

# Statistical stocks analysis



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# Data summary

## **Overview:**

- The dataset comprises live stock values of three major companies: Microsoft, Apple, and Tesla.
- Data has been extracted from Yahoo Finance and covers the period from 2018 to 2023, providing daily stock values for each company.
- Additionally, the dataset includes S&P 500 values for the same time period, offering a broader market perspective.

## **Variable Description:**

- For each trading day, the dataset includes the following variables: Date, Open, High, Low, Close, Adjusted Close, Volume, MS%change, Apple%change, Tesla%change, SP\_500%change.
- These variables represent daily stock values for Microsoft, Apple, and Tesla, as well as the percentage change in the S&P 500 index.

## **Importance of Beta B1:**

- According to the Capital Asset Pricing Model (CAPM), the slope coefficient Beta (B1) in a simple regression of the excess return on the stock (e.g., Apple%change) versus the stock return on the market (S&P\_500%change) serves as a measure of the relative risk of the stock.
- Stocks with higher Betas are considered more risky and are expected to have higher returns in the market

# Descriptive statistics

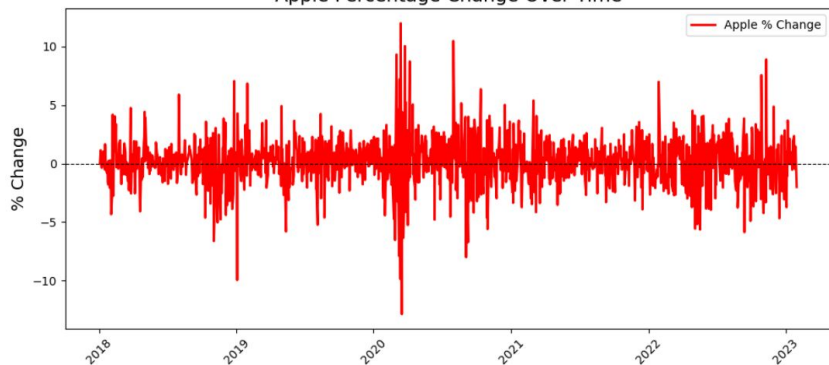
Stock	Mean	Median	Mode	Count	Max	Min	Variance	Std Dev
MSFT	194.510548	203.050003	92.330002	1278	343.109985	85.010002	5511.864378	74.241931
Tesla	131.790281	97.640004	14.641333	1278	409.970001	11.931333	13684.080793	116.978976
Apple	98.646516	95.615002	145.860001	1278	182.009995	35.547501	2133.617820	46.191101
SP500	3457.230055	3298.025000	2723.060000	1278	4796.560000	2237.400000	444593.791085	666.778667

## Summary of Descriptive Statistics Key Insights

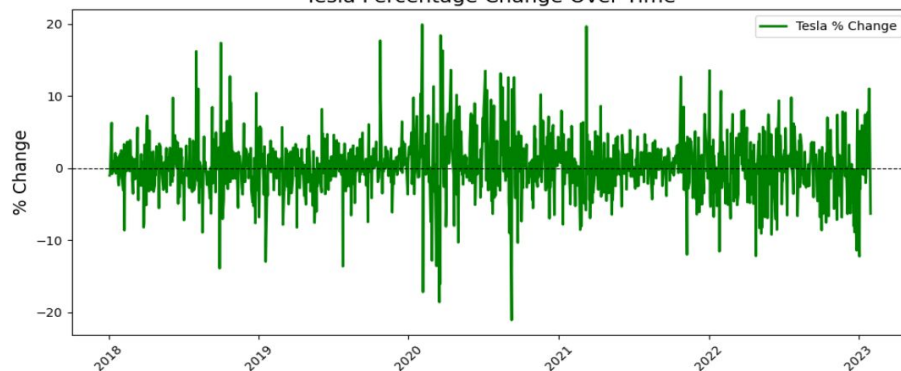
1. **Performance Metrics:** Microsoft (MSFT) has the highest mean (194.51) and median (203.05), indicating strong performance, while Tesla shows significant volatility with a high standard deviation (116.98) and variance (13684.08).
2. **Volatility:** Tesla's price fluctuations are the most pronounced, reflected in its wide range (398.04). The S&P 500 also shows considerable volatility but has the highest overall mean (3457.23).
3. **Stability:** Apple presents more stability with a lower standard deviation (46.19) compared to Tesla and MSFT, making it a potentially safer investment.
4. **Investment Consideration:** Investors seeking lower risk may prefer MSFT and Apple, while those willing to take on higher risk for potential rewards might consider Tesla.

