ANALYSIS AND RISK ASSESSMENT OF FAAMG STOCKS

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Abstract: The FAAMG stocks refer to the major tech companies that have shown the highest growth since the dot com bubble erupted in the United States. The primary motive of the research is to extract information regarding these stocks and hence, statistically measure, through the moving averages trading strategy as to measure the growth of the stocks in the past 5 years. The paper seeks to statistically measure the risk factors, using the trading strategy made, and other statistical measures, to determine the best giant tech investment. FAAMG stocks, has grown immensely popular amongst investors, and are owned by some of the world's wealthiest people. Seeing the huge shift in the use of technology for everyday work, owing to the global pandemic, there has been an increasing focus in the stock prices of these giants, and subsequently has attracted potential investors. However, against contrary belief, often, we believe in conventional wisdom to invest in the companies that, on paper, and news highlights, seem most probable to yield high returns. Yet, this is not the case always, which is why this research brings a different paradigm into assessing the market stability and risks of the investments in these companies.

Introduction:

Technology, over recent years have significantly changed the way we live on this planet. With the nature of the pandemic that surrounds us as we speak, our lives have become indulged in technology more than ever. Hence, this becomes a considerable time to emphasize on the stocks of the most popular technology companies to draw significant conclusions, from an investors' point of view amongst these stocks.

The FAAMG stocks, the term coined by Goldman Sachs, consist the premium stocks of tech companies probably are the most well-known around the world. The stocks are Facebook, Apple, Amazon, Microsoft, and Google/Alphabet. These are the biggest tech companies in the world, thus the speculation surrounding them is immense, hence forming the need to analyse these stocks in detail to establish and measure the potential that they have from the views of the typical investor.

The consumer base of these companies has, in no doubt have reached households across the world, ranging from lower middle class, to the extremely rich, whilst impacting millions of people and the way they carry out their daily routine. It is due to their underlying capacity to expand even further, and to their continuous innovations in the tech sphere that it remains a pertinent mindset amongst people to invest in one of the fastest growing stocks in the world.

Additionally, these stocks have accumulated a market capitalization of a stunning $4.1 trillion dollars as of January,2020, with the likes of Apple being the first trillion-dollar company in the world. Interestingly, while they are only 1% of the total stocks listed on the S&P500 index, they accumulate a massive 13% of the total weighted value.

Big data has proven to be highly influential in the world of finance, with many investors relying to supercomputers to direct them into making the most profitable trades with relatively lesser risk quotients. With the significant noise created by fluctuations in the world of financial markets, technical analytics provides the prerequisites to enable the optimum trading strategies that allow traders to instantiate trades withing milliseconds, much faster than humans could be. This major leap of the integration of the financial and technological systems have majorly resulted in high-frequency trades happening on the floors of Wall Street with more and more people getting acquainted to the idea of letting a machine drive their investments.

It is with this, that the research on the risks generated by these stocks become imperative in nature that could provide insights into the aspects of growth and wealth creation from investing in these high-profile stocks.

Methodology:

The research focuses on using statistical methods using python in order to derive results and assess the reward of investing in these stocks over the past 20 years. The primary source of data is secondary and have been taken from Yahoo Finance, that provides accurate financial data.

The major emphasis lies into creating a trading strategy using moving averages across the 10- and 50-day averages, and subsequently virtually investing in these stocks at the most optimum period. The same trading algorithm is used for all the respective FAAMG stocks, which could provide us with a basic conclusion on the returns of investments of the stocks. Further the paper would go on to assess market risks of these stocks, whilst also, using regression models to fit in data, in an attempt to find their growth over the decade.

The trading strategy that has been executed involves the use of Moving averages over the 10-and 50-day periods, where, if the 10-day moving average is higher than the 50-day average, the algorithm invests in the market, else it does not. It indicates to long 1 share of the stock, otherwise denotes 0, that means doing nothing.

ALGORITHM:

- 10-day rolling means (MA-10) of the Closing Amount of the stock
- 50-day rolling means (MA-50) of the Closing Amount of the stock
- Create a list comprehension: 'Shares': [1 if MA-10 > MA-50 else 0 for range of dates]
- Difference in daily values: Close of next day – Close of today
- Create a list comprehension for the profit gained or loss incurred from the stocks: 'Profit': [Difference in daily values where 'Shares==1' else 0 for range of dates]
- Total wealth= Add profit or subtract losses of all days

The above algorithm would provide us with the basic profit or losses applicable using the underlying trading strategy. Further, the paper will draw conclusions upon the growth of the stocks and the estimation of the stock value through regression models.

