

FE 511

FINAL PROJECT REPORT

ON

PORTFOLIO ANALYSIS

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MOTIVATION

With an increase in the penetration of analytics into numerous facets of our lives, finance is one of the earliest to catch onto this trend. With this project, I have attempted to showcase how data analytics and visualization techniques can be incorporated in the world of finance by performing a portfolio analysis, calculating the daily returns, performing trend analysis, and plotting various time-series visualizations and the volatility of the selected stocks against the S&P 500 Index to check if these stocks could be bought together in a portfolio depending on their correlation. The selected stocks are:

1. Pfizer US <PFE>



2. Apple US <AAPL>

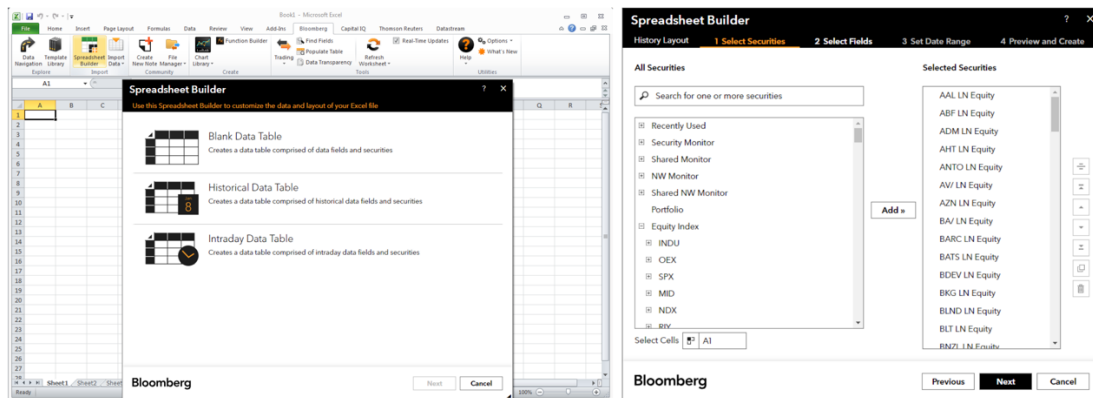


3. Coca-Cola US <KO>



RETRIEVAL OF DATA

To perform the data analysis and creating useful data visualizations, we first need to download historical data for the 3 stocks that we have considered. For this, we have made use of the Excel plug-in of Bloomberg Terminal. We used the Spreadsheet Builder function here to select the securities and their fields/data columns that we would like to work on.



Below, is the snapshot of the data we have downloaded using Bloomberg, of the 3 stocks that we are interested in along with the time period of the data that data we have selected (15 Feb 2018 to 14 Feb 2020)

