Finance and Risk Analytics - Capstone Project

EPGP – Data Science Program(Data Analytics)

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Background and Objective

- Background:
  - Mr. Patrick Jyengar Portfolio Building
  - Daily return from each stock
  - Average daily return from each stock
  - Risk of Stocks in Portfolio
  - Daily return from the portfolio
  - Total Portfolio Return
  - Cumulative return from the Portfolio
  - Portfolio Risk – Portfolio Standard Deviation
  - Sharpe Ratio
- Being a Portfolio Manager our task is to present the consultation to two investors based on their requirements and goals. The two Investors are Mr. Patrick Jyengar and Mr. Peter Jyengar

Our Objective is to:

- - Provide a Portfolio of stocks to Mr. Patrick Jyengar, who wants to invest 500 thousand dollars for a period of 5 years. His objective is to gain the double the amount at the end of 5 years with minimum risk possible. So that he can buy a minority stake in Naturo.
- - Provide a high risk stocks to Mr. Peter Jyengar since he is handling accompany and need more investors for his organization. He is expecting a high risk high return for an investment. The amount he is expecting to invest is 1 million dollars for the period of five years as well.

Problem Solving Analysis

- Steps Involved:
  - Preliminary Steps - Data loading
  - Data Exploration
  - Stock Analysis and Portfolio Management
  - Reporting
  - Mr. Patrick Jyengar Portfolio Building
  - Daily return from each stock
  - Average daily return from each stock
  - Risk of Stocks in Portfolio
  - Daily return from the portfolio
  - Total Portfolio Return
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Data Understanding and Demographics

- You are provided with the following information for 24 stocks of leading companies listed in New York Stock Exchange(NYSE):
  - Date
  - Open price: Price of stock at the start of the day
  - Close price: Price of stock at the end of the day
  - High price: Highest price reached by the stock on that day
  - Low price: Lowest price reached by the stock on that day
  - Adjusted close price: Stock price adjusted to include the annual returns (dividends) that the company offers to the shareholders
  - Volume traded: Number of stocks traded on the day

- The information for every stock ranges from 1st October 2010 to 30th September 2020.
- The stocks belong to different domains:
  - Technology/IT
  - Travel/Aviation/Hospitality
  - Banking/Financial Services and Insurance
  - Pharmaceuticals/Healthcare/Life Sciences

- To help with the market benchmark, we are given the S&P500 index prices for the same period.

Assumptions and Constraints

Assumptions:

- Merging the stock price into one file. For daily stock prices we are using Closing Price of the stock
- The missing Data is done by adding mean or median values
- Use of 0.75% as a risk free rate based on 10 years US Treasury bond yield

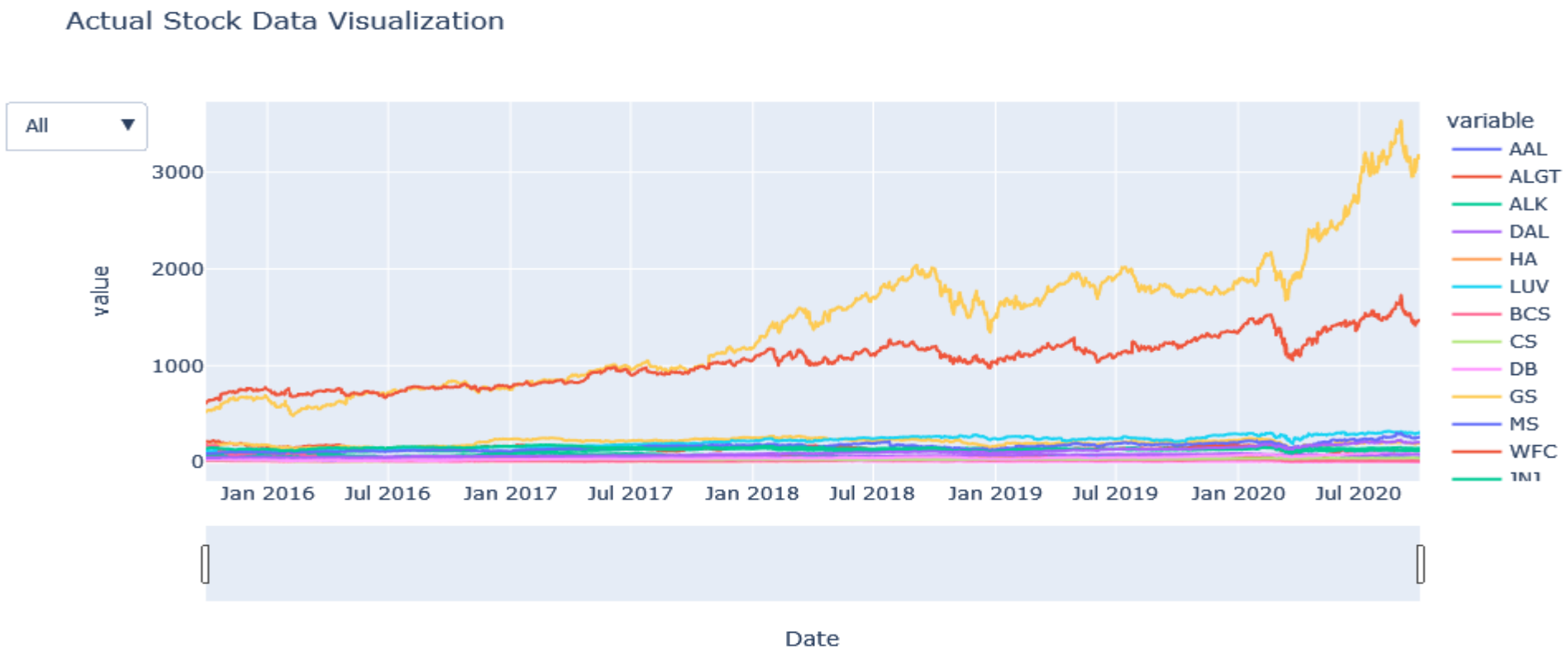
Constraints:

- We consider 5 years of data for prediction, instead of all data, assuming the trends will remain the same in future
- Performing equal allocation of the capital for the desired stocks

Data Cleaning

- Renaming the columns for each file will give the individual Column identity. Since we will be using the Close column in future, we rename it with the company abbreviation only
- After merging all data we are left with 2106 rows × 26 columns
- The DATE in the dataset is in object datatype, we have to change it in datatime format
- Also looking at the value counts we can see that there is no missing data in any of the columns of the dataset , thus we will go along with dataset without treatig for any missing values data
- According to the Information provided, the client want to invest for the period of 5 years.
- Since we are given the data for the period of 10 years we will analyse the data for 5 years and predict for the next 5 years
- Once all the data cleaning is done we save the new dataframe into .csv file

