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## ARTICLE

# From Cognitive Bias to Algorithmic Influence: Theoretical Shifts in Behavioral Finance

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## ABSTRACT

Behavioral finance emerged as a response to the limitations of classical financial theory, revealing that investor behavior is shaped by cognitive biases, heuristics, and emotional influences rather than pure rationality. The rapid diffusion of artificial intelligence (AI) across financial systems now challenges this foundation, introducing new dynamics in how decisions are made, information is processed, and markets evolve. This paper examines the theoretical implications of AI for behavioral finance, proposing that algorithmic systems act not merely as analytical tools but as active participants in financial cognition. Through concepts such as computational rationality, algorithmic irrationality, and algorithmic nudges, the study explores how technology both mitigates and amplifies human biases, creating hybrid decision environments where psychological and algorithmic factors interact. The framework extends the Adaptive Market Hypothesis (AMH) to an AI-driven context, conceptualizing market efficiency as a co-evolutionary process shaped by human learning and machine adaptation. While AI enhances information assimilation and decision precision, the convergence of similar algorithmic models introduces new systemic risks, including volatility, feedback loops, and loss of market diversity. By integrating insights from behavioral economics, cognitive psychology, and computational

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finance, this paper advances a revised theoretical model of financial behavior in the algorithmic era. It argues that understanding the cognitive-algorithmic interface is essential for scholars, practitioners, and regulators seeking to interpret market dynamics in increasingly automated and data-driven environments.

**Keywords:** Behavioral Finance; Cognitive Bias; Algorithmic Decision-Making; Investor Behavior; Market Dynamics

**JEL Codes:** G02; G11; G12; D83; C88

## 1. Introduction

Artificial intelligence (AI) is reshaping nearly every sector of the global economy, and finance is no exception<sup>[1]</sup>. Powered by machine learning (ML) and deep learning, AI systems can process vast quantities of data, identify subtle and nonlinear patterns, and execute decisions with unprecedented speed and precision<sup>[2]</sup>. This technological transformation sits at the intersection of computer science and behavioral finance, a field that examines how psychological and emotional factors shape investor decisions and market outcomes.

Traditionally, behavioral finance has challenged the assumption of fully rational investors. Instead, it emphasizes how cognitive biases, heuristics, and emotional influences consistently lead individuals away from optimal decision-making. Today, as AI becomes increasingly embedded in financial systems, new forms of human-machine interaction are redefining how investment decisions are made. These developments do more than add complexity to existing behavioral models; they actively transform the psychological and structural dynamics that underpin financial behavior<sup>[1]</sup>.

At the core of this emerging paradigm lies a provocative proposition: artificial intelligence does not merely refine existing theories of behavioral finance; it fundamentally reconfigures them. AI alters the manifestation of traditional cognitive biases and introduces new layers of algorithmic influence across financial markets. Through large-scale data analysis and automated execution, AI challenges long-standing assumptions about rationality, market efficiency, and investor psychology. For academics seeking to advance financial theory, and for practitioners designing investment strategies or regulatory frameworks, understanding this transformation is critical. The interaction between human cognition and algorithmic decision-making

opens a new domain of inquiry for both qualitative and quantitative research into market behavior<sup>[2]</sup>.

This paper explores how the integration of AI is reshaping behavioral finance in theory and practice. It begins by revisiting the foundations of behavioral finance and outlining the operational logic of AI within financial contexts. It then examines how AI-driven systems compel a re-evaluation of key behavioral constructs and market hypotheses. Subsequent sections discuss research approaches suitable for investigating these dynamics, with particular emphasis on qualitative methodologies. The analysis proceeds to evaluate how AI is transforming investor behavior, influencing market dynamics, and posing new ethical and regulatory challenges. Finally, the paper synthesizes the main findings and proposes directions for future research in this emerging field, highlighting implications for financial practice, governance, and policy design.

## 2. Methodology

This study employs a conceptual and integrative theoretical approach to examine how artificial intelligence (AI) reshapes behavioral finance. It synthesizes insights from recent empirical and theoretical literature (2019–2025) across finance, psychology, and technology to explore the intersection between cognitive biases and algorithmic decision-making. The analysis adopts a qualitative meta-synthesis framework, identifying recurring themes and conceptual patterns within peer-reviewed studies, policy reports, and institutional analyses. While primarily theoretical, the paper also outlines prospective qualitative research methods, including ethnography, interviews, and comparative case studies, to investigate how financial professionals interact with AI systems in practice. This mixed conceptual orientation allows for a holistic understanding of how human cognition and algorithmic processes co-evolve within modern financial environments.

