

The Impact of Technological Advancements on Investor Decision-Making and Stock Market Efficiency: A Comprehensive Analysis

Ms Prabha Ravi Mishra

Research Scholar

Sharda School of Business Studies

Prof. Dr. Santosh Kumar

Associate Professor

Sharda School of Business Studies, Sharda University, Greater Noida

ABSTRACT

The study here investigates the influence of technological tools and behavioral biases on investment decision-making and stock market trading rationality. Using a dataset of 200 retail customers from Delhi-NCR, India, the research employs regression analysis to examine the effects of Robo-Advisors, Machine Learning Models, and Integrated Reporting on the Quality of Investment Decisions (QID), and how Anchoring Bias, Confirmation Bias, Herd Behavior, and Technological Tools affect Rationality of Stock Market Trading (RSMT). The results indicate that Robo-Advisors significantly improve investment decision quality, while Machine Learning Models and Integrated Reporting have moderate impacts. Behavioral biases such as Anchoring and Confirmation Bias significantly influence trading rationality, whereas Technological Tools do not have a notable effect. The findings hereon emphasize on the importance of integrating technology and addressing psychological biases to optimise investment strategies. Researchers in future should explore the causal effects of technological advancements and market dynamics instigating investor behavior. The study generates a clear understanding for Retail/wholesale investors, Asset managers, Investment advisors, and institutions aiming to optimize investment decision-making and improve market stability.

Keywords: Investment Decision-Making, Behavioral Biases, Technological Tools, Stock Market Rationality.

Introduction

The rapid advancement of technology has significantly transformed the landscape of stock market trading and investor decision-making. The infusion of technological tools and applications has led investors to have access to real-time information and updates, sophisticated analytical tools, and personalized investment advice, which have collectively reshaped their approach to the financial markets. The objective of this study is to explore the multifaceted impact of technology on investor behavior and decision-making, highlighting the role of innovative technology deployed in the form of robo-advisors and machine learning, including nonfinancial information disclosure.

Digital innovation has brought about technologies like robo-advisors that improve investing decision-making and reduce behavioral biases, especially in the wealth management space. The moderating function of robo-advisors in addressing prevalent behavioral biases among investors, such as overconfidence and loss aversion, is examined by Bhatia et al. (2022). By providing algorithm-driven recommendations, robo-advisors offer a more disciplined and unbiased approach to portfolio management, which can significantly improve investment outcomes. This shift underscores the importance of digital tools in promoting rational decision-making and reducing the impact of emotional biases on investment choices.

In addition to robo-advisors, advancements in machine learning and artificial neural networks have further enriched the investment decision-making process. Bihari et al. (2023) investigate how cognitive biases, which are often ingrained in human decision-making, can be mitigated using

sophisticated machine-learning algorithms. By examining large datasets and finding patterns that human investors would miss, their empirical study demonstrates how these technologies have the potential to improve the precision and dependability of investment judgments. This technological intervention aids in making more informed and objective investment choices, thereby improving overall market efficiency.

The role of nonfinancial information in investor decision-making has also gained prominence with the rise of integrated reporting. Ribeiro et al. (2024) explore how the disclosure of nonfinancial information, such as environmental, social, and governance (ESG) factors, influences professional investors in Brazil. Their findings suggest that comprehensive and transparent reporting practices enable investors to make more holistic assessments of a company's value and long-term sustainability. This shift towards integrated reporting reflects a broader trend where investors increasingly consider nonfinancial metrics alongside traditional financial indicators, facilitated by enhanced information accessibility through digital platforms.

Investors' personalities have a significant impact on how they trade, especially when it comes to gathering information. Tauni et al. (2017) investigate how the Big Five personality qualities impact the connection between stock trading behavior and information gathering. Their study reveals that personality traits such as openness and conscientiousness significantly affect how investors process and act on information. Understanding these traits can help in designing more effective technological tools that cater to individual differences, thereby enhancing the overall investment experience.

A systematic review by Badola, Sahu, and Adlakha (2024) sheds light on various behavioral biases that affect individual investment decisions. Their review identifies common biases such as anchoring, confirmation bias, and herd behavior and discusses how technological interventions can help mitigate these biases. Technology can be a key to encouraging more logical and impartial investing practices by giving investors access to data-driven insights and automated decision-making tools.

The integration of technology into stock market trading and investor decision-making processes has brought about profound changes. Technological developments have improved investors' capacity to make more educated, logical, and objective judgments through the use of robo-advisors, machine learning, nonfinancial data, and personality traits. This paper explores various facets, emphasizing how technology is revolutionizing investor behavior and financial markets.

The financial sector's technological advancements have changed the dynamics of the market, in addition to giving individual investors access to cutting-edge instruments. The accessibility of sophisticated algorithms and data analytics democratizes investment opportunities, allowing retail investors to compete with institutional counterparts. As Bihari et al. (2023) highlight, machine learning models and artificial neural networks enable investors to leverage extensive datasets and predictive analytics, thus leveling the playing field and fostering more inclusive market participation.

The integration of technology enhances market transparency and accountability. As Ribeiro et al. (2024) discuss, the adoption of integrated reporting and the emphasis on nonfinancial disclosures reflect a growing investor preference for comprehensive and transparent information. This shift promotes greater corporate accountability and encourages companies to adopt sustainable practices, thereby aligning their operations with broader societal values. The availability of detailed and reliable information through digital platforms ensures that investors can make well-rounded decisions that consider both financial performance and ethical considerations.

