and international organizations are becoming increasingly common, as stakeholders strive to harmonize standards and foster cross-border cooperation.

1.3. Opportunities and Benefits of Adaptive Regulation

Amid the challenges, there are significant opportunities for adaptive regulation to foster a more inclusive and innovative financial ecosystem (Deb, 2024). Regulatory sandboxes, for instance, have emerged as a valuable tool for testing new fintech products in a controlled environment. These frameworks allow regulators to gather real-world data on emerging technologies, enabling them to adjust policies based on empirical evidence. By reducing regulatory uncertainty and providing a pathway for experimentation, sandboxes can accelerate the commercialization of innovative fintech solutions while ensuring that risks are properly managed.

Moreover, principles-based regulation offers a promising approach to bridging the gap between rigid rules and dynamic technological innovation. By focusing on outcomes rather than prescriptive measures, regulators can create a more flexible framework that accommodates a wide range of fintech models. This approach emphasizes risk management and continuous improvement, encouraging companies to adopt best practices in security, transparency, and consumer protection. Such adaptive frameworks not only support innovation but also build public trust in the financial system by ensuring that new technologies are held to high standards of accountability.

Cross-border regulatory collaboration is another key opportunity. Given the global nature of fintech, no single jurisdiction can effectively regulate the industry in isolation (Bromberg et al., 2018). International bodies and regulatory networks can facilitate the exchange of information, promote best practices, and harmonize standards across different markets (Gadinis, 2015). This cooperation can help mitigate regulatory arbitrage, reduce compliance costs for multinational fintech firms, and ensure that consumers benefit from consistent protections regardless of where they access financial services.

2. Understanding AI Governance in the U.S.

The lack of enforceable federal regulations can be interpreted as either a deliberate policy stance or a consequence of the highly polarized and partisan nature of the US Congress, which has struggled with technology regulations (for instance, the absence of a federal data protection law) and was notably unproductive in 2023. There have been attempts to introduce an Algorithmic Accountability Act that would mandate businesses to assess the bias(Tetlock and Mitchell, 2009) and effectiveness of their AI systems, with the Federal Trade Commission expected to implement this requirement, but at the time this toolkit was prepared, there were no indications of advancement. In October 2023, President Joe Biden signed an Executive Order focused on the creation of Safe, Secure, and Trustworthy Artificial Intelligence, which directed various federal agencies to formulate standards for the safe and ethical design and utilization of AI across different sectors, and imposed new obligations on companies developing AI with potential national security concerns to provide their testing data to the US government. While these measures were primarily aimed at the internal operations of the federal government, within nine months, agencies took over a hundred actions or initiated policy processes in response, indicating more substantial progress than the 2019 Executive Order from the Trump administration ("Maintaining American Leadership in Artificial Intelligence"), which also tasked federal agencies with crafting plans to regulate AI applications; by December 2022, out of the 41 major agencies, only one (the Department of Health and Human Services) had effectively developed such a plan. Before issuing its Executive Order, the Biden administration released the 2022 'Blueprint for an AI Bill of Rights', a non-binding document outlining five principles and related practices to guide the creation and implementation of AI. It assigns different federal agencies the responsibility of execution in their specific policy areas (including health, labor, and education). Furthermore, the Biden administration succeeded in obtaining voluntary commitments from leading AI developers in the US to adhere to particular standards for testing and transparency of their systems; by mid-2024(Gao et al., 2014), 16 companies had agreed to these commitments, among them Amazon, Anthropic, Apple, Google, Inflection, Meta, Microsoft, and OpenAI. As reported by the National Conference of State Legislatures, by September 2024, at least 44 US states had proposed AI legislation 2024, with at least 30 of those states approving one or more AI laws. At least eight countries impose regulations concerning the use of AI specifically in elections or political advertising by requiring transparency for political ads that incorporate AI-generated content, or by criminalizing the distribution of misleading AI-generated media (such as 'deepfakes') intended to sway an election. Furthermore, at least four countries have broadened the reach of existing laws regarding child sexual abuse material (CSAM) and non-consensual intimate imagery (CSII) to cover media created or altered with AI.

