LEGAL ANALYSIS OF ALGORITHMIC TRADING AND AI-ENABLED MARKET MANIPULATION

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ABSTRACT

The paper provides a granular doctrinal examination of the specific legal problems that arise from algorithmic trading and AI-enabled market manipulation. The central question is not merely whether existing law prohibits the impugned conduct in most instances it does but whether the legal definitions, evidentiary standards, and liability frameworks constructed for a world of human decision-making are capable of being applied, coherently and consistently, to the outputs of autonomous AI systems.

The paper examines the statutory status of algorithmic trading under Indian securities law, identifying the absence of specific legislative recognition and assessing the adequacy of SEBI's circular-based regulatory framework. It undertakes a doctrinal analysis of four principal forms of AI-enabled market manipulation -spoofing and layering, quote stuffing, wash and circular trading, and momentum ignition, examining each against the applicable provisions of the SEBI Act, 1992, and the SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003 (PFUTP Regulations). Also examines the novel and legally unresolved problem of insider trading by algorithmic inference- the question of whether an AI system that derives material price-sensitive insights from publicly available alternative data can be said to possess Unpublished Price Sensitive Information (UPSI) within the meaning of the SEBI (Prohibition of Insider Trading) Regulations, 2015 (PIT Regulations). Finally analyses the attribution of legal liability when AI systems cause market harm, examining vicarious liability, negligence, strict liability, and the case for a reverse burden of proof. Throughout, the research draws on Indian statutory provisions, SEBI enforcement orders, Securities Appellate Tribunal (SAT) jurisprudence, and comparative regulatory developments.

LEGAL STATUS OF ALGORITHMIC TRADING UNDER SECURITIES LAW

Statutory Recognition of Algorithmic Trading: An Absent Legislative Framework

A foundational observation that shapes the entire legal analysis of this research is that neither the SEBI Act, 1992, nor the Securities Contracts (Regulation) Act, 1956 (SCRA), nor any other primary legislation governing Indian securities markets contains a definition of algorithmic trading, high-frequency trading, or AI-driven trading systems. The legislative silence is not incidental; it reflects the fact that both statutes were enacted in a legal environment premised on human decision-making and have not been substantively amended to account for the algorithmic revolution in securities trading.

The sole statutory reference point is the definition of "securities" in Section 2(h) of the SCRA and the broad regulatory powers conferred upon SEBI under Section 11(1) of the SEBI Act to regulate the securities market by "such measures as it thinks fit." It is in exercise of these residual powers that SEBI has constructed, through a series of circulars and consultation papers, the entire regulatory framework for algorithmic trading. This circular-based approach raises a threshold constitutional and administrative law question: can a regulatory body, acting under a general enabling power, impose obligations of the specificity and consequence that SEBI's algorithmic trading framework entails, without specific statutory authority?

The Supreme Court of India has consistently held that delegated legislative power must be traced to, and remain within the bounds of, the parent statute, and that regulations imposing penal consequences must be founded on express statutory authority.[1] The absence of a statutory definition of algorithmic trading means that SEBI's regulatory framework rests on interpretive extension of general prohibitions rather than on legislative text specifically crafted to address the phenomenon. This is a structural weakness that this research argues requires legislative remedy.

The SEBI Circular of 2012 and Its Legal Character

The foundational regulatory instrument governing algorithmic trading in India is SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012, issued to all stock exchanges under Section

[1] Indian Express Newspapers (Bombay) Pvt. Ltd. v. Union of India (1985) 1 SCC 641, paras 68–70; Hamdard Dawakhana v. Union of India AIR 1960 SC 554.

11(1) of the SEBI Act.[2] The Circular defines algorithmic trading in the absence of any statutory definition as "any order that is generated using automated execution logic." It imposes obligations on both stock exchanges and stock brokers.

At the exchange level, the 2012 Circular requires: arrangements to manage system load and ensure consistent response times; economic disincentives for high order-to-trade ratios; routing of all algorithmic orders through broker servers located in India; identification and shutdown of dysfunctional algorithms; and inclusion of algorithmic trading data in Monthly Development Reports submitted to SEBI. At the broker level, it mandates a minimum set of pre-trade risk controls price checks, quantity limit checks, order value checks, cumulative open order value checks, and automated execution checks and requires that all algorithmic orders carry a unique identifier for audit trail purposes.[3]

The 2012 Circular also requires stock brokers desirous of placing algorithmic orders to submit an undertaking to the exchange confirming that: they possess the technical capability and proper procedures to carry out algorithmic trading; they have safeguards against misuse or unauthorised access to algorithms; they maintain real-time monitoring systems; they maintain comprehensive logs of all trading activity; and they will inform the exchange of any modification to approved algorithms.[4]

As a matter of administrative law, SEBI circulars issued under Section 11(1) of the SEBI Act have been recognised by courts as having the force of regulatory direction binding on recognised stock exchanges and their members. The Bombay High Court in BSE Brokers Forum v. SEBI affirmed that SEBI has wide powers to issue circulars for the development and regulation of the securities market, and that compliance with such circulars is mandatory for registered intermediaries.[5] However, the legal character of these circulars as subordinate legislation rather than as statutes is significant: they can be challenged on grounds of unreasonableness, non-application of mind, or ultra vires the parent statute, and they do not carry the presumption of constitutionality that attaches to primary legislation.

[2] SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012, para 11 (issued under Section 11(1) of the SEBI Act, 1992).
[3] Ibid., paras 4(i)–4(viii) (exchange obligations) and para 6(i)–(vi) (broker-level risk controls).
[4] Ibid., para 8(i)–(v) (broker undertaking).
[5] BSE Brokers Forum v. SEBI (2001) 3 Comp LJ 204 (Bom).

