ANALYSING FINANCIAL DATA WITH PYTHON

By Ben Owens

PART 1: VISUAL ANALYSIS OF TECH STOCKS

PROJECT OVERVIEW

This project will analyse the financial data of the top five Nasdaq companies by weight, over a four-quarter period. The period starts July 1st, 2022, and ends July 1st, 2023.

The five technology stocks that will be examined are:

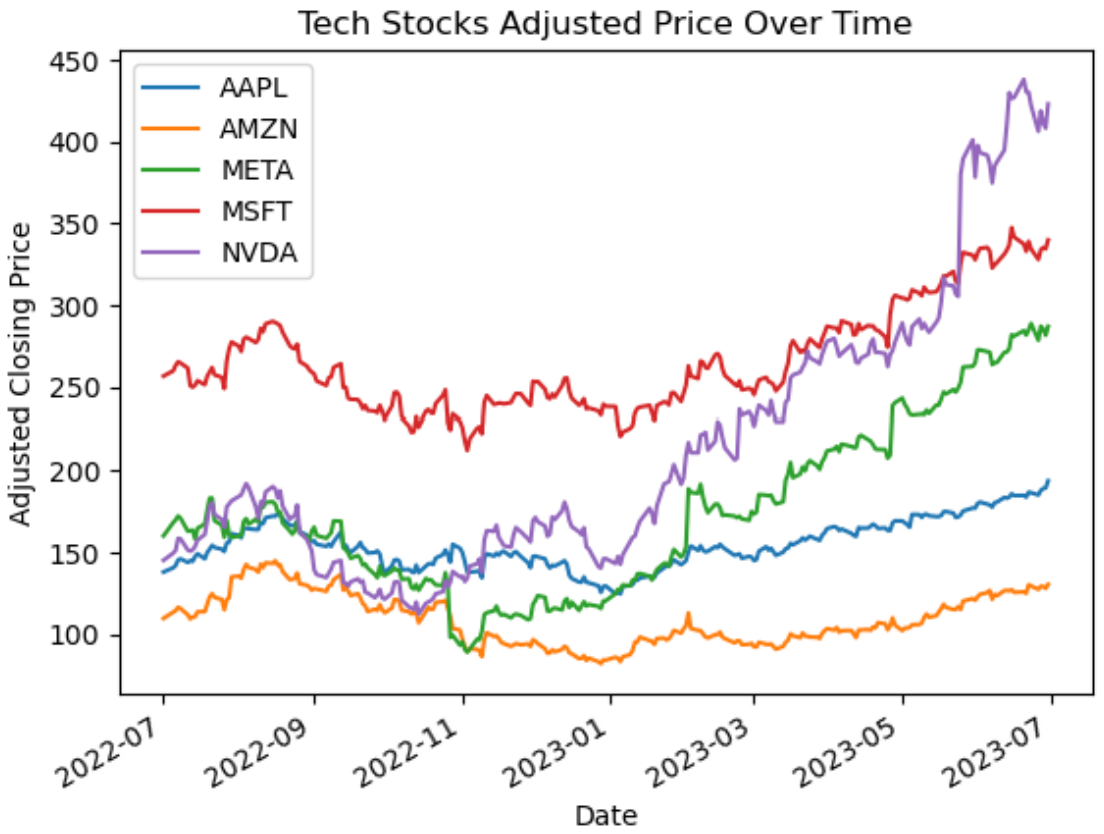
- Apple (NASDAQ:AAPL)
- Microsoft (NASDAQ:MSFT)
- Amazon (NASDAQ:AMZN)
- NVIDIA (NASDAQ:NVDA)
- Meta (NASDAQ:META)

WHAT WILL BE ANALYSED?

