Security Analysis and Portfolio Performance Analysis

<u>BBUS 350- BUSINESS FINANCE</u>

<u>Section C</u>

Section 1: Security Analysis

META

Sector Overview

The tech industry is a dynamic and transformative force, driving innovation, economic growth, and societal progress. Its strengths lie in its ability to innovate, disrupt, and connect people and businesses globally. However, the industry faces challenges in bridging the digital divide, addressing ethical concerns, and ensuring sustainable practices. Recent changes, such as the rise of AI, cloud computing, and mobile technologies, have reshaped the industry landscape. Looking ahead, AI-powered automation, edge computing, the IoT, and emerging technologies will further transform industries and redefine the future of technology.

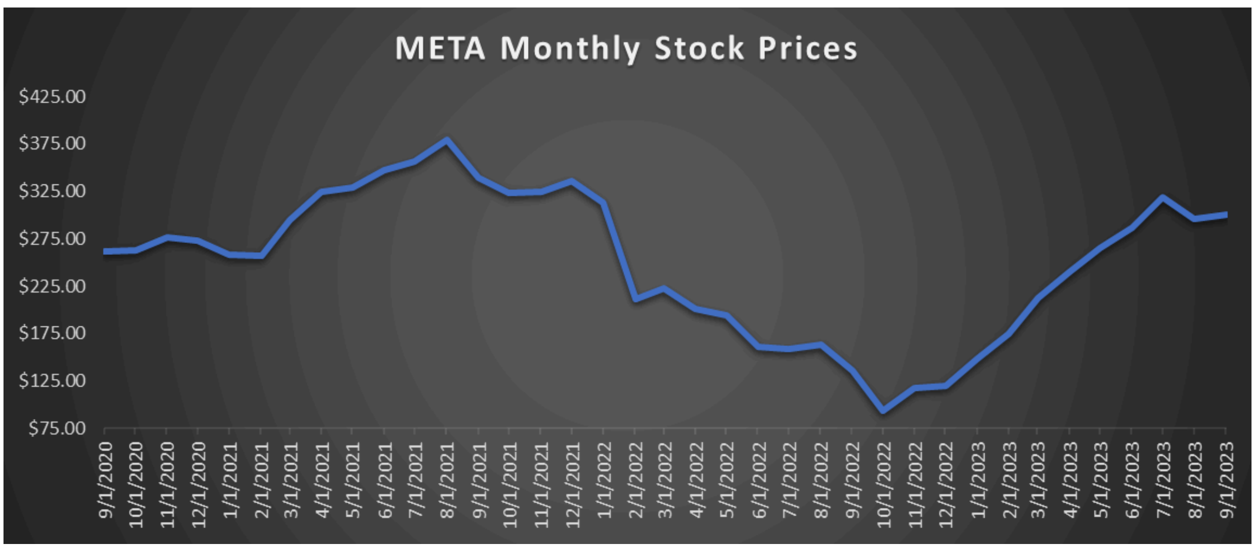
The tech industry's strengths include its ability to innovate and disrupt, its global reach, its economic impact, its problem-solving capabilities, and its versatility and adaptability. However, the industry also faces weaknesses such as the digital divide, ethical concerns, overreliance on technology, environmental impact, and cybersecurity threats. Major challenges facing the tech industry include bridging the digital divide, addressing ethical dilemmas, upskilling and reskilling the workforce, developing sustainable technology practices, and enhancing cybersecurity resilience. Recent changes in the tech industry include the rise of artificial intelligence, the growth of cloud computing, the emergence of mobile technologies, data monetization and analytics, and cybersecurity threats and responses. Upcoming changes in the tech industry include AI-powered automation and robotics, edge computing, the Internet of Things and connected devices, virtual reality and augmented reality, and emerging technologies. The tech industry is constantly evolving, and these strengths, weaknesses, challenges, and recent and upcoming changes highlight the dynamic nature of this transformative sector. As technology continues to advance, its impact on society, economies, and individuals will undoubtedly be profound and far-reaching.

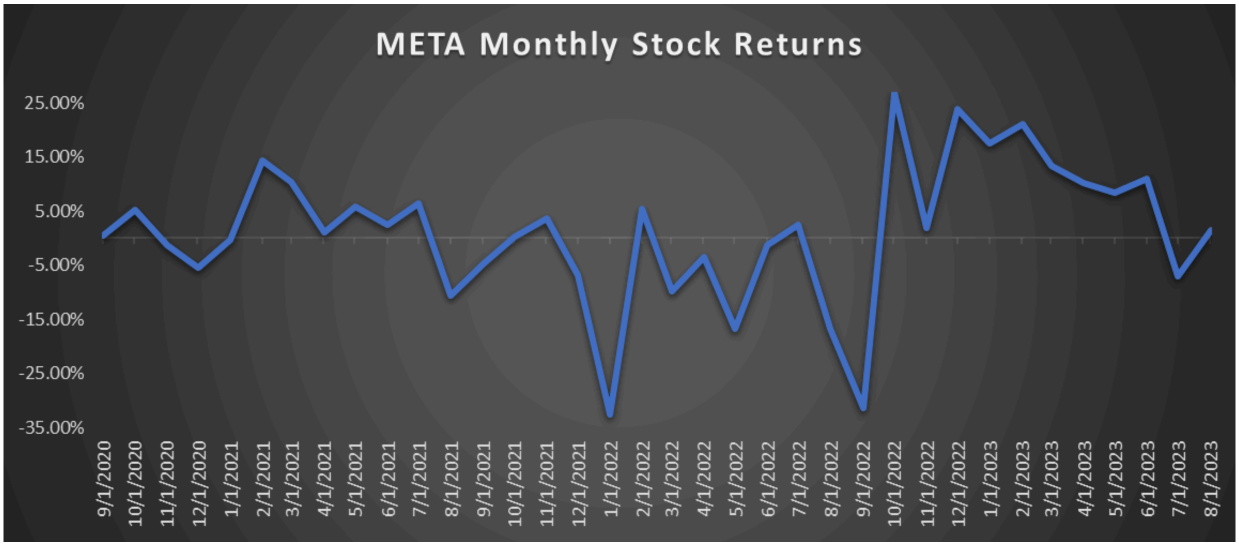
META News (September 2020 - Sept 2023)

Between 2020 and 2023, Meta, formerly known as Facebook, has been in the news for several reasons. In 2020, 48 states and territories sued the company on antitrust grounds, alongside a separate complaint from the Federal Trade Commission. The attorneys general alleged that Meta designed its Facebook and Instagram products to keep young users on them for longer and repeatedly coming back.

In 2022, Meta reportedly introduced a policy allowing Facebook and Instagram ads that question the outcome of the 2020 presidential election. This decision was met with criticism, as it was seen as a way for Meta to profit from ads that promote misinformation. These events highlight some of the challenges that Meta has faced in recent years, including legal issues, public backlash, and the ongoing struggle to balance freedom of speech with the prevention of misinformation.

Stock Prices and Monthly Returns





Highest Returns

November 1, 2022 (26.77% Increase):
In November 2022, Meta announced a strategic restructuring, involving the layoffs of over 11,000 employees, as part of an initiative to streamline operations and concentrate on key growth areas. However, this move was overshadowed by a €265m fine related to a data protection breach.

January 1, 2023 (23.79% Increase):
In January 2023, Meta's stock surged nearly 20% after CEO Mark Zuckerberg declared the year as a 'year of efficiency.' Despite facing a third consecutive quarterly decline in revenue and a significant drop in profit for the final three months of 2022, the company exceeded Wall Street analysts' sales expectations.

Lowest Returns:

February 1, 2022 (-32.63% Decrease):

February 2022 witnessed a notable 32.6% decline in Meta's stock, triggered by disappointing financials and a cautious annual forecast, raising concerns about the company's growth trajectory.

October 1, 2022 (-31.34% Decrease):
In October 2022, Meta's stock dipped by 24.5%, marking its second consecutive quarterly revenue decline and a sharp profit decrease for the final three months of 2022.

It's crucial to contextualize these events within the broader tech industry and global economic landscape. The tech sector grappled with widespread layoffs in 2022 amid economic uncertainty. Simultaneously, global economic fluctuations, fueled by factors such as inflation and the ongoing impact of the COVID-19 pandemic, likely influenced Meta's stock performance.

Credit Ratings

Company	S&P Rating	Investment Grade
META	AA-	YES
GOOGLE	AA+	YES
MSFT	AAA	YES

The table I created provides a snapshot of the most recent credit ratings for META, Google, and Microsoft based on S&P Global.

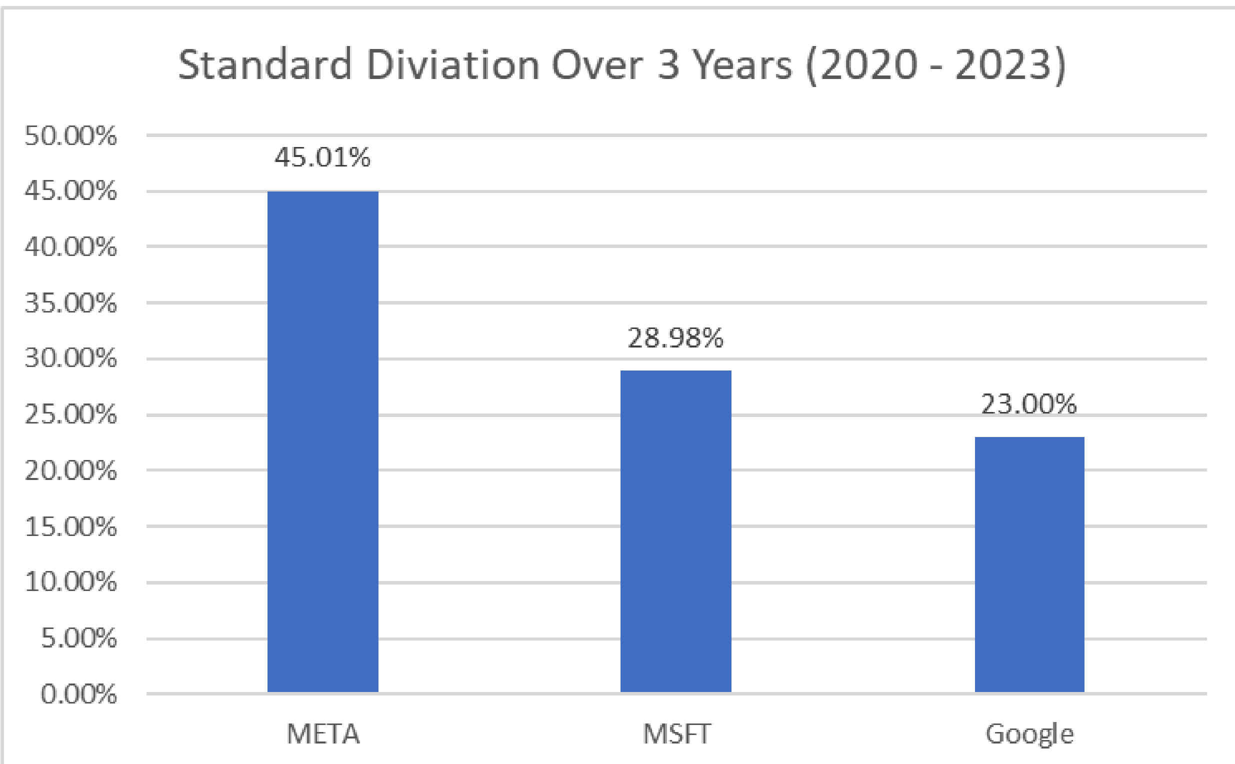
Microsoft has the highest credit rating of AAA, indicating an extremely strong capacity to meet its financial commitments. This is the highest issuer credit rating assigned by S&P Global Ratings.

Google follows closely with a credit rating of AA+, which also signifies a very strong capacity to meet financial commitments. The "+" in the rating shows that Google's standing is relatively high within the AA category.

META, on the other hand, has a slightly lower credit rating of AA-, which still represents a very strong capacity to meet financial commitments. The "-" in the rating indicates that META's standing is relatively low within the AA category.

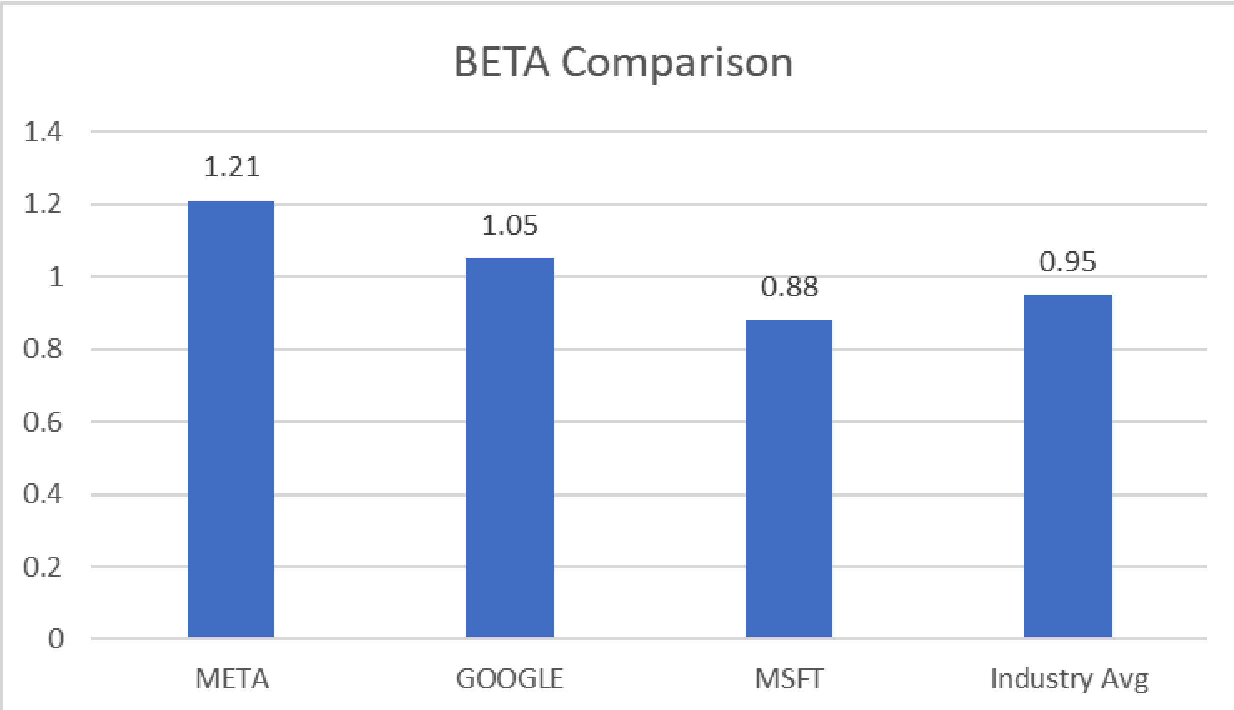
All three companies - META, Google, and Microsoft - have credit ratings that are considered investment grade. This means that they are deemed to have a low risk of default and are generally considered safe for investment

