Object Oriented Programming II Final Project: Mini Financial Advisor

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II. Description of Application

I chose to make this application because I retrieved many financial datasets from Yahoo Finance and Wharton Research Data Services (WRDS), and both of these financial databases download the data for each stock separately, and I spent a lot of time cleaning and reorganizing the datasets before I could even use it. Their databases are also very cluttered and filled with information that I do not need, and I had to keep scrolling and clicking around to find what I was looking for, which wasted a lot of time.

Therefore, I created the Mini Financial Advisor. The purpose of Mini Financial Advisor is to provide a fast, concise, and informative summary of any stock, and then the Mini Financial Advisor will give a recommendation of whether to buy, hold, or sell the stock. It retrieves data from Yahoo Finance, and can give 10 important financial statistics about the stock including:

1) Current Price, which is the current price that each share is trading for,
2) Enterprise Value, which measures the company's total value,
3) Price to Book Ratio, which is the stock price divided by its book value per share, which can be useful in finding undervalued stocks,
4) Earnings Quarterly Growth, which is the growth of sales in one quarter when compared with another quarter,
5) Return on Assets, which measures how profitable a company is compared to its total assets,
6) Profit Margin, which is the revenue after subtracting all the costs of business,
7) Free Cash Flow, which is the cash leftover after paying for operational costs,
8) Return on Equity, which is the profitability of a business in relation to its equity, especially used to compare companies in the same industry,

9) Debt to Equity, which measures a company's financial leverage because it measures how much a company is financing its operations through debt, and
10) Revenue per Share, which is the total revenue earned per share over the quarter.

After the financial data have been displayed, the Mini Financial Advisor will also give a recommendation as to buy, hold, or sell the particular stock. Once a stock ticker has been entered, the application can also plot historical price data directly from the application. Users can select 1 month of historical data, 1 year of historical data, or 5 years of historical data to plot, and a new window with the graph plotted.

Additionally, users can also calculate the sentiment of a particular company using the "Calculate Sentiment" button on the right side. This will calculate the average sentiment of the top 50 Google search results. This will give a sentiment score, which will be modified by a comment stating positive (>0.25), neutral (-0.25 to 0.25), or negative (-0.25). If the news about a particular company is overwhelmingly positive or negative, then investors should reconsider any financial strategies and take into account the market sentiment before selling or buying the stock.

III. Impact of Mini Financial Advisor on the Financial Industry

This will allow much faster evaluation of stocks than the existing methods to retrieve data about particular stocks, and Mini Financial Advisor provides a simpler interface that does not contain the clutter and disorganization of an online database. It is also much easier to read than the data retrieved from an API approach, because usually those results are not very human-readable and also packed with dictionaries of dictionaries of dictionaries, which is not very easy to read. Mini Financial Advisor is also extremely fast because it takes less than 1 second before

entering the stock ticker to display the financial data listed above, and it is much faster to enter a stock ticker into the app than to go onto Google Finance or Yahoo Finance and click through endless tunnels of data in order to find the numbers and ratios that the user needs.