The equation of the regression model is as follows:

$Y = B_1 + B_2 * x + U_t$ --------------------------(Eq.1)

Where:

Y= Closing value/ Value of stock

B_1= Intercept of the model

B_2= Coefficient of independent value (Date in natural numbers, starting from 1-1-15)

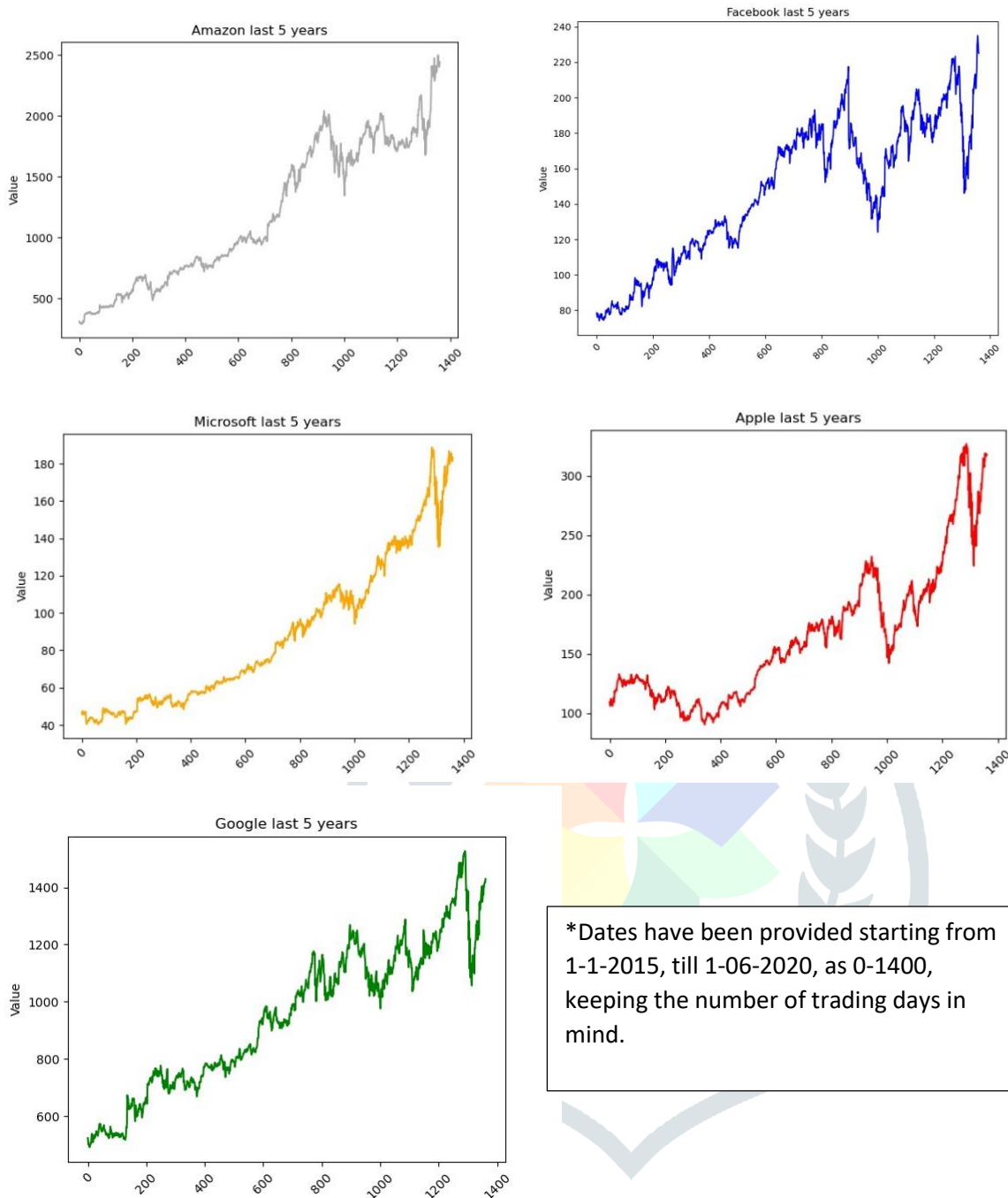U_t= Mean residual Error as calculated by the regression model

The equation used to calculate the CAGR is:

CAGR= ((Final Day's Value/Intercept) ^(1/t))-1

Where:

T= time in years; that is 5.5 years for all the stocks

OVERVIEW OF THE STOCKS:

*Dates have been provided starting from 1-1-2015, till 1-06-2020, as 0-1400, keeping the number of trading days in mind.

Visualizing the data of the last 5 years show a high upward trend amongst all the stocks. This provides further insights upon the popularity amongst investors gained by these companies. However, at this juncture, it becomes more important to find an estimation to the rise of the values in the stocks. This estimation is provided with the help of regression models in this research. Further, the graphs also visualize the fact that the companies are on the verge of recovery from the pandemic as indicated by their stock prices.