Legal Distinction Between Manual and Automated Trading: Regulatory and Evidentiary Consequences

The distinction between manual and automated trading carries significant regulatory and evidentiary consequences, yet Indian securities law does not draw this distinction with any precision at the statutory level. The distinction matters for three reasons: (i) the attribution of intent; (ii) the allocation of compliance obligations; and (iii) the admissibility and probative value of evidence in enforcement proceedings.

On the question of intent, Indian securities law provisions addressing market manipulation Section 12A of the SEBI Act and Regulations 3 and 4 of the PFUTP Regulations use language implying volitional human conduct. Section 12A prohibits "any person" from engaging in "any act, practice, course of business" that operates as a "device or artifice to defraud."[6] The PFUTP Regulations similarly proscribe acts that are done "knowingly" or that are designed to "create a false or misleading appearance."[7] In enforcement proceedings involving algorithmic trading, SEBI has addressed the intent question by imputing the intent of the algorithm's operator, the broker or trading firm from the design and behavioural pattern of the algorithm. This approach is legally defensible where the algorithm operates deterministically according to human-programmed rules. It becomes far more strained where the algorithm employs self-learning mechanisms and produces trading strategies that were not anticipated by its designers.

As the scholar Tom Lin has observed, traditional corporate and securities laws were designed to oversee individuals with "discernible bad intentions," and these legal frameworks struggle to police AI because black-box algorithms make autonomous decisions without a culpable mental state.[8] This observation has direct doctrinal relevance to the application of Section 12A of the SEBI Act to self-learning trading systems whose manipulative patterns emerge from reinforcement learning optimisation, not from human design.

On the allocation of compliance obligations, the 2012 Circular places responsibility on the stock broker. Broker-level obligations include maintaining audit trails, conducting system audits by Certified Information System Auditors (CISAs) empanelled by the exchange, and notifying the exchange of algorithm modifications.[9] However, the broker's technical ability to

[6] Section 12A(a) and 12A(b), SEBI Act, 1992 (inserted by Securities Laws (Amendment) Act, 2002).
[7] Regulation 3(a) and 4(1), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.
[8] Lin, T.C.W., "Artificial Intelligence, Finance, and the Law" (2019) 88(2) Fordham Law Review 531, at 547.
[9] SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012, para 5 (system audit by CISA) and para 8(iv)

monitor and control a sophisticated, self-adapting AI system that may update its strategies in real time poses a practical compliance challenge that the circular's framework designed for rule-based algorithms does not adequately address.

SEBI's Evolving Regulatory Framework: From Risk Controls to AI Governance

Following the 2012 Circular, SEBI has progressively refined its algorithmic trading framework through a series of regulatory instruments. The SEBI Circular of May 13, 2015, addressed co-location and proximity hosting services, requiring exchanges to provide these services on a fair, transparent, and non-discriminatory basis and to conduct regular audits to ensure equal access.[10] The impetus for this circular was the NSE co-location controversy, in which certain high-frequency traders were alleged to have obtained preferential access to the exchange's trading engine, enabling them to systematically front-run other market participants a practice that, while not explicitly prohibited by statute, is incompatible with the equal access principle that underpins market integrity.

SEBI's Report of the Committee on Algorithmic Trading (November 2016) recommended enhanced risk management requirements for algorithmic trading, including a minimum resting period for orders submitted through algorithms - a proposal that, if implemented, would substantially curtail high-frequency trading strategies dependent on rapid order submission and cancellation.[11] The 2025 Consultation Paper on Responsible Usage of AI/ML in Indian Securities Markets represents the most recent and ambitious regulatory initiative, proposing governance frameworks, accountability requirements, and explainability standards for AI systems deployed in securities markets.[12] However, the Consultation Paper remains at the advisory stage; its proposals have not yet crystallised into binding regulatory obligations, and the legal analysis in this research proceeds on the basis of the currently operative framework.

AI-ENABLED MARKET MANIPULATION: DOCTRINAL ANALYSIS

The Legal Threshold for Manipulative Conduct in AI-Driven Markets

Before examining specific manipulative practices, it is necessary to establish the general legal

(maintenance of logs).
[10] SEBI Circular No. CIR/MRD/DP/10/2015 dated 13 May 2015, paras 3–5.
[11] SEBI, Report of the Committee on Algorithmic Trading (November 2016), Recommendations 3–5.
[12] SEBI, Consultation Paper on Responsible Usage of AI/ML in Indian Securities Markets (2025), paras 4–6, available at www.sebi.gov.in.

threshold for manipulative conduct under Indian securities law. Section 12A of the SEBI Act prohibits any person from directly or indirectly engaging in manipulative, fraudulent, or unfair trade practices in securities. Regulation 4 of the PFUTP Regulations provides an illustrative, non-exhaustive list of manipulative practices. The general standard requires proof of: (i) a prohibited act or omission; (ii) in connection with the purchase or sale of securities; (iii) that either creates a false or misleading impression regarding trading activity, or that operates to the detriment of investors.[13]

Critically, SEBI's enforcement jurisprudence affirmed by the SAT has established that intent to manipulate may be inferred from the nature and pattern of trading activity, rather than proven through direct evidence of subjective intention.[14] This inferential approach to intent is the cornerstone of SEBI's ability to proceed against algorithmic market manipulation; without it, the absence of a human actor consciously intending a manipulative outcome would render the manipulation provisions largely inapplicable to automated systems. However, the inferential approach has limits: courts have held that inference must be drawn from cogent and reliable evidence, not mere suspicion, and that the standard of proof in penalty proceedings before SEBI is the civil standard of balance of probabilities, rather than the criminal standard of proof beyond reasonable doubt.[15]

Spoofing and Layering: Legal Analysis Under Section 12A and the PFUTP Regulations

Spoofing refers to the practice of placing large orders on one side of the order book with the intention of cancelling them before execution, in order to create a false impression of market depth and induce other traders to trade at an artificially inflated or depressed price, from which the spoofer benefits by trading on the opposite side.[16] Layering is a related practice involving the submission of multiple orders at different price levels to create the appearance of substantial buy or sell interest, which are then cancelled once the desired price movement has been achieved.

