Relative Valuation of Companies in the S&P 500 Based on Financial Ratios

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Finding out whether a company is over or undervalued is the main goal of many companies in the financial services industry, especially for portfolio managers. If a company is deemed undervalued, the investor can take a "long" position, which means to buy the stock of the company and expect the price to increase in the future and make money from it. If a company is deemed overvalued, the investor can either sell their current position in the company or take a more aggressive approach and "short" the stock, which means to bet on the price of the stock falling and make money off the difference.

In this project, I analyze whether the big technology companies are over or undervalued using a relative valuation approach based on certain financial metrics. Those metrics are compared to the metrics of the S&P 500, which serves as a proxy for the entire market. I determine whether the companies are over or undervalued based on whether their values are greater or less than the index's values, with the former implying that the stock is overvalued and the latter indicating that the stock is undervalued.

I concluded that despite the rapid growth technology companies have experienced in the past, undervalued companies such as Google are still poised for further growth relative to the market, while some companies such as Microsoft may be overvalued and will not experience as much future growth.

Analysis

S&P 500 Companies and their Financial Ratios

The data that I am using is from Kaggle and contains various csv files that consist of different financial metrics of each stock, which can be found in Appendix B [1]. The most important file is the FS_sp500_stats.csv file as it contains the financial ratios, such as the P/E, P/B and P/S, that will be used to conduct the relative valuation.

I conducted some manipulation of the dataset to be able extract the financial ratios of each stock using its ticker symbol. Furthermore, I performed calculations on the data to solve for the average ratio for the entire S&P 500, which will be used as the comparison in the relative valuation.

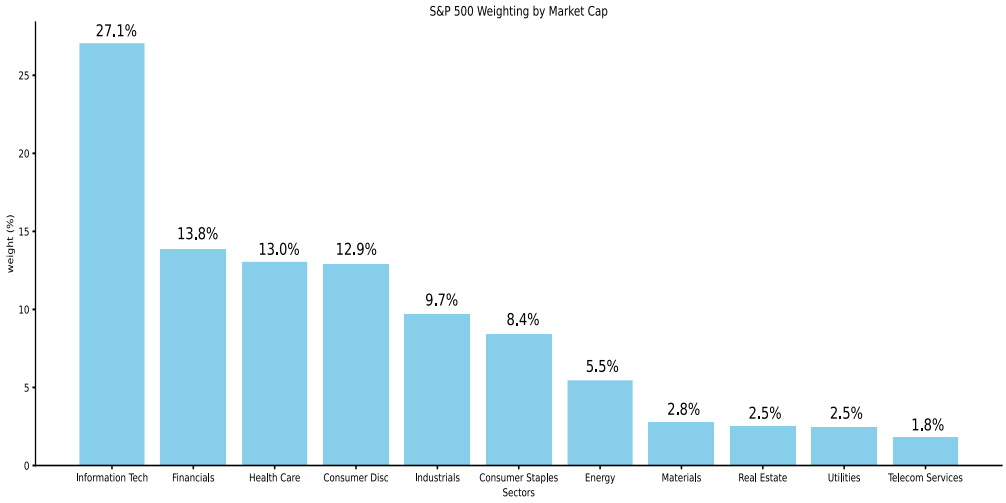
A shortcoming of the dataset is that there is data for the price of each stock for a 10-year period, but the financial ratios are only from one point in time, which hinders me from conducting a correlation analysis of the ratios to the price. Furthermore, the financial ratios are not updated to the most recent time. The companies listed in the dataset are also only denoted by its ticker symbol and there is no data which companies belong to which sector.

S&P 500 Sectors

I am using another dataset that is similar to the previous data on the S&P500 index, found in Appendix B [2]. However, this data contains the sectors of each company in the index, allowing me to calculate the weighting of each sector.

