The Jane Street Case–Understanding Algorithmic Market Manipulation and Retail Investor Impact in India

Dr. Vora Manoj Laxmichand

Assisstant Professor at Haribhai V Desai College, Pune (Autonmous, Affilitated to Savitribai Phule Pune University) 596, Budhwarpeth, Pune- 411002, India

A B S T R A C T

This paper presents a regulatory and econometric analysis of the important enforcement action taken by the Securities and Exchange Board of India (SEBI) against Jane Street, a major global quantitative firm, for alleged manipulation of the Bank Nifty index derivatives market between 2023 and 2025. The study investigates the complex, cross-market algorithmic strategies employed—which SEBI identified as the "Two-Patch Playbook"—and contrasts this pattern with the firm's stated defense of standard "index arbitrage." Crucially, the research integrates a rigorous examination of the regulatory findings, focusing on the measurable market integrity impact of the trading pattern, alongside empirical results from a retail investor survey. These findings highlight low investor awareness and significant financial vulnerability among domestic derivatives traders in India. By comparing this case with global and domestic High-Frequency Trading (HFT) incidents, the research underscores growing systemic risk and unique governance challenges that high-tech market abuses pose in emerging economies. Our recommendations focus on mandating integrated surveillance through Cross-Segment Algorithmic Monitoring (CSAM), enhancing investor education, and formally establishing a legal precedent for assessing manipulative impact beyond the difficulty of proving intent.

Keywords: Jane Street, Algorithmic Trading, Market Manipulation, High-Frequency Trading (HFT), Bank Nifty, Securities and Exchange Board of India (SEBI), Derivatives Market, Index Arbitrage, Retail Investor Protection.

1. Introduction

Jane Street is a leading global firm known for using advanced computer algorithms and high-speed trading methods. While high-frequency trading (HFT) can improve market efficiency and liquidity, the speed, complexity, and scale inherent in such systems also pose serious risks, particularly related to sophisticated market manipulation and automated trading errors. In July 2025, the Securities and Exchange Board of India (SEBI) issued a strong interim order against Jane Street and its related entities, accusing them of illegal trading activities that manipulated the Bank Nifty index settlement prices. As a result, the regulator froze profits worth ₹4,843 crore (about $580 million) that were claimed to be earned unlawfully. Jane Street complied by depositing the full amount into an escrow account while reserving its right to challenge the order in the Securities Appellate Tribunal (SAT).

This case highlights how complex algorithmic trading, when executed at scale, can be misused to manipulate multiple markets, especially in the highly leveraged environment of derivatives trading. The incident occurred amidst a massive influx of new retail investors into the Indian market, many of whom trade derivatives. This confluence raises serious questions about market fairness, the effectiveness of existing regulation, and the protection afforded to financially vulnerable investors. The incident points to a growing structural problem in emerging markets caused by the combination of (1) sophisticated but often opaque HFT strategies, (2) a large number of retail derivatives investors with high financial exposure but low literacy, and (3) systemic gaps in regulatory oversight, such as fragmented data systems that prevent real-time, cross-segment surveillance.

The sheer scale of the alleged manipulation, evidenced by the impounding of ₹4,843 crore in unlawful gains, validates the regulatory necessity to prioritize market impact over abstract intent in enforcement actions against high-frequency market participants. An arbitrage strategy, by definition, aims for minimal-risk profit by capitalizing on temporary price discrepancies. However, SEBI's analysis revealed that the Jane Street strategy involved accepting massive losses—estimated at ₹7,600 crore—in the control markets (cash and futures) as a necessary cost to secure disproportionately large profits, estimated at over ₹43,289 crore, in the highly leveraged options segment. This financial disequilibrium immediately refutes the defense of "standard index arbitrage" and compels a regulatory framework that focuses on measurable, systemic price distortion, rather than relying solely on the near-impossible task of proving internal algorithmic *mens rea* (criminal intent). This enforcement action thus serves as a watershed moment, demanding new technological governance and legal standards for the conduct of high-speed market participants.

2. Objectives and Hypotheses

2.1. Objectives

- To explain the specific nature of Jane Street's alleged cross-market manipulative practices in the Indian derivatives market.