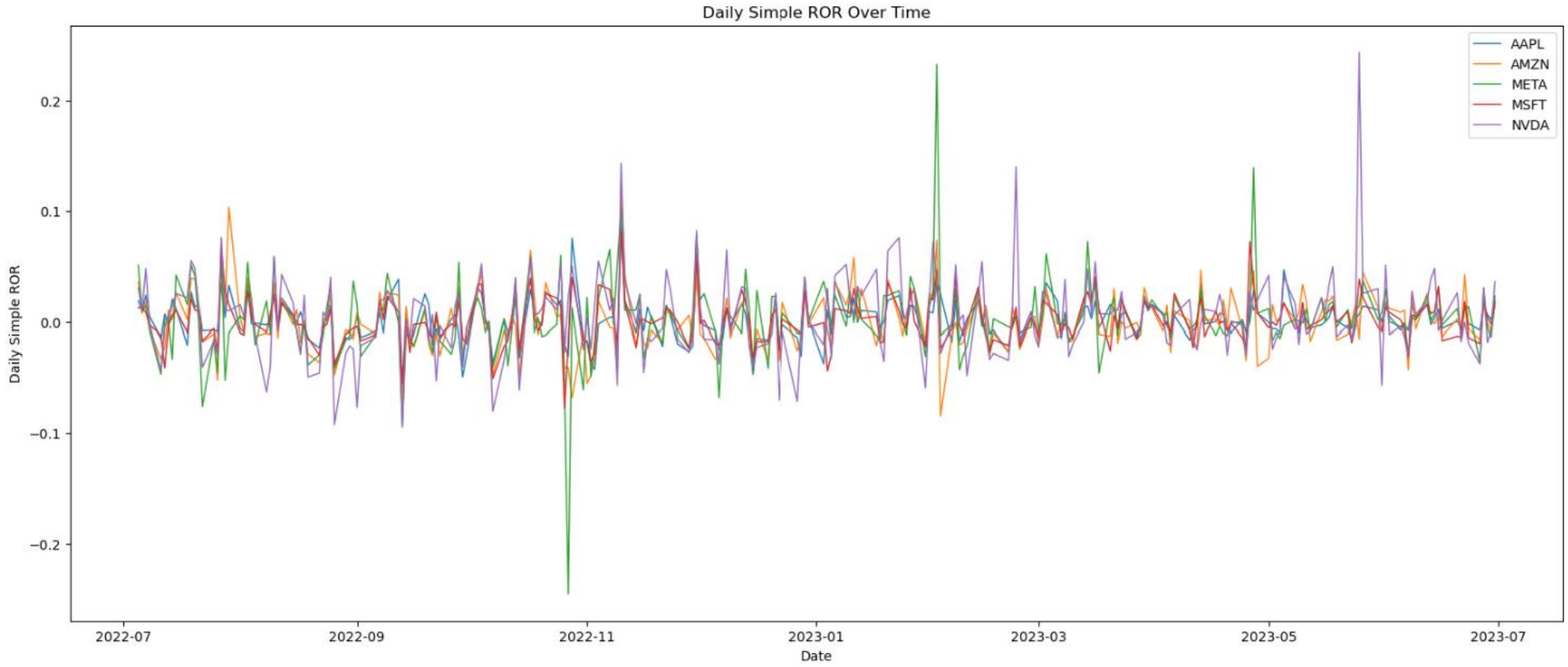
Using imported packages, the following analysis will be conducted:

1. Visualise the stock prices
2. Calculate and visualise the daily simple rate of return
3. Calculate and visualise the mean rates of return
4. Calculate and visualise the variances of the returns
5. Calculate and visualise the standard deviations of the returns
6. Calculate and visualise the correlation between the companies

