INSIDER TRADING VIS-À-VIS ARTIFICIAL INTELLIGENCE: REGULATORY CHALLENGES AND THE FUTURE OF MARKET INTEGRITY

Maglin M Raja, Research Scholar, Bhagwant University, Ajmer, Rajasthan (Department of Law)

ABSTRACT

Artificial Intelligence (AI) and algorithmic trading have fundamentally reshaped global financial markets through unprecedented analytical power, automation, and data-driven decision-making. While these technologies have enhanced liquidity, efficiency, and speed, they have simultaneously complicated the enforcement of insider trading laws. Traditional doctrines of insider trading developed in legal systems such as India's SEBI (Prohibition of Insider Trading) Regulations, 2015, the U.S. classical and misappropriation theories, and the EU/UK Market Abuse Regulation (MAR) were framed for human actors, linear information flows, and intentional misuse of Unpublished Price Sensitive Information (UPSI). The emergence of algorithmic systems capable of analysing alternative data, generating predictive signals, and engaging in autonomous trading challenges the foundational assumptions of insider trading law. In many cases, algorithms replicate the outcomes of insider trading without accessing UPSI in its conventional sense, thereby undermining legal tests based on possession and intent. The widespread use of machine learning has also facilitated sophisticated market manipulation practices, such as spoofing, layering, momentum ignition, and quote stuffing, exposing regulatory limitations in detecting, attributing, and penalising misconduct. This paper examines how insider trading regulation must evolve to address algorithmic finance. Through a comparative analysis of Indian, U.S., and EU/UK legal systems, the study identifies key doctrinal and operational gaps and proposes a forward-looking regulatory architecture grounded in transparency, accountability, and algorithmic oversight. It advocates for redefining "insider," institutionalising algorithmic audits, deploying AI-driven surveillance systems, and strengthening international regulatory cooperation. These measures are essential to preserving market integrity and investor confidence in an increasingly data-driven and automated trading environment.

Keywords: Insider Trading, Algorithmic Trading, Artificial Intelligence, SEBI PIT Regulations, Market Abuse Regulation (MAR)

1. Introduction

Financial history has changed with AI in securities markets. AI trading algorithms assess enormous datasets, monitor market signals, and execute plans quicker than humans. These advances have increased efficiency, liquidity, and transaction costs but undermined legal frameworks based on identifiable human actors and inappropriate use of unpublished information. Insider trading legislation implies human insiders employ UPSI for undue market benefit. AI complicates these assumptions. Like insiders, algorithms may make choices based on data patterns. Public datasets may provide UPSI-like data, combining prediction and unfair advantage.[1] They can launch market-distorting trades without guidance or prediction. As markets become increasingly automated, how should insider trading law change? This article uses worldwide legislation to evaluate insider trading and AI in India. It states that purpose, knowledge, and possession alone cannot enforce insider trading. Tech-driven information, automated judgements, and vague, self-learning algorithm threats require regulation.[2]

2. Evolution of Insider Trading Regulation in India

Indian insider trading enforces market integrity without openness. Indian securities law had little insider trading guidance and inconsistent enforcement until the 1990s. Liberalisation and fast-growing finance markets revealed regulatory inadequacies. SEBI oversees insider trading and capital markets.[3] The 1992 law prohibited weak security insider trading. Important early limitations were unclear, poorly enforced, and lacking misbehaviour monitoring. Indian legislation, "insider," and disclosure techniques were harmonised with worldwide insider trading norms from 2002 to 2008. The methodology improved but struggled to uncover complex trading methods, motives, and unreported facts. SEBI passed the 2015 SEBI (Prohibition of Insider Trading) Regulations after the Justice N. K. Sodhi Committee's recommendations. In 2015, India's most thorough insider trading law update strengthened it. 2015 rules defined “insider,” “connected person,” and “Unpublished Price Sensitive Information” (UPSI) to broaden and clarify regulations. Compliance and prevention were promoted by structured trading windows, blackout times, listed business and intermediary restrictions, and better information. Rules are possession-based.[4] UPSI trading without profit

