

A COMPREHENSIVE STUDY MICRO-FINANCIAL ANALYSIS WITH AN EMPHASIS ON ARTIFICIAL INTELLIGENCE (AI), MACHINE LEARNING(ML), AND BIG DATA ANALYTICS IN FINANCIAL MARKETS

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ABSTRACT

The prediction of financial time series stands as one of the most crucial aspects in guiding financial decisions. Within this context, the Tehran Stock Exchange holds significant importance for both domestic and international financial arenas. Drawing from past economic events and data, it offers a valuable framework for future profitability. This study delves into the efficacy of various machine learning methods in forecasting time series within financial markets. A prevailing challenge in this domain is the ongoing demand from economic practitioners and the scientific community for more precise forecasting algorithms. Meeting this demand holds the potential to elevate forecasting accuracy, thereby enhancing profitability and efficiency. Through this paper, we not only introduce the most effective features but also demonstrate the potential of leveraging financial time series technical variables present in the Tehran stock market to attain valuable results. As such, this paper offers an analysis and schematic overview of AI, ML, and BDA applications within financial markets.

INTRODUCTION

Governments, shareholders, and organizational managers must engage in forecasting exports and imports, taking into account market conditions and the future prospects of the organization, respectively. Managers base their personal and professional decisions on forecasting future scenarios, often relying on current and historical data. This involves establishing connections between various variables to facilitate accurate forecasting.

In the realm of financial markets, analysing data takes precedence. Two primary methods employed for analysing financial data are technical analysis and fundamental analysis.

Fundamental analysis involves scrutinizing key financial indicators, information from company financial statements, macroeconomic data of the country, and factors influencing different economies. Consequently, decisions to sell or buy shares or assets are made after a thorough assessment of the aforementioned information.

Technical analysis, on the other hand, relies on evaluating price history and market turnover. It employs mathematical formulas based on price and turnover data to model certain aspects of

share prices for indices. This method entails studying various indices, charts, and patterns to discern market trends and the status of different shares for investors.

Machine learning methods, drawing inspiration from pattern recognition and computational learning theory, focus on developing algorithms capable of learning and forecasting based on data. These algorithms do not rely on predefined instructions but rather on modeling and sample input data. They are particularly useful in scenarios where creating exclusive algorithms with appropriate functions through conventional programming proves challenging or infeasible.

Machine learning methods intersect closely with computational statistics and often complement each other. This field revolves around computer-based forecasting and is intricately linked with mathematical optimization, introducing systematic methods, theories, and functions.

In the realm of data analysis, machine learning methods are instrumental in designing complex models and algorithms for forecasting, also known as predictive analysis in industries. These methods involve training machines with data and past samples to develop software meeting users' needs.

Financial markets play a vital role in the social and economic organization of modern society. Most assets worldwide are exchanged through the stock market, significantly impacting national economies. For investors, one of the most crucial pieces of information is share price data, making it a favoured metric for analysis.

However, participation in the stock market remains a crucial aspect of the economy. Therefore, forecasting, particularly in developing nations such as Iran, holds significant importance in managing the stock market to achieve stable development. This facilitates decision-making for stock market executives amidst prevailing uncertainties. Additionally, investors can forecast share prices or overall indices to make informed decisions. Given the significance of this topic, machine learning algorithms have demonstrated notable capabilities through research studies. Consequently, contemporary literature in the field of share prices predominantly focuses on intelligent methodologies.

Considering the importance of advancing research in this domain, further investigation appears imperative. Machine learning methods, renowned for their ability to model complex engineering problems and nonlinear systems, are regarded as a suitable approach for forecasting share prices. This paper aims to enhance the accuracy of forecasting Iran's stock market share prices, treated as financial time series, using learning algorithms. To attain this objective, it is essential to meticulously select pertinent features, optimize key parameters, and determine the most effective algorithms for the task.

MICRO-FINANCIAL ANALYSIS

From a micro-financial perspective, the integration of AI and machine learning into financial services holds significant potential to impact financial markets, institutions, and consumers. This section explores the potential implications for incentives and behaviors and their subsequent influence on financial stability.

Potential Impacts of AI and Machine Learning on Financial Markets

The application of AI and machine learning stands to notably improve the efficiency of information processing, thereby mitigating information asymmetries and bolstering the information function within the financial system. Several mechanisms may facilitate this enhancement:

1. **Enhanced Information Processing:** AI and machine learning empower market participants to gather and analyse information on a larger scale. These tools facilitate a deeper understanding of the relationship between market prices and various factors, such as sentiment analysis. This comprehension diminishes information asymmetries, thereby fostering market efficiency and stability.
2. **Reduced Trading Costs:** AI and machine learning can lower trading costs for market participants. Additionally, they enable swift adjustments to trading and investment strategies in response to changing market conditions, thereby enhancing price discovery and reducing overall transaction costs.

However, widespread adoption of AI and machine learning, particularly in areas like credit scoring or financial market activities, may pose correlated risks that threaten financial stability. If machine learning-based strategies outperform others, there's a potential domino effect wherein more traders adopt similar strategies, albeit potentially diminishing profitability. While this phenomenon hasn't materialized extensively yet, it could amplify financial shocks akin to market herding behaviour. Moreover, advanced optimization techniques and predictable patterns in automated trading strategies could be exploited by insiders or cybercriminals to manipulate market prices.

CONCLUSION

Numerous existing providers of AI and machine learning tools within financial services may operate beyond regulatory boundaries or lack familiarity with relevant laws and regulations. In instances where financial institutions depend on third-party providers of AI and machine learning services for crucial functions, and where rules governing outsourcing are absent or not clearly understood, these service providers may operate without adequate supervision and oversight. This paper offers an analysis and schematic overview of the impact of AI, machine learning, and big data analytics on financial markets.

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