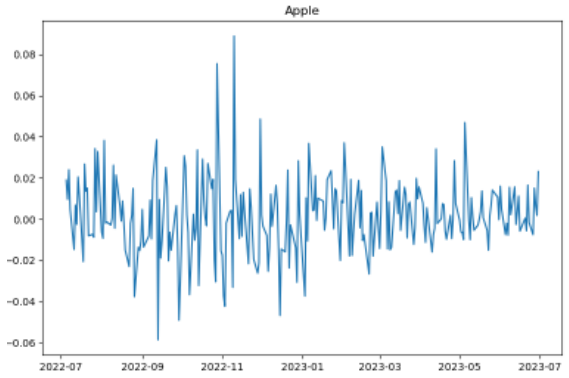
VISUALISATION OF STOCK PRICES

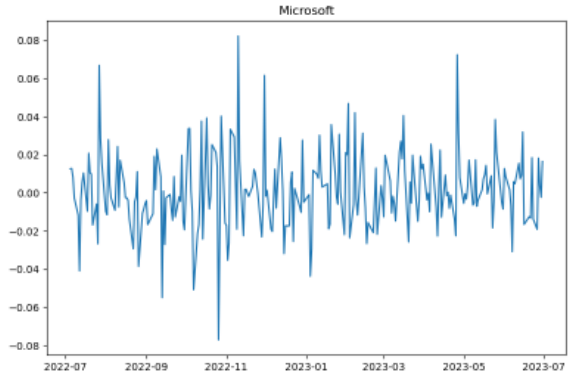


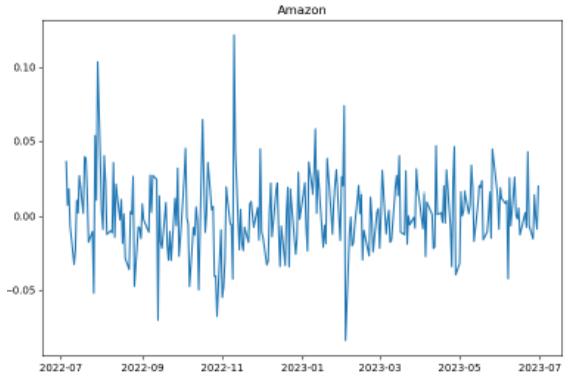
SIMPLE RATE OF RETURN OVER THE PERIOD

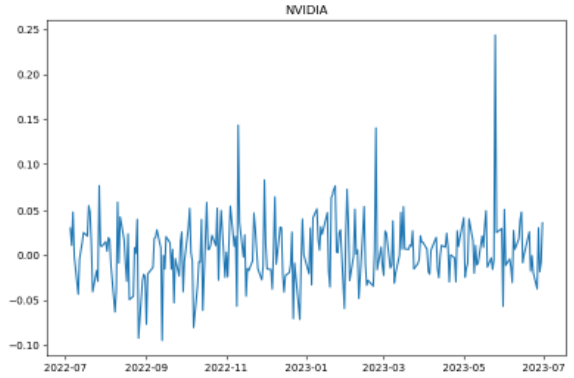


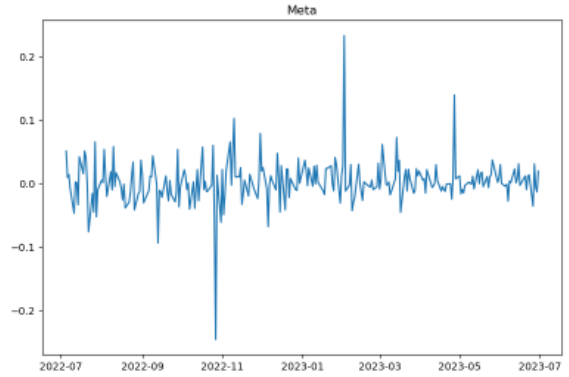
SIMPLE RATE OF RETURN FOR INDIVIDUAL STOCKS





