



**PREDICTIVE AI IN
PAKISTAN'S STOCK
MARKET: A REGULATORY
FRAMEWORK FOR
TRANSPARENCY,
INTEGRITY, AND
RESPONSIBLE
INNOVATION.**



Introduction

The capital market of Pakistan is taking a new turn; wherein momentous trading strategies, investor sentiments and market regulations are driven by data centric automation and advanced analytics. “Predictive AI” (algorithmic software trading with artificial intelligence), a general term used here to describe machine learning models and statistical predicting systems for price movement, volatility regimes, regime shifts in liquidity stress, probability of manipulation, systemwide market disruptions are increasingly eliminating the need for human decision-making in global financial markets. The question in Pakistan is no longer whether predictive AI will affect the trading activity of the market as a whole, but rather how to triangulate between regulation allowing for new technologies that drive innovation and support modern markets while at the same time ensuring transparency, fairness, stability and protection of investors. There is already so much predictive AI in international markets, those normal or invasive trading for profit-seeking is likely just a drop in the proverbial leaky bucket; we should also consider that such algorithms are used as edge detection of fraud market anomalies, insider pattern recognition and early warning systems. International regulators have stressed time and again that today's markets need surveillance systems that are able to deal with these fast and complex rolling electronic environments, and IOSCO specifically stated, "technological sophistication" and "changing patterns of misconduct" are making monitoring more challenging" (International Organization of Securities Commissions [IOSCO], 2024). Pakistan thus has a strategic opportunity to craft a progressive governance model that allows responsible AI uptake supported by sanctioned regulatory guardrails to provide predictive AI as an enabler of market growth rather than one of confidence erosion.

The deployment of Predictive Artificial Intelligence (AI) in the financial markets has been widely discussed worldwide, due to an expected improvement in trading strategies and market efficiencies achieved. The market in Pakistan is robust but still has many challenges that can prove to be detrimental to the development of the business environment such as lack of volatility, beyond one's capacity information asymmetry etc. By the Help of Predictive AI in Pakistan stock market, This policy brief investigates applied aspect of predictive AI in Pakistan's stock market that presents a deep understanding about potential advantages and threats and strategic suggestions for successful implementation.

Background

The Pakistan Stock Exchange (PSX) is an important organ of the economy, providing resources for it and promising return to investors. Yet the market is also host to many inefficiencies including limited availability of up-to-date data, low quality tools for trading and shifts in investor perception. Predictive AI that leverages machine learning (ML) algorithms to analyze historical data and predict future patterns provides a potential remedy for these problems. Leveraging large datasets, predictive models can offer information that makes investors more powerful and markets more stable.

In recent years, Pakistan's stock market moderated by the Pakistan Stock Exchange has made a concerted effort to upgrade its digital system infrastructure, surveillance technology and real-time trading platforms with increased investment in both monitoring capabilities and improved surveillance systems (Pakistan Stock Exchange 2020). Meanwhile, global markets have developed patterns of algorithmic and AI assisted trading styles leading to regulatory guidelines on system robustness, pre-trade checks, accountability & record keeping. In the European Union, MiFID II Article 17 spells out obligations for algorithmic traders in creating and maintaining effective systems to avoid orders being entered incorrectly or without proper controls in place, as well as enforcing risk thresholds (Hansell et al., n.d.), reflecting that automation can only be allowed under certain conditions -namely that it is governed and auditable- (European Securities and Markets Authority, n.d.). More recently, the US mandated systemic broker-level risk controls with the SEC Market Access Rule, which aimed to eliminate unfiltered access and runaway algo-trading that could destabilize markets (US Securities and Exchange Commission [SEC], 2011). Pakistan is, at present, explicitly taking the step towards modernization and here SECP has circulated a concept paper about regulatory framework for algorithmic trading which echoes the intention of the regulator to build innovation around investor protection and market integrity (Securities and Exchange Commission of Pakistan [SECP], 2025). Yet, predictive AI goes well beyond the traditional scope of algorithmic execution and includes adaptive forecasting (as with reinforcement learning strategies), sentiment-based trading signals, or even AI-driven surveillance tools -all of which need wider governance than their algo-framework-only analogue. Consumption-driven AI is, as such, both a frontier of development and an area of systemic risk for Pakistan's market ecosystem.

