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| **PROJECT OVERVIEW** | **Project Name:** | **Project Manager:**  **Mansurova Aigerim** |

**STATEMENT (POS)**

The stock market is a complex and dynamic system, and predicting stock prices accurately is a challenge for both investors and financial institutions. The aim of this research project is to evaluate the performance of different forecasting models in predicting the prices of stocks in a portfolio. Furthermore, the study aims to optimize the portfolio using optimization techniques to determine the optimal allocation of assets for maximum return and minimal risk.

**Problem/Opportunity/Research Question(s):**

* Which forecasting model performs the best in predicting the prices of stocks in a portfolio?
* How can optimization techniques be used to determine the optimal allocation of assets in a portfolio for maximum return and minimal risk?
* How do the results of this study contribute to our understanding of effective portfolio management strategies and forecasting methods in the stock market?

**Dataset:**

I will retrieve the data from Yahoo Finance API and create a dataset containing open/close/high/low prices of 3 stocks in different areas (tech, energy, etc.).

**Goal:**

To evaluate the performance of different forecasting models and optimize a portfolio of stocks for maximum return and minimal risk, by analyzing the historical stock prices, selecting the best performing models, and using optimization techniques to determine the optimal allocation of assets.

**Objectives:**

* Collect and preprocess stock price data for a portfolio of stocks from 2013 to present date.
* Evaluate the performance of several machine learning models, such as ARIMA, SARIMA, Prophet, and LSTM, in predicting the prices of stocks in the portfolio.
* Compare the performance of the models using appropriate evaluation metrics, such as mean absolute error, mean squared error, and root mean squared error.
* Determine the best performing model based on the evaluation results.
* Use optimization techniques, such as Markowitz portfolio optimization, to determine the optimal allocation of assets in the portfolio for maximum return and minimal risk.
* Evaluate the performance of the optimized portfolio using relevant performance metrics, such as Sharpe ratio, returns, and risk.
* Compare the performance of the optimized portfolio with a benchmark portfolio, such as the S&P 500, and assess the improvement in portfolio performance.

**Success Criteria:**

Evaluation of the performance of the selected time series forecasting models with a minimum of 75% accuracy in predicting the stock prices.

**Assumptions, Risks, Obstacles:**

Assumptions:

* The data collected from Yahoo Finance API is accurate and reliable.
* The selected time series forecasting models can accurately predict stock prices in various market conditions.
* The optimization techniques used can effectively determine the optimal allocation of assets in the portfolio for maximum return and minimal risk.
* The historical stock price data can accurately represent future market trends and conditions.

Risks:

* The selected models may not be suitable for all types of stocks or market conditions, which may lead to inaccurate predictions and poor portfolio performance.
* The historical stock price data may not be representative of future market trends and conditions, which could result in poor portfolio performance.

Obstacles:

* Evaluating and comparing the performance of several time series forecasting models may require a significant amount of computational resources.

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| **Prepared By** | **Date** | **Approved By** | **Date** |
| Aigerim Mansurova | 02/11/2023 |  |  |