# PERFORMANCE ANALYSIS ON % OF CHANGE

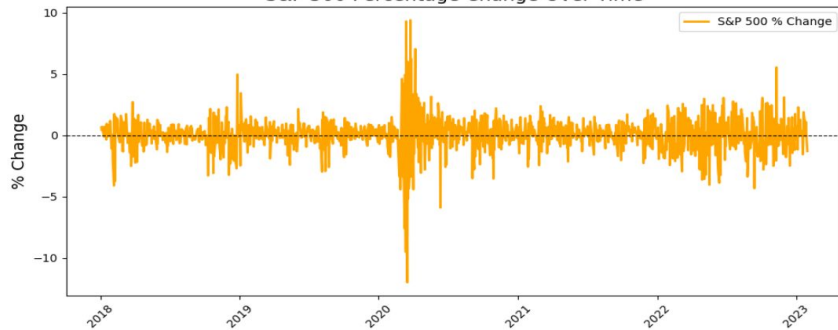
Apple Percentage Change Over Time



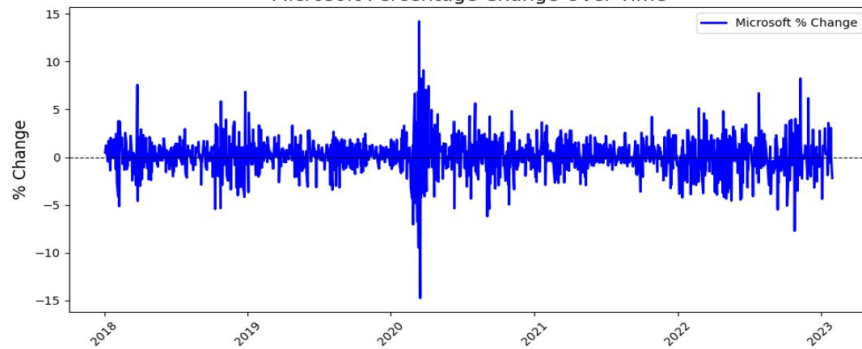
Tesla Percentage Change Over Time



S&P 500 Percentage Change Over Time



Microsoft Percentage Change Over Time



# Performance Analysis on Percentage Changes

## Microsoft

- Average Daily Percentage Change: Approximately 0.00098
- Volatility: Relatively stable day-to-day fluctuations
- Total Percentage Change: 1.25
- Overall Growth: Modest growth in stock prices

## Apple

- Average Daily Percentage Change: Approximately 0.00117
- Volatility: Moderate fluctuations in stock prices
- Total Percentage Change: 1.50
- Overall Growth: Moderate growth in stock prices

## Tesla

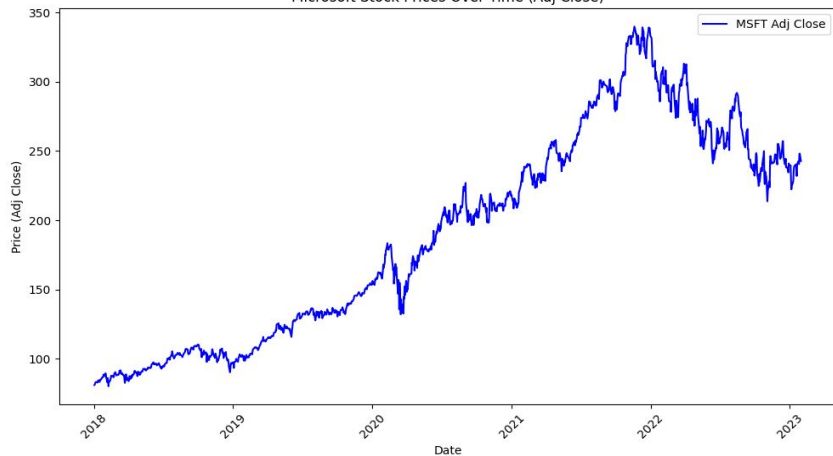
- Average Daily Percentage Change: Approximately 0.00263
- Volatility: Higher volatility with larger fluctuations
- Total Percentage Change: 3.35
- Overall Growth: Substantial growth in stock prices

## S&P 500

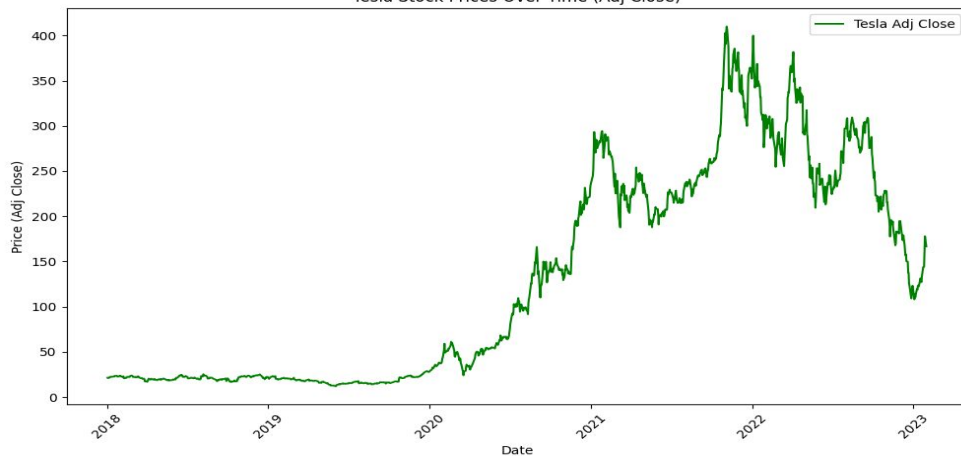
- Average Daily Percentage Change: Approximately 0.00039
- Volatility: Relatively stable fluctuations in the broader market
- Total Percentage Change: 0.50
- Overall Growth: Modest growth in the stock market

