

InvestEdge: Stock Recommendation and Trading Platform

Sumathi S*¹, Bhavya Datta*², Bhumika Singh*³, Disha Yadav*⁴, Janhvi Dikhit*⁵

*¹Professor, Department of Computer Science and Engineering, JSS Academy of Technical Education, Noida, Uttar Pradesh, India.

*^{2,3,4,5}Student, Department of Computer Science and Engineering, JSS Academy of Technical Education, Noida, Uttar Pradesh, India.

Abstract - Online trading combines finance and technology into an active alliance that has changed the way people interact with financial markets. The evolving environment of online trading platforms is examined in this paper together with their effects on traders' actions, risk tolerance, and portfolio results. By means of an analysis of several studies spanning thousands of trading accounts, field research with seasoned investors, and consumer feedback, we expose significant insights on the efficiency and satisfaction related with these platforms.

Especially in a globalized, privatized, and digitalized environment, the study underlines the need of consumer awareness and seamless trading experiences. This paper emphasizes the need of companies using consumer insights to solve problems, enhance trading systems, and offer innovations with an eye toward the user.

Key Words: InvestEdge, Stock Trading Platform, Machine Learning, LSTM, Recurrent Neural Network, Regression.

1. INTRODUCTION

The fast development of technology has fundamentally changed the financial scene, thus online trading is becoming a necessary component of contemporary investing plans. Through their speed, simplicity of access, and cost effectiveness, digital trading platforms have changed the conventional stock trading approach. Currently, traders value the ease with which they may place buy and sell orders for securities with just a few clicks, so lessening their reliance on in person broker or financial advisor visits. This development has not only increased access to financial markets but also given trading behavior and portfolio management fresh dimensions. Because online brokers charge less commissions, trading online has become less expensive, which helps to drive more regular turnover and increasing trading volumes. While traders gain from this convenience, it begs questions about how rising trading activity affects portfolio results, especially in view of related transaction costs and possible behavioral biases. Furthermore, the rise of "social trading," in which traders share their strategies and activities online, has promoted a community-oriented approach to investing by fusing elements of social media with financial decisions.

The use of information technology (IT) in finance has opened up new research avenues from an interdisciplinary standpoint. However, conventional financial theories alone are unable to fully explain the complexities present in this IT driven financial environment. Although they are still not fully explored in the financial industry, frameworks such as the Technology Acceptance Model (TAM) have proven crucial in understanding user experiences and IT adoption in a variety of fields. Similar to this, current financial theories like Portfolio Theory and Behavioral Portfolio Theory (BPT) have largely ignored how IT affects these dynamics in favor of concentrating on behavioral biases and rational decision-making. This review aims to address this gap by exploring how IT—especially its perceived usefulness and user contentment—influences traders' risk-taking tendencies and the effectiveness of their portfolios. This study examines the relationship between IT adoption and financial decision-making by drawing on recent research and applying interdisciplinary methodologies. In addition to contributing to the expanding corpus of work at the intersection of technology and finance, this study emphasizes the critical role that IT plays in contemporary finance and offers a thorough understanding of the opportunities and difficulties present in the current online trading environment. Since so many traders now rely on IT-driven platforms, it is imperative to comprehend the ramifications of this change. In order to ensure that the relationship between IT and finance develops in ways that benefit individual traders as well as the larger financial system, this review compiles recent research while also pointing out areas that require further investigation.

2. LITERATURE REVIEW

Technology's integration into stock trading has radically changed how investors interact with financial markets, creating opportunities for efficiency while also posing new difficulties for platform development and investor behavior. The evolution, acceptance, and effects of online trading platforms—particularly their impact on stock recommendations and trading actions—are examined in this review, which compiles important contributions in the field.



Fig -1: Online Trading Scenario

2.1 Online vs. Traditional Trading Practices

In their comparative analysis of online and traditional trading in India, Wail and Kumar (2021) highlight the fact that investors typically favor conservative trading strategies and show broker loyalty. Their findings show that despite online trading's transparency and oversight, many investors are still reluctant to use it. This cautious approach raises questions about the barriers preventing online platforms from being widely adopted. Similarly, Ancuta (2015) argues that more education and a solid understanding of internet technologies are necessary for investors to switch to online trading, suggesting a lack of knowledge among investors in general.

