# Week 1 – Domain Knowledge

## Day 1

First day of my internship with AmBank group. Introduced with the department members as well as getting to know the domain knowledge and task briefing. Was assigned a new project that involves dividend investment strategies, where I will be assigned to work on a system that simplifies the process. First day focuses on learning more about the fundamentals on dividend investment.

## Day 2

Working from home. Received a call from my supervisor where I asked about their dividend investment system, such as the framework used and the API. Continued my research to gain domain knowledge of stock investment and dividends.

## Day 3

Working from home. Involved myself by looking up financial records of various companies to study the important fields and assess share performance. Gained additional domain understanding before working on the system. Tried out web scraping technique to gather financial records from Yahoo Finance to output real time data into a Flask web application.

## Day 4

Working from home. Created logs and slides that outlines the system requirements such as explaining what calculations are required to assess the dividend performance. Researched on other data collection techniques such as Alpha Vantage API and Pandas DataReader API. Tested out the APIs available functions with small prototypes to assess if it fits system requirements.

## Day 5

Working in office. Reported supervisor of my progress and what I have learnt so far. Received additional details on the domain knowledge as well as the stock environment. Researched on the differences between utilizing web scraping and API for data collection and their application. Researched on the most important metrics and ratios to assess company stock performance.

# Week 2 – API Research & Testing

## Day 1

Working from home. Created more slides and logs on the differences between utilizing web scraping and API for data collection and their suited application. Tested with a small prototype on how Pandas DataReader works. Ran into some issues as Yahoo Finance has made some changes which has made DataReader unable to access, rendering it unusable. The issue is researched, addressed and will attempt to solve starting tomorrow.

import pandas\_datareader.data as pdr

def get\_stock\_data(symbol, date):

        #date\_format = "%Y-%m-%d"

        #date\_obj = dt.datetime.strptime(date, date\_format)

        start = dt.datetime(2010, 1, 1)

        end = dt.datetime (2010, 1, 2)

        stock\_data = pdr.DataReader(name = "BTC-USD", data\_source = "yahoo", start = start, end = end)

        print(stock\_data)

        print("hi")

        if len(stock\_data) == 0:

            print(f"No data available for {symbol} on {date}.")

            return None

        else:

            print('No data found for the given symbol.')

            return None

# Your Flask route remains mostly the same

@views.route('/', methods=['GET', 'POST'])

@login\_required

def home():

    if request.method == 'POST':

        company\_symbol = request.form.get('Companysymbol')

        start\_date = request.form.get('StartDate')

        if not company\_symbol:

            flash('Please enter a company symbol', category='error')

        else:

            stock\_data = get\_stock\_data(company\_symbol, start\_date)

            if stock\_data is None:

                flash('Company symbol not found or data retrieval error!', category='error')

            else:

                new\_company\_info = CompanyInfo(

                    companyname=company\_symbol,

                    price=stock\_data['price'],

                    value\_diff=stock\_data['value\_diff'],

                    perc\_diff=stock\_data['perc\_diff'],

                    user\_id=current\_user.id

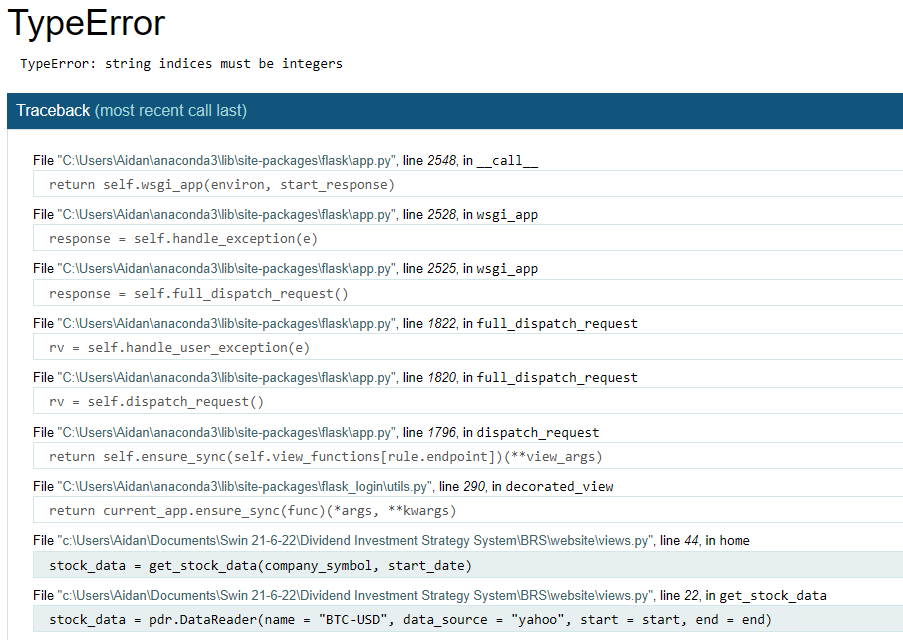
                )