# TREND OF ADJUSTED CLOSING STOCKS

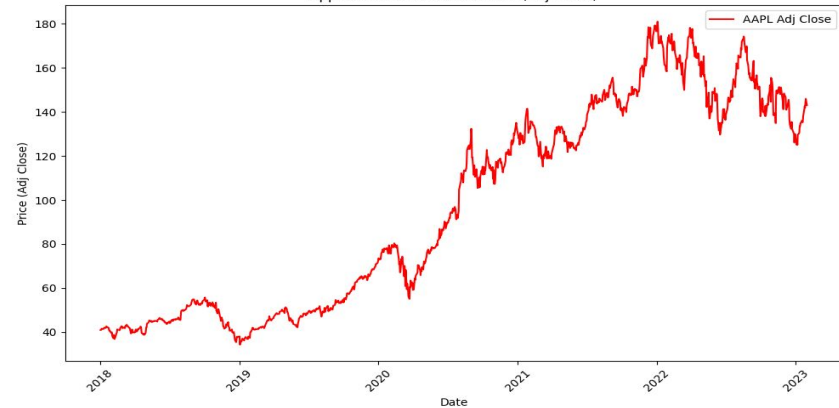
Microsoft Stock Prices Over Time (Adj Close)



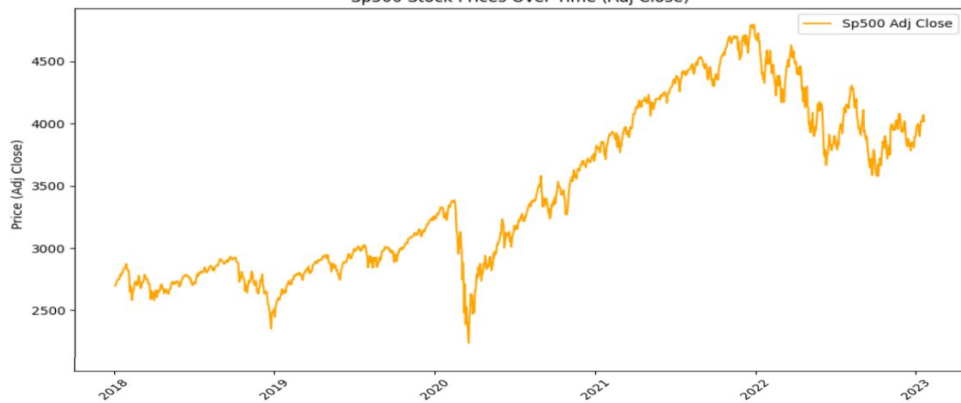
Tesla Stock Prices Over Time (Adj Close)



Apple Stock Prices Over Time (Adj Close)



Sp500 Stock Prices Over Time (Adj Close)



# Trend Inference on Adjusted Close Stock Prices

## Microsoft (MSFT)

- **Trend:** Generally upward from 2018 to 2023.
- **Peaks:** Notable peaks in 2018, 2019, 2020, and 2023, often linked to strong earnings, product launches (e.g., Azure, Office 365), and acquisitions (e.g., GitHub).
- **Drops:** Experienced declines during broader market downturns, particularly in late 2018 and early 2020 due to trade tensions and COVID-19.
- **Recovery:** Quick recovery driven by its resilient business model and digital transformation efforts.

## Apple (AAPL)

- **Trend:** Fluctuating with upward momentum overall.
- **Peaks:** Significant peaks in 2018, 2020, and 2023, typically associated with new product launches and strong earnings.
- **Drops:** Notable declines during iPhone sales concerns in 2018 and pandemic-related supply chain disruptions in 2020.
- **Recovery:** Rebounded due to sustained demand for products and services.

## Tesla (TSLA)

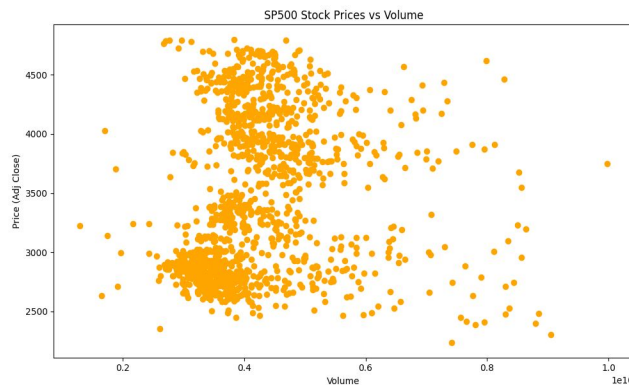
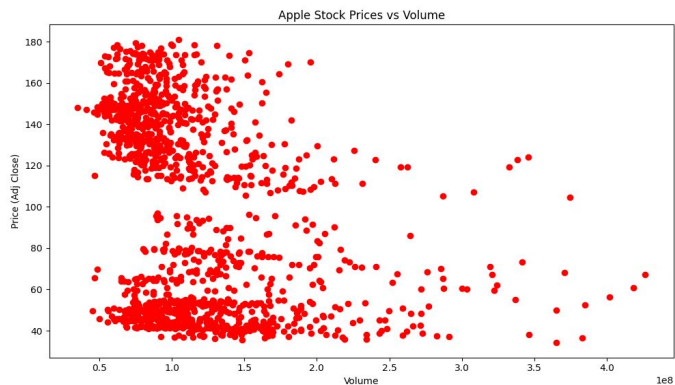
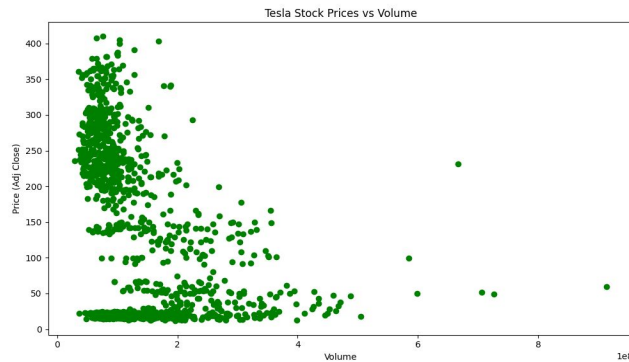
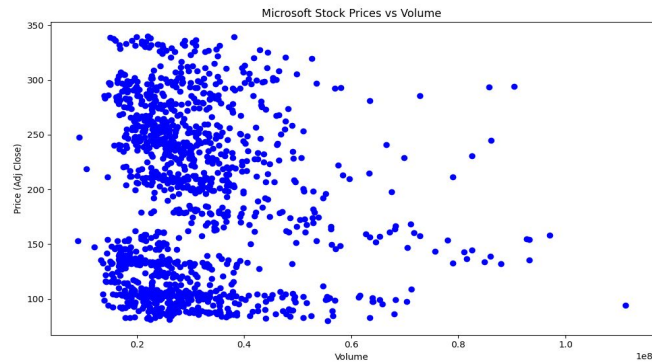
- **Trend:** Highly volatile, with sharp increases and declines.
- **Peaks:** Major peaks in 2020 and 2021 driven by record deliveries and profitability milestones.
- **Drops:** Fluctuations occurred due to regulatory scrutiny, production challenges, and Elon Musk's controversial remarks.
- **Overall Trend:** Despite volatility, the stock trended upwards, fueled by optimism around electric vehicles and renewable energy.

