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Machine Learning Models for Analyzing Investor Decision-Making in Equity Markets: An Empirical Study

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ABSTRACT:

The behavioral factors shaping equity investment decisions, focusing on trade dynamics, essential marketing, financial health, risk tolerance, psychological biases, and social media influence. This study examines how behavioral biases influence the investment decision-making. The investors decision is main influencing factor is economic environment of individuals. Stock markets are often seen as a reflection of the country's economic health, where changes in macroeconomic conditions can lead to fluctuations in stock prices, investor sentiment, and market stability. The main purpose of this study is to determine the factors influencing investors decision-making and to analyze the impact of cognitive biases on trading behavior, volatility, market returns and portfolio selection. Stock market performance is essential for investors, policymakers, and economists alike, as it provides valuable insights into market behavior, investment strategies, and economic forecasting. Recent advances in machine learning provide powerful tools to analyze such complexities by modeling high-dimensional and nonlinear relationships in financial data. This study empirically applies machine learning models to examine investor decision-making in equity markets, comparing their predictive performance and ability to identify key behavioral factors. The findings contribute to behavioral finance literature and offer practical insights for investors and market participants.

KEY WORDS: Machine learning models, risk tolerance, behavioral biases, Investor decision making, portfolio selection, Stock market.

1.INTRODUCTION:

The equity market is one of the most important sectors for economic development, as it provides the opportunity for capital formation. Investor decisions in the equity market are a complex process that involves rationality as well as behavioral aspects. Although the Efficient Market Hypothesis (EMH) states that investor decisions are based on rational analysis of the information given, recent findings in the field of finance have stated that the decisions of the investor are also influenced by behavioral aspects. Always emphasized the need for savings or depositing money in the bank or any other instrument with low risk. However, with the reduction of interest rates and the rise of technology, people are ready to accept more risk for the sake of stability in the future and for the chance to earn more in a short time. This increases the interest of the investor in the stock market. The aim of this study is to empirically examine the different factors that influence the decision-making of the investor in the equity market. These factors can include demographic factors, financial knowledge, risk-taking ability, market trends, etc. These factors play an important role in explaining the rationality of the investor's decisions. The stock exchange in India can be traced back to 1875 in Bombay, thus making it the oldest in Asia. Today, India boasts of 24 stock exchanges, but the most popular ones are the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE).

Our models for predicting stock returns for the current day and the next day have been created using a machine learning technique called Long Short-Term Memory (LSTM). The results have shown that news sentiments are an important aspect in determining stock prices. This indicates that investors can make better decisions based on business news as opposed to just relying on financial news. Similarly, regulators can make better decisions by targeting specific sectors such as manufacturing instead of a blanket approach.

2. LITERATURE REVIEW:

Shilpi Gupta & V. Sudhakar Rao (2025) "AI in Behavioral Finance: Understanding Investor Bias Through Machine Learning." To investigate how machine learning models can identify, analyze, and predict cognitive biases (such as overconfidence, loss aversion, herding, and confirmation bias) in investor behavior by integrating financial data with sentiment and psychological indicators. The study uses supervised and unsupervised ML techniques to uncover bias-driven patterns in decision-making that traditional finance models often miss.

Bustos et al. (2025) "Machine Learning, Stock Market Forecasting, and Market Efficiency" Comparative analysis of machine learning methods in forecasting stock indices, with a focus on understanding how market efficiency impacts model accuracy. The study investigates whether ML models (e.g., tree-based methods, neural nets) can outperform benchmarks and how predictive performance varies across markets relevant to investor decision-making under different market conditions.

Noel Juby Chandy (2025) "AI Driven Investment Strategies for Enhancing Stock Market Forecasting with Machine Learning Models" conducted a study on AI-driven investment strategies using machine learning models. The objective of the research was to evaluate how artificial intelligence and machine learning improve stock market forecasting accuracy and assist investors in making better investment decisions in volatile financial markets.

Manogna and Kulkarni (2025) "Portfolio optimization model for stock price prediction using machine Learning" developed a portfolio optimization model using machine learning algorithms. The objective of the study was to use the Extreme Gradient Boosting (XG Boost) model to predict stock prices and optimize investment portfolios, thereby helping investors improve decision-making and portfolio performance.

Aakanksha Jadhav & Vishal Mirza (2025) "**Large Language Models in Equity Markets: Applications, Techniques, and Insights**." To synthesize research from 2022 to early 2025 on Large Language Models (LLMs) applied to equity markets. This review categorizes LLM applications in stock forecasting, sentiment analysis, portfolio management, and algorithmic trading, highlighting how advanced language-based ML techniques are beginning to model investor behavior from text data (news, analyst reports, social media) for investment decisions.