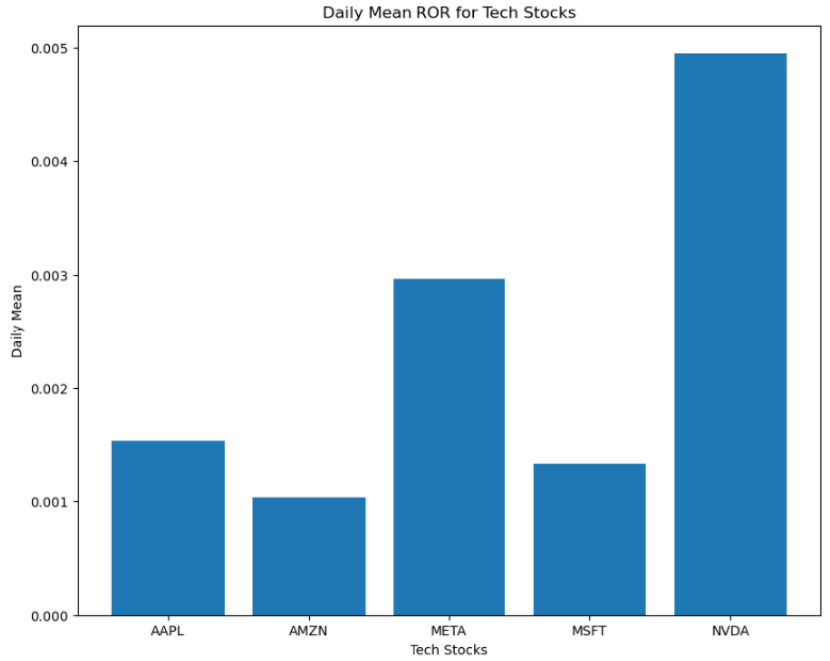






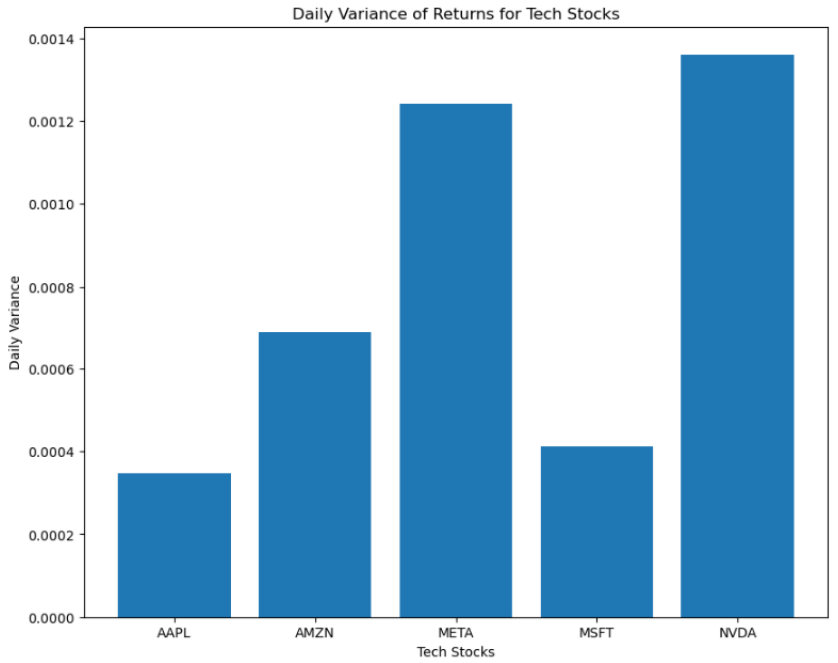
DAILY MEAN RATE OF RETURN

NVIDIA has the highest simple mean rate of return out of the five stocks in this period, thus would have been the best investment choice. Amazon on the other hand has the lowest simple mean rate of return over the period, and thus would have been the worst preforming investment choice of the five stocks.