Davies and Cunningham (2012) used qualitative methods, such as online surveys and the Repertory Grid method, to examine investor opinions regarding online trading in the United Kingdom. Their study emphasized the need for platform forms to align with user frameworks and the critical role that customized user experiences play in encouraging adoption.

2.2 Behavioral Aspects of Online Trading

Barber and Odean (2000) draw attention to how behavioral biases affect trading habits, particularly in online environments. It is acknowledged that overconfidence and increased optimism are significant biases that lead to increased trading frequency and risk-taking. Similarly, traders who have limited access to high-quality information tend to have less diversified portfolios and exhibit more irrational trading behaviors, according to Huberman (2001) and Kahneman et al. (1999). These results emphasize the crucial role that information flow plays in investor decisions. Epstein and Schneider (2008) have further explored this idea and show how trading patterns and portfolio changes are significantly impacted by the credibility of news sources.

2.3 Customer Satisfaction and Service Quality

In online trading platforms, customer satisfaction is vital. Customer satisfaction is a critical component of business

profitability, according to Reichheld and Sasser (1990) and Bolton (1998). Dhar and Zhu (2002) and Fournier (1998) argue that in the context of online trading, behavioral biases such as high trading frequency and reliance on word-of-mouth recommendations are influenced by satisfaction. According to Zeithaml et al. (1996) and Ruyter et al. (1997), platform usability, dependability, and support services are critical for user retention and improving trading outcomes. They also stress that service quality is a major component of customer satisfaction.

2.4 Impact of Technology on Trading Behavior

According to Srivastava (2016), the emergence of online trading platforms has lowered entry barriers for individual investors. Geographical restrictions have been lifted, and financial offerings are now more widely known. However, as Bade (2017) points out, online trading is still in its infancy in India and requires more infrastructure and educational funding to encourage uptake. Rahim (2013) highlights the regulatory framework put in place by SEBI and the NSE, which has contributed to the expansion of online trading, but also highlights the need for continuous improvements.

2.5 Synergy Between IT and Finance

The convergence of IT and finance has created innovative prospects for interdisciplinary research. Conventional financial theories, like Portfolio Theory, emphasize logical decision making and risk preferences but overlook the impact of IT. Behavioral Portfolio Theory (BPT) enhances this comprehension by investigating how biases influence portfolio outcomes, but it also falls short in emphasizing technology integration. The Technology Acceptance Model (TAM) offers a solid framework for analyzing IT adoption via elements such as perceived utility and user contentment, serving as an important perspective for researching the uptake and efficiency of online trading platforms.

2.6 Conclusion

The literature analyzed shows a vibrant and changing domain where technology and investor behavior meet. Online trading platforms are transforming conventional trading models, yet their uptake is affected by elements like education, behavioral tendencies, and platform ease of use. As online trading expands, grasping these aspects will be essential for creating platforms that fulfill investor requirements while also improving trading efficiency and satisfaction. This review emphasizes the significance of cross-disciplinary strategies in tackling these challenges, ensuring that the collaboration between IT and finance keeps progressing in significant and impactful manners.

2.7 Challenges and Opportunities

The incorporation of technology into stock trading and recommendation platforms presents major challenges and transformative possibilities. A significant obstacle is the reluctance of investors to embrace online trading. Research conducted by Wail and Kumar (2021) shows that a limited number of investors move to online trading, frequently because of ignorance, cautious attitudes, and dependence on conventional brokers. Moreover, behavioral biases like overconfidence and optimism, as pointed out by Barber and Odean (2000), result in excessive trading, poorly diversified portfolios, and increased risks. A further critical concern is the reliability and trustworthiness of information; Epstein and Schneider (2008) point out that untrustworthy sources can lead traders astray, worsening inadequate decision-making. Moreover, technological limitations, such as insufficient infrastructure and regulatory challenges in areas like India, continue to be major hindrances (Srivastava, 2016).

