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The Role of Artificial Intelligence in Reshaping Trading Strategies and Price Discovery in Financial Markets

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Abstract

Artificial Intelligence (AI) is rapidly transforming the structure and functioning of financial markets by reshaping trading strategies and the process of price discovery. This study examines the role of AI in Indian financial markets, where algorithmic and AI-assisted trading have moved from niche applications to core market infrastructure. Drawing on recent secondary data from regulatory reports, stock exchanges, and industry studies (2020-2025), the chapter analyses how AI-driven models influence trading behaviour, liquidity, volatility, and market efficiency. The findings indicate that AI-based and algorithmic systems now account for a dominant share of trading activity in India, with over 60% of total trading volume and an even higher share in derivatives. The Indian algorithmic trading market, valued at over USD 560 million in 2024, is projected to grow strongly in the coming years, reflecting increased institutional and gradual retail adoption. AI tools enable high-speed data processing, predictive analytics, and automated execution, allowing faster incorporation of information into prices and thereby improving price discovery. Evidence suggests tighter bid-ask spreads, lower transaction costs, and deeper liquidity in actively traded securities. However, the study also highlights a dual impact. While AI improves efficiency and liquidity under normal conditions, it can amplify short-term volatility during market stress due to synchronized algorithmic responses. Additional concerns include model risk, black-box decision-making, cybersecurity vulnerabilities, and potential market concentration among technologically advanced participants. Regulatory initiatives by SEBI such as algorithm registration norms, audit requirements, and risk controls play a critical role in balancing innovation with investor protection. The study concludes that AI has become a structural driver of modernization in Indian financial markets, enhancing speed, efficiency, and liquidity. Yet, its long-term benefits depend on robust governance, transparency, and responsible AI frameworks. Future research should focus on empirical measurement of AI's long-run effects and the development of explainable AI systems for inclusive and stable markets.

Keywords: Artificial Intelligence, Algorithmic Trading, Price Discovery, Market Efficiency, Financial Markets.

Introduction

The advent of AI has profoundly reshaped financial markets worldwide, and India's capital markets are no exception. In recent years, AI adoption has accelerated across trading platforms, risk management systems, and regulatory oversight frameworks, fundamentally altering how price discovery and trading strategies operate. AI-driven techniques especially algorithmic and machine-learning-based models are now central to many trading approaches, enabling automated execution, rapid pattern detection, and more sophisticated risk controls that were previously infeasible at scale. In India, the algorithmic trading market itself reached an estimated USD 562.20 million in 2024, and it is projected to expand further as AI, machine learning, and cloud computing drive broader automation and strategic trading adoption. This growth reflects a structural shift: recent analyses indicate that algorithmic systems account for more than 60% of overall trading volume in Indian markets, with particularly strong penetration in derivatives segments. Such scale signals that AI-augmented models are no longer niche tools for institutional desks but are becoming core infrastructure for price discovery and execution efficiency across market segments.

At the same time, India's market regulator, the SEBI, has taken active steps to govern and guide AI use in trading. In 2025, SEBI issued a consultation paper proposing guidelines for responsible AI/ML deployment in securities markets, emphasizing transparency, governance, fairness, and risk controls to balance innovation with investor protection. Additionally, updates to algorithmic trading frameworks such as revisions to the Order-to-Trade Ratio rules effective from April 2026 seek to refine market incentives and ensure that AI-driven strategies contribute to healthy liquidity and fair price formation without excessive speculative excess. AI's influence extends beyond execution mechanics to the broader price-discovery process. Machine learning models can ingest vast volumes of historical and real-time data, detect subtle structures in order books, and adapt strategies to evolving market conditions thereby enhancing signal quality and reducing latency in decision-making. Nonetheless, such transformative potential brings systemic and governance challenges. Algorithmic dominance raises questions about market stability, fairness, and the risk of crowding effects when large AI models converge on similar trade signals. Moreover, regulatory attention has been sharpened by high-profile enforcement actions against trading practices deemed manipulative, illustrating the fine line between sophisticated strategy and unhealthy market distortion.

In this context, India's financial ecosystem is experiencing a gradual and sophisticated integration of AI, where advancements in trading strategies and price discovery are carefully balanced with emerging regulatory frameworks and risk-aware oversight. This study explores the transformative role of AI in reshaping trading

approaches, improving the efficiency of price discovery, and aligning with the regulatory requirements within India's dynamic and rapidly evolving financial markets.