[13] Regulation 4(1) and 4(2), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.
[14] Ketan Parekh v. SEBI, SAT Appeal No. 2/2004, decided 14 September 2006; Nirmal Bang Securities Pvt. Ltd. v. SEBI, SAT Appeal No. 89/2011.
[15] SEBI v. Shriram Mutual Fund (2006) 5 SCC 361, para 35 (civil standard of proof in SEBI adjudication).
[16] Harris, L., Trading and Exchanges: Market Microstructure for Practitioners (Oxford University Press, 2003), p. 235.

Doctrinal Application of Prohibition Provisions

Spoofing and layering fall squarely within Regulation 4(2)(a) of the PFUTP Regulations, which prohibits any act that "creates a false or misleading appearance of trading in securities." They also engage Regulation 4(2)(b), which prohibits transactions in securities that are "not intended to effect a genuine change in the beneficial ownership thereof." The submission of orders with a pre-formed intention to cancel before execution results in transactions or attempted transactions that do not reflect genuine supply or demand, precisely the kind of artificial market impression that Regulation 4(2)(a) prohibits.[17]

SEBI has proceeded against spoofing in several enforcement orders. In Re: Shailesh Babulal Shah, SEBI found that the systematic placement and cancellation of large orders by the respondent's algorithmic trading system, in a pattern designed to move prices, constituted a fraudulent and unfair trade practice under the PFUTP Regulations.[18] Importantly, SEBI imputed the requisite intent from the pattern of trading, observing that the regularity and precision of the order placement and cancellation sequence was inconsistent with any legitimate trading purpose and could only be explained as a deliberate manipulation strategy.

The Intent Problem in AI-Driven Spoofing

The legal difficulty that arises when spoofing is conducted by a self-learning AI system is that the algorithm may arrive at a spoofing strategy through reinforcement learning discovering that placing and cancelling large orders is rewarded by profit without any human programmer specifically designing a spoofing strategy. In this scenario, the traditional approach of imputing human intent from algorithmic pattern becomes legally strained. The algorithm has no subjective intention; it has an optimised strategy. The operator may have intended to deploy an AI system that maximises profit, without specifically intending that the system employ spoofing as the means of doing so.

Two legal responses are available. First, the concept of recklessness: if the operator deployed a self-learning AI system in a trading environment without implementing adequate safeguards to prevent the emergence of manipulative strategies, the operator could be held to have been

[17] Regulation 4(2)(a) and 4(2)(b), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.
[18] SEBI Order in Re: Shailesh Babulal Shah, Adjudication Order No. Order/KSJ/SS/2018 dated 2018.

reckless as to the risk of manipulation a mental state that may suffice for liability under Section 12A of the SEBI Act, which does not restrict its prohibition to intentional conduct and applies to any "device or artifice."[19] Second, strict liability: as argued in Section D of this research, there is a strong policy case for imposing strict liability on AI operators for manipulative outcomes caused by their systems, regardless of intent. The United States Commodity Futures Trading Commission (CFTC) has taken enforcement action for algorithmic spoofing under the Dodd-Frank Act provisions that prohibit spoofing per se, without requiring proof of specific intent as to each individual order.[20]

Quote Stuffing: Legality Under the Unfair Trade Practices Framework

Quote stuffing refers to the practice of flooding an exchange's trading system with an extremely large volume of orders and cancellations in a very short period of time, with the effect of slowing the processing capacity of competitors' trading systems and creating a latency advantage for the quote stuffer.[21] Unlike spoofing, which is designed to move prices, quote stuffing is primarily a competitive weapon aimed at degrading the technological performance of rival traders.

Legal Characterisation

Quote stuffing does not have an explicit statutory or regulatory definition in Indian securities law. Its legal characterisation must be derived from the general framework of the PFUTP Regulations and SEBI's market integrity mandate. Regulation 4(2)(a) of the PFUTP Regulations prohibiting acts that create a false or misleading appearance of trading is the most directly applicable provision, as the rapid submission and cancellation of orders that constitute quote stuffing do not represent genuine trading interest and can distort the market's perception of supply and demand.[22]

Regulation 4(1) of the PFUTP Regulations also provides a general prohibition on "any act, omission or course of conduct" that is "fraudulent" or "unfair" a formulation broad enough to encompass quote stuffing, which is unfair in the sense that it exploits a technological

[19] Section 12A(b), SEBI Act, 1992 (prohibiting "any device or artifice" without requiring proof of specific intent as to each element).
[20] CFTC v. Oystacher, No. 15 C 9196 (N.D. Ill. 2016); 7 U.S.C. Section 6c(a)(5)(C) (Dodd-Frank Wall Street Reform and Consumer Protection Act, 2010).
[21] Egginton, Z., Van Ness, B. and Van Ness, R., "Quote Stuffing" (2016) 45 Financial Management 583, at 584.
[22] Regulation 4(2)(a), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.