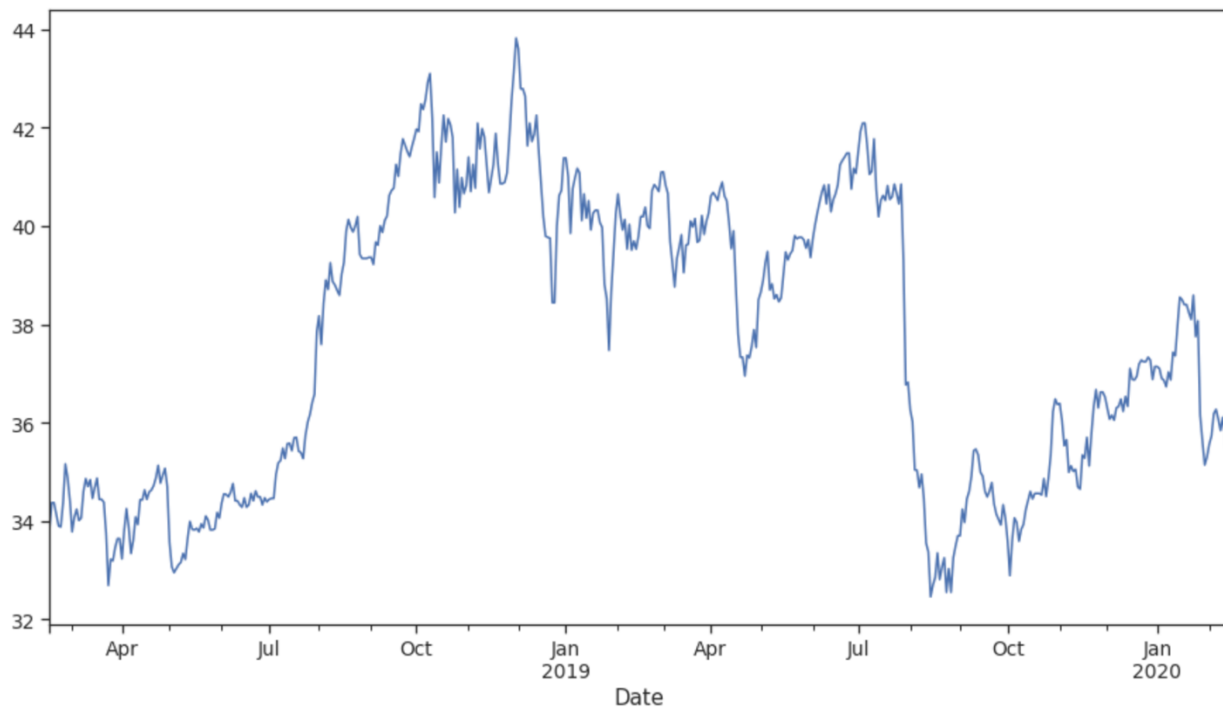
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Start Date	2/15/18																		
2	End Date	2/14/20																		
3																				
4																				
5		PFE US Equity						AAFL US Equity						KO US Equity						
6	Dates	PX_OPEN	PX_HIGH	PX_LOW	PX_CLOSE	PX_OFFICIAL	PX_VOLUME	PX_OPEN	PX_HIGH	PX_LOW	PX_CLOSE	PX_OFFICIAL	PX_VOLUME	PX_OPEN	PX_HIGH	PX_LOW	PX_CLOSE	PX_OFFICIAL	PX_VOLUME	
7	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?
8	2/16/18	33.5289	33.8702	33.254	33.3583	33.8512	21431059	43.09	43.273	42.25	41.843	43.248	2.05E+08	44.83	44.12	44.1	44.78	13467318		
9	2/19/18	33.8986	34.7518	33.8228	33.8512	34.3726	26242465	43.09	43.705	42.943	43.248	43.108	1.61E+08	45.57	45.6401	44.72	44.78	44.98	17202302	
10	2/20/18	34.1451	34.5932	34.0124	34.3726	34.1356	25808704	43.013	43.565	42.855	43.108	42.963	1.36E+08	44.75	44.83	43.94	44.98	43.99	14137347	
11	2/21/18	34.0977	34.6854	33.8702	34.1356	33.8986	24546750	43.208	43.53	42.753	42.963	42.768	1.5E+08	44.11	44.26	43.33	43.99	43.34	12792902	
12	2/22/18	34.0029	34.2683	33.7564	33.8986	33.8797	22754704	42.95	43.488	42.928	42.768	43.125	1.24E+08	43.43	43.82	43.22	43.34	43.52	13277840	
13	2/23/18	34.0598	34.4105	33.965	33.8797	34.3726	17020895	43.418	43.913	43.385	43.125	43.875	1.35E+08	43.58	44.06	43.42	44.04	44.03	8277178	
14	2/26/18	34.4011	35.2732	34.3252	34.3726	35.1594	24105629	44.088	44.848	44.053	43.875	44.743	1.53E+08	44.23	44.39	43.81	44.04	44.03	12713306	
15	2/27/18	35.1405	35.2969	34.8276	35.1594	34.8845	23336909	44.775	45.12	44.54	44.743	44.598	1.56E+08	44.15	44.311	43.62	44.03	43.62	12774392	
16	2/28/18	35.1025	35.3395	34.42	34.8845	34.42	26907899	44.815	45.134	44.513	44.598	44.53	1.51E+08	43.83	43.91	43.22	43.62	43.22	11529561	
17	3/1/18	34.2399	34.3814	33.3631	34.42	33.7754	28731400	44.635	44.944	43.165	44.53	43.75	1.95E+08	43.1	43.64	42.82	43.22	43.43	17746825	
18	3/2/18	33.6996	34.1925	33.5574	33.7754	34.0788	21130333	43.2	44.075	43.113	43.75	44.053	1.54E+08	43.25	43.8	43.24	43.43	43.72	14050081	
19	3/5/18	33.9555	34.3916	33.9081	34.0788	34.2399	21176053	43.803	44.435	43.63	44.053	44.205	1.14E+08	43.57	43.935	43.5	43.72	43.89	11992712	
20	3/6/18	34.3537	34.3537	33.8892	34.2399	34.0124	17081100	44.478	44.563	44.033	44.205	44.168	95154024	43.95	44.05	43.59	43.89	43.93	10010478	
21	3/7/18	33.747	34.202	33.6996	34.0124	34.0598	22239404	43.735	43.963	43.568	44.168	43.758	1.27E+08	43.59	43.92	43.47	43.93	43.82	10881683	
22	3/8/18	34.1167	34.6001	34.0598	34.0598	34.6001	20537588	43.87	44.28	43.768	43.758	44.235	95096428	43.9	44.46	43.8	43.82	44.45	12361100	
23	3/9/18	34.7044	34.9983	34.6286	34.6001	34.8561	18311855	44.49	45	44.348	44.235	44.995	1.29E+08	44.57	44.82	43.49	44.45	44.82	9778643	
24	3/12/18	34.9983	35.0741	34.6001	34.8561	34.7044	25210277	45.073	45.598	45.053	44.995	45.43	1.29E+08	44.95	45.09	44.33	44.82	44.53	11857700	