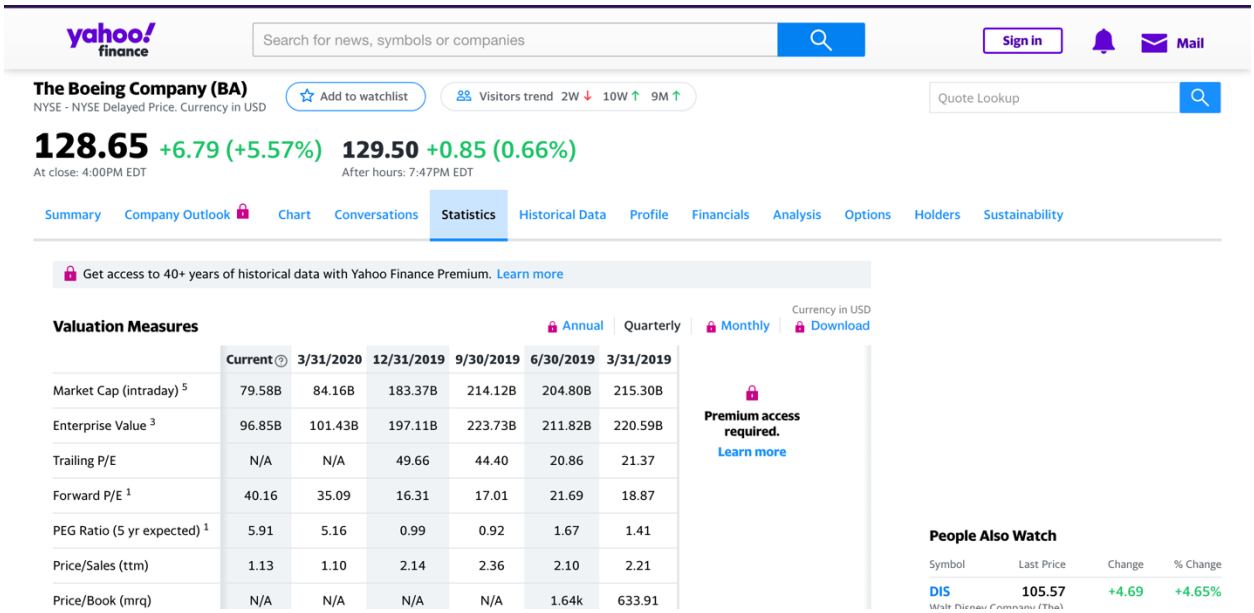

Figure 2.1: First Approach to Evaluating Stocks: Retrieve Data Directly from a Financial Database or Website. Gathering data from Yahoo finance directly from their website requires a lot of time and effort, because there are some unnecessary numbers in there that are not useful to evaluating stocks, and there is a lot of clutter that users have to scroll through before they can find the data that they need. Furthermore, users have to do it individually for each stock, and gathering all the data, putting them into Excel, and plotting everything is very tiresome.

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Figure 2.2: *Second Approach to Evaluating Stocks: Retrieve Data with API*. Gathering data with a financial API is much faster than doing it manually, but the results from the requested data are not user-friendly and not human readable.

As can be seen from Figure 2.1 and Figure 2.2, both approaches, including directly gathering data from financial databases online or retrieving data with an API, are very slow and tedious. Mini Financial Advisor is a much faster way to concisely summarize key financial statistics and ratios and help users make decisions on whether to buy, hold, or sell stocks in their portfolios.

This will benefit everyone who needs to know how their stocks are performing, because Mini Financial Advisor retrieves real-time data and displays it in a user-friendly interface. This will help users make a decision about their stock holdings, and users would not have to search through a financial database or scroll through API results to get the data that they need. The time needed to search one stock and display its financial data takes less than 1 second in Mini

Financial Advisor, and users can do as many searches as they want. Mini Financial Advisor will also graph historical prices and also calculate sentiment scores about the company that the user searched. This is a much more time-efficient and effective way than the other two traditional approaches outlined above.

IV. Design of Mini Financial Advisor and Module Interaction

Modules Used

- **BeautifulSoup**: used to extract the html from the Google search results for the sentiment calculation
- **Datetime**: for manipulating dates and time
- **FigureCanvasTkAgg**: necessary for using matplotlib on Tkinter windows
- **Matplotlib**: used to plot graphs and figures
- **Natural Language Toolkit (NLK)**: used for parsing text and also analyzing content of each article
- **Newspaper's Article**: used to download and parse the text portion of each website
- **Requests**: used for sending HTTP requests
- **TextBlob**: a simple module to analyze sentiment
- **Tkinter**: used for designing the GUI interface. It allows for adding buttons and laying out elements and labels
- **Yfinance**: to retrieve financial data from Yahoo! Finance

Module Interaction

Tkinter organizes the layout with grid, and if a button is clicked, a selected event will call a function which will perform the necessary task such as graphing historical prices or calculating sentiment. Tkinter interacts with FigureCanvasTkAgg, because FigureCanvasTkAgg allows matplotlib to plot figures and graphs onto Tkinter windows.