Standard Deviation



*** Calculated by using the STDEV.S(array) formula on Excel which estimates Standard Deviation Based on a given sample in this case being the monthly returns for each of the stocks over 2020 - 2023. Then I used the SQRT(12) function to get the annualized standard deviation.**

Beta Analysis



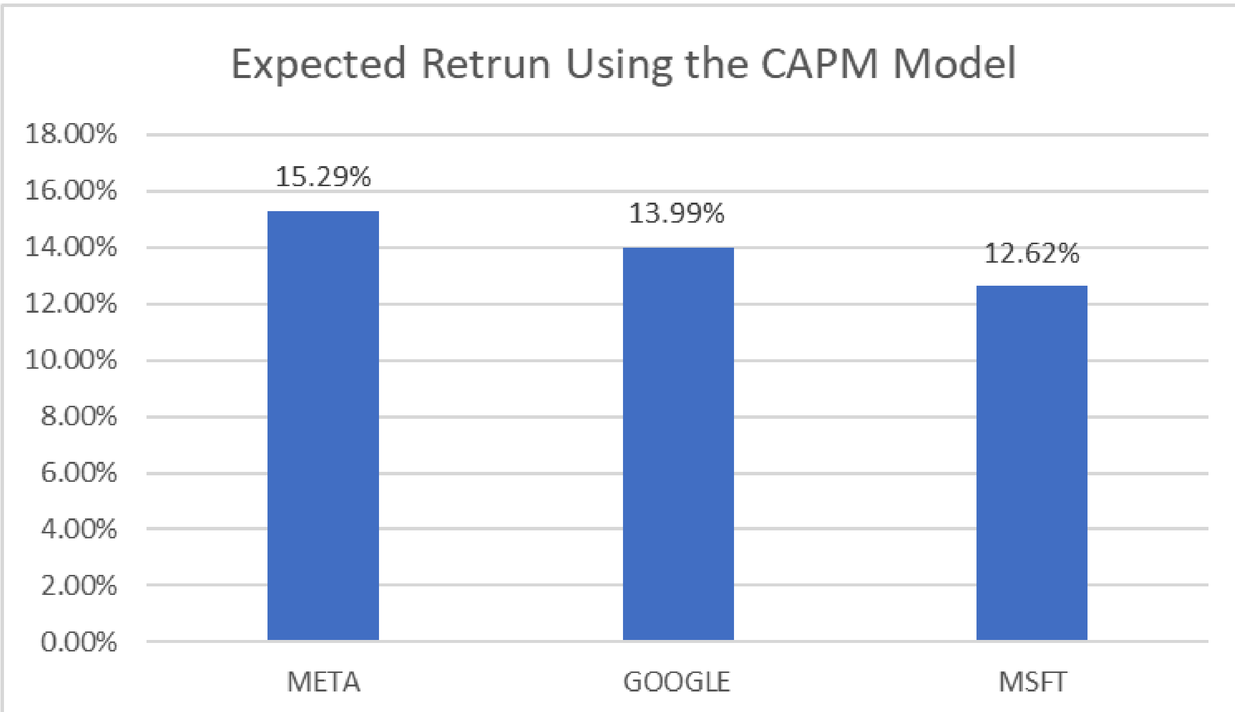
*** The formula to calculate beta is as follows:**
β=Variance(index returns)Covariance(stock returns, index returns)

Beta is a key concept in finance, representing a measure of a stock's risk in relation to the market. In other words, it's a measure of a stock's sensitivity to market movements. This measure is used in the Capital Asset Pricing Model (CAPM), a model that calculates the expected return of an asset based on its beta and expected market returns.

- **META** has a beta of 1.21, indicating that it is more volatile than the market. In practical terms, this means that META's price tends to move more than the market when the market goes up or down.
- **Google**, with a beta of 1.05, is slightly more volatile than the market. This suggests that Google's price will move slightly more than the market in response to market changes.
- **MSFT** has a beta of 0.88, making it less volatile than the market. This means that MSFT's price tends to move less than the market when the market goes up or down.

The Industry Average beta of 0.95 suggests that, on average, stocks in this industry are slightly less volatile than the market.

<u>CAPM Analysis</u>



META: 5.5%+1.21*(13.59%-5.5%)
GOOGLE: 5.5%+1.05*(13.59%-5.5%)
MSFT: 5.5%+.88*(13.59%-5.5%)

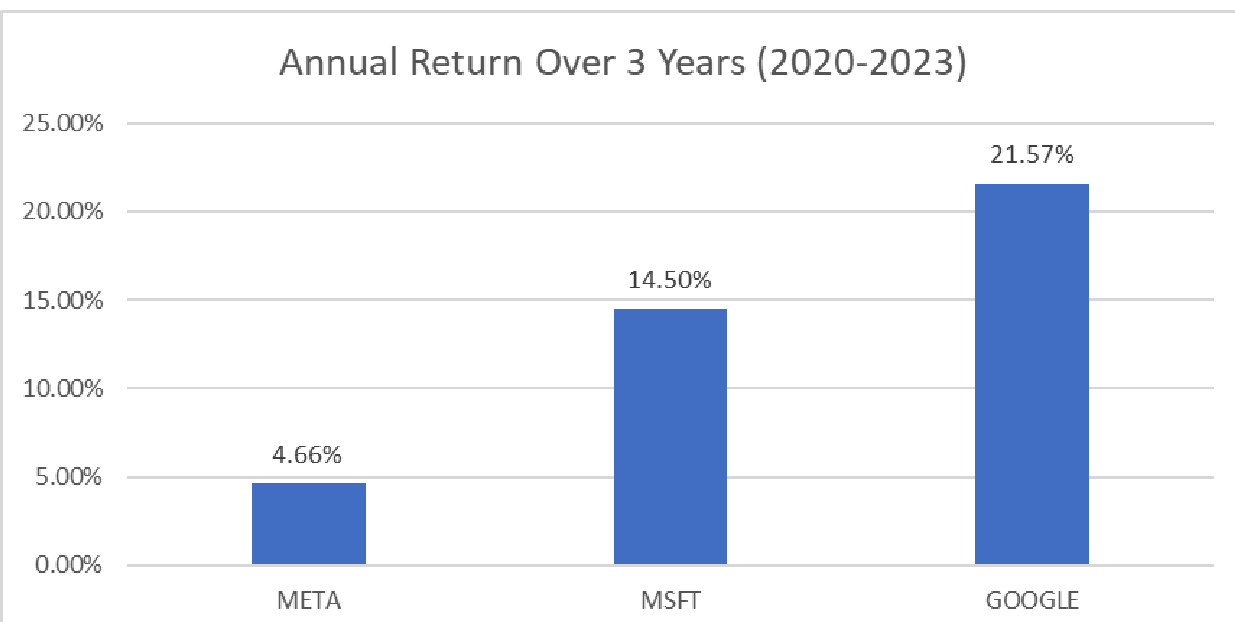
The CAPM data suggests that Meta is expected to have the highest return among the three companies, with an expected return of 15.29%. Google is expected to have the second-highest return, with an expected return of 13.99%. MSFT is expected to have the lowest return, with an expected return of 12.62%.

This is because Meta has the highest beta of the three companies, which means that it is more volatile than the market. However, it also means that Meta has the potential to earn higher returns than the market if the market goes up. Google has a beta that is slightly lower than Meta's, but it is still higher than the market. This means that Google is also expected to have a higher return than the market, but not as high as Meta. MSFT has the lowest beta of the three companies, which means that it is less volatile than the market. This also means that MSFT is expected to have a lower return than the market.

Sources:

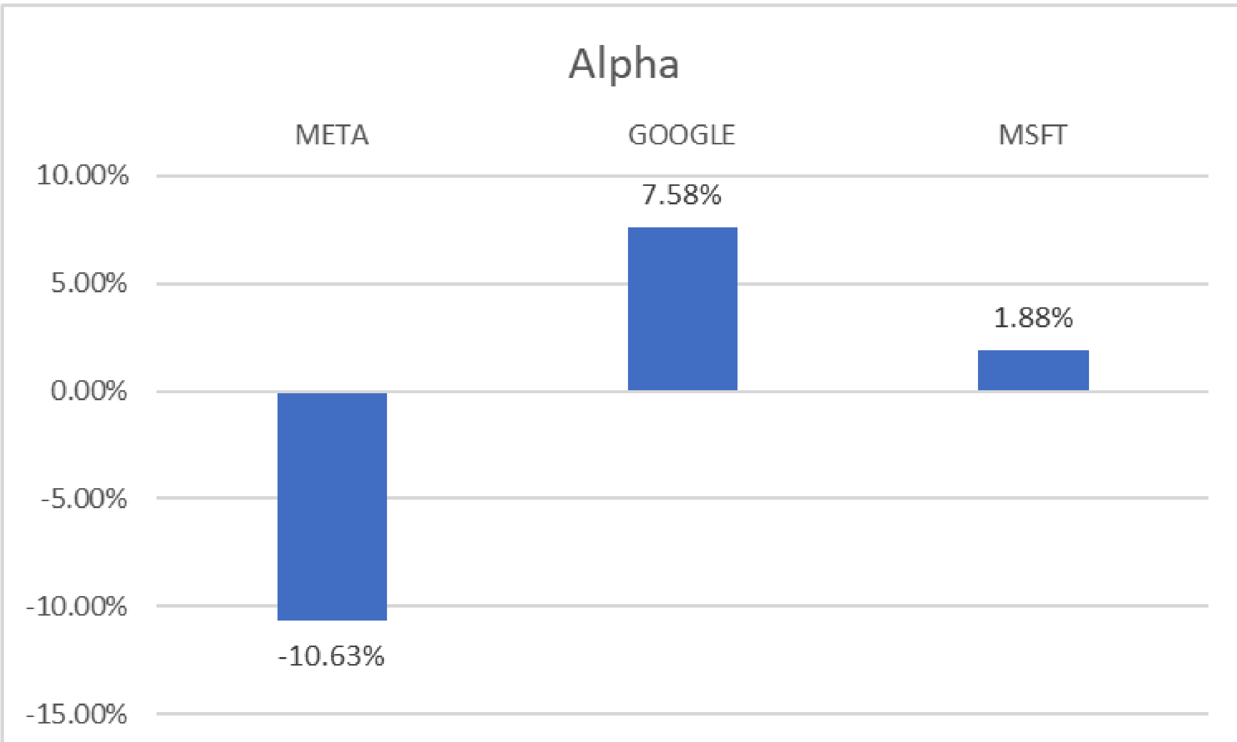
https://finance.yahoo.com/quote/META/
https://finance.yahoo.com/quote/GOOGL?p=GOOGL&.tsrc=fin-srch
https://finance.yahoo.com/quote/MSFT?p=MSFT&.tsrc=fin-srch
https://home.treasury.gov/resource-center/data-chart-center/interest-rates/TextView?type=daily_treasury_yield_curve&field_tdr_date_value_month=202311

Annual Returns



***This was Calculated By using this formula: CAGR = (Ending Value / Beginning Value)^(1/3) - 1**

<u>Alpha Analysis</u>



*** This was calculated by using the alpha formula: alpha = Portfolio Return - Expected Return Using the CAPM Model**

- Meta's alpha of -10.63% suggests that the company's stock underperformed the market over the period of time being considered
- Google's alpha of 7.58% suggests that the company's stock outperformed the market over the period of time being considered
- Microsoft's alpha of 1.88% suggests that the company's stock performed slightly below the market over the period of time being considered

Overall, the alpha data suggests that Meta is facing some challenges, while Google and Microsoft are both performing well. However, it is important to note that alpha is just one measure of a company's performance, and there are many other factors that investors should consider before making a decision.

Equifax

Sector Overview

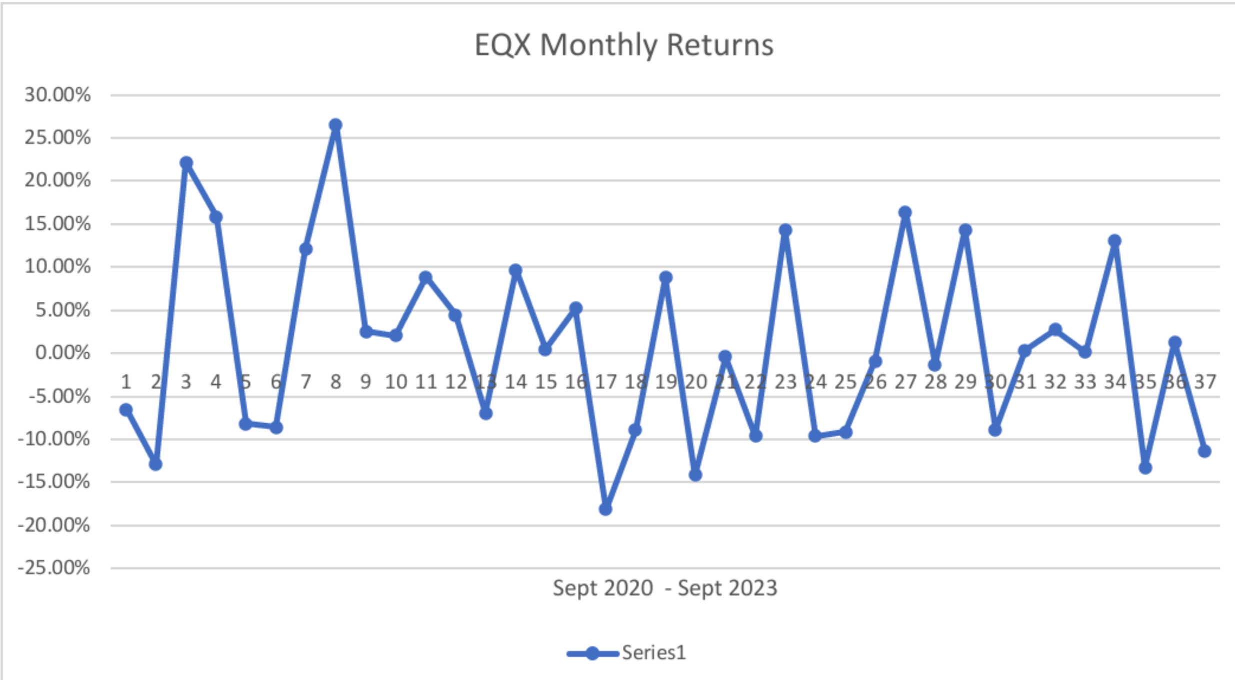
The financial data and analytics industry is a broad sector that includes a wide variety of businesses that analyze, collect, and sell financial information. They collect important financial data like credit reports and market and transaction data. They then employ their sophisticated analytics techniques in order to gain insight from the collected data and make more informed decisions concerning creditworthiness and risk management. This industry plays a pivotal role in the modern economy due to the essential information it provides to businesses, consumers, and government agencies. Financial data and analytics are important in mediating risk, preventing fraud and loss, and providing overall stability to financial markets.