Despite these challenges, there are a lot of opportunities in the industry. According to Ancuta (2015), platforms can close adoption gaps by enhancing financial literacy and offering user-friendly interfaces that empower investors. By adding features that encourage users to make rational decisions and diversify, behavioral insights present a chance to improve platform design. Decision-making processes can be substantially improved by using AI and machine learning to deliver accurate, timely information. Furthermore, Srivastava (2016) points out that emerging markets present an untapped potential for growth because of the increase in internet access. Online trading platforms have the potential to transform financial markets by addressing these issues and utilizing technological advancements, enabling greater participation and encouraging informed, capable investors.

3. Research Process

This research was carried out following the subsequent procedure-

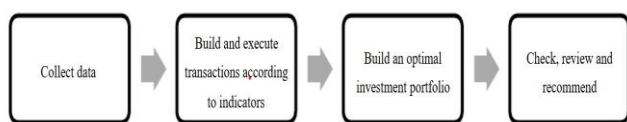


Fig -2: Research Process

Over the course of five years (2018–2023), the research team gathered transaction price data for the VN30 stock code. The two stages of the data collection process are the training phase (2018–2022) and the testing phase (2023).

The research team simultaneously develops trading algorithms based on indicator trading strategies and portfolio risk optimization algorithms using the Sharpe

ratio method. The research team uses indicator trading strategies to trade stock symbols during training. The five stocks that yield the highest returns in each indicator strategy are combined to form a portfolio with the goal of maximizing total returns. Furthermore, the research team raises the risk of investment portfolios by determining the optimal Sharpe ratio or capital allocation ratio to achieve the best risk-adjusted performance. The information used to raise portfolio risk is known as training stage data. During the testing phase, switch the aforementioned portfolios and the related tactics to ascertain the most effective strategy and portfolio based on the investment portfolio return rates.

4. Proposed Work

InvestEdge: Stock Recommendation Trading Platform is a state-of-the-art system designed to empower investors by utilizing advanced machine learning models and user-focused technologies. This is the main goal of this research. A broader audience, including those without technical expertise in financial analysis or programming, will find the stock market more accessible thanks to the proposed platform's user-friendly, data-centric insights and personalized stock recommendations, which aim to simplify the complexities of stock evaluation and trading.

4.1 Architecture of the System

The modular design of the InvestEdge Stock Recommendation Trading Platform blends advanced machine learning models, user-friendly interfaces, and efficient data processing workflows. Through a number of interrelated components, the system encourages investors to make data-driven decisions.:

4.1.1 Machine Learning System: This module, which forms the platform's core, assesses historical stock data, market trends, and macroeconomic variables using advanced deep learning models (TensorFlow and Keras).

Key characteristics include:

i. Stock Prediction Model: This model uses long shortterm memory (LSTM) networks and recurrent neural networks (RNNs) to manage temporal relationships in stock information in order to predict future stock behavior. ii. Sentiment Analysis Tool: To improve forecasts, this tool extracts market sentiment from news articles and social media sites.

4.1.2 Data Processing and Integration Layer: This layer gathers and examines a range of financial data: i. Live Data Retrieval Tool: Provides real-time market data and news alerts by connecting APIs. ii. Data Preprocessor: Enhances and standardizes data to ensure consistency for forecasting and model training.

4.1.3 Recommendation System: This module provides personalized stock recommendations according to user-specified parameters like investment goals, preferences, and risk tolerance.

It makes use of:

- i. Collaborative Filtering: Uses user behavior and trends to identify stocks.
- ii. Portfolio Optimization: Uses algorithms like Markowitz's Modern Portfolio Theory to strike a balance between risk and returns.

4.1.4 User Interface Layer: An interactive web interface powered by Streamlit:

- i. Visualization of Data Dashboard: Uses interactive graphs and charts to show important data.
- ii. Query-Driven Interaction: Allows users to ask questions in natural language for recommendations and stock evaluation

4.1.5 Communication and Scalability Framework:

RESTful APIs facilitate seamless module-to-module communication, enabling real-time data processing and ensuring the system can grow to accommodate expanding user demands.

4.2 Methodology

InvestEdge was created using a systematic process that includes data collection, preprocessing, model training, interface design, and performance optimization. Reputable APIs like Alpha Vantage and Yahoo Finance provide financial datasets, including historical stock prices and news about the market. To ensure its relevance and applicability for predictive modeling, the original data goes through extensive preprocessing stages like sentiment labeling, normalization, and filling in missing values.