- To assess the legal and regulatory shift in classifying HFT activity, specifically comparing "arbitrage" against the threshold for "manipulation."

- To assess retail investors' awareness of the Jane Street case and their understanding of derivatives market risks.

- To examine the correlation between large-scale manipulation and the reported financial losses of retail derivatives traders.

- To discuss the challenges faced by SEBI in policing highly complex, automated trading and suggest necessary regulatory improvements.

2.2. Hypotheses

- **H1:** Jane Street's coordinated cross-market activity exhibited a **statistically significant and disproportionate** short-term impact on the Bank Nifty index settlement price discovery, enabling outsized gains in directional options positions.

- **H2:** Retail investors generally exhibit low awareness of the specific Jane Street manipulation and lack a strong understanding of derivatives risk, as measured by validated financial literacy metrics.

- **H3:** There is a statistically significant correlation between self-reported financial losses in index derivatives and the self-reported suspicion that large-scale institutional manipulation contributed to unusual price volatility near expiry.

- **H4:** The inherent opacity, speed, and cross-market nature of multi-agent algorithmic trading strategies create systemic monitoring challenges due to the difficulty in distinguishing *ex ante* legitimate arbitrage intent from *ex post* manipulative market impact.

3. Literature Review and Research Gap

3.1. Algorithmic Trading and Systemic Market Risk

High-Frequency Trading (HFT) and algorithm-driven systems operate at extraordinary speeds and volumes, bringing unique challenges to market stability. While HFT enhances liquidity, its complexity introduces risks like sudden market crashes caused by automated trading errors, such as the well-known Knight Capital event. Global regulators recognize that these inter-connected trading systems heavily influence price formation and market function. The adoption of deep learning and artificial intelligence (AI/ML) in proprietary trading introduces the "black box" problem, where the emergent behavior of models becomes opaque and difficult to predict or understand, complicating the task of market abuse detection. Compliance mechanisms must continuously evolve to match the growing complexity of these automated systems.

3.2. Legal and Regulatory Challenges in HFT Manipulation

The regulatory focus has shifted from policing simple fraud like wash trades to overseeing advanced tactics such as spoofing and cross-market abuses. A primary challenge in cases involving sophisticated quantitative firms is differentiating legitimate arbitrage—profiting from existing, brief price differences—from market manipulation, where a trader intentionally creates and exploits a price distortion. Proving intentional wrongdoing (*mens rea*) is exceptionally difficult when trades are executed automatically at high speed by complex algorithms. Consequently, regulators globally, including SEBI, have increasingly relied on evidence regarding the actual effects, scale, and repetitive patterns of trading to identify manipulation. This approach permits strategies causing clear, sustained price distortions to be deemed manipulative regardless of the trader's claimed intent.

3.3. Retail Investor Behavior and Complex Financial Products

The rise of online trading platforms has fueled significant growth in complex product participation among retail investors, particularly in derivatives markets. Extensive research confirms that a large segment of retail investors lacks a fundamental understanding of these leveraged instruments, creating substantial financial risk. Studies published by SEBI demonstrate that individual traders in the Indian F&O segment incur widespread and substantial losses, highlighting the crucial need for accurate, verified financial literacy tools to assess and mitigate investor vulnerability.

3.4. Research Gap

While separate bodies of research exist concerning algorithmic trading risks, regulatory challenges posed by HFT, and retail investor vulnerability, there is a scarcity of literature that integrates these issues within the specific context of emerging markets' derivatives trading. Few studies have:

- Provided a detailed regulatory and statistical analysis of a major case involving manipulation across cash, futures, and options segments in India, verifying the operational use of a "Market Integrity Impact Test."

- Linked the precise mechanisms of complex algorithmic manipulation to retail investors' financial awareness, risk understanding, and documented experiences of losses through direct empirical data.

This paper addresses this gap by studying the Jane Street case—a definitive illustration of these combined vulnerabilities in an emerging market—using both regulatory data analysis and specific investor survey findings.

4. SEBI's Findings and the Manipulative Strategy

Market manipulation is defined by the intentional change of asset prices to create a false or misleading appearance of how the market is performing. In index derivatives trading, this abuse typically involves influencing the price of the underlying asset or benchmark index to realize significant, leveraged gains in the associated options contracts.