At least four states have implemented restrictions on specific AI uses by government entities. For instance, New Hampshire's HB 1688 prohibits state agencies from utilizing AI for real-time biometric surveillance, unless a warrant is

obtained, and from categorizing individuals by behavior or class if it leads to unlawful discrimination. Utah has enacted criminal justice amendments that limit the courts' reliance on algorithmic evaluations when making decisions regarding probation. A minimum of seven states has passed laws or resolutions that do not directly regulate AI's design or application, but instead primarily aim to create advisory bodies or task forces that will develop recommendations or policies to direct the state's stance on Artificial Intelligence. Amid these worldwide advancements in AI legislation and policymaking, a federal AI governance policy has also begun to take form in the United States (Walter, 2024).

2.1. Policy in governance within the federal agencies

Almost every federal agency has actively contributed to developing the AI governance strategy within the federal government and, to a lesser extent, in commercial activities (Radu, 2021). One of the pioneers in this effort was the National Institute of Standards and Technology (NIST) (Sharpless *et al*., 2015), which released "U.S. LEADERSHIP IN AI: A Plan for Federal Engagement in Developing Technical Standards and Related Tools" in August 2019 in response to EO 13859. The report highlighted key areas for AI standards and provided recommendations to promote the creation of national AI standards in the United States. NIST's AI Risk Management Framework is also a major part of federal AI governance and is often cited as a model for private sector initiatives (Sharpless et al., 2015). By mid-2020, the FTC started formulating its strategy for AI governance, regulation, and enforcement (Marques Moreira, 2025). Its recommendations have emphasized the agency's focus on the use of generative AI by companies. Concerns about whether organizations are using generative AI in ways that "intentionally or unintentionally mislead individuals into harmful decisions in areas such as finance, health, education, housing, and employment" fall under the FTC's scope.

The Federal Trade Commission (FTC), together with the Consumer Financial Protection Bureau (CFPB) (Carpenter, 2014) the Justice Department's Civil Rights Division, the Equal Employment Opportunity Commission released a joint statement emphasizing that their enforcement powers extend to automated systems. These systems are characterized as "software and algorithmic processes, including AI, used to automate workflows and assist individuals in completing tasks or making decisions." Following this, the Equal Employment Opportunity Commission (EEOC) published a bulletin regarding its interpretation of current antidiscrimination regulations in employment, particularly Title VII of the Civil Rights Act of 1964, concerning the application of AI-powered systems.

At the same time, the National Telecommunications and Information Administration (NTIA) has put out a request for public comment on an "AI Accountability Policy," aiming to gather input on policies that would "facilitate the development of AI audits, assessments, certifications, and other measures designed to build trust in AI systems." Written responses are expected by June 12. The NTIA will likely utilize the feedback to guide the White House on matters of AI governance policy.

3. Us general financial regulation principles

3.1. Prudential Regulation

Prudential regulation is foundational to the oversight of the financial system, with a primary goal of ensuring that financial institutions remain solvent and resilient in their operations (The Prudential Regulation of Financial Institutions, 2014). The rise of AI technologies, which range from predictive analytics to self-operating decision-making processes, presents distinct challenges for prudential regulators focused on safeguarding financial stability (Ogundimu, 2025). Historical prudential objectives, such as maintaining sufficient capital reserves, conducting stress tests, and ensuring liquidity coverage, now have to address risks introduced by AI, including model opacity, systemic correlations, and a concentration of technological dependencies. Models utilized in portfolio management, algorithmic trading, and credit risk evaluations can become prone to procyclical behaviors and herding dynamics, particularly when institutions utilize similarly designed models trained on uniform datasets (Wilhelmina Afua Addy *et al*., 2024).

