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FROM MARKET NOISE TO RATIONAL CHOICE: A TECHNOLOGY-ENABLED DECISION SUPPORT FRAMEWORK FOR RETAIL INVESTORS

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Abstract:

Recent developments in financial markets, including an increase in the complexity of the markets as well as an expansion in the derivatives trading markets (i.e., the movement away from traditional stocks and bonds) has placed additional cognitive burdens on retail investors, and has led to a greater potential for behavioral biases to play an increased role in the decision-making processes of retail investors.

This research seeks to better understand how market volatility and financial literacy relate to retail investor behaviour in India, and to provide a technology-enabled decision-support framework (DSF) to allow for more rational investment decision-making. An exploratory quantitative approach was taken based on secondary data sources and simulated investor sentiment analysis. Statistical techniques including correlation, regression and chi-square tests were performed using SPSS and have demonstrated that increasing volatility of the financial markets has a positive relationship with behavioral biases, and that higher levels of financial literacy are associated with lower levels of panic-selling behaviour.

Even though access to the financial markets has improved, behavioral biases continue to negatively affect retail investor outcomes. The proposed DSF combines principles of behavioral finance with AI-based analytics to assist investors in filtering out market noise and maintaining disciplined decision-making for longer periods of time in increasingly complex financial environments.

Introduction:

Individual investors are confronted with decision environments that frequently exceed their bounded rationality capabilities owing to the growing complexity and noise in financial markets (Kahneman & Tversky, 1979; Thaler, 2015). The rapid expansion of the Derivative Market has created significant increases in Cognitive Barriers for individual players because of the leverage features, product complexity, and speed at which derivatives are used for price discovery. Over the past few decades, there has been a dramatic change in the global financial architecture from the more primitive forward-style contracts to well-structured futures and options markets that are used as an essential risk transfer and hedging mechanism for the purposes of price discovery (SEBI, 2010).

In India, with the introduction of exchange-traded derivatives, the development of the capital market experienced a major milestone, which was made possible primarily through recent changes in the regulatory framework and trading system design. While there have been many changes to create an environment of

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increased liquidity and efficiency, the complex nature of the information provided to individual market players has also increased. Signals and noise exist simultaneously in an inseparable manner owing to real-time data streams, algorithmic trading, macroeconomic shocks, and geopolitical events. As such, individual investors face the challenge of processing large quantities of information under time constraints and with limited access to sophisticated analytical tools (OECD, 2022).

Statement of problem:

However, the features that make it attractive also introduce ample information complexity and market noise. The research shows that retail traders depend on limited analytical abilities and actual decision-making capacity. The first results of behavioral finance research show that investors operating in high-uncertainty environments involving high leverage experience more cognitive biases, emotional trading, and heuristic-based decision-making (Shefrin, 2000; Thaler, 2015). Hence, expansion leads to the behavioral vulnerabilities of retail investors, raising concerns about decision quality and market outcomes.

Despite advanced market infrastructure and regulatory oversight, the decision-making process of retail investors continues to be distorted due to further influence. The trading platforms that currently exist primarily highlight execution efficiency rather than behavioral correction and cognitive support after noise, such as uncertain events, creating a critical gap between market complication and the decision capabilities of retail investors (SEBI, 2023; NSE, 2023).

Significance of the study:

In response to this gap, the present study proposes a technology-enabled decision support framework designed to help retail investors navigate market noise by improving overall decision-making. The significance of this study is underscored by the rapid expansion of the retail investor base, with over eight crore active participants and more than 15 crore demat accounts in recent years (SEBI, 2023; NSE, 2023), reflecting a growing reliance on digital trading platforms. Simultaneously, high market volatility and foreign portfolio movements, currency fluctuations, geographical tensions, and inflationary pressure have increased uncertainty.

By incorporating data-driven analytical tools, the framework aims to enhance decision- making through AI-integrated long-term portfolio allocation and rebalancing using rational and factual information after an uncertain event.

This study contributes to the growing convergence of financial technology and behavioral investment research by providing a structured and simplified approach to strengthen retail investor decision-making for rebalancing for long-term gains in a complex market environment.

Limitations of the Study:

- This study is exploratory and primarily based on secondary data and simulated analysis.
- The proposed technology-enabled decision support framework has not been verified through primary data collection.
- Behavioral and psychological characteristics differ across individual retail investors; however, the framework is developed based on generalized patterns.

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Objectives of the Study:

Primary objective:

- To develop a technology-enabled decision support framework that enhances rational investment decision-making through various simplified tools and AI- integrated portfolio rebalancing for retail investors.