25	3/13/18	34.8845	35.0362	34.5338	34.7044	34.8371	28046226	45.648	45.875	44.81	45.43	44.993	1.27E+08	44.67	44.825	44.4	44.53	44.57	11342136	
26	3/14/18	34.9224	35.0646	34.2968	34.8371	34.4579	22180728	45.08	45.13	44.453	44.993	44.61	1.17E+08	44.38	44.43	43.725	44.57	43.78	15321218	
27	3/15/18	34.4579	34.894	34.4579	34.4579	34.676	19457602	44.625	45.06	44.518	44.61	44.663	90975192	43.88	44	43.55	43.76	43.67	13456712	
28	3/16/18	34.7328	35.112	34.7139	34.676	34.8655	23376925	44.663	44.78	44.405	44.663	44.505	1.58E+08	43.7	44.02	43.45	43.67	43.46	26603281	
29	3/19/18	34.8845	34.8845	34.202	34.8655	34.439	18978917	44.33	44.368	43.415	44.505	43.825	1.34E+08	43.46	43.71	43.175	43.46	43.26	13280290	
30	3/20/18	34.4769	34.6475	34.2352	34.439	34.439	19255999	43.81	44.2	43.735	43.825	43.81	78597400	43.32	43.48	43.01	43.26	43.16	13559805	
31	3/21/18	34.5906	34.8184	34.3157	34.439	34.3821	18094250	43.76	43.773	42.815	43.81	42.818	1.48E+08	43.13	43.45	42.79	43.16	43	13053980	
32	3/22/18	34.1546	34.262	33.6237	34.3821	33.747	20962742	42.5	43.17	42.15	42.818	42.213	1.66E+08	42.88	43.365	42.7	43	42.76	12274085	
33	3/23/18	33.6427	33.6522	32.6473	33.747	32.6947	27680166	42.098	42.48	41.235	42.213	41.235	1.64E+08	42.82	43.1556	42.29	42.76	42.33	13452005	
34	3/26/18	33.1118	33.3204	32.5336	32.6947	33.2161	23649364	42.018	42.375	41.61	41.235	43.193	1.5E+08	42.61	42.8099	42.25	42.33	42.61	11276082	
35	3/27/18	33.3488	33.7091	32.9697	33.2161	33.1877	27357878	43.42	43.788	41.73	43.193	42.085	1.64E+08	42.7	43.31	42.525	42.69	42.89	11627041	
36	3/28/18	33.3488	33.946	33.292	33.1877	33.4626	24999735	41.813	42.505	41.298	42.085	41.62	1.67E+08	43	43.7	43	42.89	43.32	16277393	
37	3/29/18	33.6711	33.8181	33.2446	33.4626	33.6427	23533906	41.951	42.938	41.725	41.62	41.945	1.54E+08	43.54	43.92	43.29	43.32	43.43	10450497	
38	3/30/18	33.6711	33.8181	33.2446	33.4626	33.6427	23533906	41.951	42.938	41.725	41.62	41.945	1.54E+08	43.54	43.92	43.29	43.32	43.43	10450497	
39	4/2/18	33.763	33.7997	32.9507	33.6427	33.256	26877193	41.97	42.235	41.118	41.945	41.67	1.5E+08	43.44	43.5	42.473	43.43	42.67	14207925	
40	4/3/18	33.2825	33.8749	33.1024	33.2256	33.8228	20254152	41.91	42.186	41.22	41.67	42.098	1.21E+08	42.98	43.535	42.84	42.67	43.38	15484644	
41	4/4/18	33.4815	34.3442	34.057	33.8228	34.2494	20882990	41.22	43.003	41.193	42.098	42.903	1.38E+08	43.14	44.4	43.11	43.68	44.24	13563321	
42	4/5/18	33.8133	34.1245	33.6854	34.2494	33.8702	24460903	43.145	43.558	43.02	42.903	43.2	1.08E+08	44.28	44.61	43.94	44.24	44.4	11707816	
43	4/6/18	33.7091	34.0029	33.0739	33.8702	33.3394	21146274	42.743	43.12	42.05	43.2	42.095	1.4E+08	44.28	44.52	43.71	44.4	43.92	11495075	
44	4/9/18	33.4626	34.0598	33.3867	33.3394	33.6143	19409229	42.47	43.273	42.461	42.095	42.513	1.16E+08	44.03	44.31	43.78	43.92	43.83	11913408	