Feature engineering is crucial during the model training phase since it produces significant metrics like sentiment scores, trading volume, and moving averages. To predict future price changes, a combination of historical stock data and sentiment analysis is used in conjunction with advanced deep learning models, such as Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU) networks. Stock recommendations are made using a hybrid approach that combines collaborative filtering and content-based filtering to offer useful and customized recommendations for portfolio management.

Streamlit is used to create a user-friendly interface that offers personalized portfolio recommendations and real-time data display. Hyperparameter adjustments are used to increase model precision and backend operations are improved to reduce query delays in order to improve user experience. This ensures that the platform delivers precise

and useful insights in a timely manner. This study was conducted using the following methodology.

Module	Key Features	Technologies Used
Data Collection	Historical prices, market sentiment	Alpha Vantage, Yahoo Finance
Preprocessing	Normalization, sentiment tagging	Pandas, Scikit-learn
Model Training	LSTM, GRU, feature engineering	TensorFlow, Keras
Interface Development	Real-time visualization, portfolio customization	Streamlit
Optimization	Latency reduction, hyperparameter tuning	Python, Hyperopt

Table -1: Technologies used

4.3 Anticipated Contributions

With the use of cutting-edge AI models, InvestEdge is poised to revolutionize stock market decision-making. Investors can make well-informed financial decisions because they have access to real-time insights and customized recommendations. By linking complex financial systems to easily accessible applications, the platform's user-friendly interface makes it simple for novice traders to use sophisticated trading tools. Scalability is ensured by its modular design, opening the door for future integrations such as cryptocurrency markets or Environmental, Social, and Governance (ESG) factors. Furthermore, advanced portfolio optimization techniques support profitable and sustainable investment strategies by helping users effectively manage risk while increasing returns.

4.4 Evaluation Plan

Comprehensive evaluation techniques will be used to gauge the platform's efficacy. Performance metrics, such as portfolio yields, recommendation efficacy, and prediction accuracy, will be compared to leading platforms. The usability and accessibility of the system will be clarified by user studies involving participants with varying degrees of experience. Real-world case studies will illustrate the platform's potency and applicability in diverse market situations. InvestEdge seeks to revolutionize the stock trading landscape by combining state-of-the-art technology with an intuitive user interface, promoting more astute and data-driven investment approaches.

5. CONCLUSION

A significant advancement in the field of stock market forecasting and investment selection is represented by InvestEdge. By combining machine learning capabilities, real-time financial data, and an intuitive user interface, this platform provides a comprehensive solution for investors wishing to make well-informed stock market decisions. The platform provides accurate stock recommendations based on historical data and market trends thanks to the use of TensorFlow and Keras for predictive modeling.

Making more strategic investment decisions is made easier by the application's user-friendly design, which is powered by Streamlit and makes predictions and insights simple for both novice and experienced investors to understand. Additionally, using Yahoo Finance's Financial Data API ensures that users get upto-date market information, which is crucial for maintaining a competitive edge in the dynamic world of stock trading.

InvestEdge can effectively process and store vast volumes of data thanks to the integration of a robust database management system (DBMS), ensuring optimal performance during periods of high demand. For seamless integration and increased scalability and adaptability, the platform makes use of RESTful APIs. InvestEdge continues to place a high premium on security, using encryption techniques to protect user data and financial transactions.

InvestEdge has a lot of room to grow and improve in the future. The integration of advanced machine learning models, which provide deeper insights like automated trading strategies and portfolio optimization, may be one of the upcoming enhancements. Additionally, InvestEdge could serve a larger spectrum of investors with diverse portfolios by expanding its data sources and adding more asset classes.

To sum up, InvestEdge is set to become an essential tool for anyone involved in the stock market. The platform makes stock trading simple and accessible for all types of investors by utilizing cutting-edge technologies and a customized, data centric approach. With its emphasis on accuracy, security, and user engagement, InvestEdge has the potential to completely transform the way that people invest in the stock market.