asymmetry to systematically disadvantage other market participants. However, the application of this general standard requires SEBI to demonstrate that the conduct was sufficiently connected to a securities transaction to engage the regulatory framework, and that the technical degradation caused by quote stuffing caused material harm to identifiable market participants or to the integrity of the market as a whole.[23]

Exchange-Level Obligations and the 2012 Circular

The SEBI 2012 Algorithmic Trading Circular directly addresses the risk of order flooding by algorithms. Paragraph 4(ii) of the Circular requires stock exchanges to "put in place effective economic disincentives with regard to high daily order-to-trade ratio of algo orders" and to "put in place monitoring systems to identify and initiate measures to impede any possible instances of order flooding by algos."[24] This provision implicitly recognises that quote stuffing operationally equivalent to order flooding is a risk that must be managed at the exchange level through both pricing disincentives and surveillance mechanisms. However, the Circular addresses order flooding as a systemic risk management issue rather than expressly classifying it as a prohibited unfair trade practice, which creates ambiguity about whether an exchange or broker that fails to prevent order flooding by its systems is exposed to enforcement action under the PFUTP Regulations in addition to regulatory sanctions under the SEBI Act.

The legal gap is significant: the 2012 Circular creates a regulatory obligation to prevent order flooding but does not clearly classify such flooding as an unfair trade practice, leaving open the question of whether a market participant that engages in quote stuffing is subject to the full range of SEBI enforcement powers under the PFUTP Regulations or only to the more limited disciplinary action available for breach of exchange bye-laws.

Wash Trading and Circular Trading Via Algorithms

Wash trading involves a trader simultaneously buying and selling the same security, or entering into coordinated transactions with an associated party, to generate the appearance of trading volume without any genuine change in beneficial ownership.[25] Circular trading extends this practice to a ring of participants who trade among themselves in a pre-arranged sequence,

[23] Regulation 4(1), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.
[24] SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012, para 4(ii).
[25] Putniņš, T. J., "Market Manipulation: A Survey" (2012) 26(5) Journal of Economic Surveys 952, at 960.

creating the impression of active market trading and, in some cases, artificially inflating or deflating prices. Both practices are prohibited under Regulation 4(2)(b) of the PFUTP Regulations, which proscribes transactions that "are not intended to effect a genuine change in the beneficial ownership" of securities.[26]

AI Facilitation of Wash and Circular Trading

The deployment of AI in wash and circular trading represents a qualitative escalation in the sophistication of these practices. Where human-coordinated circular trading typically involves a discernible pattern of pre-arranged communication among participants which SEBI surveillance can identify through call records, email trails, and trading correlations. AI-coordinated wash trading can be designed to avoid the temporal and pricing patterns that conventional surveillance algorithms detect.[27]

More troublingly, AI systems deployed by multiple entities without any explicit coordination can, through learning from each other's trading patterns, arrive at de facto circular trading arrangements. Where the coordination is emergent rather than pre-planned, the application of Regulation 4(2)(b) is legally problematic: the provision requires proof that the transactions "are not intended to effect a genuine change in beneficial ownership," which imports a requirement of purposive conduct. If the circular pattern results from independent AI systems each pursuing their own profit-maximisation objectives, the intent element of the prohibition may not be satisfied in respect of any individual participant, even though the aggregate effect is indistinguishable from coordinated manipulation.[28]

The Corporate Attribution Problem

Indian company law and securities law attribute the acts of corporate officers and employees to the company under the principle of vicarious liability and the directing mind doctrine. However, where an AI system rather than a human officer executes wash trades, the attribution of the AI's acts to the company requires a legal fiction that courts have not yet been called upon to address in the securities context. Section 27 of the SEBI Act provides that where an offence has been committed by a company, "every person who at the time of the offence was in charge

[26] Regulation 4(2)(b), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.
[27] Allen, F. and Gale, D., "Stock Price Manipulation" (1992) 5(3) Review of Financial Studies 503, at 510.
[28] Financial Stability Board, Artificial Intelligence and Machine Learning in Financial Services (November 2017), p. 27.

of, and was responsible for the conduct of, the business of the company" is deemed guilty of the offence unless they prove ignorance or due diligence.[29] This provision was designed for human decision-making and does not resolve the question of how responsibility is attributed where the offending conduct is the autonomous output of an AI system rather than the decision of a human officer.

Momentum Ignition Strategies: Manipulation Under Section 15HA

Momentum ignition is an algorithmic strategy in which a trader submits a sequence of orders designed to trigger a directional price movement typically by activating the stop-loss orders of other market participants or by creating the appearance of a price breakout and then rapidly exits the position at a profit once the momentum-driven price movement has been achieved.[30] The strategy exploits the predictable behaviour of algorithmic trading systems and the psychological responses of human traders to price movements, using AI to calibrate the precise sequence, volume, and timing of orders needed to ignite the desired momentum.