FACEBOOK:

The basic statistics of the dataset emerging from the stock values of Facebook are as follows:

Statistics	Close	Open
count	1361	1361
mean	147.078	147.014
std	39.755	39.705
min	74.05	74.04
25%	114.6	114.42
50%	151.38	151.69
75%	179.78	179.6
max	234.91	239.77

We further, feed the dataset acquired for Facebook into the algorithm created:
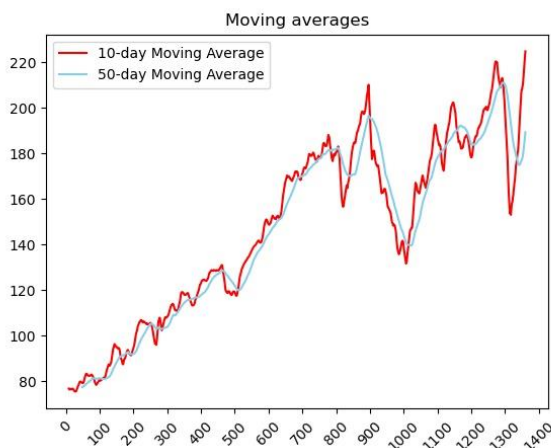
We invest into a share whenever the 10-day moving average is more than the 50-day moving average.

The following are the plots of the profits or losses incurred per trade, and the wealth accumulated over time.
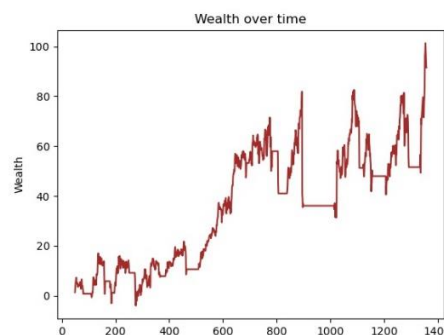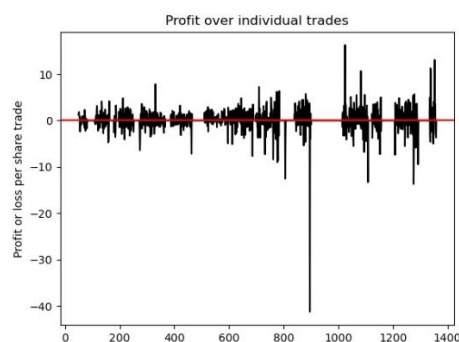
Total money you win is 91.51

Total money you spent is 78.07

Ratio of winning to spending: 1.172

Hence, we notice that there is a high return to investment. Further, the risk of the trades are calculated:

We calculate the log return and normalize the data using scientific computation. This provides us with results to obtain the risk assessment of the investments. We can see that the graph is a more or less a normal distribution, which suggests that there is a high probability for returns closer to 0.

Subsequently, we find the risk of the investments.

The Probability that the stock price of Facebook will drop over 5% in a day: 0.0048

The Probability that the stock price of Facebook will drop over 10% in a day: 1.4087e-07
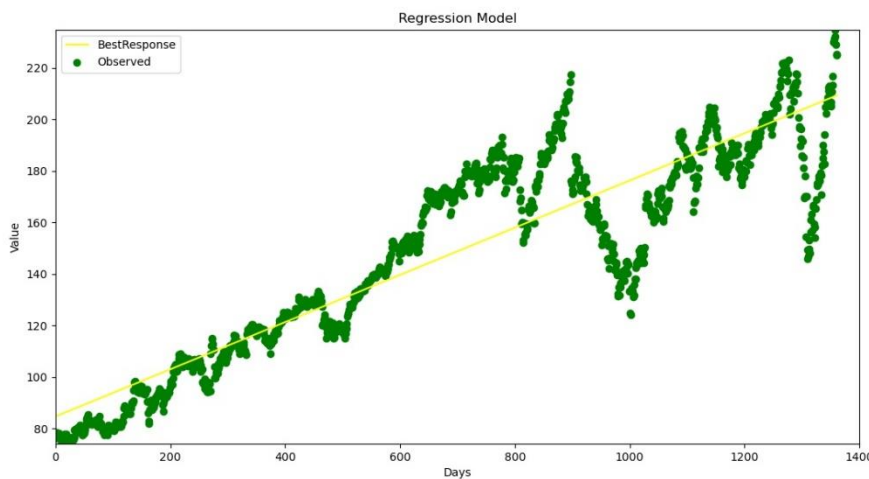
The probability of dropping over 40% in 220 days is 0.025

The probability of dropping over 20% in 220 days is 0.102

Single day value at risk -0.0315

95% confidence interval is (-0.000268, 0.00182)

Further, we look at the daily growth rates of the model as calculated by the regression model used.

The equation of the regression model as shown by the Best Response line is as follows:

$$Y = 84.689 + 0.0916 * x + 12.624$$

$$Y = 97.313 + 0.0916 * x$$

	coefficient	Standard Error	t
Intercept	84.689	0.914	92.616
Day	0.0916	0.001	78.768
R-squared	CAGR:	Kurtosis	Skewness
0.82	0.195%	3.687	-0.15

Hence, the Annual Growth rate is predicted as $0.0916 per day according to the graph.