                db.session.add(new\_company\_info)

                db.session.commit()

                flash('Company information added!', category='success')

    return render\_template("home.html", user=current\_user)



Yahoo made changes to their API that broke compatibility with previous pandas datareader versions.

## Day 2

Working from home. Finally addressed the Pandas DataReader issue and concluded that Yahoo has made some internal changes which has made the API unusable. To solve this, I switched to another API library to yfinance which serves the same function. I have successfully requested for company’s financial data with the new library in Pandas Dataframe. Started designing Entity Relationship Diagram (ERD) to structure how data is stored in the proposed system.

def get\_stock\_data(symbol, start\_date):

    try:

        # Convert the start\_date string to a datetime object

        startdate = dt.datetime.strptime(start\_date, '%Y-%m-%d')

        # Create a Ticker object for the specified symbol

        tic ker = yf.Ticker(symbol)

        # Get historical data (adjust parameters as needed)

        historical\_data = ticker.history(period="1d", start=startdate)

        if historical\_data.empty:

            print(f"No data available for {symbol} on {startdate}.")

            return None

        # Extract the latest data (usually the last row in the DataFrame)

        latest\_data = historical\_data.iloc[-1]

        stock = {

            'open': latest\_data['Open'],

            'close': latest\_data['Close'],

            'dividends': latest\_data['Dividends'],

        }

        return stock

    except Exception as e:

        print(f"An error occurred: {str(e)}")

        return None

@views.route('/', methods=['GET', 'POST'])

@login\_required

def home():

    if request.method == 'POST':

        company\_symbol = request.form.get('Companysymbol')

        start\_date = request.form.get('StartDate')

        if not company\_symbol:

            flash('Please enter a company symbol', category='error')

        else:

            stock\_data = get\_stock\_data(company\_symbol, start\_date)

            if stock\_data is None:

                flash('Company symbol not found or data retrieval error!', category='error')

            else:

                new\_company\_info = CompanyInfo(

                    companyname=company\_symbol,

                    price=stock\_data['open'],

                    value\_diff=stock\_data['close'],

                    perc\_diff=stock\_data['dividends'],

                    user\_id=current\_user.id

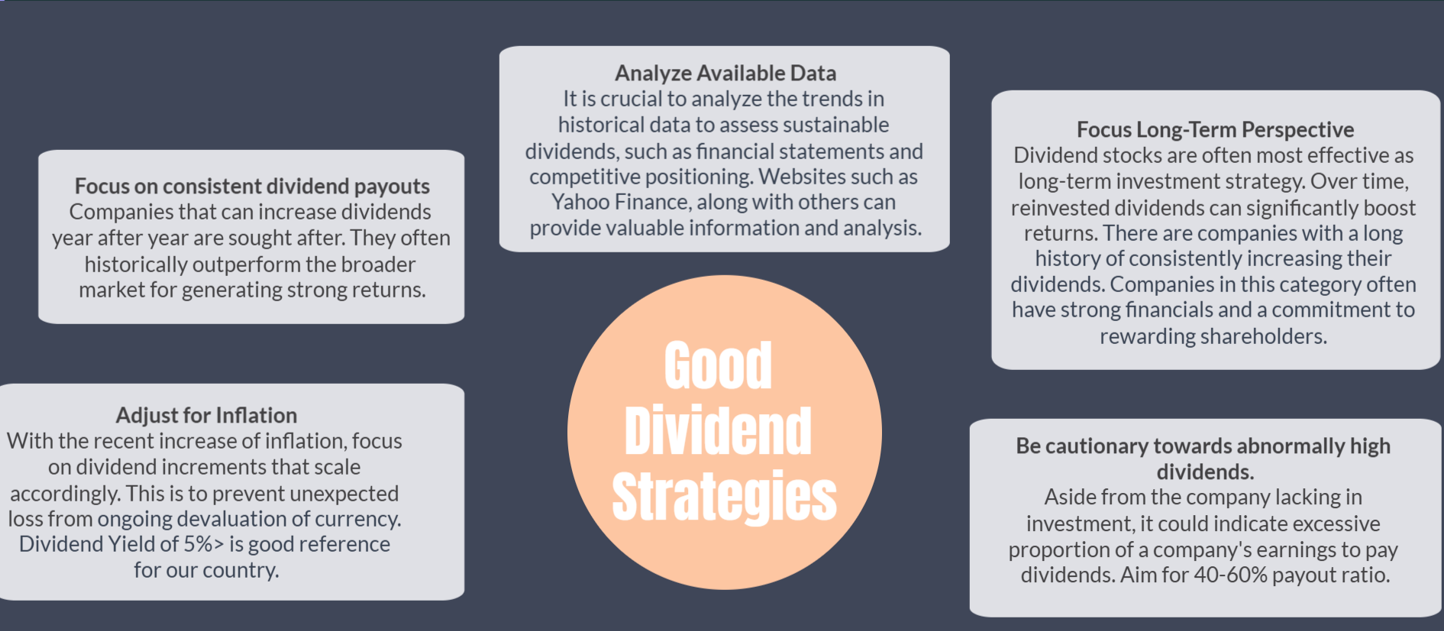
                )

                db.session.add(new\_company\_info)

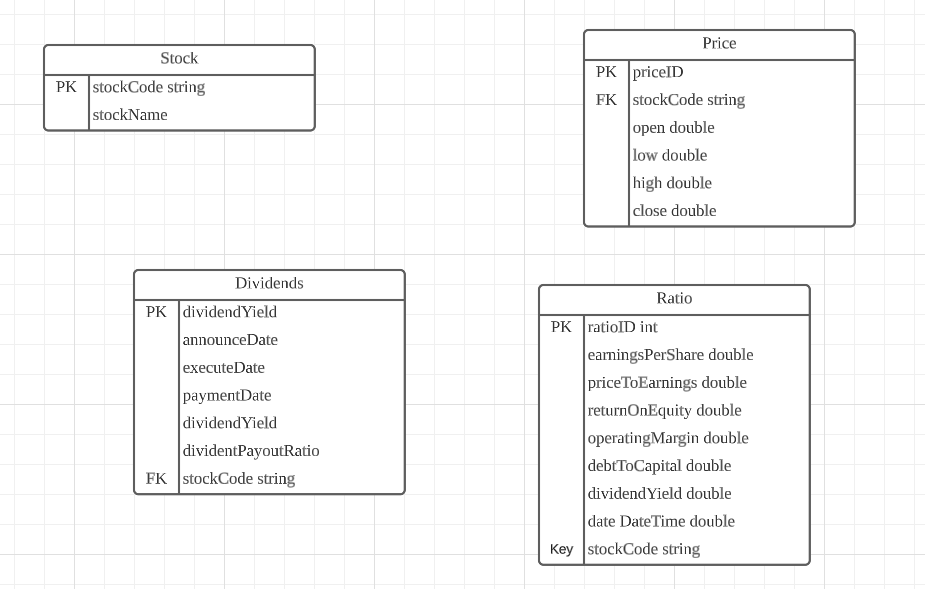
                db.session.commit()

                flash('Company information added!', category='success')

Changed API library from Pandas DataReader to yfinance. Successfully retrieved financial data by passing stock symbol as the parameters and stored in the SQL database prototype.