Application of Section 15HA SEBI Act

Section 15HA of the SEBI Act imposes a penalty on any person who "indulges in fraudulent and unfair trade practices relating to securities." Read with the PFUTP Regulations, momentum ignition strategies engage at least two limbs of the prohibition: Regulation 4(2)(b), which prohibits transactions designed to affect the price of securities by a series of transactions without genuine change in ownership; and Regulation 4(2)(e), which prohibits manipulation of the price of a security by taking advantage of a dominant position in the market.[31]

SEBI has addressed momentum-ignition-like strategies in enforcement orders, though not always by that name. In several orders relating to algorithmic spoofing and price manipulation, the SAT has affirmed that a pattern of trading that is designed to trigger predictable market reactions and is then exploited for profit constitutes manipulation regardless of whether each individual trade was, in isolation, a genuine transaction.[32] The SAT's reasoning that the totality of a trading strategy, rather than its individual components, determines whether it is

[29] Section 27, SEBI Act, 1992.
[30] Comerton-Forde, C. and Putniņš, T.J., "Stock Price Manipulation: Prevalence and Determinants" (2015) 19 Review of Finance 23, at 31.
[31] Regulation 4(2)(b) and 4(2)(e), SEBI (Prohibition of Fraudulent and Unfair Trade Practices) Regulations, 2003.
[32] Nirmal Bang Securities Pvt. Ltd. v. SEBI, SAT Appeal No. 89/2011; SEBI Order in Re: Nikhil Vora (2017).

manipulative is the correct doctrinal approach and should be explicitly extended to momentum ignition strategies in future enforcement actions and regulatory guidance.

The Speed Problem and Regulatory Lag

The practical enforcement challenge posed by AI-driven momentum ignition is the speed at which these strategies operate. As Lin observes, AI creates market threats that are "too fast to stop" accelerating volatility faster than traditional market forces, often before financial institutions or regulators can take preventive action.[33] By the time SEBI surveillance systems detect the pattern of orders that constitutes a momentum ignition strategy, the strategy has been executed and the profit taken. Post-hoc enforcement through adjudication and penalty is the only available remedy in the absence of real-time automated enforcement mechanisms, and such enforcement faces the additional difficulty of reconstructing the intent behind a sequence of algorithmic orders executed in microseconds.

This temporal dimension of AI-driven manipulation suggests that the existing enforcement model which is reactive rather than preventive is structurally inadequate for the AI trading environment. The solution requires a combination of: enhanced real-time surveillance capabilities at the exchange level; pre-trade compliance checks embedded in algorithmic systems; and a legal framework that facilitates immediate suspension of trading privileges where manipulative AI strategies are detected in real time, without waiting for the completion of formal adjudication proceedings.

INSIDER TRADING BY INFERENCE: EMERGING LEGAL ISSUES

The Traditional Insider Trading Framework Under the PIT Regulations 2015

The SEBI (Prohibition of Insider Trading) Regulations, 2015 (PIT Regulations) establish the core prohibition on insider trading in Indian law. Regulation 3 prohibits any "insider" from communicating, providing, or allowing access to any UPSI. Regulation 4 prohibits any person in possession of UPSI from trading in the securities to which such information relates.[34]

The definitional structure of the PIT Regulations is built around three key concepts. First, "insider" is defined in Regulation 2(1)(g) as any person who is a "connected person" or who is

[33] Lin, T.C.W., "Artificial Intelligence, Finance, and the Law" (2019) 88(2) Fordham Law Review 531, at 549.
[34] Regulations 3 and 4, SEBI (Prohibition of Insider Trading) Regulations, 2015.

"in possession of or having access to" UPSI.[35] Second, "unpublished price sensitive information" is defined in Regulation 2(1)(n) as any information relating to a company or its securities, directly or indirectly, that is not generally available, which upon becoming generally available is likely to materially affect the price of the securities.[36] Third, the prohibition in Regulation 4 is triggered by "possession" of UPSI, a concept that was designed to capture the situation of a human individual who has received specific confidential corporate information through a relationship of trust or access.

The entire architecture of the PIT Regulations assumes a human actor who possesses specific, identifiable, corporate information - the kind of information that flows from a boardroom to a connected person through human communication. The regulations were not designed to address the scenario in which an AI system, working exclusively with publicly available information, derives an insight about a company's financial condition that is functionally equivalent to inside information.

AI-Driven Inference from Public Data: The Alternative Data Problem

Alternative data refers to data derived from non-traditional sources satellite imagery, credit card transaction records, web traffic analytics, social media sentiment analysis, mobile phone location data, shipping container tracking, and electricity consumption data that can provide insights into a company's operational performance and near-term financial results before those results are publicly disclosed through regulatory filings.[37] AI systems, through their capacity for pattern recognition across vast and heterogeneous datasets, are uniquely suited to extracting actionable insights from alternative data.

The legal question is whether an AI system that ingests publicly available alternative data and derives a material predictive insight about a company's upcoming earnings for example, by analysing satellite images of retail store parking lots to infer consumer traffic trends can be said to "possess" UPSI within the meaning of Regulation 2(1)(n) of the PIT Regulations. This question has not been directly addressed by SEBI or by any Indian court.

[35] Regulation 2(1)(g), SEBI (Prohibition of Insider Trading) Regulations, 2015.
[36] Regulation 2(1)(n), SEBI (Prohibition of Insider Trading) Regulations, 2015.
[37] Kolanovic, M. and Krishnamachari, R.T., Big Data and AI Strategies: Machine Learning and Alternative Data Approach to Investing (J.P. Morgan, 2017), pp. 4–7.

The "Generally Available" Threshold

The definition of UPSI in Regulation 2(1)(n) turns on whether the information is "generally available." The Explanation to Regulation 2(1)(e) of the PIT Regulations provides that information is "generally available" if it is accessible to the public on a non-discriminatory basis.[38] Satellite imagery, web traffic data, and credit card transaction records are, in principle, commercially available from third-party data vendors. The question is whether the purchase of commercially available alternative data from a data vendor, and the deployment of an AI system to extract insights from it, is equivalent to accessing information "on a non-discriminatory basis" in the sense contemplated by the PIT Regulations.