[1] Securities and Exchange Board of India. (2015). SEBI (Prohibition of Insider Trading) Regulations, 2015. SEBI.
[2] Securities and Exchange Board of India. (2014). Report of the High-Level Committee to Review the SEBI (Prohibition of Insider Trading) Regulations, 1992 (Justice N. K. Sodhi Committee Report). SEBI.
[3] Avgouleas, E. (2015). Regulating financial innovation: A jurisprudential critique. Cambridge University Press.
[4] Arner, D., Barberis, J., & Buckley, R. (2017). Fintech and regtech: Impact on regulators and banks. Journal of

is unlawful. Best practices worldwide support this. SEBI can now investigate, seize phone data, freeze assets, penalise, and recover illegal gains. This effective method humanises markets. Insiders can obtain, distribute, or abuse UPSI through personal, fiduciary, or business ties. The idea that algorithmic and AI-driven markets purposely trade poorly is fading. Modern algorithms automate trading. These methods uncover market trends machine learning analysts ignore. Alternative data mapping, predictive analytics, and digital data can disclose sensitive information. Privacy and public data clash legally. Public data deep learning: UPSI trading predicts quarterly deals or earnings? Traders, brokers, programmers, or algorithms insider trading? Do regulators consider algorithm developers with privileged data or prediction tools "insiders"? AI and data-driven finance insider trading laws should be reviewed since machine decision-making varies from human law.[5]

3. Algorithmic Trading and AI in Financial Markets

Financial markets are speedier and agreements are different due to algorithmic trading. Brokers and managers used market data, financial documents, and economic trends. Trading algorithms use math and market signals. Technological indicators, thresholds, and price fluctuations were employed in algorithms. These complex frameworks employ AI, deep learning, machine learning, and current computing. Modern AI trading is unregulated. They can adapt to market changes, learn from past data, and forecast using advanced analysis. Machine learning evaluates massive market, corporate, economic, and behavioural data. Deep learning may reveal complex, non-linear data correlations. Trading AI consistently surpasses humans. Improve HFT.[6] Low-latency huge market data processor. HFT signals are sent faster by trading servers near stock exchange servers. HFT firms monitor several exchanges to profit on price differences and arbitrage opportunities before they disappear. HFT tightens bid-ask spreads and enhances market liquidity, but global flash breakdowns show its susceptibility. Market-making algorithms trade. These approaches keep assets liquid amid volatility via buy-and-sell quotes. Order flow, risk, and market depth stabilise prices. Arbitrage algorithms use exchange and market pricing differences to trade quickly. AI has greatly improved algorithmic trading beyond quantitative analysis. AI can analyse unstructured data, unlike algorithms. Computers

Banking Regulation, 19(4), 1–14.

[5] Securities and Exchange Commission. (2010). Concept Release on Equity Market Structure, Release No. 34-61358. SEC.

[6] Kaal, W. A., & Vermeulen, E. (2017). Artificial intelligence, legal singularity and the regulation of financial markets. Minnesota Journal of Law, Science & Technology, 18(3), 743–789.

analyse news, corporate filings, earnings calls, social media, and political speeches using NLP. Company sentiment may suddenly change trading methods with NLP engines. Satellite images can assist AI systems recognise mining, agriculture, retail, and commerce data. Reinforcement learning teaches AI by trying and getting rewards.[7] Trading automation changed. Modelling market scenarios helps us create long-term incentive systems. RL provides algorithms for market response, risk reduction, and fund management. Advanced trading AI makes flawed decisions. As "black boxes," deep learning systems report conclusions without explanation. Developers, regulators, and traders may misinterpret trade motivations. Opacity affects accountability, especially with algorithms and insider trading. Fast, harsh evaluations harm attribution, market integrity, and risk management. AI financial markets can conceal data theft estimates. AI can process and respond to complex data, creating ethical and legal issues human law cannot resolve. AI and algorithmic trading are changing finance.[8]

4. Risks Associated with AI-Driven Trading Systems

Financial market transparency and stability are endangered by AI trading. Advanced AI models' inexplicability disturbs me. Complex trading algorithms, especially deep learning. Their examinations are hard to copy. These models find big data patterns unexpectedly. Developers, regulators, and compliance teams struggle with trading. Enforcement of insider trading is unclear. Self-learning robots' random decisions are illegal. AI's independence challenges financial market monitoring. AI systems detect insider practices and enable UPSI-free trading. Supply-chain data, internet traffic, and management tone can help machine learning systems forecast revenue reductions.[9] Authorities struggle to discover insider trading without UPSI. This error creates worthless legislation by combining fair analysis and unjust benefit. Speed and size make AI hazardous. To respond to modest market swings, automated trading algorithms make multiple fast trades. Reactivity increases liquidity and efficiency but diminishes price stability. The Dow Jones fell 1,000 points in minutes during the 2010 U.S. “Flash Crash” before recovering. High-frequency trading, algorithms, and automatic feedback loops harm markets, say academics. It revealed interconnected trading platforms might unintentionally disrupt global markets.[10] AI may shake markets. Multiple algorithms may sell

