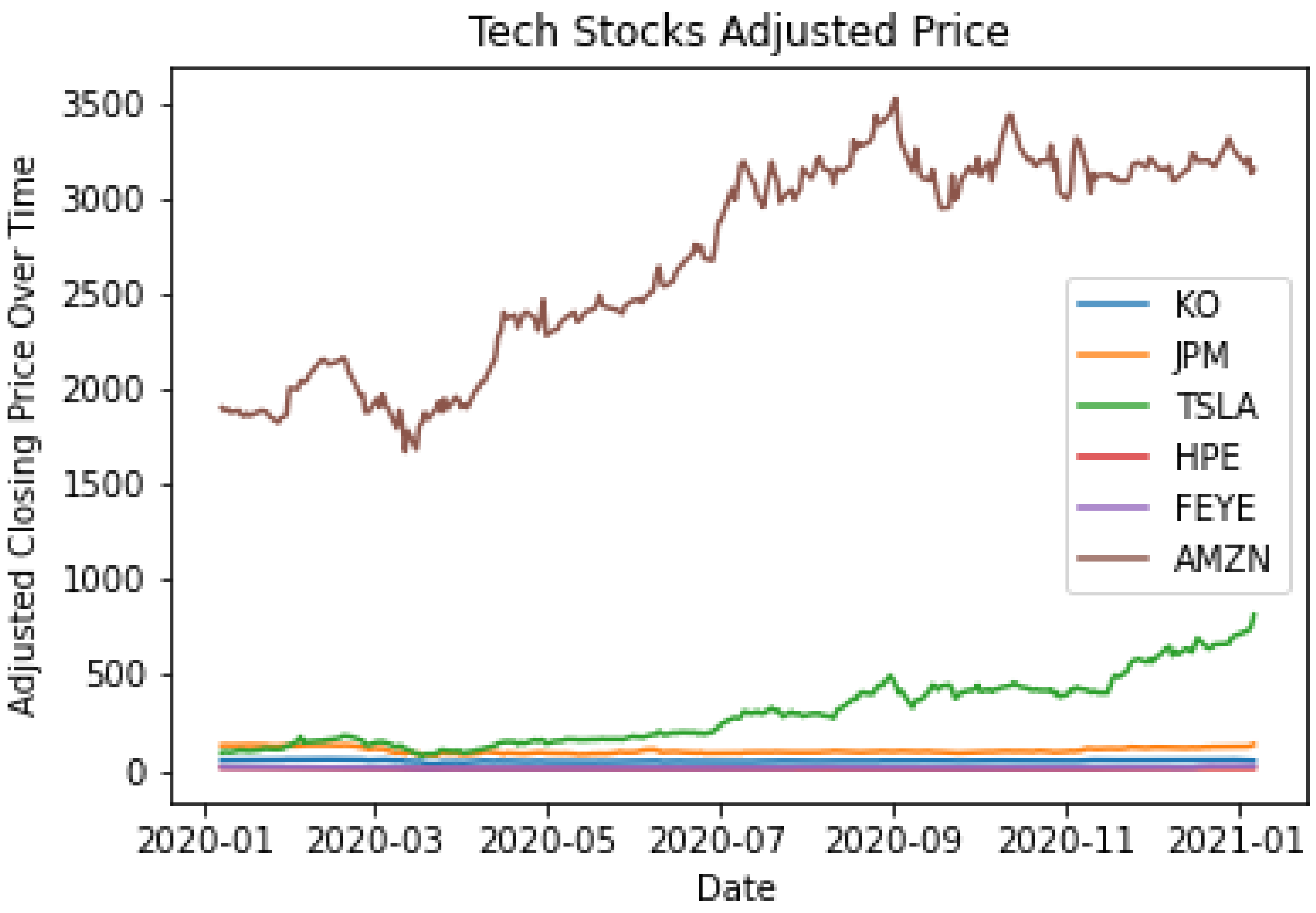
First Portfolio Option

Coca Cola, JP Morgan Chase, Tesla, Hewlett Packard, FireEye, Amazon

7 January 2020 to 7 January 2021

Background, Assumptions

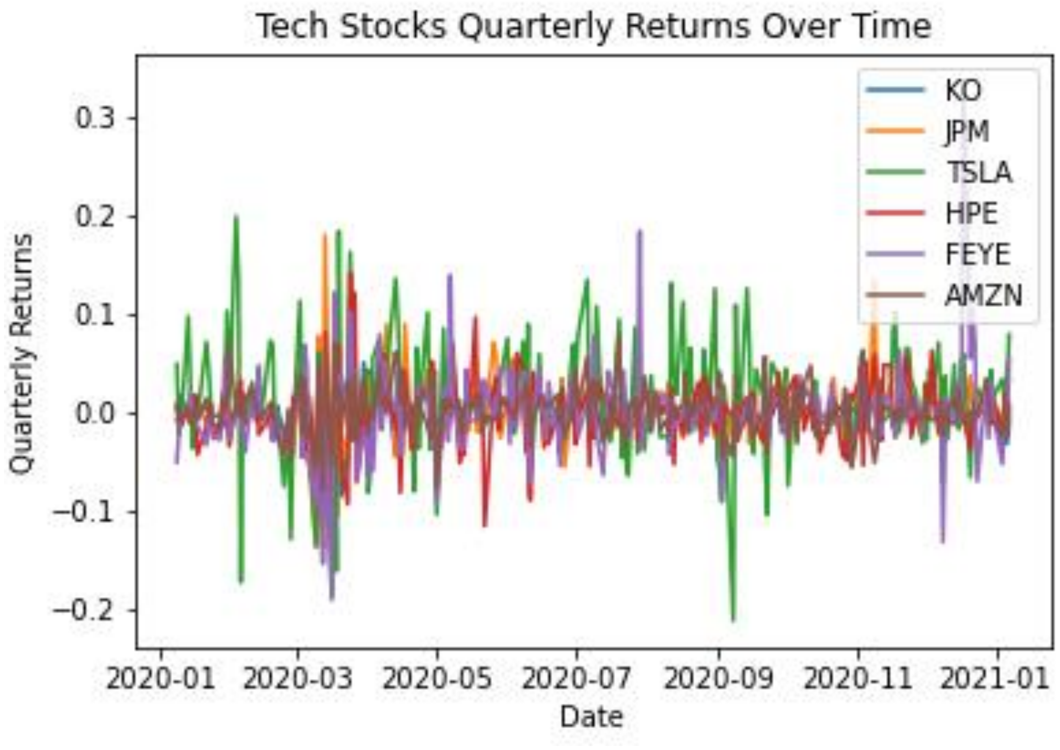
- Each of the stocks are for companies in very different industries except for Tesla and Amazon which are both into a variety of tech endeavours. Tesla is into electric luxury cars, solar systems for homes, and commercial space research. Tesla's company efforts led to space launches during the past year. Amazon is into online purchases, video streaming, and a variety of other niches. Both companies have done well over the past year despite the pandemic.
- I would expect that the other companies have fluctuated to a smaller degree
- FireEye has been in the news a lot over the past 2-3 months because of various high-profile cyber investigations with the US Government