Secondary objectives:

- To examine the impact of market complexity and volatility on retail investors
- To identify crucial behavioral impulses impacting retail investors
- To analyse the limitations of existing trading platforms in addressing behavioral decision error after uncertain events
- To evaluate the potential of behavioral finance-based technological interventions in improving investment discipline.

Literature Review:

1. ***Foundations of Behavioral Finance***

   As stated in the traditional theory, which assumes investors act rationally and utilize their maximum, it is opposed by behavioral finance's concept of rationality by placing more emphasis on the effect of emotions, perceptions, and cognitive biases on investment decisions. An example of such bias is presented in Prospect Theory developed by Kahneman and Tversky (1979), where gains and losses are asymmetrically evaluated, thus making losses evoke a greater psychological response than an equivalent gain.

   Citing Shefrin (2000), it is evident that cognitive and emotional biases hinder rational (or optimal) decision making throughout different time frames of uncertainty. Also, Thaler (2015) introduced the notion of Bounded Rationality, which indicates that investors will often use heuristics method instead of optimizing their investment selections. When merged together, these perspectives provide an accurate perspective for explaining investor behavior in dynamic, high-volume, information-rich markets.

   The emergence of behaviorally influenced decisions is much higher in emerging markets like India because of low levels of financial sophistication, less-than-perfect access to information and fast-growing retail investor participation. As noted by SEBI (2023), the growth of the retail investor base is making behavioral finance extremely applicable given the current market conditions in India.

2. ***Behavioral Biases Among Indian Investors***

   Empirical research constantly records the commonness of behavioral biases among retail investors, including loss aversion, herding, overconfidence, anchoring, and recency bias (Barber & Odean, 2001; Kahneman & Tversky, 1979). Studies reported in the *International Journal of Economics & Financial Issues* indicate that many retail investors are influenced by media sentiment and social instead of fundamental analysis.

   Overconfidence has especially increased in the post-2020 period with the growth of mobile trading platforms and online brokerage participation (NSE, 2023). Barber and Odean

   (2001) confirmed that overconfidence repeatedly leads to excessive trading and lower net returns, a pattern also observed in Indian derivatives traders.

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Herding behaviour is commonly observed during bullish market phases due to fear of missing out (FOMO), while bearish periods frequently trigger panic selling The presence of anchoring bias in the market leads to investors placing too much weight on prior highs, which can lead to a lack of reevaluation of the fundamentals behind an investment as well as the behaviour of other traders. These behaviours together also create a scenario for retail traders making poor portfolio decisions.

3. ***Investor Behaviour During Market Crises and Down Cycles***

Market disruptions deliver strong evidence of behavioral responses. During 2008 Global Financial Crisis, the Indian equity market dropped sharply, which affected NIFTY by falling more than 50% while retail investors exited and shifted toward safer options such as gold and fixed deposits, frequently missing the later recovery (SEBI, 2010).

In contrast, the COVID-19 market crash of March 2020 witnessed a rush of new retail investors during the recovery phase. Low interest rates, accumulated household savings, and social media influence and promoted quick gains in the market (NSE, 2023). This period also saw increased derivatives trading, reflecting overconfidence and recency bias.

More recently, the 2023–2024 bull phase has been characterised by momentum-driven retail participation and sector-chasing behaviour. SEBI (2023) reports that many derivatives traders continue to incur losses despite rising participation, highlighting the persistent gap between market access and decision quality

4. ***Financial Literacy and Investment Behaviour in India***

Financial literacy remains a crucial factor of investment behaviour. The National Centre for Financial Education (NCFE, 2019) reports that only a limited proportion of Indian investors demonstrate adequate financial literacy despite rising awareness. Similarly,

OECD (2022) findings show that higher financial knowledge is connected with improved diversification and financial planning.

However, literacy alone does not fully eliminate behavioral biases. Thaler (2015) notes that even financially literate investors may act irrationally under uncertainty. Therefore, alongside financial education, structured decision-support systems are increasingly necessary to guide retail investors. The rapid expansion of retail participation since 2020 further strengthens the case for technology-enabled behavioral support in Indian financial markets (NSE, 2023).

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Behavioral Bias among Investors

Behavioral Bias Table

Stage	Investor Psychology	Behavioral Bias	Typical Actions	Market Opportunity
Optimism	Confidence, Greed	Overconfidence	Aggressive Buying	Overvaluation Risk
Fear	Anxiety	Loss Aversion	Partial Selling	Volatility Rise
Panic	Extreme Fear	Herding	Panic Selling	Buying Opportunity
Regret	Self-Blame	Hindsight Bias	Market Exit	Missed Recovery
Recovery	Gradual Confidence	Recency Bias	Re-entry	Trend Formation

The chart depicts cyclical investor sentiment across market phases. Optimism fuels overconfidence and overvaluation, while market declines trigger fear-driven loss aversion and herding, increasing volatility and creating contrarian opportunities. During recovery, confidence returns, but biases such as recency and hindsight continue to influence decisions.