Objectives

- To examine the extent of adoption of AI-based trading strategies in Indian financial markets.
- To analyse the role of AI in enhancing price discovery and market efficiency in Indian stock exchanges.
- To assess the impact of AI-driven algorithmic trading on liquidity, volatility, and trading behaviour in India.
- To evaluate the regulatory and risk management challenges associated with the use of AI in Indian securities markets.

Methodology

This study adopts a descriptive and analytical research design to examine the role of AI in reshaping trading strategies and price discovery in financial markets, with special reference to India. The research is primarily based on secondary data sources, including recent reports from SEBI, RBI publications, stock exchange statistics (NSE and BSE), research articles, industry reports, and peer-reviewed journals published between 2020 and 2025. Relevant data on algorithmic trading volumes, AI adoption rates, and market performance indicators are systematically reviewed and compared. The study also uses a qualitative content analysis approach to interpret policy documents and regulatory guidelines related to AI and algorithmic trading. Trends and patterns are identified to understand AI's influence on efficiency, liquidity, and volatility.

Growth of AI and Algorithmic Trading

AI-enabled algorithmic trading has seen substantial quantitative growth in India's financial ecosystem. The India algorithmic trading market was valued at approximately USD 562.20 million in 2024, reflecting strong uptake of AI, machine learning, and cloud-based execution tools among institutional and advanced retail participants. Projections suggest continued expansion, with the market expected to reach between USD 1.08 billion USD 2.61 billion by 2032, implying double-digit annual growth trends. Additionally, India captured an estimated 5% share of the global algorithmic trading market in 2024, underscoring its rising presence regionally and globally.

Market Participation and Trading Volume

Recent industry data indicate that algorithmic techniques many of which rely on AI components such as predictive analytics and automated execution now dominate a significant share of trading activity in Indian markets. Over 60% of overall trading volume in stock markets is attributed to algorithmic orders, demonstrating the

deep penetration of AI-assisted strategies in real trading flow. In comparison with developed global markets (where algorithmic share often reaches 60-70%), India's adoption is rapidly catching up. This trend highlights that contributions from AI-enabled strategies are not isolated but constitute a substantial portion of transaction dynamics on exchanges such as NSE and BSE.

Retail and Institutional Integration

While institutional use of AI-based algorithmic systems remains dominant, retail adoption is also increasing. With SEBI opening access to algorithmic and AI-assisted tools for retail investors through regulated broker APIs and platforms, more individual traders are exploring automated strategies. Reports suggest that at least 10% of retail investors use AI tools or chatbots (like ChatGPT) for stock selection and trading insight generation, reflecting spreading interest among non-institutional participants. Though exact figures vary, this demonstrates uptake beyond traditional investment models and signifies a broader democratization of AI in financial decision-making.

Broader AI Adoption Context

The wider environment of AI adoption in India supports financial market trends: a Microsoft study found that 65% of Indians had used AI technologies in various capacities, well above global averages, suggesting a strong domestic readiness for AI integration into sectors like finance. This societal embrace of AI underpins the increasing appetite for AI-assisted trading, analytics, and automated execution tools in financial markets. The extent of adoption of AI-based trading strategies in India is summarized through key indicators presented in Table 1, show market size, trading volume share, and investor participation.

Table 1: Indicative Data on AI-Based Trading Adoption

Indicator	Value/Trend
Algorithmic trading market size (2024)	USD 562.20 million
Projected market size (2032)	USD 1.08 billion 2.61 billion
India's share of global algo trading	5% (2024)
Algo trading share of total volume	60%
Retail AI tool usage in trading	10% of investors
General AI usage in India	65% of population

Source: Industry and market research reports on algorithmic and AI adoption (2024–2025)

Table 1 presents key indicators reflecting the growing adoption of AI-based trading in India. The data shows that the algorithmic trading market is valued at USD 562.20 million in 2024 and is projected to grow significantly by 2032, indicating strong future expansion. India currently accounts for about 5% of global algorithmic trading, while nearly 60% of total trading volume in the country is driven by algorithmic systems, highlighting their dominant role in market operations. Additionally, around 10% of retail investors are using AI-based tools for trading, demonstrating gradual

penetration at the individual level. The broader context of AI adoption is also evident, with 65% of the population engaging with AI technologies, which supports the increasing integration of AI in financial markets. Overall, the table reflects a clear trend toward rising reliance on AI-driven trading mechanisms in India.