## S&P 500

- **Trend:** Overall growth from 2018 to 2023, marked by peaks and troughs.
- **Peaks:** Significant peaks in 2018, 2019, 2020, and 2023 due to strong corporate earnings and economic stimulus.
- **Drops:** Experienced declines during geopolitical tensions and the COVID-19 pandemic in early 2020.
- **Recovery:** Swift rebound following downturns, showcasing market resilience.



# Stock Volume Analysis



- **Microsoft**

Currently experiencing high trading volume, reflecting robust investor interest and the potential for significant price movements.

- **Tesla**

Recently observed a sharp increase in trading volume, indicating a major news event or a shift in market sentiment.

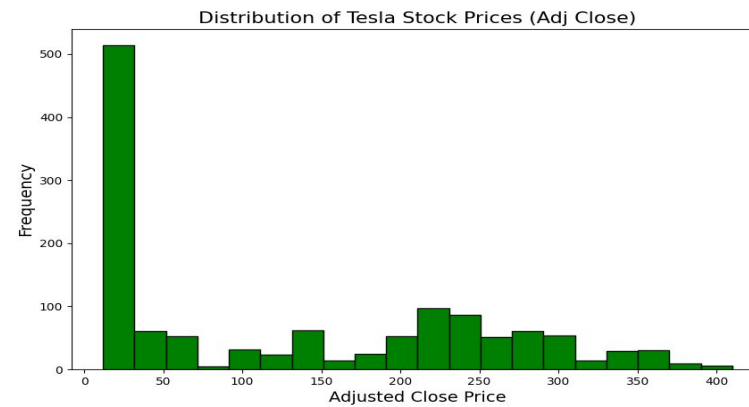
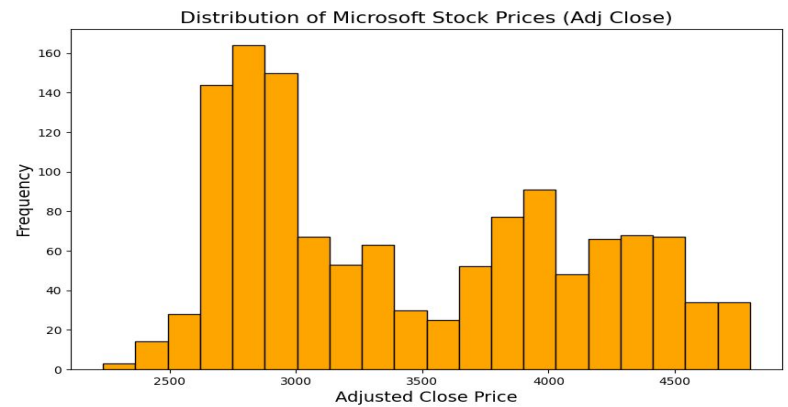
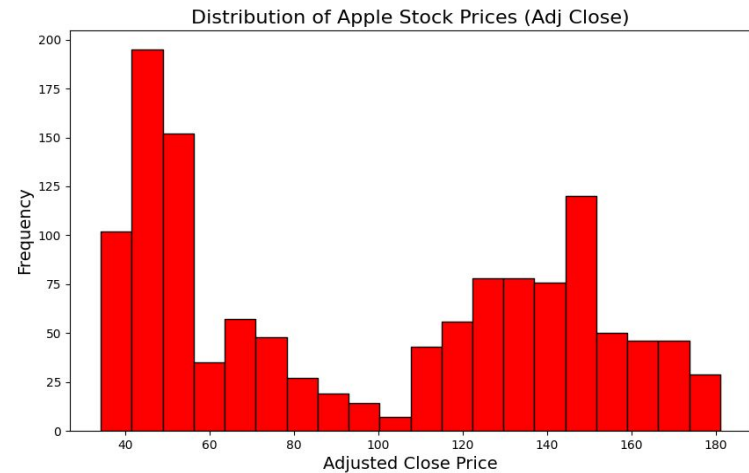
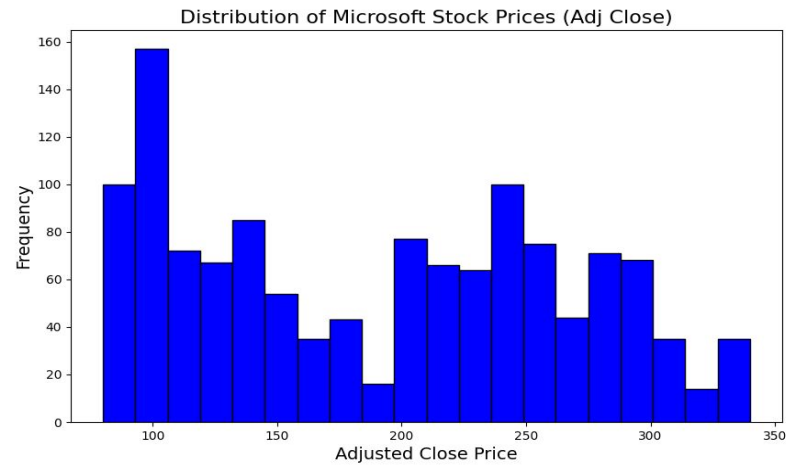
- **Apple**