Designed Slide for Good Dividend Strategies



Started with the initial design of Entity Relationship Diagram (ERD) to to structure how data is stored in the proposed system.

## Day 3

Working from home. Researched and tested more functions of the yfinance library. Created a new Jupyter Notebook Project as a platform to easily test the library. Crosschecked with Yahoo Finance website and researched more on the financial metrics to choose the most important one to scrape for the proposed system.

## Day 4

Working from home. Primarily researched on the most important financial ratios and documented their definitions and ideal values. Discovered and surveyed new financial stock information website, which are Bursa Malaysia and KLSE screener to analyze later for web scraping.

## 1. Payout Ratio

Retrieved by Earnings / Dividends Paid. Can be retrieved with Ticker.info

The dividend payout ratio measures the proportion of a company's earnings that are paid out as dividends. A lower ratio suggests that a company is retaining more earnings for reinvestment or future dividends,

## 2. Dividend Yield

Dividends per share / Share price. Can be retrieved with Ticker.info or Nasdaq

It represents the income generated from an investment in the form of dividends.

## 4. Earnings Per Share (EPS) (chatgpt)

Net Income / Outstanding Shares. Can be retrieved with Ticker.info (trailingeps key)

The portion of a company's profit attributable to each outstanding share of common stock. A higher EPS can support higher dividend payments which increases likelihood of good dividend returns.

## 5. Debt to Equity Ratio (chatgpt)

Liabilities or Debt / Shareholders’ Equity. Can be retrieved with Ticker.info

A high debt-to-equity ratio can signal financial leverage, which may affect a company's ability to maintain dividend payments.

## 6. Price to Earnings Ratio

Share Price / Earnings per Share. Can be retrieved with Ticker.info

## 7. Operating Margin

(Operating Income / Total Revenue) \* 100%. Can be retrieved with Ticker.info

## 8. Return on Equity (ROE)

(Earnings – Dividends) / Shareholders Equity. Can be retrieved with Ticker.info

## 9. Return on Assets (ROA)

Net Income / Average Total Assets. Can be retrieved with Ticker.info

## 10. Profit Margin

Profit / Revenue. Can be retrieved with Ticker.info

## 11. Quick Ratio (gocardless)

(Current Assets – Inventory) / Current Liabilities. Can be retrieved by Ticker.info

## 12. Current Ratio or Working Capital Ratio (gocardless)

Current Assets / Debts or Liabilities. Can be retrieved with Ticker.info

## 13. Dividend Growth Rate (chatgpt)

(Current Dividend - Previous Dividend) / Previous Dividend. Can be retrieved by calculating Ticker.dividends

Measures the rate at which a company's dividends have been increasing over time. Consistent and sustainable dividend growth is often seen as a positive sign.

# Week 3 – Created Flask Website Template & Learnt Web Scraping

## Day 1

Working from home. Mainly focused on completing the first iteration of the Entity Relationship Diagram. Discussed with supervisor where he provided recommendations on what fields and tables to include as well as providing normalization tips. New database design proposal has been accepted as well as open for future changes.

A computer screen shot of a computer

Description automatically generated

## Day 2

Working from home. Can start proceeding with bulk web scraping now that I have successfully learnt the fundamentals of the required libraries and the process itself. Downloaded a list of stock symbols from the official Bursa Malaysia where it can be scraped via PDF tabula library. Retrieved the list of stocks to be put in CSV and inserted in the database schema.

## Day 3

Working from home. Moved on to start scraping historical prices from Yahoo Finance of all the stock symbols that was retrieved. Created an intelligent looping process with Python where it iterates through the list of stocks and passing them each into YFinance to retrieve all daily historical data from 2022-2023. 1 million total records were received in CSV and inserted into the database schema.