REFERENCES

- [1] Y. L. Lai, K. L. Huang, and S. Y. Yang," Real-Time Stock Prediction Through Correlation and Application of Deep Learning Models," in IEEE Access, vol. 7, pp. 173774173785,2019, Doi: 10.1109/ACCESS.2019.2959047.
- [2] A. Kumar and S. Thenmozhi," Forecasting Stock Index Movement: A Comparison of Support Vector Machines and Random Forest," in 2014 IEEE International Conference on Computational Intelligence and Computing Research, Coimbatore, 2014, pp. 1-6, Doi: 10.1109/ICIC.2014.7238424.
- [3] V. Mnih, K. Kavukcuoglu, D. Silver, et al.," Playing Atari with Deep Reinforcement Learning," ArXiv, abs/1312.5602, <https://arxiv.org/abs/1312.5602> 2013. Available:
- [3] M. H. Alomari, Y. K. Meena, and K. Suresh," Stock Market Analysis: A Review and Taxonomy of Prediction Techniques," International Journal of Financial Studies, vol. 7, no. 2, p. 26, May 2019, Doi: 10.3390/ijfs7020026.
- [5]. J. B. Heaton, N. G. Polson, and J. H. Witte," Deep Learning for Finance: Deep Portfolios," Applied Stochastic Models in Business and Industry, vol. 33, no. 1, pp. 3-12, Jan 2017, Doi: 10.1002/asmb.2209.
- [6] E. F. Fama," The Behavior of Stock-Market Prices," in Journal of Business, vol. 38, no.1, pp. 34-105, Jan. 1965.
Available:
<https://www.jstor.org/stable/2350752>
<https://www.jstor.org/stable/2350752> J. B. Dixit," Stock Market Analysis Using Artificial Intelligence: An Empirical Study," Journal of Computational Finance, vol. 25, no. 3, pp. 85-98, May 2021. [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
- [7] J. Murphy," Technical Analysis of the Financial Markets: A Comprehensive Guide to Trading Methods and Applications," New York Institute of Finance, New York, 1999.
- [8] Gowtham R. (2018). A Study on The Significance of Algorithms Trading's In Indian Stock Market. International Journal of Research and Analytical Reviews (IJRAR).
- [9] Ernest P. Chan. (2013). Algorithmic Trading: Winning Strategies and Their Rationale. University of Toronto.
- [10] Andersen, M. and R. Subbaraman (1996). Share Prices and Investment, Reserve Bank of Australia, Research Discussion Paper Nr. 9610.
- [11] Ziemba, William, T (1991). " Japanese Security Market Regularities: Monthly, Turn-of-the-Month and Year, Holiday and Golden Week Effects," Japan and the World Economy, Vol 3, pp 119-146.
- [12] Penman, Stephen, H (1987)." The Distribution of Earnings News Over Time and Seasonalities in Aggregate Stock Returns," Journal of Financial Economics, Vol 18, pp 199-228.
- [13] Mishra, B (1998)." Is "There Any Monthly Seasonal Pattern in Indian Stock Market?" paper presented in the Second Capital Market Conference of UTI-ICM, Mumbai, December 23-24, 1998.
- [14] Cadsby, C B and Ratner, M (1992)." Turn-of-Month and Pre-holiday Effects on Stock Returns: Some International Evidence," Journal of Banking and Finance, Vol 16, pp 497509.
- [15] Barone, E (1990)." The Italian Stock Market-Efficiency and Calendar Anomalies," Journal of Banking and Finance, Vol 14, pp 483-510.
- [16] Arumugam, S (1998)." High Stock Returns before Holidays: New Evidence from India," WPS No 11, UTI-ICM, Mumbai, February.