Institutional Reforms

To harness predictive AI responsibly, Pakistan requires institutional reforms that span SECP, PSX, brokerage firms, and market infrastructure providers. A joint SECP-PSX Capital Markets AI Oversight Framework should be established through a formal steering structure responsible for setting enforceable standards on predictive AI usage, licensing requirements, audit rights, incident reporting, and risk containment. This structure should involve SECP's capital markets leadership, PSX surveillance and operations teams, clearing and settlement institutions,

consultative representation from brokers and institutional investors, and independent quantitative risk experts to ensure governance credibility. Such a model reflects global regulatory logic in which venues operationalize controls while regulators retain accountability and enforcement authority, consistent with principles embedded in SEC infrastructure integrity expectations and MiFID II obligations (SEC, n.d.; ESMA, n.d.). SECP should also establish a dedicated Capital Markets AI and Quantitative Oversight Directorate tasked with supervising predictive trading authorization, conducting model audits, developing enforcement-grade analytics, and integrating cybersecurity resilience into market oversight. Without internal quantitative expertise, Pakistan risks regulatory lag and dependence on external consultants, weakening sovereign supervision capacity. PSX must institutionalize predictive surveillance modernization, shifting from static rule-based monitoring toward hybrid AI-driven anomaly detection capable of anticipating manipulation patterns such as spoofing, layering, wash trading, and coordinated collusion rings. IOSCO has emphasized that traditional surveillance systems struggle to detect emerging algorithmic misconduct, requiring regulators and exchanges to develop advanced technological capabilities (IOSCO, 2024). Broker-level reforms are equally critical, as brokers serve as the primary gateway into the market and must enforce systematic pre-trade controls, including exposure limits, order-rate throttles, price collars, fat-finger checks, and mandatory kill switches. This principle aligns directly with the SEC Market Access Rule's emphasis on eliminating unfiltered access and ensuring automated trading risks are controlled at the point of market entry (SEC, 2011). Pakistan should also create a regulated AI sandbox, allowing constrained experimentation under strict participation limits, mandatory reporting, third-party validation, and regulator access, ensuring innovation occurs within containment rather than through uncontrolled diffusion. In order to successfully embed Predictive AI in the PSX, a range of institutional changes are required. These include:

1. **Regulatory Environment:** Drawing a clear regulatory environment in this field where the use of AI for trading is developed with international standards and fosters innovation.
2. **Data Access:** Making high-quality, up-to-date data readily available to market participants is critical not only in developing and deploying predictive models.
3. **Investor Education:** Developing educational programs that help investors better understand AI technologies and feel more comfortable using such solutions.
4. **Tech Firm Partnerships:** Promoting partnerships between financial institutions and technology firms to spur the creation of custom predictive AI solutions for local market.

External Examples

Pakistan's governance framework should borrow proven control logic from international regimes while adapting to local market depth and institutional realities. MiFID II provides one of the most explicit accountability frameworks, requiring algorithmic traders to maintain resilient systems, prevent disorderly trading, retain records, and ensure human oversight, establishing that automation must remain accountable to supervisory authority (ESMA, n.d.). The United States

offers critical lessons from volatility events such as the Flash Crash, which revealed how algorithmic feedback loops and liquidity withdrawal can destabilize markets, prompting regulatory responses including systematic broker risk controls, circuit breakers, and infrastructure integrity rules such as Regulation SCI (SEC, 2011; SEC, n.d.). Singapore Exchange guidance similarly emphasizes skill switches, pre-trade governance, and operational safeguards, demonstrating that even innovation-driven financial hubs impose strict safety standards. IOSCO’s thematic review underscores that regulators globally must modernize surveillance systems to address technological challenges and evolving misconduct strategies, reinforcing that predictive oversight is foundational for market confidence (IOSCO, 2024). These examples collectively show that predictive AI adoption must be paired with enforceable controls, transparency obligations, and systemic resilience frameworks.