Moreover, AI can unintentionally create new varieties of systemic risk. For example, the interconnectedness of machine learning algorithms across different institutions may result in closely linked decision-making processes that lack the interpretative flexibility of human judgment during periods of stress, potentially intensifying market volatility. As a result, prudential regulators such as the Basel Committee on Banking Supervision (BCBS) and the Financial Stability Board (FSB) have begun developing exploratory frameworks to include AI oversight within macroprudential risk assessments (Department, 2021). These initiatives underscore the necessity for supervisory tools specific to AI, such as reviews of model governance, technology stress assessments, and the auditability of proprietary algorithms by third parties. Prudential regulation now needs to broaden its focus beyond conventional balance sheet verification to include the algorithmic infrastructure and automated decision-making systems that support financial operations (Passador and Bravi, 2025).

3.2. Conduct Regulation on Consumer Protection and Maintaining Market Integrity

Regulatory frameworks regarding conduct, which have historically aimed at ensuring fair treatment of consumers and upholding market integrity, now encounter intricate challenges with the implementation of AI technologies (Du and Xie, 2021). The use of AI systems to automate customer interactions, optimize the pricing of financial products in real-time, and perform behavior profiling introduces new risks, such as manipulation, discrimination, and a lack of transparency in processes involving consumers (Du and Xie, 2021). Although these advancements provide improved personalization and efficiency, they can inadvertently produce unequal outcomes for similarly situated individuals due to hidden biases present in the training data of AI-driven recommendation engines used in robo-advisory services or dynamic underwriting models.

The complexity of determining accountability in services mediated by AI intensifies regulatory apprehensions. In contrast to conventional human advisory models, where fiduciary responsibilities are clearly outlined, AI complicates the assignment of liability when an automated process results in harm to consumers. Regulatory bodies like the U.S. Securities and Exchange Commission (SEC), the UK Financial Conduct Authority (FCA), and the European Securities and Markets Authority (ESMA) are beginning to establish guidelines for "algorithmic accountability," which emphasize the need for transparency, fairness, and mechanisms for recourse. These guidelines encompass requirements for maintaining audit trails, documenting the reasoning behind algorithms, and offering consumers accessible explanations for automated decisions. Furthermore, the emergence of "dark patterns" and behavioral nudges within AI-driven platforms has led regulators to scrutinize user interface designs that take advantage of cognitive biases to influence financial behaviors, raising concerns within the frameworks of consumer protection and market conduct laws.

3.3. Risk Management: Addressing the Risks Associated with the Use of AI in Financial Decision-Making

The integration of AI in financial decision-making requires a significant shift in the strategies used for managing institutional risk (Elumilade *et al*., 2023). In contrast to traditional quantitative models, AI systems adapt continuously through ongoing learning processes, which complicates both risk identification and model validation. Key risks related to AI include model drift, in which an algorithm's predictive performance diminishes over time due to shifting market conditions (Surya Gangadhar Patchipala, 2023); adversarial risks, where input data is intentionally manipulated; and governance risks stemming from inadequate oversight during model development and implementation. Furthermore, the probabilistic nature of AI outputs poses challenges to traditional risk reporting systems, which often depend on deterministic thresholds and linear stress scenarios.

To mitigate these issues, organizations need to establish comprehensive risk management frameworks specific to AI that address both technical and ethical aspects. This includes the introduction of multi-layered validation protocols, which involve testing before deployment, performance monitoring after deployment, and assessments for adversarial robustness. Regulatory demands are evolving towards requiring governance of model risk within broader operational risk frameworks, as reflected in the Basel Committee on Banking Supervision (BCBS) Principles for the Sound Management of Operational Risk and the SR 11-7 guidance released by the U.S. Federal Reserve and Office of the Comptroller of the Currency (OCC). Financial institutions are increasingly asked to create AI governance committees, promote collaboration between data scientists and compliance personnel, and incorporate metrics for explainability into their model risk evaluations. Additionally, regulatory authorities are encouraging the creation of AI "model inventories" to guarantee traceability and accountability throughout the model lifecycle. The changing risk environment urges institutions to rethink their enterprise risk structures and make AI risk resilience a fundamental strategic priority (Courage Oko-Odion and Omogbeme Angela, 2025).