Research gap:

The existing literature has widely recorded behavioral biases among retail investors and their impact on overall decisions, such as investment decisions, particularly in emerging markets such as India. Past studies have mainly focused on identifying biases such as overconfidence, herding, and loss aversion, along with the role of financial literacy in influencing investor behavior.

However, most research is still diagnostic in nature and does not provide any effective mechanism to oppose such behavioral distortions in real-time trading situations. The current trading platform largely focuses on practical execution rather than being focused on guidance and support after uncertain events. Thus, this creates a clear and noticeable gap between the growing complexity of markets and the decision support tools available to retail investors.

Hypotheses of the Study:

Based on the behavioral finance literature and the observed increase in market participation amid rising volatility, the present study formulates testable hypotheses to examine the relationship between market conditions, investor psychology, and decision discipline. Prior studies suggest that heightened market uncertainty tends to amplify behavioral biases, while improved financial awareness may moderate panic-driven responses among retail investors.

Prior evidence from behavioral finance suggests that market uncertainty worsens cognitive biases in retail investors (Kahneman & Tversky, 1979; Shefrin, 2000), as does financial literacy, which has been shown to impact panic-driven investor behaviours (OECD, 2022). Therefore, we hypothesise as follows:

Accordingly, the following null and alternative hypotheses are proposed:

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H_{01}: Market volatility (India VIX) does not significantly influence behavioral bias among retail investors.
H_{11}: Market volatility (India VIX) significantly influences behavioral bias among retail investors.
H_{02}: Financial literacy does not significantly reduce panic-selling behaviour among retail investors.
H_{12}: Financial literacy significantly reduces panic-selling behaviour among retail investors.
These hypotheses are empirically examined using simulated time-series data to evaluate whether behavioral-aware analytical support can meaningfully improve retail investor decision stability.

Research Methodology:

The present study adopts an exploratory quantitative research approach based on secondary data and simulated analysis to examine behavioral patterns among retail investors and to develop a technology-enabled decision support framework. The methodology integrates behavioral finance insights with historical investor sentiment data and analytical modelling to assess the feasibility of supporting rational investment decision-making. The study primarily relies on secondary data sources supplemented with simulated analytical validation to evaluate the proposed framework.

Research Design:

This research follows an exploratory quantitative research design supported by a conceptual framework development and an investor sentiment dataset. The exploratory component is used to identify key behavioral biases and market-related challenges faced by retail investors, while the conceptual framework focuses on designing a structured decision support model.

The study further incorporates a descriptive analytical layer through simulated portfolio scenarios to examine how uncertain market events and emerging developments may affect portfolio performance when supported by technology-enabled rebalancing interventions. This multilayered design is appropriate given the evolving nature of behavioral fintech integration in retail investing.

Participants / Sample:

The study focuses on retail investors participating in Indian financial markets, particularly those engaged in equity and derivatives trading. As the research is quantitative and secondary in nature, the analysis is based on behavioral patterns and participation trends reported in published sources such as SEBI reports, NSE statistics, and prior empirical studies.

For illustrative validation of the proposed framework, representative retail investor profiles (e.g., conservative, moderate, and aggressive) are incorporated into simulated portfolio scenarios to reflect diverse behavioral tendencies.

Data Collection Instruments:

The study primarily utilises secondary data sources, including:

- SEBI and NSE published reports
- NCFE and OECD financial literacy data
- Peer-reviewed behavioral finance literature
- Market volatility indicators (e.g., India VIX trends)

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- Investor sentiment dataset (CSV format) accessed via a Google Drive repository

In addition, a conceptual analytical model and AI-assisted rebalancing logic are employed as evaluative tools to examine the potential effectiveness of the proposed framework. The investor sentiment dataset used in this study is publicly accessible via Google Drive to ensure transparency and reproducibility https://drive.google.com/drive/folders/1Gs5AKk8nkLbBhYf0ewy7LnW2iJChb2iT?usp= sharing

Procedure:

The research was conducted through the following steps:

- Literature synthesis to identify dominant behavioral biases affecting retail investors.
- Market context analysis using secondary data to understand retail participation trends and volatility conditions.
- Framework development integrating behavioral finance principles with technology-enabled decision rules.
- Simulated portfolio assessment to examine how the proposed framework may improve decision discipline, allocation rebalancing, and investment outcomes.
- Interpretation and validation of findings in relation to behavioral finance theory and retail market realities.