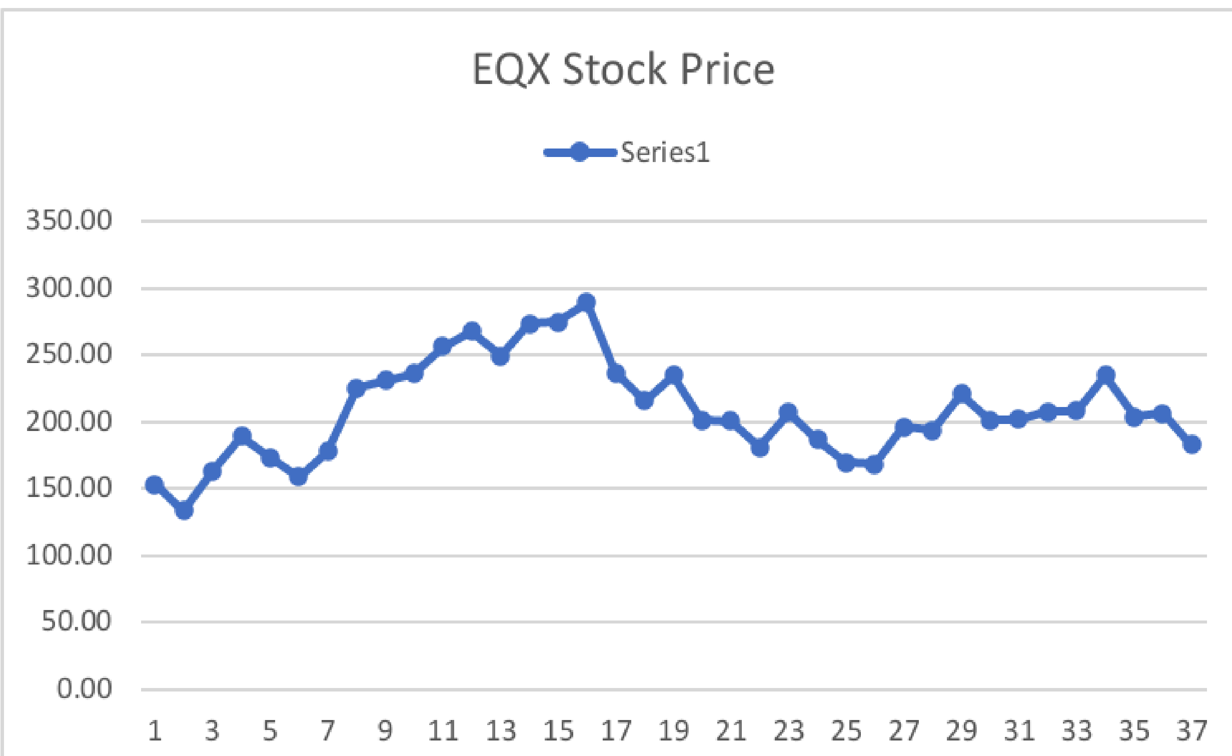
The financial data and analytics industry has four major segments: credit reporting, data analytics, fraud prevention, and market data and research. Credit reporting companies handle the collection, analysis, and sale of credit reports that provide information about an individual's creditworthiness and history. Data analytics companies provide analytics and decision support services to businesses that need assistance making informed decisions about credit risk, marketing strategies, etc. Fraud prevention companies focus on detecting and potentially preventing financial fraud such as payment fraud or identity theft. Market data and research companies provide insight into the trends and patterns in financial markets.

Equifax News (Sept 2020 - Sept 2023)

During the provided time period, September 2020 to September 2023, many important developments were made. Equifax had decided to expand its presence in Latin America by acquiring a Brazilian Credit Bureau. This opened up a new stream of revenue for the company and overall strengthened its position in that region. Equifax enhanced its data and analytics capabilities by partnering with large companies like Microsoft and Plaid. In terms of regulation and data privacy, Equifax began implementing more measures in order to protect consumer's data. Equifax also continued investing in things like cybersecurity to protect their systems from potential cyber threats.

Monthly Returns and Stock Prices





Highest Returns

- During **April of 2021** Equifax reached its highest return of 26.56%, this was because Equifax was investing a lot of resources into EFX Cloud data and was on a regular basis delivering many new products and services to meet the evolving needs of their customers. One example is the launch of the Equifax Decision Catalyst which was designed to assist businesses in making better customer-related decisions about creditworthiness and risk. During this month they also announced their partnership with Microsoft to create a cloud-based solution for managing consumer data called Equifax Data Fabric on Microsoft Azure. This was designed to help businesses comply with regulations related to data privacy and the protection of consumer data from fraud.
- During November 2020 Equifax reached its second-highest return of 22.18%, During this time Equifax focused on mediating the challenges related to their 2017 data breach while continuing to strengthen its cybersecurity position. They had also extended the deadline for their customers to file claims for the data breach class action settlement and as a result, reported strong third-quarter financials.

Lowest Returns

- During **January of 2022** Equifax's return reached its lowest return of -18.11, During this time Equifax was focusing its resources on addressing the fallout of its 2017 data breach. They had reached a settlement and began giving out payments to the consumers affected, overall causing a low return for that period

- During April of 2022 Equifax's return reached its second lowest return of -14.16%, During this time Equifax had had a significant coding error in their online model platform, OMS. This caused many miscalculations of certain credit attributes for consumers and impacted their credit scores as well as lending decisions

Credit Ratings

Company	S&P Rating	Investment Grade
EQUIFAX	BBB	YES
EXPERIAN	BBB	YES
TRANSUNION	BB+	NO

Equifax's Credit Rating is a BBB, This rating is considered to be Investment grade meaning Equifax is a relatively low credit risk. They are also considered stable, rating agencies do not expect this rating to change in the near future

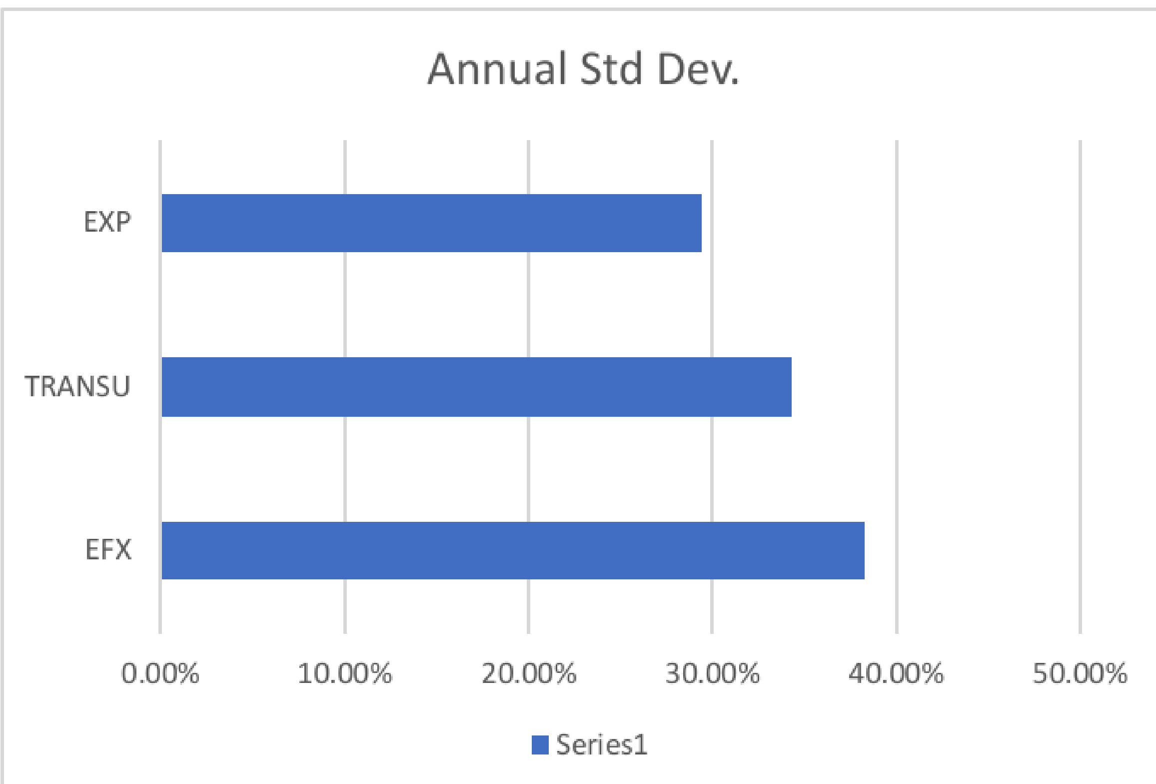
TransUnion's Credit Rating is a BB+ according to the S&P Global Ratings, This rating indicates they are considered to be a higher credit risk and therefore are not Investment-grade. Credit rating agencies do not expect this to change in the near future

Experian's Credit rating is a BBB so they are in a similar position as Equifax where they are considered stable and a low credit risk. Rating agencies do not expect this to change in the near future.

Sources:

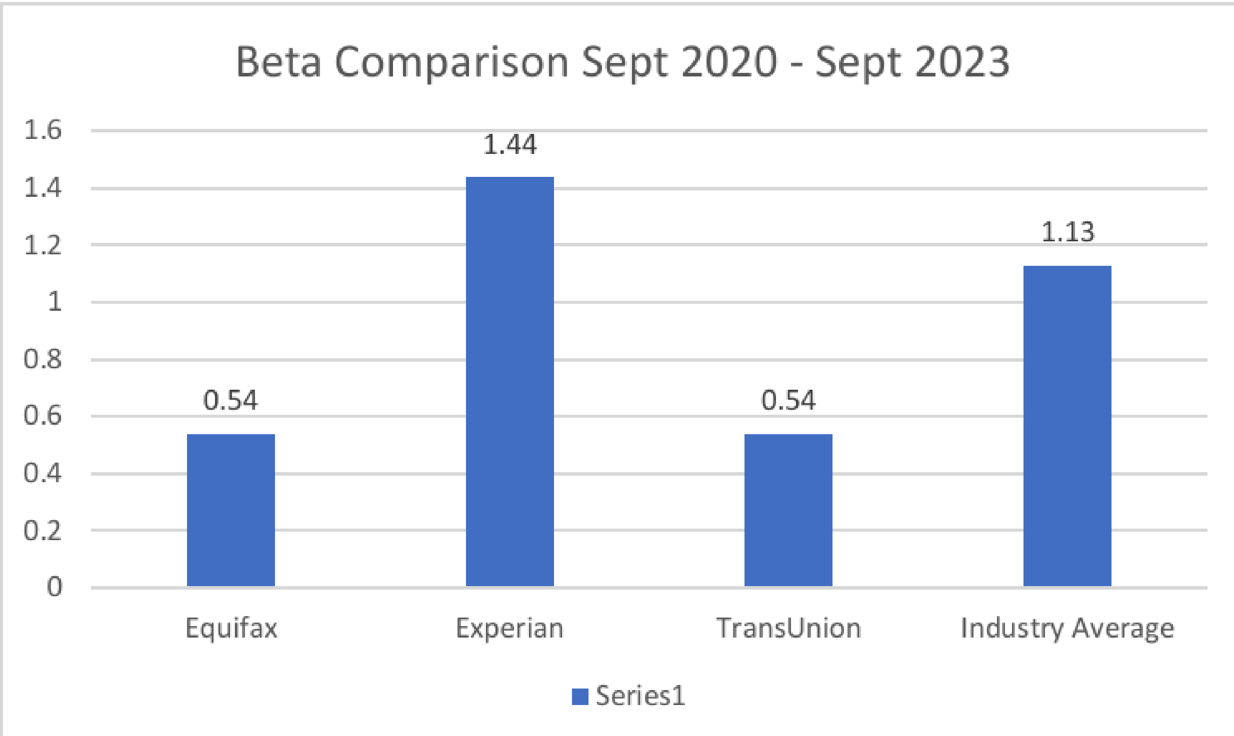
Equifax Inc. - Ratings Actions | S&P Global Ratings; (Disclosure.spglobal.com)
TransUnion LLC Credit Rating | S&P Global Ratings (Disclosure.spglobal.com)
Disclosure.spglobal.com

Annual Standard Deviation



***Found by taking the monthly returns for each company from September 1, 2020 through September 1, 2023, finding the Standard Deviation of each using Excel, and multiplying those values by the square root of 12.**

Beta Analysis



Beta is a measure of a stock's volatility in relation to the overall market, Equifax and Transunion have a Beta of 0.54 which is below the industry average of 1.13. This indicates a lower volatility and therefore a less risky stock than what the industry is used to. This also indicates a lower sensitivity in general meaning the stock does not experience drastic changes from one year to the next, rather they change slowly over time.