[7] Securities and Exchange Commission. (2015). SEC v. Navinder Singh Sarao, Civil Action No. 1:15-cv-02196.
[8] Zingales, L., & Gennaioli, N. (2019). Data, artificial intelligence, and financial markets. NBER Working Paper No. 25588. National Bureau of Economic Research.
[9] Commodity Futures Trading Commission. (2015). CFTC v. Navinder Sarao, No. 15-cv-3398 (N.D. Ill.).
[10] European Parliament & Council. (2014). Regulation (EU) No 596/2014 on Market Abuse (MAR). Official Journal of the European Union L 173/1.

at once if a market signal is bad, lowering stock prices. Big, fast machinery aids merchants. Price discovery, market confidence, and financial worry may decline. Ai is attackable. Criminals can exploit AI model flaws by injecting corrupted data into real-time systems. Market disruptions and losses can result from trading algorithm faults. Protect AI-powered trading systems against hackers. AI trading is riskier. It's hard to blame market disruptions and losses. Trading businesses and engineers may declare they couldn't forecast algorithm outcomes or market conditions were terrible. AI and multi-person accountability complicate enforcement. These hazards make AI trading systems unethical. Financial market AI is expanding, therefore regulators must rethink purpose, knowledge, and accountability and build new trading frameworks.[11]

5. Algorithm-Enabled Market Manipulation

Security market Legal trade and intricate market manipulation are accelerated by AI. Market data is processed faster by high-frequency trading AI systems. This speed and complexity have made some manipulations more effective and harder to identify and punish. In algorithms, quotation stuffing is common. Trading algorithms automatically cancel many buy/sell trades. Trading system congestion affects competition latency, supply, demand, and market depth. Traditional monitoring ignores microsecond instructions. Filling quotations tricks traders into buying or selling. Fast exchange algorithms affect trading and price. AI improves spoofing and stacking. Massive counterfeit orders disrupt markets. To profit from price changes, manipulators cancel orders and reverse transactions. Layering, a complicated kind of spoofing, produces many bogus orders at different prices to simulate market depth. AI orders numerous things in seconds based on market patterns.[12] Traditional trading instruments are hard to monitor since manipulative orders cancel fast. The 2010 Flash Crash CFTC spoofing conviction of Navinder Sarao. They emphasise the difficulty of finding such activities without modern technologies. Market manipulation via momentum-igniting algorithms. This fast transaction method leverages algorithms, making security prices unpredictable. Regular traders and slower institutional algorithms may endure price volatility. Some lose momentum when manipulators sell cheaply during herd reactions. Quick trade in illiquid or unstable marketplaces can radically change prices. Market manipulators use AI to recognise swarms

[11] European Parliament & Council. (2014). Directive 2014/65/EU on Markets in Financial Instruments (MiFID II). Official Journal of the European Union L 173/349.
[12] European Securities and Markets Authority. (2016). Guidelines on Market Abuse Regulation: Systems and Controls in an Automated Trading Environment. ESMA/2016/1452.

and gain momentum. AI can identify historical liquidity shortages, wide spreads, and heavy retail activity. Simulations show transaction volume and timing trigger chain reactions. Human traders lack strategy, making computer manipulation risky. Market manipulation is hardest to see. Insider trading and market manipulation need deceit. AIs can break laws without human intervention. The liar hides in little chats. Firms may argue that algorithm reactions to market conditions produce unexpected patterns, not purposeful misbehaviour. AI will complicate market manipulation and strain standards. Fast market data analysis and autonomous trading laws prevent disadvantages. Adjust manipulation limitations. Machine-driven financial markets need AI governance, algorithm audits, and accountability to be fair and efficient.

6. Comparative Regulatory Framework: India, United States, and EU/UK

AI financial market regulations are global. Tech threatens dependable legal systems. Technology, rules, and enforcement affected community reactions. U.S. and EU/UK changes may help Indian securities legislation. US courts oversee insider trading and market manipulation. Two basic ideas explain insider trading liability. Classicism targets data-misusing CEOs. Misappropriation theory states outsiders who misuse sensitive information lose confidence.[13] SEC's Market Access Rule (15c3-5) was designed for people, but U.S. regulation has swiftly adapted to technology. Automated brokers must reduce pre-trade risk and market disturbances. SEC sanctions high-frequency traders for simulating S&P 500 futures markets to combat algorithmic misbehaviour. Digital risk reduction via algorithmic manipulation is CFTC enemy. Activated EU-UK AI trade. The EU's Market Abuse Regulation (MAR) is crucial because it holds traders accountable for their actions, not their views. This helps AI-driven marketplaces with unknown aims and decisions. MAR bans person or robot spoofing, quotation manipulation, and deception. Authorities may reject algorithmic exploitation without considering AI independence or complexity. MiFID II and MAR restrict algorithmic and high-frequency trading investment businesses. MiFID II requires investment companies to register, test, control, and have automated kill-switches to suspend trading in abnormal markets. MiFID II seeks algorithmic investment tool clarity and appropriateness. Companies must defend AI trading decisions using customer profiles and legislation, not "black box" algorithms. Unlike other mature systems, Indian securities legislation does not govern AI. SEBI's IMSS and DWBIS real-time monitoring boost market surveillance.