BeautifulSoup is used along with Requests to make retrieving the URLs from the articles that come up from the Google search result much easier. Article works well with TextBlob, as well as BeautifulSoup, because once the URL of the article is extracted with BeautifulSoup, the article's text content can be downloaded with Article, and then it can be passed into TextBlob for sentiment analysis.

V. Features and Output with Screenshots

Displaying Financial Data

When the user runs MiniFinancialAdvisor.py, a window will open and an Entry box will appear for the user to enter a stock ticker.

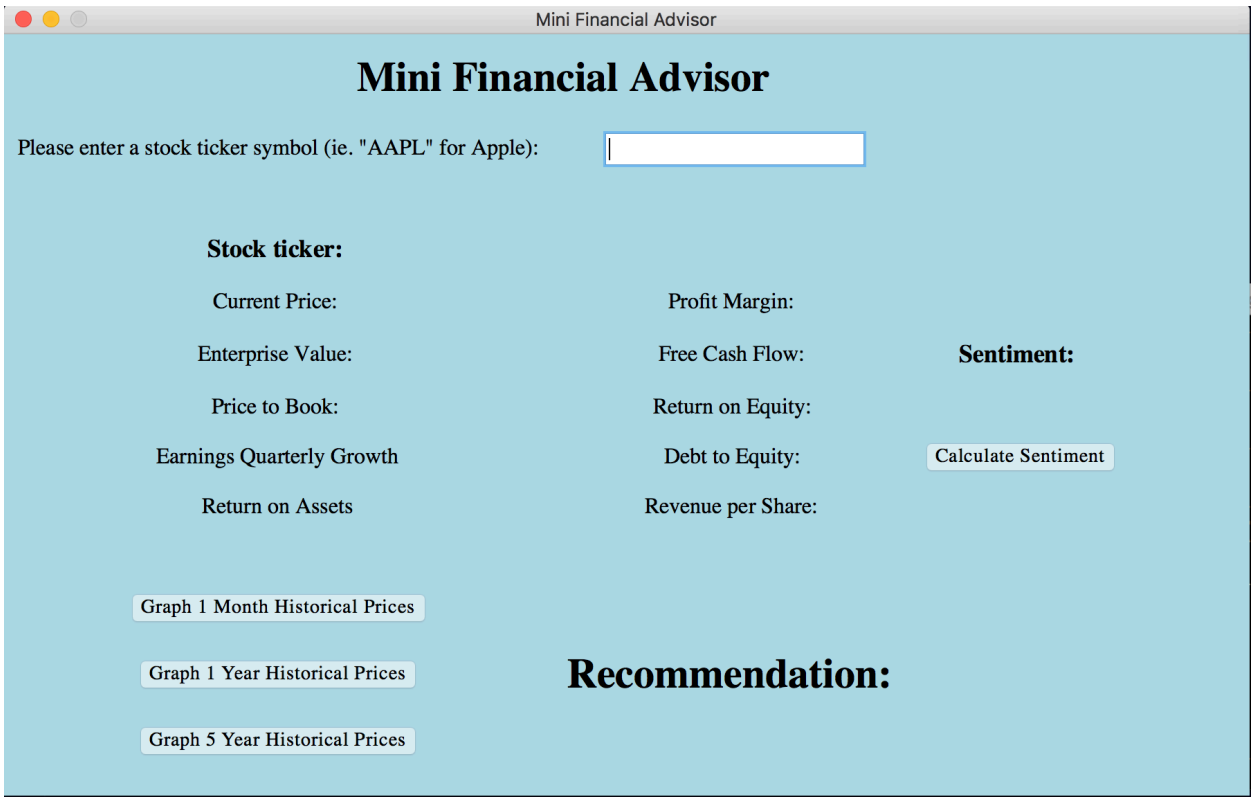

Figure 4.1: Main Page. Users will see a Main Page screen when they launch the application, where they can enter a stock ticker into the box.

Once they enter a stock ticker, the page will update to display all the financial data as well as recommend whether to buy, hold, or sell the stock.