3. RESEARCH METHODOLOGY AND RESEARCH DESIGN:

3.1 RESEARCH METHODOLOGY:

The research is depend on both primary and secondary data. For the purpose of primary data collection, a structured questionnaire was prepared and circulated among 150 respondents through Google Forms in the revenue divisions of Tirupati, Srikalahastri, and Sullurupeta using convenience sampling. The respondents were retail investors, individual investors, students, and working individuals of different age groups. The data collection process took place from December 2025 to March 2026. The questionnaire contained 16 questions, including demographic variables like age, gender, educational qualifications, employment status, and work-related activities, as well as opinion-based, yes/no, and Likert scale-based questions related to behavioral variables affecting investment performance in the equity market. For the purpose of secondary data collection, relevant research articles, journals, books, and case studies were collected for the purpose of supporting the research, designing the questionnaire, and understanding investor decision-making behavior. Statistical methods like factor analysis were employed for the purpose of analyzing the collected data.

Research hypothesis:

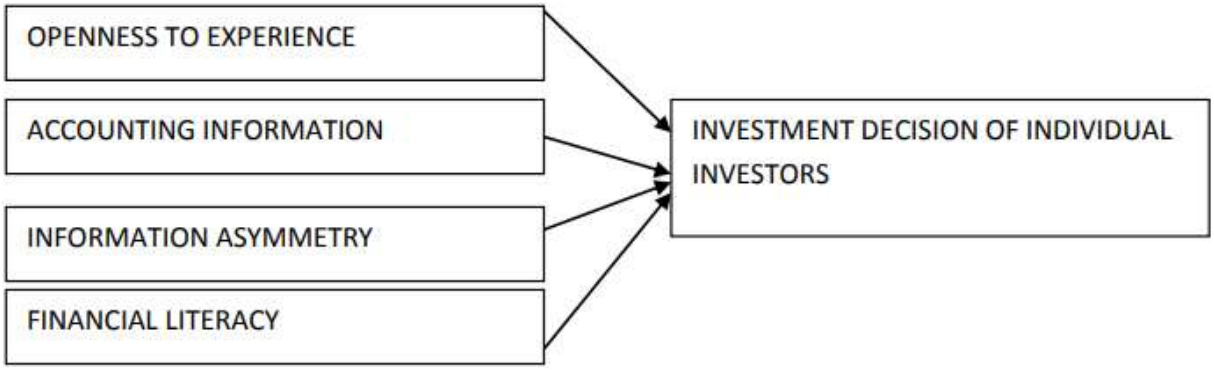
1) H0: Financial literacy and risk taking have a positive correlation. HA: Financial literacy and risk taking do not have a positive correlation.

2) H0: Experience and propensity to risk do not have a direct relationship. HA: Experience and propensity to risk have a direct relationship.

3) H0: Accounting information and risk aversion have an inverse relationship. HA: Accounting information and risk aversion do not have an inverse relationship.

4) H0: Analysis of financial statements is important to lower information asymmetry. HA: Analysis of financial statements cannot lower information asymmetry.

5) H0: Age and preference for investment in shares have a perfect positive relationship. HA: Age and preference for investment in shares do not have a perfect positive relationship.



RESEARCH DESIGN:

The data collected for the purpose of this research is of the primary type and has been collected through the administration of a questionnaire to individual investors in Tirupati. The respondents included executives, teachers, businessmen, students, white-collar and blue-collar employees, and housewives aged 18 years and above, without any discrimination based on gender, religion, caste, and culture, etc. The questionnaire included mostly questions of the checklist type, in which the respondents were required to choose one option, and some questions using the Likert scale to determine the importance that investors lay on the analysis of financial statements prior to making any investment decision. Though the main source of data is primary data, some support has also been taken from the journals and books that were available online to determine the variables, design the questionnaire, and interpret the statistical results.

Data type: The type of the data is Quantitative, as all the questions in the questionnaire have been designed to be close ended, as the primary aim of the research is to determine whether the relationship exists or not? And if it does exist, to what extent it is correlated and what is the statistical equation that links those variables?

Research sample: All the 150 questionnaires were distributed through e-mail, at different educational institutes (including students, teachers, and management), all the questionnaires was received back from the e-mail.

Sampling technique: Simple random probability sampling technique is used where every individual aging 18 years or above has an equal chance to be selected for survey.

Reliability of the research: The reliability of the research is satisfactory by the sufficient sample size and the state of the population that is being chosen and keeping in view other environmental variables too.