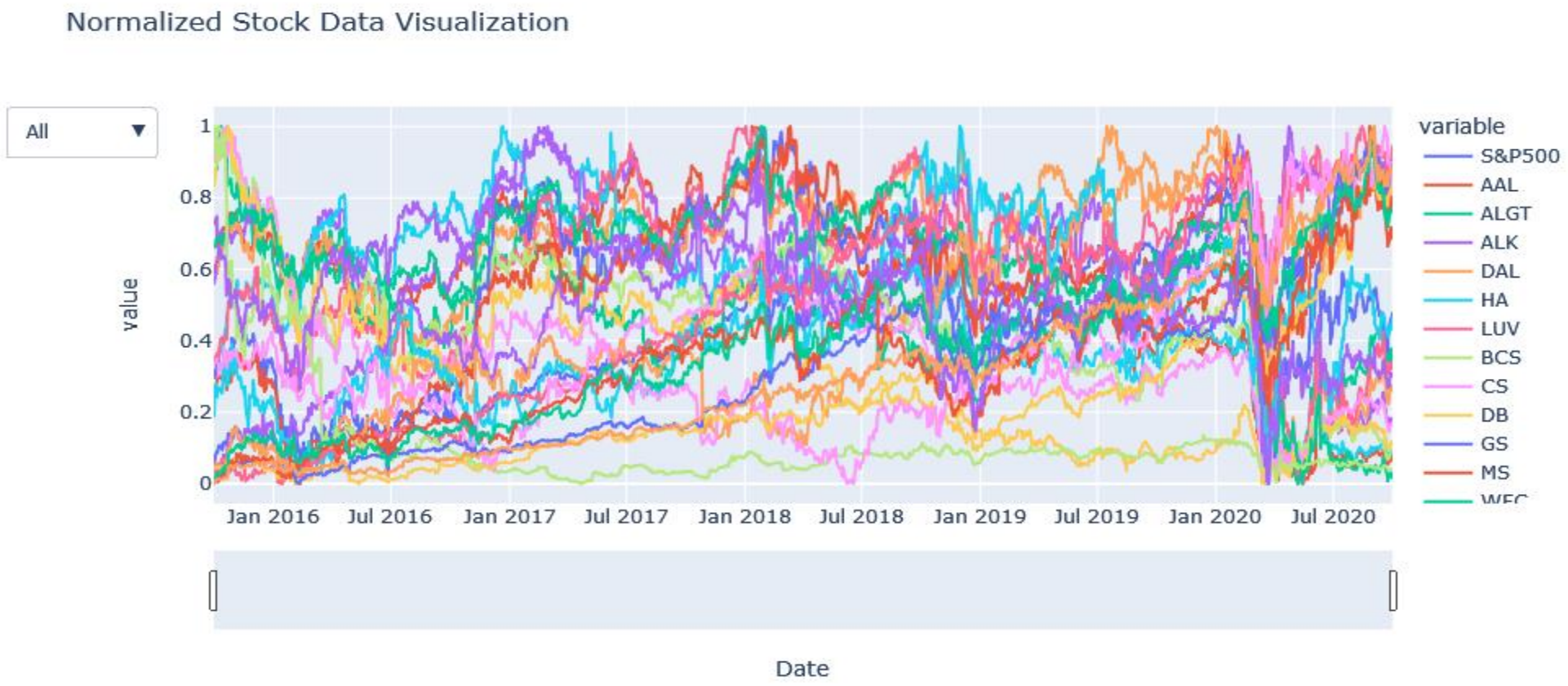
Data Exploration



Insights

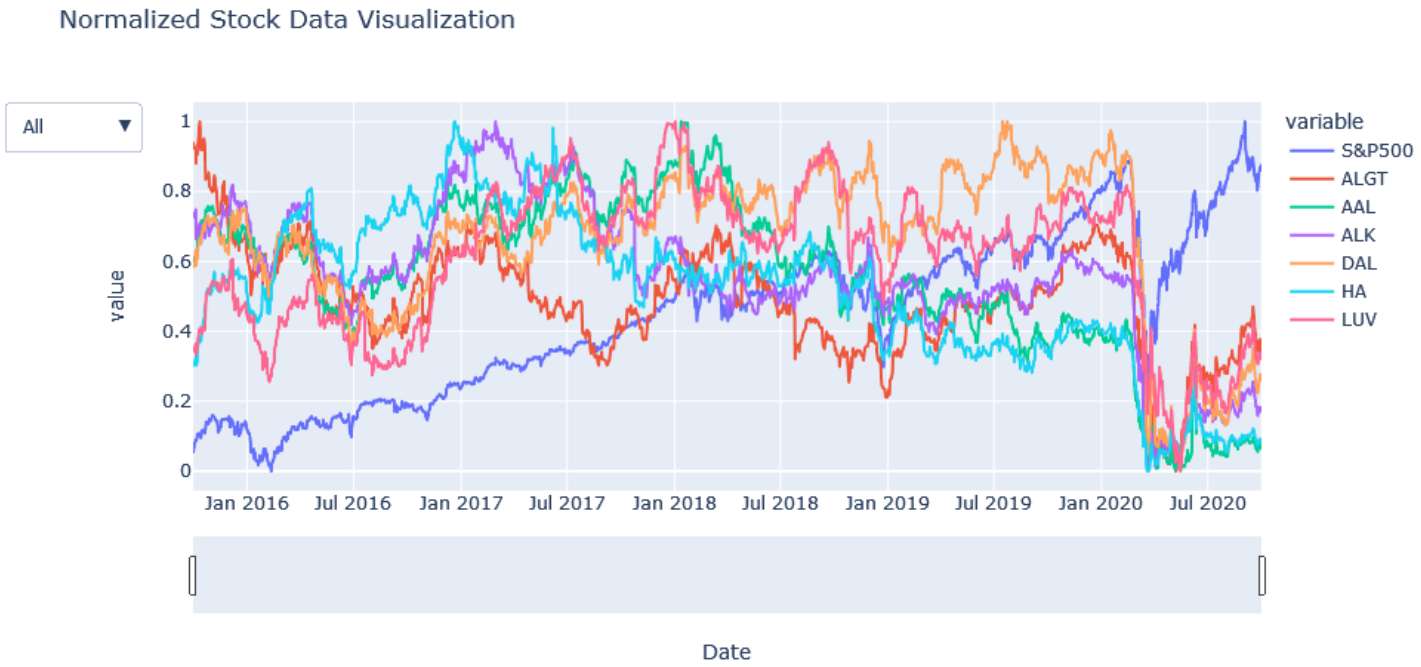
- Amazon and Google are the two companies which are trailing all the other companies mentioned in the data - The trend has been consistent over the five years.

Normalized Stock Data Visualization



- By the end of the 5 year, we see some of the stocks like United Health, Johnson and Johnson, Microsoft, Amazon, Apple, Google, Morgan and Stanley, Merck and Company, Rosch and Holding gaining value about more than 70 %.

