Abstract

Stock Price Movement Prediction Using LSTM-Based Deep Learning: A Framework for Multi-Asset Investment Analysis

Financial market prediction remains a critical challenge in quantitative finance, with significant implications for investment decision-making. This dissertation proposes an LSTM-based deep learning framework for predicting price movements across multiple asset classes, including individual stocks, mutual funds, and exchange-traded funds (ETFs). Traditional forecasting methods such as ARIMA and GARCH models often fail to capture the complex non-linear relationships and temporal dependencies present in financial time series data. This research addresses these limitations by leveraging the sequential learning capabilities of LSTM networks.

The proposed methodology integrates multiple data sources including historical price and volume data, technical indicators, and macroeconomic variables. A key contribution is the development of an attention mechanism within the LSTM architecture that identifies relevant temporal patterns for improved prediction accuracy. The framework extends beyond equity markets to include mutual fund performance prediction by incorporating fund-specific characteristics such as expense ratios, portfolio composition, and historical performance metrics.

The research objectives are: (1) to develop an LSTM-based model for stock price movement prediction, (2) to extend the framework for mutual fund and multi-asset analysis, (3) to evaluate performance against traditional statistical and machine learning methods, and (4) to integrate predictions into a portfolio optimization framework. The modular design allows for future extensions including additional asset classes and advanced deep learning architectures.

Preliminary analysis suggests that LSTM networks demonstrate promising capabilities in capturing temporal dependencies that traditional methods overlook. The expected outcomes include a robust predictive framework that serves as a decision support tool for investors and fund managers, with potential applications in automated portfolio management and risk assessment systems.

This dissertation contributes to the intersection of artificial intelligence and finance by demonstrating the practical applicability of deep learning for investment analysis across multiple asset classes, providing a foundation for future research in intelligent financial systems.

Keywords: LSTM, Deep Learning, Stock Price Prediction, Mutual Funds, Portfolio Optimization, Time Series Forecasting, Financial Market Analysis