Methods of Analysis:

a) One Sample t-test

The test is a parametric test that compares the mean of the sample data to a known value. It is employed when there are two experimental conditions in the test, and the same participants were part of both the conditions of the experiment. In the present research, one sample t test is employed on all the statements that form behavioral biases to see if the mean response significantly differs from the neutral response.

The null hypothesis (Ho) and the alternative hypothesis (H1) of the one-sample t test can be written as follows:

Ho: μ=3 "the sample mean is equal to the sample test value (midpoint) in a 5 Likert Scale."

Ho: μ≠3 "the sample mean is not equal to the sample test value (midpoint) in a 5 Likert Scale."

Test Statistics

$$t = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{N}}}$$

Where, μ= Proposed constant for the population mean, $\bar{x}$= Sample mean, N= Sample size, S= Sample standard deviation

b) One-way ANOVA

The One-way ANOVA ("analysis of variance") is a parametric test used to determine whether there are any statistically significant differences between the means of three or more independent groups. Originally, it test the null hypothesis.

$$H_0: \mu_1 = \mu_2 = \mu_3 = \cdots = \mu_k$$

In the present study, this test is used to determine whether the impact of behavioral biases is same among all the respondents with respect to age, income level and experience of investors/traders.

3.2 NEED OF THE STUDY:

Equity market has a significant role to play in economic growth by providing a scope for savings and investment mobilization, which affects both personal and national financial stability. Despite its significant role, it has been observed that investors' behavior in the equity market does not entirely comply with conventional finance theories' assumptions of rational decision-making. Investors' decisions are taken under uncertain conditions and are affected by a wide range of psychological, economic, and socio-demographic determinants.

This study is needed for several key reasons:

1. Understanding Behavioral Dynamics:
Conventional finance theories, such as the Efficient Market Hypothesis, are not able to explain investors' behavior. Behavioral determinants such as overconfidence, risk perception, loss aversion, and herd behavior play a critical role in shaping investors' decisions. An empirical study can reveal how behavioral determinants can practically impact investors' decisions regarding equity investment.

2. Reducing Information Asymmetry:
Investors face many challenges because of the lack of proper information in the market. Knowing the information factors that affect investor decisions can assist in the development of better investor education schemes.

3. Enhancing Investment Performance:
Knowledge of the influencing factors can assist investors in taking rational decisions. Knowing the factors that affect investor decisions can also assist in the development of strategies to enhance the performance of investments.

4. Benefiting Financial Institutions and Policy Makers:
Financial institutions, such as financial advisors and brokerage firms, can benefit from the findings of the study regarding investor behavior. The findings of the research can assist in the development of better policies to protect the interests of retail investors.

5. Addressing Market Volatility and Risk Management:
The decisions of investors, as a whole, shape the market trends. The research can assist in the development of strategies to forecast the market trends by understanding the factors that affect investor decisions.

6. Filling the Research Gap:
Though there has been a wide array of literature on financial markets, there has been a lack of empirical evidence on specific regional areas or financial market conditions, like emerging financial markets, stock exchanges in India, etc. This research attempts to fill this gap by providing localized and updated empirical evidence on how various factors affect investors' decisions.

3.3 SCOPE OF THE STUDY:

The scope of this study includes the analysis of the various factors affecting individual investors' decision-making in the equity financial market. The study will cover the impact of various factors, like the economy, companies, psychology, and information, on investors' decisions. The study will be limited to retail investors' equity investments in a particular geographical location and time period, and the data will be collected using questionnaires, keeping in mind certain limitations like sample size and dynamic market conditions.

• The study is based on individual (retail) investors' participation in the equity market.

• The study includes economic factors, company-related factors, psychological factors, and information-related factors that affect the decisions of the investors.

• The study is based on equity investments only. Other investment options are not considered.

• The study is based on the geographical location of the data availability.

• The study is based on the investor behavior over a specific time period with the prevailing market conditions.

• The data is collected mainly from primary sources with the support of the secondary data.

• The findings of the study are subjected to limitations.

3.4 OBJECTIVES OF THE STUDY:

I. To understand the key behavioral factors that influence retail investors when selecting stocks for investment.

ii. To examine the impact levels of behavioral factors on the investment performance of the retail investors.

3.5 LIMITATIONS:

The study has certain limitations, and it is important to take these limitations into account while interpreting the results of the study. First of all, the sample size of the study is limited, and it is quite possible that it does not reflect the diverse population of investors in the equity markets. The results could have been more accurate and generalized if a larger sample size had been considered for the study. Secondly, the geographical area of the study is limited in the sense that it has only considered investors from a certain region or location. Hence, it is quite possible that the results of the study are not accurate enough to reflect the behavior and opinions of investors from different regions and locations of the world. Finally, the time period of the study is limited, and it has restricted the depth of the study in a certain way. It is possible that the study has not been able to reflect the changing behavior of investors over time.