The difficulty is that while the raw data may be technically available to any purchaser, the ability to extract material insights from it requires sophisticated AI capabilities and substantial financial resources that are concentrated among a small number of institutional players. The structural information asymmetry created by differential access to AI analytical capabilities effectively makes the derived insight though derived from publicly available data functionally non-public in relation to the vast majority of market participants. This is the paradox of AI and alternative data: the inputs are public, but the output of their AI-driven analysis is privately held and acts on the market like inside information.[39]

The Mosaic Theory and Its Limits in the AI Context

The mosaic theory, developed in United States securities law jurisprudence, holds that an analyst who combines multiple pieces of publicly available information to arrive at a conclusion that is not individually obtainable from any single piece of public information does not thereby possess inside information, provided that each individual piece of information used is itself public.[40] The theory was developed to protect legitimate securities analysis from the chilling effect of insider trading prohibitions.

In the context of AI-driven alternative data analysis, the mosaic theory provides a partial but not complete defence. The theory's applicability depends on the nature of the derived insight.

[38] Explanation to Regulation 2(1)(e), SEBI (Prohibition of Insider Trading) Regulations, 2015.
[39] Patel, S., "Alternative Data, Artificial Intelligence, and Insider Trading Law" (2020) 15 Virginia Law and Business Review 313, at 327.
[40] In re Dirks v. SEC 463 US 646 (1983) (US Supreme Court articulation of the mosaic theory in the insider trading context).

If the AI system's output is a probabilistic prediction based on publicly available market and operational data, the mosaic theory supports the view that this does not constitute possession of UPSI. However, if the alternative data that the AI ingests includes information that was not intended to be publicly disclosed such as data obtained by scraping a company's internal procurement database or by accessing satellite imagery that reveals information subject to a reasonable expectation of confidentiality the mosaic theory defence is unavailable, and the AI's derived insight may constitute UPSI regardless of the public availability of each individual data point.[41]

Case Law Analysis: N. Narayanan v. SEBI and Application to AI Contexts

N. Narayanan v. SEBI,[42] decided by the Supreme Court of India, remains the leading authority on insider trading under the predecessor Insider Trading Regulations of 1992. The Court held that the prohibition on insider trading is premised on the principle that no person should be permitted to use information that is not publicly available to gain an advantage in securities trading, and that the regulations must be interpreted purposively to give effect to this principle.

Although N. Narayanan was decided under the pre-2015 regulations, its purposive interpretive principle provides the most important guidance for the application of the PIT Regulations 2015 to AI-driven alternative data trading. Applying the Court's purposive approach, the question is not whether the information possessed by the AI system technically falls within the literal definition of UPSI which, as discussed above, it may not but whether permitting AI systems to trade on the basis of AI-derived insights from alternative data is consistent with the principle that no person should gain an unfair informational advantage in securities trading.

Applying this purposive approach, there is a strong argument that AI-derived insights from alternative data that are materially predictive of a company's undisclosed financial results, and that are not accessible to ordinary investors, constitute the functional equivalent of inside information and should attract proportionate regulatory scrutiny.[43] The PIT Regulations 2015, however, do not support this purposive extension in their current form without amendment, because the definition of UPSI is explicitly anchored to "information relating to a company or its securities" that is "not generally available" a formulation that does not, on its face, extend

[41] Ibid. at 660–662; SEC, Statement on Certain Uses of Alternative Data (2021), available at www.sec.gov.
[42] N. Narayanan v. SEBI (2013) 12 SCC 152.
[43] Ibid., para 47 (purposive interpretation of insider trading prohibition).

to AI-derived inferences from third-party data.

Legal Gap Analysis and Proposed Doctrinal Response

The analysis in Sections 3.11 to 3.13 discloses a significant and growing legal gap in the PIT Regulations 2015: the framework was designed to address human insiders with access to specific confidential corporate information, and it does not adequately regulate AI systems that derive functionally equivalent insights from alternative data. Four specific lacunae require legislative or regulatory attention.

First, the PIT Regulations do not address the concept of "constructive possession" of UPSI whether an entity that deploys an AI system capable of deriving material non-public insights from data should be treated as constructively possessing the resulting UPSI, regardless of whether a human individual consciously received or identified the information. Second, the regulations do not address the "alternative data" problem: no guidance exists on which categories of alternative data, when analysed by AI, may give rise to a regulatory obligation equivalent to the UPSI trading prohibition. Third, the mosaic theory has not been recognised or applied by SEBI or Indian courts, leaving analysts and AI operators without clear guidance on the boundary between legitimate quantitative analysis and unlawful information arbitrage. Fourth, the regulations do not address the disclosure obligations of entities that deploy AI systems using alternative data, creating a transparency gap that undermines investor confidence in the fairness of market information.[44]

As a comparative reference, the United States SEC has issued guidance emphasising that the use of alternative data does not insulate a trader from insider trading liability where the data provider has breached a duty of confidentiality, or where the data was obtained through deception.[45] A similar framework adapted to the definitional structure of the PIT Regulations 2015 would provide a workable doctrinal basis for addressing AI-driven information arbitrage in India.

[44] IOSCO, The Use of Artificial Intelligence and Machine Learning by Market Intermediaries and Asset Managers (2021), pp. 28–30.
[45] SEC, Statement on Certain Uses of Alternative Data (2021), available at www.sec.gov.

LIABILITY ATTRIBUTION AND ACCOUNTABILITY FRAMEWORKS

The Legal Attribution Problem in AI-Driven Securities Markets

The attribution of legal liability when an AI system causes market harm is the most fundamental and unresolved question in the intersection of AI and securities law. The problem arises from a structural mismatch between the AI liability chain developer, data provider, training environment, deploying entity, broker, investor and the liability frameworks of Indian securities law, which were designed to identify and sanction individual human decision-makers.

