

# Analysis of Apple and Google stock prices during May 2013 and April 2023

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**Introduction:**

One of the biggest and most prosperous technological businesses in the world, Google is recognized for its search engine and online advertising platform. Since its founding in 1998, the business has expanded quickly, entering new markets and sectors, including cloud computing, mobile devices, and software. Apple is an American corporation that develops and sells computer electronics, software, personal computers, and portable devices internationally. It is currently the biggest company in the world, with a market capitalization of \$2.54 trillion.

This study analyzed Google and Apple stock prices from May of 2013 to April of 2023. The main objective of this study is to identify significant trends or patterns, explain major factors that affected Apple and Google stock prices, link the causes of price fluctuations to the socio-economic factors, such as COVID, inflation and high interest rates, evaluate the business state of a company based on the past performance and current economic situation.

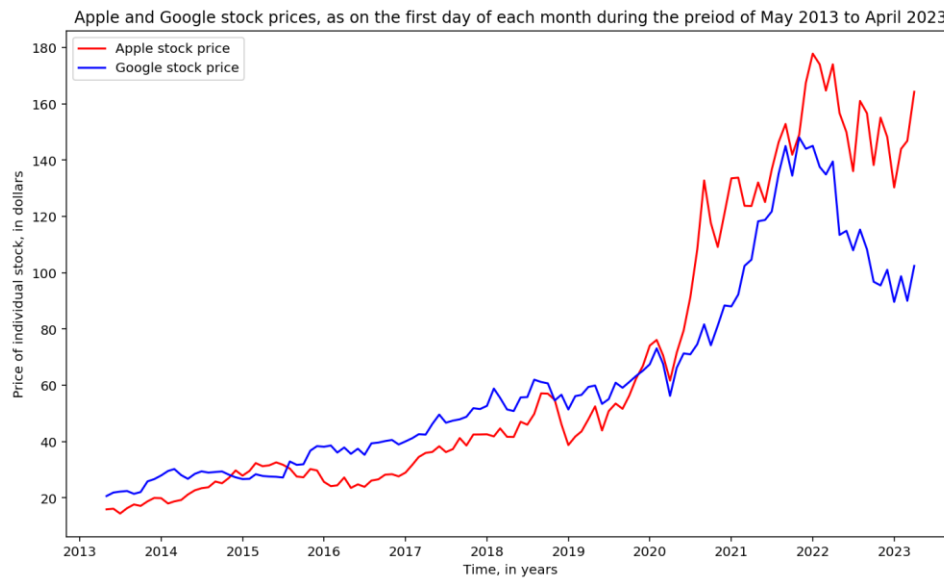
**Dataset:**

The dataset for this report consists of monthly stock prices for Apple and Google from May 2013 to April 2023. The data includes the opening, highest, lowest, close, adjusted close prices and trading volume of the first day of each month during this period. The information opening price and volume data were used for stock analysis in this paper. The datasets were obtained from Yahoo finance (Apple stock price) [a] and Kaggle (Google stock price) [b], which are widely known, reputable data providers. The periods of datasets were adjusted to be the same to make analysis process easier. All calculations and graphs were made based on the information contained in datasets.

**Analysis method:**

A variety of data analysis methods were used, such as descriptive statistics, data visualization, and correlation analysis, to address the research issues. All the coding for this paper was done on the cocalc platform, from which the graphs of stock prices, trading volume and linear regression were obtained. Trends and patterns in the stock price movements were visualized by making line and scatter plots. The connection between the stock values of Google and Apple was comprehended thanks to the correlation analysis and linear regression graph. It was expected to see the two stocks to be closely related to each other due to them being large contributors to the tech sector. Similar events were expected to influence the price changes, like over hiring, data related policies and technological innovations [1]. The information about the influences of stock prices and trading volume trends was collected from external sources.

## Results and Discussion:



*Figure 1\*\*\*: Prices for individual stocks of Apple and Google throughout the period between May 2013 and April 2023.*

As can be seen on the graph, both stocks have significantly increased in value over time. Google and Apple stock prices have increased from 20.6 to 102.4 and from 15.9 to 164.3 dollars a share, respectively. They followed similar growth trends. The sharp changes in both graphs are mostly simultaneous, which suggests that the same events had an impact on stocks. The most interesting parts for investigation are volatility periods: December 2018 and March 2020 to January 2022.