DATA ANALYSIS AND VISUALIZATION

Before performing any kind of data analysis or visualizations on the data, we first performed the data cleaning and validation process to make sure all our data is in the right format and without any null or unwanted values. We also checked their shape and data types for efficient data imputation and cleaning.

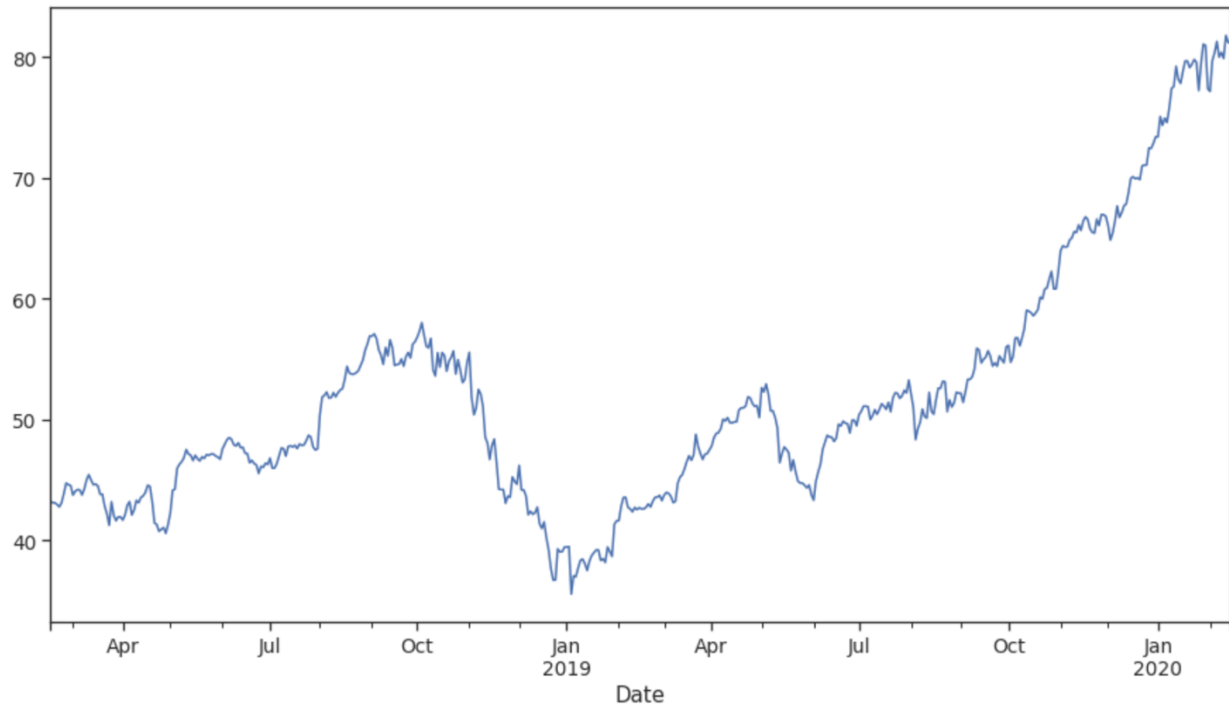
After, all of this was done, the first thing we did was to plot a time-series of the closing prices of the 3 stocks to get a general idea of how the stocks performed in the given period.

1. PFIZER



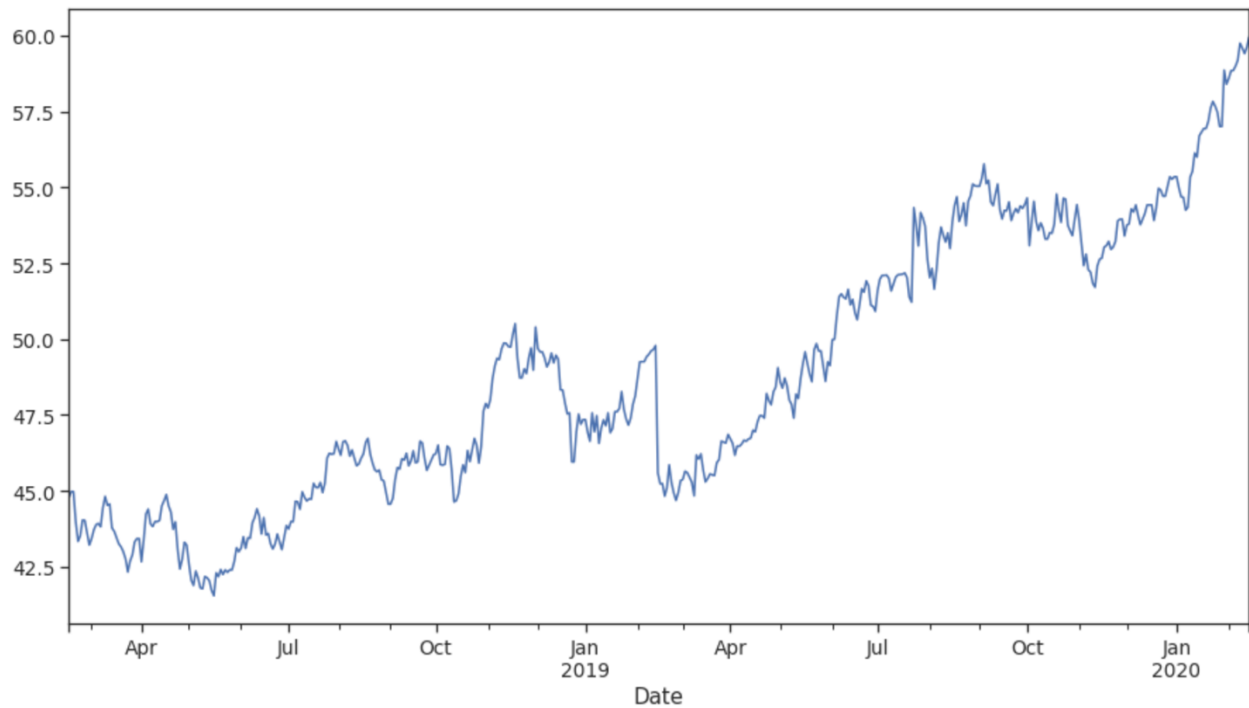
In the above plot, we notice that there was a steep increase in the PFE stock during July – October of 2018 and then a steep decrease later in August of 2019.

