
MarketMatrix Pro
Stock Market Analysis & Prophet forecasting

Executive Summary

- What is the best time to buy, and what is the best time to sell a stock or crypto?
- What is the overall trend of the stock or crypto?
- What month, day, time is the best time to buy or sell the stock or crypto?

This tool will take in multiple stock market and crypto ticker symbols. It will gather as much data on those symbols as available, under the yahoo finance API. It will then provide closing prices based on a user provided frequency (1day, 6 months, 1yr, etc.).

It will then provide predictions using that data on where the stock is heading in the near future which will then give us the ability to choose the best action to take on whether to buy or sell. It also provides additional data such as news events and the yahoo provided recommendations on whether its a strong buy, buy, hold, sell, or strong sell.

Project Approach

- Our analysis tool is built using Python, leveraging several libraries, such as Yahoo Finance (yfinance), Pandas (pandas), Plotly (plotly.graph_objs), Prophet (prophet), and Streamlit (streamlit). The tool is designed to provide users with detailed financial analysis and visualizations for selected ticker symbols.

- We shifted our approach from a static ticker selection to a user interactive input to take in a dynamic list of ticker symbols.

- We decided to use Streamlit which is a GUI interface Python module to provide a better user experience while using our tool.

Data Collection & Cleanup

- Data Sources
  - The data for this project was sourced from the Yahoo Finance API (yfinance).
  - We use yfinance to fetch stock data, including historical prices, financial statements (income statement, balance sheet, cash flow statement), analyst recommendations, and news articles.
- Data Cleanup Process
  - Whitespace Removal .....
  - Handling Missing Values .....
  - Data Formatting .....
  - Column Renaming .....
  - Data Transposing .....
  - Error Handling.....

```
research_symbol = research_symbol.strip()
prophet_df.dropna(inplace=True)
prophet_df['ds'] = prophet_df['ds'].dt.tz_localize(None)
recommend_new = recommend.rename(columns=new_column_names)
income_stmt_t = income_stmt.transpose()
except Exception as e:
    st.error(f"Could not retrieve data for ticker symbol: {research_symbol}. Error: {e}")
```

Data Exploration

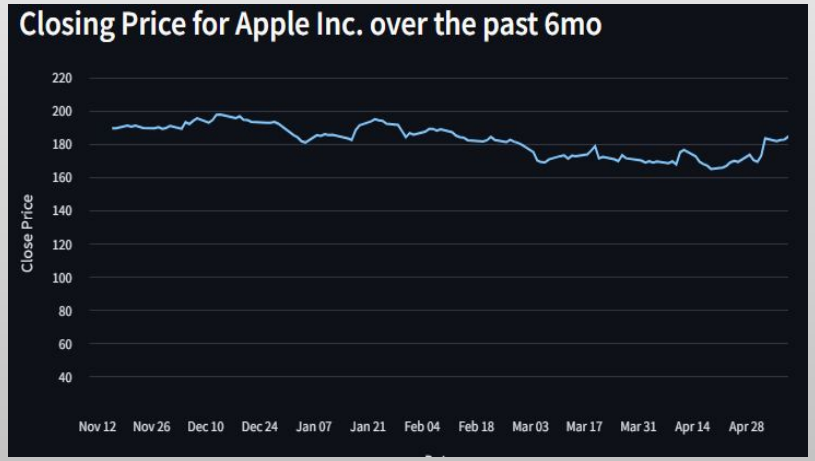
- Exploratory Data Analysis
  - Data Retrieval
  - Initial Data Examination
  - Visual Data Exploration
  - Financial Statement Analysis
  - Advanced Statistical Analysis
  - Comparative Analysis