Figure 4.2: Example Stock: MSFT. When users entered MSFT, Mini Financial Advisor displays all of the financial data and recommended to buy the stock.

Figure 4.3: Example Stock: TSLA. When users entered TSLA, Mini Financial Advisor displays all of the financial data and recommended to hold the stock.

Figure 4.4. *Example Stock: HE*. When users entered HE (Hawaiian Electric Industries), Mini Financial Advisor displays all of the financial data and recommended to sell the stock.

Exception Handling

If the user enters an invalid stock ticker, the Mini Financial Advisor will display an error message.

Figure 4.5. Example Stock: QED (Nonexistent Stock). When users entered QED, Mini Financial Advisor displays an error message.

Graphing Historical Prices

Mini Financial Advisor allows users to graph 1 month historical prices, 1 year historical prices, and 5 year historical prices once the stock ticker has been entered.

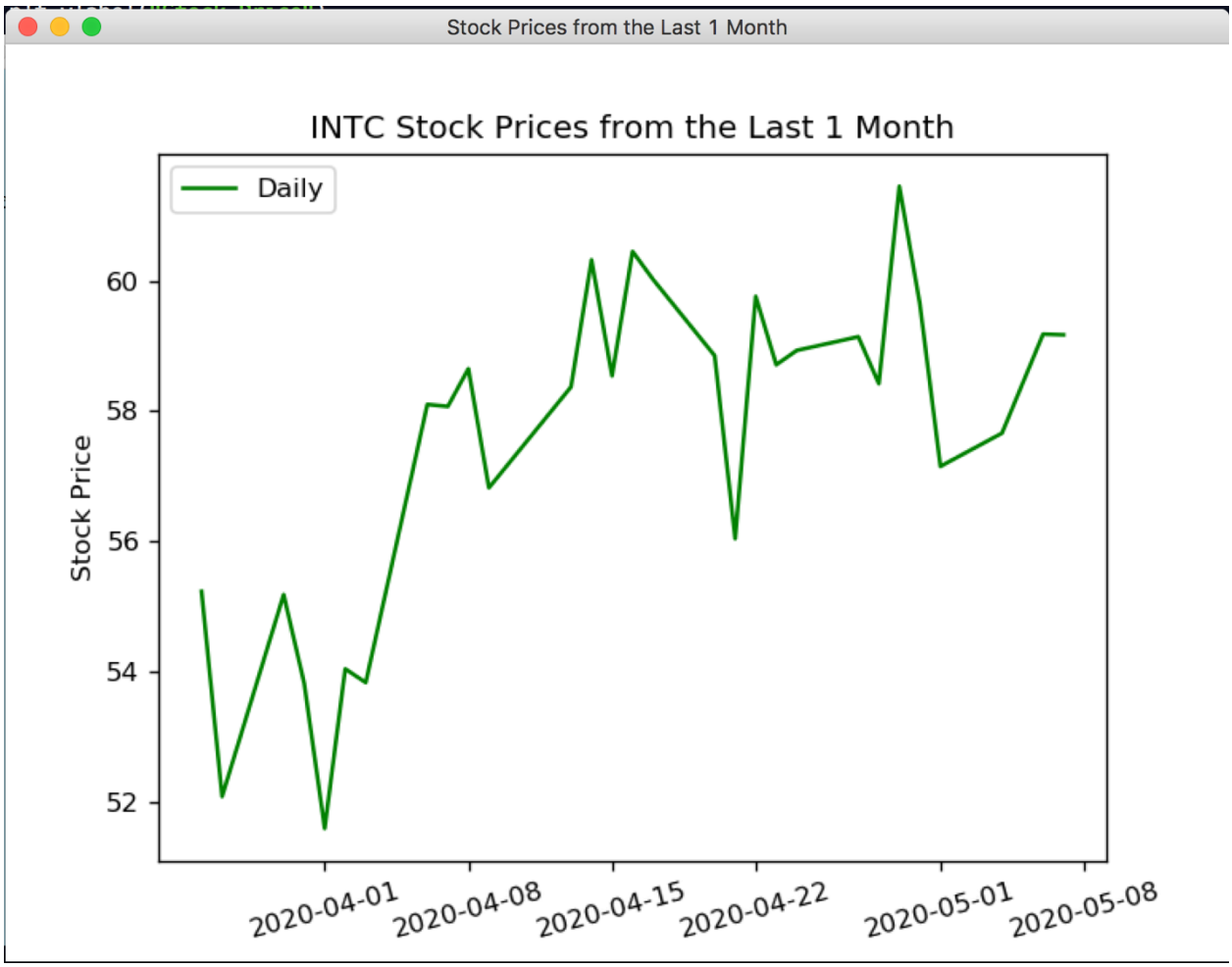

Figure 4.6. Graphing 1 Month of Historical Prices. When users entered a stock (INTC), they have the option to graph 1 month of historical prices if they click the button.