Data analysis:

The statistical analysis was conducted using simulated time-series and cross-sectional data derived from publicly available market indicators and investor sentiment proxies. Correlation, regression, and chi-square tests were performed using SPSS. To empirically examine the proposed hypotheses, statistical analyses including correlation, regression, and chi-square tests were performed using the investor sentiment dataset. The results indicate that periods of heightened market volatility—such as the 2008 Global Financial Crisis and the March 2020 COVID-19 crash—were associated with stronger behavioral responses among retail investors. Notably, the sharp recovery following the March 2020 decline, during which the Nifty 50 Index nearly doubled by the end of 2021 (NSE, 2023), coincided with increased retail participation and momentum-driven trading.

The findings further suggests that rising market optimism in late bull phases tends to elevate risk tolerance and overconfidence (Barber & Odean, 2001). Simultaneously, the rapid expansion of dematerialised accounts between 2020 and 2025 has amplified the role of behavioral reactions in shaping market liquidity (SEBI, 2023; Economic Times, 2024). Overall, the results support the hypotheses that market volatility intensifies behavioral bias,

while stronger financial literacy and structured decision support systems can help mitigate panic-driven investment behaviour (Thaler, 2015).

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Table 1 —Relationship Between Market Volatility and Behavioral Bias

Statistic	Value
Pearson Correlation (r)	**0.943***
Sample Size (n)	17
R Square (R^2)	**0.888**
F-statistic	**119.427***
Standardized Beta (β)	**0.943***
Regression Coefficient (B)	0.0793
Significance (p-value)	< .001
Decision	**Reject H_{01}**

Note. *p < .01. Higher India VIX is strongly associated with increased behavioral bias among retail investors.*

Table 2 — Financial Literacy and Panic-Selling Behaviour

Statistic	Value
Pearson Chi-Square (χ^2)	**67.498***
Degrees of Freedom	4
Sample Size (n)	240
Cramer's V	**0.375**
Spearman's rho	**0.490***
Significance (p-value)	< .001
Decision	**Reject H_{02}**

Note. *p < .01. Lower financial literacy is significantly associated with panic-selling behaviour during market downturns*

Table 3 — Summary

Hypothesis	Relationship	Result	Decision
H1	Market volatility → Behavioral bias	Significant (p < .001)	Supported
H2	Financial literacy → Panic selling	Significant (p < .001)	Supported

The statistical results suggest that market volatility significantly amplifies behavioral bias, while higher financial literacy reduces panic-selling behaviour among retail investors. Thus, both hypotheses receive empirical support.

Challenges:

Financial AI systems have many challenges in dealing with large amounts of data. Some of the challenges include the ability to filter out news that is macro-relevant from the noisy financial news environment, where non-relevant news can overshadow relevant news. The alignment of the complex behavioral theories, such as

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models of investor psychology, with the strict computational rules of AI systems can result in inconsistencies in decision- making logic. Dealing with the variability of the data in real-time is a challenge because financial news sources can be volatile due to external sources or system failures. Over- interpretation of the signals in financial news is also a challenge because financial AI systems can interpret noise as signals, leading to poor trading decisions.

Remedies:

To address these issues, there has been the use of multi-stage news relevance filtering, where AI classifiers and keyword scores are used to emphasize high-impact news and filter out fluff. At the sector level, there is guidance that ensures a behavioral emphasis, where psychological concepts such as loss aversion or herd behaviour are directly linked to trading rules. The system's performance is also checked through controlled simulations, where back testing is performed on past data to detect edge cases as early as possible. There is also logical reasoning that is applied in allocation suggestions, where explanations are given step-by-step to the user (for example, "This shift is because of a rising volatility signal").

Conclusion:

Retail investors are facing difficulties because of the increasing complexity of financial markets, especially in derivatives. Overconfidence, loss aversion, herd behaviour, and biases impact retail investor decision-making, which is contrary to earlier accepted views of traditional finance (Kahneman & Tversky, 1979; Thaler, 2015). In India, the rapid increase in the number of retail investors is increasing the length of time between having access to the stock market and being able to make an informed investment decision.

Studies show that major market disruptions, such as the 2008 Global Financial Crisis and the 2020 COVID-19 crash, indicate that while the fundamentals of focus influence market behaviour, behavioural responses have a greater impact on investors' outcomes (Barber & Odean, 2001). Even while financial literacy will help investors understand their options, it will not eliminate irrational investment behaviour during volatile market conditions. The proposed decision support framework (DSF) leveraging technology is intended to provide retail investors with a structured method of filtering noise from the market and making more rational investment allocation decisions, through the integration of behavioral finance principles and artificial intelligence-based analytics. Future research can confirm whether the DSF is effective in real-time market environments using primary, investor-level data. Overall, findings suggests that the use of technology-based decision framework can help improve retail investor decision-making.

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