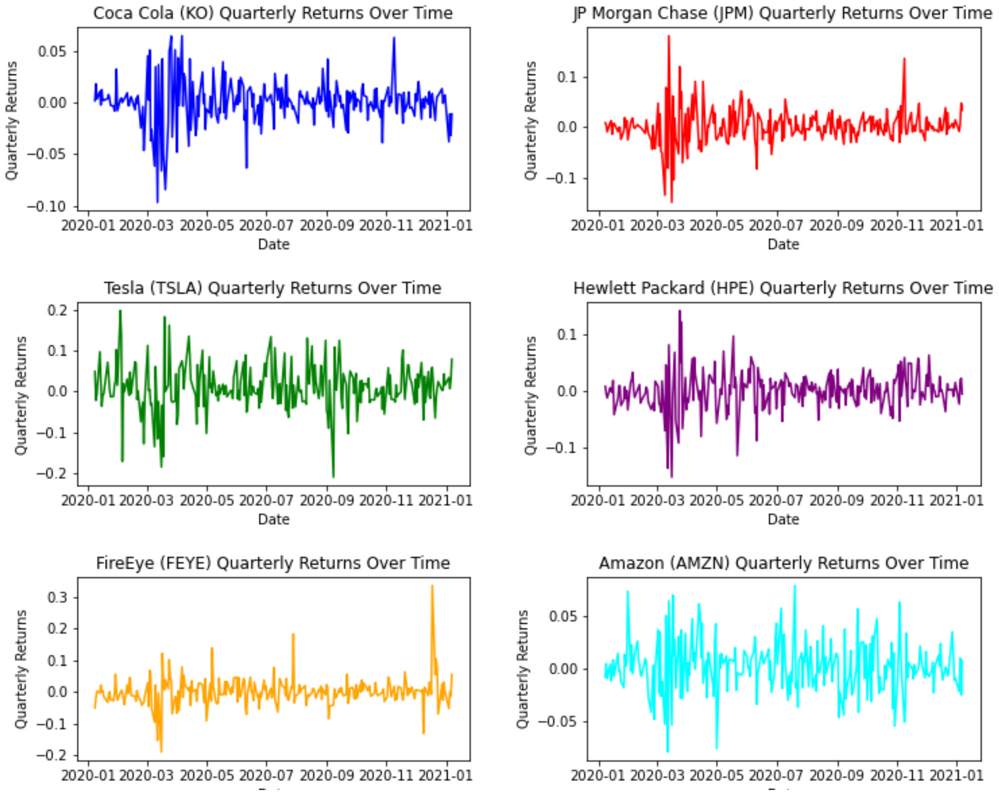


- Amazon and Tesla adj. price near doubles
- Other stocks stagnant

Simple Rate of Returns

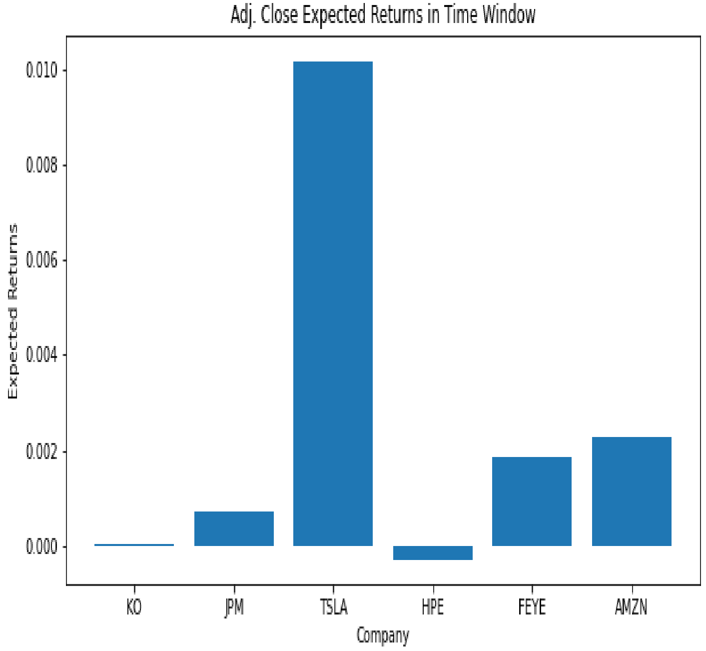
- All companies showed simple rate of return downward dips in March
- FireEye showed a dramatic simple rate of return in late 2020 and Januar 2021

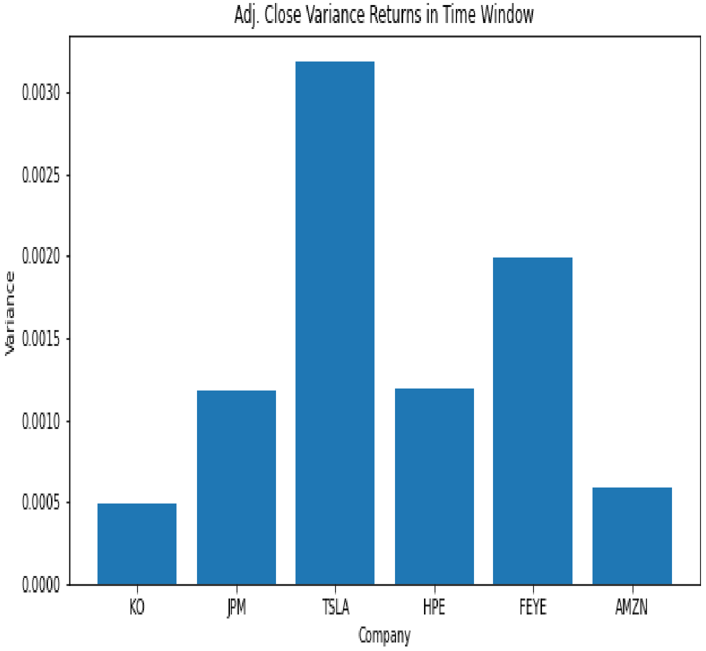


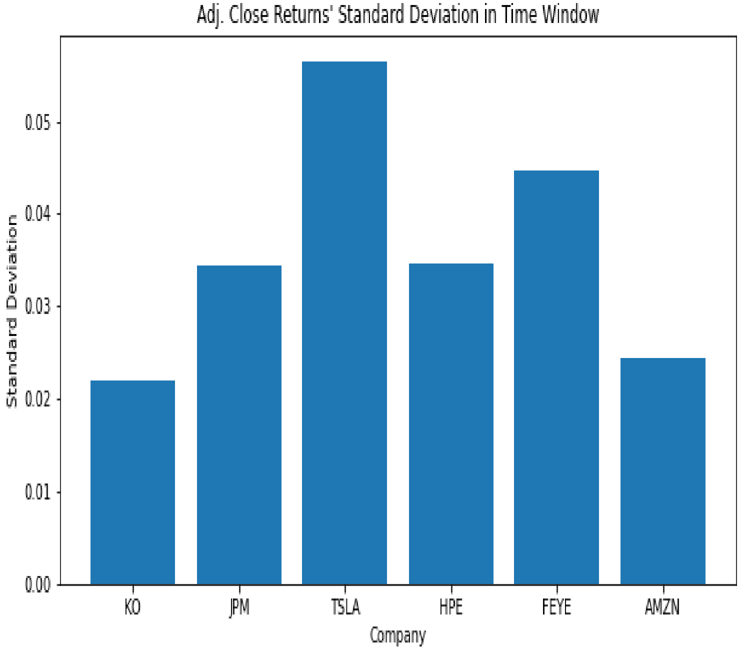


Expected Returns, Variance, Stdv

Tesla has the most variance, standard deviations, and expected returns







How are the stocks correlated?

Symbols	KO	JPM	TSLA	HPE	FEYE	AMZN
Symbols						
KO	0.000486	0.000541	0.000364	0.000467	0.000343	0.000171
JPM	0.000541	0.001183	0.000601	0.000849	0.000578	0.000213
TSLA	0.000364	0.000601	0.003181	0.000569	0.000715	0.000623
HPE	0.000467	0.000849	0.000569	0.001195	0.000549	0.000229
FEYE	0.000343	0.000578	0.000715	0.000549	0.001986	0.000428
AMZN	0.000171	0.000213	0.000623	0.000229	0.000428	0.000590

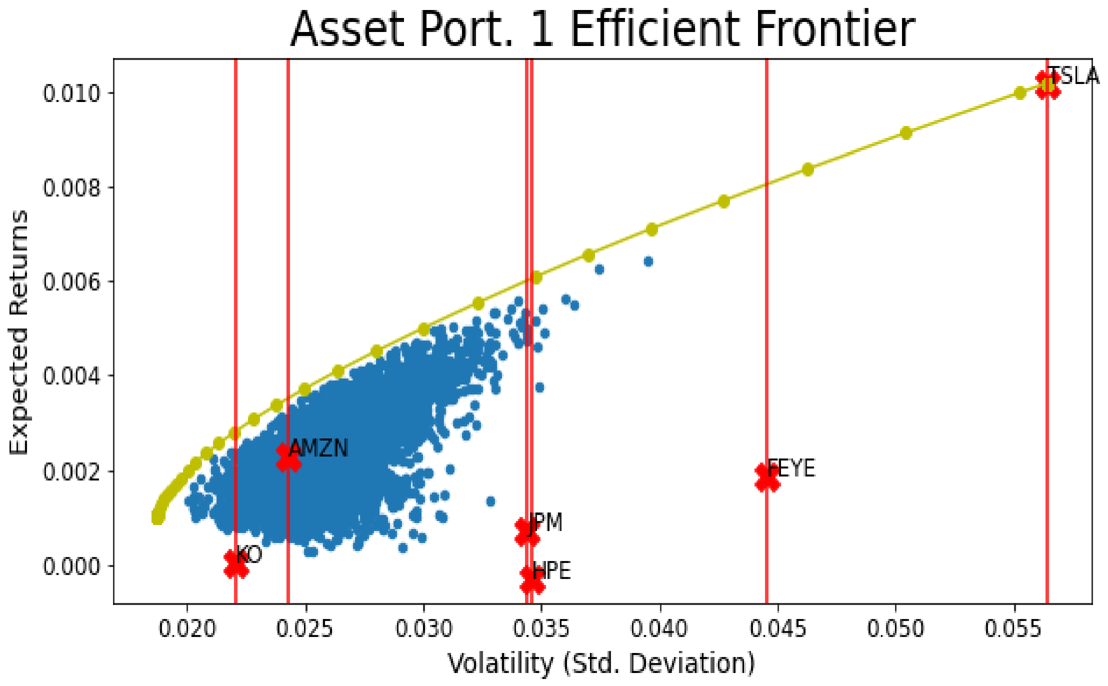
Covariance indicates whether one stock increase as another decreases (negative number) or does two stocks increase together or decrease together (positive number)

The information indicates all stocks are correlated to a small degree, which could mean this is a pretty diverse portfolio