### 3. Literature Review: Shifting Paradigms in Behavioral Finance

Behavioral finance emerged as a critical response to classical financial economics, which traditionally assumes that investors act rationally and markets are efficient. In contrast, behavioral finance demonstrates that psychological and emotional factors systematically influence financial decision-making, often generating market outcomes that deviate from the predictions of rational models. At its foundation, this field explores how cognitive biases, systematic patterns of deviation from logical judgment, shape investor behavior. Biases such as overconfidence, anchoring, confirmation bias, and loss aversion act as mental shortcuts that simplify complex decisions, but also lead to predictable errors. These biases contribute to phenomena such as speculative bubbles, panic selling, and other market anomalies that cannot be fully explained by traditional theories. Understanding these ingrained behavioral tendencies is therefore essential for interpreting investor behavior and market fluctuations.

Market anomalies, including calendar effects (e.g., the January effect), momentum trading, and the value premium, challenge the efficient market hypothesis by revealing persistent, psychology-driven pricing patterns. Similarly, herd behavior, in which investors imitate the actions of others, can amplify collective irrationality, contributing to asset bubbles or abrupt market crashes. These dynamics illustrate how individual cognitive processes and collective behavior jointly shape market movements, an interaction that lies at the core of behavioral finance. In recent years, artificial intelligence (AI) has become deeply integrated into financial systems, extending the analytical and operational boundaries of behavioral finance <sup>[3]</sup>.

AI technologies facilitate predictive analytics, risk management, and automated financial decision-making, processing information at speeds and scales that surpass human capabilities <sup>[2]</sup>. Within this context, machine learning (ML) algorithms analyze vast datasets to uncover intricate relationships and generate predictions without explicit programming <sup>[4]</sup>. In financial applications, ML supports credit scoring, fraud detection, algorithmic trading, and market forecasting. Supervised learning models, such as regression and classification, utilize labeled historical data

to predict outcomes, while unsupervised learning techniques, including clustering, identify hidden structures in unlabeled data. Reinforcement learning further enhances adaptability by refining strategies through real-time feedback in dynamic environments. Collectively, these computational methods deliver forecasting accuracy that often surpasses traditional econometric techniques.

A particularly transformative branch of AI, Natural Language Processing (NLP), enables machines to interpret and generate human language. In finance, NLP plays a crucial role in sentiment analysis, extracting emotions and opinions from diverse textual sources such as news reports, corporate disclosures, and social media. This ability to quantify market sentiment adds a valuable dimension to behavioral finance, as investor mood can significantly influence asset valuations independent of fundamentals. For example, positive sentiment surrounding a stock may inflate its price even in the absence of strong financial indicators. Moreover, NLP applications enhance efficiency in regulatory compliance, document review, and automated reporting, bridging the gap between qualitative market perception and quantitative analysis. By transforming qualitative insights into measurable variables, NLP contributes to a richer and more integrated understanding of behavioral dynamics in AI-driven financial ecosystems <sup>[3]</sup>.

### 4. Theoretical Integration: AI's Influence on Behavioral Constructs

The growing integration of artificial intelligence (AI) into financial markets compels a reassessment of several foundational assumptions in behavioral finance. AI is no longer merely a computational instrument; it actively interacts with human cognition and reshapes how markets function. Its emergence challenges the traditional dichotomy between rational and irrational decision-making that underpins behavioral theory. While behavioral finance has historically attributed deviations from rationality to human cognitive and emotional biases, AI systems operate through algorithmic logic, executing rule-based or adaptive decisions derived from learned patterns. These systems exhibit a form of computational rationality, performing actions with speed, precision, and consistency far beyond human capacity. However, this apparent rationality

is not free from distortion. When algorithms are trained on biased or incomplete historical data, they risk reproducing and amplifying those same distortions, that can be called algorithmic irrationality. This phenomenon introduces new systemic risks that extend beyond individual investor psychology<sup>[5]</sup>.