Weight of Sectors

Figure 1: Weight of each sector in the S&P 500

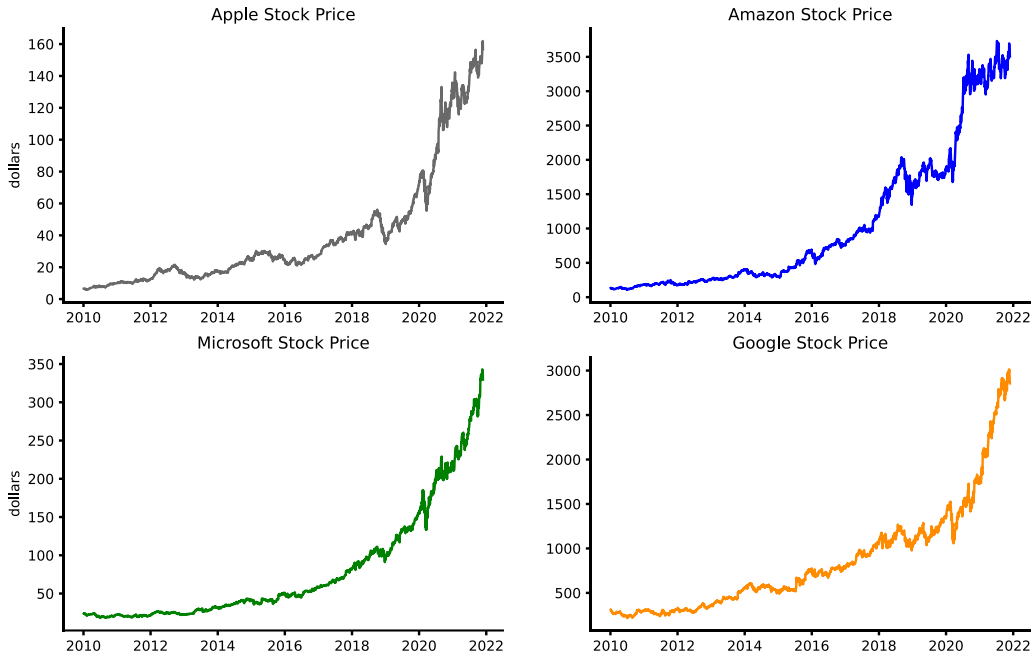


As shown in Figure 1, there are 11 sectors in the S&P 500 and the index is dominated by the Information Technology sector, making up 27.1% of the entire index's market capitalization. Therefore, this report will investigate the valuation of the prominent companies in the information technology industry, which are: Apple, Amazon, Microsoft, and Google.

Since the information technology sector has the largest weight in the S&P500, it would be reasonable to utilize the average financial ratios of the entire index to conduct the relative valuation of the technology companies. Using the average of the index to compare against companies in a sector would be less valid when valuing a sector that makes up only a small percentage of the index, such as utilities or real estate, as the index averages will be skewed to the direction of the values of sectors that have a greater weight.

<u>Past Performance</u>

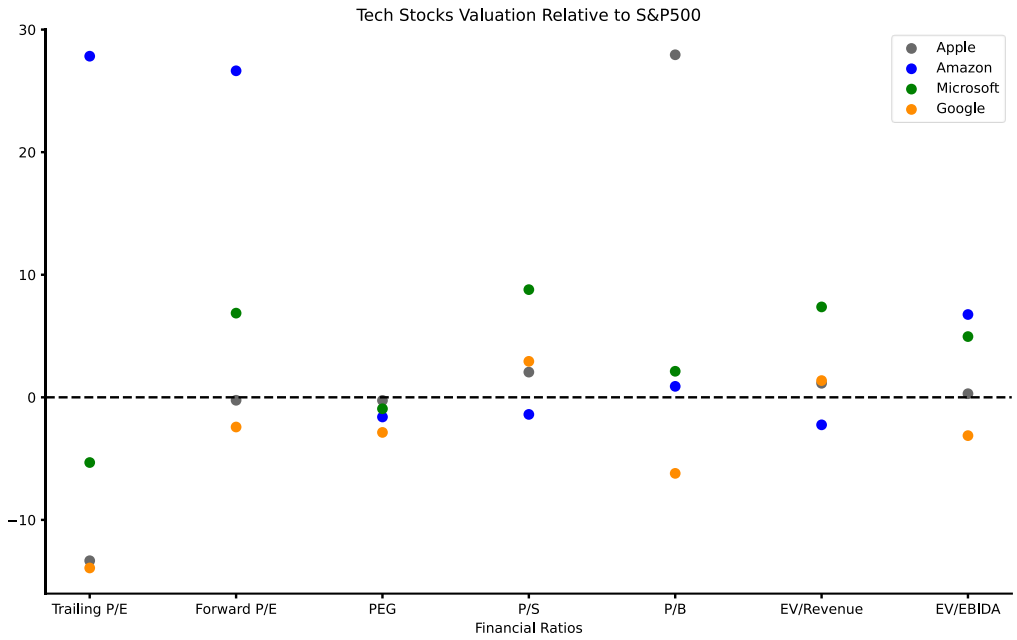
Figure 2: Price chart of Apple, Amazon, Microsoft, and Google over the period 2010-2022.