AI's Contribution to Faster Price Adjustment

AI enabled trading models help Indian stock exchanges incorporate information into prices more rapidly than manual systems, contributing to improved price discovery and market efficiency. By mid-2025, algorithmic and AI-assisted trading systems were estimated to account for around 55% of all orders placed on Indian exchanges such as the NSE and Bombay Stock Exchange (BSE), a sharp increase from earlier years. This higher proportion of automated trades implies that price changes increasingly reflect real-time data and signals generated by machine learning models, reducing delays in information assimilation. AI models process vast datasets including order books, historical prices, and macroeconomic indicators enabling prices to adjust more quickly to new public information and lowering information asymmetry among traders.

Liquidity Enhancement and Spread Reduction

Empirical observations and market reports indicate that algorithmic and AI-driven strategies have improved market liquidity in India. As AI-enabled algorithms continuously place buy and sell orders, they contribute to tighter bid-ask spreads and more resilient markets, especially in high-volume securities. Prior studies show that increased algorithmic trading tends to be associated with improved liquidity and lower transaction costs across global markets, including India. For example, the prevalence of algorithmic order flows has led to more competitive quoting, which typically narrows bid-ask spreads by several basis points in actively traded equities and index futures meaning lower execution costs for investors. Better liquidity also enhances depth, reducing price impact costs for large trades and supporting more accurate price discovery across market segments.

Empirical Evidence from Market Studies

Quantitative research using high-frequency data from the Indian equity market finds that algorithmic participation contributes positively to price formation and efficiency. Higher algorithmic trading activity correlates with reduced price volatility and quicker adjustment of prices toward equilibrium after information shocks, a hallmark of improved semi-strong form market efficiency. Although exact percentages for efficiency improvements are still emerging in academic literature, studies demonstrate that markets with greater algorithmic participation exhibit tighter spreads and lower short-term inefficiencies, suggesting a measurable role of AI and automation in advancing price discovery. The quantitative impact of AI on price discovery and market efficiency in Indian stock exchanges is showed in Table 2.

Table 2: AI's Role in Price Discovery and Efficiency

Indicator	Trend/Value
Percentage of orders via algorithmic/AI systems	55 % statewide adoption on Indian exchanges
Impact on bid-ask spreads	Tighter spreads by several basis points due to enhanced liquidity
Liquidity contribution	Increased continuous quoting improving depth in active stocks
Speed of information incorporation	Faster adjustment to news and data via automated models
Transaction cost trend	Reduction in execution costs for large trades

Source: SEBI reports, NSE market statistics, and recent industry studies on algorithmic trading (2023–2025)

Table 2 presents the growing influence of AI and algorithmic trading on price discovery and market efficiency in Indian stock exchanges. With approximately 55% of orders executed through AI-based systems, there is clear evidence of widespread adoption. The data indicate that algorithmic participation contributes to tighter bid-ask spreads, enhanced market liquidity through continuous quoting, and faster incorporation of information into prices. Additionally, the reduction in transaction costs for large trades reflects improved execution efficiency. Overall, these indicators demonstrate that AI plays a significant role in strengthening market quality, efficiency, and the price discovery process in India's financial markets.

Impact of AI on Market Liquidity

AI-driven algorithmic trading has played a significant role in enhancing liquidity in Indian financial markets. Liquidity refers to the ease with which securities can be bought or sold without causing major price changes. In India, algorithmic and AI-based trades now account for more than 60% of total trading volume, with the share exceeding 70% in the derivatives segment, particularly in index futures and options. This high participation ensures continuous availability of buy and sell orders, reducing gaps in the order book. AI-powered market-making algorithms actively provide two-way quotes, dynamically adjusting prices based on demand supply conditions and volatility. As a result, bid-ask spreads in actively traded stocks and indices have narrowed by 5-15 basis points over the past decade. Improved liquidity lowers transaction costs, encourages higher participation from institutional and retail investors, and supports smoother price discovery. The presence of AI thus contributes to deeper and more resilient markets, especially during normal trading conditions.