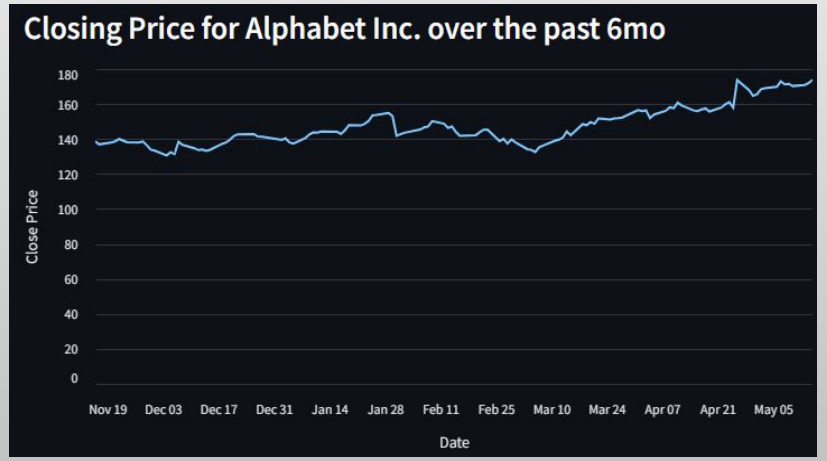
Data Exploration

- Key findings from initial data exploration
  - Prophet model output, when based on simple closing data, isn't a very good output on predicting where closing prices will be, it's more of a trending line extension.
  - It does however give a good overview of what days and time of year is the best time to buy or sell.
  - We were limited on daily close data with the free yahoo API. If we could tie this to a paid subscription API to gather more granular data, it could be more accurate in predicting future prices.