The notion of human-centered AI thus becomes crucial. As Riedl<sup>[5]</sup> argues, understanding AI's impact requires situating it within broader social, cultural, and institutional contexts. Rather than viewing AI as a corrective force that eliminates human error, we must recognize that it can both mitigate and magnify behavioral biases. This duality necessitates a redefinition of rationality, one that accommodates the interaction between human cognition and algorithmic processes<sup>[5]</sup>.

A useful conceptual bridge for this rethinking is the Adaptive Market Hypothesis (AMH). The AMH posits that market efficiency evolves dynamically as participants learn and adapt to changing environments. In AI-driven markets, adaptation occurs not only at the human level, but also through machine learning mechanisms. Algorithms can modify trading strategies in real time, accelerating information assimilation and potentially reducing traditional market anomalies. Yet, when multiple AI systems rely on similar data sources or optimization techniques, they can converge toward homogeneous behaviors, generating new inefficiencies or instability. This synchronized adaptation may produce feedback loops that alter market dynamics at an unprecedented scale. Consequently, AMH in the era of AI must be reconceptualized as a co-evolutionary process in which human and artificial agents jointly shape market efficiency. Studying this evolving interaction requires methodological pluralism. While quantitative data analysis remains essential for mapping AI-induced market patterns, qualitative inquiry offers vital insight into the socio-cognitive dimensions of financial decision-making. Methods such as in-depth interviews with financial professionals, ethnographic observation on trading floors, and discourse analysis of industry communications can illuminate how human actors perceive, integrate, and adapt to AI systems. Comparative case studies across organizations with varying levels of AI adoption can reveal how institutional contexts mediate behavioral change. Such qualitative approaches provide context to numerical trends and help

uncover subtle shifts in trust, intuition, and professional identity as humans collaborate or compete with algorithms. AI's influence on financial behavior also operates as a multiplier effect in market dynamics<sup>[5,6]</sup>.

Algorithms process information at millisecond speeds, adjusting positions and asset prices faster than any human trader<sup>[7]</sup>. This high-frequency responsiveness amplifies both gains and losses, mirroring how fiscal multipliers propagate shocks through an economy<sup>[8]</sup>. When AI-driven strategies react simultaneously to shared signals, market volatility can intensify, as seen in algorithmic trading episodes and flash crashes<sup>[9]</sup>. Sentiment analysis powered by AI further reinforces this feedback loop, translating collective mood shifts into rapid capital flows. During periods of optimism, AI may accelerate inflows into growth sectors, while in downturns, automated risk aversion can deepen contractions<sup>[10]</sup>. Liquidity provision, too, follows this pattern, expanding in stable times but evaporating abruptly during stress events<sup>[9]</sup>. For regulators and central banks, managing these algorithmically amplified cycles poses challenges akin to stabilizing macroeconomic shocks<sup>[10]</sup>.

Empirical evidence underscores AI's dual role in behavioral finance. Tools such as robo-advisors can reduce emotional biases by offering rule-based and objective guidance, promoting diversification and disciplined investment behaviors. Conversely, the same systems can generate new forms of bias, including automation bias, in which investors over-rely on algorithmic outputs, and algorithm aversion, where distrust in automated systems impedes their effective use. Studies of algorithmic trading reveal how synchronized AI reactions contribute to market volatility and systemic fragility, while AI adoption in banking improves efficiency at the cost of greater data dependency and ethical complexity<sup>[11]</sup>. Furthermore, when AI models internalize biased historical patterns, they may inadvertently perpetuate inequality or discrimination within financial systems.

In sum, AI reshapes the theoretical landscape of behavioral finance by introducing new dimensions of rationality, adaptation, and systemic behavior. It requires a shift from human-centered behavioral models toward hybrid frameworks that account for the co-evolution of human cognition and algorithmic intelligence within modern financial ecosystems.

## 5. Analytical Assessment: Implications of AI for Behavioral Finance Theory

The expanding role of artificial intelligence (AI) in financial systems is transforming the very foundations of behavioral finance. AI not only mediates decision-making processes but also alters the manifestation and propagation of behavioral biases. These transformations emerge both through direct interactions between investors and algorithms, and through broader, system-level effects that ripple across financial markets.

