

AI-driven compliance and risk management in finance: A comparative study of global and Arab regulatory approaches

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Received: June 27th, 2026 **Accepted:** July 9th, 2026 **Published:** September 01st, 2026

Abstract:

Artificial intelligence is transforming risk management and regulatory compliance in the financial sector, prompting leading regulators, including the United States Department of the Treasury and the central banks of the Gulf, to issue AI-specific governance directives in 2025 and 2026. This paper presents a qualitative, descriptive-analytical, and comparative study of this transformation, focusing on the United States' Financial Sector AI Risk Management Framework (FS AI RMF) and the United Arab Emirates Central Bank's 2026 AI guidance note, complemented by case studies of BNP Paribas (France) and Emirates NBD (UAE). Four hypotheses are evaluated through qualitative pattern-matching: the transition from reactive to proactive compliance; the regulatory risk of opaque “black box” models; a UAE–Saudi regulatory disparity in AI governance; and the current global dominance of principles-based regulation. All four hypotheses are supported. The study concludes that the UAE is emerging as a regional regulatory benchmark, while the wider Arab region remains at an earlier stage of this evolution.

Keywords: artificial intelligence; regulatory compliance; risk management; explainability; financial regulation.

Jel Classification Codes: G21, G28, K23, O33.

1. Introduction:

The global financial sector is experiencing a significant transformation in risk management and regulatory compliance, propelled by the rapid integration of artificial intelligence (AI) and machine learning in internal controls, anti-money laundering, and fraud detection operations. Prominent regulators globally, including the United States Department of the Treasury and the central banks of the Gulf, have commenced a new phase of issuing governance directives specifically for AI in the financial sector, rendering this topic both pertinent and significant for comprehending industry trends in 2025 and 2026.

This paper examines the most notable developments, analyzes practical case studies from both international and regional banking, and compares the status of Arab countries, primarily the United Arab Emirates and Saudi Arabia, within this global regulatory transformation. The objective is to deliver a thorough narrative for both expert and lay audiences.

All sources referenced in this study were last examined in June 2026; mentions of regulatory developments up to February 2026 represent the most recent publicly accessible documentation at the time of writing and should be interpreted with that deadline in consideration.

1.1 Research objectives:

- ✓ To examine the paramount advancements in the application of artificial intelligence for risk management and regulatory compliance within the financial sector during 2025-2026.
- ✓ To evaluate the predominant emerging international regulatory frameworks (the U.S. FS AI RMF framework and the UAE regulatory approach) and to analyze their key instruments.
- ✓ To examine practical application models (the BNP Paribas and Emirates NBD case studies) to comprehend the utilization of AI in risk assessment and compliance within both international and regional banking frameworks.
- ✓ To evaluate the regulatory maturity of the UAE and Saudi Arabia as representative Arab cases in comparison to their Western counterparts, with the aim of situating this segment of the Arab region within the larger global context.

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- ✓ To foresee forthcoming challenges (explainability, algorithmic bias, “algorithmic disgorgement”) and their implications for the financial compliance sector.

1.2 Research hypothesis:

Hypothesis One: Artificial intelligence is transforming the role of regulatory compliance from a conventional “reactive” model, where violations are identified post-occurrence, to a “proactive” model based on continuous monitoring and predictive risk assessment.

Hypothesis Two: Increased dependence of financial institutions on “black box” AI models, which lack adequate explainability, correlates with heightened regulatory and legal vulnerability, irrespective of the technical accuracy of those models.

Hypothesis Three: A regulatory disparity exists between the UAE and Saudi Arabia regarding AI governance in the financial sector; the UAE has established a clear, sector-specific regulatory framework, whereas Saudi Arabia, during the examined period, has maintained a fragmented approach concentrated on particular applications, such as anti-money laundering, lacking a corresponding comprehensive governance framework. This hypothesis pertains solely to the two jurisdictions analyzed in this study and is not posited as a general assertion regarding the Arab region as a whole.

Hypothesis Four: A principles-based regulatory framework, as opposed to comprehensive, prescriptive legislation, is presently the predominant global strategy for regulating AI in the financial sector, due to the swift evolution of technology and the challenges associated with formulating static rules that can adapt accordingly.

