

## Legal Governance of Artificial Intelligence in Financial Market Infrastructure: An Analytical and Comparative Legal Study in Light of Financial Stability and Market Integrity Requirements

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### **Abstract:**

This study examines the legal governance of Artificial Intelligence (AI) applications within financial market infrastructure (FMI), including stock exchanges, central counterparties, central securities depositories, and settlement systems. The paper adopts an analytical and comparative legal methodology to evaluate the adequacy of existing legal frameworks in addressing emerging risks associated with AI-driven operational systems.

The study argues that traditional legal rules governing financial institutions are increasingly insufficient to regulate autonomous or semi-autonomous algorithmic systems capable of influencing market integrity, operational resilience, and systemic stability. Particular attention is devoted to issues of legal liability, explainability, cybersecurity, algorithmic accountability, operational risk, and institutional governance. The research further compares international regulatory approaches, including IOSCO principles, the European Union Artificial Intelligence Act, and emerging governance standards adopted by financial regulators and international financial institutions. The paper concludes by proposing a specialized legal and regulatory framework for the Sultanate of Oman designed to balance technological innovation with investor protection, market integrity, and financial stability.

**Keywords:** Artificial Intelligence (AI) - Market Integrity- Algorithmic Governance- Financial Stability

### **Research Methodology**

This paper adopts a doctrinal legal methodology supported by comparative and analytical approaches. The study analyzes international regulatory frameworks governing AI systems in financial markets and compares them with the existing legal and institutional framework in the Sultanate of Oman.

The research further relies on comparative examination of:

- IOSCO principles relating to AI governance in capital markets.
- The European Union Artificial Intelligence Act.
- Financial Stability Board (FSB) recommendations.
- Bank for International Settlements (BIS) operational resilience principles.

The paper also incorporates practical governance considerations arising from financial market infrastructure institutions, including compliance functions, operational risk management, market surveillance systems, and institutional accountability mechanisms.

## **Introduction**

Financial market infrastructure constitutes one of the central pillars of the modern financial system. Stock exchanges, clearing houses, central securities depositories, and payment and settlement systems collectively ensure market stability, transactional integrity, and investor confidence.

The rapid integration of Artificial Intelligence technologies into financial market infrastructure has fundamentally transformed operational processes. AI systems are increasingly utilized in market surveillance, fraud detection, predictive operational risk analysis, automated compliance systems, cybersecurity monitoring, and algorithmic decision-making.

Despite these operational advantages, AI integration generates complex legal and regulatory concerns. The deployment of opaque and self-learning algorithmic systems within systemically important financial institutions raises fundamental questions concerning liability attribution, transparency, explainability, governance accountability, and systemic financial risk.

This study argues that existing legal frameworks remain inadequately equipped to address the autonomous nature of AI-driven operational systems within financial market infrastructure.

## **Theoretical Framework: Algorithmic Governance and Regulatory Accountability**

A central challenge in AI governance lies in reconciling traditional principles of legal accountability with increasingly autonomous algorithmic systems. Financial regulation has historically relied upon identifiable human decision-makers capable of assuming legal responsibility for operational misconduct or negligence.

However, AI systems operating through machine-learning models may generate decisions or recommendations that are not fully foreseeable or explainable by human operators. Consequently, traditional fault-based liability models become increasingly difficult to apply within AI-driven environments.

This study therefore proposes a governance-based approach to AI accountability, under which financial institutions remain ultimately responsible for the operational consequences of AI deployment regardless of the degree of algorithmic autonomy. Such an approach is consistent with principles of market integrity, fiduciary responsibility, and systemic risk management.

## **Legal Challenges Arising from AI Integration**

### **1. Legal Liability and Attribution of Responsibility**

One of the most significant legal challenges concerns determining liability when AI systems contribute to operational failures, inaccurate market surveillance outcomes, or financial losses. Several liability models may potentially apply:

- Contractual liability.
- Tort-based liability.
- Strict liability for high-risk systems.
- Product liability concerning defective algorithmic systems.
- Institutional liability arising from inadequate governance or oversight.

From a regulatory perspective, financial market operators should remain ultimately accountable for AI-generated outcomes due to the systemic significance of their activities.