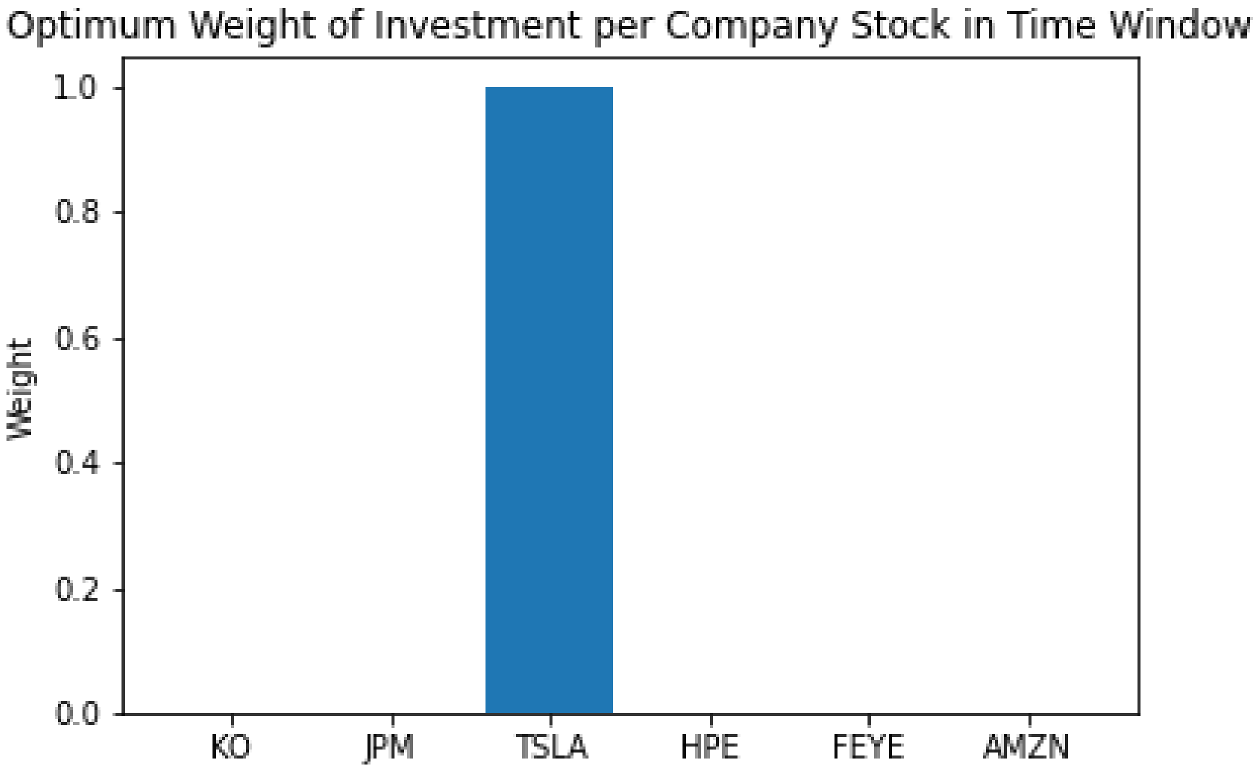
The most correlated stocks are Hewlett Packard and JP Morgan

Efficient Frontier

- Each blue dot shows the wide range of portfolios according to expected returns and volatility. The efficient frontier yellow line is on top of the top-left edge of the portfolio range. This line falls on the portfolios that maximize the expected return at all risks, and minimize the risk at all expected returns.
- From lessons but applies to my data too: The vertical red lines in the figure to the right display the standard deviation of each asset. Notice, there are a few portfolios (blue dots) with volatility lower than the least volatile asset. This feature results from having multiple, uncorrelated assets in the same portfolio.



Weight of Investment in Each Company within Portfolio



The optimal investment according to return and volatility is a 99.99% investment in Tesla with a negligible investment in the other companies

This distribution could be suggested because Tesla, while volatile, has higher returns

The optimal investment is very un-diverse portfolio. Investing all funds in Tesla could work for this year but next year may be different

Conclusions of First Set of Assets

- In the past year, an investor would have made more money from investing in Tesla than Amazon.
- Investing in FireEye over the last few months of 2020 would have proven timely as their simple stock return increased.
- The other stocks--including Coca Cola, JP Morgan, and Hewlett Packard--were consistent in minimal simple and mean rate of return.
- Each of the stocks plummeted in March 2020 as a likely outcome from the news of the pandemic. Each came back to its norm a month or two later while Tesla and Amazon continued to rise the rest of the year.
- If these six stocks were your portfolio, the optimal weight of investment would include a 99.99% investment in Tesla with a negligible investment in the others

Second Portfolio Option

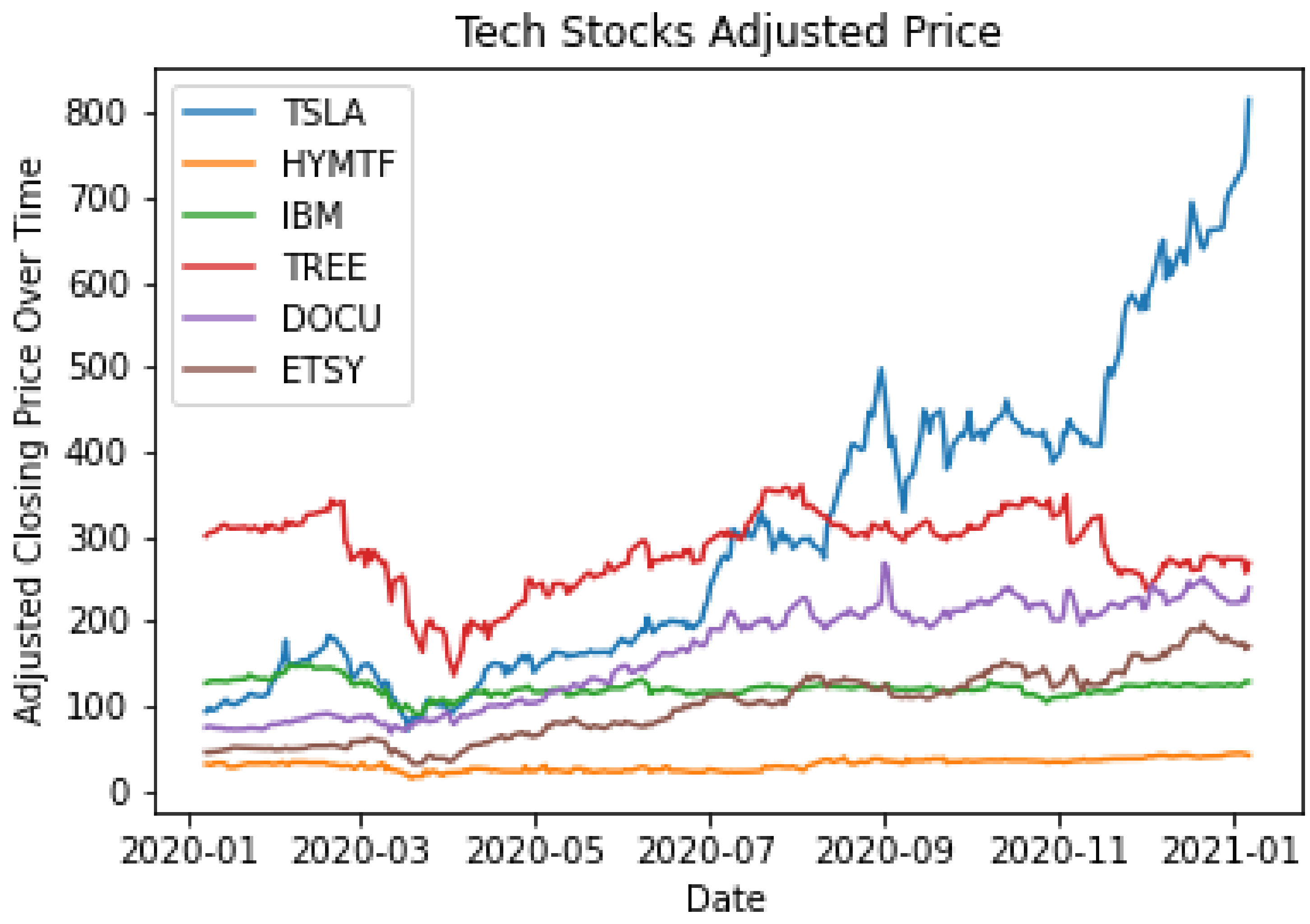
Tesla, Hyundai, IBM, Lending Tree, Docusign, Etsy

I want to find a more diverse and high performing portfolio with higher grossing stocks to accompany Tesla.