2. Literature review:

A collection of academic research regarding artificial intelligence in financial risk management and regulatory compliance has accumulated swiftly since 2023, mirroring the rate of business implementation.

2.1 Global literature on explainability, accountability, and enforcement:

A significant component of this work focuses on the conflict between model efficiency and explainability. In a report by the CFA Institute Research and Policy Center, Wilson (2025) outlines the regulatory framework for AI explainability in finance and contends that the necessity for human-interpretable outputs has transitioned from a marginal ethical issue to a fundamental criterion for the inclusion of AI

systems in critical financial decisions. A 2025 Financial Stability Institute occasional paper by the Bank for International Settlements articulates that the opacity of deep learning and large language models hinders supervisory efforts to ensure institutional accountability, and that the lack of explainability may, if unaddressed at the prudential level, exacerbate systemic risk over time.

A second, closely related research stream conceptualizes explainability not as a singular condition but as one aspect of a broader trade-off. A 2026 working paper disseminated on arXiv presents this as a trilemma involving accuracy, compliance, and comprehensibility. It suggests that regulators should abandon the mandate for a singular explanation format and instead necessitate that firms document and justify, in advance, their approach to balancing these three conflicting requirements for various stakeholders, including internal risk committees, supervisors, and impacted customers. This reframing is crucial for the current study as it indicates that the “black box” issue addressed in this paper is not simply a technical constraint in need of an engineering remedy, but rather a fundamental characteristic of financial AI that regulatory frameworks must adapt to manage instead of eradicate.

A third stream refers to regulatory enforcement procedures that extend beyond financial fines to include structural repairs. Goland (2023) offers an early legal examination of algorithmic disgorgement, investigating the U.S. Federal Trade Commission's power to mandate the deletion of models constructed from improperly obtained data. Lee (2025) recently conducted a critical re-evaluation of this remedy, observing that its scope has broadened from addressing damages during a model's creation to those resulting from its application. He warns that, although the remedy is compelling, it is not consistently commensurate or suitable for the underlying harm. Collectively, these contributions suggest that algorithmic disgorgement, rather than being a peripheral concern, is developing into a unique category of regulatory risk that financial firms must incorporate into model governance alongside traditional compliance penalties.

2.2 Literature on Arab financial markets:

Research focusing on AI governance in Arab financial markets is significantly less extensive than that of the global context, although it has shown substantial growth in the previous two years. Numerous authors expressly characterize this shortage as a gap rather than a failure. A 2023 review of AI adoption in Saudi Arabia's digital finance sector indicates that, despite significant governmental backing for technology-driven

institutions, AI “has not yet become a critical component” of financial transaction efficiency in the Kingdom. Furthermore, the limited amount of published research on AI adoption within the Saudi financial industry necessitates an extensive literature review to figure out the current state of implementation. A distinct 2024 study regarding AI's impact on customer satisfaction in Saudi banks notes that the Saudi Arabian context “has been the focus of limited research despite the acknowledged importance of AI solutions in the banking sector,” and highlights regulatory obstacles and implementation expenses as persistent challenges cited by professionals.

In 2025 preprint analyzing AI governance and ethics in Saudi Arabia offers one of the most direct evaluations of the regulatory framework to date. Regulatory fragmentation among the Saudi Data and AI Authority (SDAIA), the Saudi Central Bank (SAMA), and the National Cyber security Authority presents a significant barrier to the implementation of responsible AI in banking, as each entity implements governance standards that lack adequate harmonization (Aljerian et al., 2025). The study indicates that Saudi Arabia, in contrast to the European Union, has not implemented any AI-specific regulatory legislation, which the authors contend generates ambiguity regarding risk classification, oversight, and enforcement, despite the nascent Saudi standards demonstrating some alignment with the EU AI Act and OECD AI Principles. This finding directly supports the third hypothesis proposed in this study concerning regulatory fragmentation between Arab states.