The R squared score of 0.82 score indicates that we have predicted the data with high accuracy, particularly given the highly noisy nature of financial data.

APPLE:

Basic statistics emerging from the Apple Dataset is as follows:

	Close	Open
count	1361.000000	1361.00
mean	164.944519	164.799280
std	56.499372	56.270310
min	90.339996	90.000000
25%	116.760002	116.779999
50%	155.839996	155.839996
75%	194.809998	194.860001
max	327.200012	324.739990

We feed the data into the algorithm:
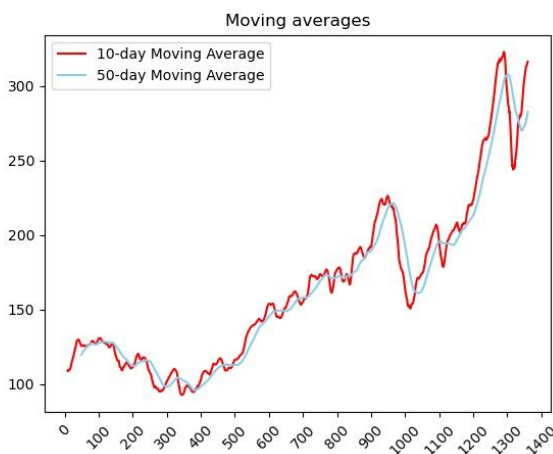
We invest into a share whenever the 10-day moving average is more than the 50-day moving average.

Below, we plot the daily profit or loss of the shares bought, and the accumulated wealth over time:
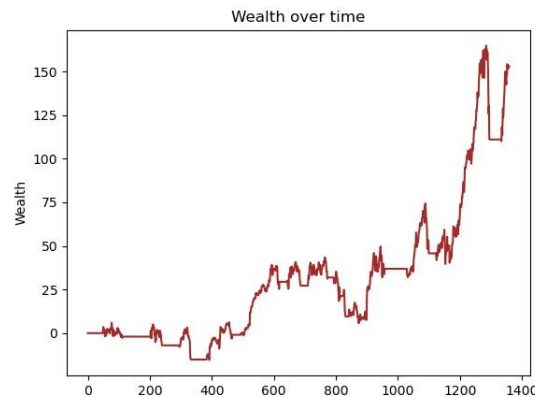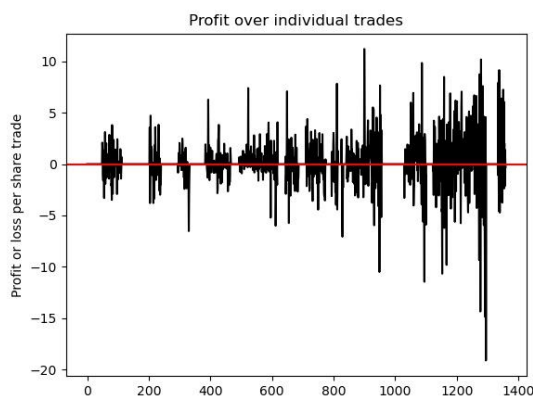
Total money you win is 152.87

Total money you spent is 109.33

Ratio of return: 1.398

Further, the risks following the trade is calculated:

The similar methods have been used for all the stocks involved to enhance the credibility of our results and make a more comprehensive comparable study.

The risks calculated are as follows:

The Probability that the stock price of Apple will drop over 5% in a day: 0.00236

The Probability that the stock price of Apple will drop over 10% in a day: 1.0248347e-08
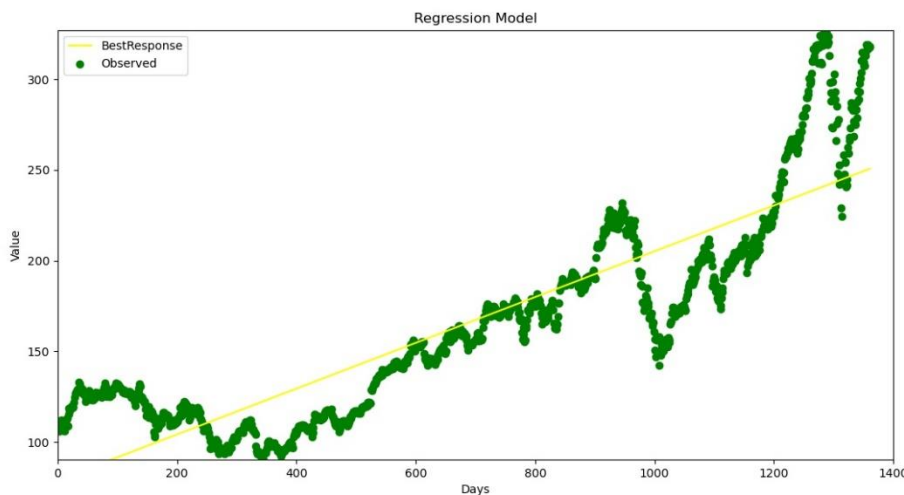
The probability of dropping over 40% in 220 days is 0.0158

The probability of dropping over 20% in 220 days is 0.081

Single day value at risk -0.0288

95% confidence interval is (-1.6397e-05, 0.00159)

Further is the daily growth rate, expressed using the regression model.