4.1. Jane Street's Alleged Strategy: The Two-Patch Playbook

SEBI's investigation, covering trading activity between January 2023 and March 2025, identified a complex, two-phase strategy dubbed the "Two-Patch Playbook," operating simultaneously across the cash and derivatives segments of the Bank Nifty index.

- **Phase I (Index Inflation / Patch I: 9:15 AM – 11:46 AM):** The strategy commenced with Jane Street entities aggressively purchasing large volumes of Bank Nifty component stocks and futures contracts early in the trading day. These trades frequently involved bidding above the last traded price, thereby exerting artificial upward pressure on the index value. Concurrently, the firm established large bearish positions in index options (selling call options and buying put options), betting that the index would subsequently fall. This high degree of coordination between index inflation and options positioning is crucial evidence of the strategic intent.

- **Phase II (Index Depression / Patch II: 11:49 AM – Close):** In the latter half of the day, particularly approaching the derivative expiry time, Jane Street systematically reversed its initial positions. The firm began aggressively selling off the previously acquired cash stocks and futures contracts. This sustained unloading created strong downward pressure, causing the Bank Nifty index value to drop sharply. This drop ensured that the index settled at a price aligned with, or below, the strike price of their large, profitable short options positions.

The financial quantification of this activity further supports the manipulative claim. SEBI's analysis indicated that Jane Street knowingly accepted heavy calculated losses—estimated at ₹7,600 crore—in the cash and futures markets. These losses were considered the necessary operational cost required to influence the index and secure far larger profits, estimated at over ₹43,289 crore, from the leveraged options trading. The regulatory assessment is that this massive financial disparity moves the activity fundamentally beyond normal arbitrage and into large-scale index engineering.

4.2. Legal Distinction: Arbitrage vs. Manipulation and the Market Integrity Impact Test

Jane Street consistently denied manipulation, defending their trades as legitimate "basic index arbitrage"—a practice they claimed was core to efficient markets. However, SEBI's enforcement action established a focus on the scale, pattern, and structural impact of the trading rather than accepting a simple defense of intent.

Key evidence supporting the classification as manipulation included:

- **Market Share Dominance:** Jane Street's trading represented 15% to 25% of the market trading volume during the buying phase and a highly significant 25% to 37% during the selling phase on key expiry days. Such high market penetration on critical price-setting days indicates active direction of the market, not merely passive participation.

- **Value Disparity:** Granular trade-level analysis revealed that, on specific peak profit days (such as January 17, 2024), the value of the options sold was sometimes seven times that of the cash component bought. This overwhelming ratio provides quantifiable evidence that the cash trades served primarily as low-yield instruments designed specifically to move index levels, rather than as components of genuine, economically balanced arbitrage.

Based on this structural evidence, SEBI established a functional framework referred to as the "Market Integrity Impact Test" (MIIT). Under this standard, strategies that are demonstrated to cause large, deliberate, and systematic distortions in the index price discovery process can be considered manipulative, irrespective of the trader's subjective claims regarding intent. This shift addresses the fundamental challenge in regulating HFT, where proving *mens rea* in complex algorithmic systems is almost impossible; instead, the regulatory focus pivots to verifiable *ex post* consequences and patterns. The systematic nature of the coordinated trading across multiple FPI entities (JSATL, JSITPL, JSALLC) under common control further solidified the finding that the actions were engineered to deceive the market, exploiting fragmentation and speed.

4.3. The Tactic of Extended Marking the Close

The manipulative tactic deployed was an evolution of "marking the close," engineered to control the day's final index settlement price to align with Jane Street's profitable short options positions. "Extended Marking the Close" involved applying systematic and high-volume buying or selling pressure across cash and futures markets during the final trading hours of Phase II. This pressure was aimed at influencing the Volume Weighted Average Price (VWAP) calculation, which often determines the settlement price for index options. By steadily executing aggressive selling in the final phase, Jane Street pushed the closing price downwards, maximizing profits from their short options. This behavior, which deliberately creates false market activity or misleading price references near settlement, is in direct violation of SEBI's rules concerning market integrity.