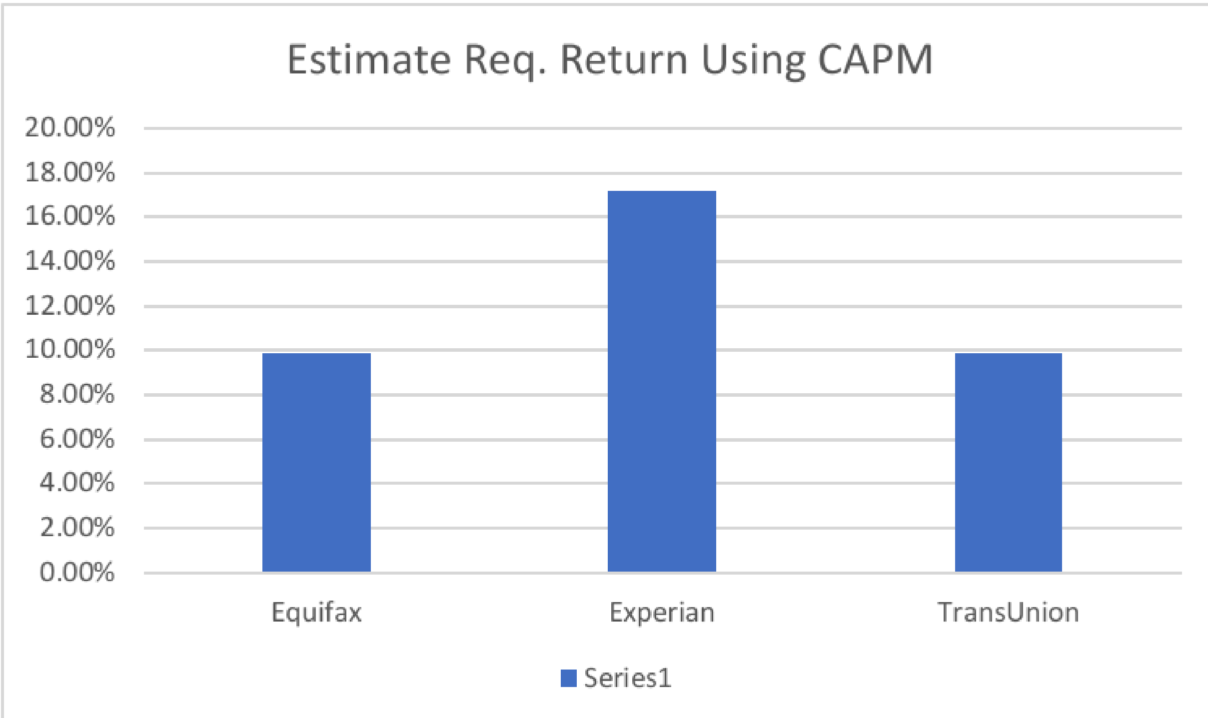
The Beta for Experian is 1.44 showing they have more non-diversifiable risk compared to Equifax, TransUnion, and the credit reporting / financial data and analytics industry as a whole. This means consumers need more compensation from Experian to be satisfied because they are stuck with more non-diversifiable risk and the higher the beta, the more risky it is.

Sources:

https://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/Betas.html

https://finance.yahoo.com/quote/EXPGY?p=EXPGY&.tsrc=fin-srch
https://finance.yahoo.com/quote/EFX/history?period1=1541289600&period2=1699056000&interval=1mo&filter=history&frequency=1mo&includeAdjustedClose=true
https://finance.yahoo.com/quote/TRU/

CAPM Analysis



The Estimated Required Return using the CAPM model tells us how much return we expect given a stock's riskiness. It tells us how much we should get rather than what we actually get so this percentage return is not guaranteed. It was calculated by taking the risk-free rate(Rf), and adding it to the Beta(B) multiplied by the expected return of the market(Rm) subtracted by the risk-free rate(Rf).

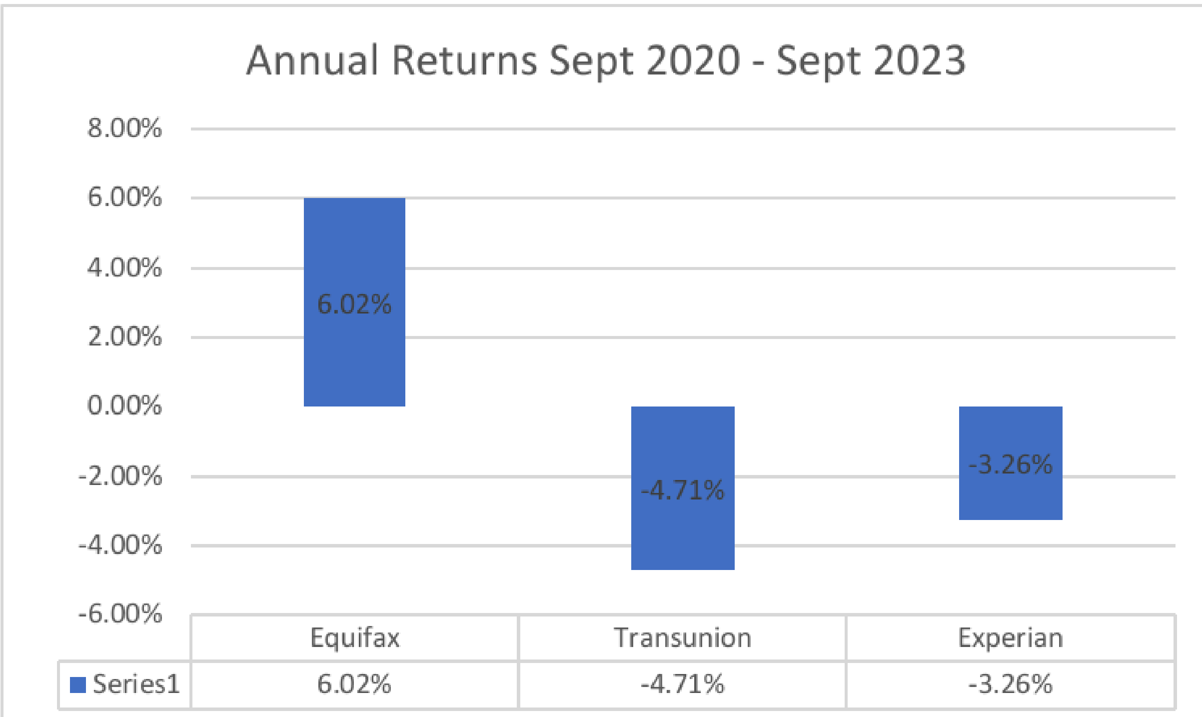
Expected Required Return = Rf + B (Rm - Rf)

Equifax = .055 + 0.54 (.1359 - .055) = 9.87%
TransUnion = .055 + 0.54 (.1359 - .055) = 9.87%
Experian = .055 + 1.44 (.1359 - .055) = 17.15%

Equifax and TransUnion both had a CAPM of 9.87% which compared to the markets expected return of 5.5% shows that the stock of these two companies may be underpriced

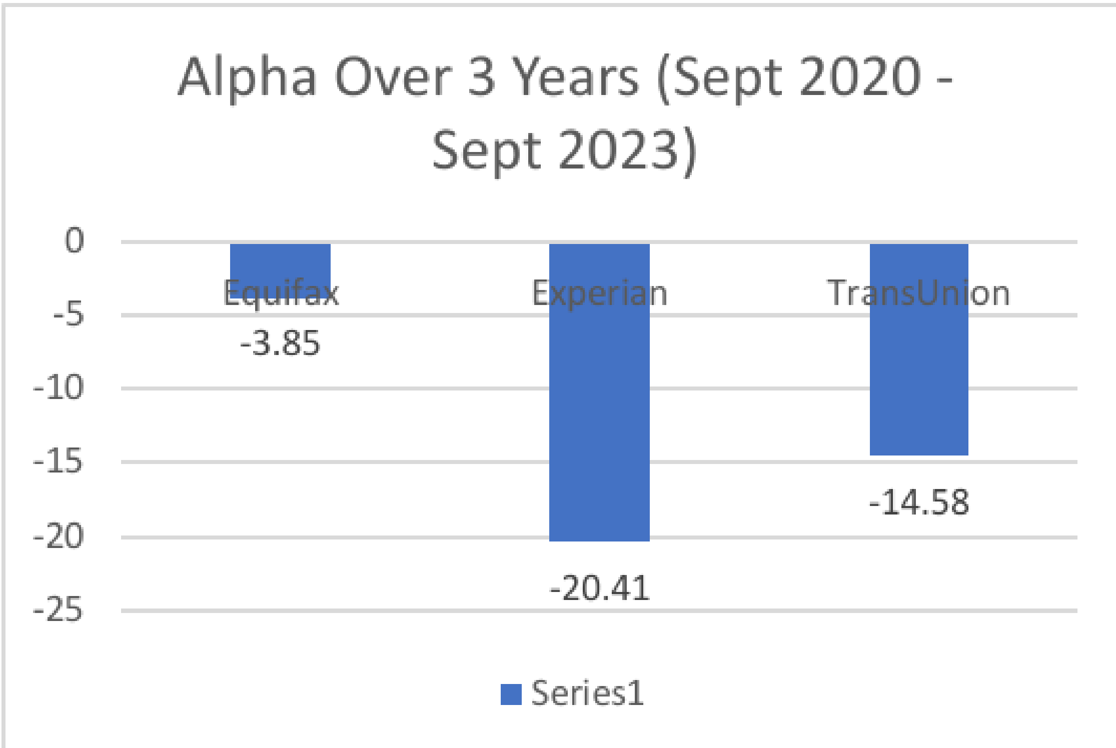
Experian has a CAPM of 17.15% which is much more than the expected return of the market of 5.5%, this shows that Experian's stock is overpriced.

Annual Returns



***This was Calculated By using this formula: CAGR = (Ending Value / Beginning Value)^(1/3) - 1**

Alpha Analysis



*** This was calculated by using the alpha formula: alpha = Portfolio Return - Expected Return Using the CAPM Model**

- Equifax's alpha of -3.85% suggests that the company's stock underperformed the market over the given time period
- Experian's alpha of -20.41% is the lowest of all three company's suggesting that the company's stock performed way below the market
- TransUnion's alpha of -14.58% suggests that the company's stock also performed way below the market over the given time period

Overall, The alpha's of these three company's have all been negative meaning the stock has not been able to provide the returns that correspond to the level of risk. This would be cause for concern for investors as it shows they have not been able to meet certain investment goals.

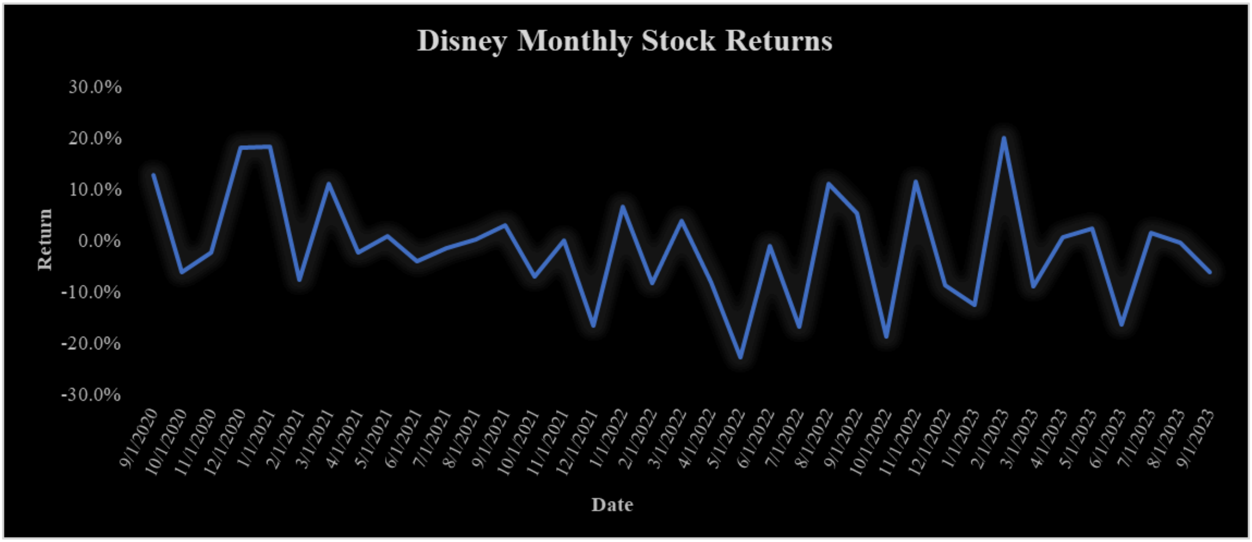
Disney

Overview

The U.S. Media and Entertainment industry is the largest in the world at $660 billion (of the $2 trillion global market). The industry is a dynamic and influential sector that encompasses a wide range of activities, including film, television, music, gaming, live performances, and digital media. Along with Disney, some of the biggest names include Netflix, Comcast, Paramount, and Universal.

Disney is a global entertainment giant founded on October 16, 1923, by Walt Disney and Roy O. Disney. Disney's influence spans television networks, theme parks, film studios, and streaming services. Media Networks, including ABC, ESPN, and Disney Channel, are significant in the television and cable industry. The Parks, Experiences, and Products division encompasses iconic theme parks worldwide. Through Pixar and Marvel Studios, they produce blockbuster films that have become cultural landmarks and they have a big presence in the streaming industry with Hulu and Disney+.

In September 2020, Disney was recovering from the effects of the COVID-19 Pandemic. As the world reopened, their stock climbed back up to pre-pandemic levels and it hit an all-time high in March 2021, driven by the huge success of Disney+ as streaming was more relevant than ever. This surge continued until the last quarter of 2021 when subscriptions to Disney+ slowed down and the success of the content they were putting out started to decrease. This trend of a lack of blockbuster films and decreasing subscriptions continued all throughout 2022 and 2023 with Disney stock eventually plummeting to pandemic levels as of Q3-Q4 2023.



Largest Increases
2/1/2023(+19.9%)
1/1/2021(+18.3%)
The biggest jump came during a period when Disney stock kept tumbling and their former CEO Bob Iger un-retired to try and turn things around. One of the things he did was cut 7,000 jobs in a plan to cut $5.5 billion in costs. The second biggest came during a period when Disney stock was soaring to all-time highs as they were recovering from the pandemic and Disney+ was taking off.
Largest Decreases
5/1/2022(-22.9%)
10/1/2022(-18.8%)

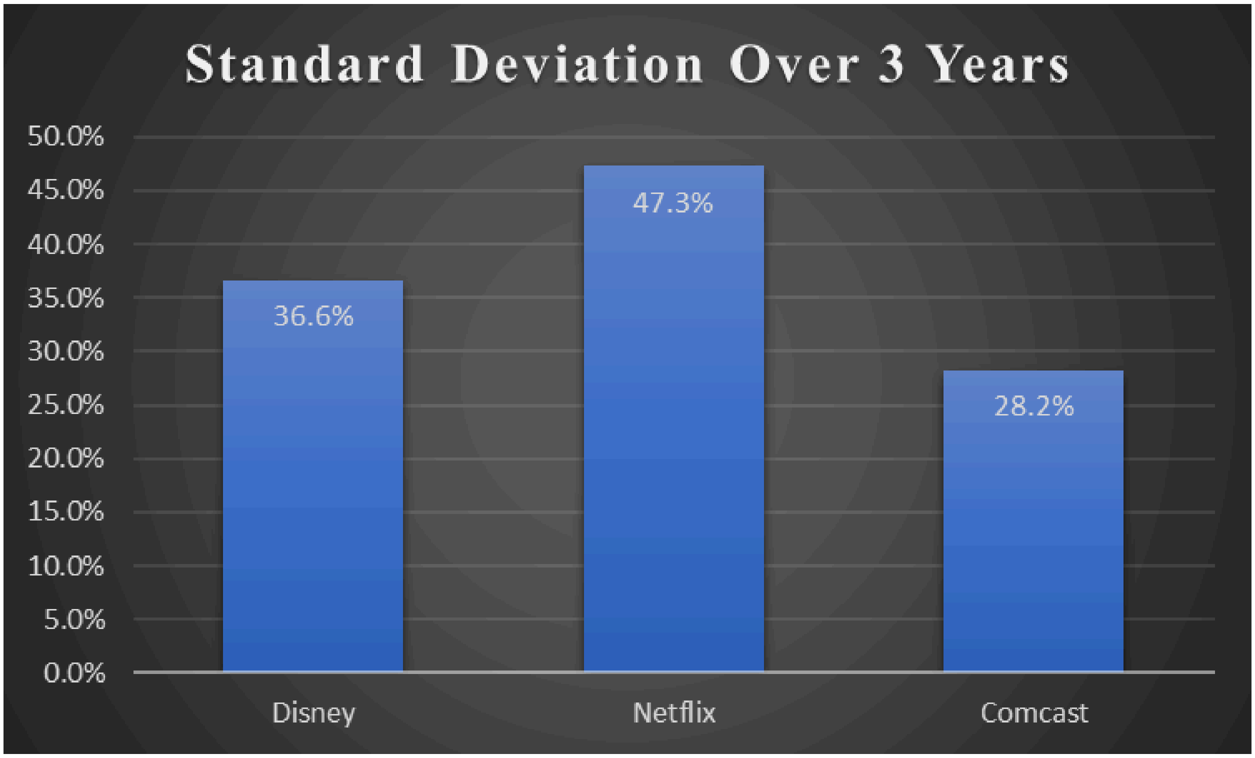
Both decreases happened in the same year, and this is because inflation was heavily impacting the economy, with increased costs and decreasing subscriptions playing a big part. During its largest decrease in May 2022, Disney was involved in a public social controversy with the governor of Florida leading to him threatening to strip the company of special tax privileges they receive in the state and causing a political debate over a law being passed in Florida.