Influence on Market Volatility

The relationship between AI-driven trading and market volatility is complex. On one hand, AI systems stabilize markets by improving liquidity and absorbing order imbalances. Empirical observations in Indian markets show that higher algorithmic

participation is associated with lower intraday volatility in large-cap stocks, as continuous trading reduces abrupt price jumps. For example, highly liquid indices such as the NIFTY 50 exhibit relatively stable volatility despite rising trading volumes. On the other hand, during periods of market stress such as sudden macroeconomic announcements or global shocks AI-driven strategies may amplify short-term volatility. High-frequency algorithms reacting simultaneously to the same signals can lead to rapid price movements. However, regulatory safeguards like circuit breakers, order-to-trade ratio limits, and real-time surveillance mechanisms help contain extreme volatility. Overall, while AI may intensify short-term fluctuations under stress, its net impact in normal conditions has been volatility-moderating rather than volatility-increasing.

Changes in Trading Behaviour and Market Structure

AI adoption has significantly altered trading behaviour in India. Trading has shifted from discretionary, long-horizon decision-making to data-driven, short-term, and systematic strategies. AI models analyse microsecond-level data, resulting in increased order frequency and reduced average trade size. This has led to a higher number of trades but lower per-trade value, reflecting fragmented and rapid execution strategies. Institutional traders increasingly rely on AI for execution optimization, arbitrage, and risk-neutral strategies, while retail traders are gradually adopting semi-automated and AI-assisted tools. Reports indicate that around 10-15% of active retail investors now use AI-based analytics, robot-advisory platforms, or automated trading systems. This behavioural shift has improved market participation but also increased the need for financial literacy and robust risk management. The influence of AI-driven algorithmic trading on liquidity, volatility, and trading behaviour is summarized in Table 3.

Table 3: Impact of AI-Driven Trading on Indian Financial Markets

Aspect	Evidence / Trend
Share of algorithmic trading	60% overall; 70% in derivatives
Impact on liquidity	Narrower bid-ask spreads by 5-15 basis points
Effect on volatility	Lower intraday volatility in large-cap stocks
Trade characteristics	Higher order frequency, lower average trade size
Retail participation using AI	10-15% of active traders

Source: SEBI reports, NSE/BSE market statistics, and recent industry studies on algorithmic and AI-based trading in India (2020–2025).

Table 3 presents the impact of AI-driven trading on Indian financial markets. Algorithmic trading accounts for approximately 60% of total market activity, rising to nearly 70% in the derivatives segment. The adoption of AI has improved liquidity, evidenced by a reduction in bid-ask spreads by 5–15 basis points. It has also contributed to lower intraday volatility in large-cap stocks. Trading behaviour has shifted toward higher order frequency and reduced average trade size, indicating

faster and more fragmented execution. Additionally, about 10–15% of active retail traders now use AI-based tools. These figures collectively demonstrate the growing quantitative influence of AI on market structure, efficiency, and participation.

Regulatory Challenges in Governing AI-Driven Trading

The rapid expansion of AI-driven and algorithmic trading in India has posed significant regulatory challenges. Financial markets operate on fairness, transparency, and investor protection, but AI systems often function as “black boxes,” where decision processes are not easily interpretable. This makes it difficult for regulators to trace the logic behind certain trades or detect whether strategies unintentionally create unfair advantages. Indian regulators have introduced frameworks requiring algorithm registration, audit trails, and broker-level approvals before deployment. However, the speed and self-learning nature of AI models complicate supervision. Unlike static algorithms, AI models can evolve based on new data, which raises questions about accountability and control. Regulators must therefore continuously update compliance norms to match technological sophistication. Another challenge is cross-border trading, where AI systems operate across jurisdictions, creating regulatory overlaps and enforcement difficulties.

Risk Management and Systemic Stability

AI-based trading introduces new dimensions of financial risk. One major concern is model risk, where flawed training data or biased algorithms produce incorrect signals. Even a small coding or data error can lead to large-scale trading losses within seconds. Globally, algorithmic errors have previously caused flash crashes, and Indian markets remain cautious about similar risks. There is also systemic risk arising from strategy crowding. When multiple AI systems use similar data and models, they may generate identical buy or sell signals simultaneously, amplifying market movements. For instance, if many AI models detect a bearish trend at once, synchronized selling could intensify price declines. To manage this, Indian exchanges use circuit breakers, margin requirements, and order-to-trade ratio controls. Stress testing and back-testing requirements are increasingly emphasized to ensure system robustness. Cybersecurity is another risk dimension. AI systems rely heavily on digital infrastructure, making them vulnerable to hacking, data breaches, and manipulation. A compromised trading algorithm could disrupt markets or exploit price movements unfairly. Hence, strong encryption, system audits, and surveillance mechanisms are essential components of risk management.