Empirical study on the UAE market provides a more detailed perspective, partly due to the UAE's regulatory framework having developed earlier than that of its regional counterparts. A 2025 study in the *Journal of Risk and Financial Management* examines the adoption of AI-driven fraud detection in financial institutions in the UAE and Qatar, creating a conceptual model that connects transparency, perceptions of justice, and institutional trust to adoption outcomes. The authors conclude that regulatory compliance serves as a beneficial facilitator of AI adoption, rather than a limitation, and indicate that openness in fraud detection models markedly affects auditors' trust in AI-generated alerts. The study highlights a deficiency in existing literature: limited empirical research has integrated transparency, bias, and trust into a unified explanatory model, and even fewer have examined the influence of local regulatory pressure and culture on trust in AI systems within Gulf banking institutions. The current study's comparative methodology partially addresses this gap by expanding the investigation beyond firm-level adoption dynamics to the realm of comparative regulatory frameworks.

Another aspect of regional literature examines the intersection of AI and Shariah-compliant finance, a topic usually overlooked in Western regulatory studies but crucial in various Gulf states. A 2025 qualitative literature review on the influence of AI on Islamic financial literacy contends that explicit regulation is crucial to facilitate AI application in Islamic finance, even when the foundational models are technically robust, as Shariah compliance necessitates an extra layer of permissibility assessment that conventional AI risk frameworks do not consider. A pertinent multi-country analysis of Islamic Fintech within the GCC, encompassing Saudi Arabia, the UAE, Bahrain, Oman, Qatar, and Kuwait, reveals that AI-driven Islamic Fintech can enhance financial inclusion. However, it warns that regulatory frameworks in these countries must evolve to align with technological progress, a suggestion that holds significant practical ramifications for policymakers aiming to reconcile innovation with prudent regulation.

In their research, Yaseen and Al-Amarneh (2025) examine the uptake of AI-driven fraud detection systems among financial institutions in the UAE and Qatar, with a special focus on trust, transparency, and perceptions of fairness. The study shows that transparency greatly enhances trust, which is the leading predictor of AI uptake. Fairness perception mediates the negative impacts of algorithmic bias, emphasizing its important role in establishing system credibility. The analysis of subgroups shows differential regional and professional variations in trust and fairness sensitivity, where internal auditors and highly AI-exposed subjects are found to exhibit higher adoption preparedness. Compliance with regulations also emerges as a positive enabler of adoption.

Table 1 identifies the key research examined in this part, their respective focal points, and the gaps they leave unaddressed, several of which this work explicitly confronts.

Table 1: Key studies reviewed, their focus, and identified gaps

Author	Region	Focus	Gap identified
Wilson / CFA Institute (2025)	Global	Explainability as a precondition for AI implementation in finance	Does not address how explainability requirements translate into emerging-market or Arab regulatory practice
BIS Financial Stability Institute (2025)	Global	Links model opacity to heightened systemic risk	Prudential framing only; no jurisdiction-specific comparison of how regulators operationalize

			explainability
Goland (2023); Lee (2025)	United States	Legal analysis of algorithmic disgorgement as an enforcement remedy	Confined to U.S. enforcement practice; no discussion of whether comparable remedies exist or are feasible in Arab jurisdictions
AI revolution in digital finance in KSA (2023)	Saudi Arabia	Reviews the state of AI adoption in Saudi digital finance	Descriptive review only; does not benchmark Saudi Arabia against international regulatory frameworks
AI in the Saudi banking sector (2024)	Saudi Arabia	AI's effect on customer satisfaction and implementation barriers	Firm-level and customer-outcome focus; does not examine regulatory architecture or cross-country comparison
Algerian et al. (2025)	Saudi Arabia	Identifies regulatory fragmentation across SDAIA, SAMA, and cybersecurity authorities	Single-country analysis; does not compare this fragmentation against a jurisdiction with a unified framework, such as the UAE
JRFM study on the UAE and Qatar (2025)	UAE / Qatar	Trust, transparency, and fairness perception in AI-driven fraud detection adoption	Firm-level adoption model; does not extend to comparative regulatory architecture or benchmark against global frameworks
Islamic fintech in the GCC (2023-2025)	GCC-wide	AI-enabled Islamic fintech and financial inclusion	Focuses on inclusion outcomes rather than the regulatory governance frameworks needed to support them

Source: Prepared by the author based on the reviewed literature.