Stock History

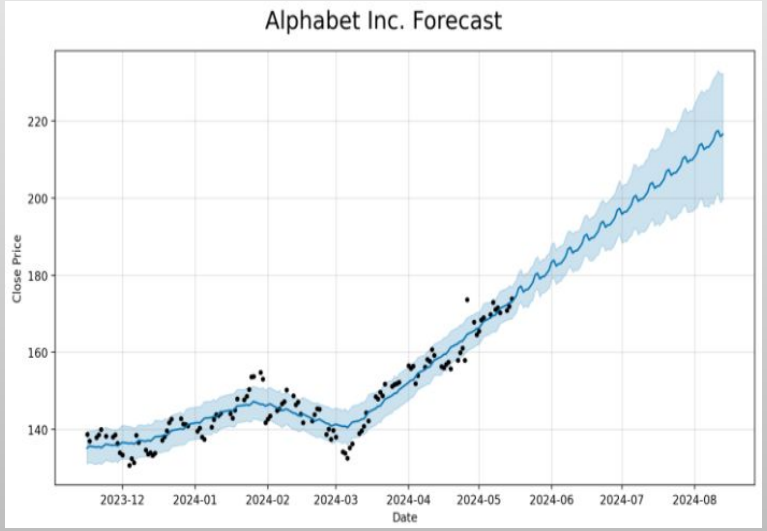
Market Closing Price Chart

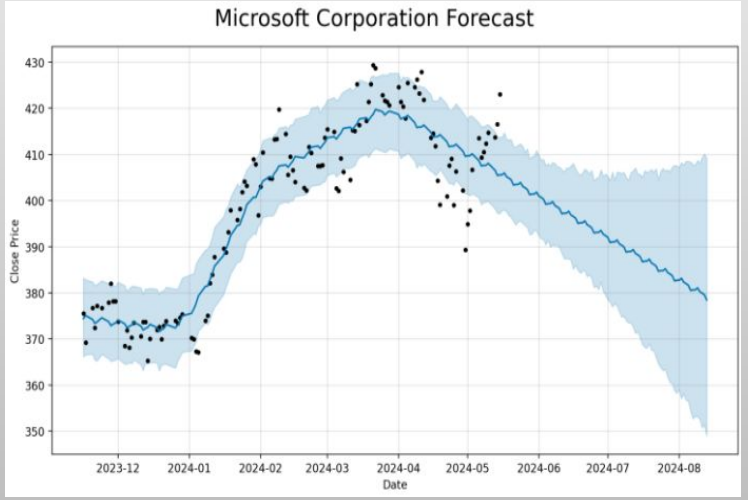




Stock Prediction

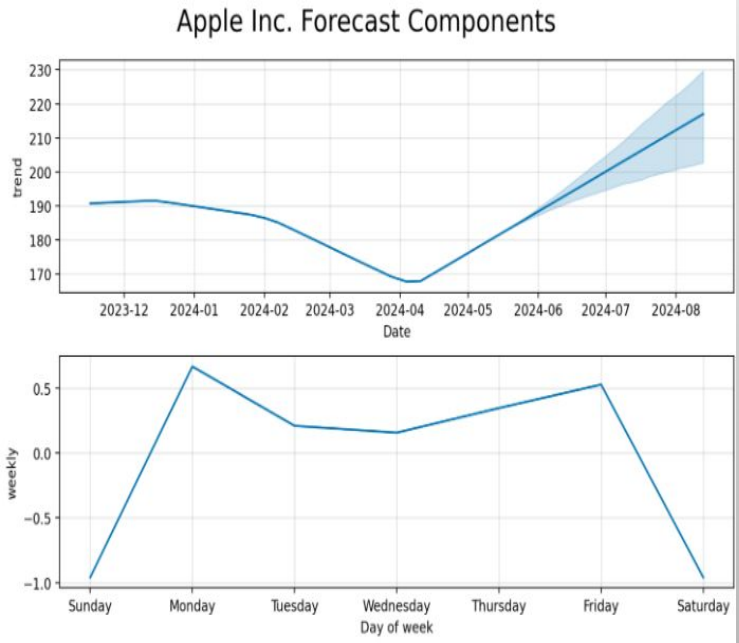
Prediction Chart

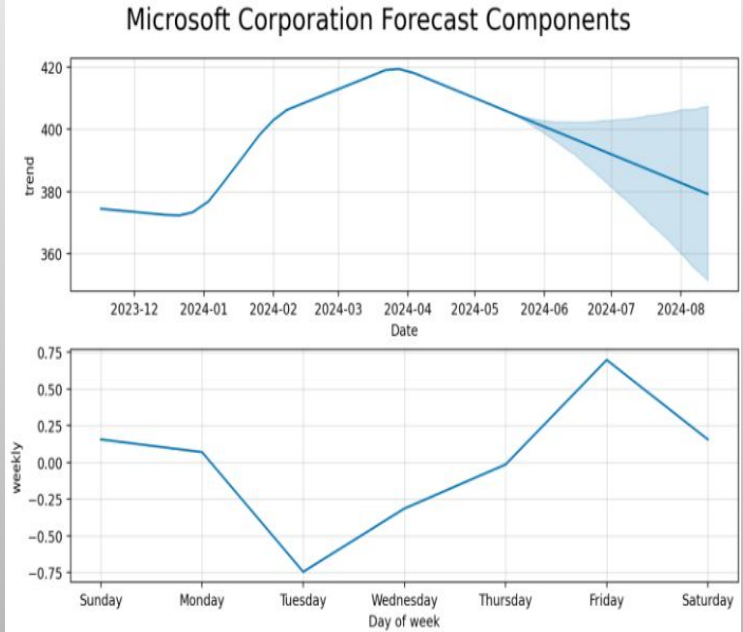




Stock Prediction

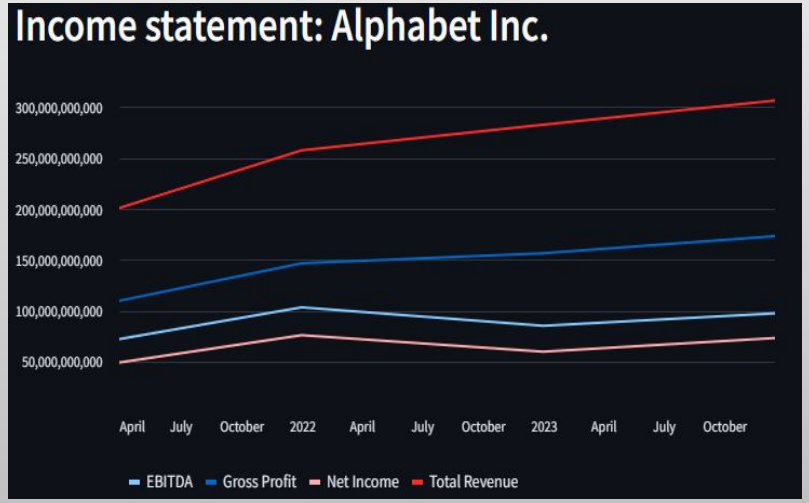
Prediction Chart

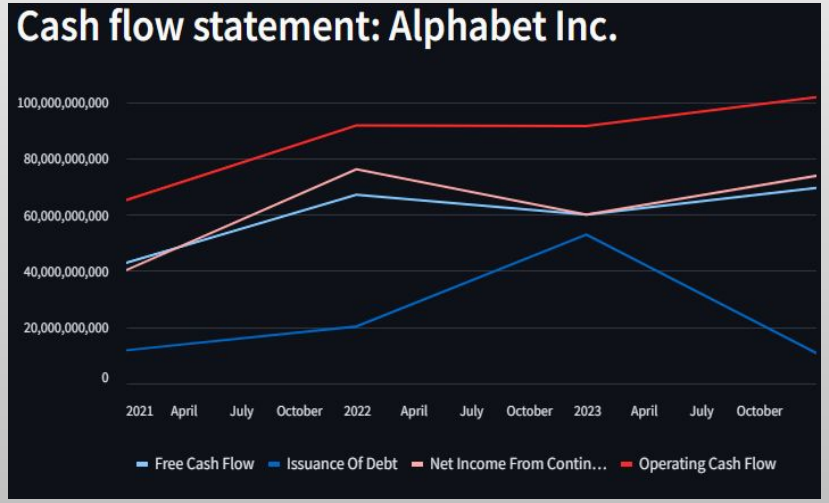




Fundamental Analysis

Income Statement & Cash flow





Challenges and Blockers

- Version control
  - We had some growing pains with merging our code and managing conflicts
- Predictive accuracy
  - There are very wide ranges for a predictive model the longer out your try to predict
- Limited time and scope creep
  - As I am sure many of you experienced, it was difficult to stay in scope
- RSI Indicator (Relative Strength Index)
  - This index provides a signal to buy or sell in the short term
- MACD indicator (Moving average convergence/divergence)
  - MACD is an indicator to help identify the best times for buying or selling
- Bollinger Bands
  - Helps gauge the volatility of stocks and other securities to determine if they are over- or undervalued.

Future Research and Development

- Multivariable analysis and prediction
  - Currently, we only base our prediction off of the close price and it would add a lot of value to be able to run predictions with more highly correlated variables
- Correlations of all of the metrics included in balance sheets, incomes statements, etc
  - It would be helpful identify all metrics that are highly correlated with stock price for prediction and tracking purposes
- Include more rigorous financial analysis methods
  - RSI Indicator, MACD indicator, Bollinger Bands
- Proactively alerting user of high performing stocks to research
  - Right now our tool is limited by what you input, and doesn't identify "hidden gems" for you to research with the tool
- Integrate with a trading platform to potentially auto trade if certain criteria are met
  - Include a log of recommendations to track accuracy over time

Results and Conclusions

Summary of Major Findings

- Predictive analysis has some limitations with forecast period accuracy
  - The farther out you try to predict the less accurate the model
- Lots of variables outside of those on a balance sheet can impact future stock price