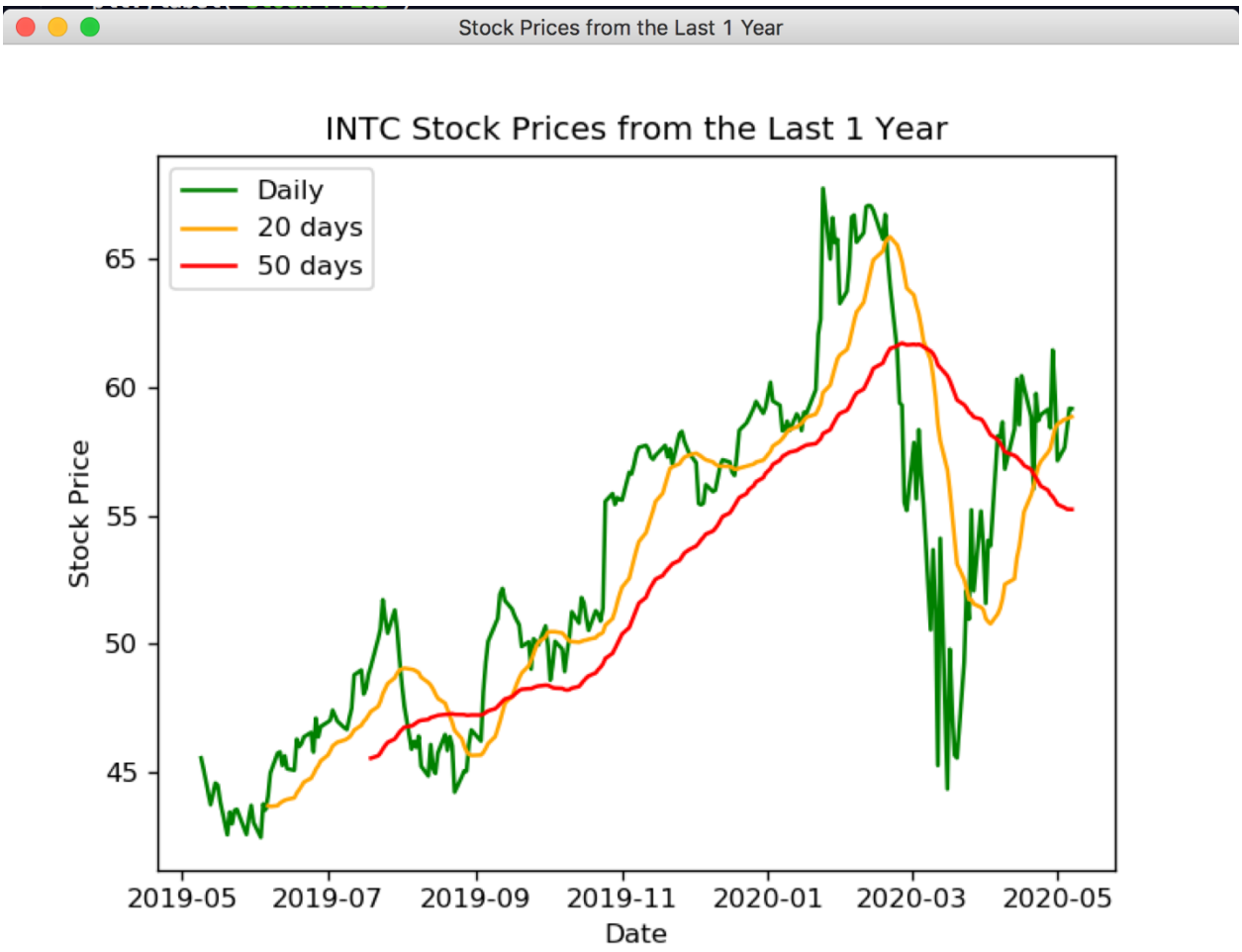

Figure 4.6. Graphing 1 Year of Historical Prices. When users entered a stock (INTC), they have the option to graph 1 year of historical prices if they click the button. This graph shows the daily stock value, the 20 day moving average, and the 50 day moving average.