2. APPLE



In the above plot, we notice that there was a gradual decrease in the AAPL stock after October of 2018 and has since then been increasing.

3. COCA - COLA

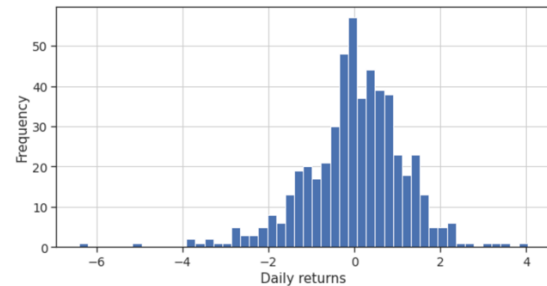
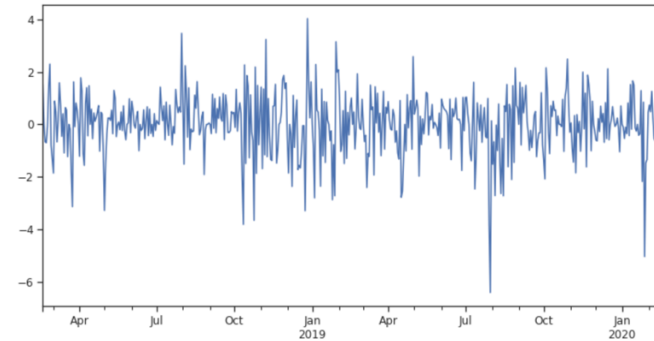


In the above plot, we notice that there have been small ups and downs in the KO stock but has seen an increase since March 2019.

After understanding their trends, we then computed their daily returns and their distributions using histograms to check their negative and positive spikes in the last 90 days:

1. PFIZER

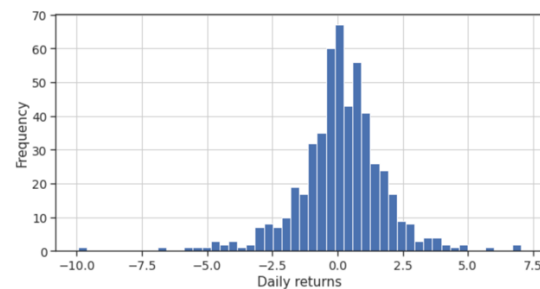
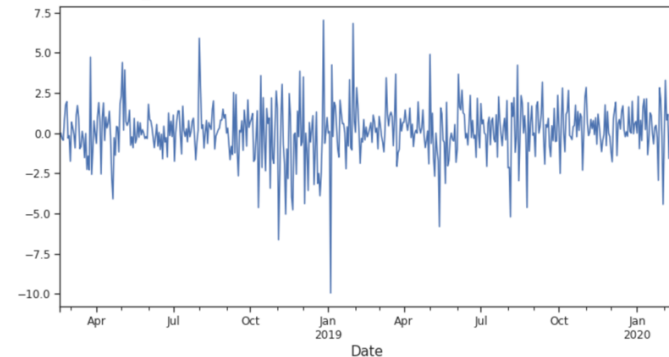
<matplotlib.axes._subplots.AxesSubplot at 0x7fa4c9cf510>



```
count    521.000000
mean      0.011128
std       1.169528
min      -6.413846
25%     -0.551204
50%      0.050839
75%      0.714498
max       4.032258
Name: Day Perc Change, dtype: float64
```