7 January 2020 to 7 January 2021

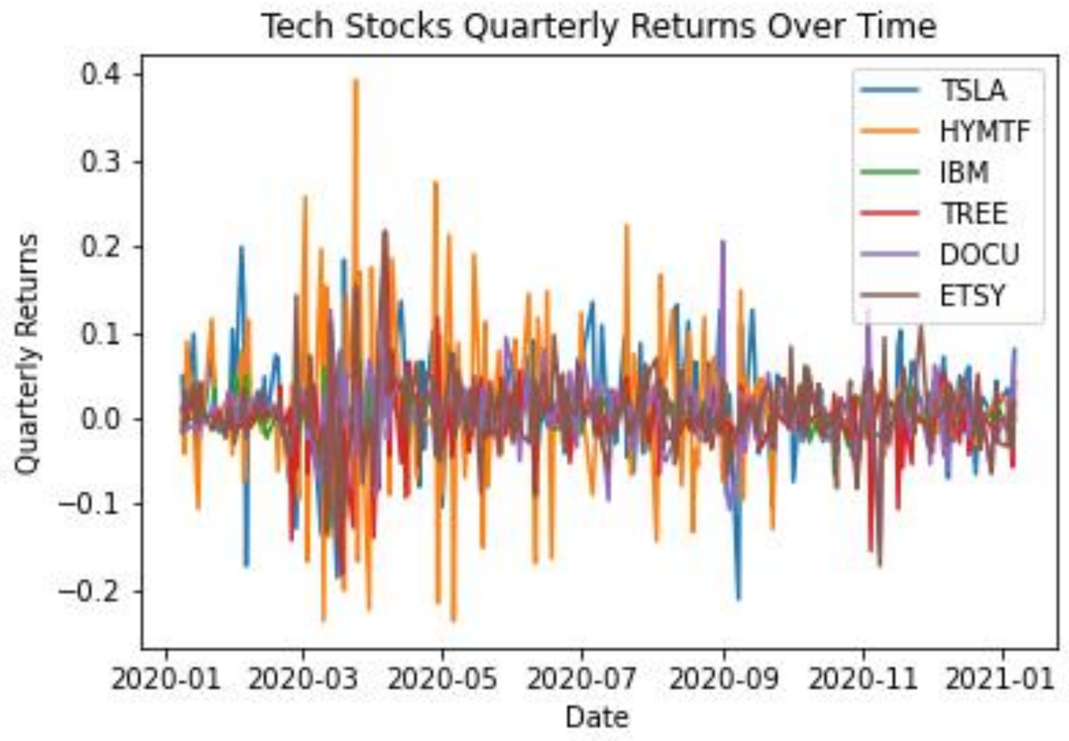
Background, Assumptions

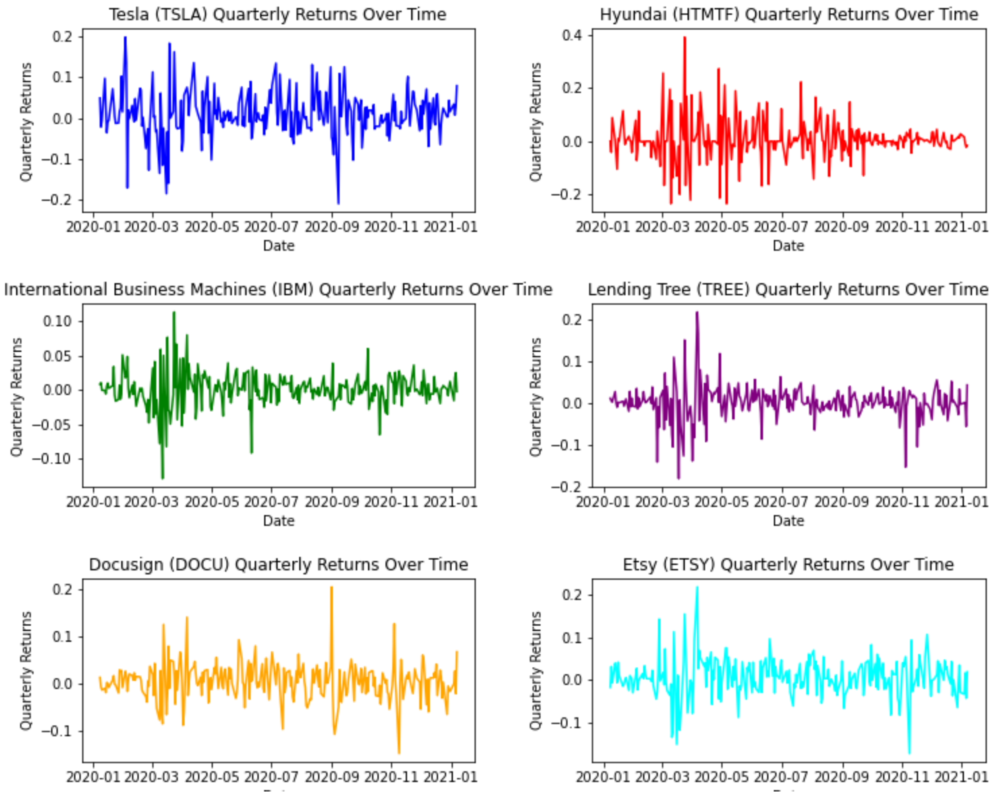
- In an effort to find a more effective and diverse portfolio I chose Tesla with several other assets that at least appeared to be performing well as of January 2021
- Some of the stocks (i.e. Etsy and Docusign) I would expect have done well in a post-pandemic economy because of the transition to much small business activities to online