[13] Bank for International Settlements. (2018). The Role of Data Analytics in Financial Supervision. BIS Working Paper Series.

Unregulated AI trading, algorithmic audits, and machine selections. Current laws do not address algorithmic guilt, culpability, or AI-generated insider information. Indian anarchy allows damaging AI. This study lifts tech-focused Indian law above market standards. SEBI may need algorithmic transparency, real-time monitoring, automated system responsibility, and coordination with sophisticated regulators like the SEC, CFTC, FCA, and ESMA as algorithmic trading increases in Indian markets. India may behind global norms and abuse AI-based marketplaces without changes.

7. Challenges in Applying SEBI PIT Regulations to AI

Applying SEBI insider trading rules to AI-driven trading is tricky. SEBI (Prohibition of Insider Trading) Regulations, 2015 assume individuals or legal entities access, possess, and misuse UPSI. The regulatory framework prioritises purpose, knowledge, fiduciary duty, and business data. Law gets confused when AI modifies fundamentals. Finding a UPSI "insider," who knows, handles, and abuses it, is hard. These categories don't fit AI. Instead of UPSI, they may use sophisticated data, supplementary data sources, or non-linear patterns to predict corporate performance or market movements. Supply-chain data, satellite pictures, and digital footprint changes can influence advanced AI models.[14] Although algorithmic inference isn't UPSI's property, it can provide it a market-affecting informational edge. AI utilises approved predictive analytics with criminal insider data. Are laws different? Since purpose is necessary, insider trading enforcement is tough. SEBI considers intent and purpose for exemptions, defences, and suspicious trading in addition to ownership. AI is uninspired and stupid. A neutral assessment uses facts and statistics. Regulations struggle to show market misuse mens rea. Should outcome- or severe liability replace intent-based responsibility in AI-driven trade? Traditional UPSI possession tests confuse AI. Despite AI system estimations being almost as precise as insider information, a trading corporation may claim it utilises solely public data. Regulators can't tell if an algorithm used UPSI, inferred it, or modified public data, making compliance tough. No law differentiates algorithmic talent from illegal informational advantage. Determining guilt is difficult.[15] Developers create algorithms, data scientists train models, firms hire them, traders follow their advice, and data vendors supply AI trading system data. Deception and insider behaviour are hard to prove. Programmers may use ML algorithms. Companies may claim the algorithm behaved unexpectedly. Traders may have mindlessly

[14] International Organization of Securities Commissions. (2021). The Use of Artificial Intelligence and Machine Learning by Market Intermediaries and Asset Managers. IOSCO FR06/2021.
[15] Securities and Exchange Commission. (2011). Rule 15c3-5: Market Access Rule. 17 C.F.R. § 240.15c3-5.

followed system outputs. Regulators may have problems attributing blame due to imprecise people and computers. AI may trade globally using foreign data. International liability and AI legislation are issues. SEBI PIT Regulations can't enforce multi-jurisdictional issues. Opacity in AI models worsens these concerns. Information flow, access, and communication are assessed by SEBI. AI and deep learning can't justify decisions. Regulations can't assess system legality without explanation, making enforcement unclear. SEBI's PIT Regulations, while successful in conventional markets, need major changes to remain relevant as autonomous and increasing AI systems make market decisions. Financial market regulators' information, intention, and accountability are changing with AI.

8. Market Abuse Regulation (MAR), MiFID II, and the Global Push Toward AI Accountability

The EU's Market Abuse Regulation leads AI-driven market manipulation prevention. MAR focusses repercussions, unlike prior models that emphasised perpetrator intent. Trader mindset is secondary to market integrity damage. Algorithms make automated processes seem false in AI-driven marketplaces. To regulate algorithmic and high-frequency trading abuses, MAR's flexible enforcement mechanism prioritises results above player attitudes. MiFID II and MAR restrict automated trading. MiFID II requires algorithmic trading investment firms to register, test, monitor, and implement risk controls to prevent market disruptions. MiFID II clarifies algorithms.[16] Enterprises must show AI decision-making to avoid dark boxes. Uncertain technology cannot justify breaking regulations, especially when algorithmic decisions influence market price, liquidity, or systemic issues. If systems fail or markets are volatile, MiFID II requires kill-switch procedures to cease trading. This article shows proactive AI trading speed and unpredictability regulation. Business audit trails are needed for MiFID II and MAR authorities to monitor algorithmic decisions and market legislation. These frameworks show a global movement towards smart, risk-aware financial AI.[17]