Consistently low trading volume suggests a lack of investor interest or participation in the stock.

- **S&P 500**

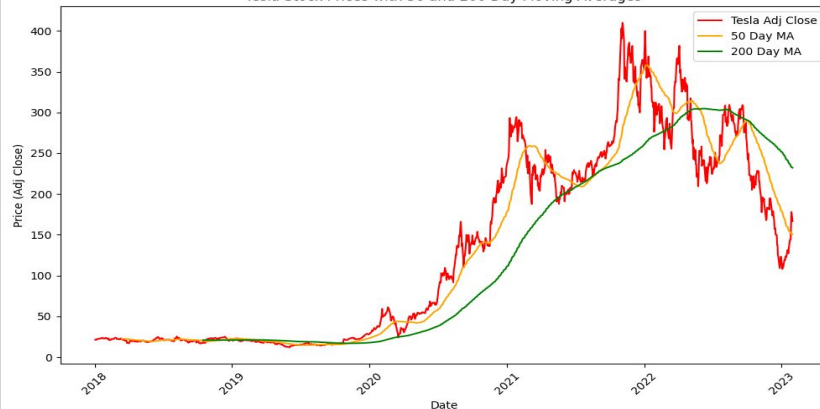
Volume analysis, when considered alongside other indicators, can offer valuable insights into broader market trends and overall investor sentiment.

# Frequency of the adjusted close stocks

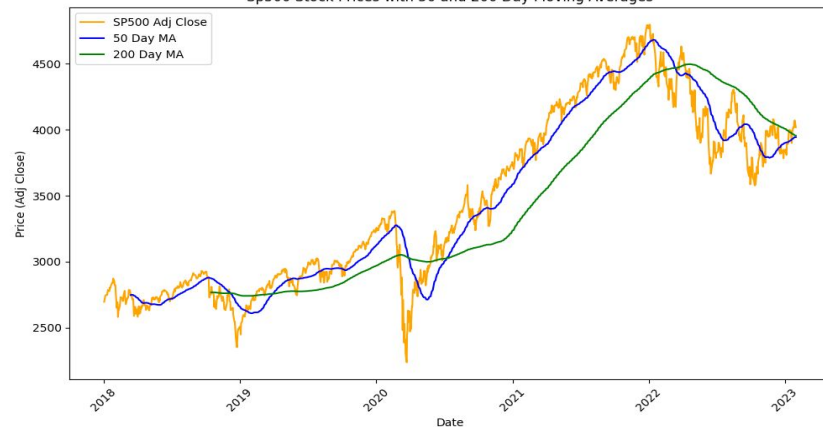


# Stock Prices with 50 and 200 Day Moving Averages

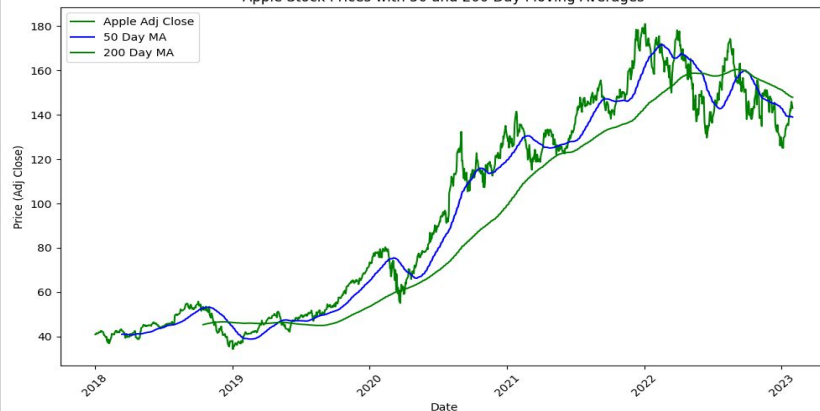
Tesla Stock Prices with 50 and 200 Day Moving Averages