  - Geopolitical factors or company leadership changes are hard to predict and plot
- This tool is likely better suited for a user who has a strong understanding of stock market analysis and knows what factors to consider
  - Just because the predict model says Microsoft is going under doesn't mean you should try to short sell, but it may be a consideration of when to buy or sell.
- The best time (day, week, month) to buy a specific stock is going to be different depending on the range and stock you are evaluating
  - Over the past two years, it is best to buy Google on Wednesday, but Microsoft was on Tuesday

Results and Conclusions

Implications

- Our predictive tool can be useful when paired with other financial analysis methods
    - It can help you to identify good times to buy or sell, but you need to identify the stock
- Depending on your level of risk tolerance you may decide to reduce your risk by diversifying in an index fund rather than betting big on an individual stock
    - Predictive models are not always correct
- If you have identified companies to invest in and have a strong understanding of financial analysis, our tool can add a lot of value and help a user to identify good times to buy or sell in the short-term.
- The tool does allow us to dynamically answer our original questions about the best time to buy or sell, tracking historical changes, and predicting future changes, but it is best used as a short-term research tool

DEMO

Q&A

- Questions from the Audience
  - Open floor for questions and discussion

Installation Instructions

- Readme instructions

Requirements

- ❏ Install Python [here](https://www.python.org/downloads/)
- ❏ Install Python Libraries (instructions listed below)
- ❏ Javascript enabled web browser

Instructions

- ❏ Download the code from Project-1 gitHub repository to your system.
- ❏ Navigate to the parent directory of the source code using terminal (e.g. gitBash or VS Code).
- ❏ Run the following command in terminal to install the required python libraries and launch the program.

```
pip install -r requirements.txt && streamlit run main.py
```

Note: We did run into an error saying that the streamlit.cli is an unknown command. A workaround is to run the following to reinstall the streamlit module

Thank You

- Acknowledgments
  - Thank You all for your support!