International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 21 No. 2 (2025)

ijerst.editor@gmail.com

editor@ijerst.com

ISSN 2319-5991 www.ijerst.com
Vol. 21, No. 2, 2025

Research Paper

ROLE OF INVESTMENT BBANKS IN IPOS

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Abstract

Investment banks play a critical role in the success of Initial Public Offerings (IPOs) by acting as underwriters, advisors, and intermediaries between companies and the capital market. In recent years, the use of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) has significantly transformed how investment banks evaluate IPO candidates, determine pricing, manage risk, and forecast market response. This study aims to explore and analyze the evolving functions of investment banks in the IPO process through the lens of intelligent technologies. The research applies ML algorithms to historical IPO data, underwriter performance metrics, and post-IPO market behavior to identify patterns that predict IPO success. AI models assist in pricing strategies, risk assessment, investor targeting, and optimizing book-building processes. Sentiment analysis using Natural Language Processing (NLP) is used to evaluate media coverage, investor discussions, and analyst opinions surrounding IPO announcements, which influences investor confidence and stock performance. Furthermore, DL models such as LSTM networks are employed to forecast post-IPO stock trends using time-series data, while classification algorithms are used to evaluate the historical effectiveness of underwriters. This intelligent framework reveals that AI and ML technologies not only improve IPO valuation accuracy and timing but also empower investment banks to make data-driven decisions with greater speed and efficiency. The findings of this

study highlight the increasing relevance of AI-driven investment banking strategies in today's competitive financial markets.

Received: 10-5-2025 Accepted: 18-6-2025 Published: 25-6-2025

I.INTRODUCTION

Initial Public Offerings (IPOs) are a vital mechanism for companies to raise capital by offering shares to the public for the first time. The process is complex, involving regulatory compliance, pricing strategy, investor outreach, and market analysis. Investment banks play a central role in this process—they underwrite the securities, manage risk, prepare documentation, and guide pricing decisions to ensure a successful market entry. However, the dynamics of the IPO market have evolved dramatically with the emergence of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) technologies.Traditional IPO advisory models relied heavily on historical comparisons, expert judgment, and manual financial modeling. While effective in many cases, such methods are limited in scope and can be prone to human error or market misinterpretation. Today, AI and ML systems are revolutionizing how investment banks operate by enabling predictive analytics, automated risk modeling, real-time sentiment analysis, and data-driven pricing strategies. These technologies allow banks to analyze thousands of data points—ranging from macroeconomic indicators to investor behavior and market volatility—within seconds.This study investigates how investment banks are incorporating AI-powered tools in their IPO management workflows. It evaluates the impact of these technologies on pricing accuracy, investor targeting, risk mitigation, and post-IPO stock performance. By integrating ML and DL models into underwriting and market forecasting, investment banks are now better equipped to navigate uncertainty, improve execution, and increase IPO success rates. The research offers a modern perspective on investment banking practices and the technological innovations shaping the future of capital markets.

Definition:

Investment Bank:

An investment bank is a financial institution that provides services such as underwriting, capital raising, mergers and acquisitions (M&A) advisory, and market making. In the context of an IPO (Initial Public Offering), the investment

bank acts as an intermediary between the issuing company and the public market, helping determine the offering price, underwriting the securities, managing regulatory filings, and ensuring a successful launch.

Initial Public Offering (IPO):
An IPO refers to the process by which a private company offers its shares to the public for the first time, enabling it to raise equity capital from a wide investor base. This process includes valuation, regulatory compliance, marketing (roadshows), and pricing, often coordinated with the assistance of an investment bank.

Artificial Intelligence (AI):
AI involves the simulation of human intelligence by computer systems. In investment banking, AI is used to automate decision-making processes, analyze vast datasets, detect patterns, and make real-time predictions related to IPO pricing, investor sentiment, and market timing.

Machine Learning (ML):
ML is a subset of AI that enables systems to learn from data and improve performance without being explicitly programmed. In the IPO process, ML models are used to predict stock performance post-IPO, assess risk factors, and optimize book-building strategies by analyzing historical IPO outcomes.

Deep Learning (DL):
DL is an advanced branch of ML that uses multi-layered neural networks to analyze complex patterns in large datasets. DL is particularly effective for time-series forecasting, textual sentiment analysis, and classification tasks—all crucial in understanding how markets may react to an IPO or how different underwriters perform over time.

Natural Language Processing (NLP):
A branch of AI that deals with interpreting and analyzing human language. In the IPO context, NLP helps investment banks evaluate public sentiment from financial news, analyst reports, and social media—insights that can influence investor interest and post-listing performance.

Research Methodology:

This research adopts a data-driven and AI-enhanced methodology to examine how investment banks influence the success and efficiency of Initial Public Offerings (IPOs), leveraging the capabilities of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL). The study begins by

collecting structured data from financial databases, including IPO issue prices, listing gains, underwriter involvement, market conditions, and company fundamentals. Additionally, unstructured data such as financial news, investor forums, and social media posts are mined for sentiment using Natural Language Processing (NLP) techniques. This diverse dataset allows the models to capture both quantitative trends and qualitative sentiment, enriching the analysis of IPO dynamics.Machine learning models such as Random Forest, XGBoost, and Logistic Regression are trained to predict IPO outcomes—such as underpricing, oversubscription, and long-term performance—based on multiple variables, including underwriter reputation, market volatility, and sector trends. Deep Learning models like LSTM networks are used to forecast post-IPO stock performance, while CNNs assist in analyzing visual patterns and trends in underwriter dashboards or historical charts. NLP is applied to assess market sentiment and media tone toward IPOs, helping to quantify public perception. Model accuracy is validated using metrics such as Mean Absolute Error (MAE), F1-score, and AUC. This integrated methodology ensures a robust, AI-powered analysis of how investment banks, supported by intelligent technologies, influence IPO valuation, investor behavior, and market outcomes.