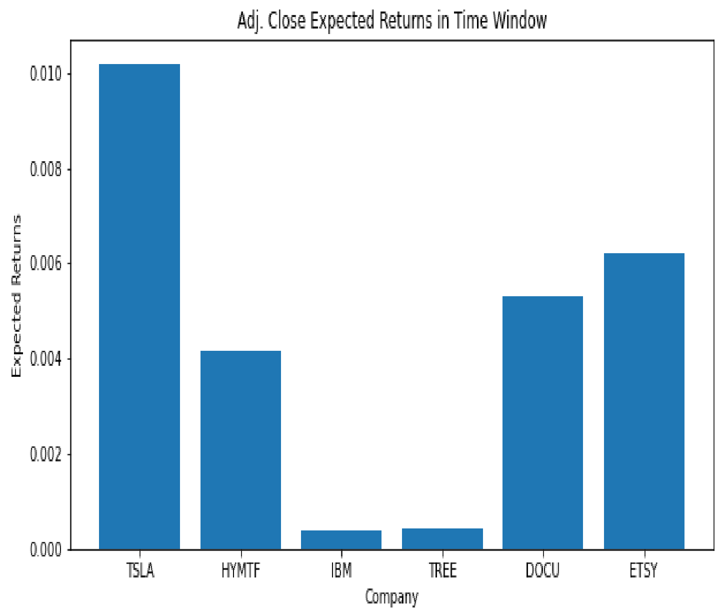
Adjusted Price of Asset over Time

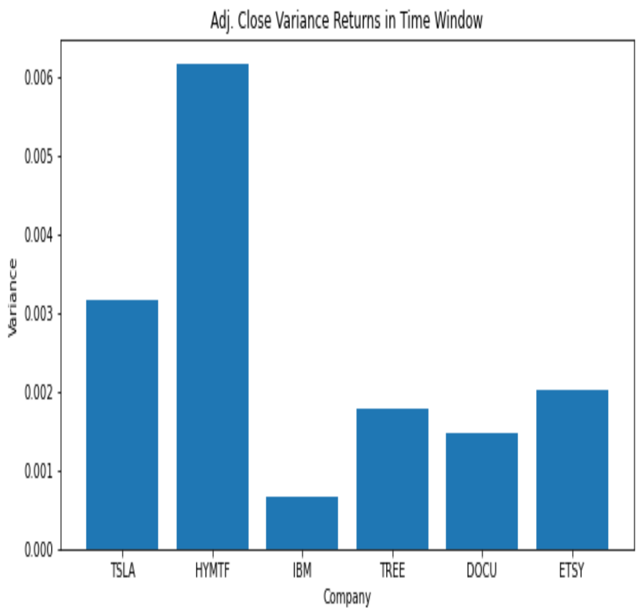
Simple Rate of Returns

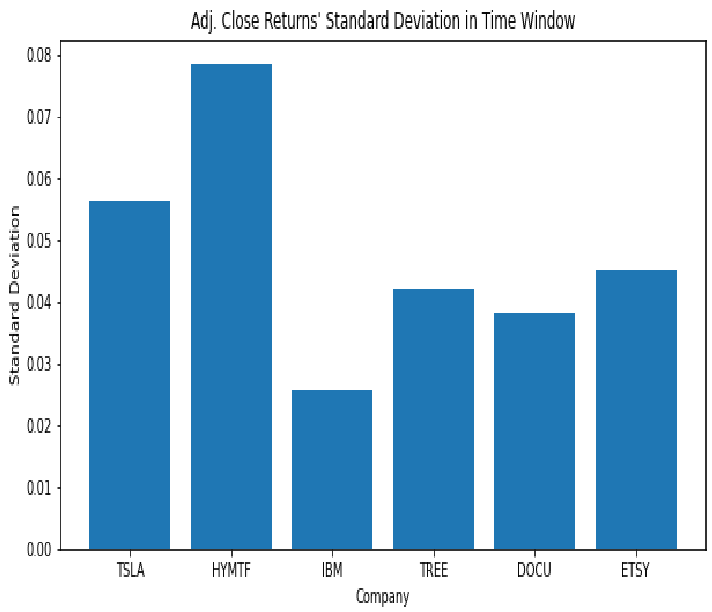




Expected Returns, Variance, Stdv





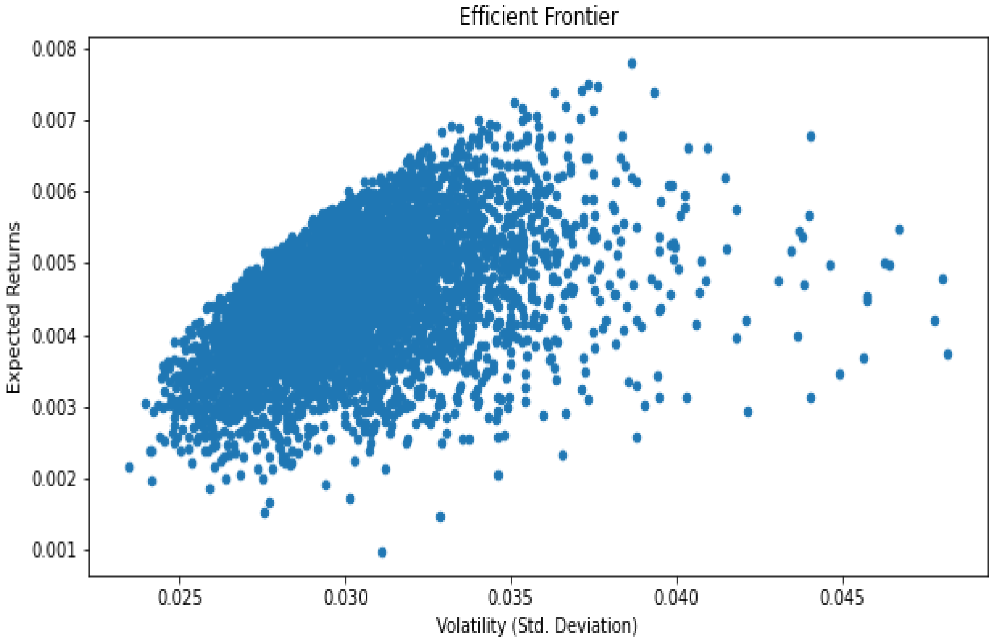


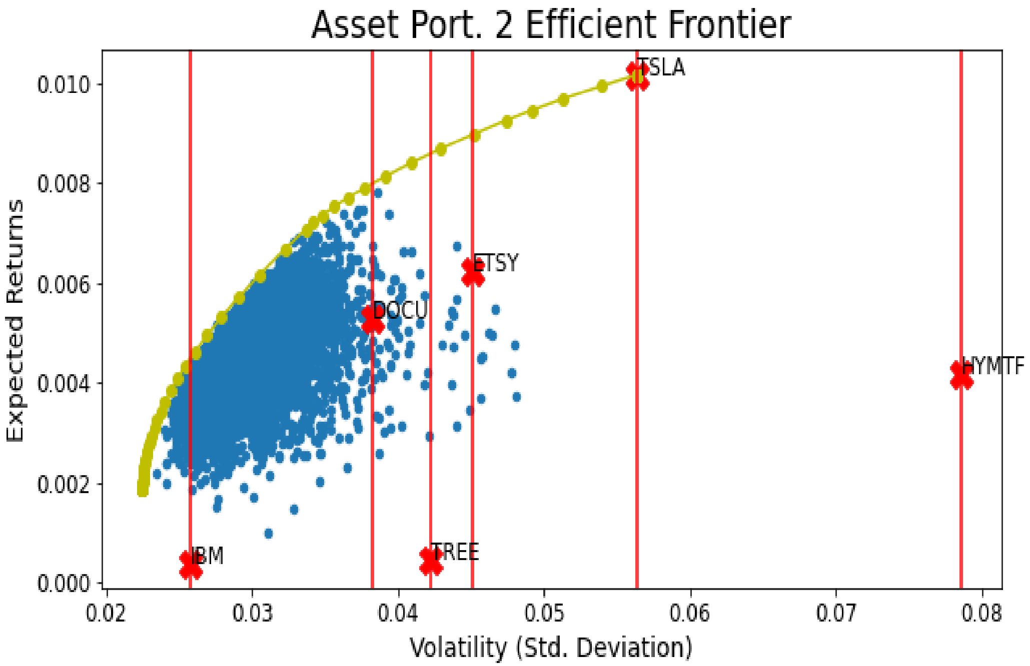
Symbols	TSLA	HYMTF	IBM	TREE	DOCU	ETSY
Symbols						
TSLA	0.003181	0.000504	0.000438	0.000700	0.000639	0.000742
HYMTF	0.000504	0.006172	0.000363	0.000401	-0.000055	0.000238
IBM	0.000438	0.000363	0.000667	0.000472	0.000164	0.000377
TREE	0.000700	0.000401	0.000472	0.001785	0.000277	0.000601
DOCU	0.000639	-0.000055	0.000164	0.000277	0.001467	0.000874
ETSY	0.000742	0.000238	0.000377	0.000601	0.000874	0.002037

How are the assets correlated?

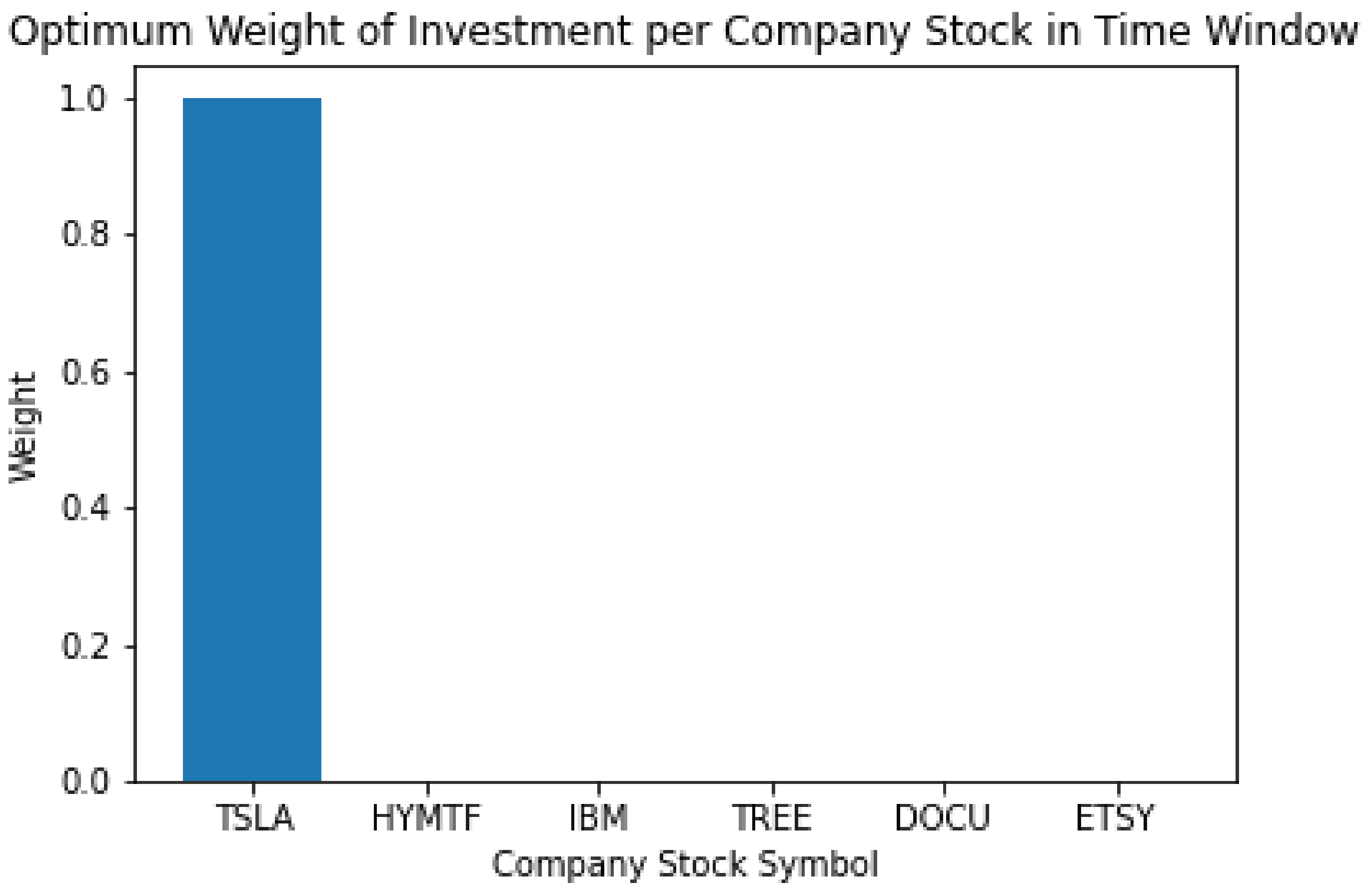
Efficient Frontier

- The efficient frontier yellow line is on top of the top-left edge of the portfolio range. This line falls on the portfolios that maximize the expected return at all risks, and minimize the risk at all expected returns.
- There are many portfolios (blue dots) with volatility lower than the least volatile asset. This feature results from having multiple, uncorrelated assets in the same portfolio.





Weight of Investment in Each Company within Portfolio



The optimal investment according to return and volatility is a 99.99% investment in Tesla with a negligible investment in the other companies

This distribution could be suggested because Tesla, while volatile, has higher returns

The optimal investment is very un-diverse portfolio. Investing all funds in Tesla could work for this year but next year may be different

Conclusions of Second Set of Assets

- The recommendation with these assets is to invest 99.99% in Tesla even though there are some higher performing stocks like Etsy and Docusign
- Despite Tesla’s volatility (second in the bunch) it has high expected rewards
- In asset port. 2, an investor would need to consider that one of its assets(Hyundai) is very volatile and only expects moderate returns

Third Portfolio Option

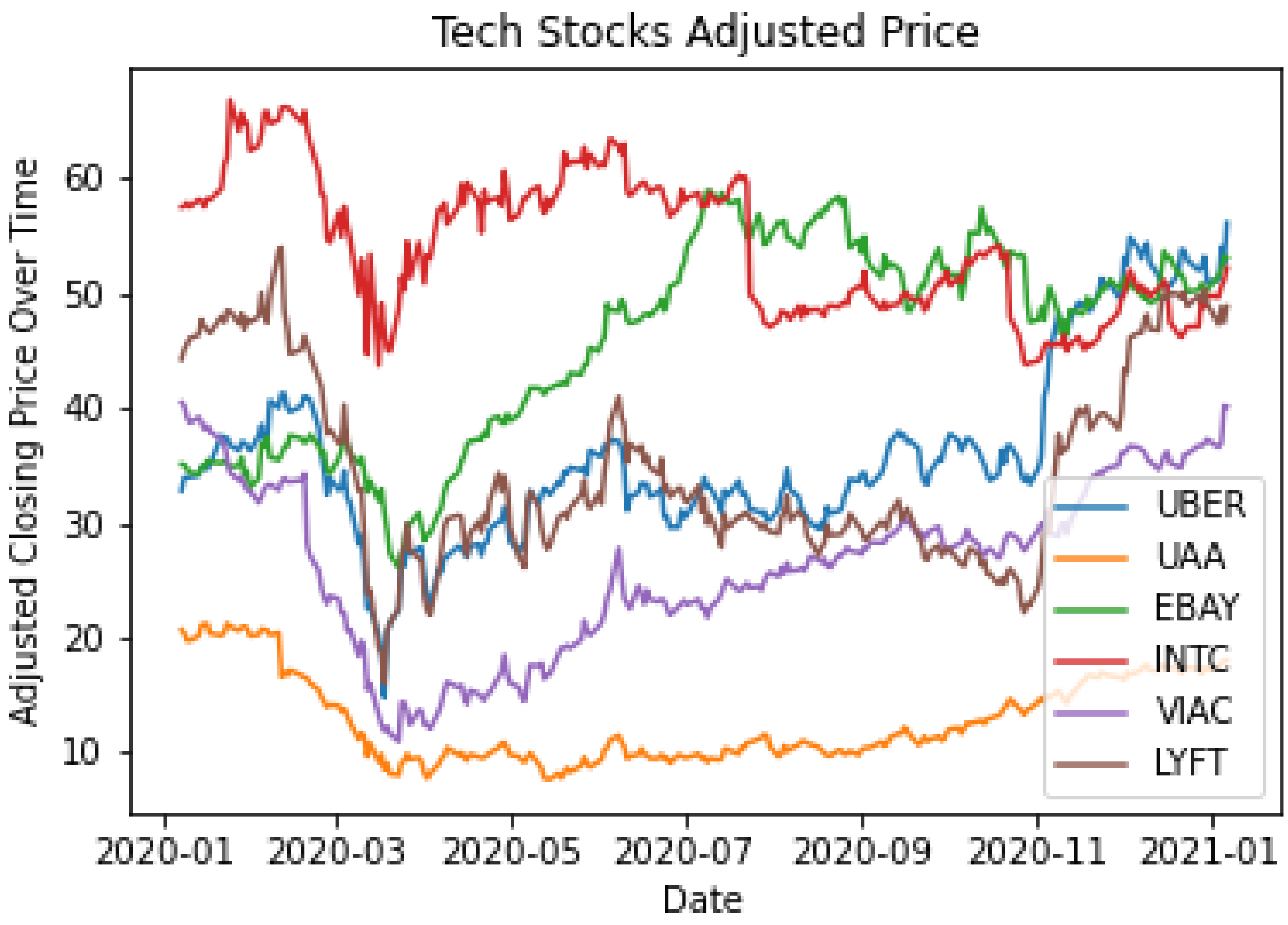
Uber, Under Armour, Ebay, Intel, ViacomCBS, Lyft