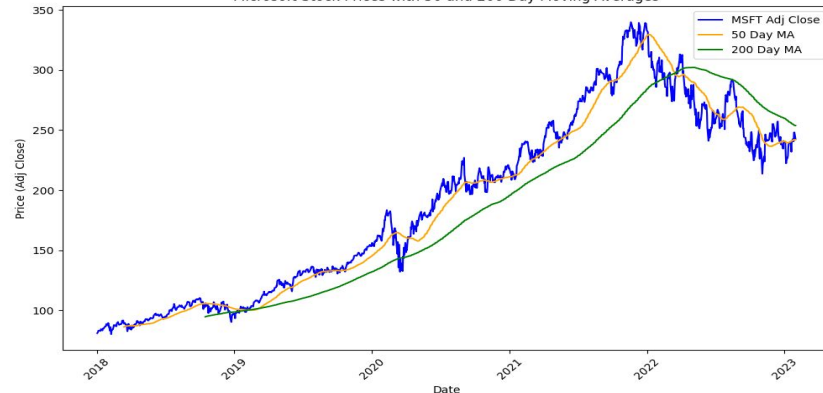
Sp500 Stock Prices with 50 and 200 Day Moving Averages



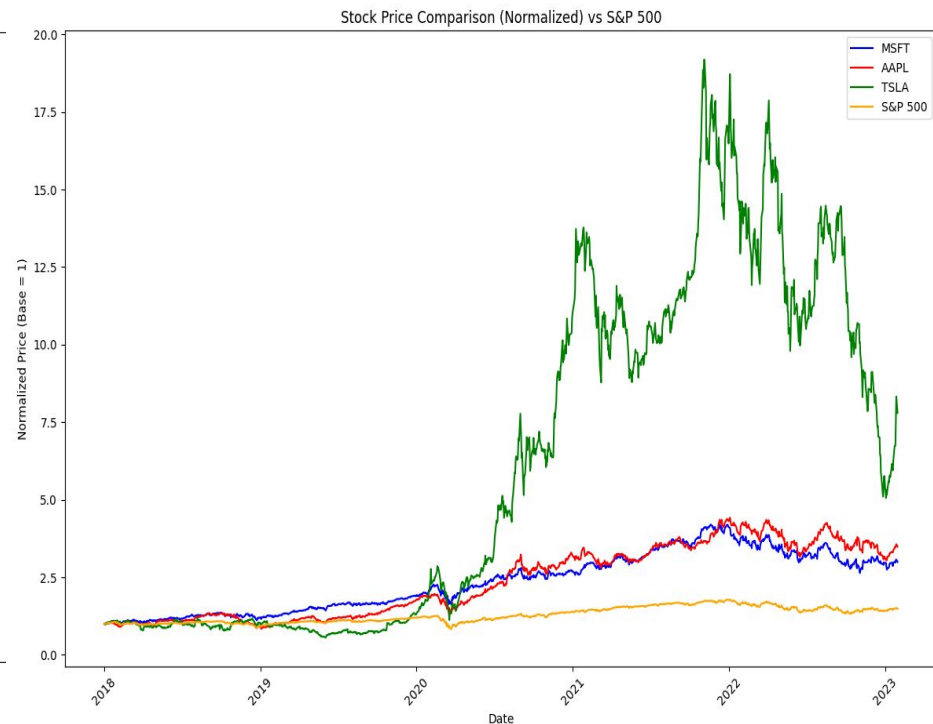
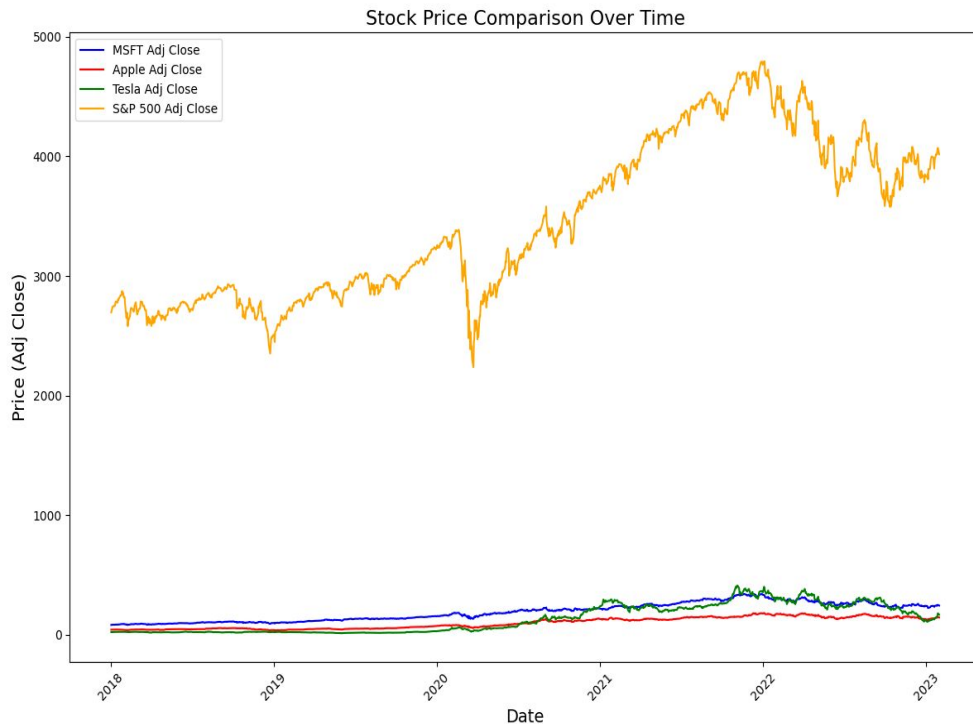
Apple Stock Prices with 50 and 200 Day Moving Averages