## Day 4

Working from home. Created another variation of the previous intelligent loop that now supports scraping of latest data as a way for the system to be up to date with the latest stock prices. By checking the date column, the loop keeps track of the latest entry of each stock symbol where YFinance is called again to gather any new records from that latest date to the present date. Any new records found will be inserted into the database schema.

## Day 5

Working in the office. Reported to supervisor on my progress of scraping respective records from Bursa Malaysia and Yahoo Finance. Received additional tips on how to analyze these retrieved data and how to gain additional useful insights from it. Showed the important financial metrics that can be possibly scraped from symbols in KLSE Screener. Received feedback on overall progress and to continue at the current pace.

# Week 4 – Continue Scraping Stock Values

## Day 1

Working from home. Continued the Python script where it now scrapes Historical Dividend data in KLSE Screener website. The code iterates through the stock symbol in the list to browse in the website before searching for a table element containing the targeted fields. It will then retrieve all the important values in the table into a Dataframe where it will be cleaned and exported to CSV.

## Day 2

Working from home. Continued the Python script where it now scrapes the Quarterly & Annual Report data in the KLSE Screener website. It iterates through the list to browse accordingly before searching for the table element containing the targeted fields. The data is retrieved into a Dataframe where it will be cleaned and exported to CSV.

## Day 3

Working from home. Created a new Python Script where it scrapes from a new website source, which is Bursa Marketplace. A new process is created where the search engine in the website is used to get the link of the symbol details by automatically filling in with the stock symbol. The link is then browsed before searching for the required field which are Price Earnings and Price to Book ratios.

## Day 4

Working form home. Continued the previous Python Script to browse to a different section in the symbol details pages. The link is browsed automatically before searching for the required fields which are Dividend Growth Rate and Price to Cash Flow.

## Day 5

Working in office. Showed and demonstrated to the supervisor on my progress as well as my learning on web scraping and data retrieval. Presented all the fields and values that was retrieved and received feedback on what are the important fields to include for my proposed system to assess. Ended up with less than half of scraped data to be useful.

# Week 5 – Preprocessing Financial Ratios & Backtesting

## Day 1

From this week onwards, will work in office. Attended Internship OnBoard briefing in Menara AmBank, Kuala Lumpur. Had ice breaking activities, presentation on terms and services, as well as potential career opportunities after the internship program. Interacted with HR and other interns on a short tour around the building to get to know the departments.

## Day 2

After received feedback from employer, targeted the 5 most important financial metrics to receive through means of API or Web Scraping. Scouted through various sources online to decide where to retrieve these ratios and assess their data quality and consistency. Created a python script that scrapes these values with intelligent looping process using a combination of yfinance API and web scraping.

## Day 3

Carried out data cleaning on retrieved ratio values to handle missing values and data types. Carried out classification on every stock symbol based on the ranges of the financial ratios to determine which is a potentially healthy and growing company. Learnt backtesting.py library that carries out stock investment simulation based on historical prices on the potential companies, and gather additional information such as average win rate, return ratio and expectancy.

## Day 4

Presented the backtesting.py library report with supervisor and received feedback and teachings on the historical analysis that was reported. Also received additional instructions on creating a custom backtesting process. It involves manual calculation by choosing a date to purchase a number of unit stocks and comparing the total purchase price with the current price. Started creating the Python script for the process.

## Day 5

Created a custom backtesting python script that observes if we have gained additional profit from the selling price from the backtesting date to the current date, including bonuses from dividends. Created the script accordingly and presented the report to supervisor.

# Week 6

## Day 1

Received additional information from supervisor on implementing a new forecasting function for the proposed system. It involves making future predictions on the important foundation and dividend ratio which provides users additional insight on future performance. Researched online for any existing information that can possibly be scraped, as well as deciding on manual calculation by averaging historical data.

## Day 2

Now that I have learnt and applied the basic functionalities of our system through Jupyter Notebook, my supervisor has approved for me to proceed creating the website that implements them. Started creating the initial template of our website such as navigation panel, user login and sign up, as well as the home page that lists the basic information of all stocks that is scraped. The list contains link for more details of the respective stocks where subscribed members can see the fundamental and dividend ratios.