The regression equation is as follows:

$$Y = 79.015 + 0.126 * x + 21.31$$

$$Y = 100.325 + 0.126 * x$$

	coefficient	Standard Error	t
Intercept	79.015	1.469	53.795
Day	0.126	0.002	67.540
R-squared 0.77	CAGR: 0.291%	Kurtosis 3.33	Skewness 0.749

Hence, the Annual Growth rate is predicted as $0.126 per day according to the graph.

R-squared score of 0.77 indicates that the regression model predicts the data with high accuracy, thus providing us with accurate results.

AMAZON:

The basic statistics of Amazon stocks are as follows:

Statistics	Close	Open
count	1361.00	1361.00
mean	1188.42	1188.46
std	575.53	575.45
min	286.95	286.28
25%	693.97	691.88
50%	995.95	998.98
75%	1760.336	1756.98
max	2497.94	2500.00

On feeding the data into the algorithm we get:
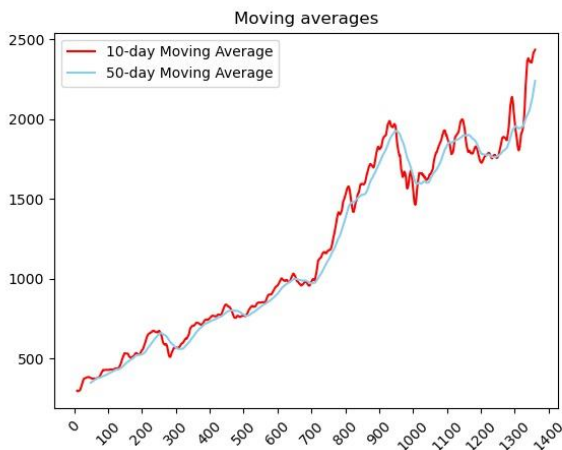
*Dates have been provided starting from 1-1-2015, till 1-06-2020, as 0-1400, keeping the number of trading days in mind.

The following are the plots of the profits or losses incurred per trade, and the wealth accumulated over time.
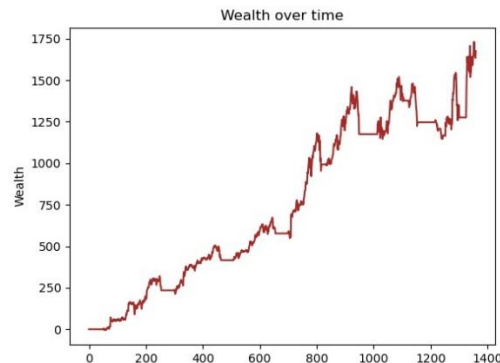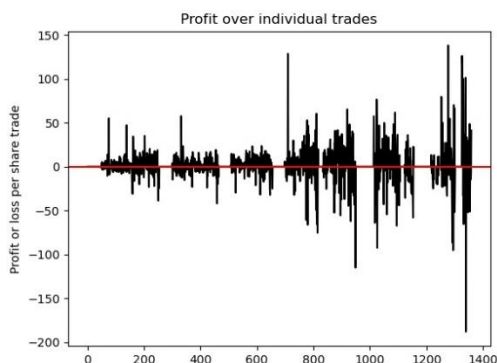
Total money you win is 1675.6

Total money you spent is 308.52

Ratio of return: 5.431

The risks on the investments are calculated:

The Probability that the stock price of Amazon will drop over 5% in a day is: 0.00342

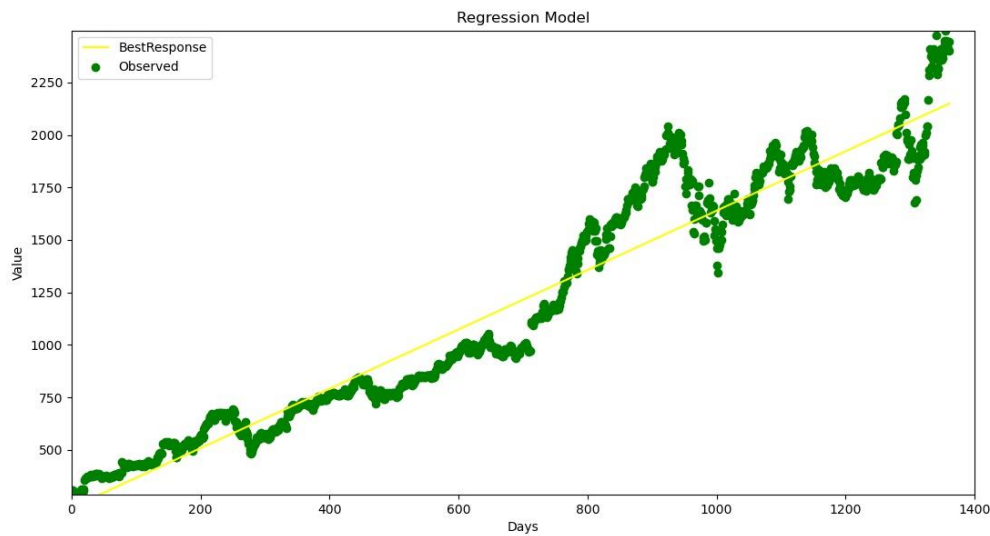The Probability that the stock price of Amazon will drop over 5% in a day is: 4.9358e-08