At least four potential defendants may bear legal responsibility for AI-caused market harm in a typical algorithmic trading scenario: (i) the AI system developer or vendor, who designed and trained the model; (ii) the financial institution or trading firm that deployed the AI system; (iii) the registered stock broker through whose infrastructure the orders were submitted; and (iv) the individual managers or compliance officers who were responsible for overseeing the AI system's deployment.[46] Indian securities law provides only partial guidance on how liability should be allocated among these parties, and the question has not been authoritatively resolved by SEBI or the SAT.

Lin's framework of "resource asymmetries" is relevant here: large financial institutions have vast resources to develop innovative AI capable of evading detection, while regulators often struggle with outdated technology and limited budgets.[47] This asymmetry means that the costs and complexity of proving liability in AI-driven manipulation cases are borne disproportionately by the regulator, creating a deterrence gap that favours sophisticated AI operators.

Vicarious Liability: Applicability of Principal-Agent Doctrine to AI Systems

The doctrine of vicarious liability holds a principal legally responsible for the wrongs committed by an agent acting within the scope of the agent's authority. In the employment context, an employer is vicariously liable for the torts of an employee committed in the course of employment. The question of whether an AI trading system can be characterised as the

[46] Scherer, M.U., "Regulating Artificial Intelligence Systems: Risks, Challenges, Competencies, and Strategies" (2016) 29 Harvard Journal of Law and Technology 353, at 378.
[47] Lin, T.C.W., "Artificial Intelligence, Finance, and the Law" (2019) 88(2) Fordham Law Review 531, at 553.

"agent" of its deploying entity, such that the entity is vicariously liable for the system's manipulative outputs, is a question of significant doctrinal importance.

Under Indian contract law, an agent is defined in Section 182 of the Indian Contract Act, 1872, as a person employed to do any act for another, or to represent another in dealings with third persons.[48] An AI system, as a matter of current Indian law, is not a legal person and therefore cannot itself be a party to a contract or the bearer of legal obligations. It cannot, strictly speaking, be an "agent" in the legal sense. The vicarious liability doctrine, as traditionally formulated, does not extend to the outputs of AI systems because the doctrine requires an agent capable of bearing legal obligations.

However, this formalistic analysis is an inadequate response to the practical problem. A more functionally appropriate approach and one that is consistent with the purposive approach to securities regulation endorsed by the Supreme Court in N. Narayanan is to treat the deploying entity as directly, rather than vicariously, liable for the outputs of its AI system on the basis that the system is an instrument, not an agent, of the deploying entity, and that the entity is therefore directly responsible for all acts done through that instrument.[49] This approach avoids the conceptual difficulties of extending agency law to AI while achieving the same practical result of holding the deploying entity liable.

Negligence and Duty of Care: Monitoring and Auditing AI Systems

The law of negligence imposes liability where a person fails to exercise the standard of care that a reasonable person in their position would exercise, and that failure causes harm to a person to whom a duty of care is owed. In the context of AI-driven securities trading, the question is whether market intermediaries' brokers, investment managers, and portfolio managers owe a duty of care to other market participants and to retail investors to audit, monitor, and control the AI systems they deploy.

The statutory framework provides a partial answer. The Code of Conduct in Schedule II to the SEBI (Stock Brokers) Regulations, 1992, requires brokers to act with "due skill, care and diligence."[50] The SEBI (Investment Advisers) Regulations, 2013, impose a fiduciary duty on

[48] Section 182, Indian Contract Act, 1872.
[49] Cf. Lister v. Hesley Hall Ltd. [2001] UKHL 22 (instrumentality approach to vicarious liability in English law); see also Bazley v. Curry [1999] 2 SCR 534 (Canada).
[50] Schedule II, Code of Conduct, SEBI (Stock Brokers) Regulations, 1992, cl. A(1).

investment advisers. The 2012 Algorithmic Trading Circular imposes specific monitoring and audit obligations on brokers deploying algorithmic trading systems.[51] These statutory obligations collectively establish that market intermediaries deploying AI systems owe a duty rooted in regulatory obligation rather than common law to exercise reasonable care in monitoring and controlling those systems.

The standard of care required of a sophisticated financial institution deploying a self-learning AI system in securities markets is necessarily higher than that required of a broker deploying a simple rule-based algorithm. A financial institution that deploys a reinforcement-learning trading system without implementing robust behavioural monitoring, anomaly detection, and human-in-the-loop override mechanisms cannot plausibly claim to have exercised reasonable care, even in the absence of a regulatory breach because the foreseeable risk of an AI system generating harmful emergent trading strategies is sufficiently high that precautionary measures are required as a matter of basic due diligence.[52]

Strict Liability: The Case for Non-Fault-Based Liability for AI Deployment

Strict liability is the imposition of legal liability without proof of fault, negligence, or intent. In Indian tort law, the rule in Rylands v. Fletcher as adapted by the Supreme Court in M.C. Mehta v. Union of India to the principle of absolute liability holds that a person who brings on their land a thing likely to do mischief if it escapes must keep it at their peril, and is strictly liable for all damage directly caused by its escape.[53] The M.C. Mehta doctrine of absolute liability is more stringent than the English Rylands v. Fletcher rule in that it admits of no exceptions for acts of God or third-party intervention.

There is a principled case for applying strict or absolute liability to the deployment of AI systems in securities markets, on the basis that such systems constitute an inherently hazardous activity capable of causing widespread and rapid market harm that cannot be adequately addressed by fault-based liability regimes. The case for strict liability rests on three grounds.