Credit Rating Analysis

Company	S&P	Moody's	Investment Grade
Disney	A-	A2	Yes
Netflix	BBB+	Baa3	Yes
Comcast	A-	A3	Yes

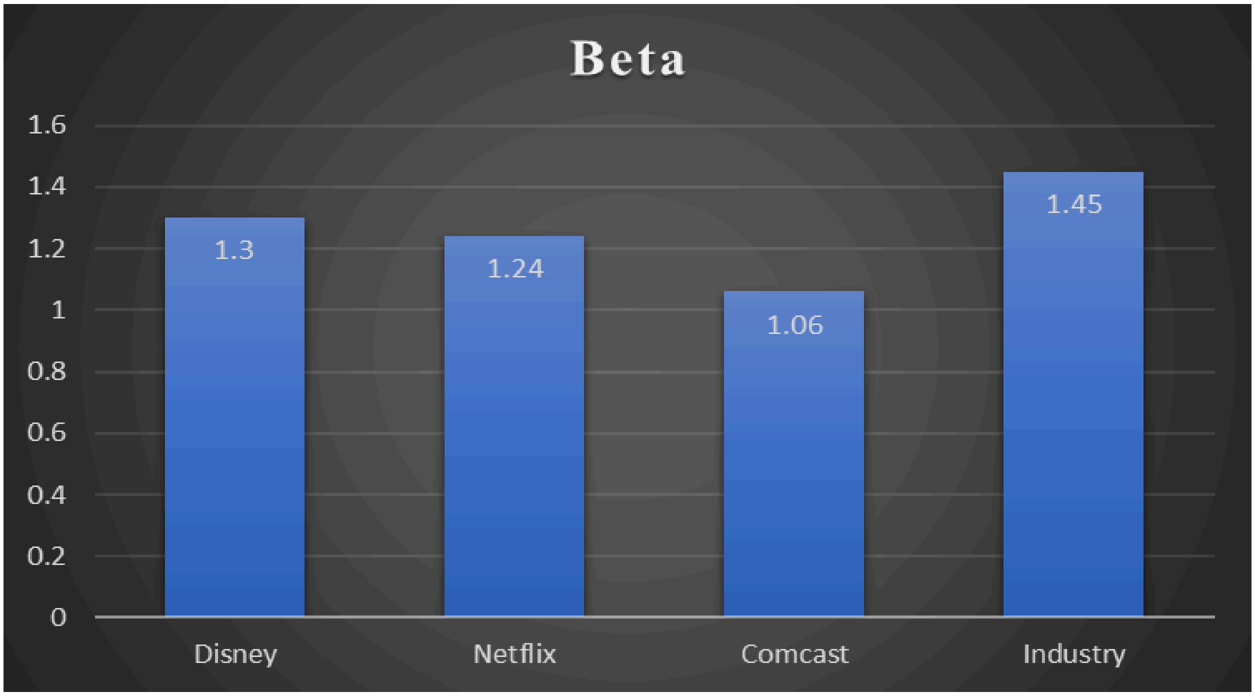
Disney and Comcast are tied for the highest rating from S&P with an A- while Netflix is the lowest with a BBB+. Moody's has Disney as the highest with an A2, followed by Comcast with an A3, and Netflix again being last with a Baa3, which is the lowest possible rating to be considered investment grade. Both Disney and Comcast have grades that are considered to be of medium quality while Netflix's grade is lower quality. The grades for Disney and Comcast show that they are considered stable companies that have decent capacity to repay all loans, but they may struggle in times of declining economic conditions. The grade for Netflix shows that they are able to at least meet the bare minimum in terms of their financial commitments, but they are not as stable as companies in the A range. Overall, all of these companies are investment grade.

Standard Deviation



The standard deviation over three years was calculated by first finding the monthly returns for Disney as well as two comparable firms (Netflix and Comcast). Then the standard deviation for each was calculated using Excel, and then the monthly deviation was multiplied by the square root of 12 to get the annual standard deviation.

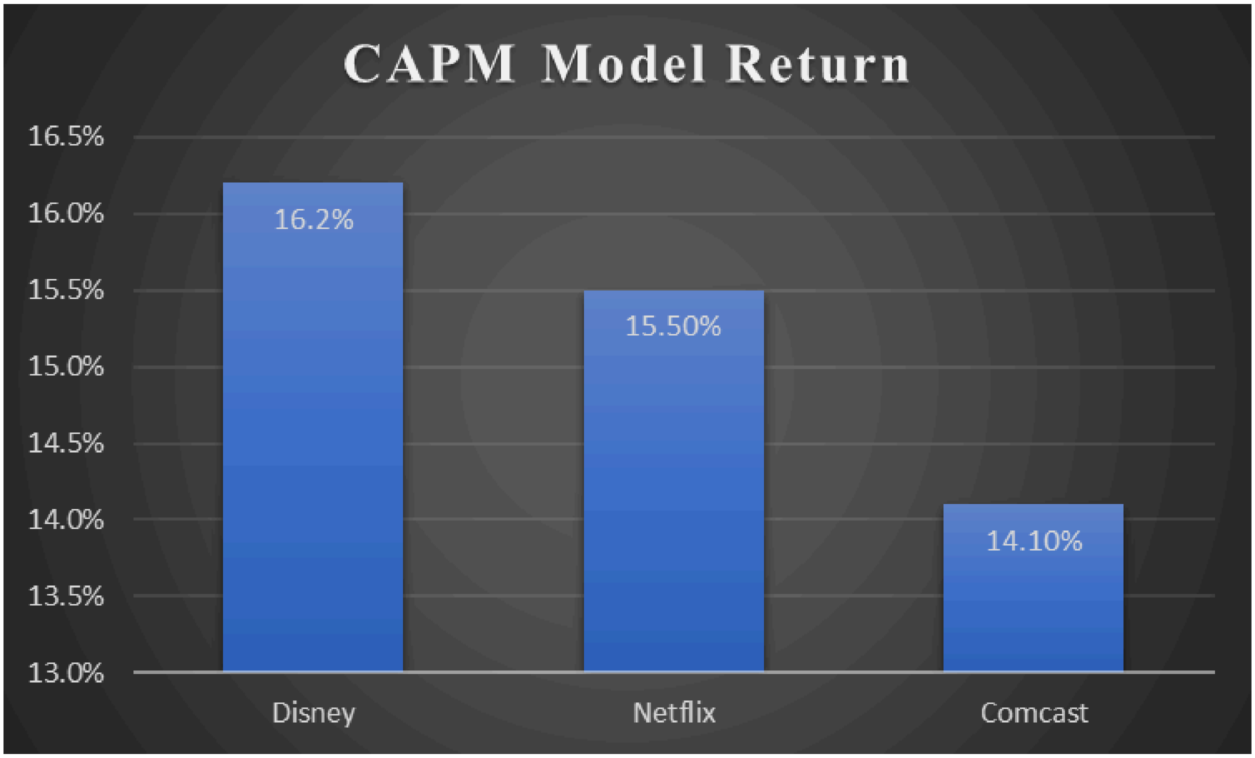
Beta Comparison



Beta is a tool used to measure how volatile a stock is. It's used to evaluate the expected risks and returns of a portfolio or to see whether a specific investment would be a good fit for a portfolio in terms of expected risks and returns. Per NerdWallet, a stock's beta is equal to the covariance of the stock's returns and its benchmark index's returns over a particular time period, divided by the variance of the index's returns over that period. The formula is β = covariance(stock returns, index returns) / variance(index returns).

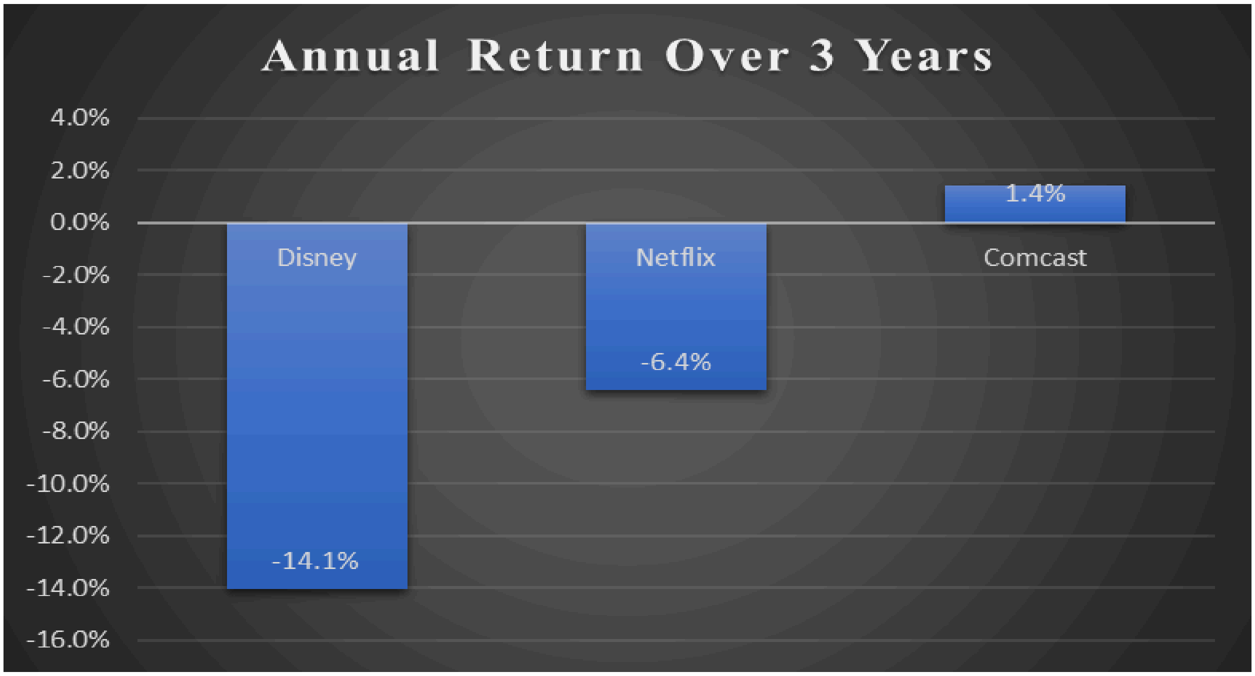
The beta for Disney is 1.3, Netflix is 1.24, and Comcast is 1.06. The industry average is 1.45 per a study from NYU. Typically, a Beta over 1 indicates that a stock is more volatile than the market, and all three of these companies and the entertainment industry as a whole meet that criteria. However, Comcast's is very close to 1, meaning that compared to the other two companies, it is closer to being in line with the market's volatility. Disney, Netflix, and the industry average are all at least 24% more volatile than the market.

CAPM Model Return



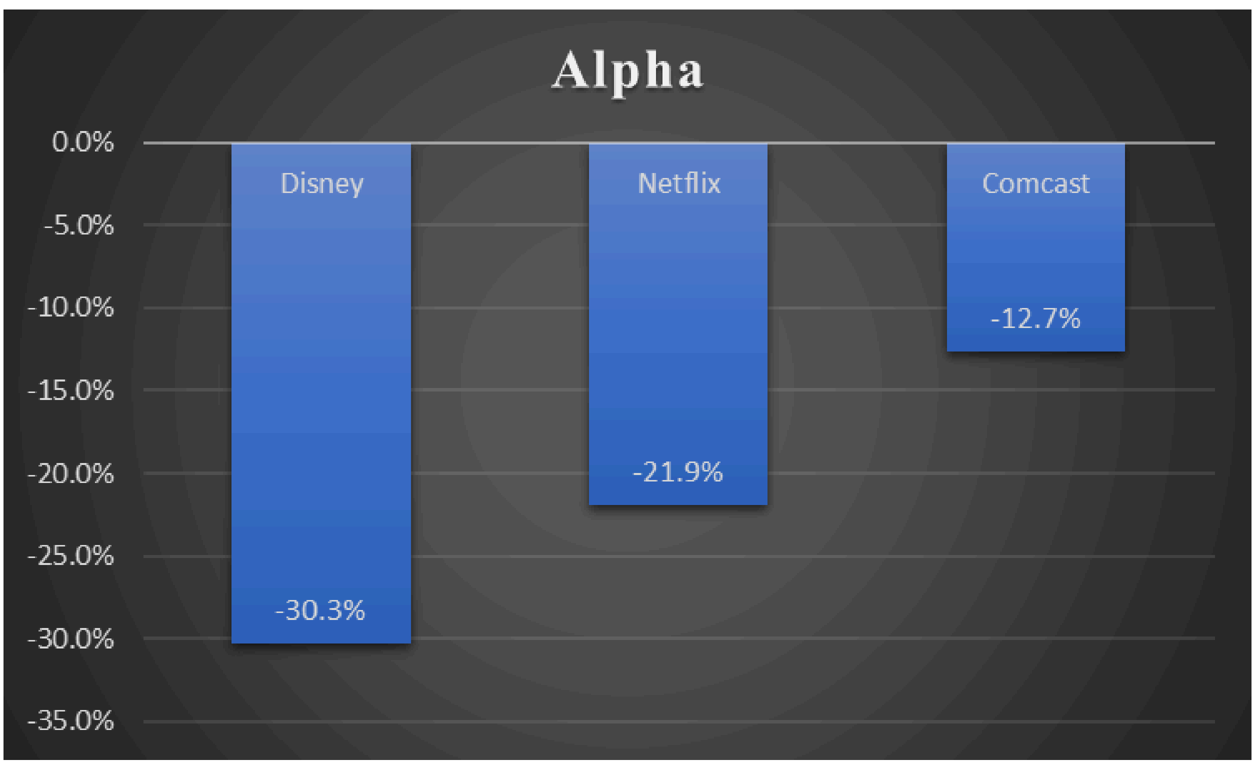
The risk-free rate was derived from the US Treasury website and as of 11/29/2023, the three-month rate was 5.5. Then I used the 'Historical Returns on Stocks' chart to calculate the 10-year average annual return of the S&P 500 from 2013-2022 to get 13.59%.
The formula is Rf + B (Rm - Rf), so for Disney, it would be (5.5 + 1.3(13.59-5.5)) = **16.02**,
for Netflix, it's (5.5 + 1.24(13.59-5.5)) = **15.53**,
and for Comcast, it would be (5.5 + 1.06(13.59-5.5)) = **14.08.**
These numbers suggest that Disney expects the most compensation for their risk, followed closely by Netflix and Comcast.

