

# **Project Proposal - Capstone Project Three: Hybrid Stock Price Forecasting**

This project aims to develop a hybrid model that accurately forecasts the price of a selected stock by integrating historical price data, correlated assets, and economic indicators. The model's performance will be measured by its ability to achieve at least a 10% improvement in prediction accuracy over baseline models that use only a single data source, using metrics such as Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE). Leveraging publicly available data and established modeling techniques, the project will focus on creating a prototype within a three-month period, ensuring the solution is both achievable and scalable for real-world application.

## **1. Context**

The financial markets are inherently volatile, with stock prices influenced by a myriad of factors including historical price trends, correlated assets, and broader economic indicators. Investors and financial analysts are constantly seeking more accurate methods to forecast stock prices in order to make informed decisions, mitigate risks, and maximize returns. Traditional stock price prediction methods often rely on singular approaches, such as analyzing time series data alone, which may not capture the full complexity of market dynamics. This project seeks to address this gap by integrating multiple sources of data—historical prices, correlated assets, and economic indicators—to develop a hybrid model that provides more accurate stock price predictions.

## **2. Criteria for Success**

- **Accuracy:** The hybrid model should demonstrate improved prediction accuracy compared to models using only one data source (e.g., only time series data).
- **Integration:** Successful integration of time series data, correlated asset data, and economic indicators into a cohesive forecasting model.
- **Usability:** The final model should be easy to interpret and deploy, providing actionable insights to investors.
- **Scalability:** The approach should be adaptable to different stocks and markets, allowing for broader application.

## **3. Scope of Solution Space**

- **Data Integration:** The solution will involve the integration of time series data, correlated stock data, and economic indicators.
- **Hybrid Modeling:** The project will explore various modeling techniques, including traditional statistical methods (e.g., ARIMA) and machine learning models, to create a hybrid prediction system.

- **Evaluation:** The solution will be evaluated against baseline models (e.g., ARIMA on time series alone) to ensure that the hybrid approach adds value.
- **Deployment:** The final model will be designed for potential deployment in a real-world trading environment, with considerations for ongoing updates and retraining.

#### **4. Constraints**

- **Data Availability:** The project will be limited to the availability of accurate and timely data from the selected sources (e.g., Yahoo Finance).
- **Computational Resources:** The complexity of the model and the volume of data may require significant computational resources, potentially limiting model complexity.
- **Time Constraints:** The project will need to be completed within a set timeframe, which may limit the depth of exploration into different modeling techniques.
- **Market Volatility:** External factors, such as sudden economic changes or unforeseen events, may impact the accuracy of the model, highlighting the challenge of forecasting in volatile markets.

#### **5. Stakeholders**

- **Investors:** Primary users of the model who will rely on its predictions to make informed investment decisions.
- **Financial Analysts:** Professionals who will use the model to enhance their market analysis and provide better recommendations.
- **Portfolio Managers:** Stakeholders who will use the model to manage and optimize investment portfolios.
- **Data Scientists/Quants:** Responsible for developing, testing, and maintaining the model, ensuring it remains accurate and up-to-date.

#### **6. Data Sources**

- **Yahoo Finance API:** For historical stock price data, including time series data for the stock being forecasted and correlated assets: [Yahoo Finance - Stock Market Live, Quotes, Business & Finance News](#)
- **Economic Indicators:** Data on economic indicators such as GDP, interest rates, and inflation, potentially sourced from platforms like FRED (Federal Reserve Economic Data) or Quandl: [Federal Reserve Economic Data | FRED | St. Louis Fed \(stlouisfed.org\)](#)
- **Other Market Data:** Additional financial data such as trading volume, market sentiment, or macroeconomic factors from sources like Bloomberg or Trading Economics.