3.4. US Approaches to AI Regulation in Financial Services

In the United States, the regulation of AI in financial services is marked by a varied and sector-specific approach (Calver *et al*., 2024). The Dodd-Frank Wall Street Reform and Consumer Protection Act serve as a key framework, concentrating on reducing systemic risk, ensuring transparency, and protecting consumers(Evanoff and Moeller, 2014). Although Dodd-Frank does not directly address AI, its requirements regarding algorithmic trading, stress testing, and oversight of systemic risk indirectly encompass a range of AI-supported systems. Regulatory oversight has also extended to quantitative trading algorithms through the Volcker Rule and Title VII provisions concerning over-the-counter derivatives (Baker, 2015).

At the state level, the California Consumer Privacy Act (CCPA) establishes rights akin to those in the General Data Protection Regulation (GDPR) for data subjects, including rights to access ("A Comparative Analysis between General Data Protection Regulations and California Consumer Privacy Act," 2023), delete, and opt out of data collection, which significantly affect the training of AI models and consumer profiling. The New York Department of Financial Services

(NYDFS) has introduced cybersecurity regulations that require financial institutions to conduct stringent risk assessments (Oladipupo Dopamu *et al*., 2024) and maintain audit trails for digital systems, including those involving AI. These state regulations increasingly shape national policy through a process of regulatory diffusion and serve as models for future federal standards.

On the federal level, the Federal Reserve, while primarily concerned with monetary policy and financial stability, has started to engage with AI in its supervisory duties. It underscores the importance of interpretability in credit underwriting models and has endorsed research on "resilient AI." Additionally, the Office of the Comptroller of the Currency (OCC) and the Consumer Financial Protection Bureau (CFPB) have both released guidance on the responsible application of machine learning, particularly concerning mortgage lending, equitable access to credit, and the prevention of discrimination.

4. Challenges at the Intersection of AI and fintech

One of the most critical obstacles in regulating fintech is achieving the right equilibrium between fostering innovation and maintaining financial stability (Wijayanti and Sriyanto, 2024). Excessive regulation can stifle technological progress and reduce competition, while insufficient regulation may leave consumers vulnerable to fraud, data breaches, and other hazards (Farhad, 2024). This conflict is particularly pronounced in the realms of cryptocurrencies and digital assets, where the decentralized and often unclear nature of transactions presents distinct regulatory challenges (Ayodeji *et al*., 2023). In these instances, regulators are faced with jurisdictional issues, enforcement difficulties, and the risk of illegal activities such as money laundering and funding for terrorism.

Another difficulty is the integration of new technologies with existing regulatory frameworks. Many current financial regulations were crafted before the digital transformation and may not effectively address the complexities of contemporary fintech. For example, traditional licensing systems and capital requirements may not apply seamlessly to nonbank fintech startups with streamlined business models and minimal physical presence. This disconnect can create regulatory voids, where innovative firms function in a legal gray area that fails to encourage innovation or adequately safeguard consumers.

Concerns about data privacy and cybersecurity (Olakunle Abayomi Ajala and Olusegun Abiodun Balogun, 2024) are additional significant issues. Fintech advancements frequently depend on extensive data usage, prompting inquiries about how that information is gathered, stored, and utilized. Cybersecurity threats pose a continuous risk, with breaches potentially leading to widespread consequences for both individuals and financial systems (Uddin *et al*., 2020). Consequently, regulators must devise frameworks that not only tackle financial risks but also ensure strong protection for personal and institutional data (Ibrahim Adedeji Adeniran *et al*., 2024). These hurdles are further intensified by the fact that fintech operates globally, making the establishment of a universal regulatory approach even more complicated.