Annual Return



The annual return over 3 years was calculated by dividing the stock price for each company at the end of the portfolio period by the price at the beginning of the portfolio period and then raising it to the power of one over the number of years the period was, which would be three in this case, and then finally subtracting one from that number.

Alpha



The alpha was calculated by subtracting the annual value over 3 years and the return expected by the CAPM model. The alphas of these three company's have all been negative meaning the stock has not been able to provide the returns that correspond to the level of risk. This would be cause for concern for investors as it shows they have not been able to meet certain investment goals.

APPLE

Sector Overview

The technology industry has undergone a remarkable evolution, becoming a central force in shaping the modern world. From the emergence of personal computers to the advent of smartphones, artificial intelligence, and the Internet of Things, technological advancements have revolutionized the way we live and do business. Companies within this dynamic sector continually strive to stay ahead of the curve by fostering innovation, creating cutting-edge products, and adapting to ever-changing consumer demands. The competitive landscape is characterized by a rapid pace of development, with breakthroughs in software, hardware, and connectivity driving progress. As we explore the landscape of the technology industry, it is crucial to recognize how companies navigate this environment, leveraging their strengths and embracing innovation to maintain a competitive edge. One such company that exemplifies adaptability and innovation in the face of industry evolution is Apple, a stalwart in the tech sector. Understanding its strategies and responses to industry shifts provides valuable insights into the broader dynamics of technology-driven progress.

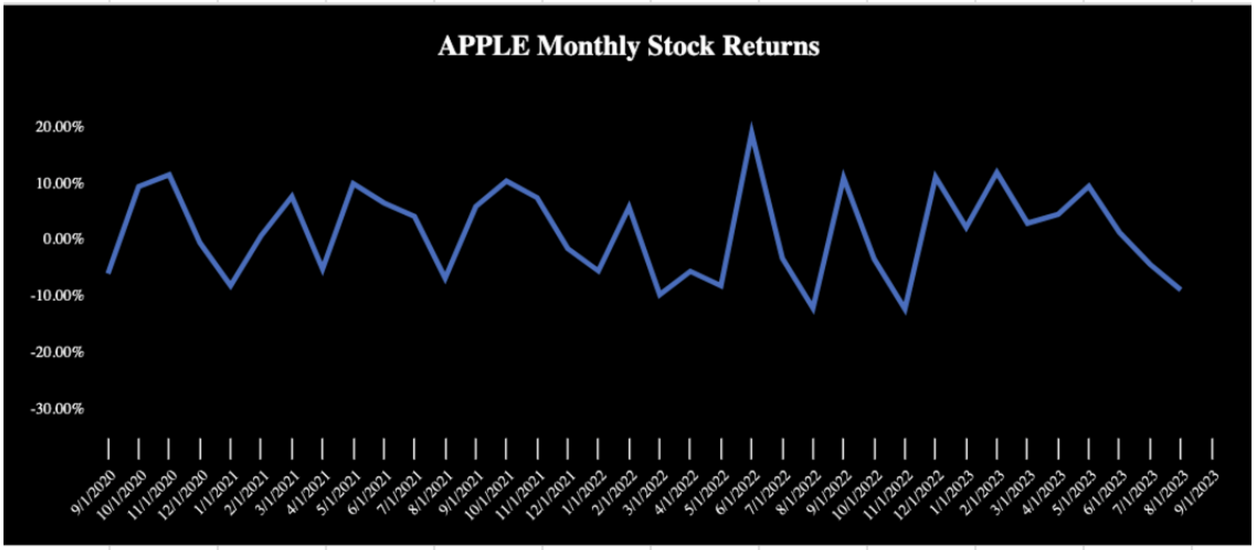
The emergence of the COVID-19 pandemic in early 2020 brought about unprecedented challenges and opportunities for the technology industry. Apple, like many other companies, faced supply chain disruptions, manufacturing delays, and shifts in consumer behavior due to lockdowns and social distancing measures. However, the company demonstrated resilience and adaptability, leveraging its strong brand reputation, robust ecosystem, and focus on innovation to navigate these challenges.

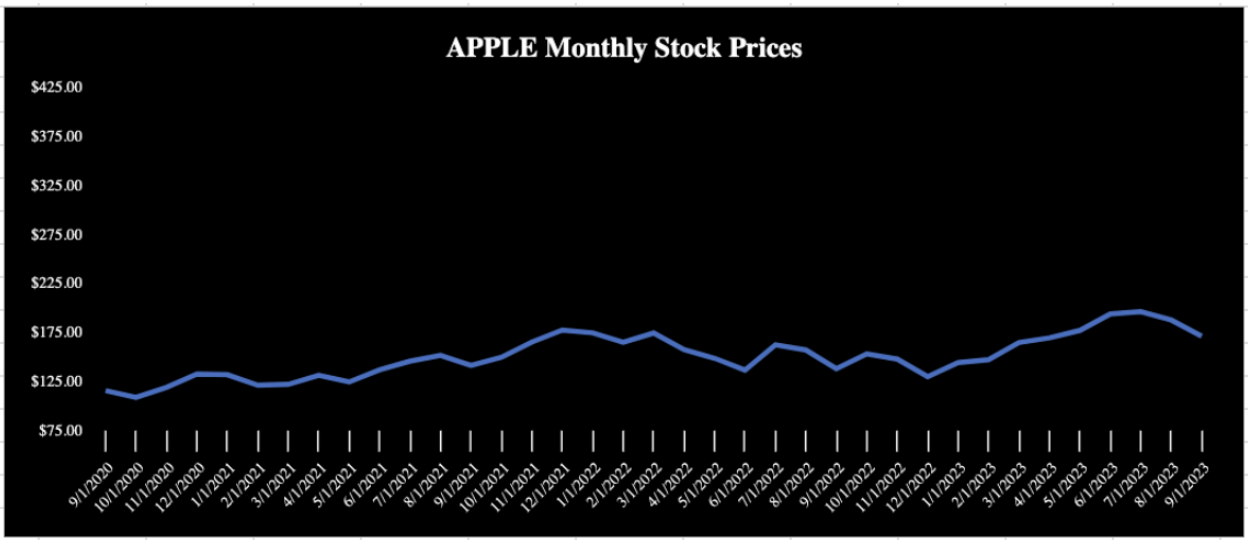
APPLE News (September 2020 - Sept 2023)

In the span of three years from 2020 to 2023, Apple has released three new iPhone trims. Apple has also made significant strides in other areas, such as introducing the M1 chip, which has revolutionized its Mac line of computers, and launching the AirPods Pro, which have become the gold standard for wireless earbuds.

Recently, Apple has shown a keen interest in venturing into new areas like metaverse technology. The company has been actively hiring engineers and software developers with expertise in augmented reality and virtual reality, suggesting that it is planning to develop hardware and software for the metaverse. Apple's entry into the metaverse could have a significant impact on the industry, as its vast resources and experience in developing consumer electronics could help to bring the metaverse to a wider audience. Only time will tell what Apple has in store for the metaverse, but it is clear that the company is well-positioned to play a leading role in this emerging technology.

Stock Prices and Monthly Returns





<u>Highest and Lowest Returns and the News Behind it:</u>

Apple Inc.'s stock experienced significant fluctuations between September 1st, 2020, and September 1st, 2023, reflecting the company's performance and broader market conditions. The highest returns were driven by several factors, including strong iPhone sales, positive investor sentiment, and overall market optimism. Conversely, the lowest returns were primarily attributed to concerns about supply chain disruptions, potential economic headwinds, and a broader market downturn.

<u>Largest Increases:</u>

July 1,2022 (18.86% Increase)

March 1,2023 (11.86% Increase)

During the period of highest returns, Apple's iPhone sales were robust, driven by strong demand for the iPhone 14 series and the introduction of the iPhone 15 set to come out later that September.

Positive investor sentiment was also high, fueled by the company's strong financial performance and continued innovation. Additionally, the overall market was experiencing an upswing, providing a favorable backdrop for Apple's stock performance.

Largest Decreases:
December 1, 2022 (12.23% Decrease)
September 1, 2022 (12.10% Decrease)

In contrast, the period of lowest returns was marked by a combination of factors that weighed on Apple's stock price. Supply chain disruptions, caused by the ongoing COVID-19 pandemic and geopolitical tensions, led to concerns about product availability and potential revenue shortfalls. Economic headwinds, such as rising inflation and interest rates, also contributed to investor uncertainty. Moreover, the broader market experienced a downturn, further exacerbating the decline in Apple's stock price.

Credit Ratings Analysis

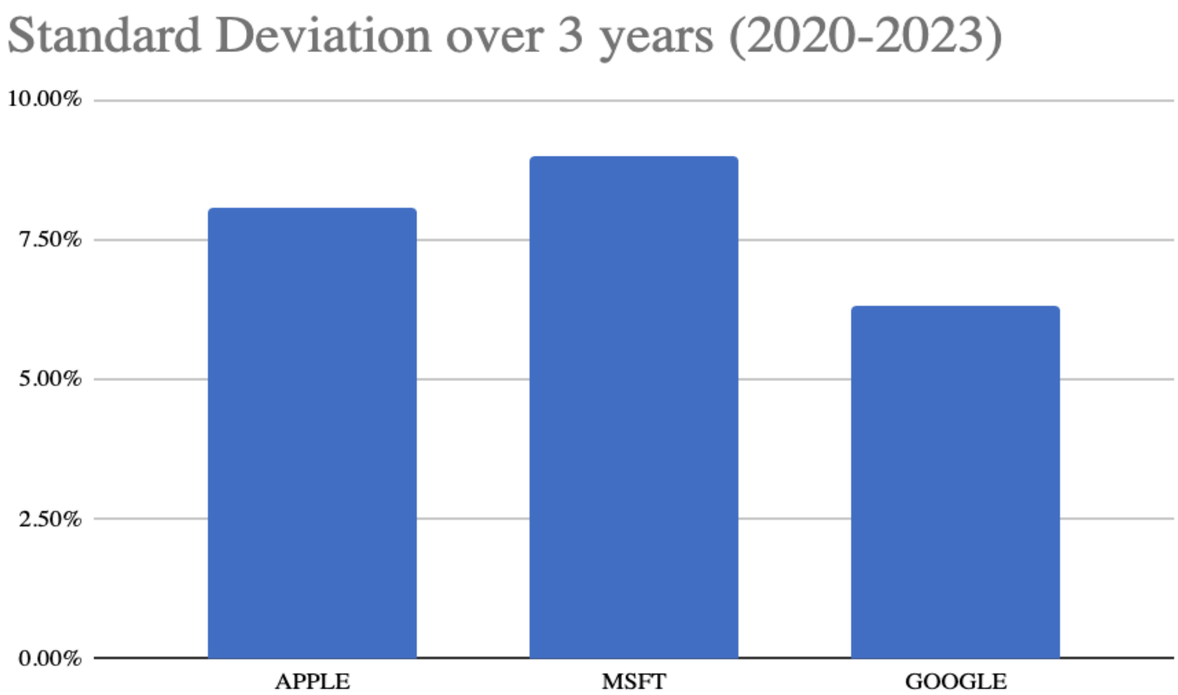
Apple's long-term credit rating was recently upgraded to AAA by Moody's Investors Service, which is the highest possible credit score. This rating puts Apple in an exclusive club with Microsoft Corp. and Johnson & Johnson as the only U.S. corporations in the S&P 500 with the highest possible credit score.

Another comparable firm is Google, with a credit rating of AA+, which is slightly lower than Apple, Microsoft and Johnson & Johnson who sit at the highest tier.

Overall, All three companies - Apple, Google, and Microsoft - have credit ratings that are considered investment grade. These ratings suggest that they are deemed to have a low risk of default and are generally considered safe for investment

	S&P Rating	**Investment Grade**
Apple Inc	AAA	YES
Google Inc	AA+	YES
Microsoft	AAA	YES

Standard Deviation

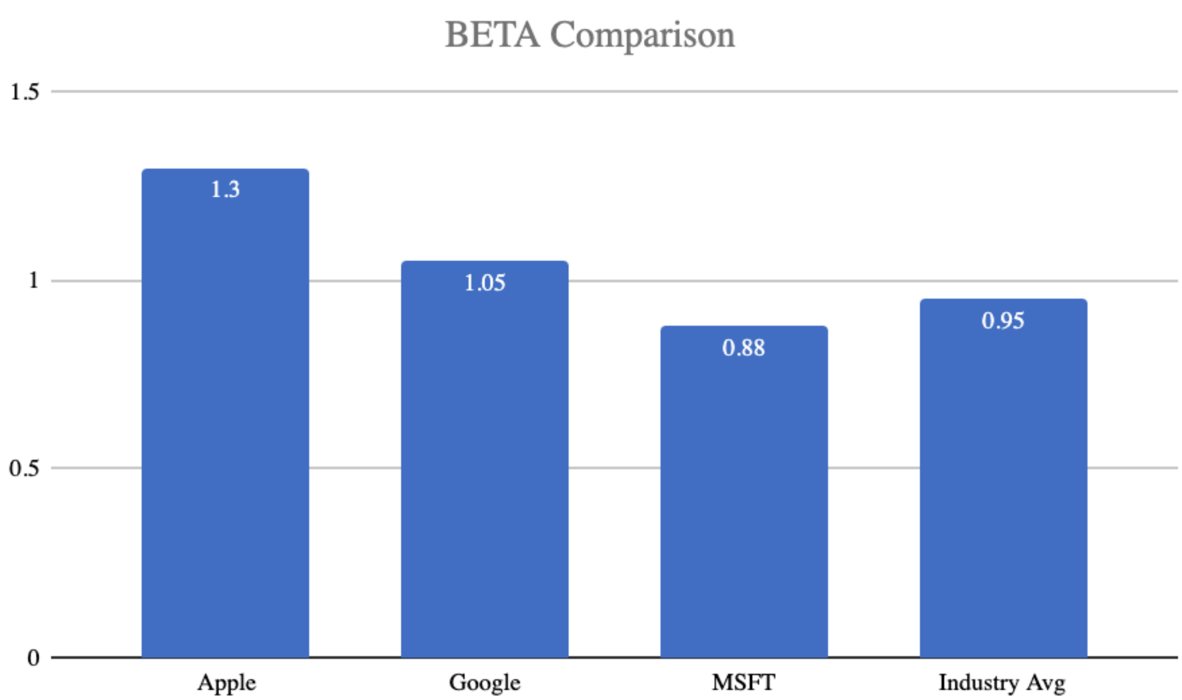


* Calculated by using the STDEV.S(array) formula on Excel which estimates Standard Deviation Based on a given sample in this case being the monthly returns for each of the stocks over 2020 - 2023. Then I used the SQRT(12) function to get the annualized standard deviation.