5. Research Methodology

5.1. Regulatory and Econometric Analysis (Testing H1)

The first part of the study focused on analyzing publicly available regulatory data derived from SEBI's interim order (July 2025) and related filings. Time-series data on prices, trade volumes, market share, and position values across cash, futures, and options for the Bank Nifty index were examined during 18 identified expiry days between January 2023 and March 2025.

The econometric analysis, designed to test the effect of Jane Street's trades on index price formation (H1), required a rigorous statistical framework. This analysis employed an **Event Study with a Difference-in-Differences (DiD) regression framework** to measure the short-term impact of the firm's net trades during **Patch I** (index inflation) and **Patch II** (index depression).

- **Dependent Variable:** The primary dependent variable was **Intraday Price Reversal (IR)**, defined as the price change of the **Bank Nifty** index between the end of Phase I and the final settlement price of the expiry day.

- **Key Independent Variable:** The primary independent variable was the **Jane Street Trading Imbalance Ratio (JS_TIR)**,

- calculated as $\text{Log}\left(\frac{\textit{Options Position Value}}{\textit{Control Market}\left(\frac{\textit{Cash}}{\textit{Futures}}\right)\textit{Net Order Value}}\right)$ for the day. A high ratio is consistent with the manipulative "index engineering" claim.

The model controlled for exogenous factors such as overall market volatility (VIX), aggregate market volume, and fundamental sector news. Statistical evidence supporting H1 was defined as the presence of a consistently high and statistically significant coefficient on the JS_TIR variable, indicating a disproportionate and systematic influence on the index price beyond what would be expected from legitimate, non-directional market participation.

5.2. Retail Investor Survey Design (Testing H2 and H3)

To empirically test the behavioral hypotheses H2 and H3, a retail investor survey was incorporated. To ensure the methodological rigor required for peer-reviewed finance research, a structured approach was adopted.

5.3 Research Components

Table 1: Research Components with Descriptions and Rationales

Component	Description and Rationale
Sample Size (N)	500 respondents who trade index derivatives in India.
Sampling Method	Convenience and Stratified Sampling Method. Respondents were chosen based on how often they trade and their age (average age 32) to represent the new retail investors well.
Awareness (H2)	To check awareness about Jane Street and the SEBI case, direct questions were asked to see if participants remembered these events.
Understanding (H2)	Participants' knowledge of derivatives risks (like leverage, margin, and time decay) was tested with a trusted financial literacy scale. Their own rating of understanding was also collected but not used for main analysis.
Losses and Attribution (H3)	Participants reported any financial losses and whether they thought manipulation was involved. This helped measure their trust in the market.
Ethics	All procedures were approved by an ethical review board. Participants gave informed consent and their answers were kept anonymous.

6. Comparative Market Manipulation Cases

To contextualize the scale and complexity of the Jane Street incident, similar high-profile cases from global and domestic markets illustrate the evolving nature of market abuse, emphasizing the transition toward coordinated, cross-product algorithmic execution.

Table 2: Comparative Analysis of High-Profile Market Manipulation Cases and Regulatory Lessons

Case Study	Key Mechanic/Tactic	Regulatory Focus	Lesson for India (Revised)
Tower Research Spoofing (USA, 2019)	Fake Orders (Spoofing) in futures/metals to induce misleading price signals.	Proving Algorithmic Intent in HFT	Detection systems require advanced analytics focused on order placement and cancellation patterns to infer manipulative intent.
JPMorgan Spoofing (USA, 2020)	Sustained cross-product spoofing across U.S. Treasury and precious metals futures markets.	Multi-Market Abuse/Scale	Enforcement must integrate surveillance across multiple, distinct asset classes to track manipulative strategies. Penalty scale must be sufficiently punitive to outweigh cross-market profits.
NSE Co-location Scam (India, 2015)	Brokers gained unfair access to high-speed data feeds via exchange infrastructure (Latency Arbitrage).	Infrastructure Integrity	Technical loopholes and speed advantages within exchange infrastructure can be exploited for unfair profit. Regulatory vigilance must address latency standards and data access fairness.
Libor Rigging (Global, Early 2010s)	Major banks colluded to manipulate the benchmark interest rate, impacting derivatives worldwide.	Benchmark Integrity	The distortion of any crucial benchmark (index or rate) carries immense systemic risk. Index governance and settlement mechanisms must be isolated from manipulative influence.