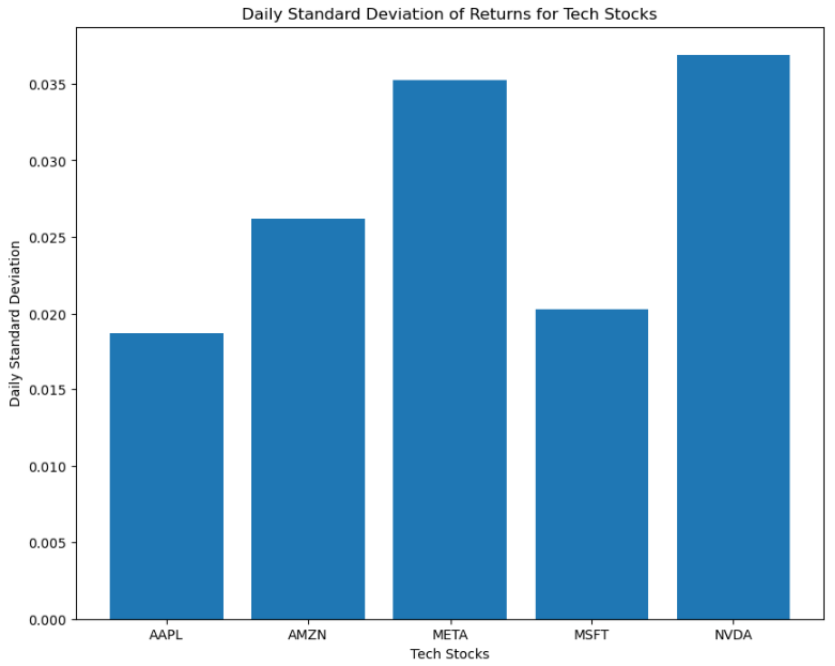
DAILY VARIANCE OF RETURNS

NVIDIA has the highest variance of the five stocks over the period, indicating it is the most risky investment. Apple on the other hand has the lowest variance and thus risk out of the five stocks. This is supported by the previous bar chart, as typically higher risk stocks have higher returns, and lower risk stocks have lower returns.



DAILY STANDARD DEVIATION OF RETURNS

The standard deviation shows the volatility of stocks. NVIDIA is the most volatile stock, as it has the highest standard deviation. However, it also has the greatest mean return. Apple on the other hand is the least volatile stock and provided the least mean return. As such, depending on the level of risk the investor is willing to invest at, differing stocks will be preferable, and the return will be valued accordingly.



CORRELATION BETWEEN STOCKS

None of the stocks are negatively correlated. This makes sense, as they are all technology stocks. As such this would not be a very diverse investment portfolio. Microsoft and Apple have the highest correlation, while NVIDIA and Meta have the lowest.

	AAPL	AMZN	META	MSFT	NVDA
AAPL	1.000000	0.642550	0.557798	0.728288	0.602609
AMZN	0.642550	1.000000	0.584283	0.715684	0.530514
META	0.557798	0.584283	1.000000	0.585038	0.433532
MSFT	0.728288	0.715684	0.585038	1.000000	0.664540
NVDA	0.602609	0.530514	0.433532	0.664540	1.000000

PART 1 IN SUMMARY...

- The returns of the top five weighted Nasdaq stocks were compared, showing which of the five companies had the highest or lower returns over the four-quarter period.
- The risk associated with each of the tech stocks was assessed by examining variances and standard deviations.
- An understanding into the relationships between these companies was gained through correlation analysis. This can be useful for diversification strategies.