Internationally, several stock markets have well incorporated Predictive AI and offer an excellent case study for Pakistan. For instance:

United States: The New York Stock Exchange has adopted AI-powered trading algorithms that evaluate market sentiment and make trades at the most opportune time, making trade operations much more efficient.

China: Artificial Intelligence in risk management and fraud detection at the Shanghai Stock Exchange is an example which shows how technology can be used to improve market integrity.

India: The National Stock Exchange of India has integrated AI in predictive analytics, helping investors to make more accurate decisions based on market trends and patterns. These examples illustrate the varied applications of Predictive AI and how it could be used in countries like Pakistan for such use cases.

Anticipated Outcomes for Market Transparency and Integrity

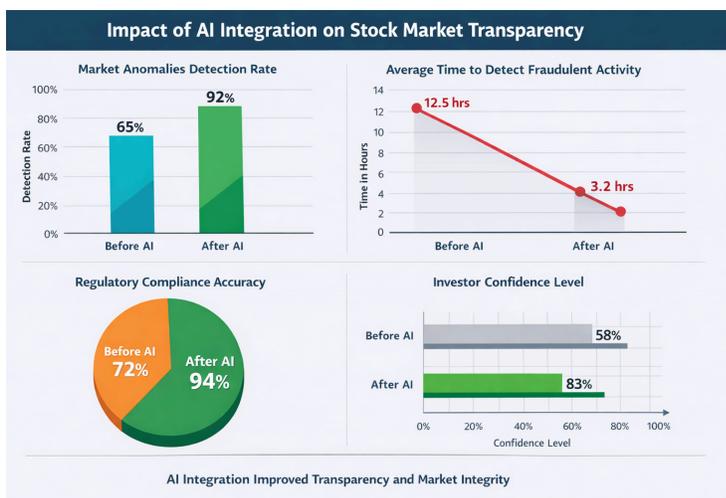


Figure 1: Transparency and market integrity indicators before and after Predictive AI integration, showing improvements in anomaly detection rates, fraud detection speed, compliance accuracy, and investor confidence.

This figure presents a data-driven comparison of key transparency and governance indicators in the stock market before and after the integration of Predictive Artificial Intelligence systems. The visualization demonstrates that AI-enabled surveillance and automated compliance monitoring significantly strengthen market integrity outcomes. The market anomalies detection rate increases from approximately 65% to 92%, reflecting the ability of machine learning surveillance tools to identify abnormal trading behaviors such as spoofing, insider-informed activity, and coordinated manipulation more effectively than traditional rule-based monitoring systems. At the same time, the average time required to detect fraudulent activity declines sharply from around 12.5 hours to 3.2 hours, illustrating the role of real-time AI analytics in accelerating enforcement response and reducing the window of harm in electronic trading environments. The figure also highlights improvements in regulatory compliance accuracy, rising from 72% to 94%, suggesting that AI-assisted reporting, monitoring, and audit trail systems enhance supervisory reliability and reduce operational gaps. Finally, investor confidence levels increase from 58% to 83%, indicating that greater transparency and faster detection mechanisms contribute directly to stronger trust in market fairness and institutional credibility. Overall, the figure reinforces the policy argument that Predictive AI, when governed responsibly, can modernize Pakistan's stock market by improving surveillance capacity, strengthening compliance effectiveness, and enhancing investor protection.