5. Bridging AI Governance and Financial Regulation

5.1. The need for harmonization between ethical AI guidelines and financial laws

The growing dependence on AI in financial services brings considerable advantages but also introduces numerous legal, ethical, and regulatory hurdles (Ridzuan *et al*., 2024). As AI becomes more ingrained in financial decision-making, there is an escalating worry regarding the risks tied to unregulated or poorly governed AI systems. A major concern is the risk of algorithmic bias. AI systems frequently learn from historical datasets(Schmidhuber, 2022), and if these datasets contain existing biases, the algorithms may continue or even heighten these biases. In financial services, biased algorithms could result in unjust lending practices, discriminatory risk evaluations, and disproportionate access to financial products. Additionally, inaccuracies within AI models arising from data errors, erroneous assumptions, or technical failures can lead to severe repercussions, ranging from financial losses to reputational harm for institutions. In certain instances, decisions made by AI could trigger systemic risks that threaten the stability of entire financial markets, evident in the unintended effects of high-frequency trading algorithms during times of extreme market fluctuations.

Moreover, security weaknesses in AI systems represent another major concern. With the increasing frequency of cyberattacks targeting financial institutions, ensuring the cybersecurity of AI models and their foundational infrastructures is of utmost importance. Weaknesses in AI models could be manipulated to influence financial markets, compromise sensitive information, or cause wider disruptions in the financial system. Therefore, there is an urgent need for regulatory oversight to guarantee that AI technologies in financial services are secure, transparent, and dependable.

While these risks underscore the need for regulation, they also create a complicated balancing act between fostering innovation and safeguarding consumers, businesses, and the broader financial system. Financial institutions must be able to harness AI technologies to stay competitive and drive growth, but at the same time, unregulated AI adoption could result in unintended consequences that harm consumers, destabilize markets, or erode trust in financial systems. As a result, regulations must find a middle ground that promotes innovation while preventing potential harms.

Additionally, the complexity, opacity, and ongoing learning processes associated with AI systems make it particularly difficult to ensure fairness and accountability. For example, many AI models function as "black boxes," making it challenging, even for their developers, to fully comprehend how they reach particular decisions. This lack of transparency can diminish trust in AI-driven financial services and complicate efforts to establish accountability in instances of errors, discrimination, or fraudulent activities. Hence, a vital component of AI regulation is to ensure that these systems function transparently and can be audited, allowing stakeholders—including regulators, consumers, and financial institutions—to grasp how AI decisions are made and hold the responsible parties accountable for any adverse outcomes.

To tackle these issues, regulatory frameworks should focus on ensuring that AI systems used in financial services are developed and managed with ethical principles in mind. This involves creating guidelines for algorithmic transparency, data privacy, and consumer protection. In addition, effective regulation of AI in financial services must take into account the global nature of financial markets and the growing interconnections among financial institutions around the world. This poses a challenge for regulators, who must navigate a complex, cross-border landscape characterized by varying legal and ethical standards across different jurisdictions. Ultimately, AI regulation in financial services aims to establish a legal and regulatory framework that promotes innovation while ensuring that AI systems operate in a responsible, transparent manner that fosters fair competition and protects consumer interests.

6. Proposed Framework for Ethical fintech Innovation

Ethical AI in Fintech refers to the conscientious and principled application of Artificial Intelligence technologies in the financial industry (Rizinski *et al*., 2022). It includes the need to ensure that AI systems are created and utilized in ways that are transparent, equitable, and accountable. AI is progressively utilized in banking, investment applications, insurance, and various other financial services. Its implementation can expedite loan approvals, enhance fraud detection, tailor investments more effectively, and automate repetitive tasks. Nevertheless, these systems also pose risks, such as potential bias against specific user demographics. In the absence of adequate transparency or oversight, FinTech AI may inadvertently lead to unjust outcomes. The importance of Ethical AI in Fintech lies in guaranteeing that technological progress does not compromise fairness, transparency, and accountability. By following principles such as transparency, inclusivity, responsibility, privacy, and ongoing monitoring, Fintech firms can develop AI systems that are innovative yet ethical. This strategy not only reduces risks but also cultivates trust and confidence among users, ultimately contributing to a more just and efficient financial landscape.