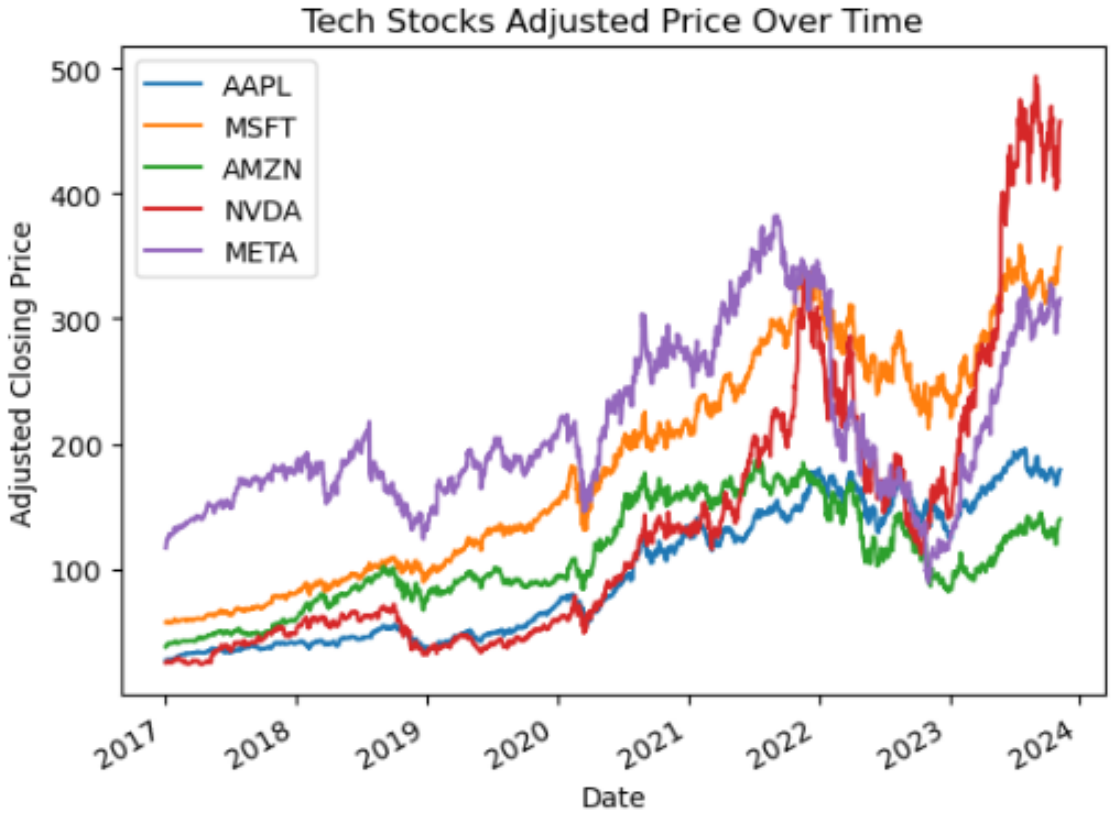
PART 2: PORTFOLIO ANALYSIS OF TECH STOCKS

PROJECT OVERVIEW

This project will analyse 5,000 different portfolios containing random weightings of the top five weighted tech stocks. These portfolios will be compared by:

- Creating a plot of the random portfolios, comparing their different volatilities and expected returns.
- Calculate the weights, returns and risks of portfolios on the efficient frontier.
- Plot the set of portfolios on the efficient frontier.