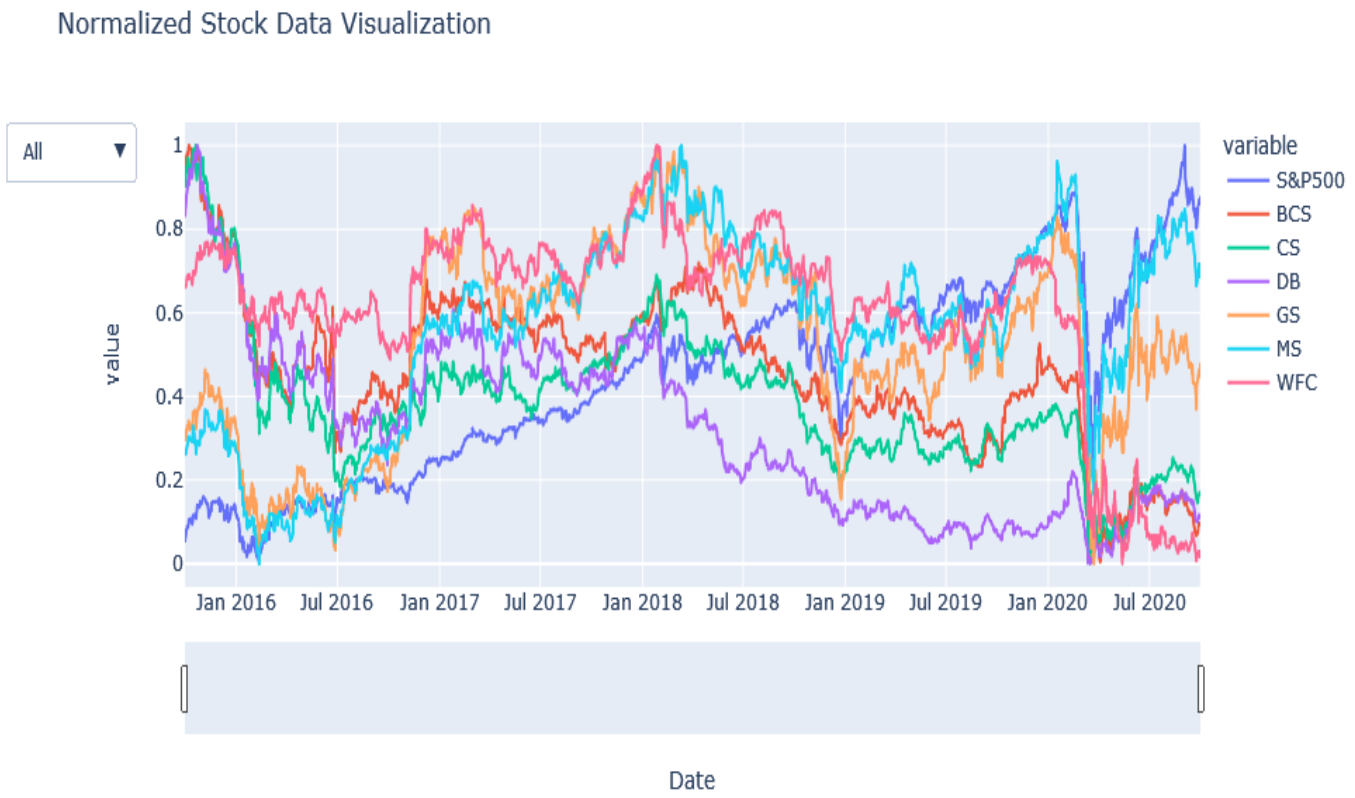
Analysing each domain separately



Aviation Stocks

- All the Stocks in the aviation sector has experienced downfall as we can see from the chart. Since March 2020 there is steep curve in all the stock graphs this can be because of the Corona Pandemic situation across the World.
- The Stock prices for 'Delta Air Lines' Inc and 'Southwest Airlines Co' are seen to be correlated while 'Allegiant Travel Company' and 'American Airlines Group Inc' are less negatively correlated.