2. APPLE

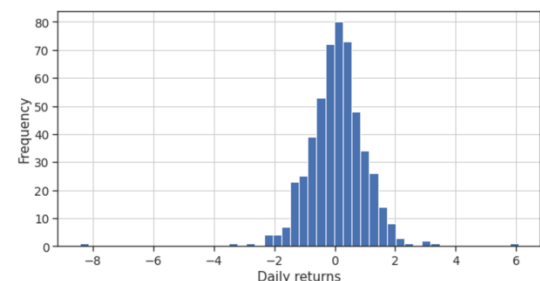
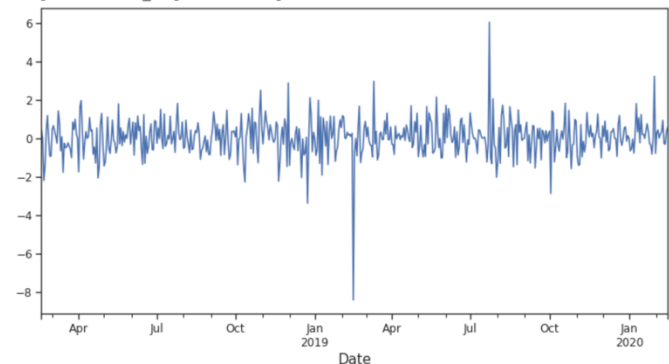
<matplotlib.axes._subplots.AxesSubplot at 0x7fa4c898f8d0>



```
count    521.000000
mean      0.135440
std       1.692454
min      -9.954407
25%     -0.616497
50%      0.085788
75%      1.005840
max       7.028058
Name: Day_Perc_Change, dtype: float64
```

3. COCA - COLA

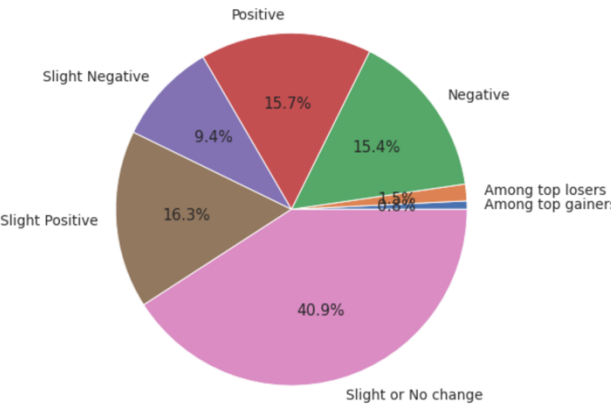
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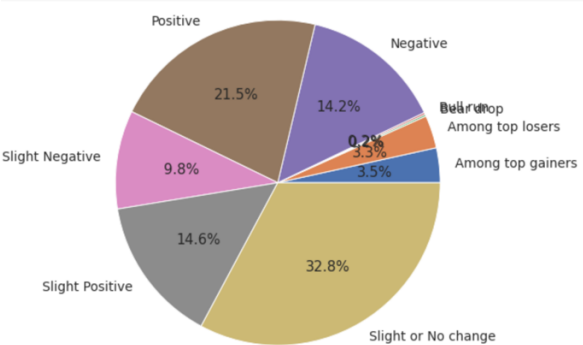
```
count    521.000000
mean      0.060821
std       0.978797
min      -8.435429
25%     -0.470790
50%      0.019183
75%      0.576590
max       6.071847
Name: Day_Perc_Change, dtype: float64
```

We then classified the daily returns into different groups to perform a trend analysis. The trend is determined from below relationship:

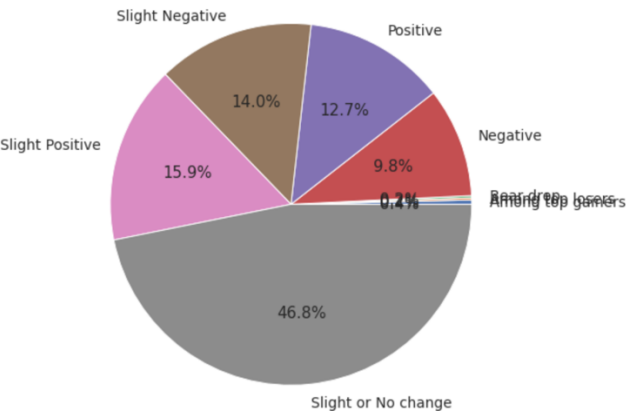
DAILY PERCENTAGE CHANGE	TREND
-0.5 to 0.5	Slight or No change
0.5 to 1	Slight Positive
-0.5 to -1	Slight Negative
1 to 3	Positive
-1 to -3	Negative
3 to 7	Among top gainers
-3 to -7	Among top losers
Above 7	Bull run
Below -7	Bear drop