9. The Need for a New AI-Driven Regulatory Architecture in India

India's insider trading and market manipulation laws demonstrate the need for AI-related securities market restrictions. For human-focused trading, SEBI rules simplify information

[16] Kirilenko, A., Kyle, A., Samadi, M., & Tuzun, T. (2017). The Flash Crash: High-frequency trading in an electronic market. Journal of Finance, 72(3), 967–998. https://doi.org/10.1111/jofi.12498

[17] Easley, D., López de Prado, M., & O'Hara, M. (2012). The microstructure of the "Flash Crash": Flow toxicity, liquidity crashes, and the probability of informed trading. Journal of Portfolio Management, 37(2), 118–128.

flow, decision-making, and responsibility. AI-driven marketplaces provide speed, opacity, autonomy, and cross-border data exchange that current standards cannot. Modern Indian AI legislation must be open, responsible, and managed. AI trading firms must explain algorithm logic, data inputs, assumptions, restrictions, and testing. This criteria should emphasise explainability. AI must be understood by regulators to recognise insider trading and market manipulation. When punishment is unclear, misconduct is overlooked. Accountability matters. An effective regulatory framework should capture AI system manipulators and insiders. Businesses, data suppliers, developers, and dealers should be compelled by law. AI businesses should treat algorithms like workers.[18] To increase monitoring, Sebi needs RegTech surveillance advances. Rapid AI-driven market exploitation defeats prior monitoring. RegTech systems utilising machine learning can evaluate millions of transactions and detect questionable behaviour in real time. SEBI may use these techniques to detect and control risks. India should recognise algorithmic trading's globality. To curb AI misbehaviour in Indian markets, the US SEC, UK FCA, and ESMA must collaborate. International firms may exploit regulatory loopholes without global consensus.

10. Recommendations for SEBI and Legal Reform

SEBI must regulate AI-era insider trading and market integrity. Define “insider” as UPSI and others who create, train, and use AI systems with sensitive data or insights. Researchers, data scientists, and AI engineers can inform insider behaviour algorithms. SEBI should mandate algorithmic audits internally or outside. Trading algorithms should be checked for ethics, legality, transparency, and manipulation. AI systems that deviate from their aims and use incorrect approaches should be monitored to avoid algorithm changes. Company kill-switches stop weird algorithmic trading. AI systems trade fast, therefore errors might cause issues. A mandatory kill-switch would prevent market disruptions and systemic danger. For improved monitoring, SEBI needs AI.[19] Machine learning anomaly detection systems can identify subtle spoofing, rapid quote stuffing, and coordinated exchange manipulation that standard methods miss. SEBI should include global regulators. Since algorithmic trading is worldwide, corporations cannot exploit legal loopholes. Task teams, common databases, and cooperation will help SEBI handle global AI concerns. Stronger algorithm tampering penalties are needed.

[18] Jones, C. M. (2013). What do we know about high-frequency trading? Columbia Business School Research Paper, 13-11.
[19] Gai, J., Yao, D., & Ye, M. (2013). The externalities of high-frequency trading. SSRN Working Paper. https://doi.org/10.2139/ssrn.2066839

SEBI should hold corporations accountable for their algorithms' behaviour regardless of intent or foreseeability. Companies must improve internal controls, algorithm design supervision, and AI development and deployment compliance under the reform.[20]

11. Conclusion

AI has transformed global financial markets, boosting efficiency, innovation, and competitiveness. This exposed insider trading and market manipulation legal loopholes. SEBI's human-made rules are overwhelmed by autonomous algorithms, complex machine learning models, many data systems, and quick trading dynamics. AI systems challenge purpose, information ownership, and accountability as autonomous market actors. Future regulation should combine tech skills and legislation. India should create an algorithmic transparency framework, audit regularly, use AI to monitor, and promote international collaboration to solve cross-border algorithmic risks. In fast-paced, data-driven markets, we must redefine "insider," rethink responsibility, and change enforcement. India needs fundamental change to maintain market integrity, investor faith, and ethical technology. As robots become increasingly important in banking, legislation must control AI and forecast its future to ensure fair, transparent, and trustworthy innovation.

[20] Ferrarini, G., & Moloney, N. (2012). Reshaping EU market regulation: Lessons from the financial crisis. Capital Markets Law Journal, 7(3), 187–218.