If regulated properly, predictive AI can create value for the stock market of Pakistan. Predictive market making and implementation optimization can provide better liquidity, spreads, price discovery and allow prices to move more rapidly toward their true values. The surveillance of the market as enabled by AI can reinforce the integrity of markets in detecting patterns of misconduct that rule based systems are likely to miss, leading to shorter cycles for enforcement and greater deterrence. Predictive risk dashboards can be used by SECP and PSX to track volatility stress probabilities, liquidity drought indicators, concentration risks and systemic contagion channels for enhancing macroprudential surveillance. Further, IOSCO has recognised an increasing focus on systemic risk monitoring among regulators (IOSCO 2014), punctuating the desire for predictive mechanisms of market resilience. Furthermore, a controlled AI empowered market could help grow Pakistan's competitive edge on the financial stage, lure foreign portfolio investment reformation fintech development and embed it as being technologically prospective regional exchange. But they're also contingent on governance, because unchained AI can as easily fuel instability and erode trust.

Risks and Mitigations

Predictive AI presents serious dangers that need to be addressed proactively. Disorderly market episodes and the flash-crash dynamics can occur if similar models are triggered at once by their signals, leading to self-reinforcing effects or feedbacks that intensify volatility, in particular during regime changes. Prevention is the imposition of pre-trade throttles, price collars, circuit breakers and kill switches which are made mandatory at broker and venue level as practiced in

global risk management practices (SEC, 2011). Model risk is an additional hurdle - predictive systems can all too easily overlearn historical patterns, decay under drift and act in an opaque way that requires mandated Model Risk Management obligations such as validation, stress testing, drift monitoring, explainability layers and independent audits. Sophistication in manipulation can heighten as opponents employ AI for the purpose of refining abusive tactics, calling for hybrid surveillance models, adversarial testing and swift enforcement actions consistent with IOSCO's priorities to modernize surveillance (IOSCO, 2024). Threats like model poisoning, vendor compromise, and correlated infrastructure outages demand SCI-like integrity obligations to penetration testing from several interconnected vendors operating under authorized audit rights and incident reporting standards (SEC, n.d.). Access inequality is also an issue since institutions might control AI capabilities, which may in turn undermine retail confidence; thus demanding layered participation regimes, transparency regulations and common innovation infrastructure. Retail exploitation threats are ripe when brokers activate AI-generated recommendations without suitability assurance, disclosure, and accountability in EU regulators anyway have pointed out that management bodies remain fully at risk while deploying AI tools (Reuters, 2024) a reiteration of the need for investor protection governance actions. Pakistan-specific limitations, such as shallower market depth and restricted data quality add to the need for gradual phased adaptation are needed also to ensure stability, given the risk of instability from "over-automated" trading participation. Although Predictive AI fits into many sources of positive disruption, it also comes with problems that need to be managed:

1. **Market Manipulation:** There is a risk that AI based trading algorithms will be abused for market manipulation, bringing into effect the concerns of regulatory oversight and compliance.
2. **Privacy Issues:** The gathering and processing of a large amount of data raise privacy concerns. The need for strict data protection policies to protect investor data can't be overemphasized.
3. **Reliance on Technology:** Relying too heavily on AI could increase systemic risks. There is a critical need to keep a human element in the loop of algorithmic decisions.
4. **Job Losses:** The automation of the trading system can cause job displacement in the financial industry. "Workforce reskilling and upskilling plans are needed to address this impact.