Let’s say Tesla was too pricey or for whatever reason we need to look at finding a lower cost, high performing portfolio

7 January 2020 to 7 January 2021

Background, Assumptions

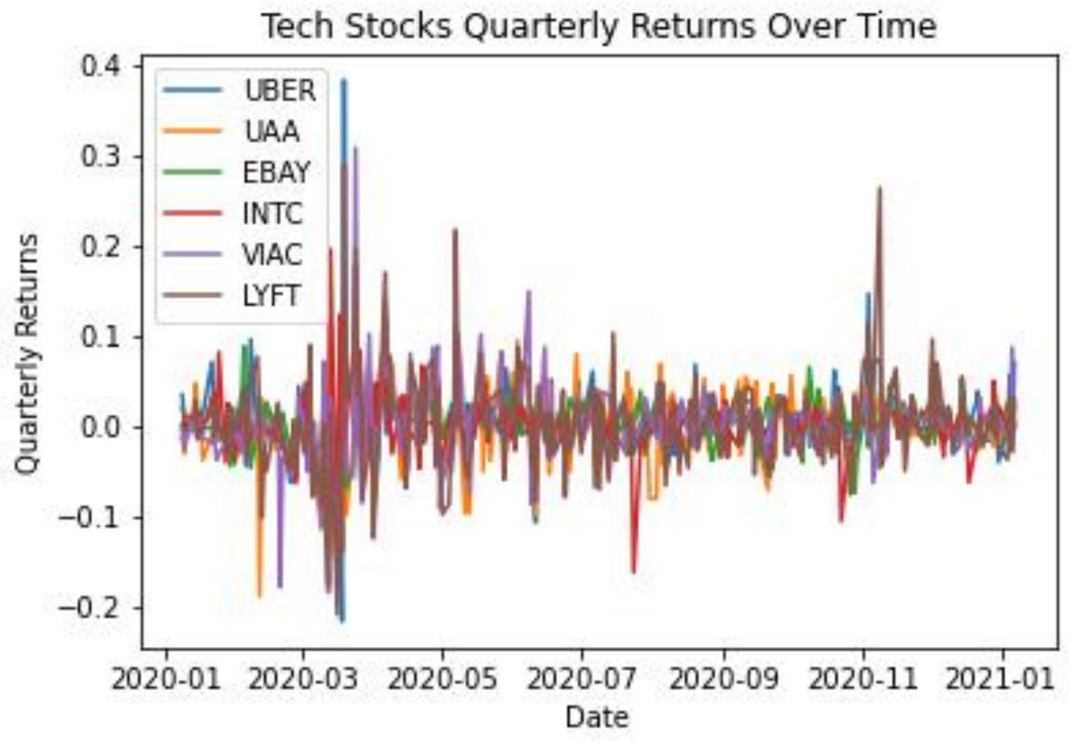
- The companies are in different industries except for Uber and Lyft.
- Many of the companies were listed in the “gainers” section of Yahoo’s stock website