The four companies that I will analyze in this project has performed extremely well over the past decade, with the most significant price appreciation in the past couple of years as shown in Figure 2. Investors who have successfully bought and held these assets in the period benefited enormously as the past decade was the decade of the Information Technology sector. The question that everybody has on their minds right now is: will this rapid growth continue over the next decade, or has most of the growth occurred already? The relative valuation of these companies will help give insight on that question.

Relative Valuation

Figure 3: Relative valuation of Apple, Amazon, Microsoft, and Google using financial ratios and comparing them against the S&P 500 average.



The various colors each represent a different company while the dotted line represents the index average for each financial ratio. In relative valuation, the stock is considered undervalued if the ratio is greater and overvalued if less than the index average. I subtracted the index's average value from each stock's financial ratio and the result is a positive value in the case that stock's ratio is greater than the average (overvalued), and negative if the stock's ratio is less than the average (undervalued). In the plot above, this can be seen whether the dots representing the companies are above or below dotted line.

Table 1: Summary statistics

Stock	Trailing P/E	Forward P/E	PEG	P/S	P/B	EV/Revenue	EV/EBIDA	Over	Under
Apple	(-)	(-)	(-)	(+)	(+)	(+)	(+)	4	3
Amazon	(+)	(+)	(-)	(-)	(+)	(-)	(+)	4	3
Microsoft	(-)	(+)	(-)	(+)	(+)	(+)	(+)	5	2
Google	(-)	(-)	(-)	(+)	(-)	(+)	(-)	2	5

Google has the largest number of financial ratios below the index average as shown in Table 1, which suggests that the company is the most undervalued compared to its competitors in the sector. On the other hand, Microsoft has the largest number of financial ratios above the index average as seen in Table 1, which suggests that the company is the most overvalued compared to its competitors.

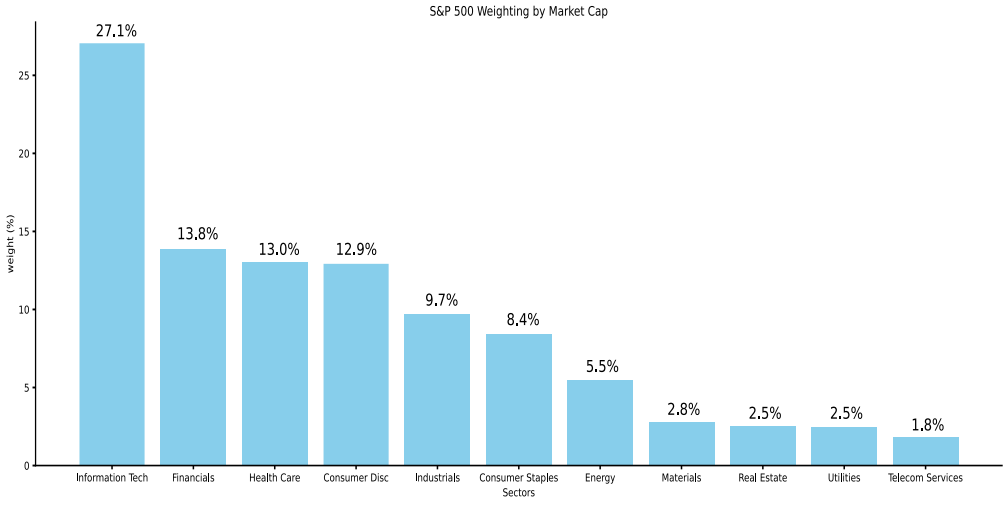
Conclusions and directions for future research

It is extremely difficult to correctly predict the outcome of the stock market and which sectors will be performing well in the future. Information Technology has been the best greatest performing sector over the past decade and as a result, the valuation of technology firms has been driven up extremely high. Conducting relative valuation of the financial ratios and comparing it against the S&P 500 average will give insight on which of the four large technology companies are over or undervalued.

The result of the relative valuation shows that Google is the most undervalued compared to its competitors in the sector based on the financial ratios used, while Microsoft is the most overvalued. This suggests that despite the rapid growth technology companies have experienced in the past, undervalued companies such as Google are still poised for further growth relative to the market. However, it is important to note that relative valuation is only one way of valuing companies and does not completely tell the entire story. Future research can incorporate the results of this relative valuation as an additional tool and consideration during the valuation process of companies.