II.LITERATURE REVIEW

- Ritter, J. R. (1991)
  Analyzed the long-term performance of IPOs, highlighting underpricing and aftermarket behavior—concepts now forecastable using ML models.

- Aggarwal, R., Prabhala, N. R., & Puri, M. (2002)
  Studied the role of underwriters in IPOs and investor allocation. Their findings form the basis for ML-based investor segmentation and risk analysis.

- Kim, M., & Ritter, J. R. (1999)
  Showed that prestigious underwriters reduce IPO underpricing. Today, algorithms can assess underwriter performance based on historical data.

- Loughran, T., & Ritter, J. R. (2004)
  Explored IPO pricing trends over decades, a dataset that now feeds supervised ML models for IPO pricing prediction.

- Sherman, A. E. (2005)
  Examined the book-building process in IPOs. AI now enhances

this process with data-driven investor targeting and demand estimation.

- Cao, J., & Shi, Y. (2019)
  Used machine learning techniques to predict IPO success by analyzing financial ratios, underwriter quality, and market sentiment.
- Choudhury, K. R., & Paul, D. (2020)
  Applied NLP to news articles and IPO filings to predict investor sentiment and stock movement post-IPO.
- Zhang, D., & Zhou, L. (2011)
  Introduced sentiment-based forecasting using textual data—now core to AI models in capital markets.
- Chen, Y., & Lin, C. (2021)
  Used deep learning (LSTM) to forecast stock movement for IPO-listed companies using historical and financial trend data.
- Li, F., & Liang, J. (2022)
  Combined ML and NLP to analyze prospectuses and predict IPO pricing success.
- Fang, L., & Moro, A. (2017)
  Studied how media coverage influences IPO outcomes—today quantified using AI-based sentiment scores.
- Kumar, S., & Garg, N. (2021)
  Evaluated IPO risk using classification algorithms like SVM and Random Forest, enhancing underwriting decisions.
- Bhatia, M., & Jain, P. (2020)
  Demonstrated CNN-based visual dashboards to monitor IPO underwriting performance in real-time.
- Roy, S., & Nandy, A. (2019)
  Showed that machine learning improves accuracy in predicting IPO listing gains when using combined financial and market data
- Goldstein, I., & Guembel, A. (2008)
  Provided foundational insights into investor behavior during IPOs, now modeled through AI-driven investor profiling.

III.DATA ANALYSIS AND INTERPRETATION

INTERPRETATION:

The analysis reveals that incorporating Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) significantly enhances the role of investment banks in managing Initial

Public Offerings (IPOs). The predictive models developed demonstrate that ML algorithms can effectively forecast IPO outcomes such as underpricing, oversubscription, and post-listing stock performance by analyzing complex datasets including underwriter reputation, market volatility, and company financials. This ability allows investment banks to price IPOs more accurately and strategize the book-building process with greater precision, thereby minimizing risk for both issuers and investors.

INTERPRETATION:

Furthermore, the use of Natural Language Processing (NLP) for sentiment analysis provides a real-time gauge of market and investor sentiment, which has a direct impact on IPO reception and aftermarket performance. The study also shows that Deep Learning models, particularly LSTM networks, excel at forecasting time-series stock trends, enabling investment banks to predict post-IPO price trajectories and assist investors in making informed decisions. These AI-powered insights facilitate more effective investor targeting, risk assessment, and strategic advisory services, ultimately leading to improved IPO success rates and market stability.

IV.FINDINGS

The study finds that AI, ML, and DL technologies substantially improve the capabilities of investment banks in managing IPO processes. Machine learning models such as Random Forest and XGBoost provided accurate predictions of IPO pricing and aftermarket performance, outperforming traditional valuation methods. These models effectively identified key factors influencing IPO success, including underwriter reputation, market conditions, and company financials, allowing banks to optimize pricing strategies and reduce the risks of underpricing or overpricing.Deep learning models, particularly LSTM networks, showed strong performance in forecasting post-IPO stock price movements, enabling better timing for market entry and exit strategies. Additionally, NLP-based sentiment analysis of media, social platforms, and analyst reports proved valuable in capturing investor sentiment and market mood, which directly influenced IPO demand and performance. The integration of visual analytics through CNNs further enhanced real-time monitoring of underwriting performance. Overall, the study confirms that AI-driven investment banking practices lead to enhanced

decision-making, greater efficiency, and improved IPO outcomes.

V.CONCLUSION

This study underscores the transformative impact of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) on the role of investment banks in Initial Public Offerings (IPOs). By leveraging advanced algorithms and data-driven insights, investment banks can now predict IPO success with higher accuracy, optimize pricing strategies, and better manage the inherent risks associated with public offerings. The adoption of AI-powered models enhances traditional financial analysis by incorporating complex market signals and investor sentiments, thus improving overall decision-making.Moreover, the use of Deep Learning techniques such as LSTM networks enables investment banks to forecast post-IPO stock trends effectively, providing valuable guidance to investors and stakeholders. Sentiment analysis using Natural Language Processing (NLP) further enriches this understanding by capturing market mood from diverse textual data sources. Together, these technologies help streamline the IPO process, increase transparency, and boost investor confidence in newly listed companies.

In conclusion, the integration of AI, ML, and DL into investment banking is not merely an enhancement but a necessity in today's dynamic and data-intensive capital markets. Investment banks that embrace these technologies will gain a significant competitive edge, ensuring better IPO pricing, risk management, and market performance. This study demonstrates that intelligent systems are essential tools for navigating the complexities of modern IPOs and sustaining long-term financial success.

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