- [17] Shiller, Robert J. (1981), "Do Stock Prices Move Too Much to be Justified by Subsequent Changes in Dividends?" *American Economic Review*, vol. 71(3), 421-36, June. 107.
- [18] 108. Smith, G. (2001), "The price of gold and stock price indices for the United States". Unpublished manuscript, The World Gold Council, pp. 1-35.
- [19] Solnik B (1983), "The Relation between Stock Prices and Inflationary Expectations", *Journal of Finance*, Vol. 38, pp.35-48.
- [20] Solow, Robert. (2009), "How to Understand the Disaster", *The New York Review of Books*, May 14.
- [21] Summers, L.H (1986), "Does the stock market rationally reflect fundamental variables?" *Journal of finance*, pp. 591601.
- [22] Syriopoulos, T. (2007), "Dynamic Linkages between Emerging European and Developed Stock Markets: Has the EMU any Impact?" *International Review of Financial Analysis*, vol. 16, pp. 41-60.
- [23] Wehinger, Gert (2011), "Fostering Long-term investment and Economic growth Summary of a High-level OECD Financial Roundtable" *OECD Journal: Financial Market Trends*, Volume 2011, Issue 1.
- [24] Wolf, Holger. (1999), "International Asset Price and Capital Flow Movements during Crisis: The Role of Contagion, Demonstration Effects, and Fundamentals." Paper presented at the World Bank/IMF/WTO conference on "Capital Flows, Financial Crises, and Policies," April 15 16, Washington, D.C.
- [25] Leong S. C. and Felmingham B. (2003), "The Interdependence of Share Markets in the Developed Economies of East Asia", *Pacific-Basin Finance Journal*, Vol. 11, 219-237.
- [26] Levine, Ross (1991), "Stock Markets, Growth, and Tax Policy", *Journal of Finance*, Vol. 46, No.4, pp: 1445-1465.
- [27] Levine, Ross (1996), "Financial Development and Economic Growth: Views and Agenda," *Policy Research Working Paper Series 1678*, The World Bank.
- [28] Levine, Ross (1997). "Financial Development and Economic Growth: Views and Agenda". *Journal of Economic Literature*, Vol. 35, No. 2 (June), pp. 688-726.
- [29] Levine, Ross, (2005), "Finance and Growth: Theory and Evidence," *Handbook of Economic Growth*, in: Philippe Aghion Steven Durlauf (ed.), *Handbook of Economic Growth*, edition 1, volume 1, chapter 12, pages 865-934 Elsevier.
- [30] Levine, Ross and Zervos, Sara, (1996), "Stock Market Development and Long Run Growth", *World Bank Economic Review*, Oxford University Press, vol. 10(2), pages 323-39, May
- [31] Levine, R. and Zervos, Sara. (1998), "Stock Markets, Banks, and Economic Growth". *The American Economic Review*, Vol. 88 (3) 537 558.
- [32] McKinnon, R.I. (1973), "Money and Capital in Economic Development" Washington D.C.: The Brookings Institution.
- [33] Michie, Ranald. C (2006), "The Global Securities Market: A History" Oxford University Press, New York.
- [34] Minsky (1982), "Can 'It' Happen Again? A Reprise," *Challenge* (July August): 513.
- [35] Boyer, Brian H., Michael S. Gibson, and Mico Loretan (1999), "Pitfalls in Tests for Changes in Correlation" *Federal Reserve Board, International Finance Discussion Paper 597*.
- [36] Bracker, K., Docking, D.S., and Koch, P.D., (1999), "Economic Determinants of Evolution in International Stock Market Integration". *Journal of Empirical Finance*, 6, 1-27.
- [37] Campbell, Y.J and Perron, P. (1991), "Pitfalls and Opportunities: What Macroeconomists Should Know about Unit Roots" *NBER Macroeconomics Annual* Vol. 6, Accessed thorough; <http://www.nber.org/chapters/c10983>.
- [38] Caporale, Guglielmo Maria and Spagnolo, Nicola (2010), "Stock Market Integration between Three CEECs, Russia and the UK" *Working Paper No. 10-02*, Department of Economics and Finance, Brunel University, London, UK.
- [39] Chakrabarti, Rajesh (2001), "FII Flows to India: Nature and Causes" *Money and Finance*, Vol. 2, No. 7, October/December.
- [40] Chakravarty Sangeeta (2006), "Stock Market and Macroeconomic Behavior in India", *Institute of Economic Growth Discussion paper series no.106/2006*.
- [41] Chen, Nai-Fu, R. Roll, and S. Ross (1986), "Economic forces and the stock market", *Journal of Business*, vol. 59, pp. 383-403.
- [42] Chittedi, Krishna Reddy (2009), "Indian Stock Market Integration and Cross-country analysis" Presented paper 11 Annual conferences on Money and Finance in Indian Economy, organized by IGIDR, Mumbai, India on January 23-24, 2009