Chapter 9
Portfolio Management Systems in Predicting the Performance of Mutual Funds Using Machine Learning

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ABSTRACT

Portfolio management systems (PMS) in mutual funds are a vital process that involve selecting, allocating, and monitoring investments within the mutual fund. They balance risk and returns consistent with the fund's objectives while ensuring it functions effectively and meets regulatory requirements. Proper PM ensures that mutual funds provide the best returns to their clients while managing risks effectively. Artificial intelligence (AI) in mutual fund management information systems (MFMIS) refers to integrating artificial intelligence technology into MFMIS. These developments help to automate tasks, optimize portfolio administration, increase risk analysis, and boost customer service. The use of machine learning (ML) to forecast mutual fund (MF) performance is becoming more essential in portfolio management systems. These systems can handle massive amounts of data, use sophisticated algorithms, and deliver data-driven insights to fund managers and investors, allowing them to make better-educated decisions.

INTRODUCTION

PMS handles a group of investments, sometimes referred to as a portfolio, to attain specified financial objectives. It entails choosing, tracking, and adjusting various investment assets, including real estate, bonds, stocks, commodities, and financial instruments. The purpose is to balance risk and return based on the investor's goals, risk tolerance, and time horizon. Efficient PM is critical for maximizing investment returns while mitigating risks. It is a critical component of managing assets for individual investors

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and institutional institutions, such as mutual funds, pension funds, and endowments. PM approaches allocate capital to varied assets with different projected returns and risk levels, intending to achieve low volatility and long-term consistent earnings. Conventional systems suffer from some degree of flexibility regarding objective achievement and time-sequential information encoding. To overcome these issues, PM approaches use ML to perform various tasks, including Classification and prediction of different assets (Sabti et al., 2023).

Machine learning technology has transformed portfolio management to offer more accuracy in predictions, leading to informed decisions and better risk management. Portfolio management involves human judgment and intuition or simple statistical techniques such as historical performance analysis and easy-to-use techniques for prediction. In contrast, massive data, powerful algorithms, and computing enable ML to build the most efficient investment policies. It can detect latent patterns, correlations, or anomalies in enormous financial data datasets ranging from market trends to asset-specific traits by processing the same (Nwabuokei et al., 2023). The PMS portfolio management system automatically mechanizes many manual processes and assesses future fund performance risk. Therefore, the integration of ML saves more time, reduces human errors and bias, and helps make more accurate decisions based on data (Odoemena and Elufidodo, 2024). The ML models will learn and adapt to changes in market conditions, and portfolio managers will get real-time updates based on factors such as macro variables, geopolitical events, or particular behaviours of assets. Some techniques of NLP and sentiment analysis use some ML, such that they process unstructured data drawn from news articles, social media, and earnings calls in a way that adds value to the decisions being taken (Olubunmi, 2024). It enables portfolio managers to act swiftly on market changes, rebalance their portfolios, and make proactive adjustments (Priscila et al., 2023). In short, it improves the accuracy of predictions about a fund's performance. It develops tools for a portfolio manager to manage his risks better and maximize his returns, forming a more dynamic and resilient way of managing investments. Its ability empowers PM professionals to deal with the complexity of the financial landscape through automation and predictive modelling (Sivapriya et al., 2023).

Research has consistently demonstrated that, on average, actively managed mutual funds tend to fall behind their benchmarks, not infrequently, with negative time-series risk-adjusted returns (alpha) after any transaction costs, management fees, and other associated expenses have been accounted for (Maroju, 2024). Much of the promise of the outperformance of active management is not delivered by such managers in the form of consistent returns that justify the higher costs of active management (Murugavel and Hernandez, 2023). Specifically, in the U.S. mutual fund industry, trends in passive funds are of particular interest, under which assets under management are growing significantly to surpass amounts held in active funds invested domestically in equities (Sulaiman et al., 2024). To benefit investors, passive funds maintain minimum management fees, transactional expenses, and other operational costs and track a specific index or market benchmark without trying to beat it (Raj et al., 2024). The persistent underachievement of many active managers is often cited as the reason for the increasing dominance of passive investing, whose higher fees and trading activity erode potential gains. Despite its higher costs, it has become evident that the typical active fund often fails to outperform its passive counterparts, particularly after adjusting for risk (Bin Sulaiman et al., 2023).

Consequently, many investors prefer passive funds that offer broad market exposure at lower costs and still have competitive long-term returns. Index funds and, more recently, exchange-traded funds have amplified this trend because they have democratized diversified investment portfolios at a fraction of the cost of traditional actively managed funds (Princy Reshma et al., 2023). Critics of the active manage-