## Day 3

Started creating the Stock Details page where it displays the current important ratios such as Earnings Per Share, Price to Earnings, Operating Margins etc. The page consists of a chart that scores the investment potential by calculating with these ratios, so users can get a quick idea on how the company is faring. Involves selecting the ratios accordingly from a database table before displaying it dynamically via Flask Python functions.

## Day 4

Continued with the Stock Details page where the historical price section is now implemented. The details page shows a table with pagination functionalities that lists down the historical stock prices of the companies, such as the date, opening price, closing price etc. Also implemented a line chart that shows the price progression throughout the year to display trends for the users. Involves selecting the historical prices from a databasetable before displaying it dynamically via Flask Python functions.

## Day 5

Implemented the Backtesting function in the website where users can select the list of stocks that are in their watchlist and a form to fill in the unit quantity and purchase date. Submitting the backtest will allow users to see the difference in stock price gained or loss, the amount of dividend received, as well as the yield relative to the purchase price. Involves complex calculations with existing data in the database tables as well as exporting the results into CSV.

# Week 7

## Day 1

Showed current system progress with Supervisor, received positive feedback with additional suggestions which is to include historical ratios from previous quarters. This is so that users of the system are able to see the trends of these ratios to get a better idea of the stock’s performance. Made additional research on how to scrape these ratios that goes back to previous quarters.

## Day 2

Continued the additional research on how to scrape the ratios that goes back to previous quarters. Discovered that the best source would be the official Bursa Marketplace’s quarterly financial statements on the public listed companies. Would need to manually calculate these raw values to get the ratios that can be used to determine their fundamental and dividend performance.

## Day 3

Started creating a script that scrapes from the Bursa Marketplace’s quarterly financial statements using intelligent looping and scraping process. By using Python’s Selenium Driver to automatically browse to every companies’ financial statement pages, Beautiful Soup to navigate and extract the financial statements values and Pandas to store and format the scraped data in a structured manner.

## Day 4

Continued with the Python script to scrape the selected values in every listed companies quarterly financial statements. The HTML format of the quarterly financial page has made it an additional challenge especially in targeting the specific element to retrieve the value from. Learnt additional web scraping techniques online such as utilizing XPATH to traverse through the HTML elements relative to a starting sibling.

## Day 5

Finalized with the Python script and successfully scraped the important values of every listed companies. The next step is to use these values to manually calculate the financial ratios such as EPS, P/E, and ROE using these values to assess the performance of these companies on a quarterly basis. This will be scheduled and implemented for the next week.

# Week 8

## Day 1

For this week, mainly focusing on a Python script that loops the data collected and calculate the financial ratios accordingly. Begin by outlining the strategy of how to traverse through the related stock code quarterly report values and calculate trailing 12 months financial ratios. Carried out manual calculation with the quarterly report values and ensure that the resulting ratios tallied with any additional sources

## Day 2

Started coding the Python script to calculate the Trailing 12 Months financial ratios based on the quarterly report values that was scraped for every stock code. An intelligent looping process is made that calculates past 4 quarters of financial values of the particular quarter date, a technique also known as the rolling window method. Values such as income, revenue, operating income and gross dividend is summed and averaged, before proceeding to calculate the ratios.

## Day 3

Continued the Python script from previously. Successfully verified the sum of values such as income, revenue, and operating income of the script through manual calculation. Proceed to Calculate related ratios with these values such as Earnings Per Share, Dividends Per Share, Return on Equity, Operating Margins, and Free Cash Flow. Tallied with the output of the script with additional sources to validate the correctness and accuracy of the calculation.

## Day 4

Continued in the development of the Python script. Involved historical prices of that stock code in that particular quarter within the intelligent looping process. This is done to calculate more financial ratios such as Price to Earnings and Dividend Yield. This process involves selecting the latest relevant price in that particular quarter to retrieve the closing price, where it will be used in the division calculation with Earnings Per Share and Dividends Per Share. Tallied the output of these ratios with additional sources for validation.