Behavioral finance studies, such as those by Badola, Sahu, and Adlakha (2024), underscore the persistent influence of psychological biases on investment decisions. Technological tools, by providing objective analysis and automated recommendations, help mitigate the impact of these biases. For instance, robo-advisors can systematically rebalance portfolios to avoid the pitfalls of emotional trading, while machine learning models can offer data-driven insights that counteract common cognitive errors. The ability of technology to provide personalized and unbiased advice is crucial in enhancing investor confidence and promoting more rational market behavior. Understanding the role of personality traits in investment behavior, as explored by Tauni et al. (2017), offers valuable insights into how technology can be tailored to meet individual needs. Personalized investment platforms that consider the unique psychological profiles of investors can deliver more effective and user-friendly experiences, thereby increasing engagement and satisfaction.

The integration of technology into the investment landscape profoundly influences investor decision-making and stock market trading. By reducing behavioral biases, enhancing information transparency, and providing sophisticated analytical tools, technology empowers investors to make more informed and rational decisions. This study aims to delve deeper into these transformative impacts, offering a comprehensive analysis of how digital innovation continues to shape the financial markets and investor behavior. Through increased efficiency, inclusivity, and sustainability in the financial markets, continuous technological breakthroughs hold the potential to significantly transform the investing landscape.

Literature Review

The integration of technology in the financial sector has significantly altered investor decision-making processes and stock market trading behaviors. Various studies have explored different dimensions of this transformation, focusing on aspects such as emotional arousal, customer relationship management, investment image, investor personality, socially responsible investment, market web traffic, and cryptocurrency investments. This literature review synthesizes insights from recent research to understand the multifaceted impact of technology on investor decision-making and stock market trading.

Emotional Arousal in Investing

Verma, Rao, and Kumar (2024) delve into the emotional aspects of investing, highlighting that investment decisions are inherently emotionally arousing processes for fund managers. Their study underscores the significance of emotional regulation in investment decision-making, suggesting that fund managers need to manage their emotional responses to market fluctuations to make rational investment choices. This insight aligns with broader behavioral finance theories that emphasize the role of emotions in financial decisions.

Customer Relationship Management and Mutual Fund Decisions

The mediation effect of relationship quality outcomes between mutual fund decision-making and customer relationship management (CRM) is investigated by Deb et al. (2023). Their study reveals that effective CRM practices enhance the quality of relationships between investors and financial advisors, leading to more informed and satisfactory investment decisions. This finding emphasizes the importance of personalized and technology-driven CRM systems in improving investor confidence and decision-making quality.

Investment Image and Country Image

The mediating function of investment image in the relationship between nation image and investment intention is examined by Izzularab et al. (2023). Their empirical research on Egypt shows that a favorable perception of the nation boosts the image of investment, which in turn raises investors' desire to invest. This research highlights the critical role of national branding and information dissemination through digital platforms in shaping investor perceptions and intentions.

Investor Personality and Behavioral Biases

Jain et al. (2023) investigated how investor personality traits predict investment intention, with an emphasis on how financial knowledge and overconfidence bias act as mediators. Their findings suggest that personality traits significantly influence investment intentions and the important mediation roles of financial literacy and overconfidence bias. This study emphasizes how important it is to have technology and financial education programs that are tailored to each person's unique personality and cognitive biases.

Socially Responsible Investment Behavior

Jonwall, Gupta, and Pahuja (2023) study socially responsible investment behavior among individual investors in India. They find that social and environmental considerations significantly influence investment decisions, reflecting a growing trend towards ethical investing. The availability of detailed and reliable information on corporate social responsibility through digital platforms facilitates this shift, enabling investors to align their investments with their values.

Investor Behavior and Market Web Traffic

Sethi, Saxena, and Singh (2023), using data from the US and India, examine the relationship between market web traffic and investment activity in the EdTech sector. Their study shows that increased web traffic on market-related websites is positively correlated with investor interest and trading volumes. This research emphasizes how crucial information sharing and internet involvement are in shaping investor behavior and market dynamics.

Cryptocurrency Investment Decisions

In an emerging Islamic market setting, Veerasingam and Teoh (2023) simulate cryptocurrency investing decisions. Their research highlights the unique factors influencing cryptocurrency investments, including religious considerations and technological awareness. The study emphasizes the need for tailored technological solutions that address specific market and cultural contexts to support informed investment decisions.

Equity Crowdfunding and Anchor Investors

Sendra-Pons, Mas-Tur, and Garzon (2024) investigate the role of anchor investors in equity crowdfunding for entrepreneurs. They discover that having anchor investors greatly increases the legitimacy and appeal of crowdfunding initiatives, which in turn attracts larger investment amounts. This research highlights the importance of digital platforms in facilitating equity crowdfunding and the pivotal role of anchor investors in driving campaign success.

The role of equity crowdfunding and the influence of investor characteristics have become critical topics in understanding how technology affects investment decision-making and market behavior. The influence of lead investor reputation and human capital on fundraising performance in equity crowdfunding syndicates is examined by Zhang et al. (2023). According to their research, crowdfunding campaign success rates are considerably increased by lead investors with solid reputations and substantial human capital. This suggests that the credibility and expertise brought by these lead investors play a pivotal role in attracting other investors and achieving fundraising goals. By highlighting the diverse risk appetites and strategic interests at various phases of

company growth, Annamalaisami (2022) examines the distinction between angel investors in pre-seed versus seed-stage investments in India. This differentiation highlights the nuanced decision-making processes of angel investors, influenced by their risk tolerance and expectations of returns, which technology platforms must accommodate to facilitate better matching and investment outcomes.