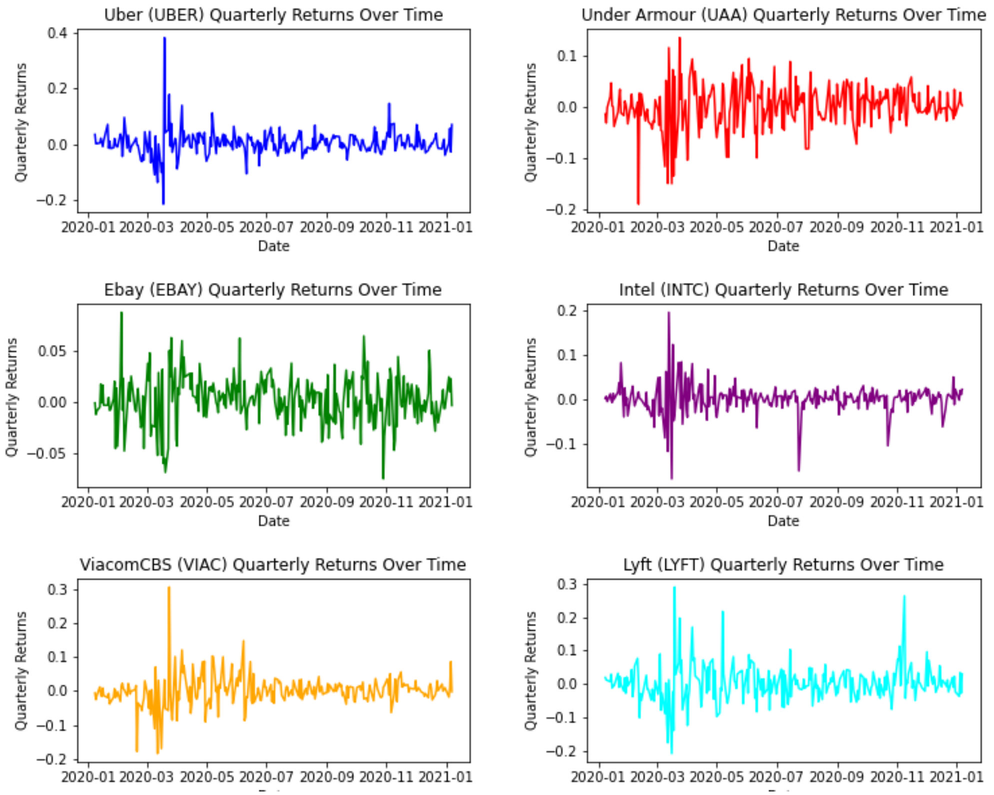


Adjusted Price of Asset over Time

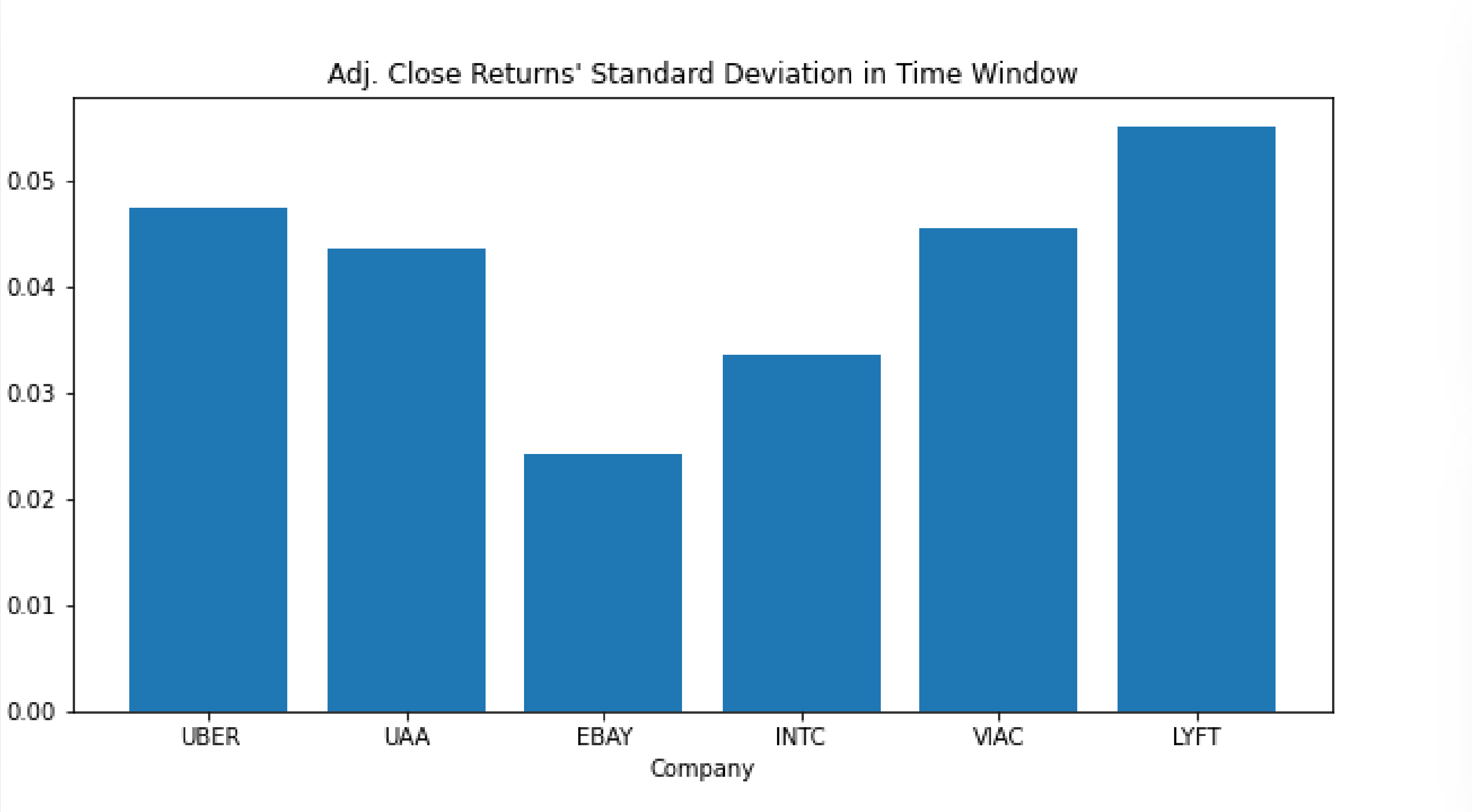
Simple Rate of Returns

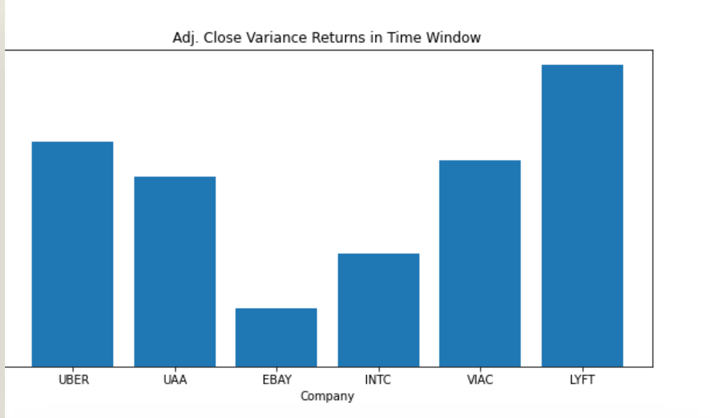
- Many of the companies fluctuate a good deal
- Dip in March 2020

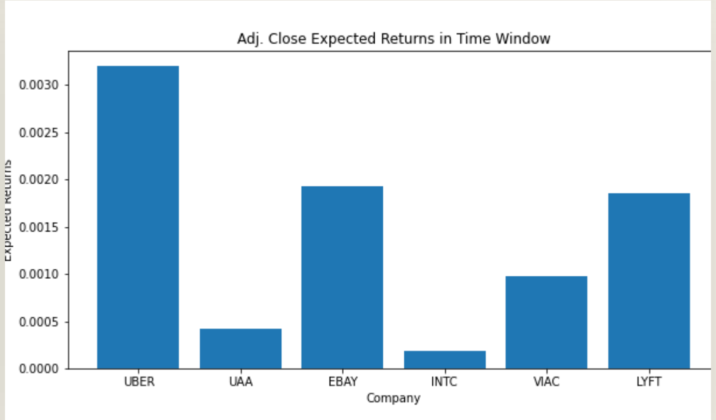




Expected Returns, Variance, Stdv







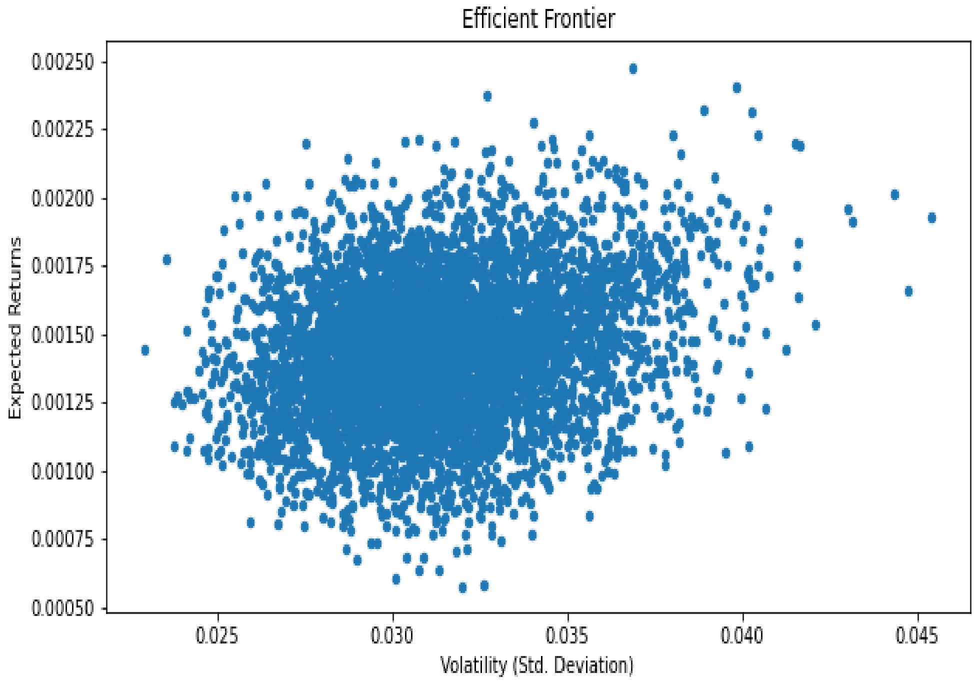
Symbols Symbols	UBER	UAA	EBAY	INTC	VIAC	LYFT
UBER	0.002247	0.000870	0.000206	0.000514	0.000896	0.002083
UAA	0.000870	0.001903	0.000267	0.000589	0.001123	0.001334
EBAY	0.000206	0.000267	0.000581	0.000313	0.000268	0.000221
INTC	0.000514	0.000589	0.000313	0.001131	0.000561	0.000673
VIAC	0.000896	0.001123	0.000268	0.000561	0.002065	0.001311
LYFT	0.002083	0.001334	0.000221	0.000673	0.001311	0.003021

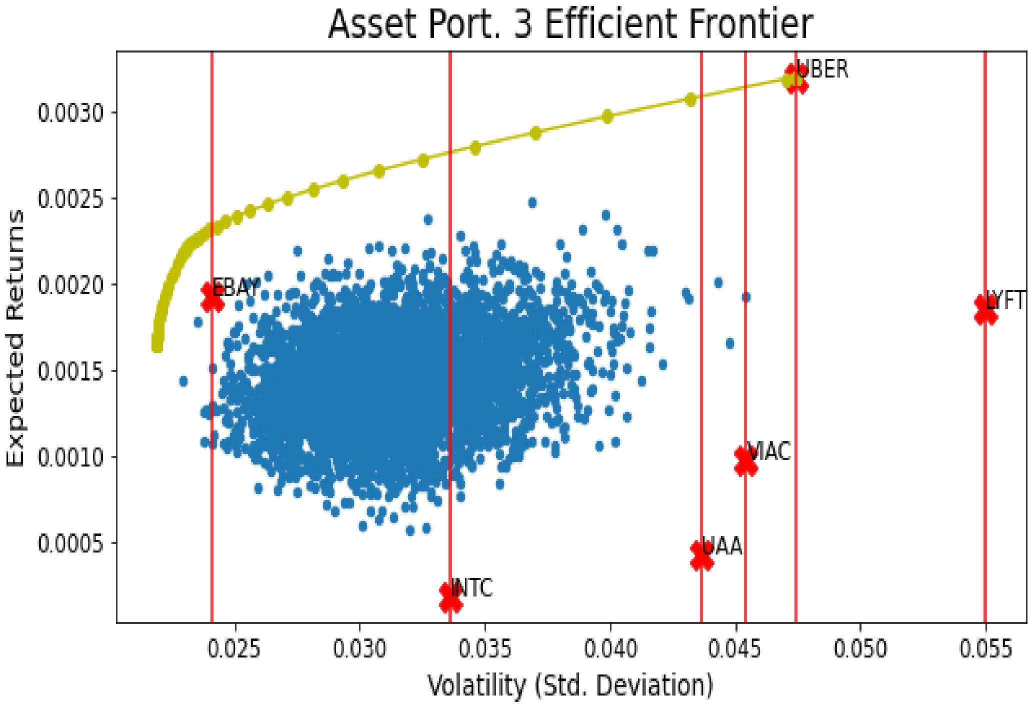
How are the assets correlated?