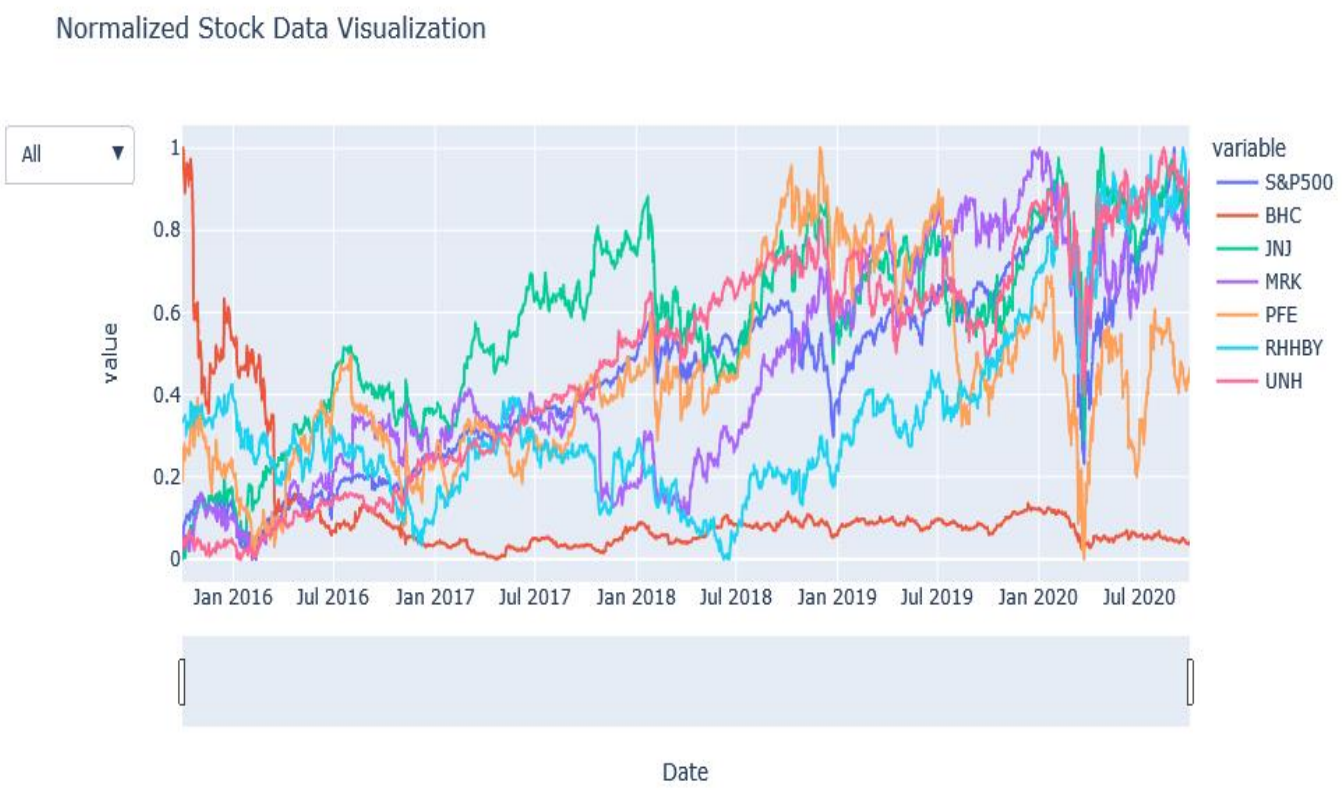
Finance



Finance Stocks

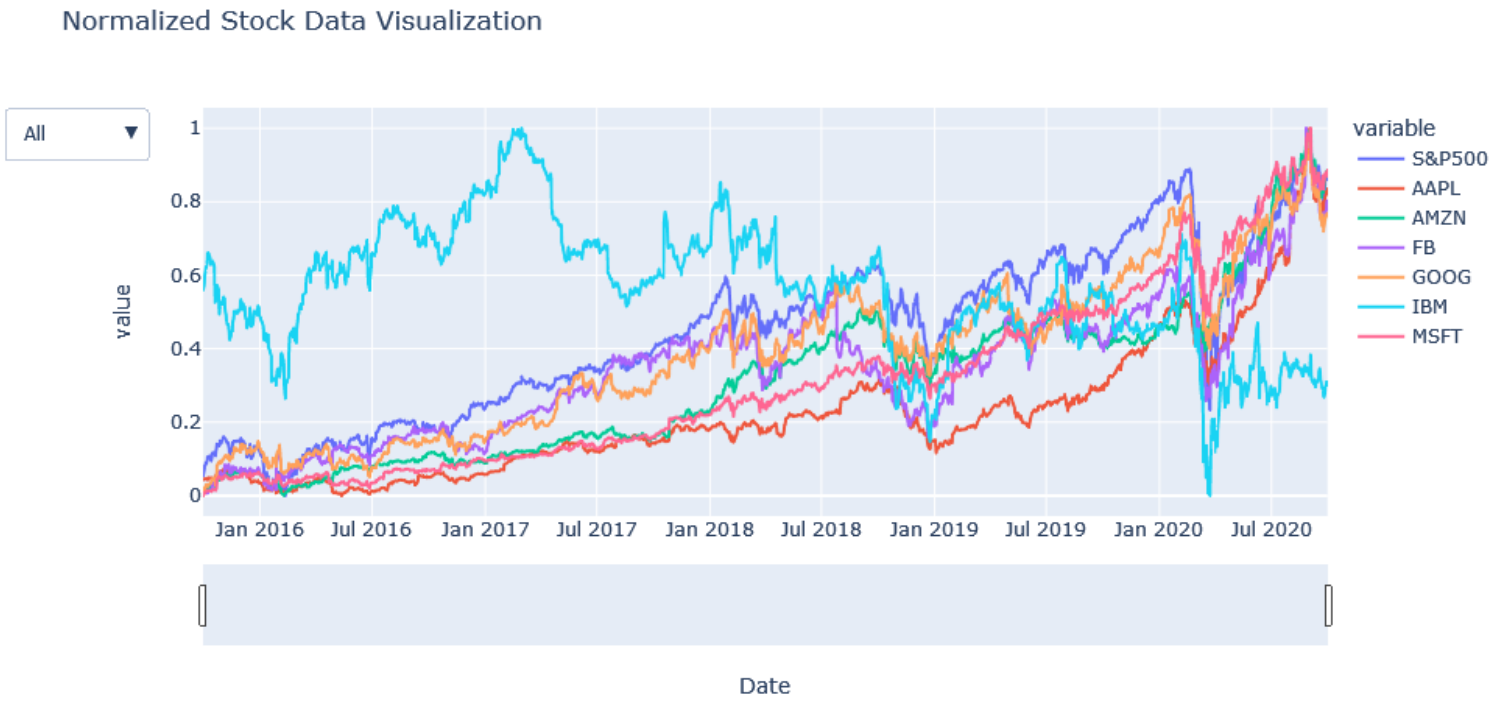
- Morgan Stanley & Goldman Sachs seems to perform well compared to other stocks.
- Deutsche Bank with correlation of -0.52 and Barclays with the correlation of -0.72 are seen to be least performers at the end of the analysis chart.

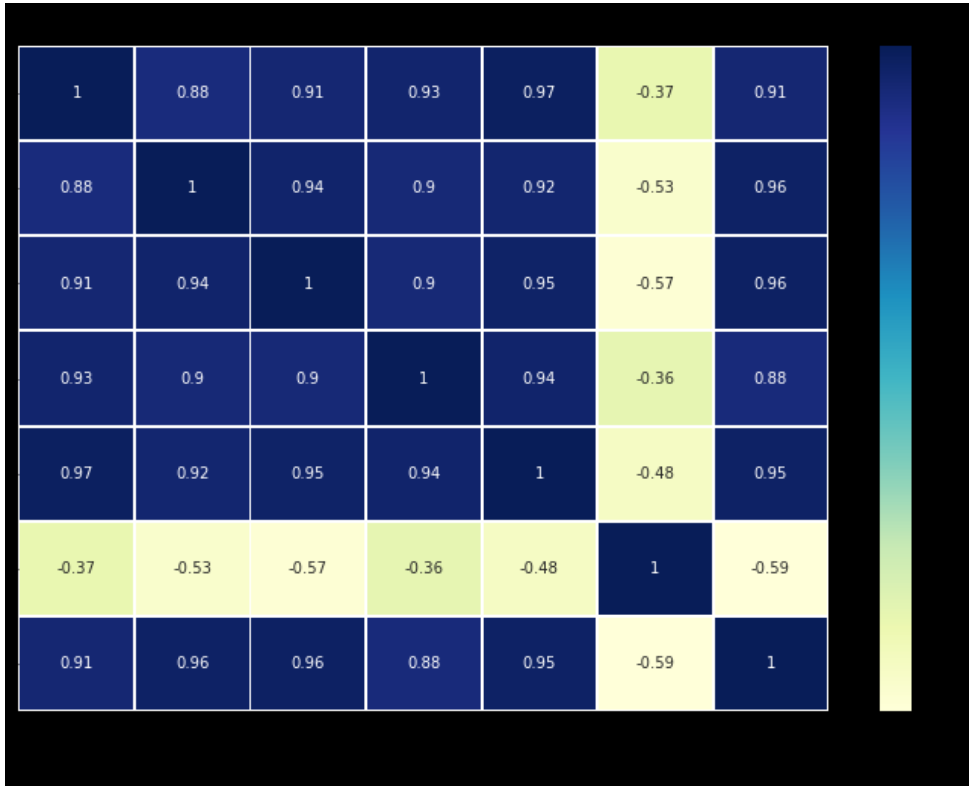
Pharma



- Pharma & Health has been hit by the Pandemic as well but can be seen recovered at the fastest rate than any other sector
- United Health, Johnson & Johnson have performed well having the correlation of 0.95 and 0.86 with the market index.
- 'Bausch Health Companies Inc.' is seen to be performing badly over the years consistently.