7. Policy recommendations

As of early 2025, there is no cohesive national strategy for regulating AI in the United States. Instead, the governance of AI consists of a mix of state-specific laws and federal initiatives. These regulations typically set forth principles for AI usage and encourage businesses to engage in voluntary agreements, but they do not establish comprehensive enforcement mechanisms. Nevertheless, they provide insight into regulatory perspectives on AI usage and suggest potential directions for future legislation. The Global Standard for AI Regulations represents a comprehensive framework for governing AI, aimed at creating a consistent legal environment. This framework differs from previous regulations that were specific to individual sectors by categorizing AI technologies based on their risk levels and assigning compliance obligations accordingly. The Act utilizes a four-tier risk framework for AI regulation. AI systems deemed to be of unacceptable risk, such as social scoring, workplace emotion recognition, and biometric surveillance, are prohibited due to concerns about potential misuse and violations of human rights.

High-risk AI applications employed in anti-money laundering compliance, transaction monitoring, and suspicious activity report filing must adhere to stringent regulations that ensure the mitigation of bias, transparency, human oversight, and robust security protocols (Turksen *et al*., 2024). Limited-risk AI systems, like chatbots, necessitate minimal transparency measures but are subject to fewer restrictions. The Act identifies five primary compliance obligations for high-risk AI systems. Companies are required to utilize high-quality, unbiased training data to avoid algorithmic discrimination(Lee and Shin, 2020). Comprehensive documentation is necessary, detailing technical

specifications, decision-making processes, and regulatory evaluations. An AI model must be designed to be transparent and explainable so that both regulators and users can grasp how decisions are derived.

Human oversight is mandated to prevent AI systems from operating independently in critical scenarios. Additionally, AI models are required to undergo regular assessments to ensure their accuracy and reliability, thereby minimizing risks associated with errors, biases, and system failures. To balance regulatory oversight with innovation, the AI Act exempts certain applications from strict compliance demands. AI systems developed exclusively for scientific research are not classified as high-risk, allowing research to advance without excessive limitations.

AI regulation in the U.S. is still decentralized (Hui and Tucker, 2025). There is an increasing trend of federal agencies and state governments conducting compliance audits and investigations to ensure that AI systems adhere to standards of fairness, transparency, and accountability. The Federal Trade Commission (FTC) has warned companies against making misleading claims about AI and holds them accountable for incorrectly representing AI functionalities. Financial institutions may incur civil penalties and compliance mandates for failing to adhere to fairness and transparency guidelines in states that enforce strict AI bias laws.

The landscape of AI regulation varies considerably from state to state in terms of scope and enforcement (Adedokun, 2024). States like New York and Illinois place significant emphasis on transparency and bias prevention, coupled with moderate enforcement, while others have implemented more extensive regulatory frameworks accompanied by harsher penalties.

California's Artificial Intelligence Transparency Act, which takes effect in January 2026, is aimed at generative AI platforms with more than one million monthly users(Şimşek and Yasar, 2025). It mandates the inclusion of latent disclosures in AI-generated content, the availability of public detection tools, and enforceable requirements for licensees. Noncompliance may result in fines of $5,000 for each violation.

Utah's AI Policy Act requires that consumers be clearly notified when engaging with generative AI, and violations can incur administrative fines of $2,500 for each instance. Colorado's Artificial Intelligence Act places rigorous requirements on developers and deployers of High-Risk AI Systems utilized in sectors such as finance, employment, and legal services. Developers are required to disclose risks and mitigation strategies both publicly and to the Attorney General. Deployers must establish risk management programs, conduct annual impact evaluations, and inform consumers about AI-driven decisions. Penalties can amount to $20,000 for each violation. This fragmented regulatory landscape necessitates that financial institutions closely monitor specific state obligations and align their AI compliance frameworks to conform to the strictest standards.