All stocks are positively correlated
UBER and LYFT most correlated
UBER and UAA second most correlated

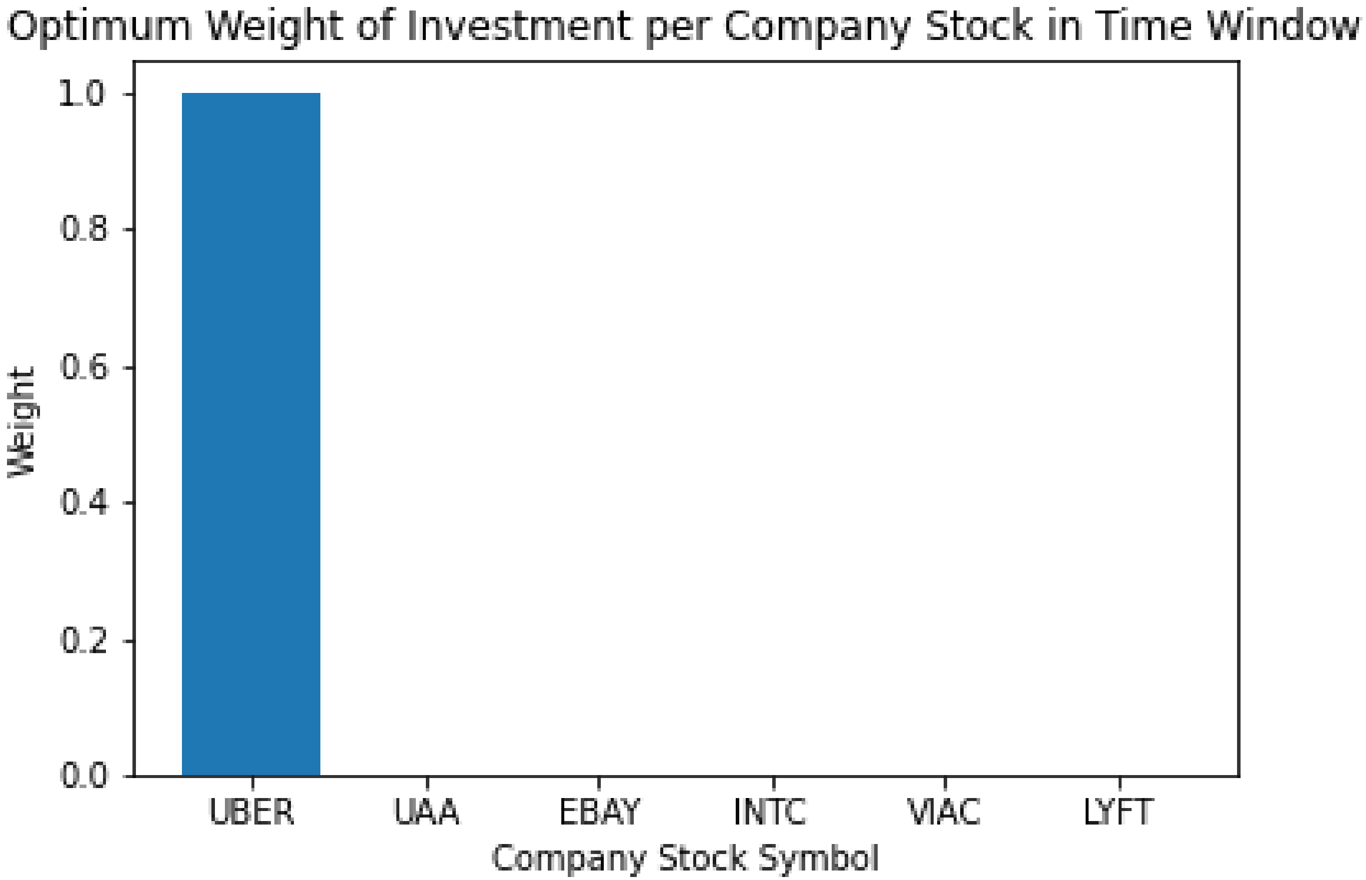
Efficient Frontier

- The efficient frontier yellow line is on top of the top-left edge of the portfolio range. This line falls on the portfolios that maximize the expected return at all risks, and minimize the risk at all expected returns.
- There are fewer portfolios (blue dots) with volatility lower than the least volatile asset than with the second asset portfolios. This means that the asset collection are more correlated than the second asset collection
- An important feature that results from this is that increasing the number of uncorrelated assets will decrease or not affect the risk of the portfolio.





Weight of Investment in Each Company within Portfolio



The optimal investment according to return and volatility is a 99.99% investment in Uber with a negligible investment in the other companies

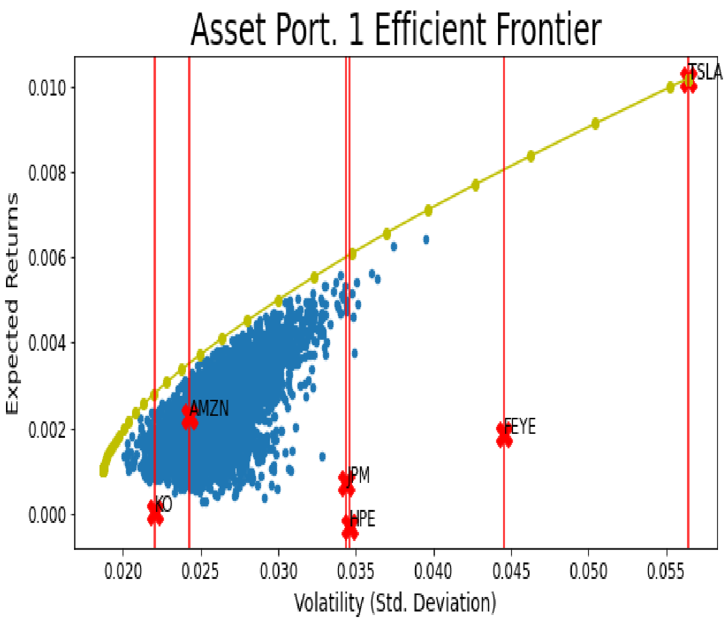
This distribution could be suggested because Uber has higher returns and medium volatility compared to the other 5 stocks

The optimal investment is not diverse. Investing all funds in Uber could work for this year but next year may be different

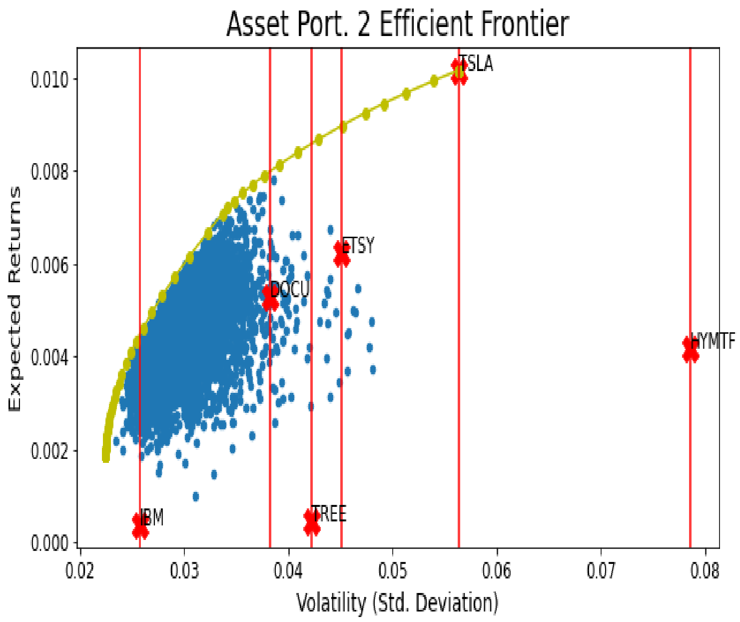
Conclusions from Third Set of Assets

- The outcome of the optimum portfolio appears to make sense when I manually sort through the random portfolios I see that portfolios with the highest returns have a very high weight of Uber. Uber also does not have the highest single asset standard deviation (volatility) out of the bunch of assets.
- Compared to the previous portfolio of 6 stocks there are far fewer portfolio options with volatility lower than the least volatile asset. This means that there while these assets are more correlated than the last batch of six assets.

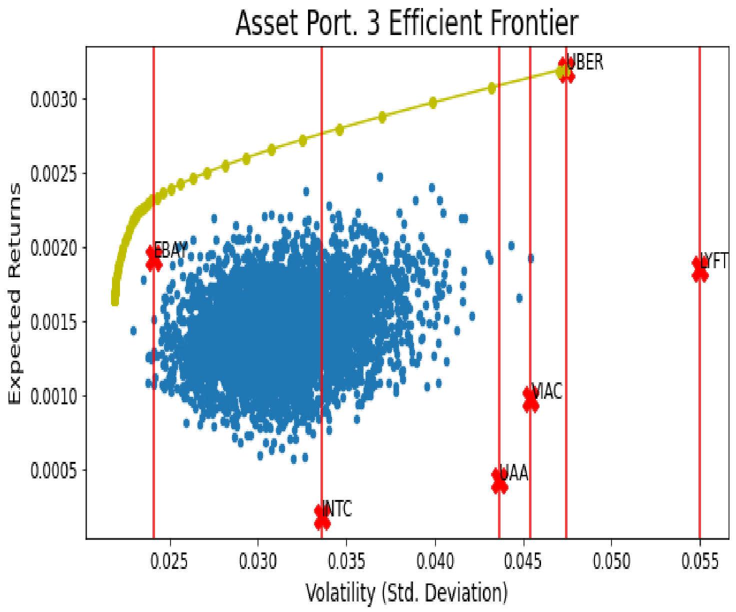
KO, JPM, TSLA, HPE, FEYE, AMZN



TSLA, HYMTF, IBM, TREE, DOCU, ETSY



UBER, UAA, EBAY, INTC, VIAC, LYFT



Comparing All Three Portfolios

Conclusions from Three Asset Sets

- Port. 3's efficient frontier is a longer slope compared to 1 and 2 which means that more volatility does not yield more returns
- Based on the maximum and minimum expected returns from the asset portolios, the highest performing asset set is the third option of Uber, Under Armour, Ebay, Intel, ViacomCBS, and Lyft
- Tesla has high return with high volatility but Uber has more expected returns with only moderate volatility. Tesla and Uber are very successful assets but they behave differently
- The second asset collection is the most uncorrelated, which makes them in one respect less risky of a collection than sets one and three.
- The recommend stock weights for the three sets recommend almost all in (99.99%) on one successful stock (either Tesla or Uber)
- If you went all in on one stock, it would appear to be less risky and more profitable for it to be Uber than Tesla
- Lyft is the single most volatile stock but it has a high return compared to all but Under Armour, Tesla, and Uber
- A few stocks show that it is possible for a stock to be volatile with little expected return(IBM, Lending Tree, Intel)