Microsoft Stock Prices with 50 and 200 Day Moving Averages



# Stock price comparison



# Price and Time Series Analysis

## **Tesla**

- Tesla's opening stock prices consistently reached new highs over the analyzed period. Significant peaks were observed in March and September 2020, January 2021, and November 2021, showcasing a general upward trend, despite occasional declines.

## **Apple**

- Apple's opening stock prices exhibited notable fluctuations, with periods of both increase and decrease. A significant rise occurred from mid-2020 to early 2021, followed by variable pricing patterns.

## **Microsoft**

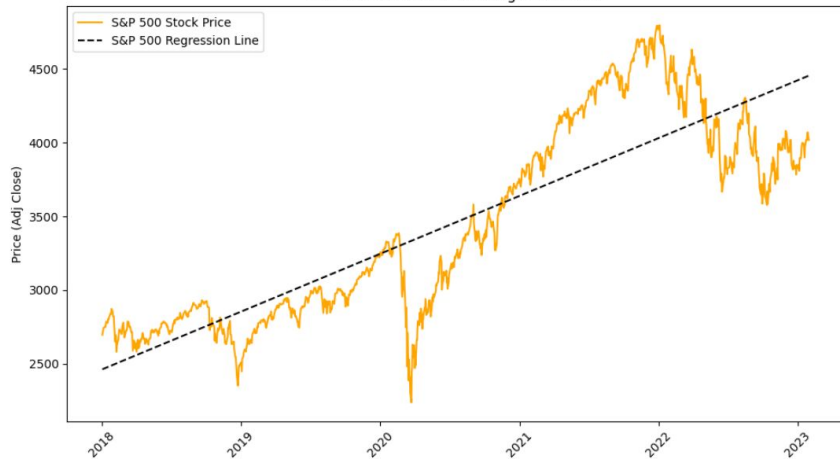
- Microsoft's opening stock prices displayed similar fluctuations as its competitors. Overall, there was a general upward trend, with 2021 marking the highest point, interspersed with occasional dips.

## **S&P 500**

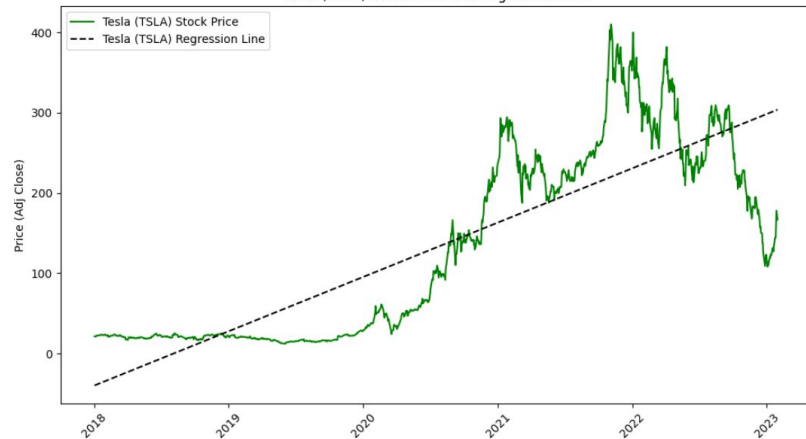
- The S&P 500 index showed overall growth from 2018 to 2023, characterized by peaks and troughs influenced by various factors. Notable peaks were observed in 2018, 2019, and early 2021, driven by strong corporate earnings and fiscal stimulus. However, the index also faced declines due to geopolitical tensions, interest rate concerns, and the impact of the COVID-19 pandemic, which caused a significant market downturn in early 2020. Despite these fluctuations, the S&P 500 rebounded quickly, reflecting overall market resilience.

# Regression line

S&P 500 Stock Price and Regression Line



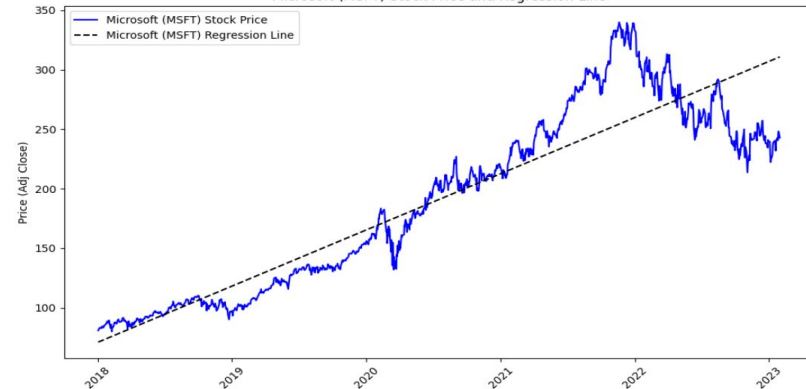
Tesla (TSLA) Stock Price and Regression Line



Apple (AAPL) Stock Price and Regression Line



Microsoft (MSFT) Stock Price and Regression Line



# Regression Insights Summary

## Slope Interpretation:

- **Microsoft (MSFT): 0.1293** (steady growth).
- **Apple (AAPL): 0.0815** (slower growth).
- **Tesla (TSLA): 0.1853** (strong growth).
- **S&P 500: 1.0742** (robust market growth).