4.DATA ANALYSIS AND INTERPRETATION:

The structural equation model below indicates how seven different perception factors impact investors' decision-making in the equity market. The seven perception factors include the future factor, trade factor, essential marketing factor, financial factor, risk-taking factor, psychological factor, and social media factor. In order to study these factors' relationship, eight observed exogenous variables and one unobserved endogenous variable were taken into consideration.

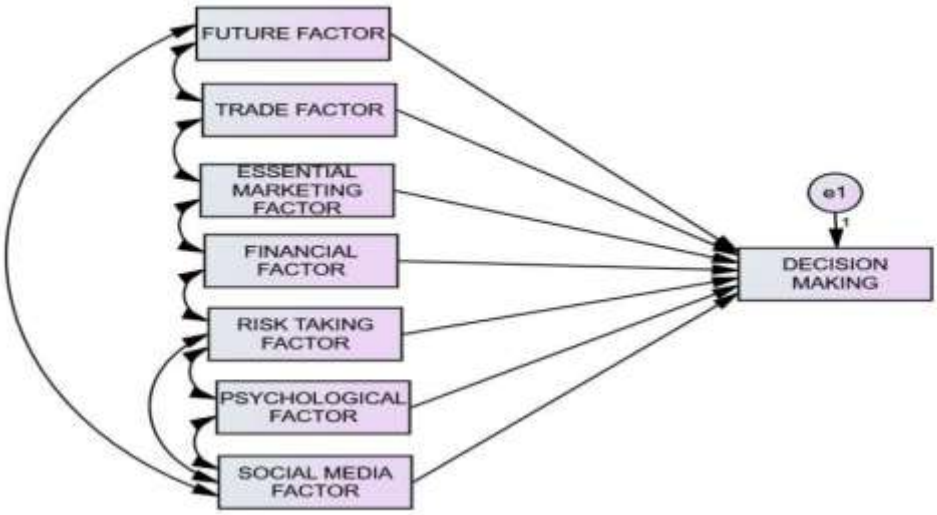


Fig.1 Structural Equation Model (SEM) of Investors' Decision-Making.

DATA ANALYSIS:

Our research study is based on primary data collected through a survey using a structured questionnaire.

Variables	Categories	Count	Percentage
Age	Below 20	33	22%
	21-30	74	49%
	30-40	21	14%
	other	22	15%
	Total	150	100
Gender	Male	74	49%
	Female	76	51%

	Prefer not to say	-	-
	Total	150	100
Occupation	Student	93	62%
	Private sector employee	30	20%
	Self-employed/Business	17	12%
	Government employee	8	5%
	House maker	2	1%
	Unemployed	-	-
	other	-	-
	Total	150	100
Educational Qualification	High school	-	-
	Undergraduate	38	25%
	Postgraduate	112	75%
	Other	-	-
	Total	150	100

Discussion:

The findings indicate that Machine Learning models aid in real-time trading, which includes models such as Random Forest, Decision Trees, Support Vector Machines, Neural Networks, Reinforcement Learning, etc. These models aid in the analysis of the decision-making of equity investors by processing large amounts of data, which can help identify non-linear patterns, sentiment, and risks, which may be missed by humans. It includes considerations such as volatility, real-world performance, data Quality performance, where over 60 percent of users experience improvement, optimization of assets, real-time trading, etc. Impact on investors decision-making, risk management, enhanced prediction, sentiment analysis, optimization of portfolios, etc.

Managerial Implications:

The results provide valuable insights for financial advisors and firms: (1) Focus on transparent marketing communication to foster trust among investors, (2) Utilize social media channels to spread reliable information among investors, and (3) Highlight financial metrics in investor education. Such an understanding can help in developing better portfolio strategies.

5 Conclusion:

Thus, it is clarified that overconfidence, economic expectation, and risk tolerance have significantly and positively influenced the investment decision of investors, while conservatism has significantly and negatively influenced the investment decision of investors. Moreover, overconfidence and economic expectation have significantly, positively, and directly influenced information search, while risk tolerance and conservatism have significantly, negatively, and directly influenced information search. Besides, information search has significantly, positively, and directly influenced the investment decision of investors. Hence, only the above five hypotheses are supported by the findings of this study. The sample size for this study is limited to 150 investors only, while four factors are only included for this study, and this study is conducted only for the Andhra Pradesh state of India. The study on the influence of personal and social factors on investment behavior among investors with the moderating effect of financial attitude may be conducted in the future.

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