Gupta and Shrivastava (2022) examined how behavioral biases like herding and loss aversion play a significant role in shaping the behavior of retail investors. They pinpoint how the fear of missing out (FOMO) acts as a mediator in escalating these prejudices, leading to irrational trading decisions. This study underscores the importance of technological tools that can help mitigate these biases by providing timely and balanced information to investors, thereby reducing the emotional impetus behind herd behavior and loss aversion.

Verma and Kumar (2022) utilize Adizes life cycle theory to analyze venture capital investors across different organizational life cycle stages. Their research demonstrates that venture capitalists adjust their investment strategies based on the maturity and growth stage of startups, highlighting the need for adaptive and stage-specific technological tools that support these strategic decisions. Property investment decision-making amid market disruptions is another area where technology plays a significant role. Bolomope et al. (2021) adopt an institutional perspective to examine how market disruptions influence property investment behavior. Their findings suggest that institutional norms and frameworks shape investor responses to market volatility, indicating that technological solutions must consider these institutional contexts to effectively support investment decisions during disruptions.

Song and Jain (2021) focus on angel investors, exploring their crucial role in providing initial funding for entrepreneurs. They highlight the importance of matching angel investors with startups based on strategic fit and alignment of goals. Technological platforms that facilitate such matching can significantly enhance the success rates of early-stage investments by ensuring that both parties have aligned expectations and complementary strengths. Misra, Srivastava, and Banwet (2020) examine the interplay between intuitive forecasting and analytical reasoning in investment decisions, emphasizing the impact of investor personality. Their study reveals that different personality traits influence the preference for intuitive versus analytical approaches, suggesting that personalized technological tools that cater to these preferences can improve investment decision-making by aligning with the inherent cognitive styles of investors.

The integration of technology in the financial sector is transforming investor decision-making and market behavior by addressing various behavioral biases, enhancing information dissemination, and facilitating better matching between investors and opportunities. The studies reviewed underscore the importance of personalized, adaptive, and context-aware technological solutions in supporting rational and informed investment decisions across different contexts and stages of investment. As technology continues to evolve, its role in shaping the financial landscape will become increasingly significant, offering new opportunities and challenges for investors and market participants alike. The integration of financial technology (FinTech) and its acceptance among investors is a critical area of study in understanding how technology influences financial decision-making. Jantarakolica and Jantarakolica (2018) delve into the acceptance of algorithmic trading in Thailand, highlighting how investors are increasingly relying on automated systems for trading decisions. This adoption of algorithmic trading is indicative of a broader trend where technology is used to enhance efficiency and reduce emotional biases in trading decisions.

Financial decision-making heavily relies on behavioral mediators. Nigam, Srivastava, and Banwet (2018) offer a thorough analysis of the behavioral finance literature, highlighting important

psychological aspects that affect investor behavior. Herding behavior, loss aversion, and overconfidence are some of the variables that can have a big influence on market results and investing decisions. Understanding these mediators is essential for developing technological tools that can mitigate their negative effects and promote more rational decision-making processes.

Rasheed et al. (2018) examine the factors influencing investor decision-making in Pakistan, identifying critical elements such as financial literacy, risk tolerance, and market perceptions. Their findings underscore the importance of investor education and the need for tools that enhance understanding and awareness of market dynamics. In this situation, technology can be quite important since it gives investors access to real-time data, analytical tools, and learning materials that help them make better decisions. Zahera and Bansal (2018) examine behavioral biases in investment decision-making systematically, revealing that biases such as overconfidence, anchoring, and hindsight bias are prevalent among investors. These biases can lead to suboptimal investment decisions and market inefficiencies. The development of FinTech solutions that address these biases by offering unbiased, data-driven insights and recommendations can significantly enhance investor outcomes.

Corporate venture capital (CVC) and its impact on portfolio diversification are explored by Yang, Chen, and Zhang (2016). Their study highlights the autonomy of CVC programs and the attention of corporate investors as critical factors influencing investment decisions. The findings suggest that CVC programs that operate with a high degree of autonomy and receive focused attention from corporate investors are more likely to achieve diversified and successful investment portfolios. This underscores the importance of strategic alignment and dedicated oversight in the success of CVC initiatives. Kalra Sahi (2012) introduces the concept of neurofinance, which examines the neurological underpinnings of investment behavior. By understanding the brain's role in financial decision-making, neurofinance provides insights into how emotions and cognitive processes influence investor behavior. This field of study can inform the development of FinTech solutions that account for the psychological and neurological aspects of decision-making, thereby promoting more rational and effective investment strategies.

Ashuri, Lu, and Kashani (2011) highlight the strategic importance of flexibility in investment decisions by putting up a real options framework for assessing investments in toll road projects. Their approach highlights the importance of considering uncertainty and the flexibility to adjust to evolving circumstances during the investment assessment procedure. This framework can be extended to other types of investments, providing a robust method for assessing the value of flexibility and strategic options. Sørheim et al. (2011) address the funding challenges faced by university spin-off companies, proposing a conceptual approach to financing these ventures. The significance of customized financing options that take into account the particular requirements and hazards connected to spin-off businesses is underscored by their research. Technological platforms that facilitate access to diverse funding sources and provide support for early-stage ventures can play a crucial role in overcoming these challenges.