The probability of dropping over 40% in 220 days is: 0.00466

The probability of dropping over 20% in 220 days is: 0.0292

Single day value at risk is: 0.0298

95% confidence interval is (0.000672, 0.00237)

We hence compute the daily growth by the regression model created:

The regression equation is as follows:

$$Y = 225.97 + 1.413 * x + 122.132$$

$$Y = 348.102 + 1.413 * x$$

|	coefficient	Standard Error	t
Intercept	225.97	8.173	27.647
Day	1.413	0.010	135.95
R-squared 0.93	CAGR: 0.541%	Kurtosis 3.261	Skewness 0.673

Hence, the Daily Growth rate is predicted as $1.41 per day according to the graph.

MICROSOFT:

The summary statistics for Microsoft are as follows:

Statistics	Close	Open
count	1361.0	1361.0
mean	87.71	87.69
std	38.75	38.76
min	40.29	40.34
25%	54.25	54.25
50%	74.26	74.18
75%	111.70	111.4
Max	188.70	190.64

We feed the data we have on Microsoft to the algorithm:
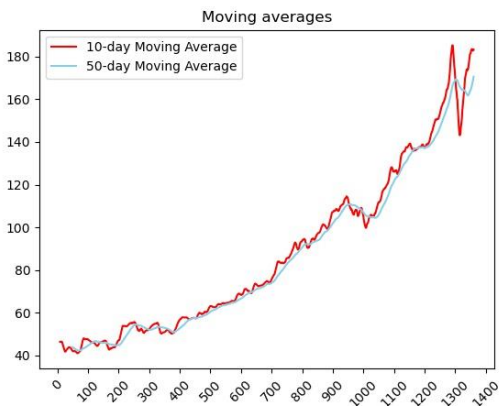
We invest into a share whenever the 10-day moving average is more than the 50-day moving average.

Following are the wealth and profit plots over time
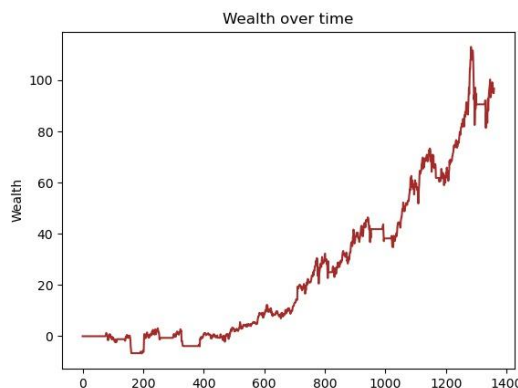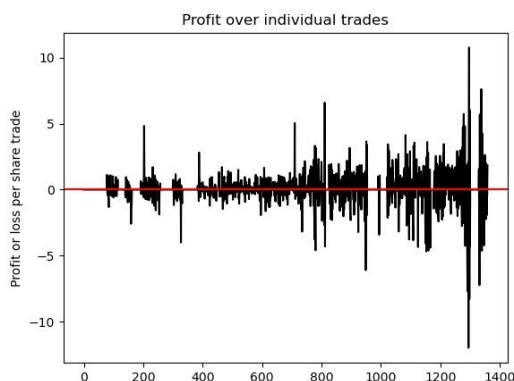
Total money you win is 96.78

Total money you spent is 46.76

Ratio of returns: 2.069

The risks of the investment are calculated as below:

The Probability of Microsoft shares dropping 5% in a day is: 0.00164

The Probability of Microsoft shares dropping 10% in a day is: 2.882e-09
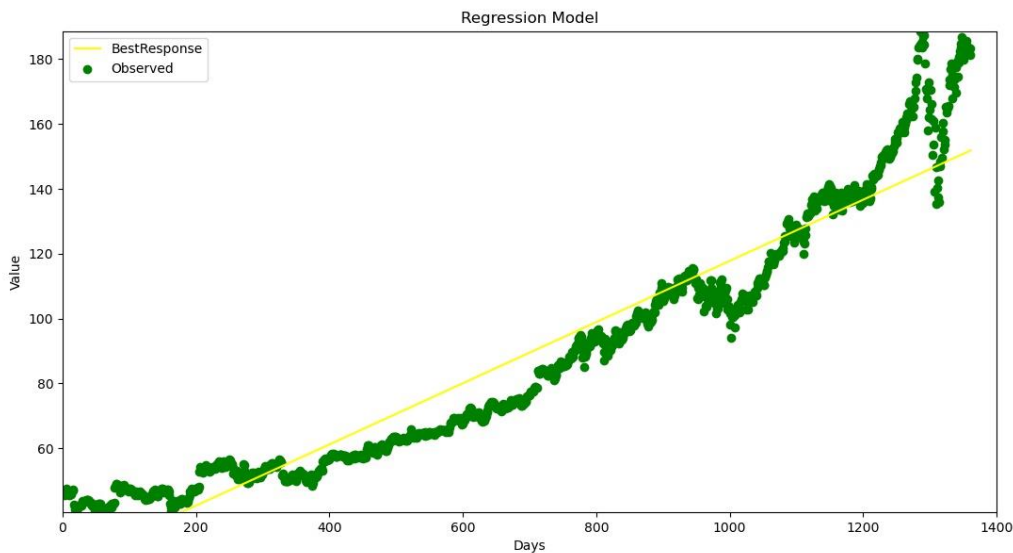
The probability of dropping over 40% in 220 days is 0.00787

The probability of dropping over 20% in 220 days is 0.0509

Single day value at risk -0.0275

95% confidence interval is (0.000231, 0.001778)

Further, we compute the daily growth using the regression model:

The equation of the model is as follows:

$$Y = 23.48 + 0.094 * x + 9.15$$

$$Y = 32.63 + 0.094 * x$$

	coefficient	Standard Error	t
Intercept	23.48	0.613	38.31
Day	0.094	0.001	120.99
R-squared 0.91	CAGR: 0.452%	Kurtosis 3.816	Skewness 1.001

Hence, the Daily Growth rate is predicted as $0.094 per day according to the graph.

GOOGLE:

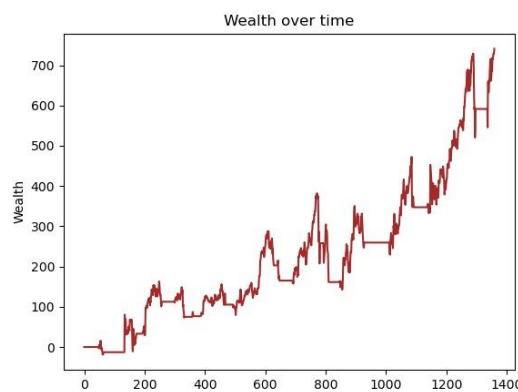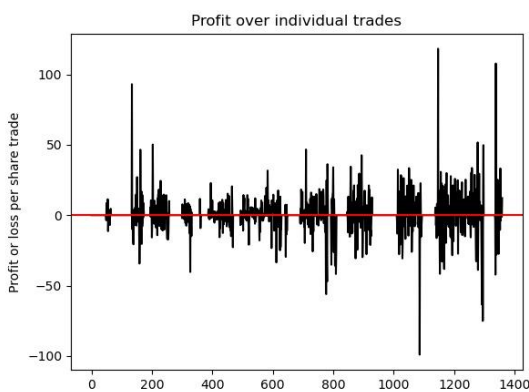Following are the basic statistics calculated using the Google Dataset.

Statistics	Close	Open
count	1361.0	1361.0
mean	945.62	945.158
std	251.205	250.664
min	491.20	493.29
25%	739.15	738.28

50%	965.40	959.97
75%	1146.32	1143.98
Max	1526.68	1525.07

We feed the data into the algorithm to find the money spent and the wealth generated:

We invest into a share whenever the 10-day moving average is more than the 50-day moving average.
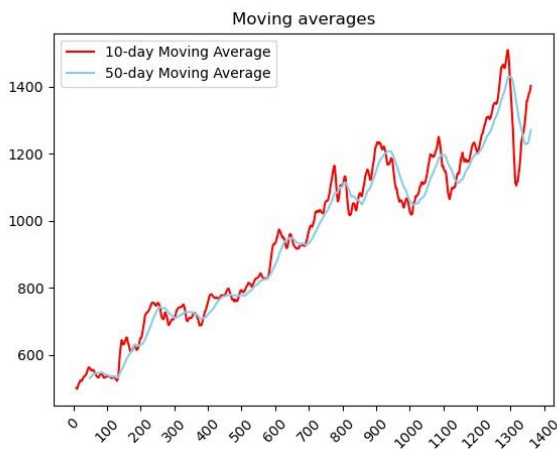
Further, we plot the daily profit or loss, and the wealth generated:

Total money you win is 740.965

Total money you spent is 523.373

Ratio of return: 1.415

The risk of the investment is calculated as below:

The Probability of Google shares dropping 5% in a day is: 0.00125

The Probability of Google shares dropping 10% in a day is: 9.575e-10
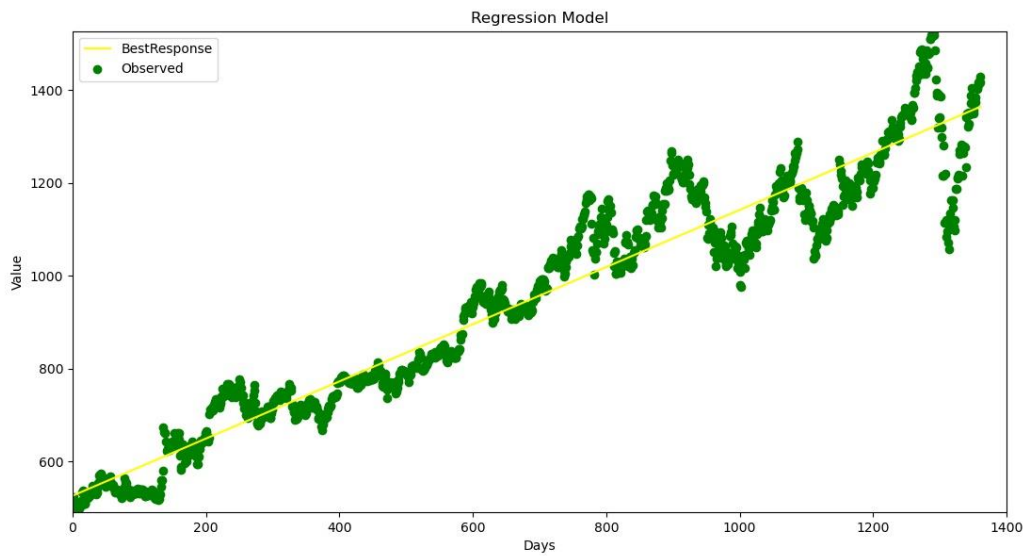
The probability of dropping over 40% in 220 days is 0.0119

The probability of dropping over 20% in 220 days is 0.0726

Single day value at risk: -0.0269

95% confidence interval is (-9.468e-06, 0.00148)

Further, the growth is calculated using the regression model:

The equation of the regression model is as follows:

Y= 526.819 + 0.615 * x + 52.168

Y= 578.987 + 0.615 * x

	coefficient	Standard Error	t
Intercept	526.819	3.712	141.91
Day	0.615	0.005	130.242
R-squared 0.92	CAGR: 0.179%	Kurtosis 4.088	Skewness 0.054

Hence, the Daily Growth rate is predicted as $1.41 per day according to the graph.

Conclusion:

Company	Ratio of returns	~Daily Growth	~CAGR	Value at Risk	Probability of Dropping 40% in 220 days.
Facebook	1.72	0.0916	0.195%	-0.0315	0.025
Apple	1.40	0.126	0.291%	-0.0288	0.0158
Amazon	5.43	1.41	0.541%	0.0298	0.0046
Microsoft	2.07	0.094	0.452%	-0.0275	0.0079
Google	1.415	0.614	0.179%	-0.0269	0.0119

The analysis shows fascinating results. When analysing the stock market trends for the biggest tech giants across the world, we notice that Apple, the first trillion-dollar company, is not the best investment to go for. Subsequently, we notice that Amazon proves to deliver a high yield of returns, with very little risk in the investment.

Apple relatively presents a relatively high probability of falling over 40% in 220 trading days, while Amazon and Microsoft provide a relatively low probability of falling over 40% in 220 trading days. Further, Amazon, presents the Value at Risk at a positive figure, hence notifying that there is in-fact a very low risk against an

investment in Amazon. Which Microsoft presents a low risk, relatively, it does not yield as high as returns as generated by Amazon, and has a weaker growth rate than Apple, Amazon, and Google.

While looking at the Ratio of returns, we notice that Amazon has produced high returns for its shareholders during the past 5.5 years, while Apple and Google, have presented relatively low returns.

Facebook, presents a low CAGR, which tells us the future scope of investing in the company is not that high, while Microsoft, which presenting a high CAGR, presents a low Growth rate, thus, presents little room for a higher return down the line. Google on the other hand, provides the least CAGR out of the top tech companies, although the high Growth rate, makes it a lucrative investment for the same, while providing a low risk.

The results of the research have comprehensively provided insights upon the investment opportunities in the global tech leaders. The major conclusion that lies ahead of the research is the fact that Amazon, has proven to be the most lucrative investment over the course of the 5 years for investors. Along with that, we find that Facebook, is not a lucrative investment under current scenarios, as it presents a high risk, along with a relatively low rate of return.

However, It is significant to note that while our research presents Amazon to be the leading lucrative investment for investors, the potential of the tech- giants should not be undermined given the hybrid rise in research in AI, that has the potential to change the world, and subsequently, sky-rocket the share prices of such giants.

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