<u>Beta Analysis</u>

Beta is a fundamental concept in finance that measures the volatility of a stock in relation to the market. In other words, it quantifies a stock's sensitivity to market movements 1. This measure is used in the Capital Asset Pricing Model (CAPM), which calculates the expected return of an asset based on its beta and expected market returns.

- **APPLE** has a beta of **1.3,** this suggests that it is more volatile than the market. In practical terms, this means that Apple's price tends to move more than the market when the market goes up or down.
- **GOOGLE** has a beta of 1.05, which is slightly better than Apple's but it is still more volatile than the market.
- **MICROSOFT** has a Beta of .88 which is below the market so it's not as volatile. This means that Microsoft's price tends to move less than the market when the market goes up or goes down.
- The **Industry Average** beta of 0.95 suggests that, on average, stocks in this industry are slightly less volatile than the market.

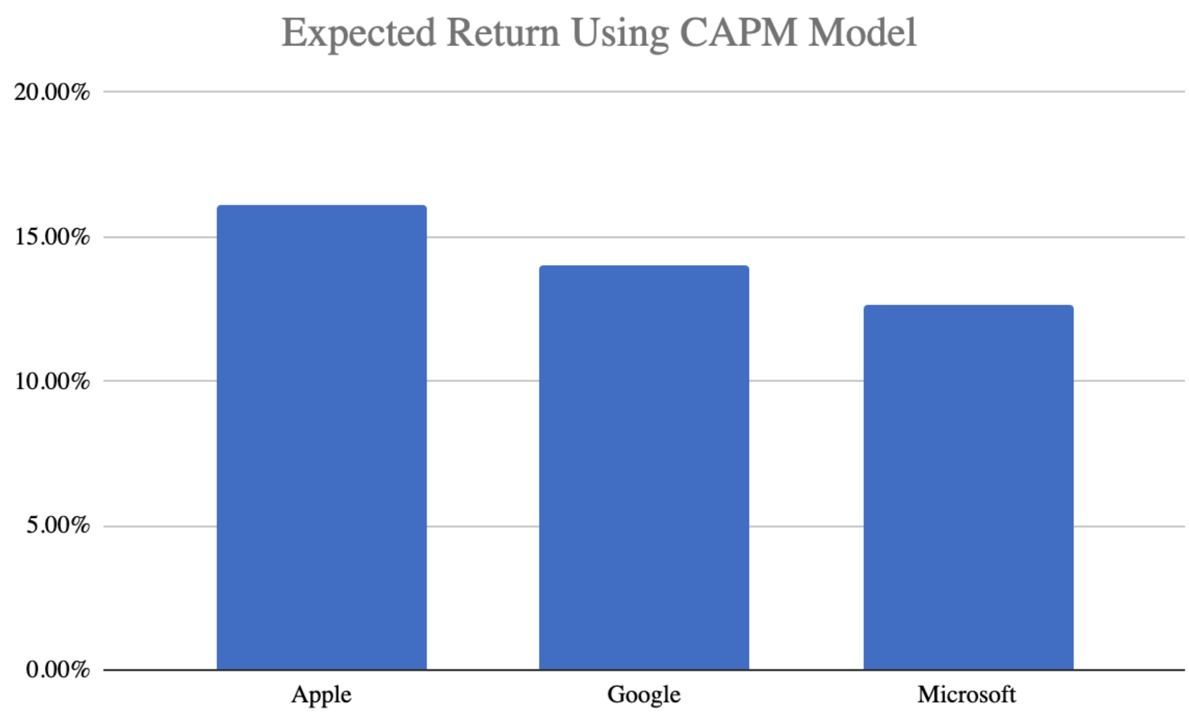


*** The formula to calculate beta is as follows:**

β=Variance(index returns)Covariance(stock returns, index returns)

<u>CAPM Analysis</u>

APPLE - 5.5%+1.3*(13.59%-5.5%) = 16.07%
GOOGLE - 5.5%+1.05*(13.59%-5.5%) = 13.99%
MSFT - 5.5%+0.88*(13.59%-5.5%) = 12.62%



The CAPM data suggests that Apple is expected to have the highest returns among the three companies, with an expected return of 16.07%. Google is expected to have the second highest returns with 13.99%. Microsoft is expected to have the lowest return with an expected return of 12.62%.

The reason why Apple has the highest expected return is because Apple's beta score of (1.3) is higher than both Google and Microsoft's which are at 1.05 and .88 respectively. Nonetheless, it implies that APPLE has the opportunity to achieve superior returns compared to the market in an upward market scenario. While Google's beta is slightly lower than Apple's, it still exceeds the market's, indicating an anticipated higher return for Google, though not as substantial as Apple's. In contrast, MSFT boasts the lowest beta among the three companies, signifying lower volatility than the market. Consequently, MSFT is projected to yield a return below that of the market.

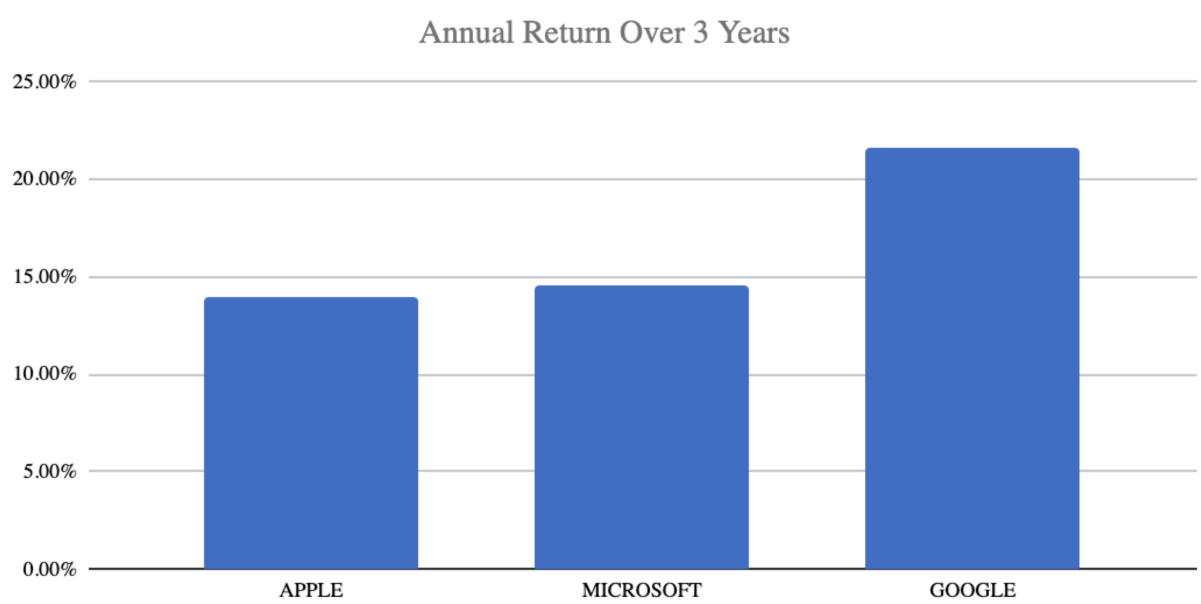
Sources:

https://finance.yahoo.com/quote/aapl/
https://finance.yahoo.com/quote/GOOGL/
https://finance.yahoo.com/quote/MSFT?p=MSFT

Market Rate - https://www.investopedia.com/ask/answers/042415/what-average-annual-return-sp-500.asp

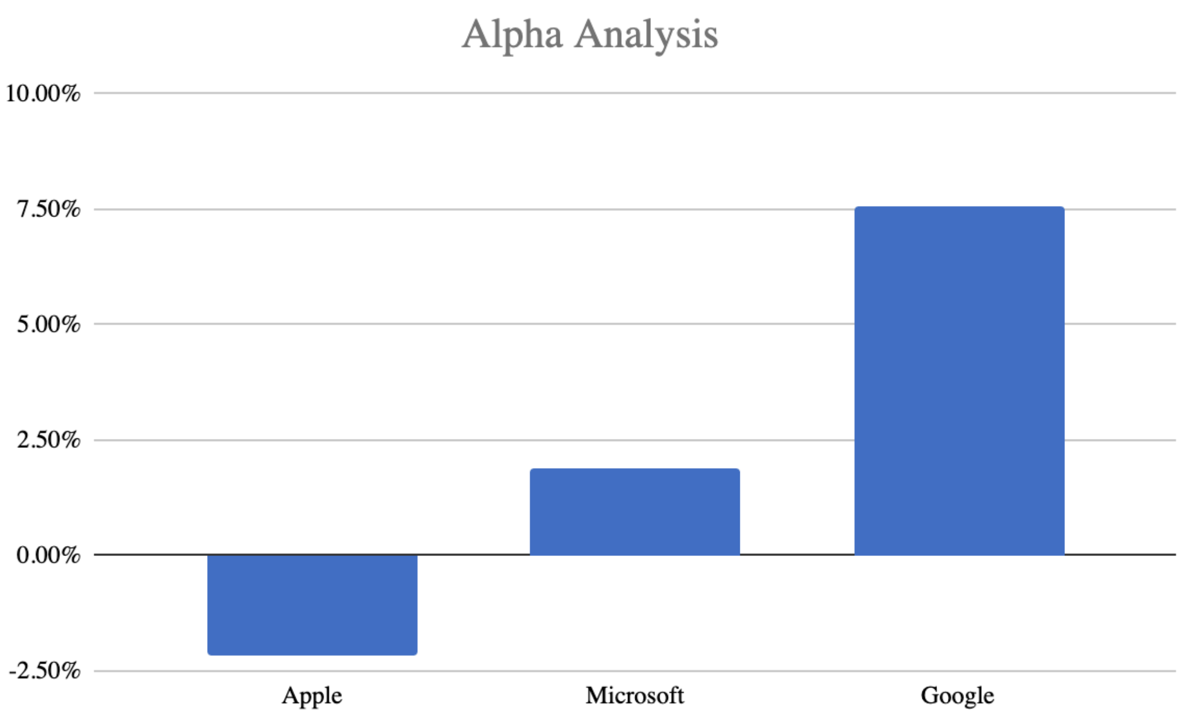
Risk Free Rate - https://home.treasury.gov/resource-center/data-chart-center/interest-rates/TextView?type=daily_treasury_yield_curve&field_tdr_date_value_month=202311

Annual Returns



***This was Calculated By using this formula: CAGR = (Ending Value / Beginning Value)^(1/3) - 1**

<u>Alpha Analysis</u>



*** This was calculated by using the alpha formula: alpha = Portfolio Return - Expected Return Using the CAPM Model**

- Apple's alpha of -2.16% indicates that the company's stock demonstrated a performance below that of the market during the specified period.
- Microsoft's alpha of 1.88% suggests that the company's stock performed slightly below the market during the specified period.
- Google's alpha of 7.58% indicates that the company's stock exhibited a performance surpassing that of the market during the specified period.

In summary, the alpha data implies that Apple is encountering challenges, whereas Google and Microsoft are exhibiting positive performance. Nonetheless, it's crucial to acknowledge that alpha is just one metric among various factors that investors should take into account when making decisions.

Section 2: Portfolio Analysis

On September 1st, 2020, we had $10,000 to devote to an equally weighted stock portfolio. In other words, we invested $2,500 into each of the following 4 companies: Apple Inc., Meta, Disney, and Equifax.