Technology

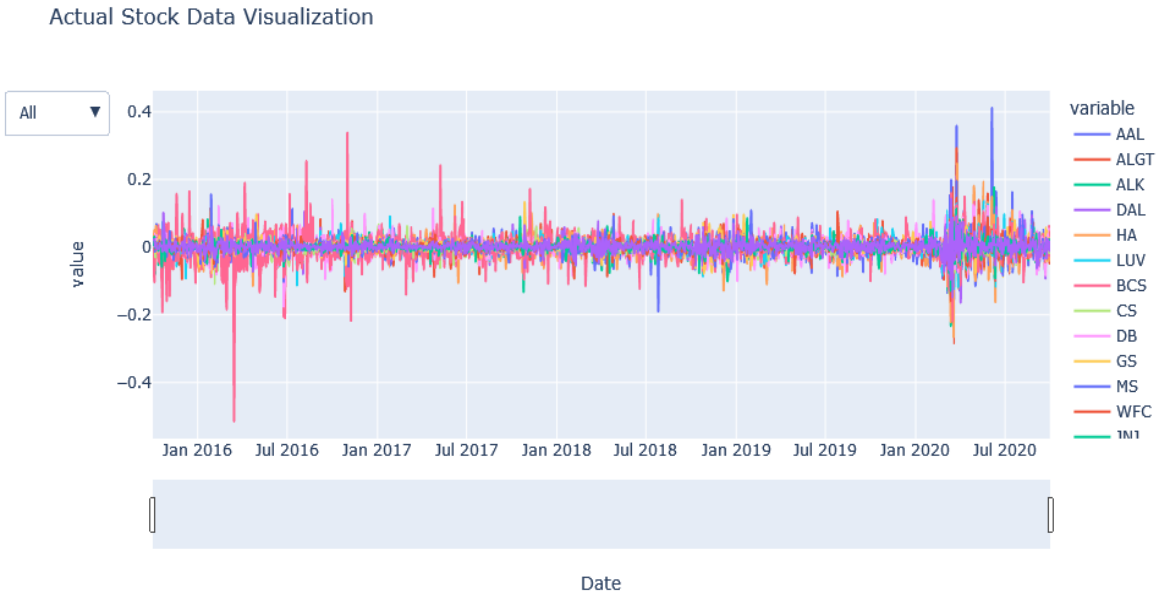


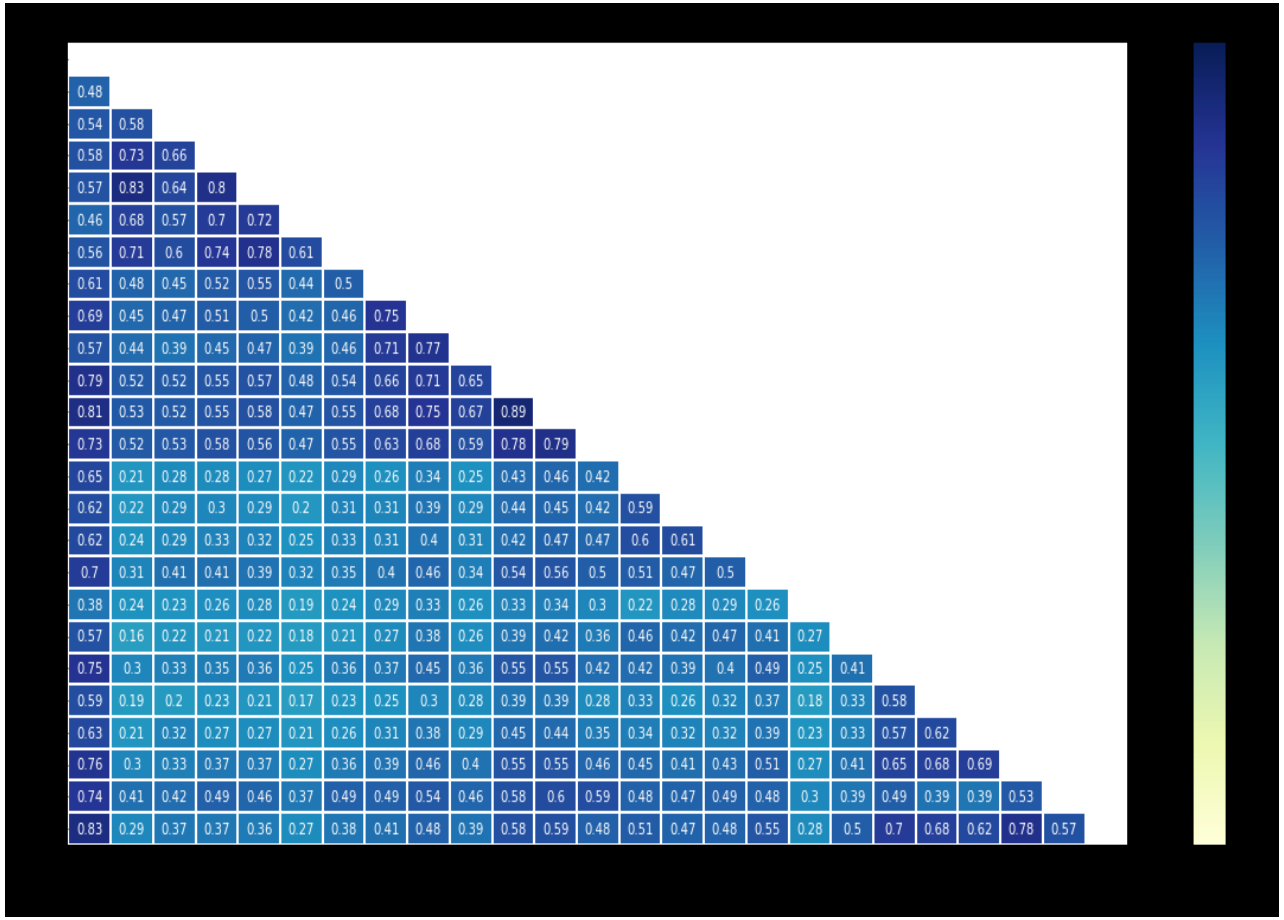


- Technology Sector is also seen performed badly during the Pandemic but has been recovered well along the way better than the Pharma healthcare Sector
  - The companies which has performed well along the market index are Microsoft, Amazon, Apple, Facebook & Google.
  - Whereas we see that IBM has performed badly consistently over the years.