First, the social cost argument: AI-driven market manipulation can cause billions of rupees of

[51] SEBI Circular No. CIR/MRD/DP/09/2012 dated 30 March 2012, paras 5 and 8.
[52] Baker, T. and Dellaert, B., "Regulating Robo Advice Across the Financial Services Industry" (2018) 103 Iowa Law Review 713, at 724.
[53] M.C. Mehta v. Union of India (1987) 1 SCC 395, para 31 (absolute liability principle under Indian law, departing from Rylands v. Fletcher [1868] LR 3 HL 330).

investor losses in seconds as illustrated by the Pentagon deepfake incident, which triggered approximately $500 billion in global stock market losses within minutes.[54] The magnitude and speed of potential harm justifies a liability regime that does not depend on proof of fault. Second, the deterrence argument: strict liability provides stronger incentives for AI operators to invest in safety and compliance measures, because operators cannot escape liability by demonstrating reasonable care. Third, the asymmetric information argument: the deploying entity has far superior knowledge of the AI system's capabilities, limitations, and risk profile than any external regulator or injured party; strict liability internalises the costs of AI deployment risk to the party best placed to manage it.

The implementation of a strict liability standard for AI-caused market harm in Indian securities law would require either legislative amendment or SEBI regulatory intervention, as it would represent a departure from the fault-based framework of the existing PFUTP Regulations. The EU AI Act's product liability framework for high-risk AI systems which creates a rebuttable presumption of causation in favour of plaintiffs once they establish that an AI system failed to comply with applicable requirements provides a useful comparative model.[55]

Reverse Burden of Proof: Legal Justification for Shifting the Evidential Burden

The reverse burden of proof is a mechanism whereby, once certain threshold facts are established by the regulator, the burden shifts to the accused party to demonstrate compliance or the absence of culpability. In Indian securities enforcement, the SEBI Act already incorporates elements of reverse burden: Section 24A provides that in proceedings for violation of the Act, the burden of proving that the accused has not committed the offence shall be on the accused where the facts alleged are particularly within the knowledge of the accused.[56]

The case for a reverse burden of proof in AI-driven securities enforcement is particularly strong. The information asymmetry between SEBI and the deploying entity is acute: the entity has exclusive access to the AI system's source code, training data, reward function, architecture, and operational logs. SEBI, by contrast, has access only to the observed market outputs of the system the orders submitted and trades executed. Requiring SEBI to prove, from these external

[54] Lin, T.C.W., "Artificial Intelligence, Finance, and the Law" (2019) 88(2) Fordham Law Review 531, at 535 (discussing the Pentagon deepfake incident and its market impact).
[55] Regulation (EU) 2024/1689 (AI Act), Articles 9 and 62; Directive (EU) 2022/2555 (NIS2 Directive), Article 21.
[56] Section 24A, SEBI Act, 1992 (as amended by the Securities Laws (Amendment) Act, 2014).

indicators alone, that the AI system was designed or operated to manipulate the market effectively insulates sophisticated AI operators from accountability.[57]

A legal framework incorporating a reverse burden in AI cases would operate as follows: SEBI would be required to establish a prima facie case by demonstrating that the AI system produced a pattern of trading that is consistent with a specific manipulative strategy identified in the PFUTP Regulations. Once this prima facie case is established, the burden would shift to the deploying entity to provide a legitimate explanation for the pattern for example, by demonstrating that the strategy was a legitimate market-making or arbitrage activity, or that the manipulative pattern was the result of a system malfunction rather than an intentional or reckless deployment decision. This approach is consistent with Lin's proposal for graduated culpability scores that reward firms with robust AI compliance programs with reduced penalties while imposing enhanced sanctions on firms that cannot demonstrate adequate governance.[58]

The legal justification for this reverse burden in the securities context is well-established: the Supreme Court has upheld reverse burden provisions in regulatory statutes where the relevant facts are peculiarly within the knowledge of the accused, as stated in State of Maharashtra v. Som Nath Thapa.[59] The operational parameters and decision logic of an AI trading system are paradigmatically facts peculiarly within the knowledge of the deploying entity, providing a sound constitutional basis for a reverse burden provision.

CONCLUSION:

This paper has sought to examine the legal framework in place in India in relation to algorithmic trading and AI-enabled market manipulation. Some of the significant findings of this research include:

Firstly, it must be noted that the current legal framework in place is largely in the form of SEBI circulars rather than legislative provisions. This is problematic as it is likely to give rise to legal issues in due course.

[57] Pasquale, F., The Black Box Society (Harvard University Press, 2015), pp. 107–109.
[58] Lin, T.C.W., "Artificial Intelligence, Finance, and the Law" (2019) 88(2) Fordham Law Review 531, at 558 (proposing culpability scores for AI compliance).
[59] State of Maharashtra v. Som Nath Thapa (1996) 4 SCC 659, para 28 (reverse burden where facts are peculiarly within knowledge of accused).

Secondly, it must be noted that even though various practices such as spoofing, quote stuffing, wash trading, and momentum ignition can all be brought within the existing legal framework, it is problematic to extend these provisions to AI as it is likely to give rise to issues of intent.

Thirdly, it must also be noted that there is an existing lacuna in insider trading provisions as AI uses alternative data to gain an edge in trading without violating existing provisions.

Lastly, it must also be noted that there is an existing need to consider stronger legislative reforms in this space as the existing legal framework is quite comprehensive but requires to be brought in consonance with AI-enabled trading in securities markets.