Findings and Discussion

The analysis of data (2020–2025) clearly indicates that AI has become a dominant force in India’s financial markets, significantly influencing trading strategies, price discovery, liquidity, and overall market structure:

- **Extent of AI Adoption in Trading:** The findings reveal a substantial rise in AI-based trading adoption. The algorithmic trading market in India reached USD 562.20 million in 2024 and is projected to grow to USD 1.08–2.61 billion by 2032, reflecting strong expansion. AI-driven and algorithmic systems now account for over 60% of total trading volume, with an even higher share of around 70% in derivatives markets. Additionally, about 55% of total orders on stock exchanges are executed through AI-based systems. Retail participation, though comparatively lower, is steadily increasing, with 10–15% of active traders using AI-assisted tools. These figures confirm that AI is no longer a supplementary tool but a core component of trading infrastructure.
- **AI and Price Discovery Efficiency:** The study finds that AI significantly enhances price discovery by accelerating the incorporation of information into market prices. With 55% of orders driven by algorithmic systems, price adjustments occur faster due to real-time data processing. AI contributes to narrower bid-ask spreads (by several basis points) and reduced transaction costs, especially for large trades. Improved liquidity and continuous quoting further strengthen market efficiency. These results suggest that AI supports semi-strong form efficiency by reducing information asymmetry and improving the speed and accuracy of price formation.
- **Impact on Liquidity and Transaction Costs:** AI-driven trading has positively impacted market liquidity. The dominance of algorithmic trading (60–70% market share) ensures continuous buy and sell orders, enhancing market depth. Empirical data show that bid-ask spreads have narrowed by 5–15 basis points, indicating lower transaction costs and improved execution efficiency. This increased liquidity benefits both institutional and retail investors by enabling smoother and faster trade execution.
- **Influence on Market Volatility:** The findings present a mixed impact of AI on market volatility. Under normal conditions, increased algorithmic participation contributes to lower intraday volatility, particularly in large-cap stocks, due to continuous trading and improved liquidity. However, during periods of market stress, synchronized algorithmic responses may amplify short-term volatility. Despite this, regulatory mechanisms such as circuit breakers and order controls help mitigate extreme fluctuations, ensuring overall market stability.
- **Changes in Trading Behaviour and Market Structure:** AI adoption has transformed trading behaviour from traditional, long-term discretionary approaches to high-frequency, data-driven, and systematic strategies. The market now exhibits higher order frequency and lower average trade size, indicating rapid and fragmented execution. Institutional investors heavily rely on AI for arbitrage and execution strategies, while 10–15% of retail traders

are adopting AI-based platforms. This shift reflects increased market participation but also highlights the growing need for financial literacy and risk awareness.

- **Regulatory and Risk Management Challenges:** The study identifies several challenges associated with AI-driven trading. The “black-box” nature of AI models complicates transparency and regulatory oversight. Risks such as model errors, algorithmic bias, and cybersecurity threats pose potential threats to market stability. Additionally, strategy crowding may lead to synchronized trading behaviour, increasing systemic risk. Regulatory initiatives by SEBI, including algorithm registration, audit requirements, and risk controls, play a crucial role in managing these challenges. However, continuous regulatory evolution is necessary to keep pace with technological advancements.

Discussion

Overall, the findings demonstrate that AI has significantly improved market efficiency, liquidity, and execution speed in Indian financial markets. Quantitative evidence such as 60% more than trading volume share, 55% algorithmic order execution, and 5–15 basis point spread reduction confirms its transformative impact. However, the benefits of AI are accompanied by emerging risks related to volatility, transparency, and systemic stability. Therefore, while AI serves as a key driver of modernization, its long-term effectiveness depends on robust regulatory frameworks, responsible AI usage, and enhanced risk management practices.

Conclusion

The study concludes that AI has emerged as a transformative force in India’s financial markets, fundamentally reshaping trading strategies and the process of price discovery. AI-driven and algorithmic systems have become an integral part of market operations, enhancing efficiency through faster information processing, improved liquidity, and reduced transaction costs. These advancements have contributed to more accurate and timely price discovery, making markets more dynamic and responsive. However, the study also highlights important challenges, including the potential for increased volatility during periods of market stress, model risk, lack of transparency in decision-making, and cybersecurity concerns. In this context, the role of regulatory authorities such as Securities and Exchange Board of India is crucial in ensuring a balance between innovation and investor protection. Overall, while AI has significantly improved market performance, its long-term sustainability depends on strong governance, transparency, and responsible implementation.

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