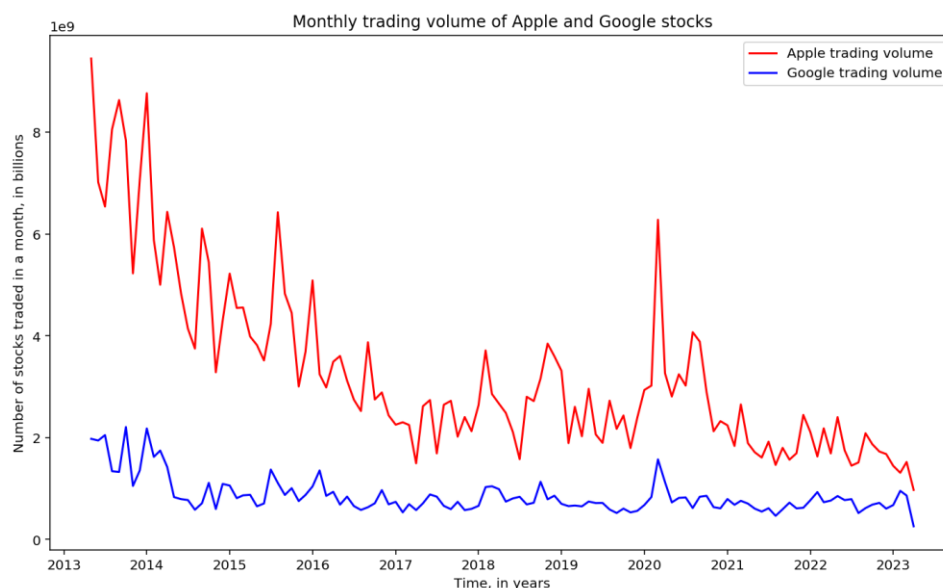
Apple's revenue did not match the forecasted revenue for the first quarter of 2018, actual 89\$ billion as opposed to predicted 93\$ billion. After the discussion of the results for the first quarter, the company refused to provide the unit sales data for its products. This resulted in a 6.6% stock price drop. During the October – December 2018 period, Apple had dropped 30%, due to weak demand for the most recent iPhone models and numerous component suppliers issued guidance warnings [2]. During same period, Google has faced a major data breach within its network, due to the glitch in Google+ apps. When the glitch was first discovered, Google decided not to notify its customers because the announcement would result in government's "regulatory interest" [3]. As a result, up to 500,000 Google+ accounts were potentially affected. Google stock price fell by 9.8% after the breach was revealed [4].

The recession in March of 2020 had a worldwide impact on the economy, including the tech sector. With the onset of COVID-19, the Apple stores and factories started closing, the supply chains were disrupted, and sales volume decreased. Apple's stock prices declined sharply, reflecting investors' concern about the potential impact on Apple's ability to cope with the challenges COVID imposed [5]. Google stock prices have also sharply decreased with the onset of COVID regulations. During the February – April of 2020, Google decreased about 23% in value. It experienced the weakest revenue growth in 5 years, which was less compared to the

previous year by \$10 billion [6]. This happened due to the significant and sudden slowdown in advertising, the company's main source of revenue [7].

Apple has recovered very quickly from the economic impact of COVID, its stock price increased from 61.6\$ per share in April 2020 to 132.8\$ in September 2020. Usage of company's digital services, including App Store, iCloud and streaming services has increased, as remote work, learning, and entertainment surged. Additionally, the actual sales of iPhone SE outperformed predictions, with China being the main contributor, and the demand for services like Apple Music and Apple TV+ continued to grow [8].

Google has also recovered quickly from the pandemic crisis, showing the ability to quickly adapt to challenges and use the emerging opportunities. The major contributor to Google's successful recovery is its core business model - online advertising. As businesses made a shift towards online operations, Google's has experienced an increased online advertisement activity. Google Cloud experienced significant expansion during this period, securing major contracts and partnerships, one of which is PayPal [9]. As people turned to digital entertainment and online services, the demand for Google's YouTube and Google Play services increased substantially. This set Google Cloud ahead of its rivals, leading to increased investor confidence.



*Figure 2: Trading volume for Apple and Google stocks throughout the period between May 2013 and April 2023.*

The trading volume of the two stocks was highly volatile during the observed period, with a sharp peak for both stocks in March 2020. The volatility of trading activity is related to the news about the company's financial performance, innovations, macroeconomic factors, and legal factors. Apple stock has much more trading volume than Google, due to the uneven amount of shares being in circulation and Apple being a more attractive investment option [10].