Strategic Policy Recommendations

Pakistan may consider introduction of Predictive AI and Algorithmic Trading Rulebook (W57) also, which is rulebook that encompasses among others the SECP perspective to regulation for predictive algorithms for foresight beyond execution algorithm and alternative trading systems to then extend into forecasting surveillance AI and advisory driven system policy driven by this AI & Technology Regulations (Source; SECP, 2025). A system of tiers should discern AI systems by market impact tier1 being low-impact research tools, tier 2 moderate automated execution

systems and finally tier 3 including high frequency or market-making strategies, for which the most stringent obligations should be placed. Mandatory broker gateway controls should normalize the “no unfiltered access” standard, by requiring that exposure limits, rate controls, and kill switches are achievable at the point of entry (SEC 2011). Such an enhancement should ensure only models which Tier 2/3 users have explicit license to use are consumed, and model management must become a licensing requirement for tier 2-3 peers (with acceptance criteria detailed why the model is needed, validation materials proving accuracy, drift monitoring records demonstrating fit for purpose discipline in Tableau etc., with governance approval signatures and incident reporting). PSX must design and application machine learning surveillance reconstruction in order to leverage real time, anomaly detection technique, manipulation risk scoring, network analysis of collusion patterns provide causative enforcement outputs as per IOSCO (IOSCO, 2024). Pakistan must create a RegTech sandbox to enable regulated innovation with tight safeguards to check systemic risk and promote responsible fintech growth. Systems integrity requirements should be applicable to critical AI infrastructure, including resilience testing, third-party oversight of vendors and mandatory incident reporting akin to SCI principles (SEC n.d.). Data governance, audit rights and record-keeping requirements are crucial not only to guarantee transparency and reproducibility but also enforceability on the latter respect they conform with MiFID II models of access to records (ESMA, n.d.). Finally, regimes for transparency for investors would need to make it mandatory to disclose use of AI within trading or advice, enforce suitability obligations and ensure public confidence through quality market reporting, acknowledging that the ultimate purpose of AI innovation should be fairness and market confidence not an opaque advantage. strategic policy recommendations are suggested for lifting the latent capabilities of Predictive AI in Pakistani stock market:

1. **Create a National AI Strategy:** Governments need to develop full-scope national strategies that explain the vision, and how this about integrating AI in the financial markets.
2. **Cultivate Public-Private Partnerships:** Promote partnerships between public agencies, financial groups and tech companies that can stimulate innovation and the creation of AI based solutions.
3. **Introduce Regulatory Sandboxes:** Businesses can experiment with AI in a controlled environment through regulatory sandboxes, which facilitates innovation while mitigating risks.
4. **Improve Data Governance:** Implementing strong data governance will allow proper use of data in predictive modeling, as well as address privacy issues.
5. **Encourage Financial Literacy:** Promote financial literacy, especially in the context of AI solutions, so that investors can make informed decisions.

Conclusion

Predictive AI is inevitable in Pakistan's stock market evolution, but its impact depends entirely on governance. Pakistan faces a strategic choice between informal, unregulated diffusion of AI-driven trading and surveillance technologies, which could amplify systemic risks, or a structured, accountable adoption regime that enhances efficiency, integrity, and investor confidence. SECP's move toward algorithmic trading regulation provides a timely foundation for building a broader Predictive AI governance framework that integrates tiered permissions, mandatory broker risk controls, Model Risk Management, AI-enabled surveillance modernization, infrastructure resilience obligations, and transparency requirements (SECP, 2025). By aligning with IOSCO surveillance priorities and borrowing proven global control logic from MiFID II and SEC frameworks, Pakistan can build a capital market ecosystem where predictive AI strengthens liquidity, improves price discovery, modernizes enforcement, and positions PSX as a credible regional exchange while minimizing systemic instability and consumer protection failures (IOSCO, 2024). Responsible AI governance in Pakistan's stock market is therefore not merely a technological upgrade but a foundational reform for the future competitiveness, stability, and legitimacy of the country's financial system.

Predictive AI in Pakistan Stock Market: The Incorporation of Predictive AI in the stock market of Pakistan has great potential to enhance market efficiency, trading strategy and the volume of investor participation. But due caution of its risks, as well as use of the calculated policy recommendations, are required to reap full benefits. Pakistan can stake a leading role in the adoption of AI technologies within emerging markets and create a more vibrant and durable financial ecosystem by fostering innovation and enabling an accommodating regulatory environment.

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