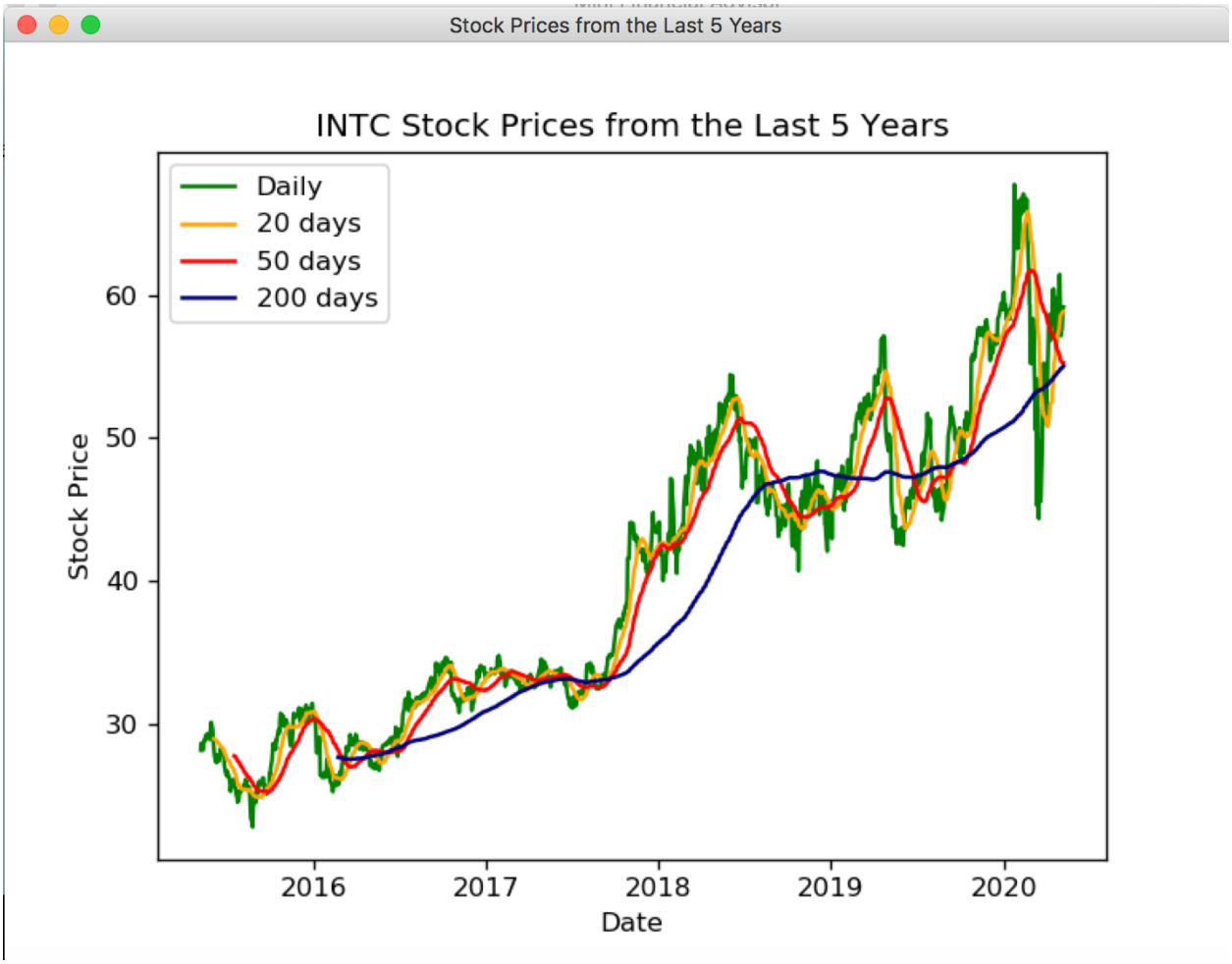

Figure 4.7. Graphing 5 Years of Historical Prices. When users entered a stock (INTC), they have the option to graph 1 year of historical prices if they click the button. This graph shows the daily stock value, the 20 day moving average, the 50 day moving average, and the 200 day moving average.

Sentiment Analysis

Perhaps a company is doing very well, but there has been a lot of negative controversy surrounding them, or if a company is relatively unknown, but is very popular with its young user base. Therefore, it is necessary to look at the market sentiment of a company, which can influence decisions to buy, sell, or hold stocks. If the market sentiment of a company is very

positive or very negative, then investors should reevaluate their trading strategies because there may be other factors to take into account when deciding whether to sell the stocks, keep them, or buy more of the stocks.

Sentiment can be calculated through clicking the “Calculate Sentiment” button, and then a score will appear with Negative, Positive, or Neutral in parentheses. Negative is defined as anything lower than -0.25, Positive is defined as anything higher than 0.25, and Neutral is defined as between -0.25 and 0.25.

When users enter a stock, they can calculate sentiment, which will scrape the top 50 Google search results for that company, and then analyze the sentiment for each website. First it will use Beautiful Soup to parse the html from the google search, and then it will use Newspaper’s Article to download the article from the website URL. Then it will use TextBlob to analyze the sentiment, and then it will return an average sentiment of the 50 search results. This can take up to 2 minutes to run depending on Internet speed.

If for some reason the website URL does not allow scraping, the URL that did not allow scraping will be printed into the terminal.