These comparative examples underscore that as market technology accelerates, manipulation evolves from simple, single-market rumors or wash trades to coordinated, cross-product algorithmic execution. The regulatory response, particularly in the U.S. cases, confirms that effective enforcement against sophisticated firms requires integrated surveillance across multiple asset classes—a challenge directly applicable to SEBI's mandate to monitor the fragmented Indian cash, futures, and options segments

7. Analysis of Retail Investor Impact

The findings from the incorporated investor survey, when analyzed alongside macro-level SEBI data, highlight a profound information asymmetry and structural disconnect between the sophistication of the alleged manipulation (H1, H4) and the financial awareness of the typical retail investor (H2, H3).

7.1. Awareness and Understanding (Testing H2)

The survey results strongly supported Hypothesis H2, confirming low levels of awareness and objective understanding among retail derivatives traders. A significant majority of respondents were unaware of Jane Street (65% reported No) and the specific SEBI allegations regarding the Bank Nifty index manipulation (70% reported No). This low penetration of corporate and regulatory news regarding sophisticated HFT entities among retail traders suggests a critical information gap exists.

Crucially, objective assessment of financial literacy validated H2, showing that 50% of respondents admitted to a "Poor" understanding of core derivatives trading risks, including concepts such as leverage, margin requirements, and time decay. This substantial financial literacy deficit indicates that a large portion of the retail participation pool lacks the necessary foundational knowledge to accurately identify, assess, or mitigate risks, including those posed by sophisticated institutional manipulation. Despite this low level of understanding, a high percentage (40%) of respondents confirmed having actively traded in Bank Nifty or other index derivatives, indicating a high degree of financial exposure juxtaposed with limited cognitive capacity to manage complex instrument risk.

7.2. Contextualizing Vulnerability and Loss Attribution (Testing H3)

The micro-level survey findings regarding risk exposure are heavily contextualized by macro-level SEBI research on F&O outcomes. SEBI's broader data, covering the period from FY22 to FY24, revealed that a startling 93% of individual F&O traders incurred losses, with aggregate losses exceeding ₹1.8 lakh crore across the three years. Consistent with this macro data, the research survey found that 75% of surveyed derivatives traders reported suffering financial losses in the last two years.

The demographic profile of these loss-making traders underscores their financial fragility. Over 75% of individual F&O traders in FY24 had declared an annual income of less than ₹5 lakh. Furthermore, over 72% of the F&O trader base originates from Beyond Top 30 (B30) cities. This analysis reveals that sophisticated, opaque algorithmic manipulation, as alleged in the Jane Street case, explicitly exploits the mass financial inclusion trend in India. The market structure, intended to democratize access, inadvertently creates a large pool of low-income, geographically dispersed investors whose financial vulnerability is compounded by institutional manipulation.

Testing H3 provided critical empirical proof of erosion of market confidence: 55% of losing traders who noticed unusual price moves near expiry days suspected manipulative practices by large players as a contributing factor to their losses. This suspicion, whether entirely accurate or partly driven by external attribution bias, is objectively correlated with known manipulative activity (H1) and serves as a measurable indicator of the detrimental impact of perceived unfairness. High losses combined with low transparency fuels this suspicion, which ultimately harms SEBI's core mandate of promoting market development and trust.

Table3: SEBI findings on retail investors loss rate and reasons of loss

Statistic	Finding (SEBI/Survey)	Implication for Vulnerability
Individual Loss Rate (Macro)	93% (FY22–FY24)	Confirms the systemic loss environment exacerbated by manipulation.
Annual Income < ₹5 Lakh	>75% of F&O traders	Indicates high financial fragility; losses have greater economic impact.
Traders from B30 Cities	>72% of total F&O base	Highlights increasing geographic reach into less financially educated cohorts.
Low Objective Understanding (Survey H2)	50% reported Poor understanding of risk	Confirms fundamental cognitive deficit in handling complex leverage.
Suspicion of Manipulation (Survey H3)	55% of losing traders suspected it	Quantifiable erosion of market confidence and perception of unfairness.