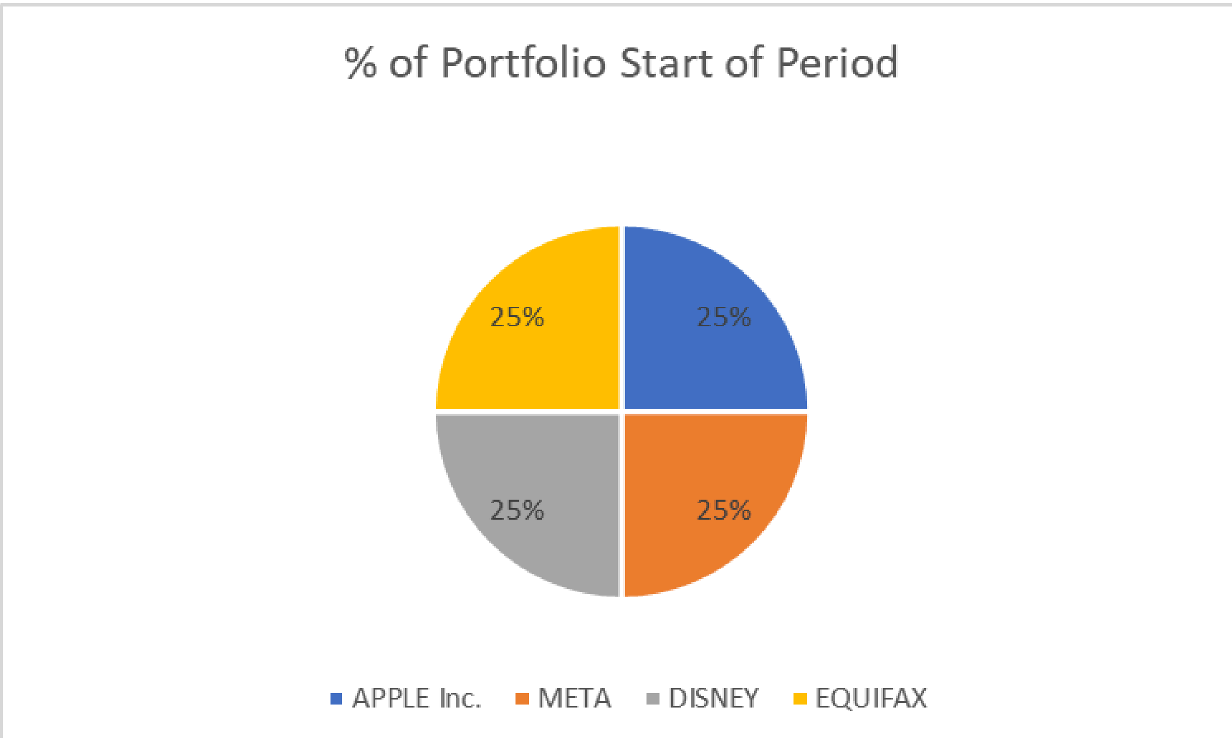
Portfolio at the Beginning (Year 0):

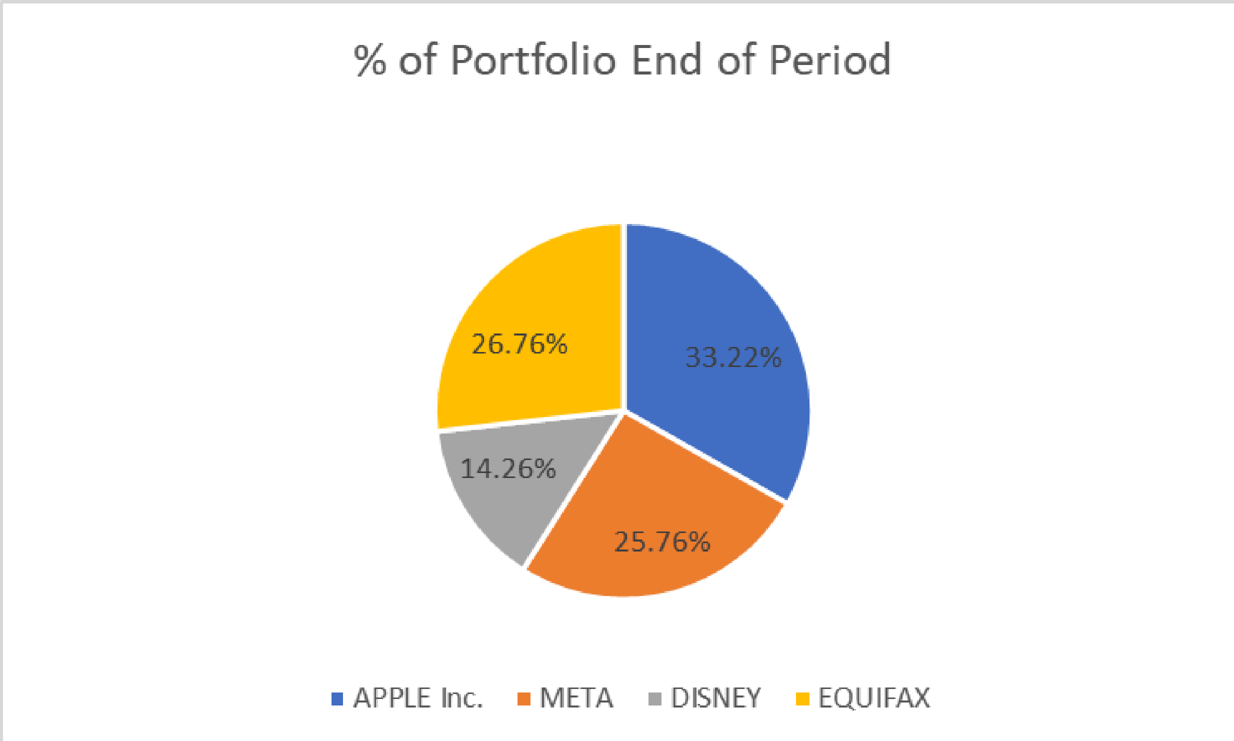
Company Name	Stock Price	Number of Shares	Total Beginning Value	Percent of Portfolio
APPLE Inc.	$115.81	21.59	$2,500	25%
META	$261.90	9.55	$2,500	25%
DISNEY	$131.87	18.96	$2,500	25%
EQUIFAX	$153.43	16.29	$2,500	25%
TOTAL			$10,000	100%

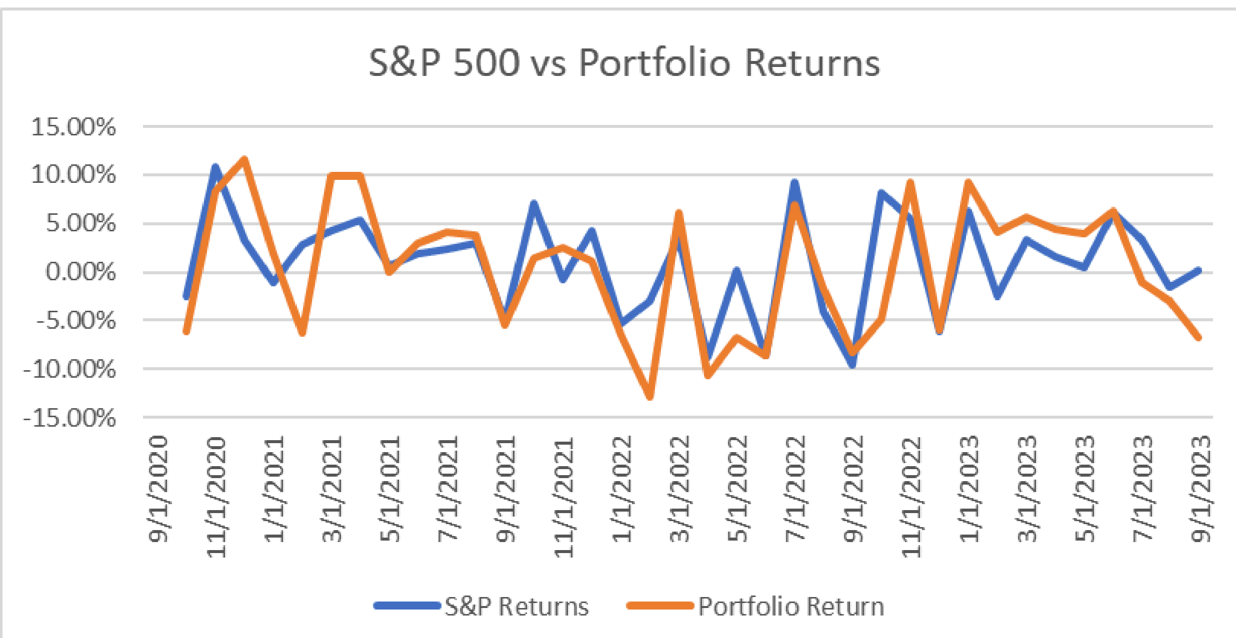
Portfolio at the End (Year 3):

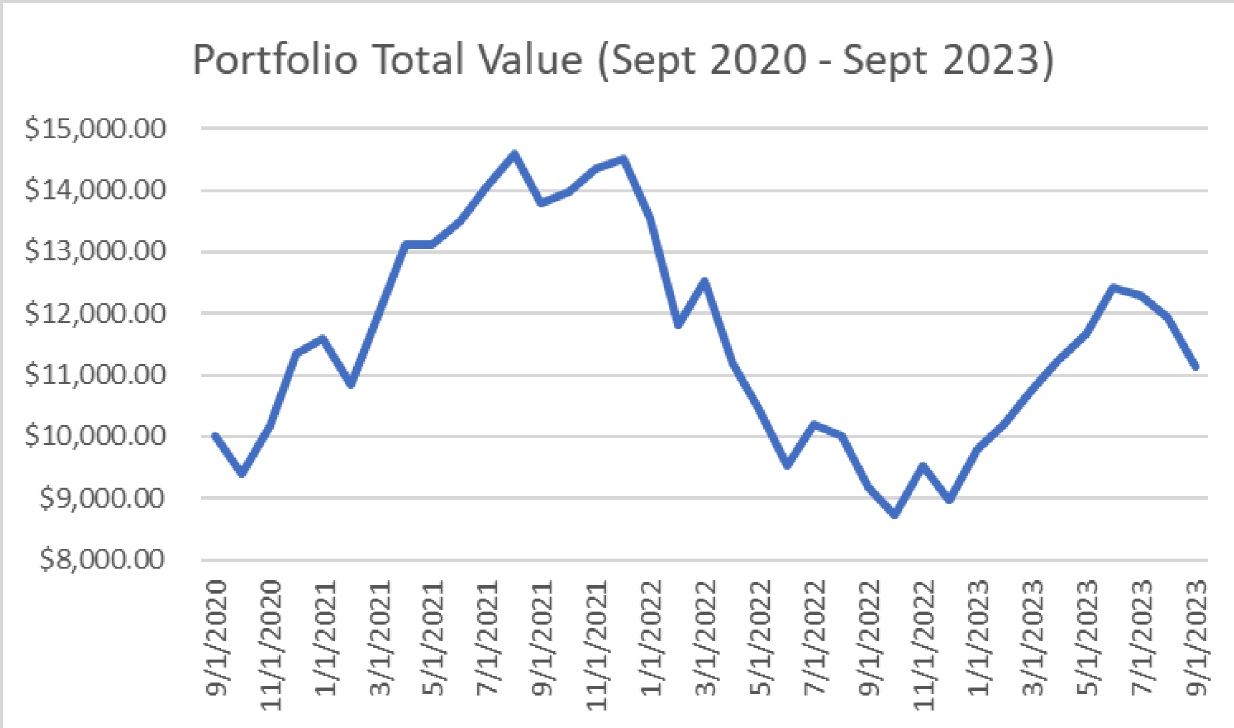
Company Name	Stock Price	Number of Shares	Total Ending Value	Percent of Portfolio
APPLE Inc.	$171.21	21.59	$3,696	33.22%
META	$300.21	9.55	$2,867	25.76%

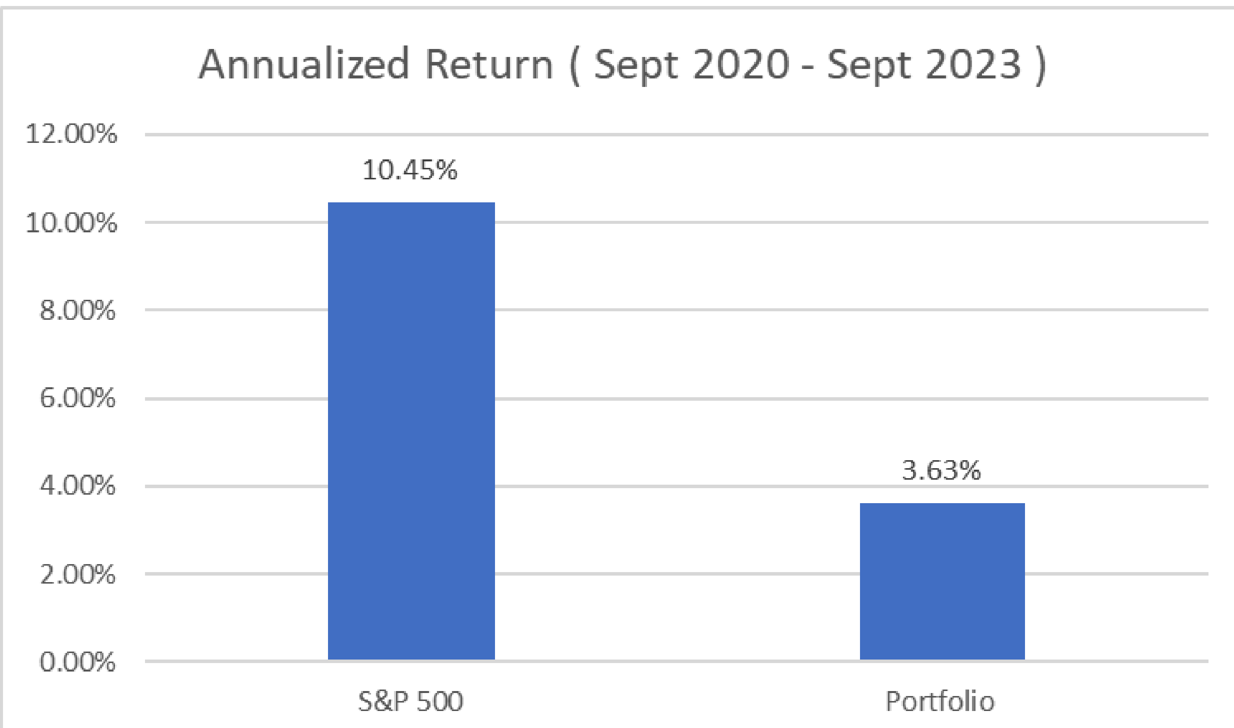
DISNEY	$83.68	18.96	$1,587	14.26%
EQUIFAX	$182.83	16.29	$2,978	26.76%
TOTAL			$11,128	100%




% of Portfolio End of Period
33.22%
25.76%
14.26%
26.76%
APPLE Inc.
META
DISNEY
EQUIFAX


S&P 500 vs Portfolio Returns
15.00%
10.00%
5.00%
0.00%
-5.00%
-10.00%
-15.00%
9/1/2020
11/1/2020
1/1/2021
3/1/2021
5/1/2021
7/1/2021
9/1/2021
11/1/2021
1/1/2022
3/1/2022
5/1/2022
7/1/2022
9/1/2022
11/1/2022
1/1/2023
3/1/2023
5/1/2023
7/1/2023
9/1/2023
S&P Returns
Portfolio Return





Portfolio Analysis

The provided data represents the annual returns of the S&P 500 index and a portfolio including our three companies including, Equifax, Meta, Disney, and Apple. The S&P 500 had an annual return of 10.45%, indicating that an investment in an index fund tracking the S&P 500 would have grown by this percentage over the year. On the other hand, the portfolio showed an annual return of 3.63%, meaning that the investments within this portfolio increased by this percentage over the same period.

When comparing these returns, it's evident that the S&P 500 outperformed the portfolio. This could suggest that the portfolio may be invested more conservatively in lower-risk assets which typically yield lower returns. Alternatively, it could indicate that the investments within the portfolio did not perform as well as the market overall, or that the portfolio may lack sufficient diversification, causing it to miss out on the sectors that contributed to the S&P 500's growth.

Source: **https://finance.yahoo.com/quote/SPY/history?p=SPY**