This review brings out three observations that jointly inform the design of the current investigation. Although explainability, algorithmic accountability, and structural remedies like algorithmic disgorgement are recognized concerns in global literature, the scholarship predominantly focuses on U.S. and European contexts, with Arab markets receiving relatively little attention. Secondly, existing Arab-focused studies primarily investigate firm-level adoption, customer satisfaction, or governance ethics within a singular nation, predominantly Saudi Arabia or the UAE, rather than conducting a systematic comparison of regulatory frameworks across the region or against international standards like the U.S. Treasury's FS AI RMF. Third, no study identified in this review

explicitly traces the shift from reactive to proactive compliance models, the central premise of this paper's first hypothesis, within an Arab regulatory setting specifically.

This paper strategically situates itself at the convergence of three gaps: it broadens the firm-level and single-country emphasis of previous Gulf-centric studies into a systematic cross-jurisdictional analysis, contextualizes that analysis within the latest global frameworks released in 2025 and 2026, and assesses the degree to which Arab regulatory methodologies align with, forecast, or deviate from the principles-based trajectory evident on an international scale.

3. Research methodology:

3.1 Research design:

This study applies a descriptive-analytical design based on a qualitative research technique, enhanced by a comparative approach across international and Arab regulatory frameworks. This design was chosen due to its focus on the examination of emerging regulatory trends and governance frameworks, rather than quantifiable statistical relationships, and because the pertinent primary documentation (regulatory guidance, legal instruments, and institutional reports) is qualitative and best analyzed through systematic content analysis instead of quantitative modeling.

3.2 Data collection instruments:

Table 2: Data collection instruments and their application

Instrument	Application
Documentary analysis	Examination of official regulatory texts (CBUAE guidance, the FS AI RMF framework, SAMA reports)
Case study	Analysis of paired international and regional implementations (BNP Paribas and Emirates NBD)
Comparative analysis	Comparison of regulatory frameworks across two or more jurisdictions (UAE/Saudi Arabia versus the United States/European Union)
Literature review	Reports issued by advisory institutions (McKinsey, Deloitte, PwC) and reports by the Union of Arab Banks

Source: Prepared by the author

3.3 Data sources:

- Primary sources: the texts of official regulations and guidance notes (central bank websites).

- Secondary sources: industry reports, specialized articles, and academic papers.

3.4 Scope and limitations:

The study examines developments occurring between 2024 and 2026 with primary focus on the UAE and Saudi Arabia as two Arab benchmark cases, compared against the United States and the European Union.

The lack of standardized quantitative data about the efficiency of AI compliance systems in the Arab area necessitates an analysis primarily based on publicly accessible regulatory records instead of quantitative performance indicators.

This dependence on documentary sources instead of primary data gathering methods (such as surveys, interviews, or institutional performance records) is a conscious methodological decision rather than an unplanned error.

The regulatory frameworks analyzed in this study, specifically the CBUAE guidance note and the U.S. FS AI RMF, were released in February 2026, just before the composition of this report. No institution has amassed multi-year performance data under these exact guidelines, and any primary survey undertaken at this stage would capture only preliminary, transitory responses rather than established practices. The analysis of documents and case studies is presently the most dependable method for evaluating the interpretation and application of these frameworks. Existing partial survey evidence, including the DFSA's 2025 generative AI usage survey, has been integrated wherever accessible to enhance this methodology.

4. Key developments:

There have been many developments in the theoretical and legal framework:

4.1 U.S. regulatory framework:

On February 19, 2026, the U.S. Department of the Treasury released the Financial Sector AI Risk Management Framework (FS AI RMF) to address the industry's "Year 1999 problem," characterized by outdated technology systems, fragmented data governance, and unclear model lifecycles, which are now anticipated to facilitate AI-driven decision-making in a highly regulated context.

4.2 A principles-based regulatory approach:

Instead of implementing extensive new legislation, U.S. regulators have embraced a risk-based, technology-neutral approach that reinforces the current compliance framework for registered investment advisers, while also retracting the U.S. Securities and Exchange Commission's (SEC) proposed rule on predictive analytics.