Appendix A: Figures and tables

Figure 1: Weight of each sector in the S&P 500



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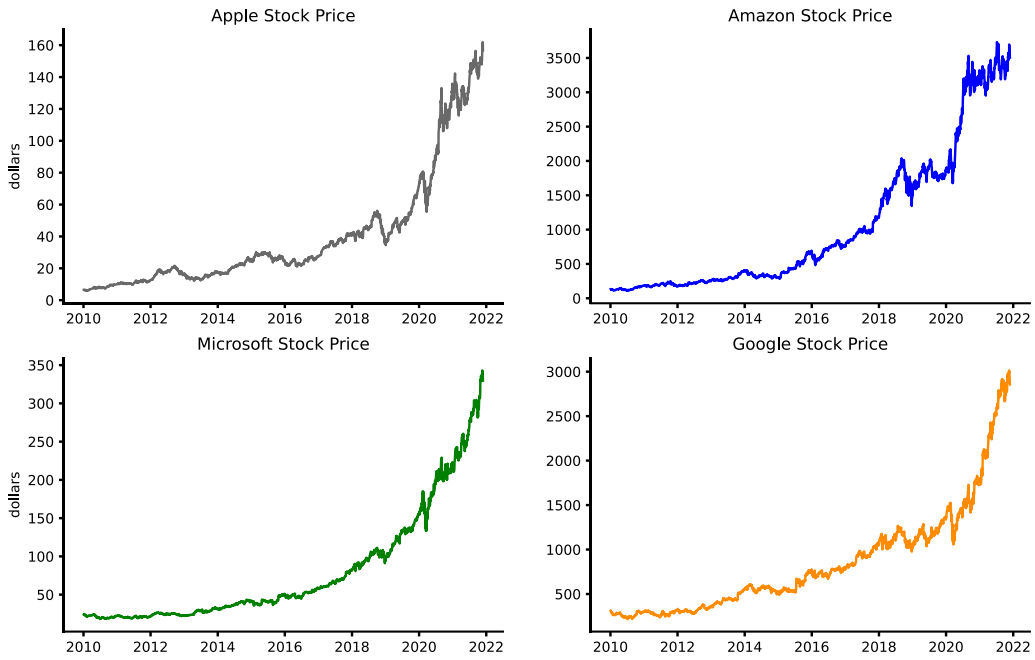

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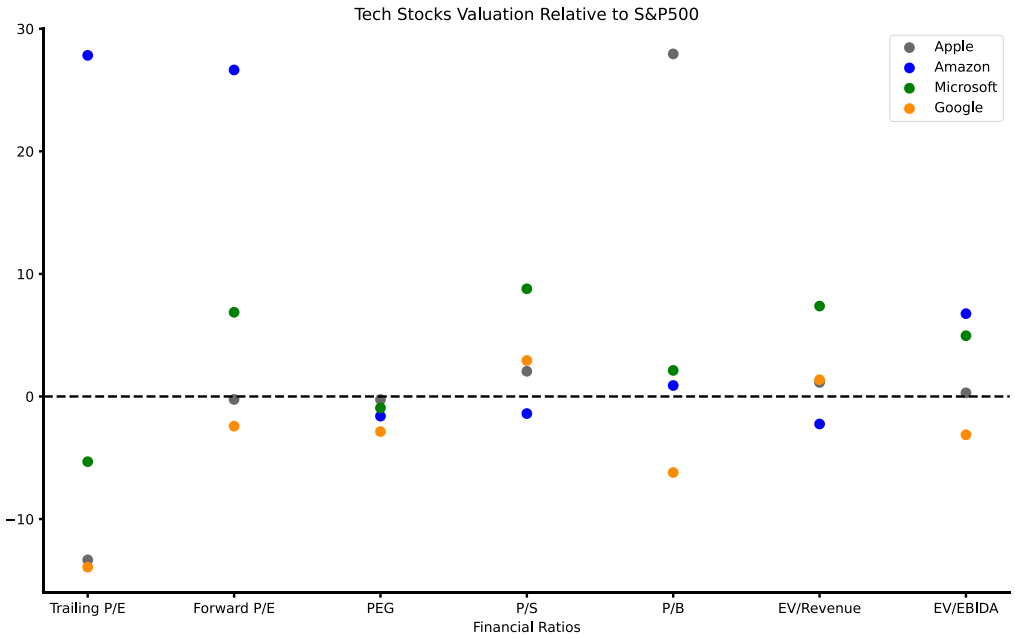

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Microsoft	(-)	(+)	(-)	(+)	(+)	(+)	(+)	5	2
Google	(-)	(-)	(-)	(+)	(-)	(+)	(-)	2	5

Appendix B: Dataset links

[1] https://www.kaggle.com/datasets/hanseopark/sp-500-stocks-value-with-financial-statement

[2] https://www.kaggle.com/paytonfisher/sp-500-companies-with-financial-information.