Risk-adjusted returns in European industrial equities are examined by Samant (1999) from the viewpoint of a worldwide investor, emphasizing the need for comprehensive risk assessment in investment decisions. His study underscores the importance of considering both market-specific and global risk factors in evaluating investment opportunities. Technology can assist investors by providing sophisticated risk assessment tools that integrate multiple risk dimensions and offer comprehensive insights into potential investment outcomes. P.H. and Uchil (2020a, 2020b) study how investor sentiment affects decision-making in the Indian stock market. Their empirical analysis reveals that investor sentiment significantly influences investment choices and market trends. Understanding the antecedents of investor sentiment and its effects can inform the

development of tools and strategies that help investors manage their emotions and make more informed decisions. Advanced analytics and sentiment analysis tools can help investors navigate market swings and offer insightful information on market sentiment.

The integration of technology in financial markets is reshaping investor behavior and decision-making processes. From the adoption of algorithm trading and the mitigation of behavioral biases to the strategic evaluation of investments and the management of investor sentiment, technology offers powerful tools and solutions that enhance the efficiency, rationality, and effectiveness of investment decisions. The studies reviewed highlight the multifaceted impact of technology on the financial landscape, offering valuable insights into how technological advancements can be leveraged to improve investor outcomes and market performance.

Research. Methodology

The purpose of this research is to examine how technology affects stock market trading and investor decision-making, with an emphasis on behavioral biases and investment results. To achieve the research objectives the study was conducted in Greater Noida, a major financial hub in India, where a diverse range of investors participates in the stock market.

The primary data collection method involved administering a structured questionnaire to a sample of 200 investors based in Greater Noida. The questionnaire was designed to capture demographic information, investment behavior, use of technology in trading, and perceptions of various technological tools. It included both closed and open-ended questions to allow for a comprehensive analysis of investor behavior and attitudes. The survey covered aspects such as the frequency of technology use, the types of technology employed (e.g., robo-advisors, algorithm trading), and the perceived impact of these technologies on investment decisions.

The questionnaire was pre-tested with a small sample of investors to guarantee the validity and trustworthiness of the data, and any necessary modifications were made in response to their input. To guarantee representation across various investor demographics, such as age, gender, income levels, and investment experience, the final sample was chosen using a stratified random sampling technique.

Objectives

- To evaluate how digital innovation tools affect the choice to invest.
- To examine how technological moderation influences stock market trading behavior and the impact of behavioral biases.

Hypotheses

- H1: Digital innovation tools positively impact investment decision-making.
- H2: Behavioral biases negatively affect stock market trading behavior, but technology moderates this impact.

Regression Analysis

The first regression model examines the quality of investment decisions (QID) as the dependent variable (Y1). The independent variables include the usage of robo-advisors (RA), the implementation of machine learning models (ML), and access to integrated reporting (IR). This model aims to identify how these technological factors influence the quality of investors' decisions in the stock market.

Regression Equation:

$$QID = \beta_0 + \beta_1 RA + \beta_2 ML + \beta_3 IR + \epsilon$$

The second regression model focuses on the rationality of stock market trading (RSMT) as the dependent variable (Y2). The independent variables are anchoring bias (AB), confirmation bias (CB), herd behavior (HB), and the usage of technological tools (TT). This model aims to explore the effect of technological adoption and these behavioral biases on investors' ability to make logical trading decisions.

Regression Equation: $RSMT = \beta_0 + \beta_1 AB + \beta_2 CB + \beta_3 HB + \beta_4 TT + \epsilon$

The gathered data was examined using a number of statistical methods. Investors' demographic traits and broad technological usage trends were compiled using descriptive statistics. Multiple regression analysis was one of the inferential techniques used to investigate the connections between technology use and investment outcomes, considering variables such as age, gender, income, investment experience, and behavioral biases. The regression models helped identify the key factors that influence investor decision-making and how technology moderates these relationships.

Analysis

In this study, a dataset of 200 samples from retail customers in Chennai, India, was analyzed to understand the influence of demographic variables on investment decisions and stock market trading behaviors. The sample's age distribution revealed a broad range of experience levels: 25% were aged 18-30, 35% were between 31-45, 25% fell into the 46-60 age bracket, and 15% were over 60. This diverse age range ensures that various life stages and associated financial responsibilities and experiences are represented, providing a comprehensive view of investment behaviors across different age groups. The gender distribution in the sample was fairly balanced, with 48% male and 52% female participants. This equilibrium is crucial for examining gender-specific patterns in investment preferences and trading decisions, ensuring that insights are reflective of both male and female perspectives.

Regarding marital status, 60% of respondents were married, 30% were single, and 10% were divorced or widowed. Marital status can significantly influence financial decision-making, as marital obligations and family responsibilities often impact investment strategies and risk tolerance. Educationally, 40% of the respondents had completed undergraduate degrees, 30% held postgraduate degrees, 20% had vocational training, and 10% had high school education or less. Educational background plays a key role in shaping financial knowledge and investment behavior, with higher education often correlating with more informed investment decisions and strategic trading practices.