Metric Calculations

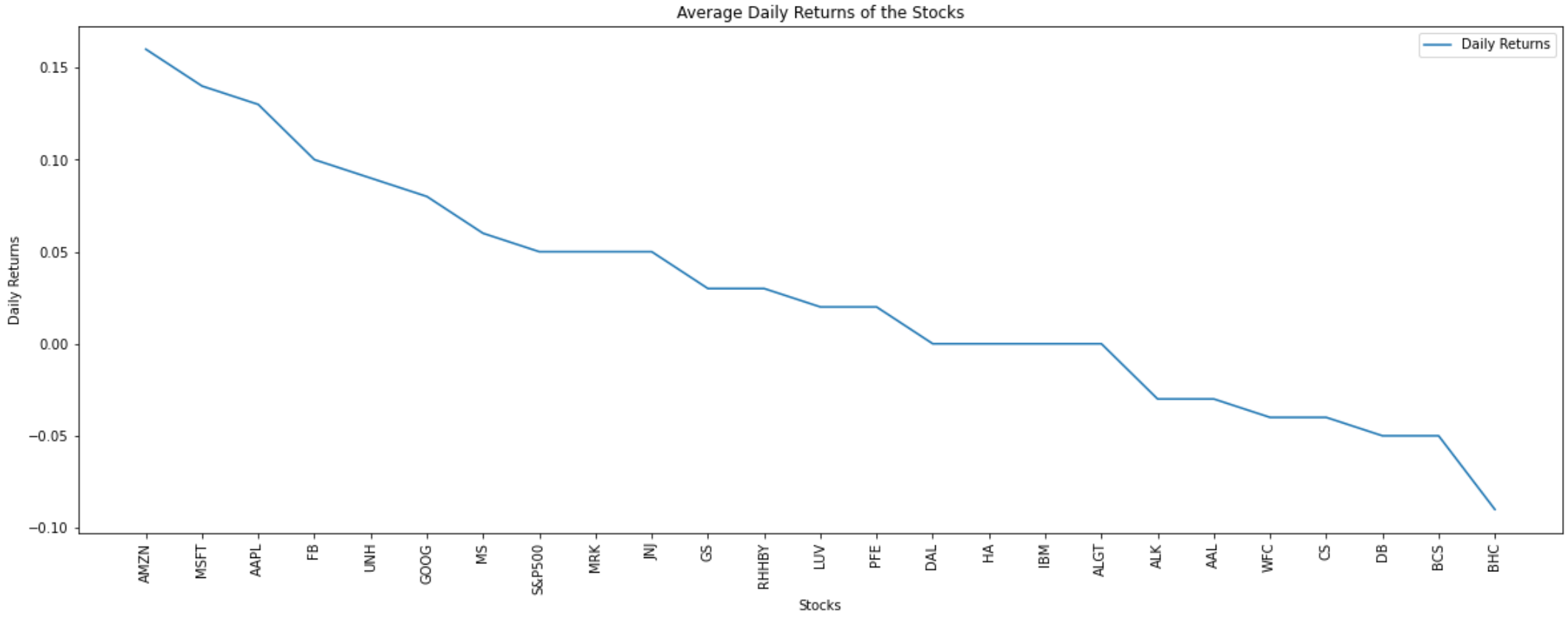
Daily returns





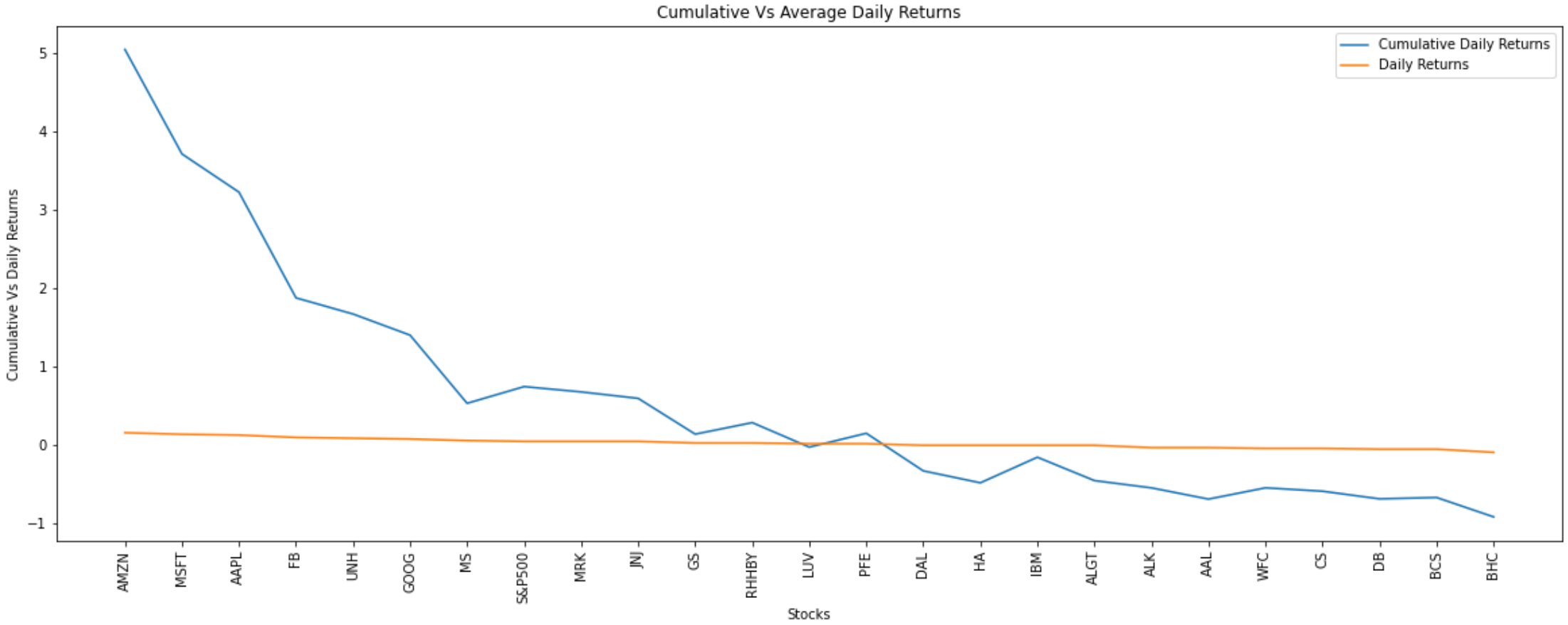
- Aviation -- Delta Airlines and American Airlines are more correlated with Alaska Air Group at third rank
- Finance -- Goldman Sachs, Morgan Stanley & Wells Fargo are ranking higher correlation with the market index
- Pharma -- Johnson's and Johnsons and Pzier are more correlated, Compared to the Other sectors Pharma is less correlated with the market index
- Technology -- Microsoft and Google are the highly correlated stocks with Amazon in the third rank

Average Daily Returns of the Stocks



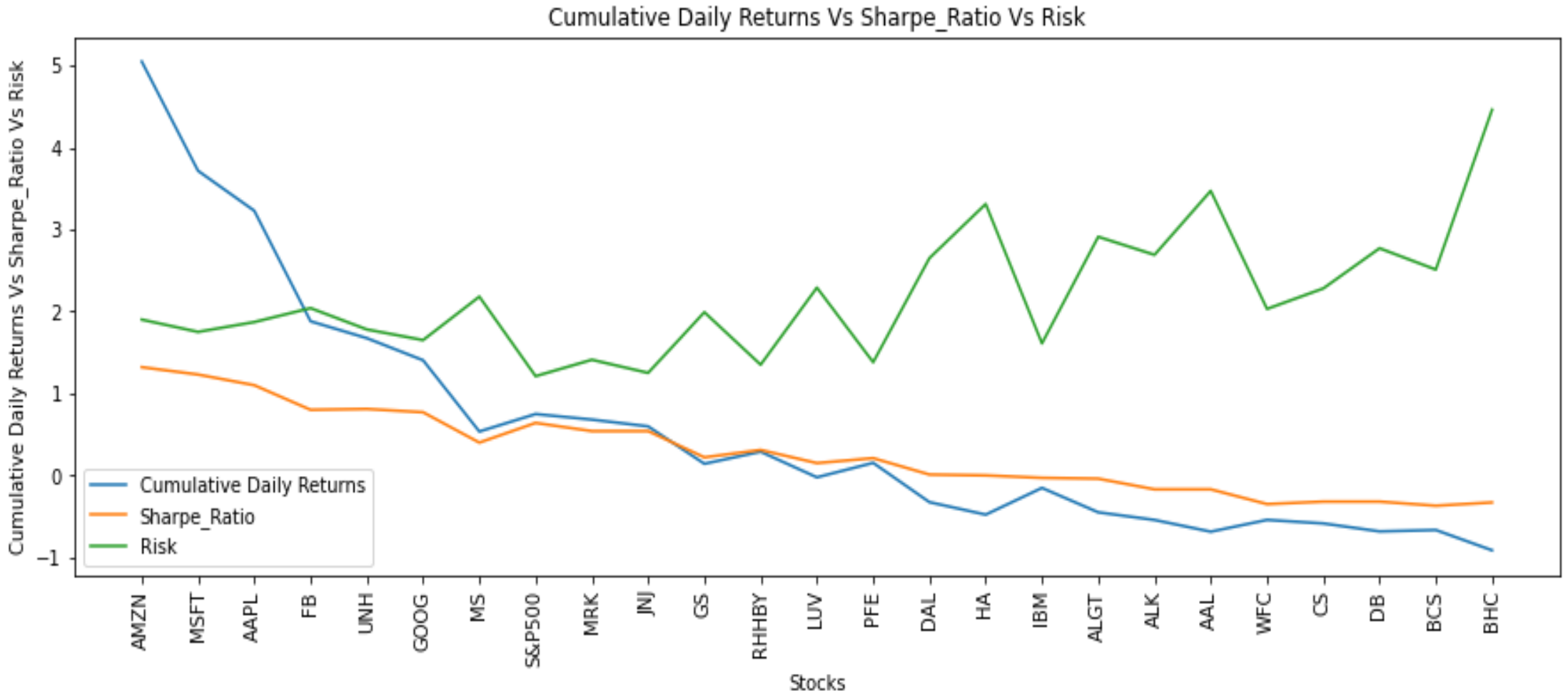
Above we can see the average daily returns of the stocks we have been studying about in the descending order with the highest being Amazon and the lowest been Bausch Health Companies inc

Cumulative Vs Daily Returns



The above is the cumulative vs Daily Return chart that shows the comparisons of the values with respect to both the metric.

