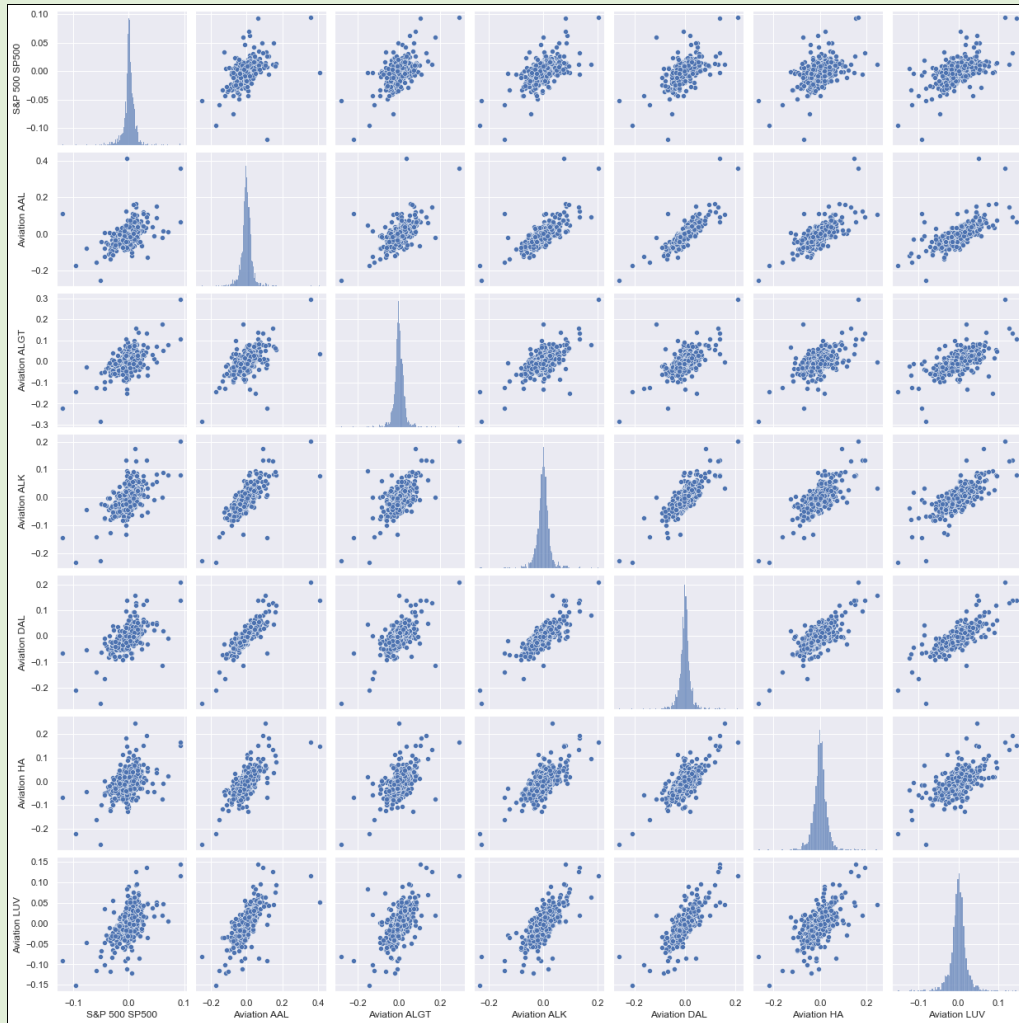


Visualisations in Jupyter Notebook & Tableau:

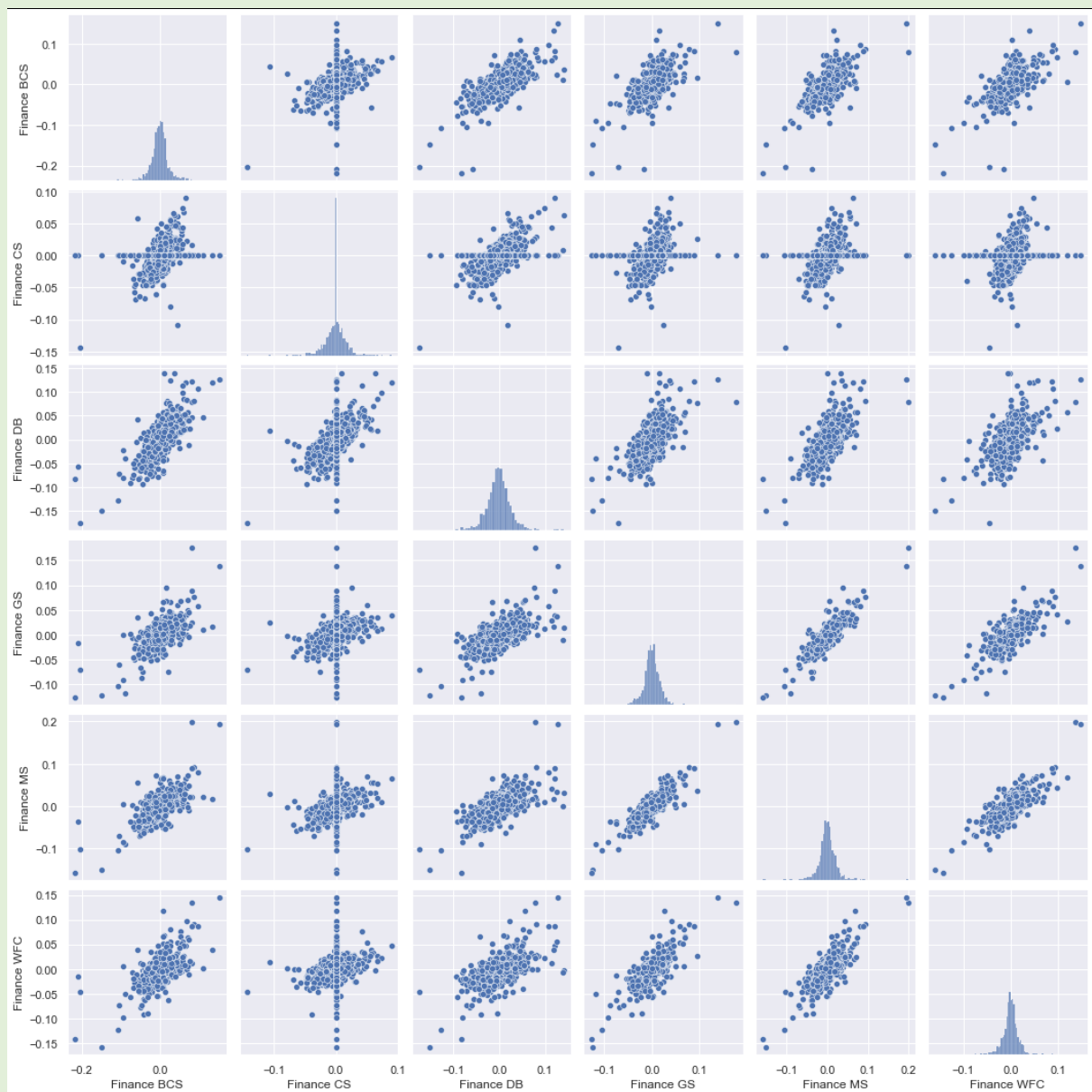
Pairplot for Aviation Industry:



Insights/Findings:

- Stock 'DAL' is highly correlated with 'stocks AAL', 'LUV', and 'HA'
- Stocks in 'Aviation' industry are not much in line with S&P500 index

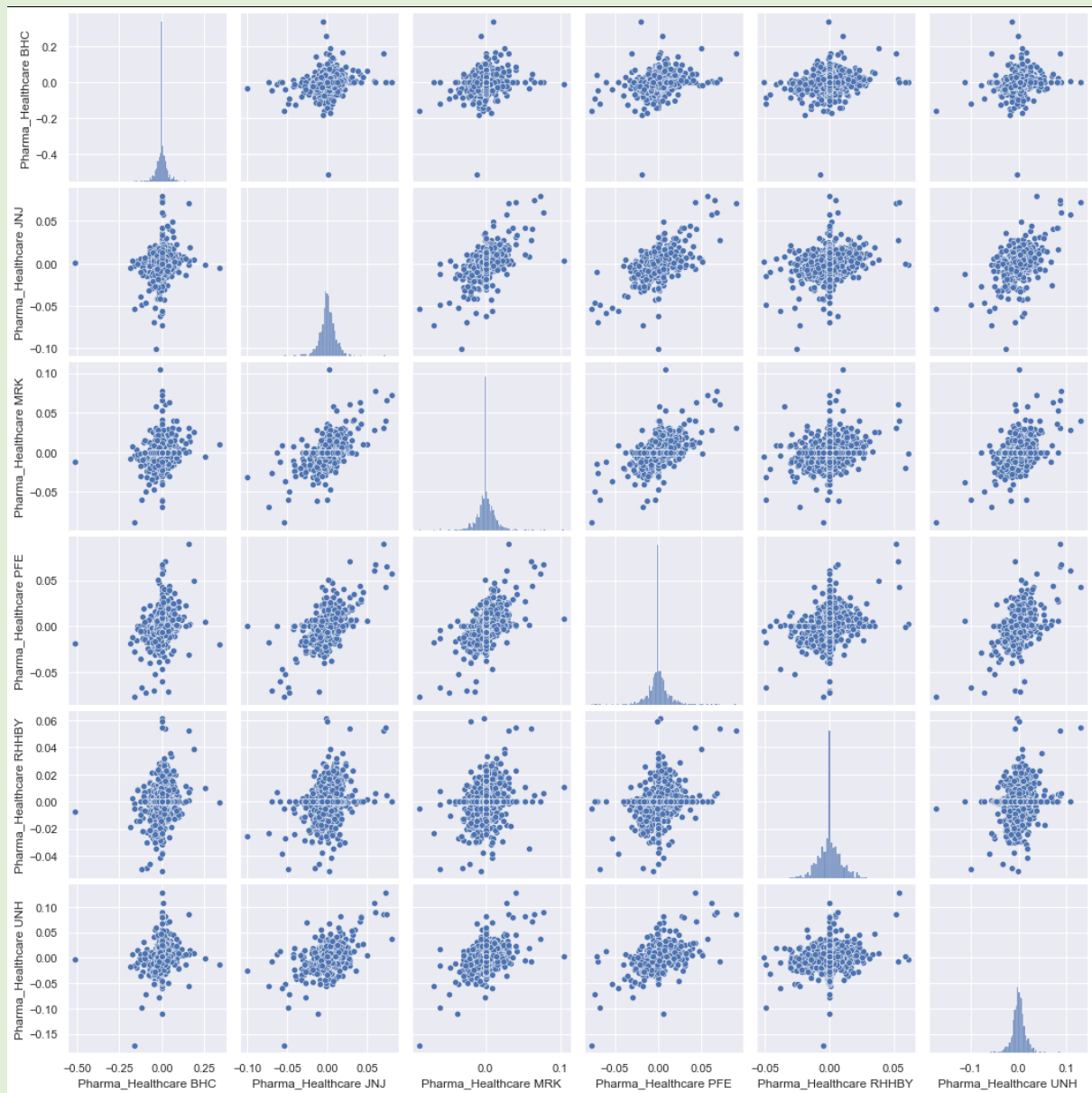
Pairplot for Finance Industry:



Insights/Findings:

- Return from stock 'CS' is mostly centered around zero
- Stock 'MS' is highly correlated with 'stocks 'WFC' and 'GS'

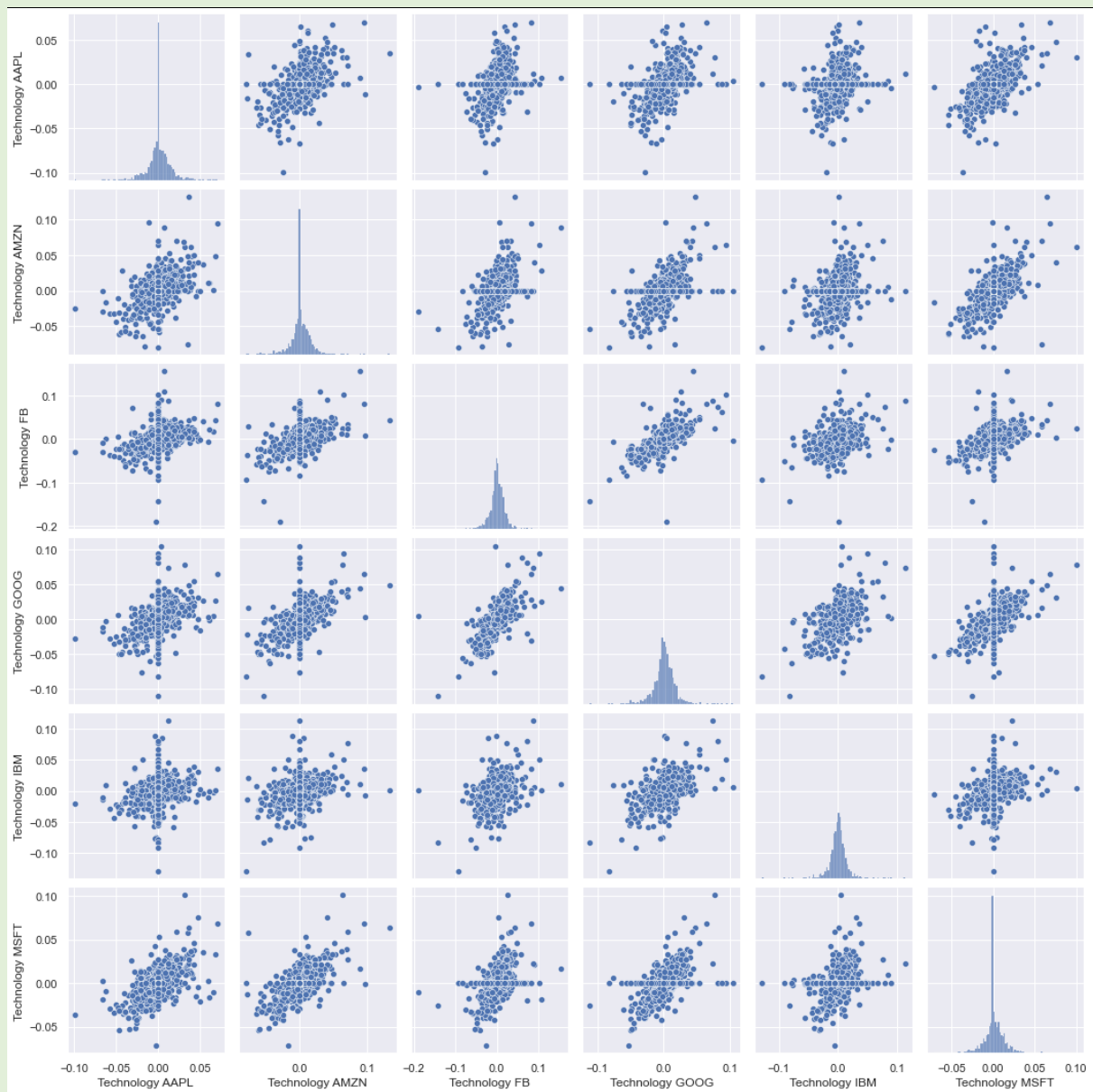
Pairplot for Pharma Healthcare Industry:



Insights/Findings:

- Return from stocks 'RHHBY' and 'BHC' is mostly centered around zero
- Stock 'MRK' is highly correlated with 'stocks 'JNJ' and 'PFE'

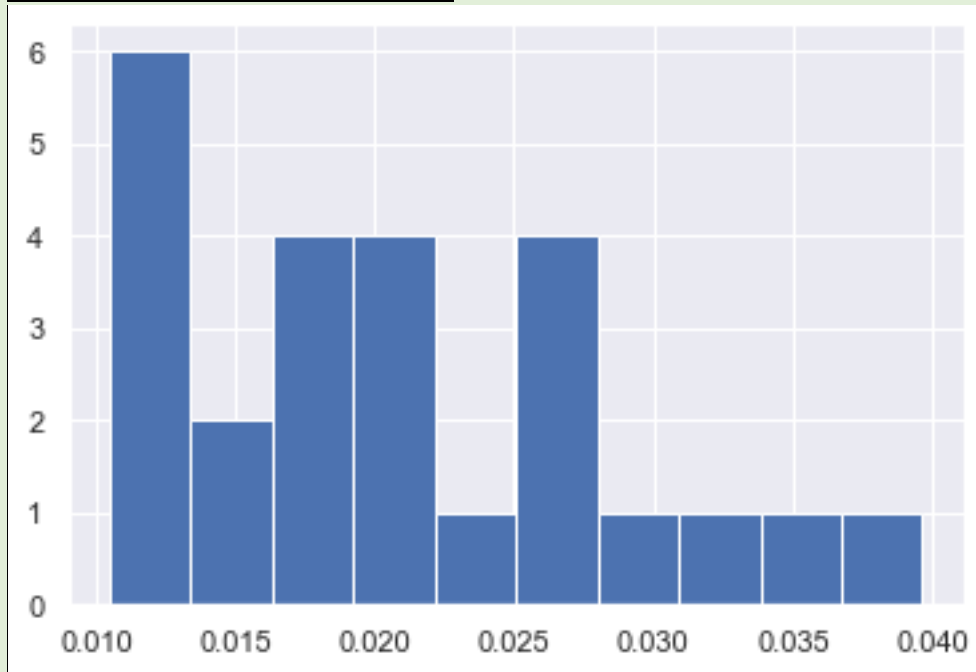
Pairplot for Technology Industry:



Insights/Findings:

- Return from stock 'IBM' is mostly negative (less than zero)
- Stock 'GOOG' is highly correlated with stocks 'MSFT' and 'FB'

Distribution of Return from Stocks:



Insights/Findings:

- All stocks return mostly 1% to 2.5%
- Maximum return by stocks is approximately 4%

Distribution of Closing Prices: Aviation Industry:



Insights/Findings:

- Average closing price of all stocks in 'Aviation' industry is much lower than that of S&P 500 index
- Closing price of stock 'ALGT' has the highest mean value among all

Distribution of Closing Prices: Finance Industry:



Insights/Findings:

- Average closing price of all stocks in 'Finance' industry is much lower than that of S&P 500 index
- Closing price of stock 'GS' has the highest mean value among all

Distribution of Closing Prices: Pharma Healthcare Industry:



Insights/Findings:

- Average closing price of all stocks in 'Pharma_Healthcare' industry is much lower than that of S&P 500 index
- Closing price of stock 'UNH' has the highest mean value among all

Distribution of Closing Prices: Technology Industry:

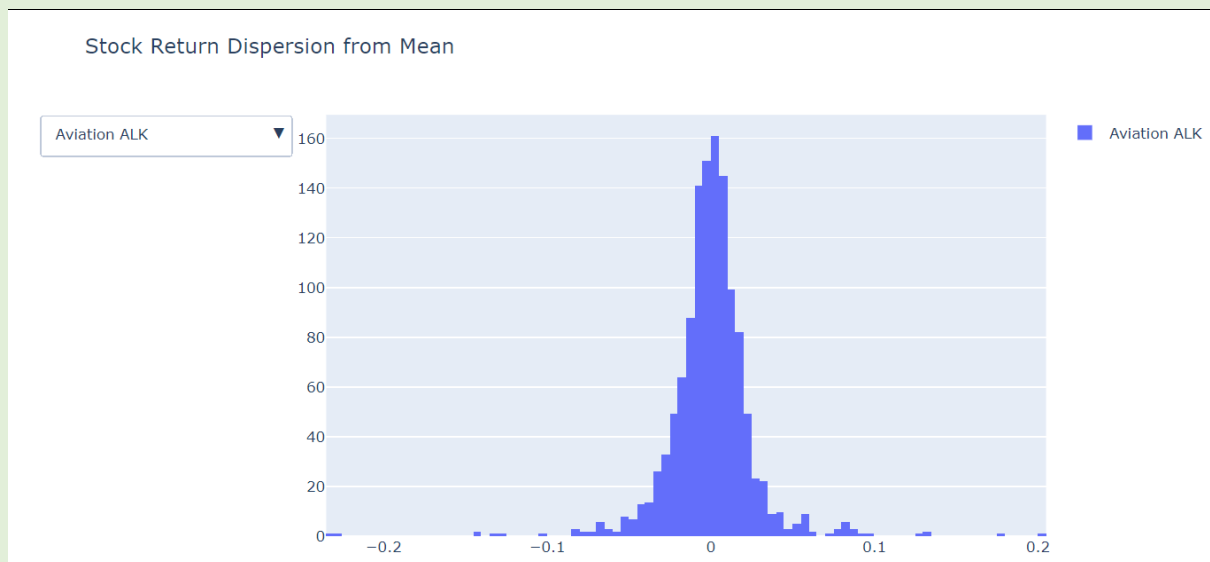


Insights/Findings:

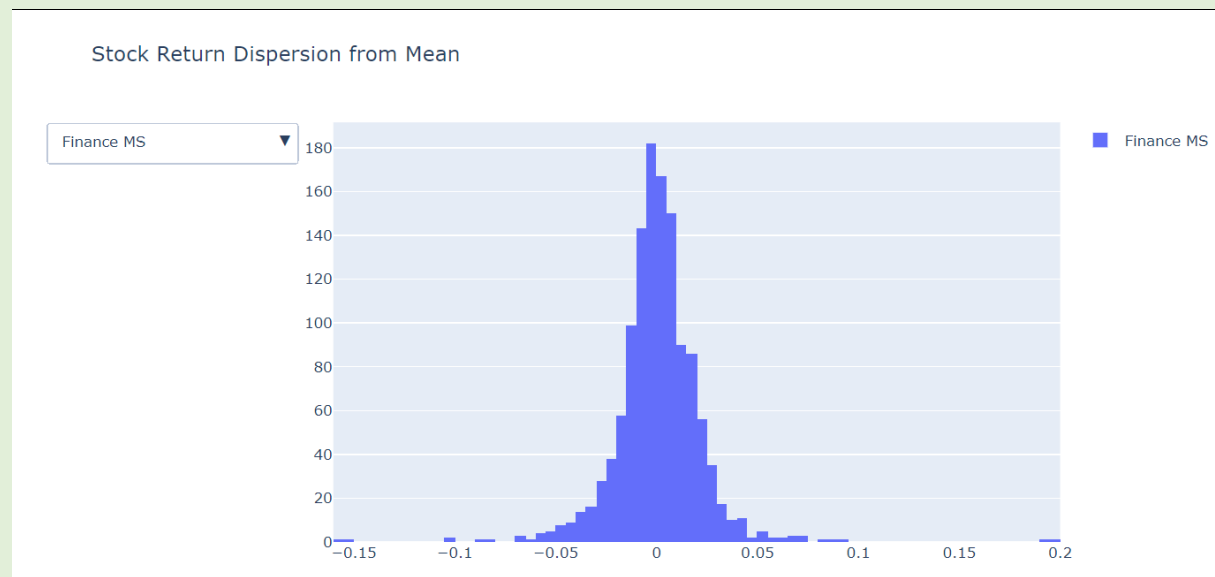
- Average closing price of most of the stocks in 'Technology' industry is in line with that of S&P 500 index
- Closing price of stock 'AMZN' has the highest mean value among all and 'AAPL' has the lowest

Stock Dispersion from Mean:

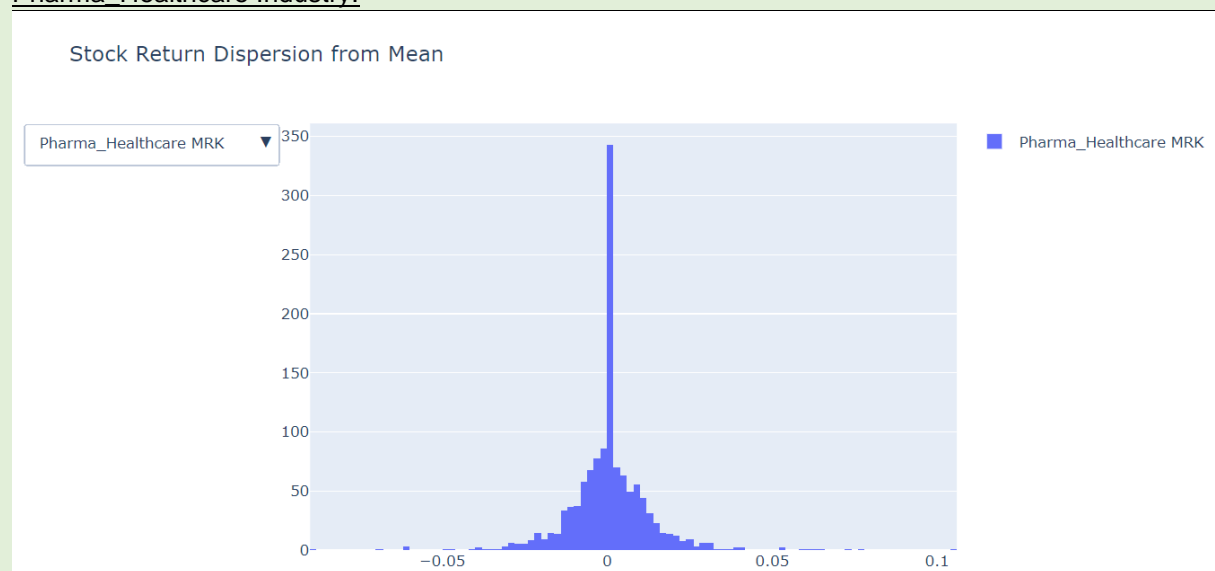
Aviation Industry:



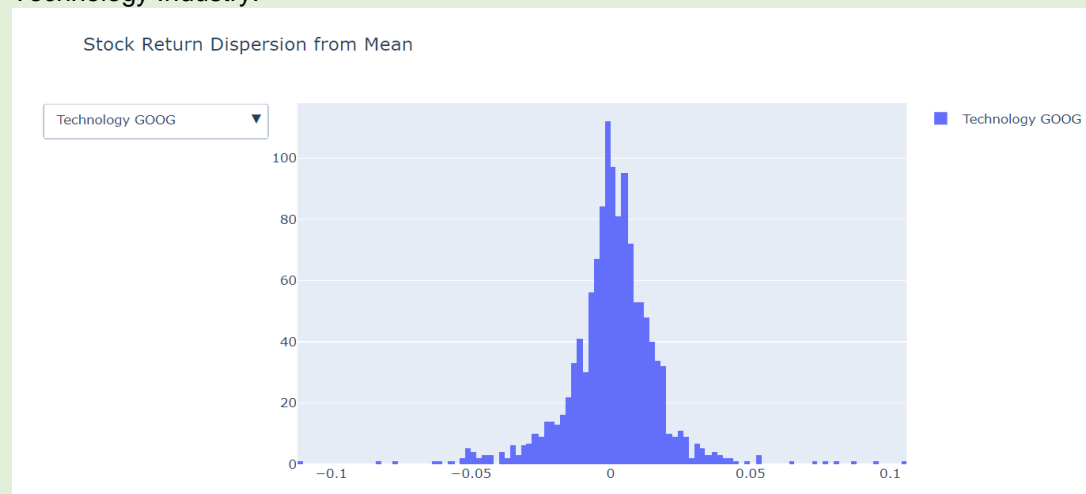
Finance Industry:



Pharma_Healthcare Industry:



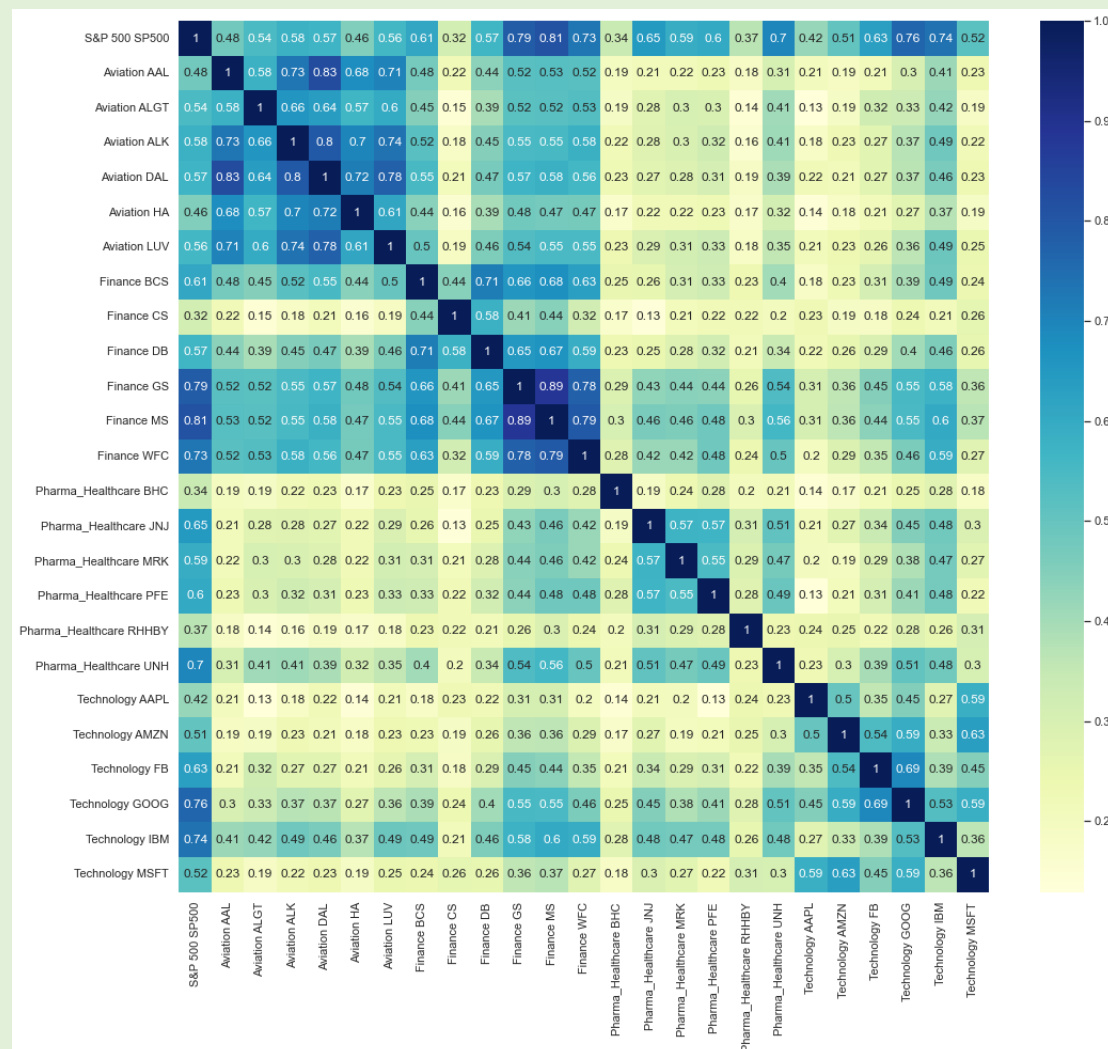
Technology Industry:



Insights/Findings:

- Return dispersion from mean for stocks is different for respective industry and stock
- Being an interactive plot, all stocks and industries can be analysed

Correlation Matrix : Return from Stocks:

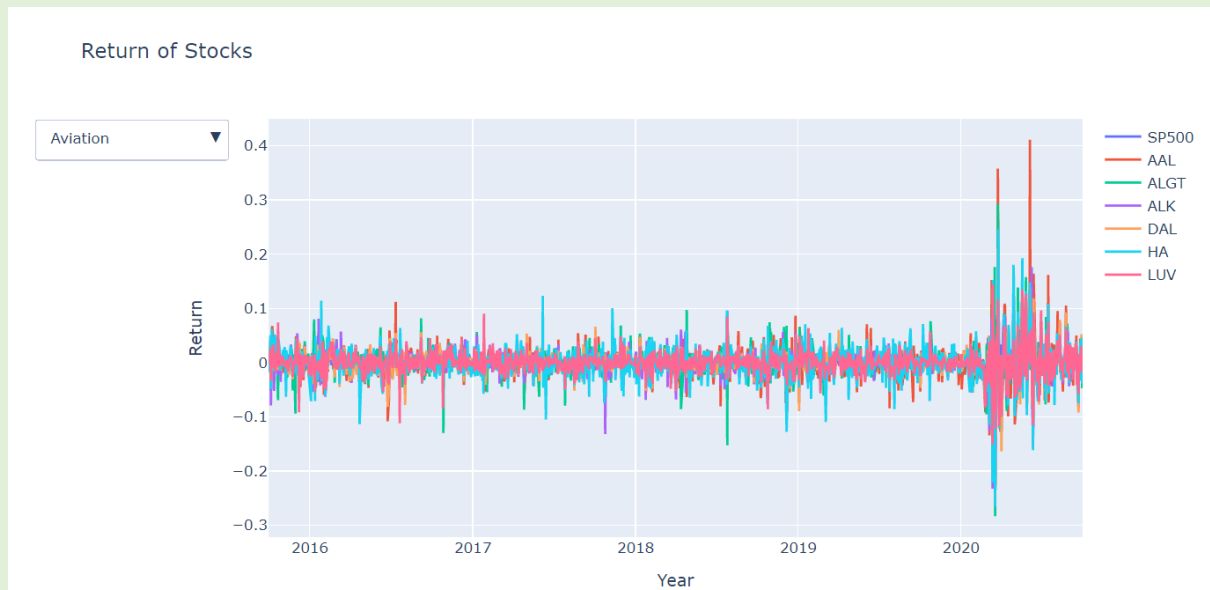


Insights/Findings:

- Stocks 'GOOG', 'MRK', 'JNJ', 'MS', and 'GS' are highly correlated with S&P 500 index
- Stocks of 'Finance' industry are highly correlated with those of 'Aviation' industry
- Stocks in 'Technology' industry : 'GOOG', 'FB', and 'AMZN' are highly correlated

Correlation Matrix : Return from Stocks:

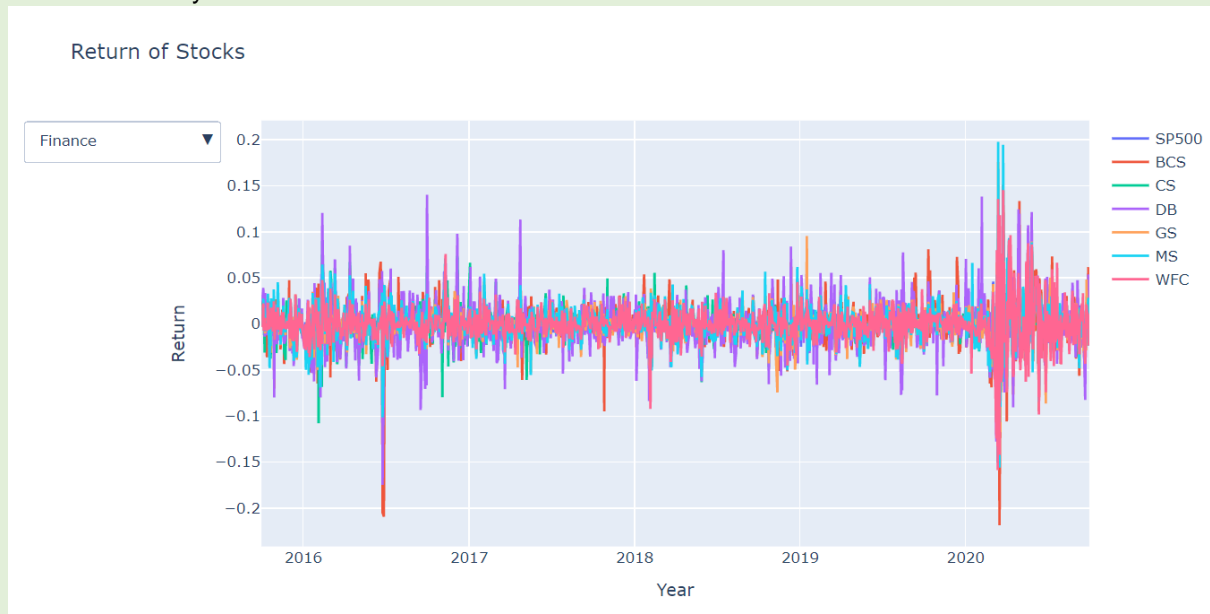
Aviation Industry:



Insights/Findings:

- Stock 'AAL' is the most volatile stock in 'Aviation' industry followed by 'HA'
- 'Aviation' is the most risky industry to invest a capital
- 'LUV' is the most stable stock in this industry

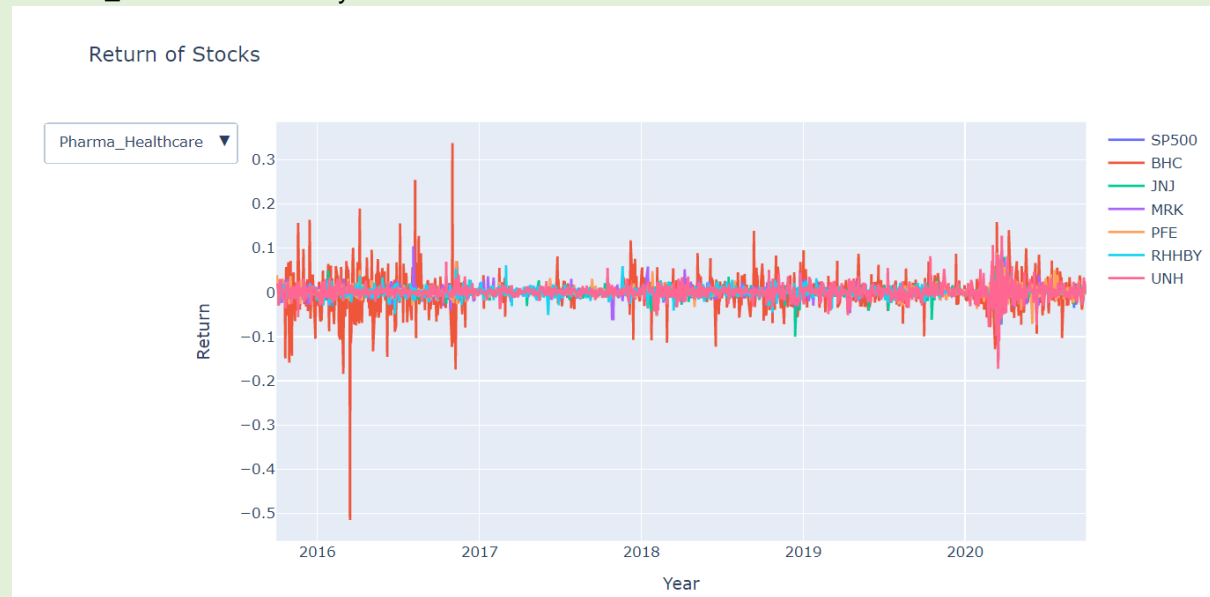
Finance Industry:



Insights/Findings:

- Stock 'DB' is the most volatile stock in 'Finance' industry followed by 'BCS'
- 'Finance' is second most risky industry to invest a capital
- 'CS' is the most stable stock in this industry but it's return is negative hence, not much useful
- Only stocks 'GS' and 'MS' have positive returns in this industry with MS being the best among all

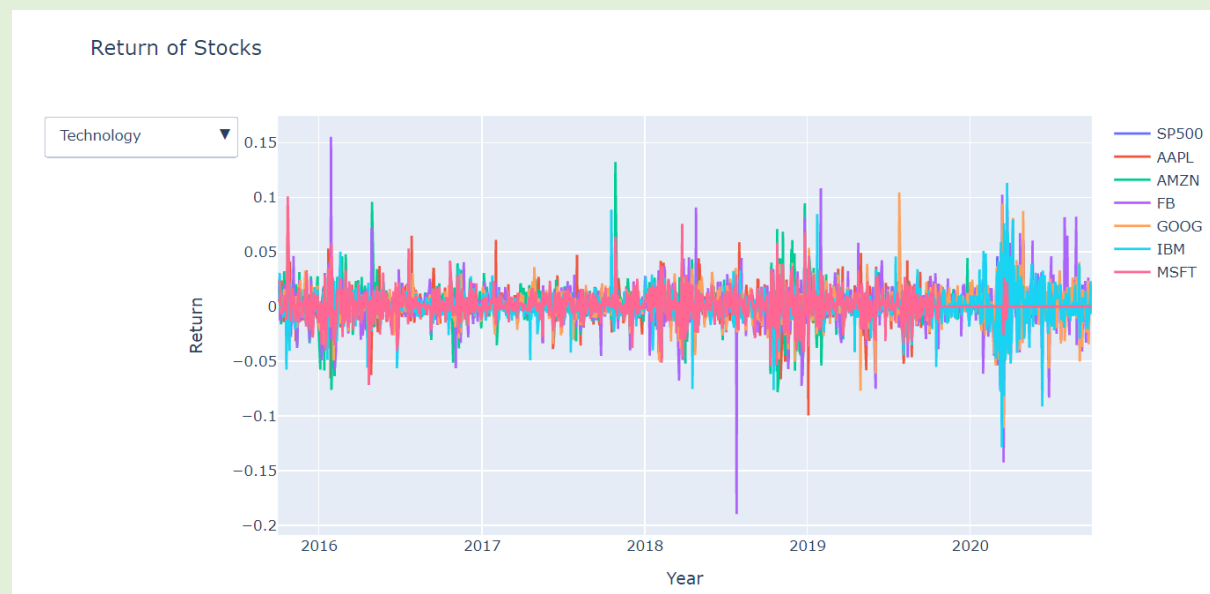
Pharma_Healthcare Industry:



Insights/Findings:

- 'BHC' is the most volatile stock in 'Pharma_Healthcare' industry followed by 'UNH' but 'BHC' offers negative returns whereas, 'UNH' offers around 0.09% average return, best among all.
- 'Pharma_Healthcare' is a decent industry to invest a capital offering positive returns with risk mostly at market standard S&P 500
- 'RHHBY' is the most stable stock in this industry but its return is quite low hence, not much useful
- Stocks 'JNJ' and 'MRK' perform similar to market index S&P 500 w.r.t risk and returns

Technology Industry:

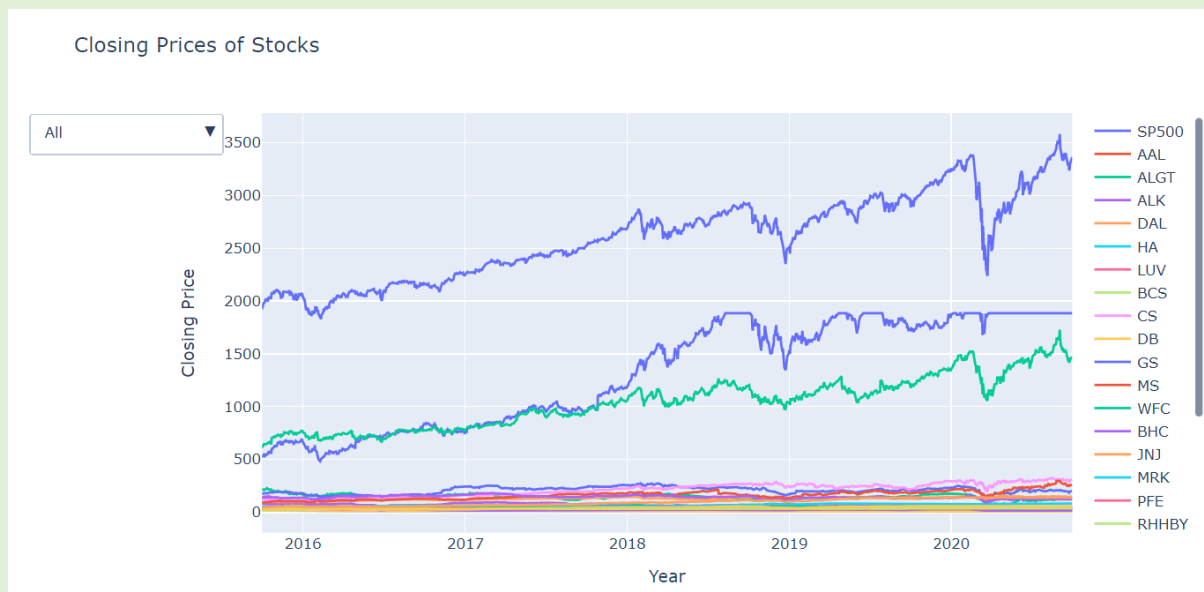


Insights/Findings:

- 'FB' is the most volatile stock in 'Technology' industry followed by 'AMZN' but both of them offer returns above market standard
- 'Technology' is a profitable industry to invest a capital offering huge gains with risk slightly above market standard S&P 500
- 'MSFT' is the most stable stock in this industry with risk similar to that of index S&P 500
- 'IBM' is the only stock in this industry offering negative return

Time Series Analysis : Close Price of Stocks:

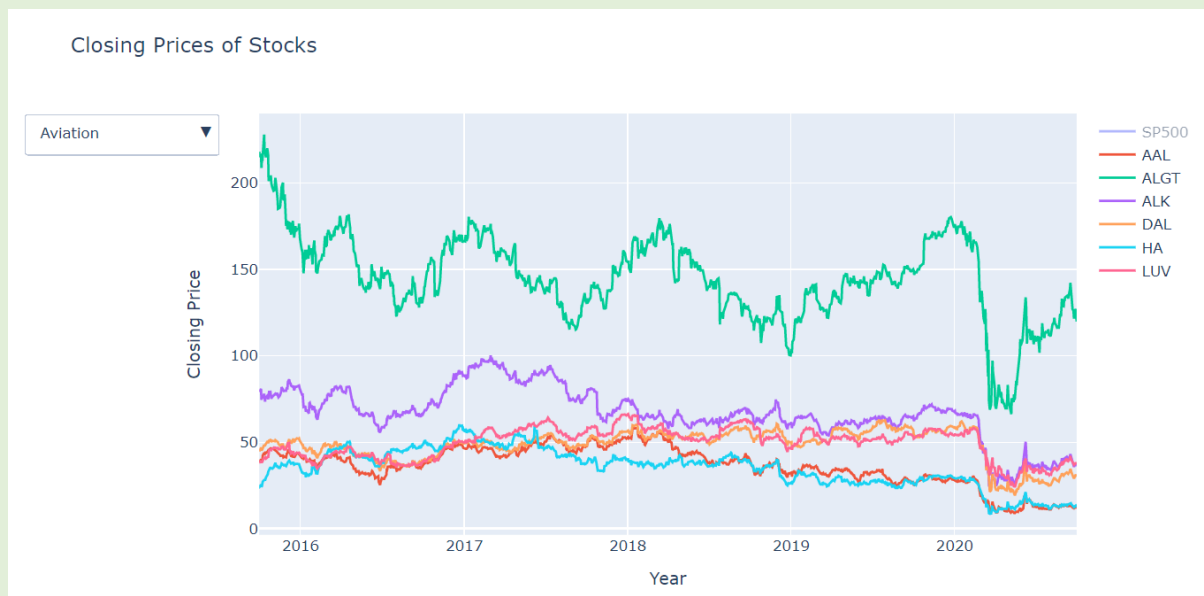
All:



Insights/Findings:

- S&P 500 index leads in closing price of stocks; Only stocks slightly close it are 'AMZN' and 'GOOG'
- During end of year 2017, 'AMZN' overtook 'GOOG' in terms of close prices of stocks

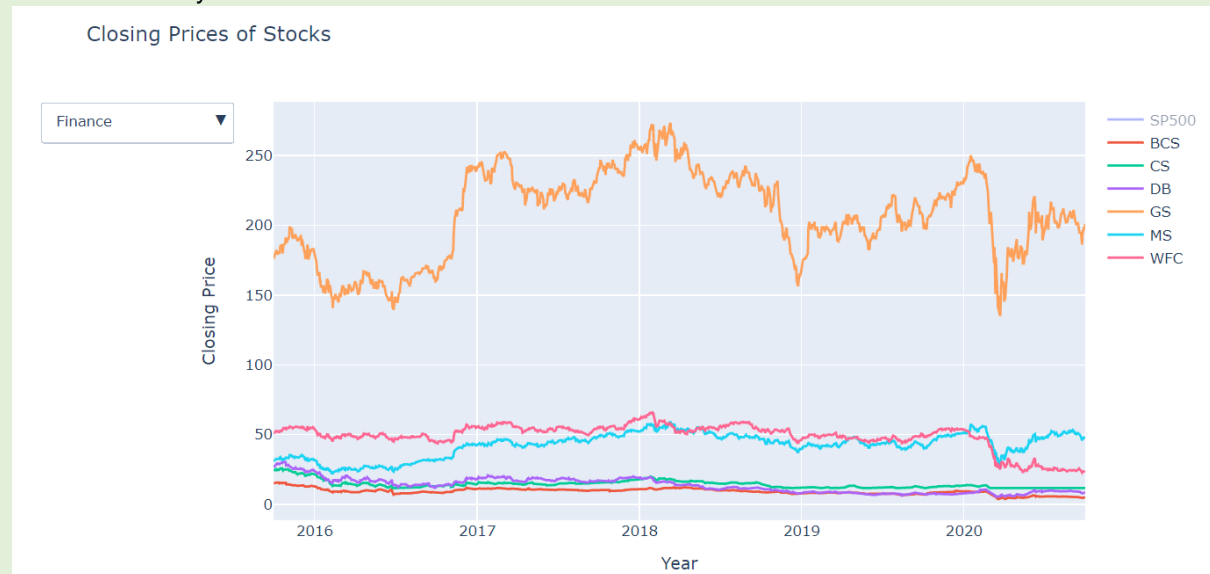
Aviation Industry:



Insights/Findings:

- In 'Aviation' industry stock 'ALGT' has highest close prices though its been declining in last 5 years
- 'ALK' stock follows 'ALGT' w.r.t close prices whereas, 'AAL' and 'HA' run lowest in value

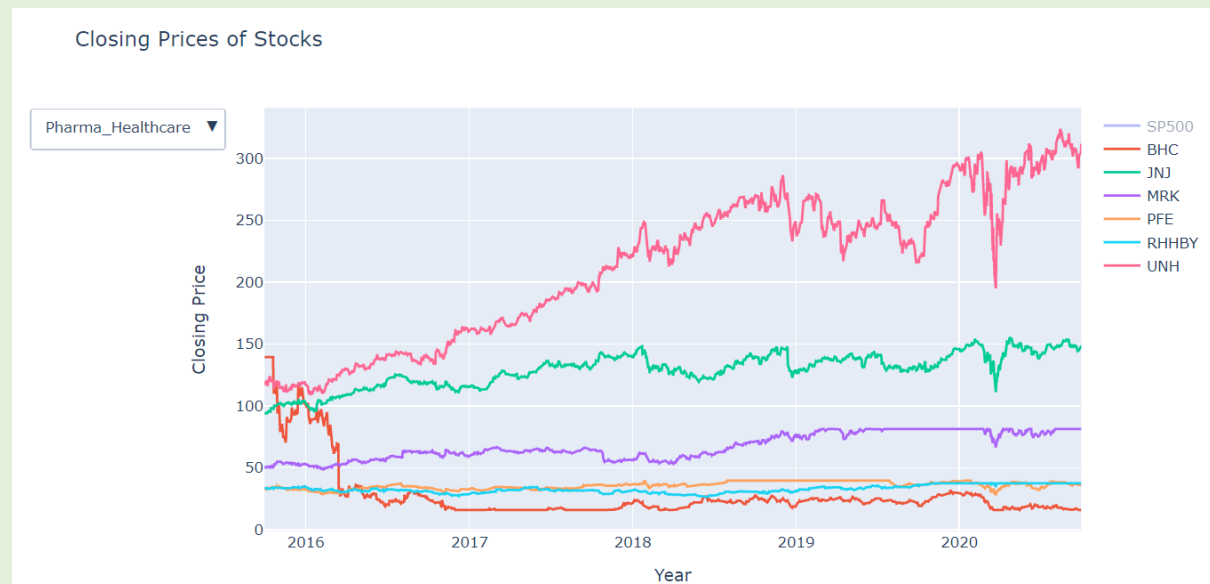
Finance Industry:



Insights/Findings:

- In 'Finance' industry stock 'GS' has highest close prices though its been fluctuating in last 5 years, resulting in similar value
- 'WFC' and 'MS' perform next after much difference from 'GS'
- 'BCS', 'CS', and 'DB' have lowest value of close prices in this industry

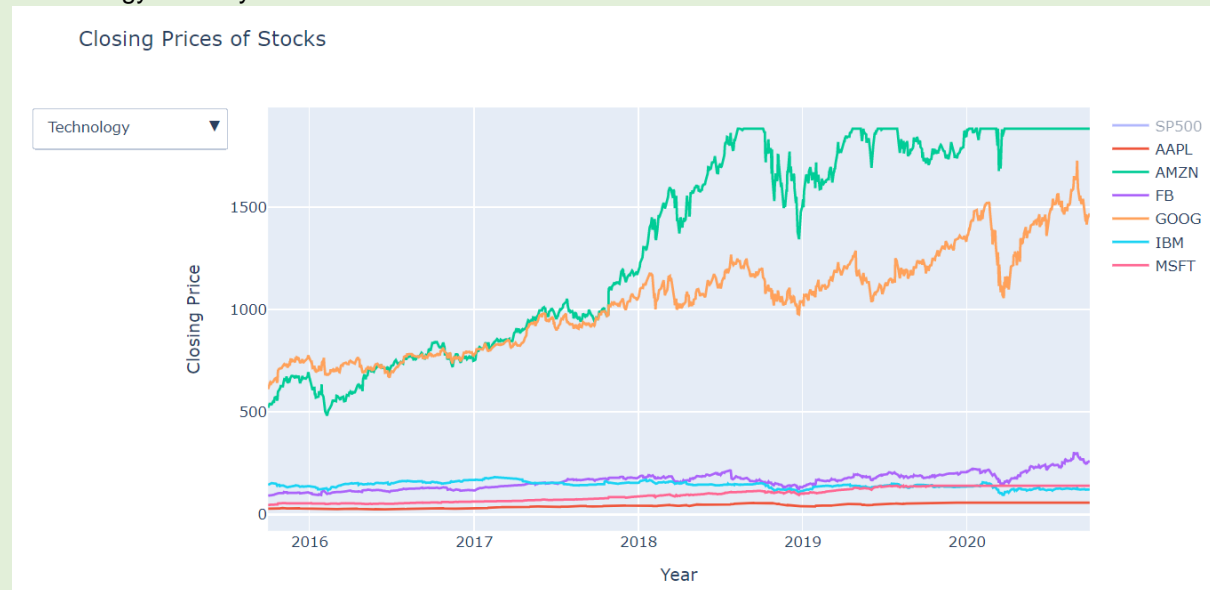
Pharma_Healthcare Industry:



Insights/Findings:

- In 'Pharma_Healthcare' industry stock 'UNH' has the highest close prices, steadily increasing in last 5 years
- Its followed by 'JNJ' and 'MRK' with decent close prices
- 'BHC' has lowest value of close price
- Close prices of stocks 'RHHBY' and 'PFE' have remained somewhat constant in last 5 years

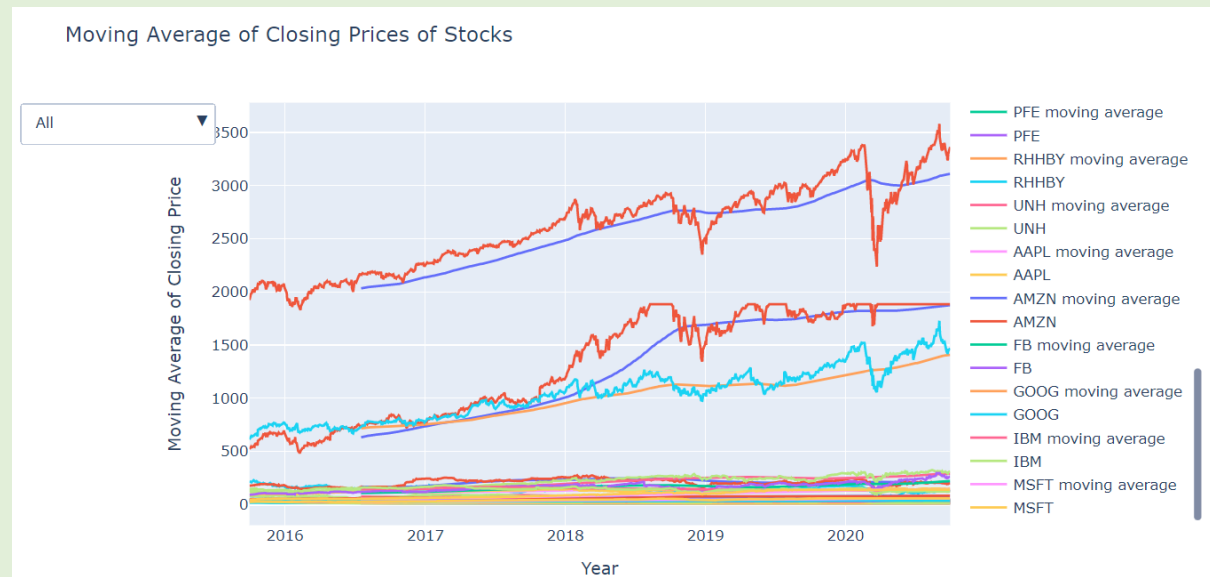
Technology Industry:



Insights/Findings:

- In 'Technology' industry stock 'AMZN' has the highest close prices, overtaking 'GOOG'
- Its followed by 'FB' with much significant difference from 'AMZN' and 'GOOG'
- Surprisingly, least value of close price is that of 'AAPL'

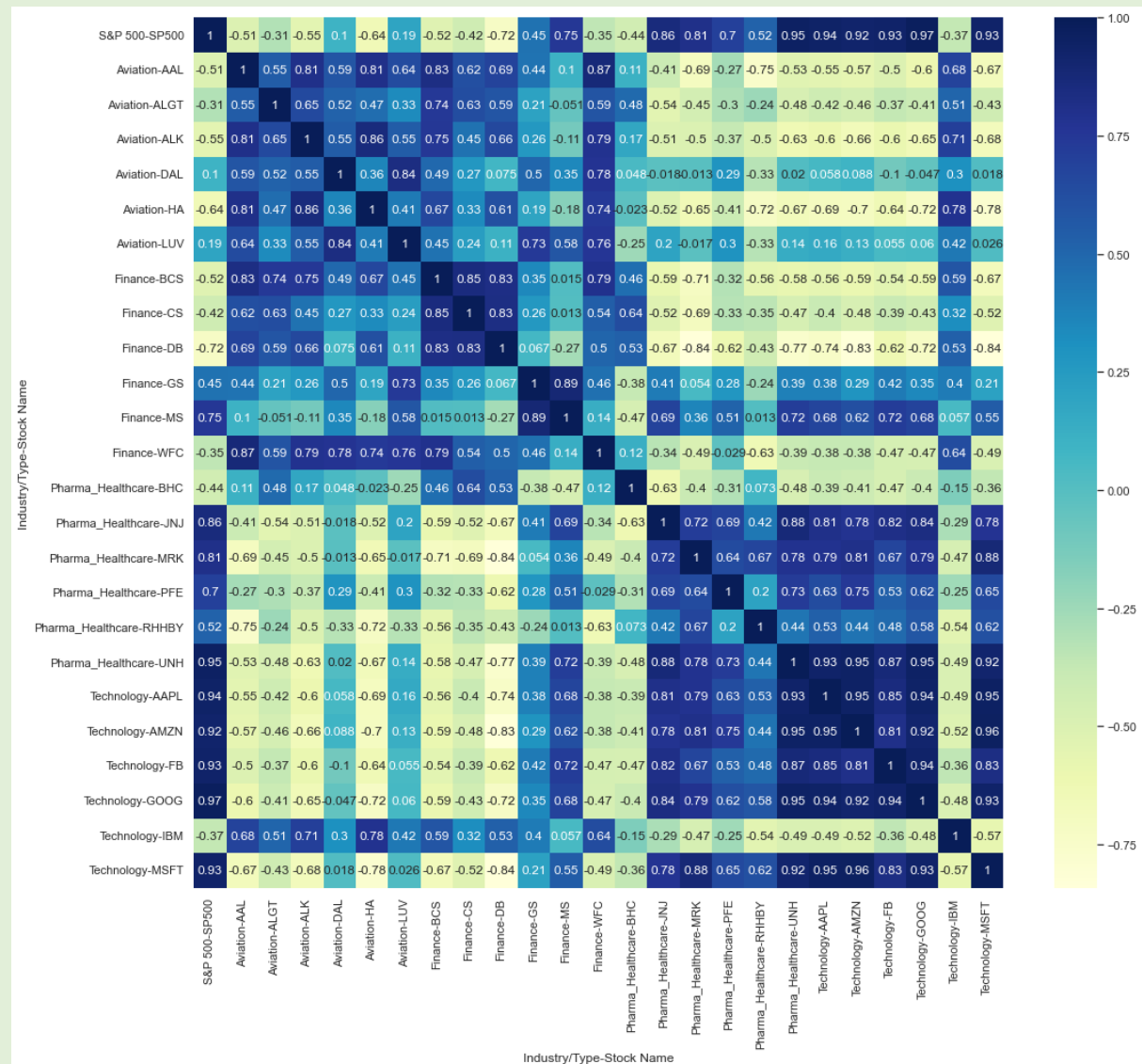
Time Series Analysis : Moving Average of Close Price of Stocks:



Insights/Findings:

Moving Average of close prices of stocks has been calculated at period of 200 trading days to get long term trend and giving uniform pattern, similar to insights in time series analysis of close prices

Correlation Matrix : Close Price of Stocks:



Insights/Findings:

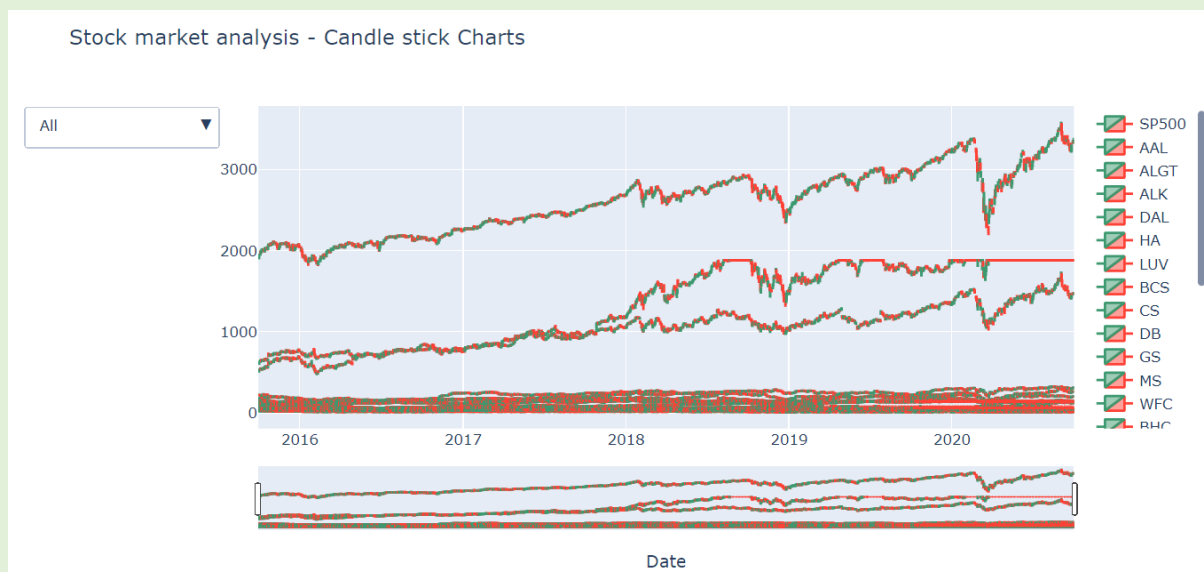
- Close prices of 'GOOG' and 'AMZN' are highly correlated with S&P 500 index
- Close prices in 'Finance' industry are highly correlated with those in 'Aviation' industry
- Close prices in 'Pharma_Healthcare' industry are highly correlated with those in 'Technology' industry

Normalised Close Price of Stocks:



Normalised close prices of all stocks, showing that stocks 'BHC' and 'CS' have least worth in market while 'AMZN' and 'MSFT' have highest

Candle Stick Chart of Stocks:



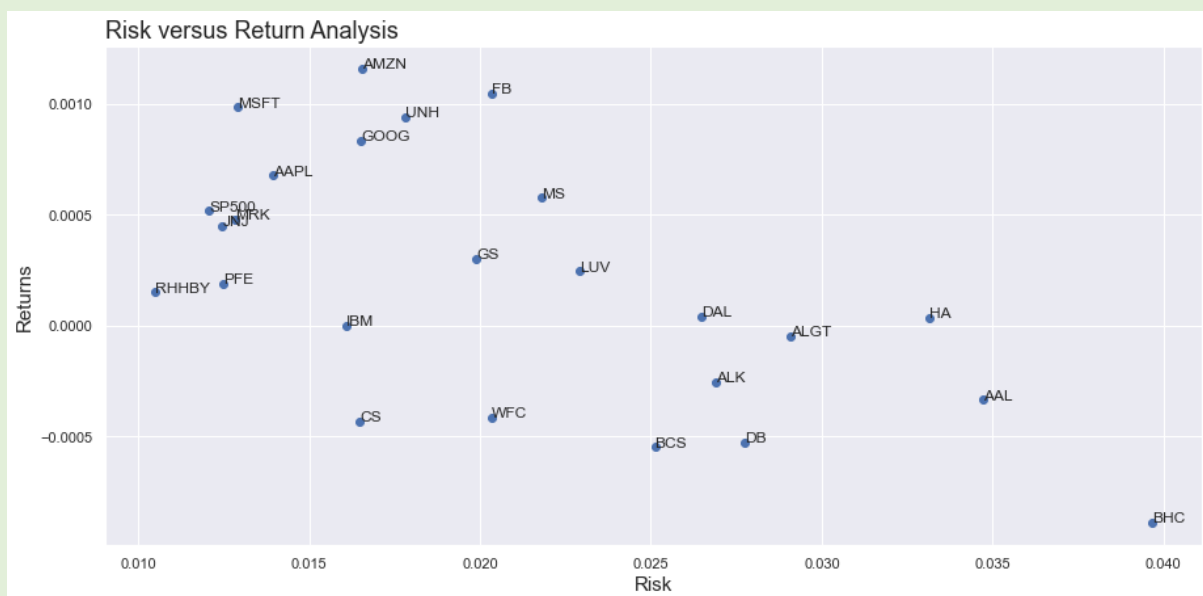
Stock market analysis - Candle stick Charts



Insights/Findings:

- Plot above shows stock prices tumble in March 2020 due to global COVID pandemic and slight improvement thereafter, due to rising hope of economic growth
- 'AMZN' had constant growth in 2020
- 'GOOG' had certain fluctuations in its rate
- Its an interactive dashboard which shows 'Open', 'Close', 'Low', and High prices of all stocks , industries

Risk versus Return Analysis:

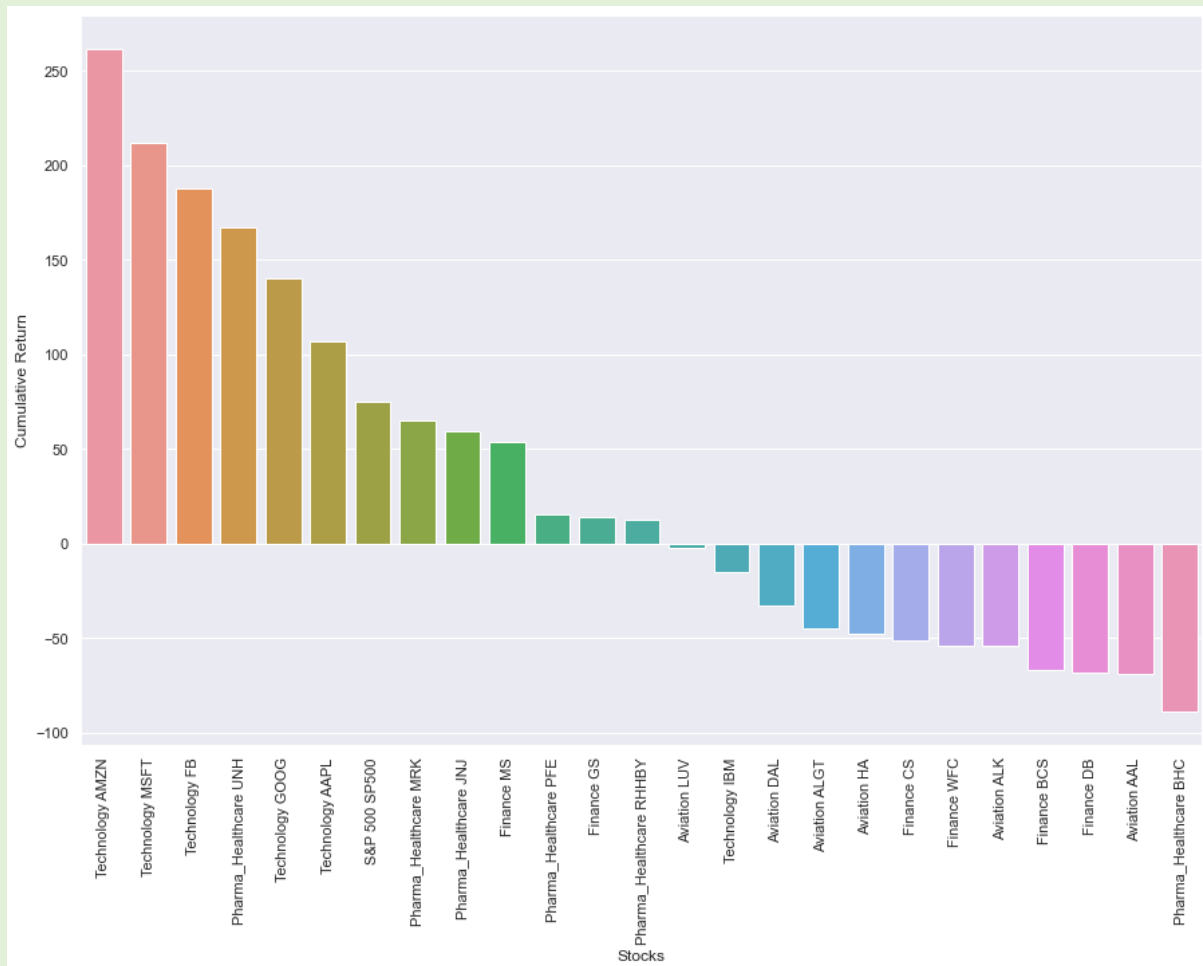


Insights/Findings:

- One-third of all stocks result in negative return hence, can be neglected while doing asset allocation for portfolio
- Stocks 'IBM', 'DAL', and 'HA' offer almost zero returns hence, again not quite useful
- 'JNJ', 'MRK' behave very similar to market index S&P 500
- 'PFE' and 'RHHBY' are least volatile stocks but as downside offer lower returns

- 'AMZN' offers the highest return, followed by 'FB', 'MSFT', 'UNH', and 'GOOG'
- 'MSFT' is the best stock to invest, providing high returns as well much less risk
- 'BHC' as stock should be totally avoided since its one with the highest risk and negative/lowest return
- 'AAPL' also offers decent return with comparatively low risk, slightly higher than that of S&P 500 index

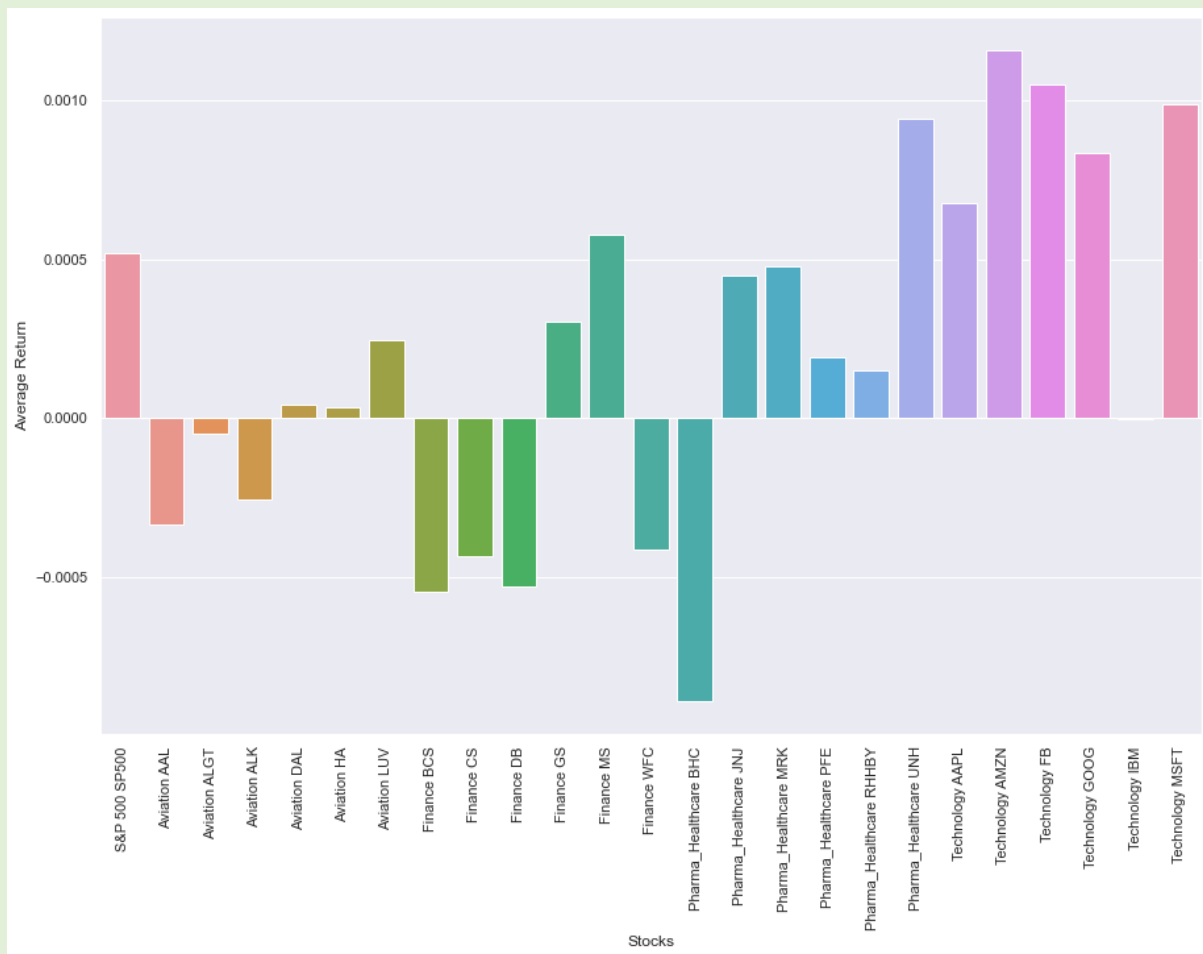
Cumulative Returns:



Insights/Findings:

- 'AMZN' provides highest cumulative returns followed by 'MSFT', 'FB', 'UNH', and 'GOOG'
- Highest cumulative return has been resulted from 'Technology' industry hence its quite profitable one
- However, 'UNH' stock of 'Pharma_Healthcare' industry overtakes 'GOOG' and even 'AAPL' in terms of cumulative return
- Stocks : 'AMZN', 'MSFT', 'FB', 'UNH', 'GOOG', 'AAPL' result in even higher return than S&P 500 index
- Stocks in 'Pharma_Healthcare' industry offer decent returns except 'BHC' which is the worst of all stocks
- Stocks 'DB', 'AAL', and 'BHC' offer least cumulative returns
- None of the stocks in 'Aviation' industry is resulting in positive cumulative return hence, its not an appropriate industry to invest
- In 'Finance' industry only 'MS' and 'GS' perform slightly better, others are resulting in negative returns only

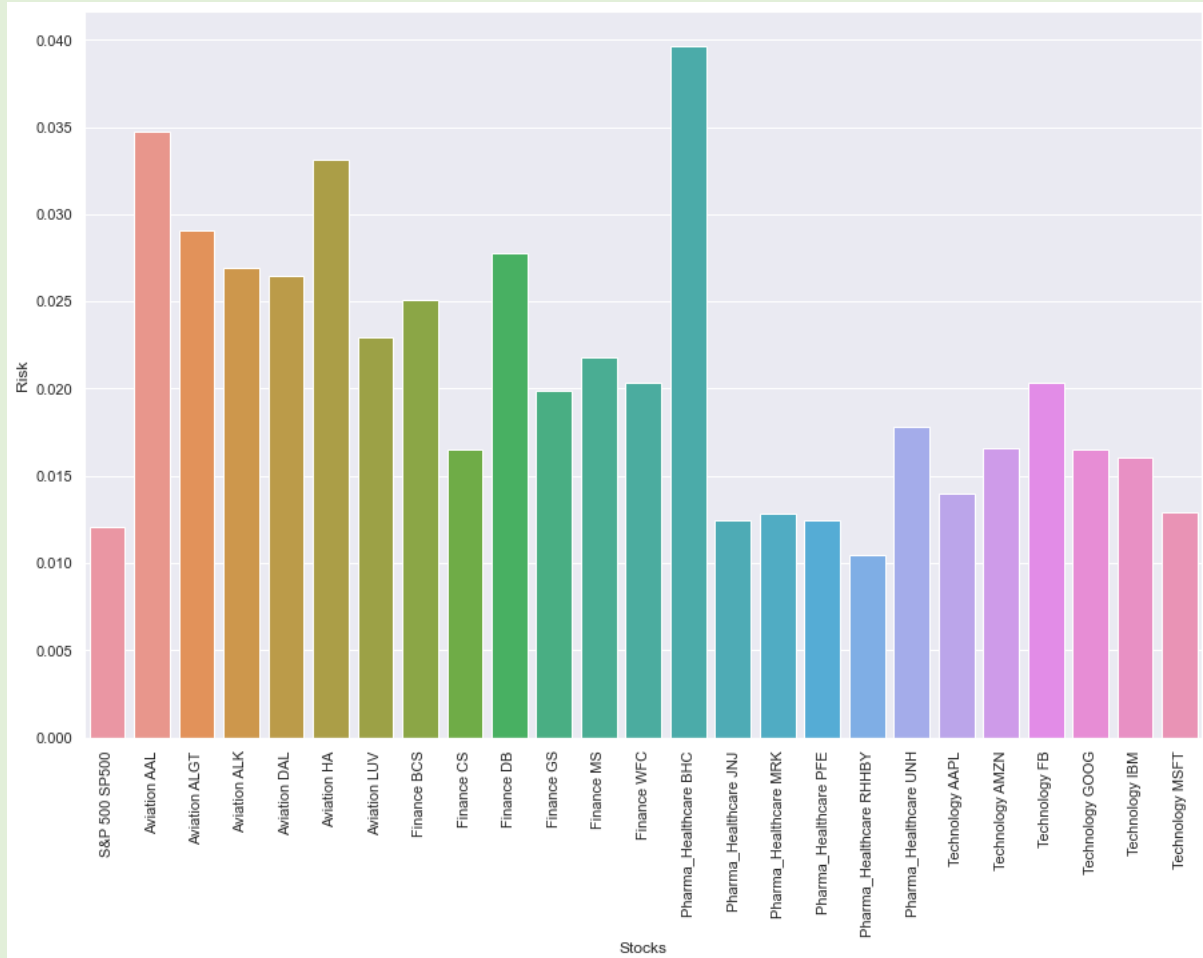
Average Returns:



Insights/Findings:

- As observed until now, 'Technology' sector is ensuring high returns and 'Pharma_Healthcare' is resulting majorly in positive returns
- 'Aviation' industry is a big no to invest while stocks in 'Finance' industry : 'MS' and 'GS' can be invested on need basis

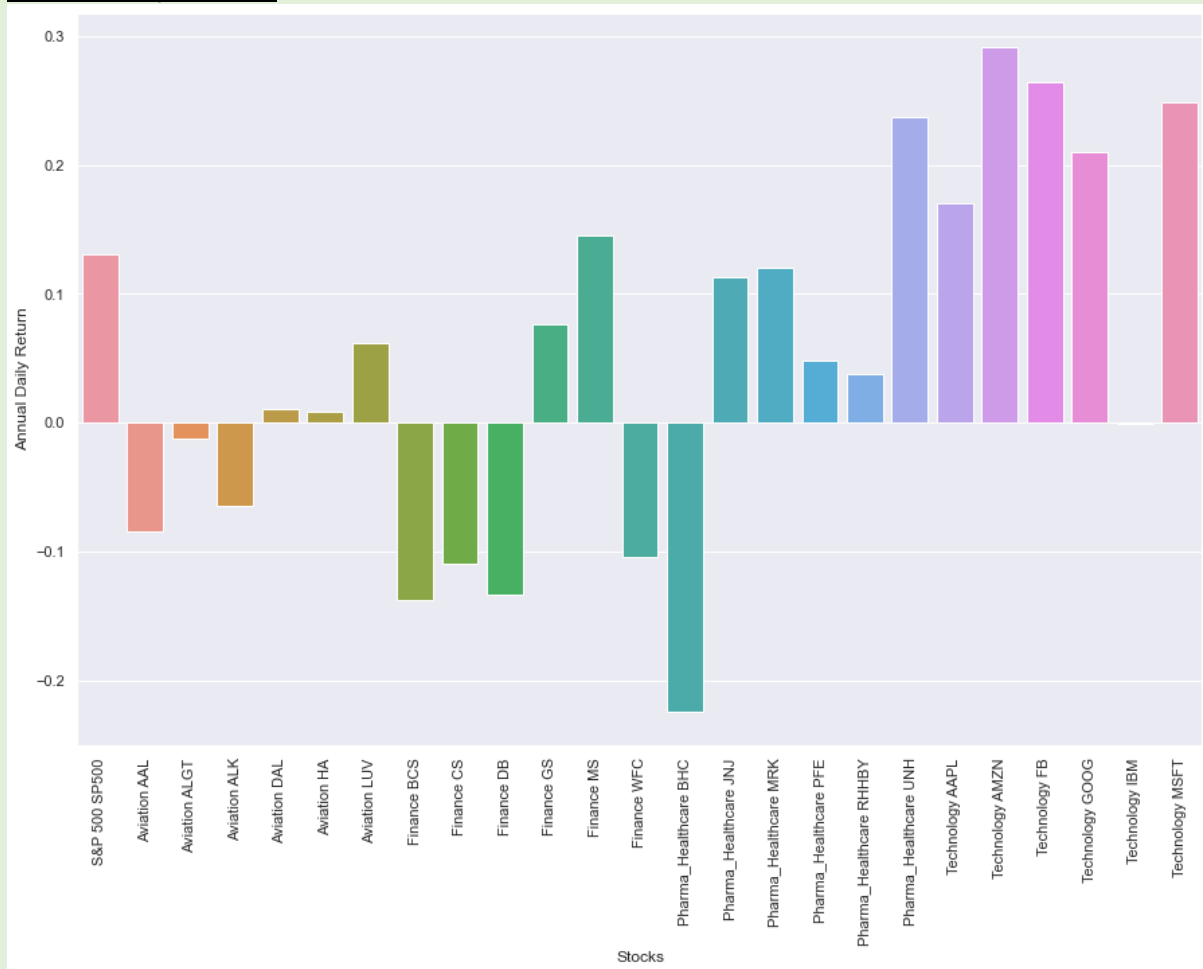
Risk Involved:



Insights/Findings:

- 'BHC' stock of 'Pharma_Healthcare' industry is most volatile followed by 'AAL' and 'HA' of 'Aviation' industry
- 'RHHBY', 'JNJ', and 'PFE' are safer stocks , similar to S&P 500 index in terms of risk
- Stocks of 'Aviation' industry are most volatile while those of 'Pharma_Healthcare' are least
- Stocks of 'Finance' industry are more volatile than those of 'Technology' industry

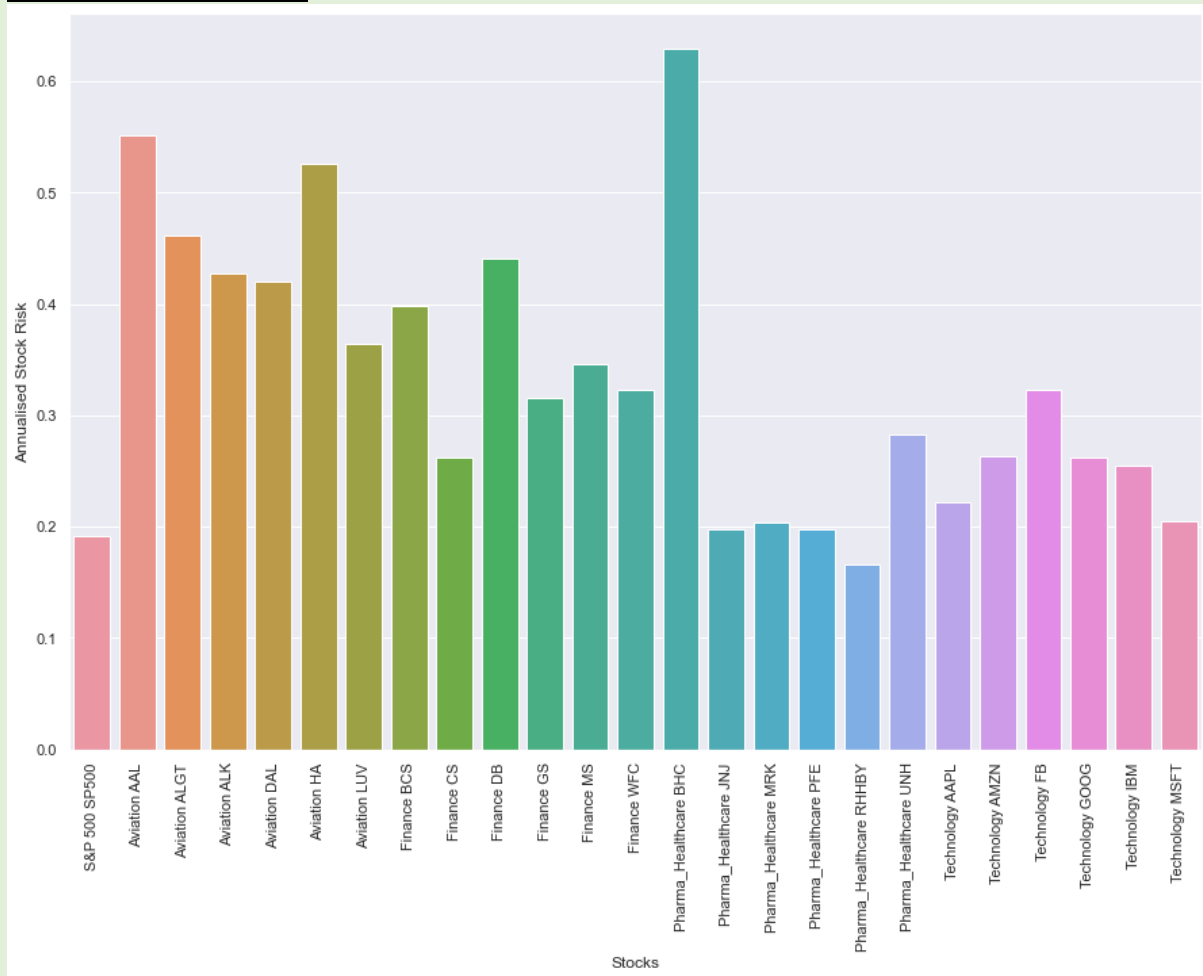
Annual Daily Return:



Insights/Findings:

- Annual return of stocks, calculated by multiplying with 252 (no. of trading days)
- Showing similar pattern as with Average return

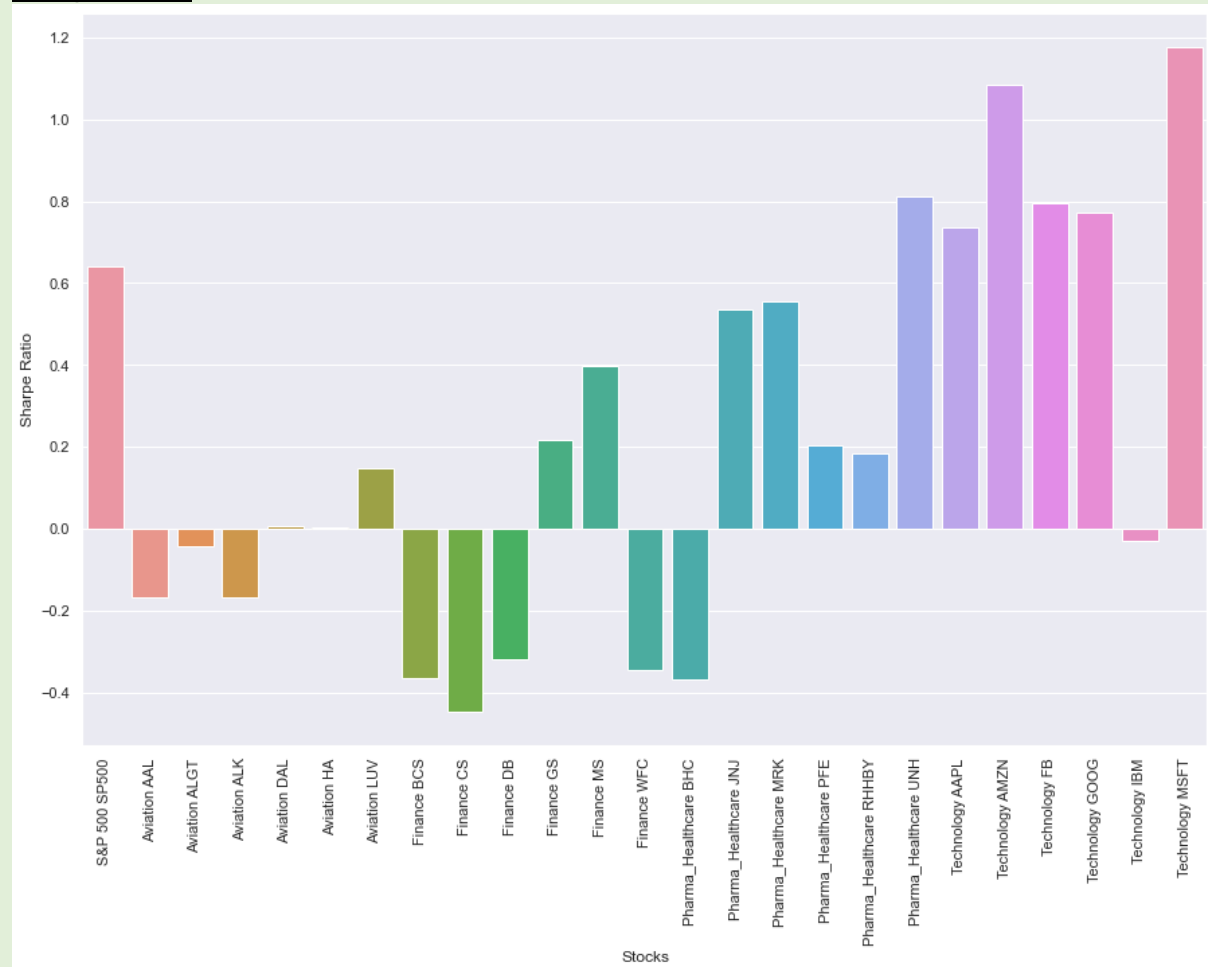
Annualised Stock Risk:



Insights/Findings:

- Annual risk of stocks, calculated for 252 (no. of trading days)
- Showing similar pattern as with risks involved

Sharpe Ratio:

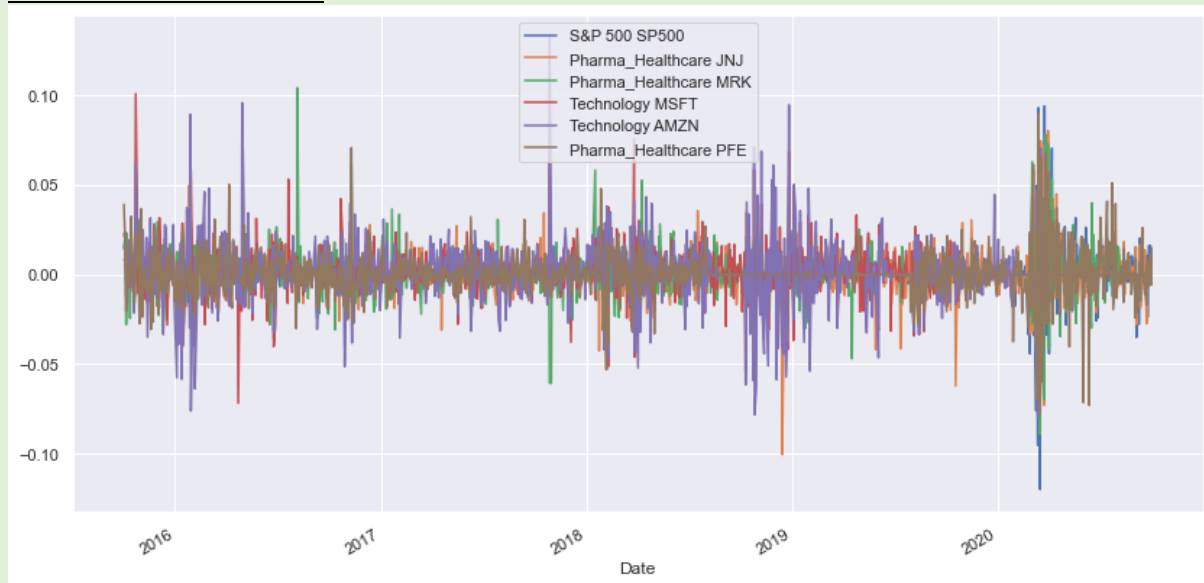


Insights/Findings:

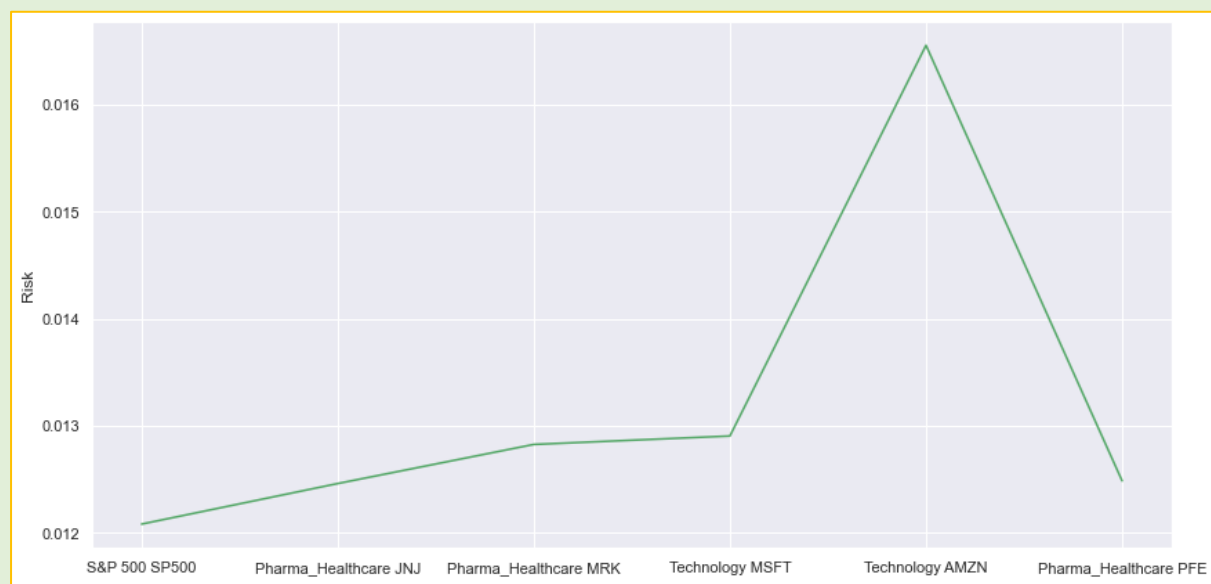
- A way to determine how much return is achieved per each unit of risk
- 'MSFT' and 'AMZN' have Sharpe Ratio more than 1, implying that their returns are not only better than the risk free rate but excess returns are also above their excess risks
- For other stocks such as 'GOOG', 'FB', 'JNJ', 'MRK' having values between 0 to 1, imply that returns are better than risk free rate but their excess risks exceed their excess returns
- Stocks having negative Sharpe ratio should be avoided while taking investment decisions

Patrick Portfolio Analysis:

Return of Stocks Selected:



Risk Associated:



Insights/Findings:

- 'JNJ' and 'MRK' are key stocks to be kept in this portfolio to ensure low risk and decent returns, in line with market standard S&P 500 index
- 'MSFT' is another imperative stock to get high gain with less risk
- 'AMZN' is necessary in this investment to ensure enough capital gain as per the requirement though, having high risk aspect
- 'PFE' as a neutral stock assists in balancing overall risk and adding some value to resultant returns/capital obtained
- Overall portfolio volatility is just 15.08%

Cumulative Return of Stocks Selected:

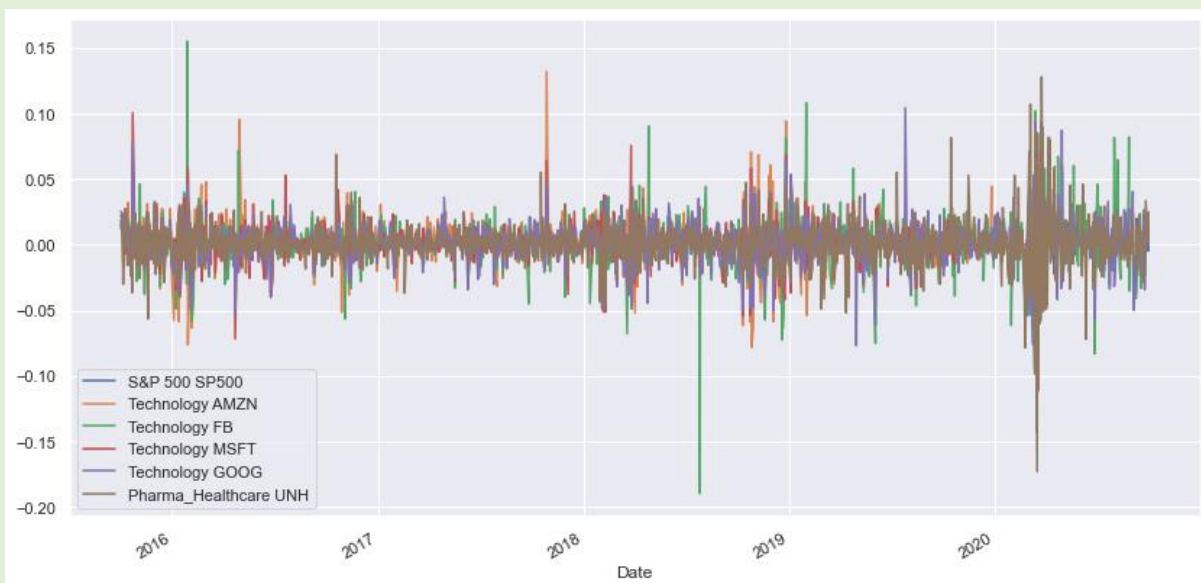


Insights/Findings:

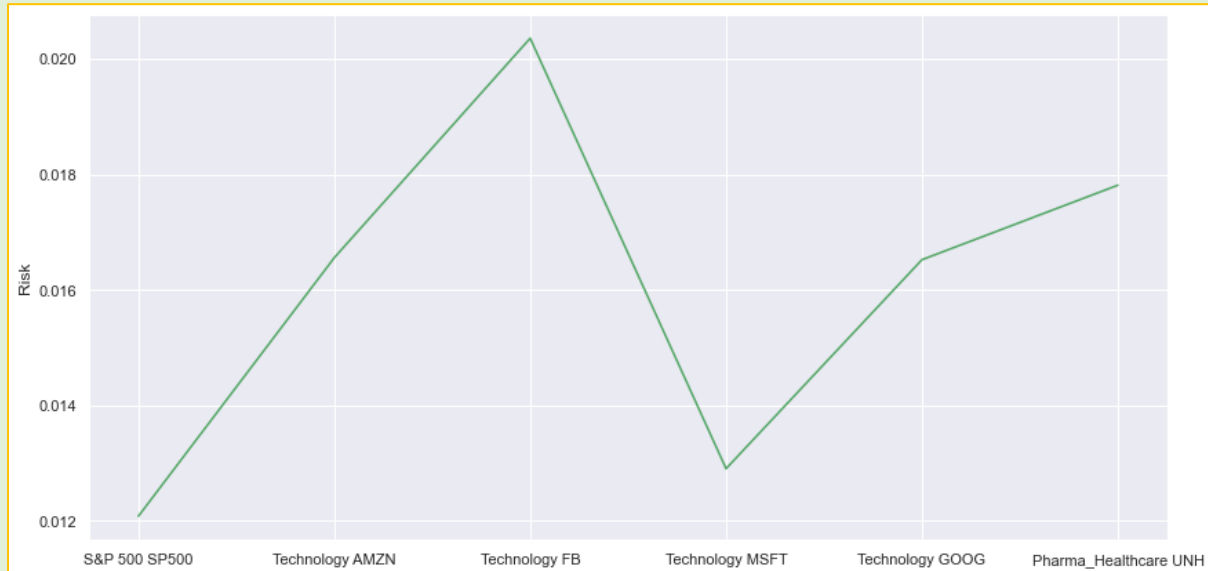
- 'AMZN' and 'MSFT' result in maximum cumulative return, even higher than that of S&P 500 index
- 'JNJ' and 'MRK' contribute similarly in terms of cumulative returns, in line with S&P 500 index
- 'PFE' being the least risky one, adds up to minimal cumulative returns
- In order to get high gains, we have considered stocks of 'Technology' industry while for less risk, stocks in 'Pharma_Healthcare' industry have been selected

Peter Portfolio Analysis:

Return of Stocks Selected:



Risk Associated:



Insights/Findings:

- Stocks selected are ones which result in highest gains and decent risk
- 'AMZN' is necessary here to ensure enough capital gain as per the requirement hence, an epitome of getting the required returns but with high risk
- 'FB' and 'GOOG' are also leading stocks in terms of high margin gains again with certain risk
- 'UNH' is another interesting stock of 'Pharma_Healthcare' industry selected to have much high returns with certain risk involved which is fine for Peter
- 'MSFT' is an imperative stock to get high gain with less risk
- Most of the stocks are from 'Technology' industry since it results in high returns; one from 'Pharma_Healthcare' i.e. 'UNH' also provides a potentially high return
- Overall portfolio volatility is 20.72%

Cumulative Return of Stocks Selected:



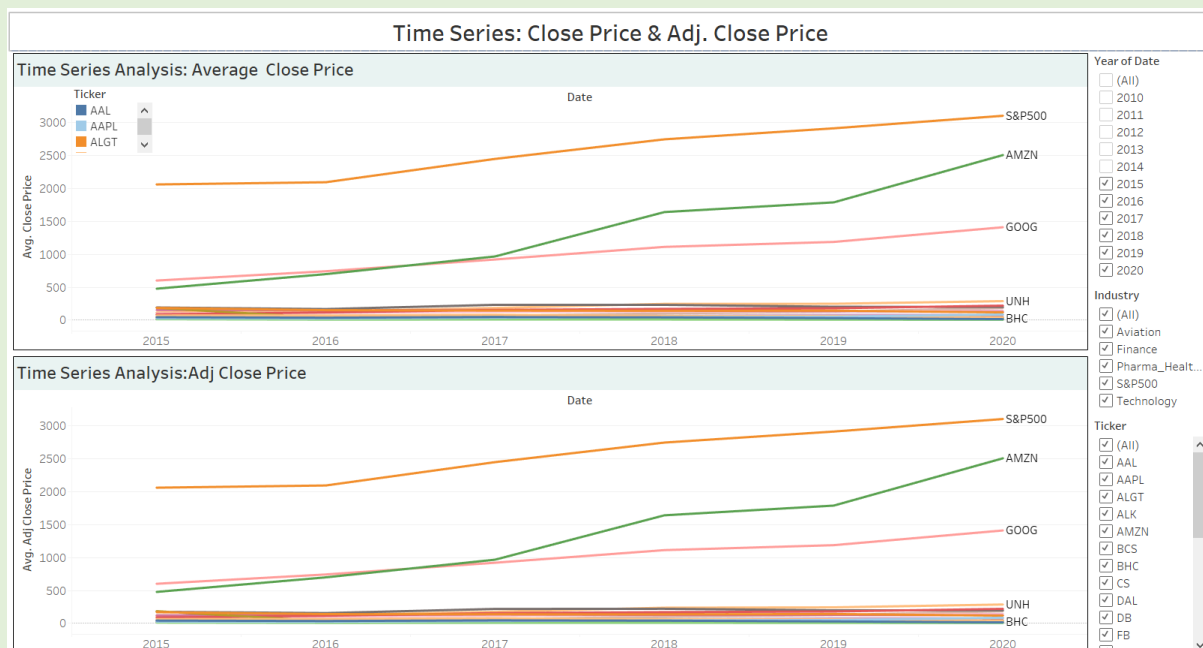
Insights/Findings:

- 'AMZN' and 'MSFT' result in maximum cumulative return, even higher than that of S&P 500 index
- Infact, 'MSFT' is adding a lot to overall return while keeping minimalist risk
- Cumulative return from 'FB' has fluctuated a lot but overall resulting in higher value in 2020 than in 2016
- Though 'FB' is on slightly higher end of risk, we have considered it due to Peter's favourable attitude towards risk and demand for high return investment
- 'UNH' is also providing commendable cumulative return whilst having decent risk
- Overall cumulative return /gains from this portfolio are much higher than those w.r.t S&P 500 index

Tableau Dashboards:

Tableau, being a powerful BI tool, has also been used for all visualisations:

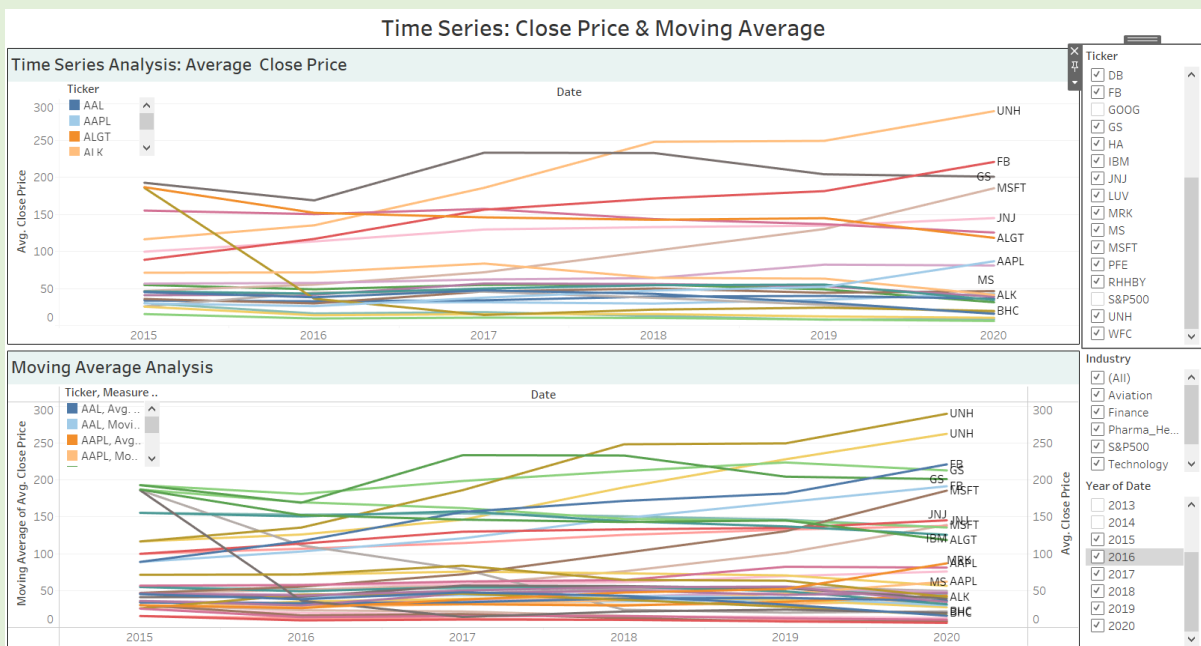
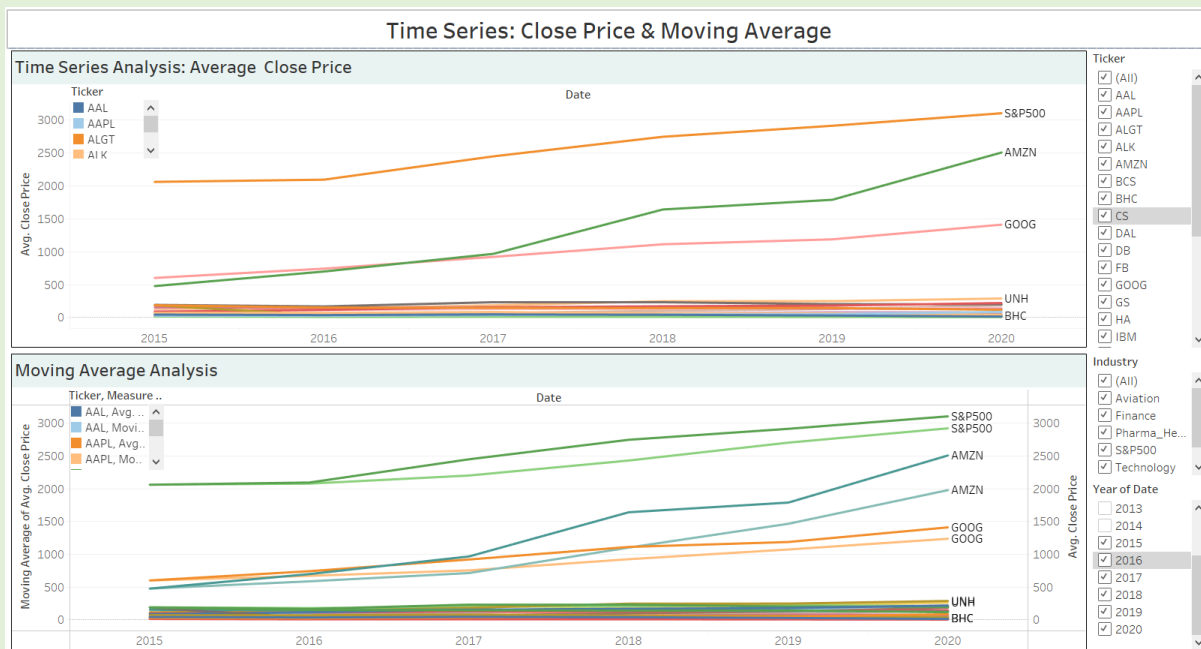
Time Series: Close Price & Adj. Close Price:



Insights/Findings:

- Overall, trend for Close price (price before market closes) and Adj. Close Price (which factors in anything that might affect the stock price after the market closes) is similar

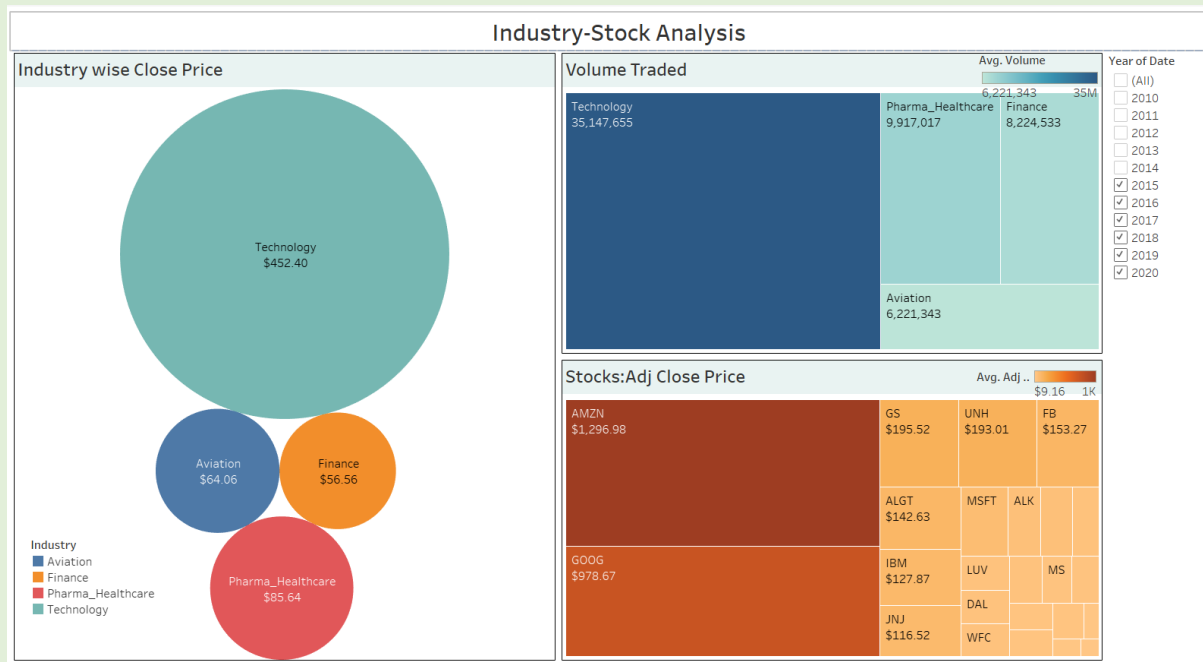
- Time Series: Close Price & Moving Average:



Insights/Findings:

- Moving average cuts down the noise hence, uniform the data.
- In here, stocks 'AMZN', 'UNH', and 'GOOG' show upward trend since their price is above moving average
- For 'GS', price is less than moving average hence, the trend is downwards

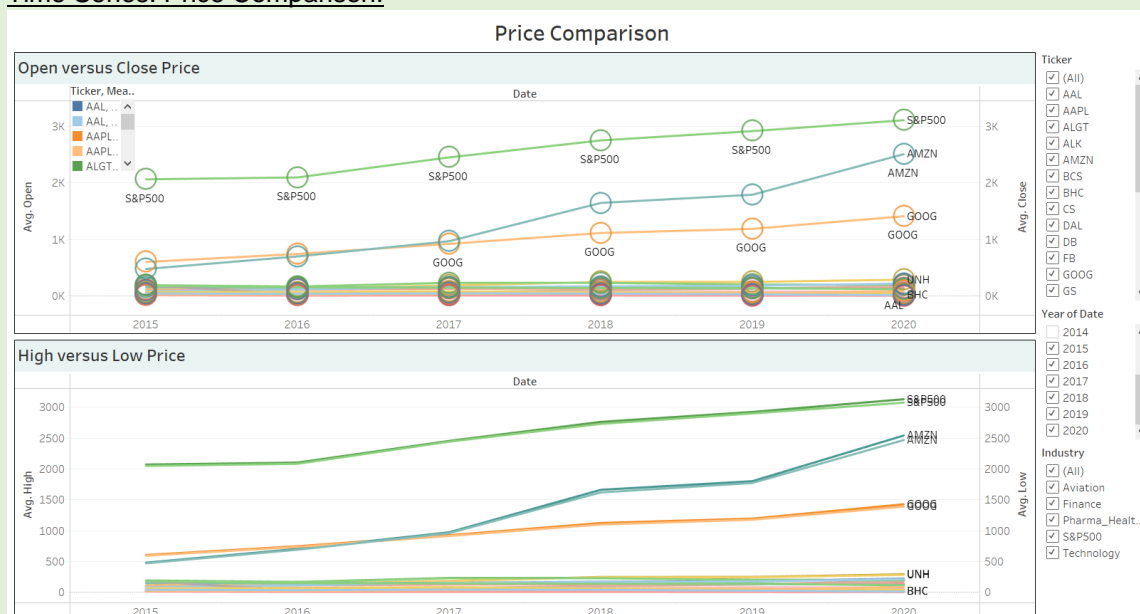
Time Series: Industry-Stock Analysis:



Insights/Findings:

- 'Technology' industry has the highest close price as well as volume traded, implying that this sector is worth the investment
- 'Finance' and 'Aviation' industries are not effective performers in stock market whereas, 'Pharma_Healthcare' performs far better
- Surprisingly, volume traded in 'Finance' industry is quite comparable to other industries though overall close prices are low
- Belonging to 'Technology' sector and being resilient stocks, 'AMZN' and 'GOOG' lead in terms of Adj. Close Price

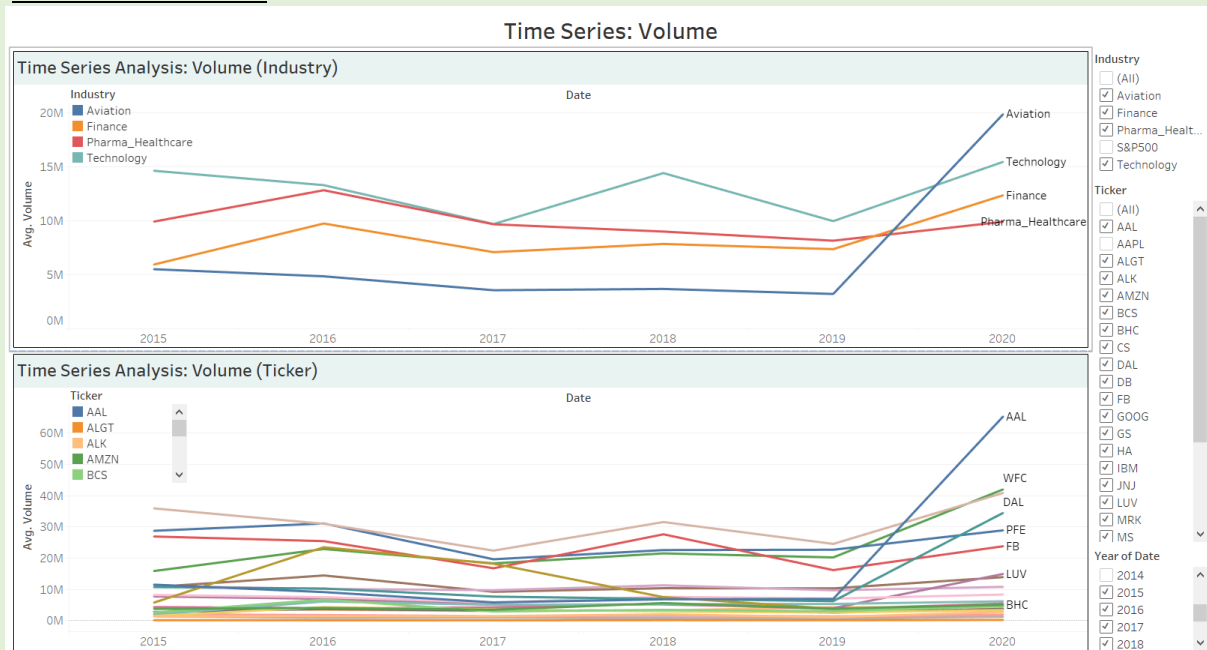
Time Series: Price Comparison:



Insights/Findings:

- Above interactive dashboard assists to understand the close, open, high, and low prices of stocks of all industries

Time Series: Volume:



Insights/Findings:

- From 2019 onwards, volume traded significantly increased in 'Aviation' industry, surpassing other three industries
- Substantial increase in 'Finance' industry could also be seen during 2019-2020
- In line with above insight, volume traded for stock 'AAL' , 'WFC', and 'DAL' increased sharply