## Day 5

Finalized with the Python script where classes are assigned to a particular quarter report based on the trailing 12 months financial ratios. Involves assessing each ratio in the quarter whether it fulfills the minimum value to determine whether the company is fundamentally healthy, growing and provides consistent dividends. Companies with higher ranks indicate a potential good investment and recommended to the system’s user.

# Week 9

## Day 1

This week will be focused primarily on the web application. In the admin panel, implemented a manage user function where admin can add, edit and monitor users. A significant feature will be implemented where the admin panel has an Update All Stocks function. This is to update the stocks information such as Dividend, Price, Quarterly Report and Ratios. This will take a rigorous effort since it involves web scraping and manual calculation.

## Day 2

Started with the Update All Stocks function in the web application. Started off with querying the database to gather the latest dates for all the tables required for update. This is to ensure that no duplicate records are scraped with the technique of comparing latest dates to the latest entries. Successfully implemented to update Stock Prices daily by retrieving from Yahoo Finance while ensuring no duplicate prices are retrieved.

## Day 3

Continued with the Update All Stocks function. Moved on to scrape Dividend information which can be retrieved in the respective stock symbol page in KLSE Screener website. This process is more challenging than Price, since it involves complex methods of web scraping instead of simply retrieving already structured and formatted data from the Yahoo Finance API. Retrieved latest Dividend records whilst ensuring no duplicates, and carried out necessary data cleaning.

## Day 4

Continued in the development of the Update All Stocks function where the Quarterly Reports can now be proceed to scrape from the Bursa Marketplace website. The process involves more complicate techniques of web scraping due to the unusual structure of the HTML page of the quarterly report of each stock code. Utilized techniques such as XPATH and concurrent drivers and date tracker when traversing through the HTML elements, ensuring correct data retrieval and formatting.

## Day 5

Almost finished with the development of the Update All Stocks function where in this phase, to calculate the trailing 12 months financial ratios such as Earnings Per Share, Price to Earnings and Return on Equity from the values retrieved in every quarterly report. This process is proved challenging since it requires some complex referencing and comparison of present records in the database to ensure that the calculation is accurate. Ensured calculation is correct by tallying several outputs with external sources.

# Week 10

## Day 1

This week will be focused primarily on the web application in regards to the analysis and visualization of the scraped data to be displayed towards the user. Improved the stocks details page where an interactive chart is implemented to showcase daily, weekly and monthly stock price. Learnt more advanced functionalities of chart.js before implementing dynamic charts for historical prices.

## Day 2

Continued with advanced visualizations implementation on the web application. By implementing complex functionalities of chart.js, users are able to zoom in and visualize trends on historical prices, ratios, and dividends. Showed progress to supervisor on the update stocks functionality of the web application and received positive remarks.

## Day 3

Upon presenting more in-depth workings of the web application to my supervisor, received suggestion on the backtesting to store records of the user’s submission. The user can utilize it as a form of past simulation of investing on multiple stocks based on date, unit quantity and stock price, where the system calculates the current value of each investment to display potential gains, losses or dividends earned in a report. Carried out research on how to implement the functionality.

## Day 4

Finished implementing the more advanced process of the backtesting functionalities, created database to store the backtesting result per user basis, as well as carried out calculations for every backtesting report. Tallied the output with manual calculation to ensure accuracy, consistency and usefulness. Presented results to supervisor and received positive comments.

## Day 5

Implemented additional reporting functionalities by adding an export to CSV button to various stock information sections such as historical prices, financial ratios, dividends as well as user backtesting report. Involves complex javascript code where the scripts sends a request to the Flask route where it carries out the exporting process.

# Week 11

## Day 2

Public holiday, working from home. Carried out brief testing of the web application, especially the update stocks functionality that involves many processes to be double checked. Ended the day ensuring that no unforeseen bugs are left before updating my supervisor of my progress the next day.