Cumulative Daily Returns Vs Sharpe_Ratio Vs Risk

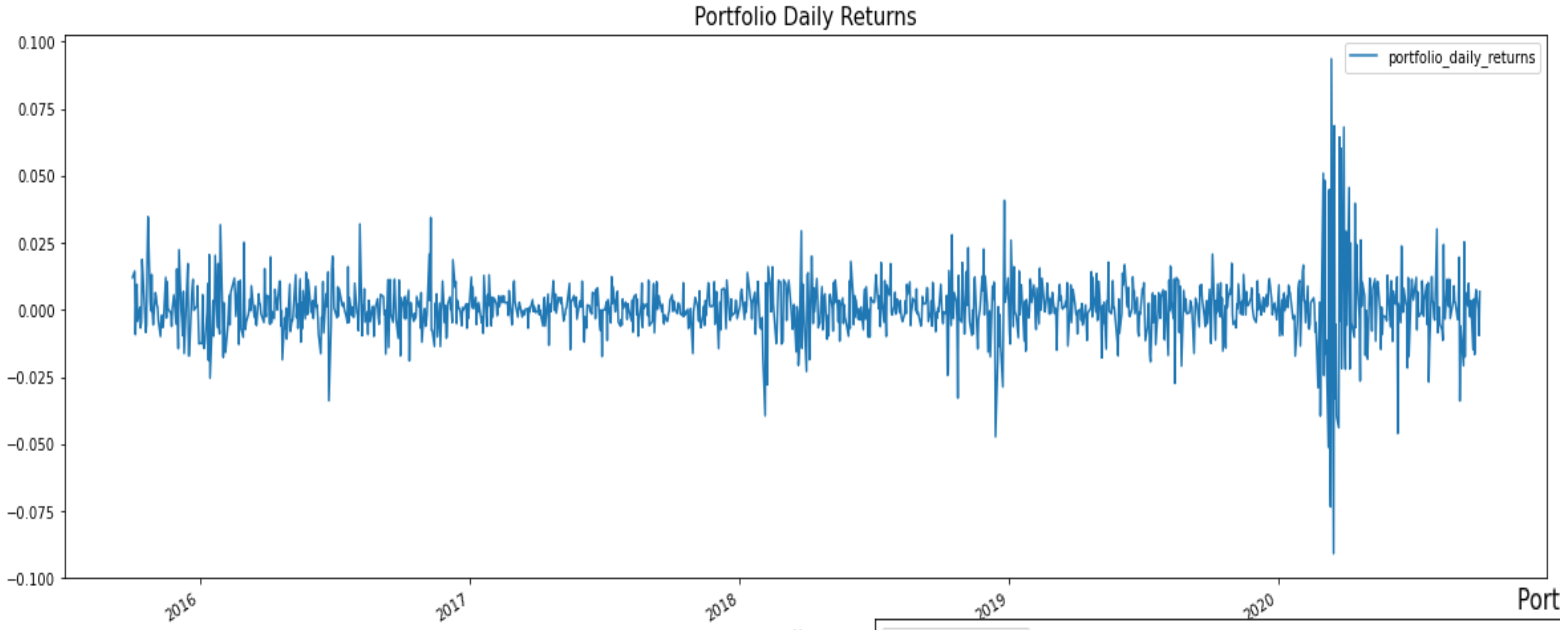


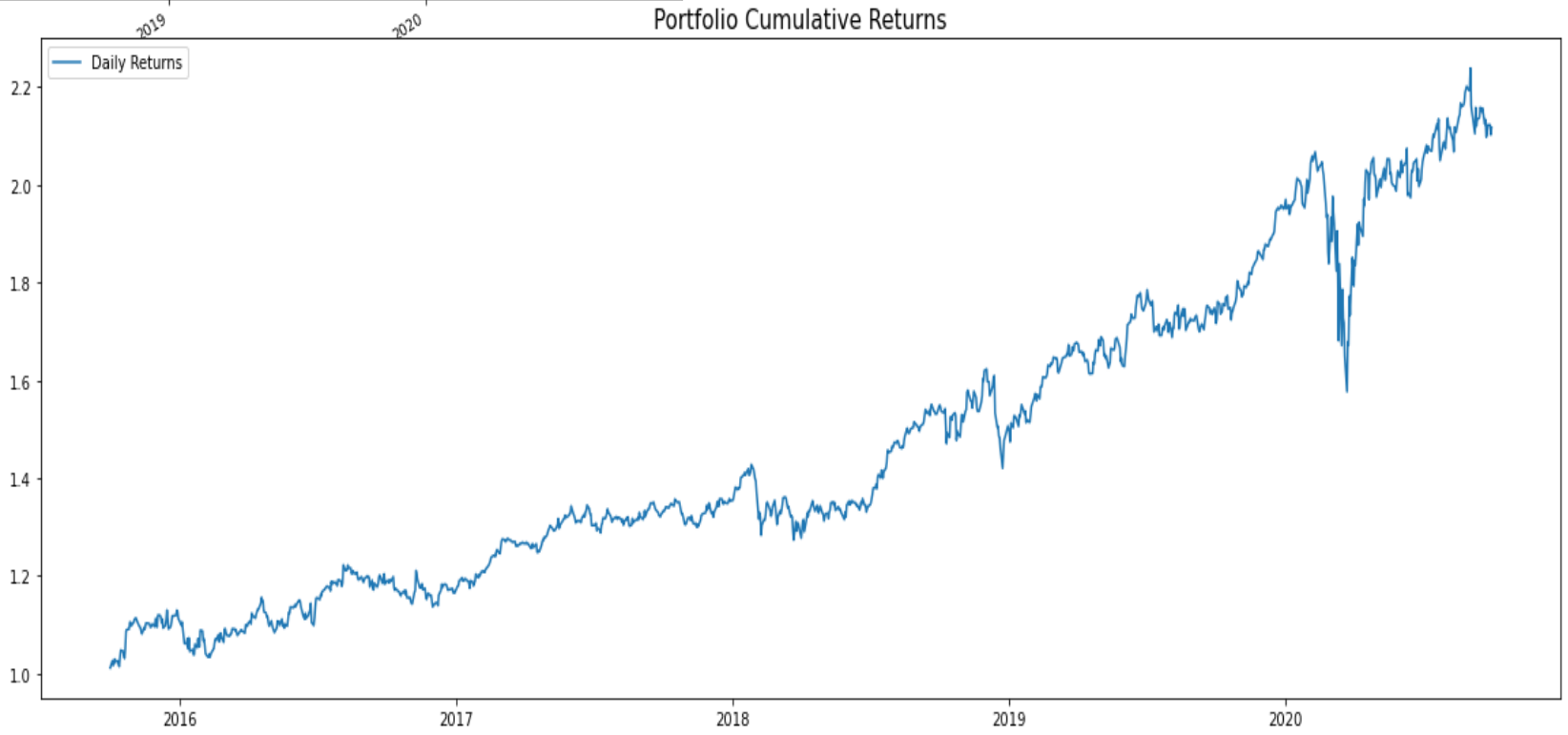
Mr. Patrick Jyengar Portfolio

- According to Mr. Patrick Jyengar, he wants to double his investments in the span of 5 years with the minimum risk as possible considering he is retired.
- Thus following his profile we will recommend him to invest in the stocks like JNJ, RHHBY and MRK. Considering the returns of these stocks. It is advisable for Mr. Patrick to invest in the Technology sector like Microsoft as it is booming with high returns which can be beneficial of expected returns to Mr. Patrick

Annual Sharpe Ratio
Annualised_Sharpe_Ratio = (252**0.5)*Sharpe_Ratio
0.1999565580009495