## Intercept Analysis:

- **MSFT: -95148.39** (poor initial performance).
- **AAPL: -60008.46** (baseline challenges).
- **TSLA: -136527.13** (disadvantaged starting point).
- **S&P 500: -788881.47** (significant decline).

## Comparative Insights:

- **Growth Rates:** Tesla leads in growth potential, followed by Microsoft and Apple. The S&P 500's high slope signifies strong market performance.
- **Investment Considerations:** Tesla is positioned as an aggressive growth stock, while Apple may be seen as more stable but slower-growing.
- **Market Sentiment:** The S&P 500's high slope suggests positive overall sentiment impacting individual stock performances.

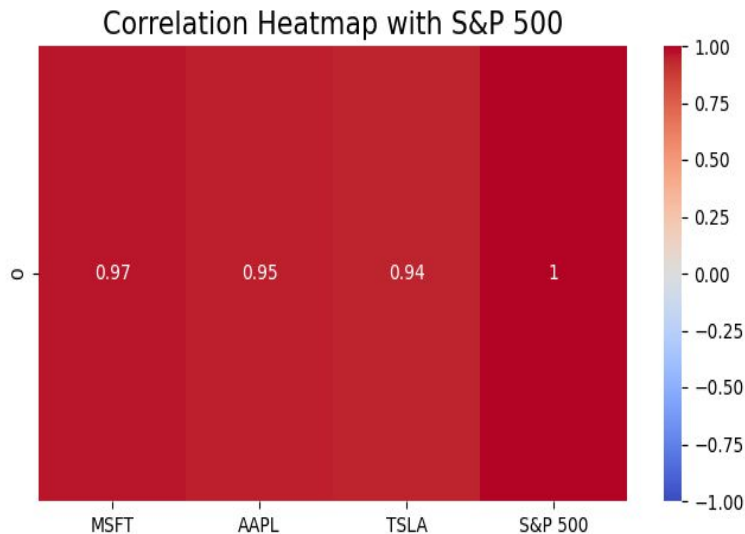
## Limitations:

- Assumes linear relationships; real-world data may exhibit nonlinear patterns.
- Important to check for outliers and residuals for model fit.
- External factors (macro-economic trends, company news) may influence stock prices and performance.

## Conclusion

These regression insights provide a snapshot of growth trends for Microsoft, Apple, Tesla, and the S&P 500. Tesla shows aggressive growth potential, while MSFT and AAPL exhibit stability, with the S&P 500 reflecting robust market health.

# Correlation Insights Summary



## Microsoft (MSFT) and S&P 500: 0.9675

- This high positive correlation suggests that MSFT moves in tandem with the S&P 500. When the S&P 500 rises or falls, MSFT is likely to follow suit, indicating strong alignment with broader market trends.

## Apple (AAPL) and S&P 500: 0.9528

- AAPL also shows a strong positive correlation with the S&P 500, indicating that its performance closely mirrors that of the broader market. This suggests that Apple is significantly influenced by market conditions similar to Microsoft.

## Tesla (TSLA) and S&P 500: 0.9417

- TSLA has a slightly lower, yet still strong, correlation with the S&P 500. This indicates a solid relationship, where TSLA typically follows market trends but may exhibit slightly more volatility compared to MSFT and AAPL.

## Conclusion

The strong positive correlations between MSFT, AAPL, TSLA, and the S&P 500 indicate that these stocks closely follow broader market trends. Investors should be aware of this relationship when considering portfolio strategies, as movements in the S&P 500 are likely to significantly influence the performance of these companies.



# Final Conclusions



## Tesla (TSLA)

- **Trend:** Significant upward trajectory with peaks in 2020-2021.
- **Volatility:** High volatility (standard deviation: 116.98) indicating substantial price fluctuations.
- **Investment Consideration:** Offers substantial growth potential (total change: 3.35%) but comes with higher risk.



## Apple (AAPL)

- **Trend:** Moderate fluctuations, overall stable growth.
- **Volatility:** Lower volatility (standard deviation: 46.19) compared to Tesla, making it a safer option.
- **Investment Consideration:** Moderate growth (total change: 1.50%) with a balanced risk profile.



## Microsoft (MSFT)

- **Trend:** General upward trend with notable peaks linked to strong earnings.
- **Volatility:** Strong performance metrics (mean: 194.51) with occasional dips.
- **Investment Consideration:** Attractive for growth-oriented investors seeking lower risk.

## S&P 500



- **Trend:** Overall growth marked by peaks influenced by corporate earnings and economic conditions.
- **Volatility:** Moderate fluctuations but resilient recovery post-downturns.
- **Investment Consideration:** Suitable for investors looking for steady market exposure.

## Overall Insights

- **Performance:** Microsoft shows the highest mean price, while Tesla exhibits significant volatility.
- **Investment Strategy:** Lower-risk investors may prefer Microsoft and Apple, while those seeking higher returns might consider Tesla.