PFIZER



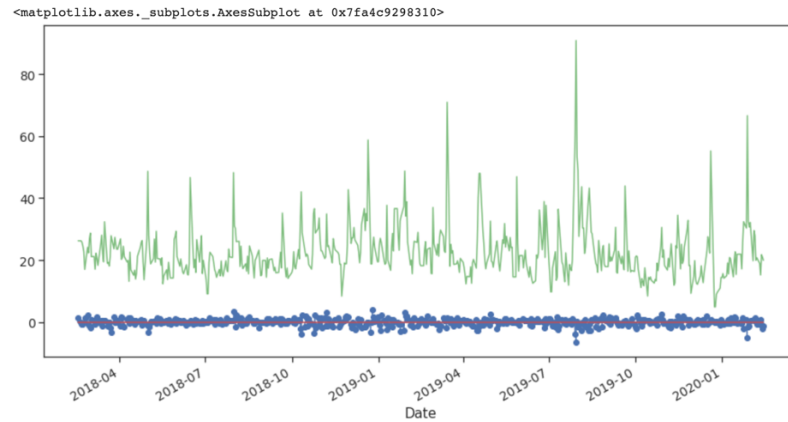
APPLE



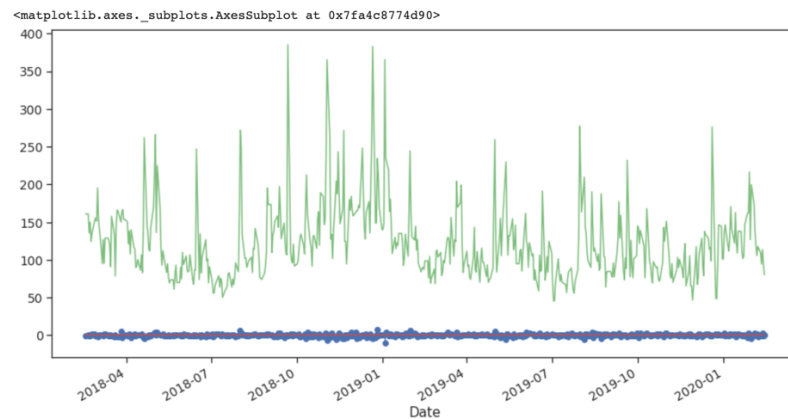
COCA – COLA

We then thought of plotting the daily returns of these stocks against their volumes as volume of shares traded when coupled with the rise or fall in the price of the stock, in general, in an indicator of the confidence of the traders and investors in a particular company. The volume of shares is shown in 'green' and their corresponding daily returns in 'blue'.