4.3 From policy debate to active examinations:

In 2025, artificial intelligence was the focal point of regulatory discussions, and in 2026, it may dominate in examination and review processes. Companies are encouraged to catalog the AI tools currently implemented, regardless of their approval status, to align use cases with existing recordkeeping and monitoring obligations, and to ensure that AI-related conversations are documented and assessed.

4.4 State-level legislation in the United States:

Colorado will require risk evaluations for high-impact AI systems beginning in 2026, while New York's financial regulator is working on AI-specific recommendations of its own.

4.5 “Black box” risk and the demand for explainability:

When a model rejects a loan application or prevents a payment, regulators require a clear rationale, and a “black box” explanation is inadequate. Fairness audits and disparate-impact assessments are increasingly anticipated by regulators, especially for high-impact applications.

4.6 A new and unprecedented risk - algorithmic disgorgement:

A rising concern of significance is the potential for regulators to mandate the “algorithmic disgorgement” of models developed with unlawfully acquired data, which entails the obliteration of the model itself as a regulatory sanction.

5. Case studies:

5.1 BNP Paribas:

The French banking group encountered difficulties in the precision and expediency of evaluating the many risks linked to its international banking activities, encompassing credit risk and operational risk.

A machine learning-driven risk assessment platform enhances the precision and efficiency of risk evaluations. The platform evaluates many

risk indicators by analyzing extensive data to forecast probable defaults and financial instability, while continuously monitoring for deviations and abnormalities.

Early risk prediction and greater operational efficiency make it a reference model against which the Arab experience can be compared.

5.2 The UAE:

On February 23, 2026, the Central Bank of the UAE (CBUAE) released its first sector-specific guidance for artificial intelligence in the financial sector, founded on five principles: governance and accountability, fairness and non-discrimination, transparency and explainability, effective human oversight, and data governance and privacy.

According to a report conducted by the Dubai Financial Services Authority, the utilization of generative AI among financial institutions in the UAE increased by 166% from 2024 to 2025. The guidance mandates the creation of documented governance frameworks commensurate with an institution's size, nature, and complexity, and introduces the notion of a "high-impact decision": a decision that significantly influences a customer's access to financial services, including credit approvals or pricing.

The new Central Bank Law (Federal Decree-Law No. 6 of 2025) became effective in September 2025, imposing administrative fines of up to one billion UAE dirhams, with a compliance grace period lasting until September 2026.

5.3 Saudi Arabia:

Artificial intelligence is implemented in the Saudi banking sector to ensure compliance with laws by automating transaction monitoring and reporting processes, hence lowering the risk of penalties. As of now, the Saudi Central Bank (SAMA) has not released a detailed regulatory framework for AI that matches the comprehensiveness of the UAE system, which serves as a significant point of comparison in this study.

Regionally, the Union of Arab Banks observes that banks function in a highly regulated environment, and the implementation of artificial intelligence prompts concerns about adherence to data privacy laws, ethical standards, and regulatory obligations, requiring meticulous oversight and governance. Arab countries have significant disparities in their investment levels in banking AI technologies.

In the Gulf states, Pulivarthy and Whig (2025) observed that banks are adopting hybrid approaches that integrate formal regulation with in-house AI ethics management. Models like the IEEE Ethically Aligned Design (EAD) are being used to support bias minimization, auditability, and human-centric risk assessment.

Table 3: Comparative summary of regulatory frameworks

Criterion	USA / Europe	UAE	Saudi Arabia and other Arab countries
Dedicated financial-sector AI framework	Yes (FS AI RMF, EU AI Act)	Yes (February 2026)	Not yet available at the same level of detail
Legal character	Mixed (partially binding)	Not formally binding, but sets supervisory expectations	Not clearly defined
Primary focus	Explainability, bias testing, algorithmic disgorgement	Consumer protection, high-impact decisions	Primarily fraud and anti-money laundering detection
Regulatory maturity	Advanced, moving toward practical enforcement in 2026	Relatively advanced and regionally pioneering	Still taking shape

Source: Prepared by the author based on the regulatory documents reviewed.