Table 1.- Regression line for Quality of Investment Decisions (QID)

Call:					
lm(formula = QID ~ RA + ML + IR, data = regression_data)					
Residuals:					
Min	1Q	Median	3Q	Max	
-2.04047	-0.33225	0.04289	0.29343	1.46069	
Coefficients:					
	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	0.75449	0.15294	4.933	1.72e-06 ***	
RA	0.44655	0.06549	6.819	1.11e-10 ***	
ML	0.13976	0.07234	1.932	0.0548 .	
IR	0.07148	0.07033	1.016	0.3107	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.5629 on 196 degrees of freedom

Multiple R-squared: 0.5105, Adjusted R-squared: 0.5031

F-statistic: 68.15 on 3 and 196 DF, p-value: < 2.2e-16

[Sources: Authors Analysis in R studio]

The analysis done for Quality of Investment Decisions (QID) using the regression model led to several key findings. The regression line, derived from the formula $\text{QID} \sim \text{RA} + \text{ML} + \text{IR}$, highlights the relationship between QID and the independent variables: Usage of Robo-Advisors (RA), Implementation of Machine Learning Models (ML), and Access to Integrated Reporting (IR). The results indicate that RA is a significant predictor of QID, with a coefficient estimate of 0.44655 and a p-value well below the 0.001 threshold, demonstrating a strong positive impact on investment decisions. ML shows a positive but marginally significant effect with a coefficient of 0.13976 and a p-value of 0.0548, suggesting a weaker influence on QID. On the other hand, IR does not significantly impact QID, with a coefficient of 0.07148 and a p-value of 0.3107, indicating the statistical insignificance of the effect.

The overall fit of the model is rather strong, as shown by an R-squared value of 0.5105 and an adjusted R-squared of 0.5031, meaning that approximately 51% of the variance in QID is explained by the independent variables included in the model. The F-statistic of 68.15 with a p-value < 2.2e-16 confirms that the model is statistically significant and effectively explains the variability in investment decisions.

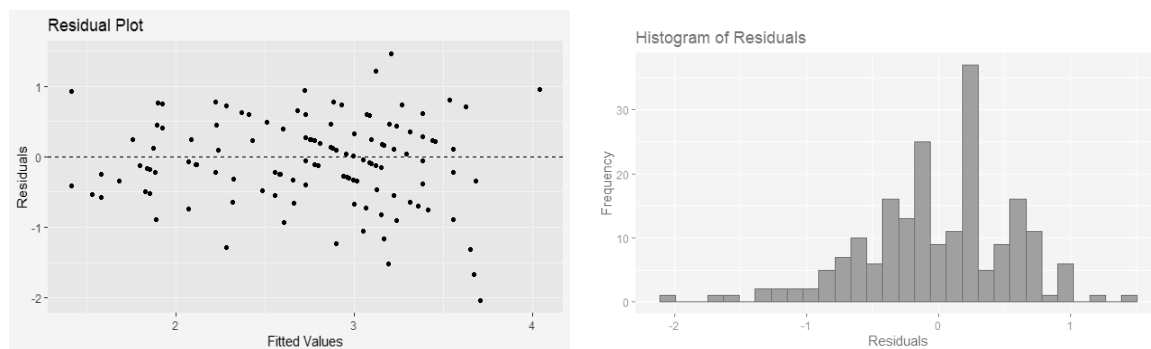


Figure 1: Residual plot, Histogram of Residuals

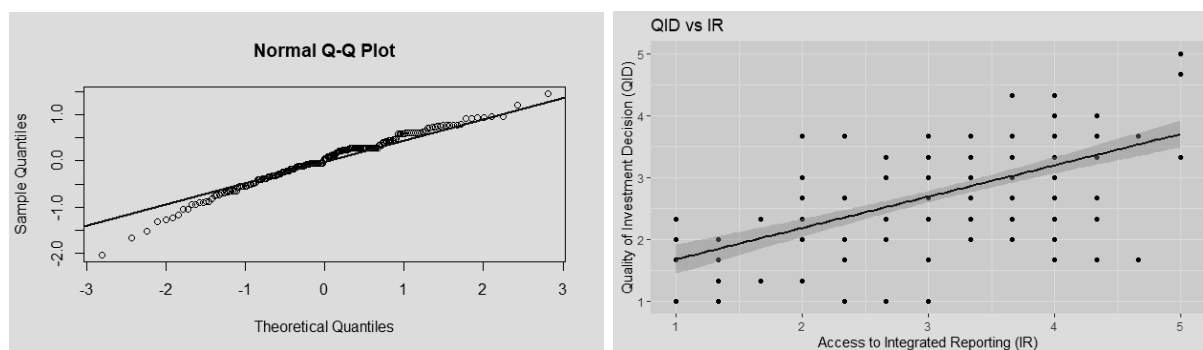


Figure 2: Q-Q Plot, QID vs IR Plot

The residual analysis, depicted in Figure 1 through a residual plot and histogram, shows that the residuals are fairly normally distributed and exhibit no apparent patterns, suggesting a good fit of the model. Figure 2 displays the Q-Q plot, which indicates that the residuals approximately follow a normal distribution. Additionally, the QID vs IR plot visually illustrates the relationship between

QID and IR, reinforcing the finding that IR has a minimal effect on QID. Overall, these findings illustrate the crucial role that robo-advisors play in enhancing decision-making processes and offer insightful information about the variables affecting the quality of investing decisions.