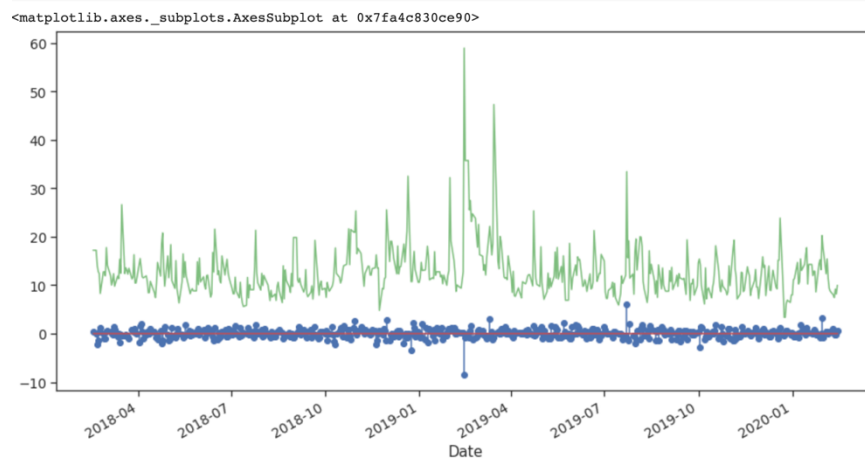
1. PFIZER



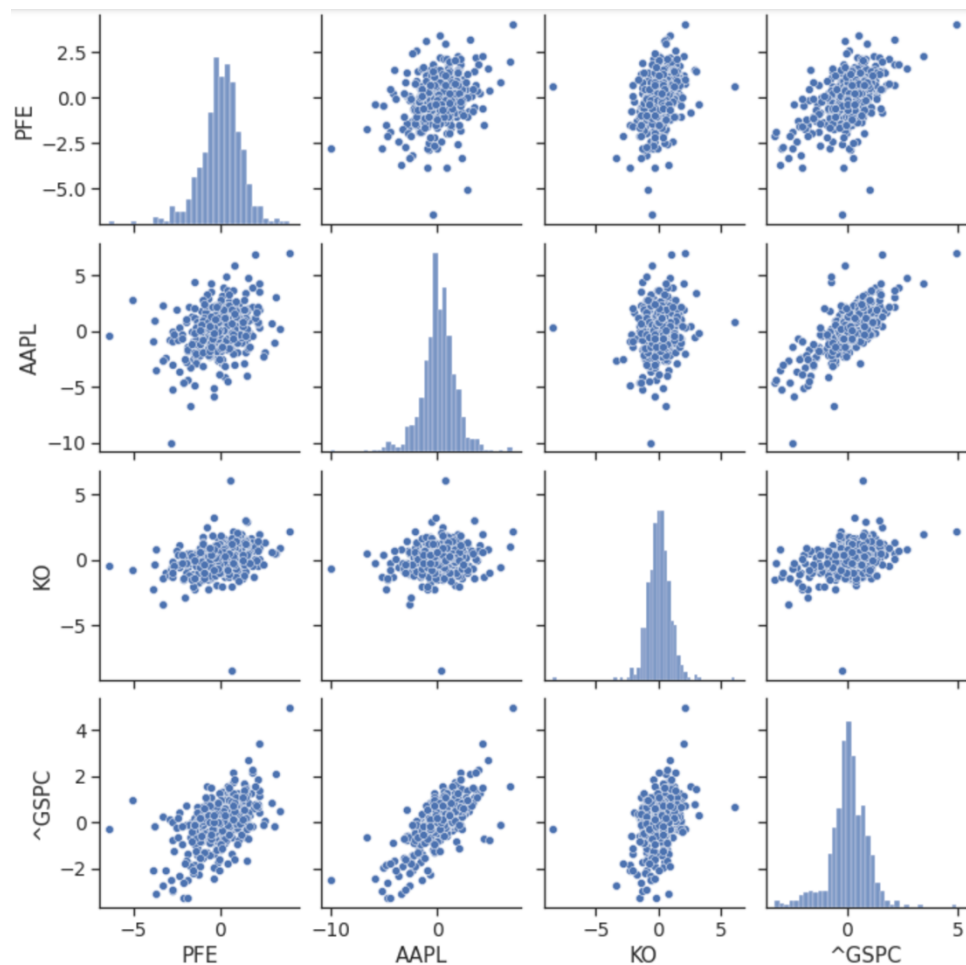
2. APPLE



3. COCA - COLA

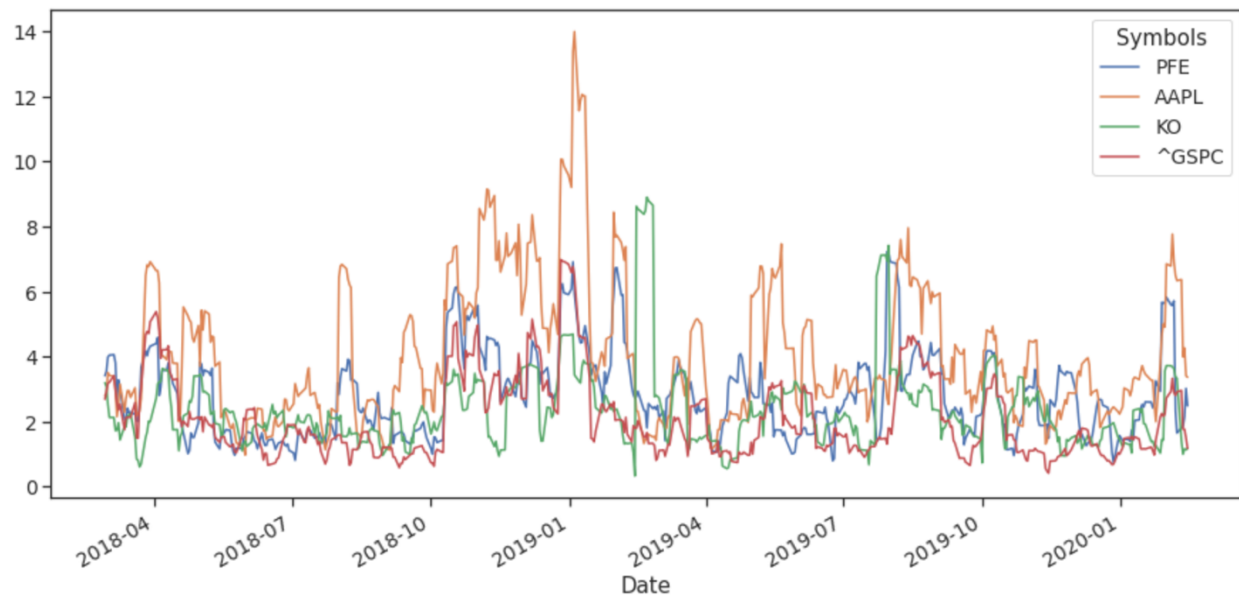


When we go for diversification of the portfolio, we would NOT want the stocks to be related to each other. The idea behind is simple — suppose your portfolio comprises of the stocks that are highly correlated, then if one stock tumbles, the others might fall too and you're at the risk of losing all your investment. We did a correlation analysis of our stock against the S&P 500 Index which is considered as a benchmark to check on a company's economic health using Seaborn pair plots in Python:



Last but not the least, we checked upon the volatility of these stocks. Volatility is one of the most important pillars in financial markets. A stock is said to have high volatility if its value can change dramatically within a short span of time. On other hand, lower volatility means that value of stock tends to be relatively steady over a period. These movements are due to several factors including demand and supply, sentiment, corporate actions, greed, and fear, etc.

<matplotlib.axes._subplots.AxesSubplot at 0x7fa4c73e0a10>



As we can see, Apple is the most volatile stock compared to other stocks in our portfolio while the S&P index has the least volatility.

CONCLUSION

We can state that we not only understood the variation of the stocks of our portfolio but also generated data points such as the daily returns, the distribution of the trend of the stocks over the given time period and also touched down on topics that covered how the correlation, daily returns v/s volume and volatility that tell us how these affect or strengthen a company's economic conditions.