## 2. Transparency and Explainability

The opacity of certain machine-learning systems creates direct tension with principles of procedural fairness and regulatory transparency. Market participants affected by automated decisions may possess legitimate legal interests in understanding the basis upon which such decisions are made.

## 3. Cybersecurity and Operational Resilience

AI-driven financial infrastructure significantly increases exposure to sophisticated cyber threats. Operational disruptions affecting central clearing or settlement systems may trigger systemic financial instability extending beyond individual institutions.

## 4. Data Governance and Privacy

AI systems require extensive access to sensitive financial and personal data. Consequently, legal frameworks governing data protection, confidentiality obligations, and cross-border data transfers become increasingly important within financial market infrastructure.

## 5. Systemic Risks

The widespread reliance on interconnected algorithmic systems may amplify market volatility and create systemic contagion risks, particularly during periods of market stress.

### **Comparative Regulatory Analysis**

International regulatory organizations have increasingly emphasized the necessity of AI governance within financial markets.

IOSCO has highlighted the importance of governance accountability, algorithmic transparency, operational resilience, and effective human oversight in relation to AI applications within capital markets. Similarly, the Financial Stability Board and the Bank for International Settlements have stressed the systemic implications of AI deployment within critical financial infrastructure.

At the European level, the Artificial Intelligence Act represents one of the most advanced regulatory models governing high-risk AI systems. The Act imposes obligations relating to:

- Transparency.
- Human oversight.
- Risk management.
- Technical auditing.
- Documentation and accountability requirements.

In contrast, the United Kingdom has adopted a more principles-based regulatory approach emphasizing flexibility and sector-specific supervision, while the United States continues to rely upon fragmented sectoral regulation.

This comparative divergence demonstrates the absence of a unified global regulatory model governing AI within financial market infrastructure.

### **Corporate Governance and Compliance Dimensions**

An effective AI governance framework within financial market infrastructure cannot rely solely upon external regulation. Internal governance mechanisms play an equally critical role.

Boards of directors should maintain ultimate responsibility for AI governance strategies, operational oversight, and risk accountability. Compliance functions must ensure that AI systems operate consistently with regulatory obligations, ethical standards, and market integrity requirements.

Additionally, internal audit departments should periodically assess:

- Algorithmic governance frameworks.

- Model risk management controls.
- Operational resilience mechanisms.
- Data governance procedures.
- Cybersecurity safeguards.

The adoption of the Three Lines Model is particularly important in ensuring clear institutional accountability for AI-related risks.

### **The Need for a Specialized Legal Framework in Oman**

The Sultanate of Oman has undertaken significant reforms aimed at modernizing financial market infrastructure and enhancing digital transformation within the financial sector. Nevertheless, the current legal framework does not yet provide a specialized regime governing AI applications within systemically important financial institutions.

Although existing legislation addresses cybersecurity, financial regulation, and personal data protection, current laws remain insufficient to regulate:

- Algorithmic accountability.
- Automated decision-making.
- Explainability obligations.
- Technical auditing standards.
- AI governance responsibilities.

Accordingly, this study recommends the adoption of a specialized regulatory framework incorporating:

1. Mandatory human oversight over high-risk AI systems.
2. Clear liability allocation mechanisms.
3. Independent technical auditing requirements.
4. Enhanced operational resilience standards.
5. AI governance obligations for boards and executive management.
6. Explicit supervisory powers for financial regulators concerning AI deployment within financial market infrastructure.

### **Conclusion**

Artificial Intelligence is rapidly reshaping the operational structure of financial market infrastructure. While AI technologies provide substantial benefits concerning efficiency, surveillance capabilities, and operational resilience, they simultaneously generate unprecedented legal and systemic risks.

This study demonstrates that traditional legal frameworks are increasingly inadequate to regulate autonomous algorithmic systems operating within systemically important financial institutions. Consequently, modern governance-based regulatory approaches are required to balance technological innovation with investor protection, market integrity, and financial stability.

The paper ultimately recommends the establishment of a comprehensive national AI governance framework for the financial sector in the Sultanate of Oman aligned with international regulatory developments and best practices.

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