Table 2: Regression line for Rationality of Stock Market Trading (RSMT)				
Call: lm(formula = RSMT ~ AB + CB + HB + TT, data = regression_data)				
Residuals:				
Min	1Q	Median	3Q	Max
-1.7596	-0.1743	-0.0527	0.1530	1.7493
Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
(Intercept)	0.28606	0.14214	2.013	0.0455 *
AB	0.31516	0.07132	4.419	1.64e-05 ***
CB	0.44827	0.07955	5.635	6.06e-08 ***
HB	0.14642	0.07143	2.050	0.0417 *
TT	0.01236	0.06235	0.198	0.8430

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1				
Residual standard error: 0.5097 on 195 degrees of freedom				
Multiple R-squared: 0.6971, Adjusted R-squared: 0.6908				
F-statistic: 112.2 on 4 and 195 DF, p-value: < 2.2e-16				
[Sources: Authors Analysis in R studio]				

Thus, Regression analysis for the Rationality of Stock Market Trading (RSMT) model, specified as `RSMT ~ AB + CB + HB + TT`, reveals several important findings into how different circumstances affect the logic of trading. The model includes four independent variables: Anchoring Bias (AB), Confirmation Bias (CB), Herd Behavior (HB), and Usage of Technological Tools (TT). The results show that AB, CB, and HB significantly influence RSMT, while TT does not have a meaningful effect.

The coefficient estimates indicate that Anchoring Bias (AB) and Confirmation Bias (CB) have substantial positive impacts on RSMT, with coefficients of 0.31516 and 0.44827, respectively, and both variables have p-values significantly below 0.001. This suggests that higher levels of these biases are associated with more rational stock market trading. Herd Behavior (HB) also positively affects RSMT with a coefficient of 0.14642 and a p-value of 0.0417, indicating that it has a statistically significant impact on trading rationality, albeit weaker compared to AB and CB. In contrast, Usage of Technological Tools (TT) has a coefficient of 0.01236 and a p-value of 0.8430, implying that it does not significantly affect trading rationality.

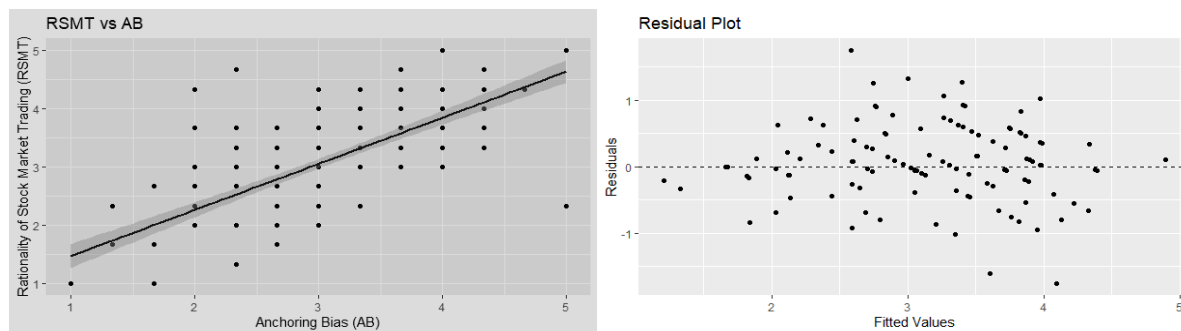


Figure 3: RSMT vs AB Plot & Residuals Plot

The overall fit of the model is strong, with an R-squared value of 0.6971 and an adjusted R-squared of 0.6908, suggesting that approximately 70% of the variance in RSMT is explained by the independent variables included in the model. The F-statistic of 112.2 with a p-value $< 2.2\text{e-}16$ confirms that the model is statistically significant.

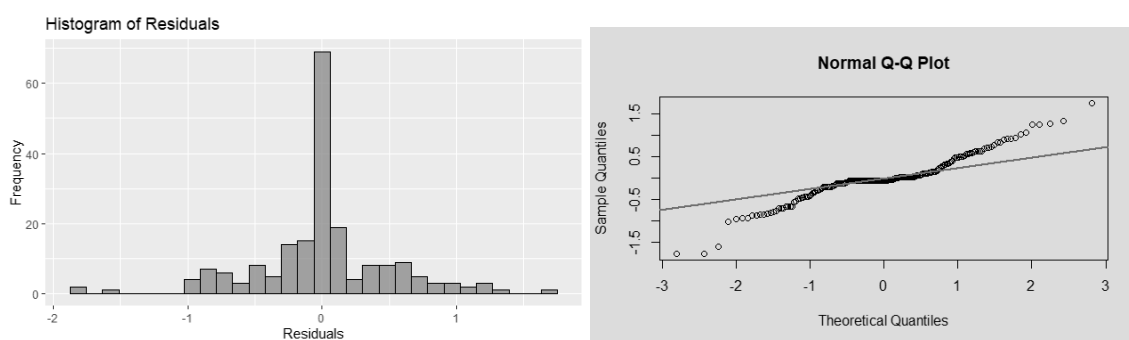


Figure 4: Histogram of Residuals and Q-Q plot

Figure 3 presents the RSMT vs. AB plot and the residuals plot, illustrating the relationship between RSMT and Anchoring Bias, as well as the distribution of residuals. Figure 4 includes a histogram of residuals and a Q-Q plot, which shows that the residuals are approximately normally distributed, indicating a good fit of the model. These findings highlight the critical role of behavioral biases in influencing the rationality of stock market trading, with Anchoring Bias and Confirmation Bias emerging as particularly influential factors.

The regression analysis results for Quality of Investment Decisions (QID) and Rationality of Stock Market Trading (RSMT) provide insights into the influence of various factors on investment and trading behaviors. For QID, the model shows that Usage of Robo-Advisors (RA) significantly improves investment decision quality, while Machine Learning Models (ML) have a marginal effect, and Access to Integrated Reporting (IR) does not contribute significantly. This indicates that technological tools can enhance decision-making quality, though their effectiveness varies.