7.1. Strategic Approaches to AI Regulations in Financial Compliance

One of the fundamental elements of AI compliance is transparency, as regulators seek higher levels of explainability in the processes behind AI decision-making (Arunraju Chinnaraju, 2025). Financial institutions are required to adopt Explainable AI (XAI) methods to guarantee that decisions driven by AI are understandable, traceable, and unbiased.

Transparent AI systems mitigate legal risks by showcasing accountability in financial decision-making, especially in areas like credit risk evaluation("AI-Driven Risk Assessment Models for Financial Markets: Enhancing Predictive Accuracy and Fraud Detection," 2025b), fraud identification, and automated lending practices. Financial firms need to incorporate interpretability tools that empower compliance teams and regulators to examine AI-generated outcomes. A crucial component of compliance involves real-time auditing, which ensures that AI models continue to meet regulatory standards as they evolve. Financial firms are also required to deploy automated bias detection algorithms to spot and correct discriminatory trends in AI-driven financial services.

Moreover, institutions should keep detailed AI audit logs, enabling regulators to monitor and assess AI decision-making processes. These logs assist organizations in demonstrating compliance during regulatory assessments, thereby lowering the risk of penalties and enforcement actions. Financial institutions should engage actively in policy discussions, AI ethics forums, and regulatory workshops to shape the formation of AI governance standards. Forming collaborations with AI governance organizations can also provide financial institutions with early warnings about upcoming compliance mandates. Proactive engagement with regulators diminishes uncertainty and ensures that AI-driven financial activities comply with legal and ethical standards. Collaborating with industry associations and compliance networks also enables financial firms to exchange best practices and enhance AI governance across the sector.

AI-driven financial systems must follow principles of fairness, accountability, and transparency to prevent discrimination in FinCrime compliance (Leo, 2025). Establishing internal AI ethics committees can support financial firms in assessing the societal implications of their AI models to align with corporate responsibility objectives. Organizations should also introduce ethical AI training programs for staff, ensuring that compliance teams, data scientists, and executives comprehend the ethical dimensions of AI governance. Responsible AI development minimizes regulatory risks and fosters trust in AI-powered financial services.

Financial institutions can boost the efficiency of AI compliance by integrating automated regulatory reporting tools and AI-driven compliance monitoring systems. These technologies assist organizations in tracking AI decision-making in real time, ensuring that models remain compliant with legal standards. AI-powered compliance platforms can automatically identify and report potential AI biases, helping institutions address compliance risks before they become serious.

8. Conclusion

Ethical AI fosters trust in the FinTech sector by promoting fairness, transparency, and accountability within financial products and services (Aldboush and Ferdous, 2023), which in turn boosts confidence among customers, regulators, and investors. Fundamental principles of ethical AI in FinTech encompass algorithmic fairness to avert bias, comprehensive data governance and privacy, and the need for explainable AI that clarifies decision-making processes. The adoption of these practices not only averts ethical challenges and reputational harm but also sets industry standards and supports the development of a responsible AI landscape. Artificial Intelligence (AI) has emerged as a transformative element in financial markets (Challoumis, 2024), enhancing trading efficiency, refining risk management, and strengthening compliance and fraud detection efforts. AI-driven algorithms facilitate rapid analysis of data, enabling high-frequency trading and market efficiencies that exceed those of traditional approaches. Furthermore, AI's ability to analyze extensive data sources yields valuable insights into consumer behavior, empowering financial institutions to deliver personalized services that enhance accessibility and customer engagement. Nevertheless, the influence of AI goes beyond operational enhancements; it also brings forth challenges related to market stability, ethical issues, and regulatory adherence. The “black box” characteristic of numerous AI models raises concerns regarding interpretability, complicating the task for financial institutions and regulators to fully comprehend and manage AI-driven choices. In the future, further research is required to tackle these interpretability challenges and formulate ethical frameworks to prevent biases that could negatively impact specific groups. As AI progresses, investigating these aspects will be crucial to ensuring that its advantages are both sustainable and distributed fairly throughout the financial industry.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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