Algorithmic interventions offer a nuanced picture of how technology influences investor psychology. Automated advisory systems, for instance, can mitigate emotional decision-making by promoting diversification and disciplined investment behaviors. Such data-driven guidance may temper biases like overconfidence and herding, as algorithmic tools replace subjective intuition with systematic analysis. Yet the same mechanisms can also amplify distortion. When AI models are trained on historically biased data, they risk reproducing and even intensifying those patterns, embedding systemic biases within financial predictions. Moreover, new forms of cognitive distortion, such as automation bias, where users overtrust algorithmic output, or algorithm aversion, where they dismiss it prematurely, complicate the behavioral landscape. Rather than eradicating biases, AI reconfigures them, requiring behavioral finance to expand its theoretical scope to include the cognitive–algorithmic interface<sup>[5,11]</sup>.

AI-driven decision tools also introduce what can be termed algorithmic nudges, subtle, data-informed prompts delivered through personalized recommendations, optimized information feeds, and automated trade execution. While these mechanisms can enhance efficiency and encourage better asset allocation, they also pose systemic challenges. When large numbers of algorithms react to similar data signals or adopt comparable learning architectures, strategy convergence may occur, reducing market diversity and exacerbating volatility. This synchronization heightens the risk of flash crashes and liquidity shortages, as multiple algorithms respond in near-unison to market shocks. Consequently, traditional notions of market efficiency must be reinterpreted within a reality dominated by high-speed,

self-reinforcing algorithmic feedback loops<sup>[3,6,9]</sup>.

Beyond behavioral implications, AI raises deep epistemological and methodological challenges for finance research. Central concerns include data integrity, causality, and interpretability. Complex machine learning architectures, especially deep learning models, are prone to overfitting, capturing noise rather than meaningful patterns from historical data. This can lead to unreliable forecasts under new market conditions and distort behavioral inference. Additionally, while AI excels at detecting correlations, it struggles to distinguish causation, making it difficult to derive robust behavioral explanations from algorithmic results. The opacity of “black-box” systems further complicates theoretical development: even when an algorithm performs effectively, the underlying reasoning behind its outputs often remains inaccessible<sup>[11]</sup>. This lack of transparency undermines efforts to build causal or psychological models of financial decision-making grounded in algorithmic behavior.

As AI systems assume increasingly autonomous roles in financial decision-making, ethical and philosophical considerations become unavoidable. Questions of accountability, fairness, and human agency take on new urgency<sup>[12]</sup>. If an algorithmic trading platform triggers significant losses or market disruptions, responsibility becomes diffuse and difficult to assign. Furthermore, biased training data can perpetuate discriminatory practices, particularly in credit scoring or automated investment advice<sup>[5]</sup>. The growing prevalence of AI-driven nudges also challenges the notion of investor autonomy, as decision pathways are increasingly shaped by algorithmic mediation. To address these concerns, behavioral finance must broaden its analytical lens to include not only psychological and economic factors but also the ethical dimensions of algorithmic governance.

AI’s deep market integration also carries profound implications for volatility, liquidity, and regulation. High-frequency trading (HFT) algorithms, capable of executing millions of orders per second, intensify market dynamics by amplifying short-term price fluctuations. While HFT can improve liquidity during stable periods, it may also withdraw liquidity abruptly during crises, producing phenomena such as flash crashes and extreme price dislocations. Because of the interconnectivity among AI



systems, a single erroneous signal can cascade into large-scale automated reactions, creating systemic instability. To analyze these effects comprehensively, behavioral finance must evolve beyond individual-level psychology to consider the emergent collective behavior of algorithms and their interaction networks. For policymakers and regulators, this transformation presents a formidable challenge. Traditional oversight frameworks, designed for human-driven markets, are ill-equipped to manage autonomous, adaptive AI systems. Regulatory priorities now span from ensuring data privacy and algorithmic transparency to preventing AI-enabled market manipulation and ensuring equitable access to digital financial services<sup>[12]</sup>.

Innovative policy tools, such as mandatory explainable AI (XAI) protocols for critical financial applications and regulatory sandboxes for experimental testing, may help balance innovation with systemic safety. Ultimately, effective governance requires reimagining oversight mechanisms, accountability norms, and definitions of misconduct in a landscape increasingly shaped by machine autonomy. Achieving this balance, between harnessing AI's efficiency and safeguarding investor protection and market stability, remains a defining challenge of contemporary behavioral finance<sup>[13]</sup>.