In the RSMT model, Anchoring Bias (AB) and Confirmation Bias (CB) are significant predictors of trading rationality, highlighting their strong influence on trading decisions. Herd Behavior (HB) also significantly impacts RSMT, whereas the Usage of Technological Tools (TT) does not have a meaningful effect. Overall, the results highlight the significance of technical tools and behavioral factors in influencing investment and trading rationality.

Conclusion.

The study explores how various technological tools and behavioral biases influence investment decision-making and stock market trading rationality. The regression analyses reveal that Usage of Robo-Advisors (RA) significantly enhances the Quality of Investment Decisions (QID), while Machine Learning Models (ML) and Access to Integrated Reporting (IR) show varying degrees of

impact. In terms of Rationality of Stock Market Trading (RSMT), Anchoring Bias (AB) and Confirmation Bias (CB) are significant predictors, while Herd Behavior (HB) also plays a role. However, the Usage of Technological Tools (TT) does not significantly affect trading rationality.

These findings highlight the crucial role of technological innovations and psychological biases in shaping investment and trading behaviors. Future research could further explore how different technological advancements impact decision-making across various markets and investor demographics. Additionally, longitudinal studies could assess how evolving technologies and changing market conditions influence investor behavior over time.

Globally, understanding these dynamics can help investors and financial institutions tailor strategies to mitigate biases and leverage technology for better decision-making. Practically, the results suggest that integrating advanced technologies like robo-advisors and machine learning into investment strategies can improve decision quality. Financial advisors and institutions should also focus on educating investors about common biases to enhance trading rationality. Overall, addressing these factors can lead to more informed investment decisions and improved market stability.

References

- Arora, A., Kumar, S., Bansal, D., & Bansal, S. (2024). A Study of Awareness and Perception Regarding MOOC Courses with Special Reference to NPTEL. *Prabandhan: Indian Journal Of Management*, 17(4), 43-57. doi:10.17010/pijom/2024/v17i4/173427
- Annamalaisami, A. N. R. (2022). What differentiates angel investors in pre-seed versus seed-stage investments? Evidence from India. *Journal of Indian Business Research*, 14(1), 4–22. <https://doi.org/10.1108/JIBR-01-2021-0024>
- Ashuri, B., Lu, J., & Kashani, H. (2011). A real options framework to evaluate investments in toll road projects delivered under the two-phase development strategy. *Built Environment Project and Asset Management*, 1(1), 14–31. <https://doi.org/10.1108/20441241111143759>
- Badola, S., Sahu, A. K., & Adlakha, A. (2024). A systematic review on behavioral biases affecting individual investment decisions. *Qualitative Research in Financial Markets*, 16(3), 448–476. <https://doi.org/10.1108/QRFM-05-2022-0095>
- Bhatia, A., Chandani, A., Divekar, R., Mehta, M., & Vijay, N. (2022). Digital innovation in wealth management landscape: the moderating role of robo advisors in behavioural biases and investment decision-making. *International Journal of Innovation Science*, 14(3/4), 693–712. <https://doi.org/10.1108/IJIS-10-2020-0245>
- Bihari, A., Dash, M., Muduli, K., Kumar, A., Mulat-Weldemeskel, E., & Luthra, S. (2023). Does cognitive biased knowledge influence investor decisions? An empirical investigation using machine learning and artificial neural network. *VINE Journal of Information and Knowledge Management Systems*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/VJIKMS-08-2022-0253>
- Bolomope, M., Amidu, A.-R., Filippova, O., & Levy, D. (2021). Property investment decision-making behaviour amidst market disruptions: an institutional perspective. *Property Management*, 39(1), 1–21. <https://doi.org/10.1108/PM-06-2020-0042>
- Deb, S. K., Jain, R., Manohar, S., & Marwah, S. (2023). A study on mediation effect of relationship quality outcome between customer relationship management and mutual fund decision. *Global Knowledge, Memory and Communication*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/GKMC-09-2022-0212>
- Gupta, S., & Shrivastava, M. (2022). Herding and loss aversion in stock markets: mediating role of fear of missing out (FOMO) in retail investors. *International Journal of Emerging Markets*, 17(7), 1720–1737. <https://doi.org/10.1108/IJOEM-08-2020-0933>