Figure 4.8. Calculating Sentiment. When users entered a stock (GOOG), they have the option to calculate sentiment. It will scrape the top 50 Google search results for that company, and then analyze the sentiment for each website using BeautifulSoup, Newspaper, and TextBlob. Then it will return an average sentiment of the 50 search results. This can take up to 2 minutes to run depending on Internet speed.

VI. Performance Analysis

Running Time

It takes less than 1 second to start up and launch Mini Financial Advisor. The speed of Mini Financial Advisor is also very fast, and the time required to get the data displayed after a stock ticker is entered is less than 1 second.

Space and Time Complexity

Mini Financial Advisor has very low space complexity because it requires very little space; all of the data is retrieved in real time and not stored within the system. It has very low space complexity because it requires very little space; all of the data is retrieved in real time and not stored within the system. It also has very low time complexity, maximum of O(n), because the overhead of running the application will always be the same as some constant k as n gets larger and larger.

Accuracy

All the data were retrieved from Yahoo Finance, which has accurate financial data purchased from a data vendor called ICE Data Services. The accuracy of the recommendation cannot be tested because it is based on stock performance up to the last known trading day and based on analyst ratings.

VII. Conclusion and Remarks

Overall, Mini Financial Advisor provides users with an easy and simple method to check whether to buy, hold, or sell stocks. It is designed for simplicity and speed because it allows users to get data within a second of entering a stock ticker. It also offers other features such as graphing historical prices and analyzing market sentiment.

One new feature to add in the future could be to recommend similar and profitable stocks that are related to the stock ticker that the user entered. For example, if a user enters FB to check for Facebook's stock value, then perhaps the application can recommend Snapchat (SNAP) or Twitter (TWTR).

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