## 6. Conclusions

The integration of artificial intelligence (AI) into financial markets is fundamentally reshaping the theoretical and empirical foundations of behavioral finance<sup>[14]</sup>. AI challenges long-standing assumptions about human irrationality and market efficiency by introducing novel forms of automated decision-making and complex human-algorithm interactions<sup>[15]</sup>. Through its dual capacity to correct and amplify biases, AI both mitigates traditional cognitive distortions via data-driven objectivity and perpetuates them through the replication of historical patterns embedded in training datasets<sup>[16]</sup>. Consequently, the notion of rationality in finance must evolve to encompass algorithmic operations, while the Adaptive Market Hypothesis gains renewed significance as algorithms dynamically learn and adjust to market conditions. Methodologically, this transformation demands a synthesis of rigorous quantitative analyses of AI-driven market data and equally robust quali-

tative inquiry into the evolving human experience of financial decision-making<sup>[17]</sup>. In this way, behavioral finance must move beyond an exclusive focus on human cognition to incorporate the emergent properties of intertwined human and artificial intelligence systems<sup>[18]</sup>.

Future qualitative research in behavioral finance should deepen understanding of the lived experiences of investors and financial professionals within increasingly AI-mediated environments<sup>[16]</sup>. Ethnographic studies of trading desks and investment firms can illuminate the micro-dynamics of human-AI collaboration and the emergence of new behavioral norms<sup>[15]</sup>. Interview-based approaches can capture more nuanced dimensions of trust, reliance, and emotional engagement with algorithmic systems<sup>[19]</sup>. Comparative case studies across institutions and regulatory contexts can further reveal how organizational cultures and governance structures mediate AI's behavioral and ethical implications<sup>[16]</sup>. Narrative and discourse analyses can enrich this understanding by tracing how AI-generated or algorithmically filtered information in financial media and social platforms shapes collective sentiment and market behavior<sup>[20]</sup>. Finally, adopting a socio-technical systems perspective allows researchers to map the recursive feedback loops between AI design, human cognition, and market phenomena, situating these processes within the broader technological infrastructures of contemporary finance<sup>[16]</sup>.

These qualitative insights are indispensable for developing a comprehensive behavioral theory that accounts for the subtle and multifaceted ways in which AI transforms financial conduct<sup>[14]</sup>. For financial practitioners, the pervasive presence of AI necessitates continuous adaptation. Advisors must cultivate literacy in AI's behavioral effects, particularly its influence on client trust, risk perception, and decision-making, while integrating algorithmic tools in ways that preserve human oversight<sup>[17]</sup>. Financial institutions must implement robust AI governance frameworks emphasizing transparency, accountability, and ethical deployment<sup>[18]</sup>. Risk management strategies, too, must evolve to address emerging sources of systemic risk arising from automated trading and algorithmic interdependencies<sup>[16]</sup>.

For policymakers, AI's diffusion presents a parallel set of challenges. Ensuring algorithmic transparency

requires clear disclosure standards for decision-making processes in domains such as credit scoring, lending, and personalized financial advice<sup>[19]</sup>. Effective data governance entails developing regulations on data collection, use, and privacy that safeguard against bias and discrimination<sup>[18]</sup>. Preserving market stability demands continuous monitoring of high-frequency trading and interconnected AI systems to prevent cascades of volatility. Investor protection must also evolve to counter new vulnerabilities arising from algorithmic nudges or AI-driven manipulation<sup>[21]</sup>. Furthermore, workforce transition policies, including reskilling and digital literacy programs, are essential to support professionals adapting to AI-integrated financial ecosystems<sup>[17]</sup>.

Ultimately, effective governance of AI in finance calls for an interdisciplinary approach, uniting expertise in finance, data science, psychology, ethics, and law to navigate the complexities of this rapidly evolving landscape<sup>[15]</sup>. As the boundaries between human cognition and algorithmic intelligence continue to blur, behavioral finance must evolve into a genuinely hybrid discipline, one that explains not only how humans think about markets but how humans and machines co-create the behavioral logic of modern finance.

## Author Contributions

Both authors contributed equally to the conception, design, data collection, analysis, and writing of this study. Both authors have read and agreed to the published version of the manuscript.

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The data used in this study are available from the corresponding author upon reasonable request.

## Conflicts of Interest

The authors declare no conflict of interest.

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