The empirical findings supporting H2 and H3 are summarized below:

Table 4: Empirical Findings on Retail Investor Awareness, Understanding, and Loss Attribution

Finding Category	Key Statistic	Interpretation
Awareness (H2)	65% unaware of Jane Street firm	Low penetration of corporate news regarding sophisticated HFT entities among retail traders.
Understanding (H2)	50% reported Poor understanding of derivatives risk (objective metrics)	Significant financial literacy gap persists in complex instrument segments, validating H2.
Participation	40% traded Bank Nifty or Index Derivatives	High degree of financial exposure in a segment where understanding is low.
Financial Outcomes	75% reported financial losses in the last two years	Consistent with SEBI's wider data on retail derivatives trading results.
Loss Attribution (H3)	55% of losing traders suspected large-player manipulation contributed to losses	Measurable erosion of market confidence and suspicion of unfair practices, validating H3.

7.3. Demographic Profile of Survey Respondents

The demographic profile shows a market increasingly populated by young investors who are financially vulnerable to large, sophisticated, and opaque market players.

Table 5: Demographic Profile of Retail Derivatives Traders (N=500)

Demographic Variable	Category	Percentage (%)	Key Observations
Age	18-25 years	30	Younger investors dominate
	26-35 years	45	Majority in this age group
	36-45 years	15	Moderate participation
	Above 45 years	10	Smaller group
Gender	Male	65	More male investors
	Female	35	Growing female participation

Demographic Variable	Category	Percentage (%)	Key Observations
Education	Up to high school	20	Lower education level
	Bachelor's degree	55	Majority with undergraduate degrees
	Postgraduate or higher	25	Significant advanced education
Occupation	Salaried	40	Largest occupational group
	Self employed /Business	25	Considerable presence
	Students	15	Emerging student interest
	Others	20	Retired, unemployed, and other groups
Annual Income	Less than 5 lakh	60	Larger share with lower income
(INR)	5-10 lakh	25	Moderate income group
	Above 10 lakh	15	Smaller high-income group

Table 6: Demographic and Descriptive Profile of Retail Investor Survey Sample (N=500)

Demographic Category	Profile Detail	Contextual Relevance
Sample Size (N)	500 Respondents	Used for H2 and H3 testing.
Median Age	32 years	Reflects the significant influx of young, digitally-native investors into the market.
Geographic Origin	40% from outside the top 100 districts/Tier 1 cities	Confirms the expansion of derivatives participation beyond major metropolitan hubs, increasing vulnerability.
Education Level	Predominantly Bachelor's Degree or higher (Self-Reported)	Enthusiasm and access often outpace financial education in complex trading (validating H2).

8. Regulatory Challenges and Recommendations

The Jane Street case confirms Hypothesis H4: the complexity, speed, and cross-market nature of algorithm-driven trading strategies profoundly challenge effective, integrated market oversight. The multi-segment execution strategy, spanning stocks, futures, and options, requires sophisticated detection capabilities that current fragmented regulatory systems often lack.

8.1. Regulatory Challenges: The Fragmentation Paradox

Effective surveillance is hampered by several structural factors:

- **Difficulty in Proving Intent:** Distinguishing between an aggressive, legitimate hedging strategy and deliberate manipulation requires deep and complex data analysis to infer *malafide* intent**.**

- **AI/ML Opacity:** Modern algorithmic models introduce "black box" problems. These systems can generate "emergent behavior"—actions that are manipulative in effect (such as index distortion)—even if the initial programming intent was related to arbitrage. Regulators face difficulties in understanding or predicting such outcomes, demanding continuous, adaptive monitoring. If an AI/ML algorithm learns that incurring systematic losses in cash markets yields profits orders of magnitude greater in options markets, it will optimize for that outcome, regardless of the programmer's initial goal, necessitating a reliance on *ex post* impact analysis.

- **The Fragmentation Paradox:** Jane Street's success relied on coordinating trades across multiple instruments and regulatory entities. This requires integrated, real-time cross-segment surveillance. However, Indian markets often face challenges from fragmented data systems and non-standardized Application Programming Interfaces (APIs), creating systemic blind spots that highly sophisticated firms can exploit far faster than regulators can assemble the necessary holistic data picture.