VISUALISATION OF FIVE TECH STOCK PRICES

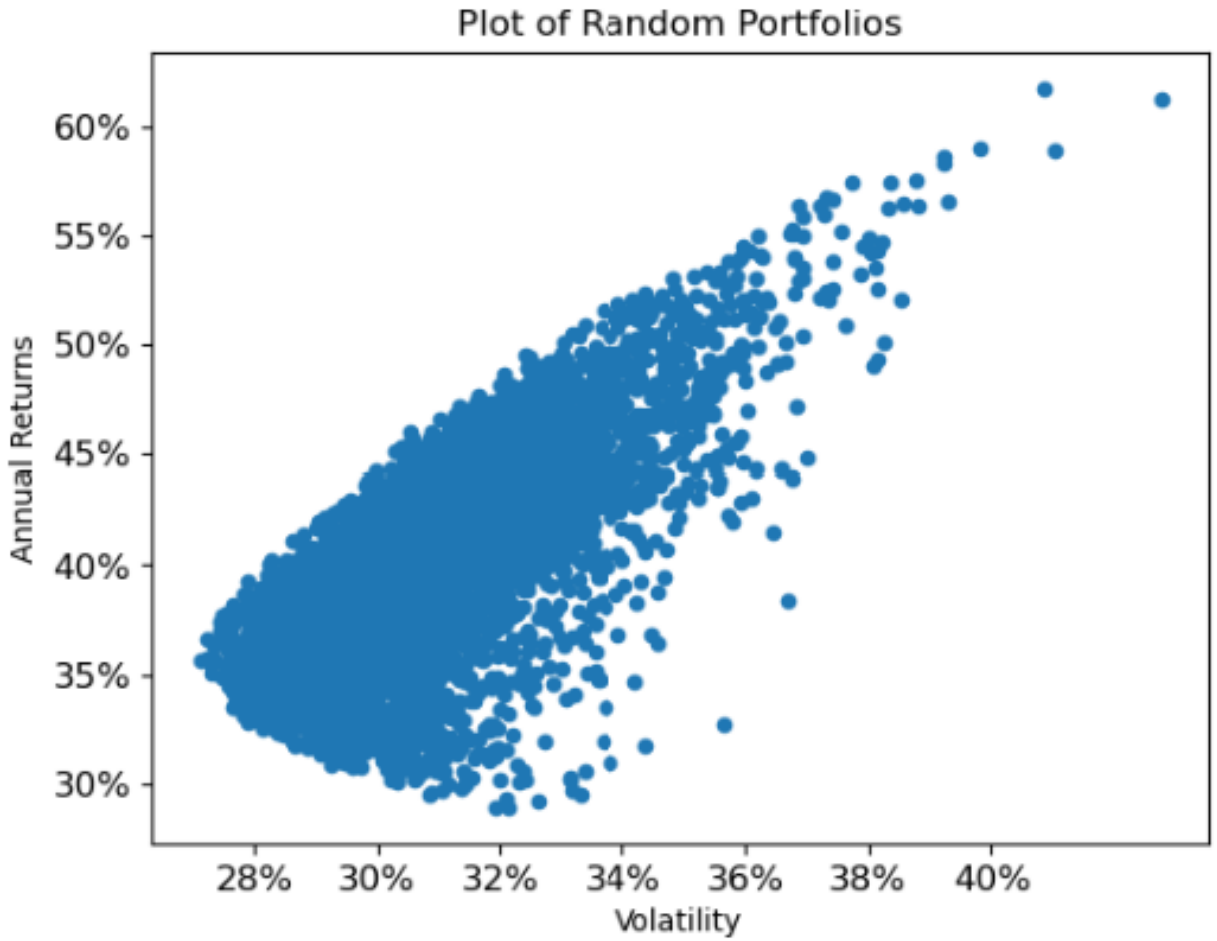


PORTFOLIO VARIANCE, VOLATILITY AND EXPECTED RETURN

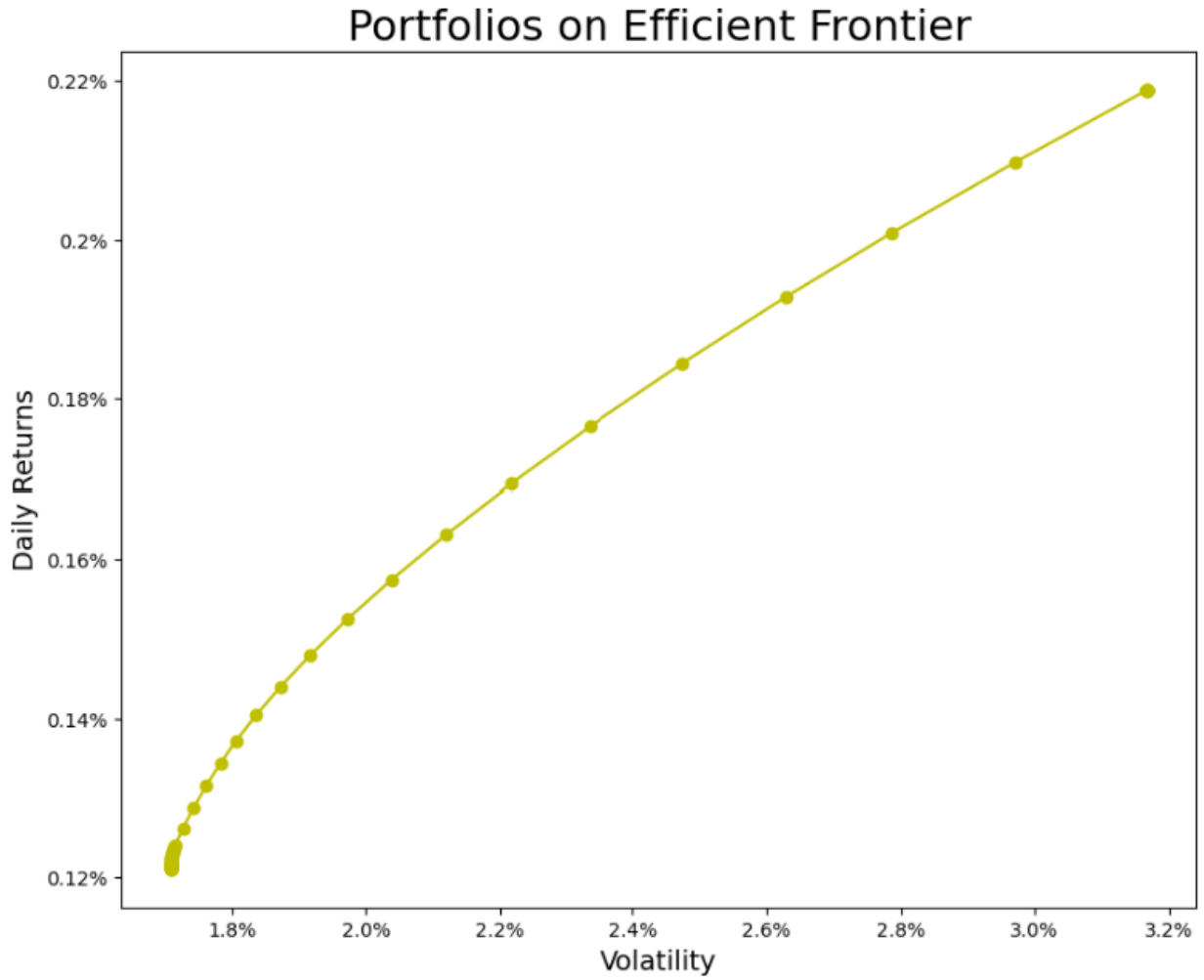
Using the adjusted close value of the stocks from the 1st of July 2017, to the 1st of July 2023, the variance, volatility and expected return of a portfolio made from even parts (20%) of each of the five tech stocks are:

- Expected Annual return: **33.22**%
- Annual Volatility: **30.60**%
- Annual Variance: **9.36**%

PLOT OF 5,000 RANDOM PORTFOLIOS



PORTFOLIOS ON THE EFFICIENT FRONTIER



PART 2 IN SUMMARY…

- By using a sample of 5,000 random portfolios, the optimal portfolios on the efficient frontier can be found.
- Using the efficient frontier, the risk-return trade off can be visualised. It once again shows that generally, to achieve higher returns, you must accept more risk.
- Portfolios on the efficient frontier represent the most efficient combinations of assets. As such the most optimised portfolio for a chosen risk can be selected.
- Diversification can be assessed through comparisons of different portfolios containing different stocks. If a portfolio lies below the efficient frontier, it suggests a less diversified investment portfolio.

TO CONCLUDE...

- The visuals created in part one show that over the last four-quarters the top five weighted tech stocks in the Nasdaq index have all increased in value.
- The higher risk stocks have higher returns, and the lower risk stocks have lower returns.
- Through the correlation matrix, it can be seen that none of the tech stocks are negatively correlated to each other.
- A portfolio of equal parts of each tech stock would generate an expected annual return of ~30%. However, the risk associate with such a portfolio is also ~30%.
- Through the efficient frontier, the most optimal portfolios for each associated risk can be determined.