- Izzularab, A. M., Radwan, F., Gad, R., & Björk, P. (2023). The mediating role of investment image in the effect of country image on investment intention: an empirical study on Egypt. *Review of International Business and Strategy*, 33(3), 493–516. <https://doi.org/10.1108/RIBS-06-2021-0082>
- Jain, R., Sharma, D., Behl, A., & Tiwari, A. K. (2023). Investor personality as a predictor of investment intention – mediating role of overconfidence bias and financial literacy. *International Journal of Emerging Markets*, 18(12), 5680–5706. <https://doi.org/10.1108/IJOEM-12-2021-1885>
- Jantarakolica, K., & Jantarakolica, T. (2018). Acceptance of Financial Technology in Thailand: Case Study of Algorithm Trading. In *Banking and Finance Issues in Emerging Markets* (Vol. 25, pp. 255–277). Emerald Publishing Limited. <https://doi.org/10.1108/S1571-038620180000025011>
- Jonwall, R., Gupta, S., & Pahuja, S. (2023). Socially responsible investment behavior: a study of individual investors from India. *Review of Behavioral Finance*, 15(6), 865–888. <https://doi.org/10.1108/RBF-05-2021-0099>
- Kalra Sahi, S. (2012). Neurofinance and investment behaviour. *Studies in Economics and Finance*, 29(4), 246–267. <https://doi.org/10.1108/10867371211266900>
- Kumar, S., & Patel, A. K. (2019). An analysis of cointegration between nifty index, dollar/INR and crude oil price. *Journal of Advanced Research in Dynamical and Control Systems*, 11(12), 151-159.
- Misra, R., Srivastava, S., & Banwet, D. K. (2020). Intuitive forecasting and analytical reasoning: does investor personality matter? *Qualitative Research in Financial Markets*, 12(2), 177–195. <https://doi.org/10.1108/QRFM-10-2018-0114>
- Nigam, R. M., Srivastava, S., & Banwet, D. K. (2018). Behavioral mediators of financial decision making – a state-of-art literature review. *Review of Behavioral Finance*, 10(1), 2–41. <https://doi.org/10.1108/RBF-07-2016-0047>
- P.H., H., & Uchil, R. (2020a). Impact of investor sentiment on decision-making in Indian stock market: an empirical analysis. *Journal of Advances in Management Research*, 17(1), 66–83. <https://doi.org/10.1108/JAMR-03-2019-0041>
- P.H., H., & Uchil, R. (2020b). Influence of investor sentiment and its antecedent on investment decision-making using partial least square technique. *Management Research Review*, 43(11), 1441–1459. <https://doi.org/10.1108/MRR-06-2019-0254>
- Rasheed, M. H., Rafique, A., Zahid, T., & Akhtar, M. W. (2018). Factors influencing investor's decision making in Pakistan. *Review of Behavioral Finance*, 10(1), 70–87. <https://doi.org/10.1108/RBF-05-2016-0028>
- Ribeiro, C. de M. de A., Cosenza, J. P., Zotez, L. P., & Vieira Neto, J. (2024). Disclosure of nonfinancial information in integrated reporting: the Brazilians professionals investors's perspective. *International Journal of Emerging Markets*, 19(6), 1695–1717. <https://doi.org/10.1108/IJOEM-11-2021-1699>
- Samant, A. (1999). RISK-ADJUSTED RETURN IN EUROPEAN INDUSTRIAL STOCKS: A GLOBAL INVESTOR'S PERSPECTIVE. *International Journal of Commerce and Management*, 9(1/2), 1–19. <https://doi.org/10.1108/eb047379>
- Sendra-Pons, P., Mas-Tur, A., & Garzon, D. (2024). Anchor investors and equity crowdfunding for entrepreneurs. *European Journal of Management and Business Economics*, 33(1), 20–36. <https://doi.org/10.1108/EJMBE-06-2022-0167>
- Sethi, S., Saxena, S., & Singh, M. (2023). A nexus of market web traffic and investor's behavior in the EdTech market: evidence of performance from US and India. *Benchmarking: An International Journal*, 30(9), 3150–3167. <https://doi.org/10.1108/BIJ-05-2022-0317>

- Song, G. H., & Jain, A. (2021). In search of angels: the first bucket of gold for entrepreneurs. *Studies in Economics and Finance*, 38(1), 126–148. <https://doi.org/10.1108/SEF-04-2020-0091>
- Sørheim, R., Øystein Widding, L., Oust, M., & Madsen, Ø. (2011). Funding of university spin-off companies: a conceptual approach to financing challenges. *Journal of Small Business and Enterprise Development*, 18(1), 58–73. <https://doi.org/10.1108/14626001111106433>
- Tauni, M. Z., Rao, Z.-R., Fang, H., Mirza, S. S., Memon, Z. A., & Jebran, K. (2017). Do investor's Big Five personality traits influence the association between information acquisition and stock trading behavior? *China Finance Review International*, 7(4), 450–477. <https://doi.org/10.1108/CFRI-06-2016-0059>
- Veerasingam, N., & Teoh, A. P. (2023). Modeling cryptocurrency investment decision: evidence from Islamic emerging market. *Journal of Islamic Marketing*, 14(7), 1817–1835. <https://doi.org/10.1108/JIMA-07-2021-0234>
- Verma, P., & Kumar, V. (2022). The analysis of OLC stages and the venture capital investors from Adizes life cycle theory. *International Journal of Organizational Analysis*, 30(6), 1819–1843. <https://doi.org/10.1108/IJOA-01-2021-2592>
- Verma, S., Rao, P., & Kumar, S. (2024). Is investing inherently emotionally arousing process? Fund manager perspective. *Qualitative Research in Financial Markets*, 16(2), 380–400. <https://doi.org/10.1108/QRFM-09-2022-0153>
- Yang, L., Lau, L., & Gan, H. (2020). Investors' perceptions of the cybersecurity risk management reporting framework. *International Journal of Accounting & Information Management*, 28(1), 167–183. <https://doi.org/10.1108/IJAIM-02-2019-0022>
- Yang, Y., Chen, T., & Zhang, L. (2016). Corporate venture capital program autonomy, corporate investors' attention and portfolio diversification. *Journal of Strategy and Management*, 9(3), 302–321. <https://doi.org/10.1108/JSMA-03-2015-0023>
- Zahera, S. A., & Bansal, R. (2018). Do investors exhibit behavioral biases in investment decision making? A systematic review. *Qualitative Research in Financial Markets*, 10(2), 210–251. <https://doi.org/10.1108/QRFM-04-2017-0028>
- Zhang, Y., Scholes, L., Fu, K., Hughes, M., & Tang, F. (2023). Equity crowdfunding syndicates and fundraising performance: the effect of human capital and lead investor reputation. *Journal of Small Business and Enterprise Development*, 30(4), 645–666. <https://doi.org/10.1108/JSBED-06-2022-0282>