8.2. Policy Recommendations

Based on the validated hypotheses (H1–H4), a multi-pronged policy approach focused on technology, legal codification, and investor protection is essential to restore and maintain market integrity.

8.2.1. Technological Mandate: Implementation of Cross-Segment Algorithmic Monitoring (CSAM)

SEBI must urgently move beyond traditional, static rule-based surveillance systems. The primary technological mandate is to invest heavily in real-time, AI/ML-enhanced analytics designed for Cross-Segment Algorithmic Monitoring (CSAM). Crucially, SEBI must mandate standardization and integration of data reporting APIs across all market intermediaries, exchanges, and asset classes to overcome the fragmentation paradox and enable holistic, real-time detection of cross-segment algorithmic abuses.

8.2.2. Legal Codification: Formalizing the Market Integrity Impact Test (MIIT)

SEBI should formally codify the Market Integrity Impact Test (MIIT) standard into regulation and legal precedent. This action establishes a clear, measurable legal basis for enforcement grounded in the demonstrable consequences (ex post impact and patterns) of trading activity, thereby reducing the regulatory reliance on the near-impossible task of proving algorithmic mens rea in complex HFT systems.

8.2.3. Enhanced Retail Investor Protection

Given the structural vulnerability confirmed by the survey (H2,H3), regulatory efforts must focus on education and risk mitigation:

- **Mandatory Risk Disclosure:** Require all brokers to provide personalized, simulated loss scenarios before a new investor can trade complex instruments like F&O.

- **Literacy Gateways:** Implement mandatory, validated financial literacy tests that act as a gateway for participation in high-leverage segments, ensuring a minimum cognitive capacity to manage risk.

Table7: SEBI's Proposed AI/ML Governance Framework: Aligning Compliance with Market Integrity

Principle Category	Core Requirement (SEBI Paper)	Link to Addressing Jane Street Vulnerabilities
Model Governance	Designated Senior Management oversight; continuous, non-traditional model monitoring.	Addresses algorithmic opacity (H4) and ensures specific accountability for HFT model behaviour.
Operational Resilience	Implementation of circuit breakers; clear back-up/fall-back plans for automated systems.	Mitigates systemic risk from AI errors or unexpected "emergent behaviour."
Transparency & Disclosure	Market participants must disclose AI/ML use to affected clients; provide risk details.	Reduces information asymmetry (H2) and rebuilds confidence post-manipulation (H3).
Data Security & Privacy	Clear policies for cyber security and data retention for model inputs/outputs (min 5 years).	Ensures regulators have the necessary data trails for *ex post* enforcement actions like Jane Street's.

8.2.4. Investor Protection: Enhanced Disclosure and Targeted Education

Given the empirical evidence of low awareness (H2), high exposure, and financial fragility among retail traders , immediate, targeted programs are required to improve retail investor understanding of derivatives risks, leverage, and complex trading strategies. Education must be specifically tailored for the B30 cohorts and low-income demographics where financial vulnerability is highest.

Furthermore, SEBI should require high-impact algorithmic firms and fund managers to disclose summary information about their trading models, use of AI/ML, and their potential systemic market impact and risk profiles on a periodic basis to the regulator. This requirement enhances the interpretability of automated market functions and reduces the information asymmetry between highly sophisticated institutional players and the regulator, thereby supporting the restoration of market trust (H3)

9. Conclusion

The Jane Street case represents a defining regulatory moment for the future governance of algorithmic trading in India. The regulatory and econometric analysis substantiated all core hypotheses, demonstrating that sophisticated, multi-segment manipulation (H1) was engineered on a massive financial scale by leveraging the speed and cross-market coordination of HFT strategies (H4). This complex mechanism directly exploited a large, financially vulnerable retail investor base characterized by low objective financial literacy (H2), leading to widespread losses and a measurable erosion of market confidence (H3).

The regulatory response, which focused on the scale and consistent pattern of trading rather than strict proof of intent, establishes a critical precedent—the **Market Integrity Impact Test (MIIT)**—for governing automated entities. This approach recognizes that in the age of algorithmic opacity, the measurable consequence of trading, especially distortion of public benchmarks like the Bank Nifty index, constitutes sufficient legal grounds for enforcement.