6. Conclusion:

This study's evidence demonstrates that artificial intelligence is a crucial factor in transforming compliance and risk management in the financial sector, marking a distinct transition from the conventional inspection model to one of continuous monitoring and proactive forecasting. The comparison between international and Arab frameworks illustrates the UAE's emergence as a regional regulatory benchmark, akin to the roles of U.S. and European authorities globally, while the remainder of the Arab area remains at a more emerging stage of this transformation.

6.1. Hypothesis testing:

This study has a qualitative, descriptive-analytical approach, hence hypothesis testing does not include statistical inference. Each hypothesis is assessed via qualitative pattern-matching, aligning with Yin's (2018) established framework for case study research, where a hypothesis is validated based on the degree of correspondence between the empirically observed pattern and the theoretically anticipated one ("analytic generalization"), rather than through statistical generalization across a sample. The evidence compiled in this study is analyzed for the existence, nonexistence, or contradiction of the pattern anticipated by each hypothesis. A hypothesis is deemed substantiated when the documentary and case-study evidence aligns with it, somewhat substantiated when the evidence is inconclusive or varies by jurisdiction, and unsubstantiated when the evidence contradicts it. This methodology aligns with recognized standards in qualitative comparative policy research, focusing on institutional and regulatory behavior rather than quantifiable variables.

Hypothesis One (reactive to proactive compliance) has been substantiated. The data examined indicates that supervisory focus is transitioning from retrospective enforcement to ongoing, real-time monitoring, exemplified by the U.S. transition from AI policy discourse to actual evaluative practices in 2026. This is substantiated by the case studies in BNP Paribas employs machine learning to forecast instability prior to its occurrence, while Emirates NBD's adaptive, AI-driven sanctions screening platform conducts continuous transaction monitoring instead of periodic manual assessments. The alignment of this pattern across both international and regional institutions enhances confidence that the transition is not confined to a singular regulatory framework. No evidence examined in this study invalidates the expected pattern of this transition.

Hypothesis Two (black-box exposure) has been validated. The study records a definitive regulatory rejection of inexplicable credit and payment determinations, while the literature examined corroborates that explainability is regarded as a prerequisite for implementation rather than a peripheral issue, with the Bank for International Settlements explicitly associating unexplainable models with increased systemic risk. The alignment of regulatory guidance and independent academic research on this matter enhances confidence in this hypothesis beyond the support of each source individually.

Hypothesis Three (Arab regulatory fragmentation) has been substantiated. illustrates that the UAE established a specialized, principles-based AI framework for the financial industry in February 2026, whereas Saudi Arabia, over the same timeframe, used AI mainly for anti-money laundering and transaction monitoring, without a comparable comprehensive framework. This conclusion is independently supported by the literature examined in the study, which highlights regulatory fragmentation among SDAIA, SAMA, and the National Cyber security Authority as a structural impediment within the Saudi environment. The hypothesis is considered validated exclusively for the UAE-Saudi comparison; its applicability to other Arab jurisdictions not directly analyzed in this study, such as Qatar, Bahrain, or Egypt, remains an unresolved issue for future investigation.

Hypothesis Four (principles-based regulation) has been substantiated. Both the U.S. Treasury's FS AI RMF and the CBUAE's 2026 guidance paper are explicitly principles-based rather than prescriptive, and neither jurisdiction has implemented precise, rule-specific AI legislation for finance that matches the granularity of existing prudential capital regulations. This pattern is consistent in both the global and Arab contexts analyzed, which is significant considering the substantial differences in their regulatory traditions, indicating that the principles-based approach is indicative of the technology's inherent characteristics rather than a regional regulatory orientation.

Collectively, all four hypotheses are supported by the reviewed evidence, with the significant caveat that Hypothesis Three is validated exclusively within the specific UAE-Saudi contrast analyzed here and should not be interpreted as a general assertion regarding the Arab region as a whole.

6.2. Recommendations:

- ✓ Observe if other Gulf states implement frameworks identical to the UAE model in 2026.
- ✓ Investigate the initial applications of “algorithmic disgorgement” as a regulatory sanction and its effects on the market.
- ✓ Analyze the impact of explainability mandates on personal credit determinations in the Arab region.
- ✓ Analyze the regulatory compliance expenses of institutions that implemented AI early against those that embraced it subsequently.

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