One of the most common reasons for the increase in trading volume is financial performance. Positive earnings reports, new product releases, and innovations tend to make investors buy stocks. On the contrary, negative news about the company missed earnings estimates or

postponing and other negative factors encourage investors to sell stocks, increasing the trading activity. An example of this can be Apple's late 2018 revenue miss match. As a result, investors started selling stocks, which corresponds to a spike in the graph during that period.

Other influences of the trading volume are macroeconomic factors, such as interest rates, inflation, and geopolitical events. Changes in interest rates by the banks can change the investors behavior. If the inflation is high, logistics costs, salaries will rise and consumer ability to spend will decrease. High interest rates mean that consumers will have less buying ability and will spend less. These factors will make investors sell stocks, leading to an increase in trading volume [11].

The legal factors and regulatory concerns can also significantly impact stock market activity. In the past, the antitrust investigations or data privacy concerns, which usually were costly to Apple and Google, had negatively impacted the stocks of both companies. An example of this can be Google+ data breach late 2018 and the App Store antitrust investigation in late 2020 [12].



*Figure 3: Scatter plot of Apple and Google stock prices in blue, with linear regression line in orange. The graph illustrates the strong correlation between the two stock prices.*

There is a strong positive correlation coefficient between the two stocks, about 0.956, with near zero associated P-value. Strong positive correlation implies that if the price of one of two stocks is increasing, the other will increase as well. The small P-value proves that the correlation is statistically significant. The interesting point of the graph is that the correlation is much stronger at the low stock prices, due to the increased Apple development at the end of investigated period. While both companies operate in different segments of the technology industry, their stock prices tend to follow similar patterns and trends due to several factors.

Apple and Google occupy leading positions in their respective markets of the technology sector. Being the leader in the industry means that the general trends in tech are clearly reflected in the

companies' stock prices. The positive news about developments in technology, like the release of the new iPhone or the improvement in Google's ad service can drive up the stock prices.

There is also an overlap in the customer base and target markets of two companies, and the companies' products being complementary. Most consumers use the products of both companies, such as using Google search or watching YouTube on iPad, iPhone, or Mac. Positive developments in any of two firms' products may boost demand for the other, hence increasing the value of the two stocks [13].

Another common factor for both stocks which contributes to the correlation is macroeconomic conditions. During times of economic prosperity, both companies may experience increased demand and investor confidence, leading to a positive correlation in their stock prices. Conversely, during the periods of high inflation, high interest rates and unstable economic situations the stock prices of both companies declined together, reflecting broader market sentiment.

However, even with the strong correlation there are differences between the two stock prices due to events related specifically to one of the two companies such as differing financial performance, regulatory challenges, or product-related issues specific to one of the two businesses.

## **Conclusion**

The analysis of Apple and Google stocks was performed in this study. Both companies have experienced significant growth in their stock prices over the years, occupying the dominant positions in their relevant sectors. There is a strong positive correlation between two stock prices, due to the shared influence on the tech sector, overlapping customer base and external economic factors like inflation and interest rates. The trading volume analysis illustrates the volatility of trading activity for Apple and Google stocks, with notable spikes during periods of significant events like publications of revenue forecasts, news about product-related issues and regulatory concerns or macroeconomic conditions. One of the biggest macroeconomic impacts during the investigated period was COVID-19 pandemic. Apple faced supply chain disruptions and reduced consumer spending, while Google experienced a slowdown in advertising revenue. Both stocks recovered quickly in the next couple of years. This analysis provides valuable insights into the trends, patterns, and factors influencing the stock prices of Apple and Google during the analyzed period, helping investors and stakeholders gain a better understanding of these tech giants' performance in the stock market.

## **Appendix**

Figure 1 shows the stock prices of Apple and Google stocks during the investigated period. The stock prices of both companies are depicted with the same x and y axis, making the graph easy to read. The title gives a clear understanding of what will be on the graph. The graphs were created using 120 points for each, reflecting the price of stocks for the first day of the month from May of 2013 to April of 2023. Red and blue colors were chosen for the graph to make a clear distinction between the prices of two stocks in overlapping regions. The significance of the data was indicated by using bright colors.

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