The Overall Earnings have summed up to be:
558232.5265964309



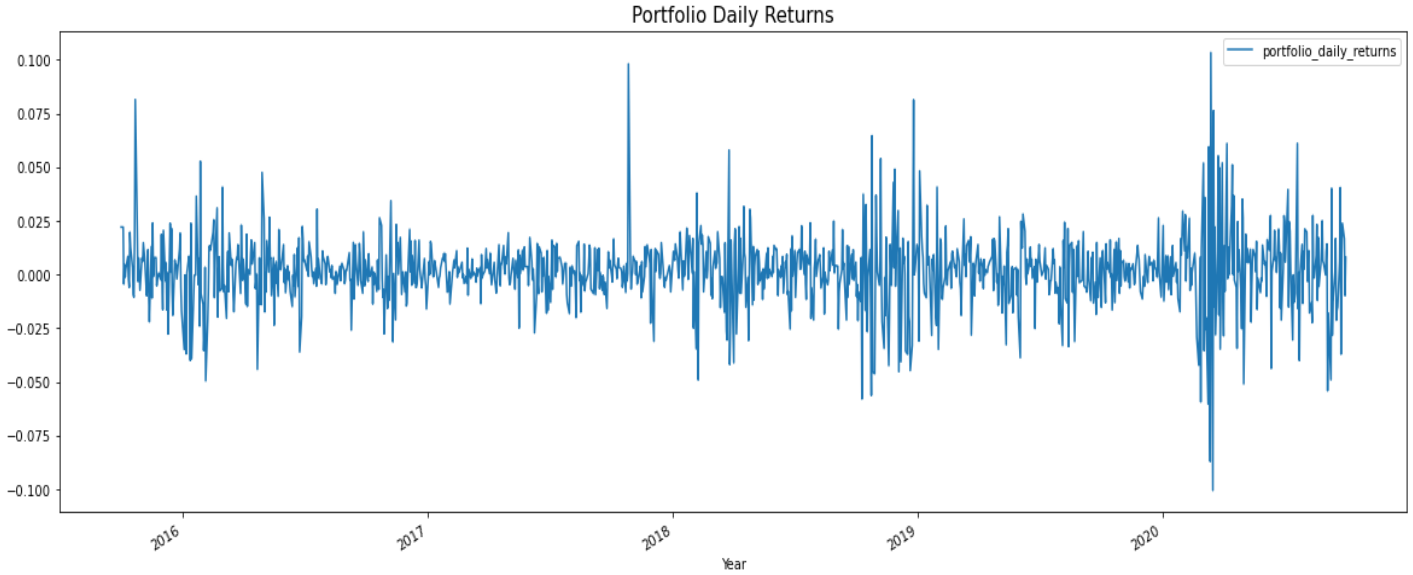


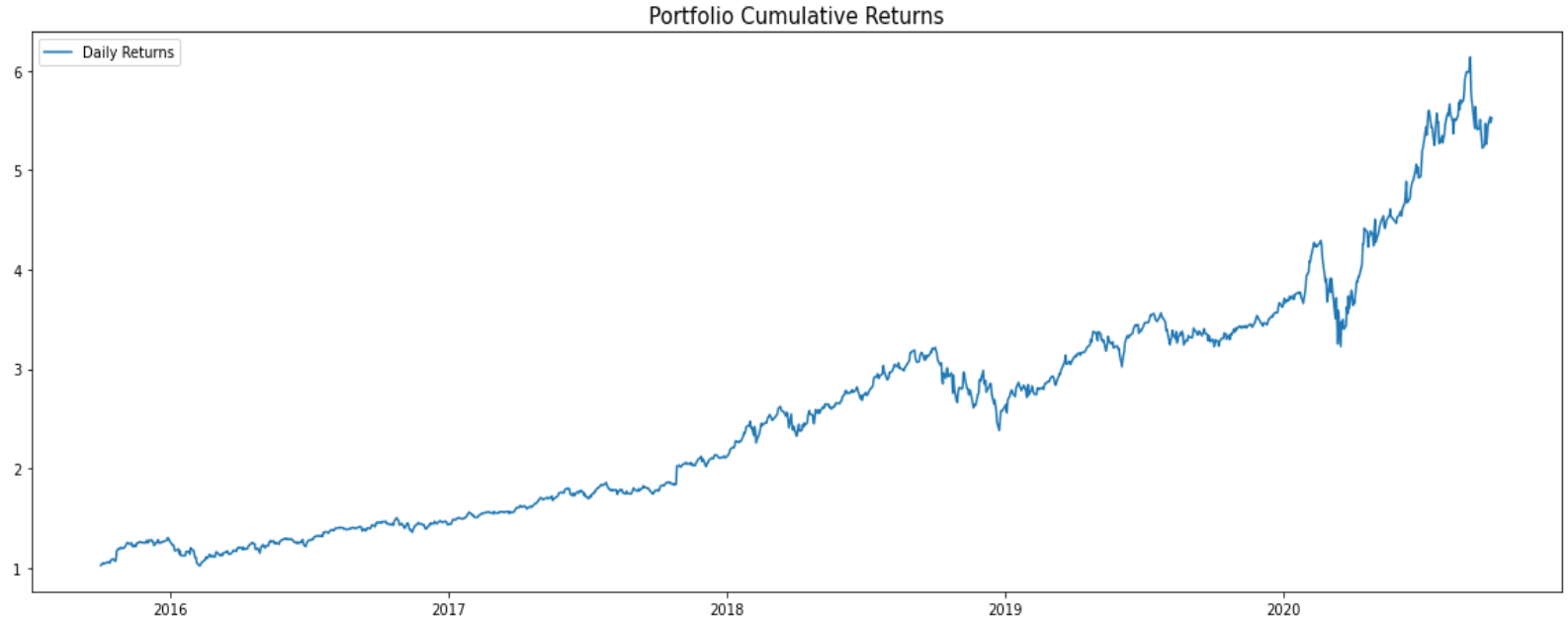
- From the above Portfolio build for Mr. Patrick Jyengar, he gets the returns of 1.58 Million dollars with the gain of 558.232 Thousand dollars on the investments of 500 Thousand dollars for the period of 5 years.
- The risk involved here for Mr. Patrick is about 18%

Mr. Peter Jyenger

- Mr. Peter Jyengar is open to the risk and is expecting high returns in investments possible as he is working towards expansion of the company.
- As he is investing the amount of $1 million from the company's account, he is expecting the high returns and is able to handle the risk
- Accordingly, we can recommend him the stocks that are high risk - high return like Amazon and Microsoft. This stocks are providing the highest returns compared to others with the relatable risk involved.
- # Assuming that the risk free rate is zero
- Annualised_Sharpe_Ratio is 0.9322571580143533
- Overall earning of Mr. Peter Jyengar is Rs 4523971.805773486

- **Total ROI from the Portfolio**
- Mr.Peter Jyengar have invested 1 Million dollar on equities. The returns he would get after 5 years is about 5.5 million dollar and the gain of about 4.5 million dollar.
- - The risk obscured by having such high gain are about 26.5% overall.


Portfolio Daily Returns
portfolio_daily_returns
0.100
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
2016
2017
2018
2019
2020
Year


Portfolio Cumulative Returns
Daily Returns
6
5
4
3
2
1
2016
2017
2018
2019
2020

Conclusion

- In this Portfolio Project we have explored stock Prices of aviation, finance, pharma, technology sectors. We have seen various key metrics for understanding the returns values, the risk involved etc when investing in these stocks.
- Aviation -- Delta Airlines and American Airlines are more correlated with Alska Air Group at third rank
- Finance -- Goldman Sachs, Morgan Stanley & Wells Fargo are ranking higher correlation with the market index
- Pharma -- Johnson's and Johnsons and Pzier are more correlated, Compared to the Other sectors Pharma is less correlated with the market index
- Technology -- Microsoft and Google are the highly correlated stocks with Amazon in the third rank
- Mr. Patrick Jyengar, he gets the returns of 1.58 Million dollars with the gain of 558.232 Thousand dollars on the investments of 500 Thousand dollars for the period of 5 years.
- Mr.Peter Jyengar have invested 1 Million dollar on equities. The returns he would get after 5 years is about 5.5 million dollar and the gain of about 4.5 million dollar.
- Stocks with low risk and high Gain is best to buy. We have Johnson's and Johnson as such stock whereas Amazon is high risk high gain