Moving forward, effective market integrity demands a coordinated effort that transcends mere punitive action. It requires continuous technological advancement in surveillance, specifically the implementation of **Cross-Segment Algorithmic Monitoring (CSAM)** to overcome the challenge of fragmented data systems. Additionally, SEBI must formalize its proposed AI/ML governance framework to ensure model transparency, accountability, and operational resilience. Only through these synchronized efforts—technological upgrades, legal clarity, and robust investor education—can SEBI ensure that the undeniable efficiency gains of algorithmic trading do not come at the expense of market fairness and essential retail investor trust

10. Future Research Directions

The regulatory shifts precipitated by the Jane Street case open several critical avenues for future academic and policy research, particularly concerning the interaction between high technology and market governance in emerging economies:

- **Legal Efficacy of the Market Integrity Impact Test (MIIT):** Future studies should track the implementation and legal acceptance of the MIIT precedent in subsequent SEBI enforcement actions against algorithmic entities. Research is needed to determine if this standard effectively lowers the judicial burden of proving *mens rea* (intent) in algorithmic cases, thereby strengthening SEBI's ability to curb advanced abuse.

- **Assessing Algorithmic Governance and Surveillance**: A key focus must be the rigorous, quantitative evaluation of the effectiveness of the proposed Cross-Segment Algorithmic Monitoring (CSAM) systems and the new AI/ML governance frameworks. Researchers should analyse whether these systems—including requirements for senior management oversight and continuous model monitoring—can proactively identify the complex, cross-market "emergent behaviour" that characterized the "Two-Patch Playbook".

- **Longitudinal Retail Investor Behaviour**: Longitudinal surveys are necessary to measure the effectiveness of SEBI's proposed investor education and disclosure reforms. This research should assess changes in retail investors' objective financial literacy metrics, derivatives participation rates, and, crucially, the long-term restoration of confidence in market fairness following the high-profile manipulation and subsequent regulatory action (H3).

- **Systemic Risk from Crypto Interconnection**: Given the increasing sophistication of multi-asset strategies, research should investigate the systemic risks posed by the growing, and often unregulated, interconnection between regulated securities markets and digital asset/cryptocurrency platforms. Understanding the potential for regulatory arbitrage and cross-market manipulation across these distinct asset classes represents a vital challenge for 21st-century financial regulation.

References:

1. Chan, E. P. (2013). *Algorithmic trading: Winning strategies and their rationale*. Wiley.

2. Ghosh, S., & Donadio, S. (2019). *Algorithmic trading: Market structure and statistical methods*. Wiley.

3. Halan, M. (2022). *Let's talk money: Your guide to personal finance*. Penguin India.

4. Graham, B. (2006). *The intelligent investor*. HarperBusiness.

5. O'Hara, M. (2015). *High-frequency trading and its impact on markets*. Princeton University Press

6. Times of India. (2025, July 4). How Jane Street made a staggering Rs 735 crore profit in Indian markets in just a day: SEBI reveals details of manipulation strategy. *Times of India*. **https://timesofindia.indiatimes.com/business/india-business/explained-how-jane-street-made-a-staggering-rs-735-crore-profit-in-indian-markets-in-just-a-day-sebi-reveals-details-of-manipulationstrategy/articleshow/122263118.cms**

7. BBC News. (2025, July 17). Why Jane Street, a US trading giant, is in trouble in India. *BBC News*. **https://www.bbc.com/news/articles/c5y0zgrevl1o**

8. The Economic Times. (2025, July 5). SEBI freezes Rs 4,843 crore assets of Jane Street for marketmanipulation. *TheEconomicTimes*. **https://economictimes.com/markets/stocks/news/sebi-extends-timeline-to-roll-out-algo-trading-for-retail-investors/articleshow/124236705.cms**

9. Reuters. (2025, August 14). How India struggled to regulate Jane Street's money-spinning machine. *Reuters*. **https://www.reuters.com/sustainability/boards-policy-regulation/how-india-struggled-regulate-jane-streets-money-spinning-machine-2025-08-14/**