

STOCK PRICE TREND ANALYSIS: UNCOVERING PATTERNS AND INSIGHTS



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INTRODUCTION

- ❑ The stock price is a representation of the market's assessment of the value of a company. It is influenced by various factors, including the company's financial performance, growth prospects, industry conditions, and overall economic trends.
- ❑ Understanding stock prices trend is important for making informed decisions related to investment, risk management, and strategic planning
- ❑ This dataset is extracted from the Website of Yahoo Finance and spans from 2018 to 2023.
- ❑ Data Set comprises of live data stock values of 3 major companies: Microsoft, Apple and Tesla as well as S&P 500(a primary stock market index)values during the same time frame

OBJECTIVES

The main goal is to conduct an in-depth statistical analysis of the stock prices of major US companies, specifically Microsoft, Apple and Tesla, covering the period from 2018 to 2023. This entails creating comparative descriptive statistics and visually engaging charts, including scatter plots and histograms, to depict and explain the trends in the price values of each stock throughout the specified duration. The objective of the statistical report is to provide a nuanced comprehension of the dynamic behaviors exhibited by company stocks, utilizing metrics such as mean, median, and deviation. Through the collection of real-time data, the analysis aims to deliver valuable insights into the changing patterns and fluctuations in stock prices, supporting informed decision-making and strategic planning in the realms of investment and financial analysis.



DESCRIPTIVE STATISTICS

MICROSOFT	
Mean	194.471
Median	203.580
Mode	95.140
Minimum	86.060
Maximum	344.620
Sum	248533.810
Count	1278.000
Range	258.560
Variance	5510.449
Standard Deviation	74.232
Skewness	0.150
Kurtosis	-1.288
Standard Error	2.076

Table 1

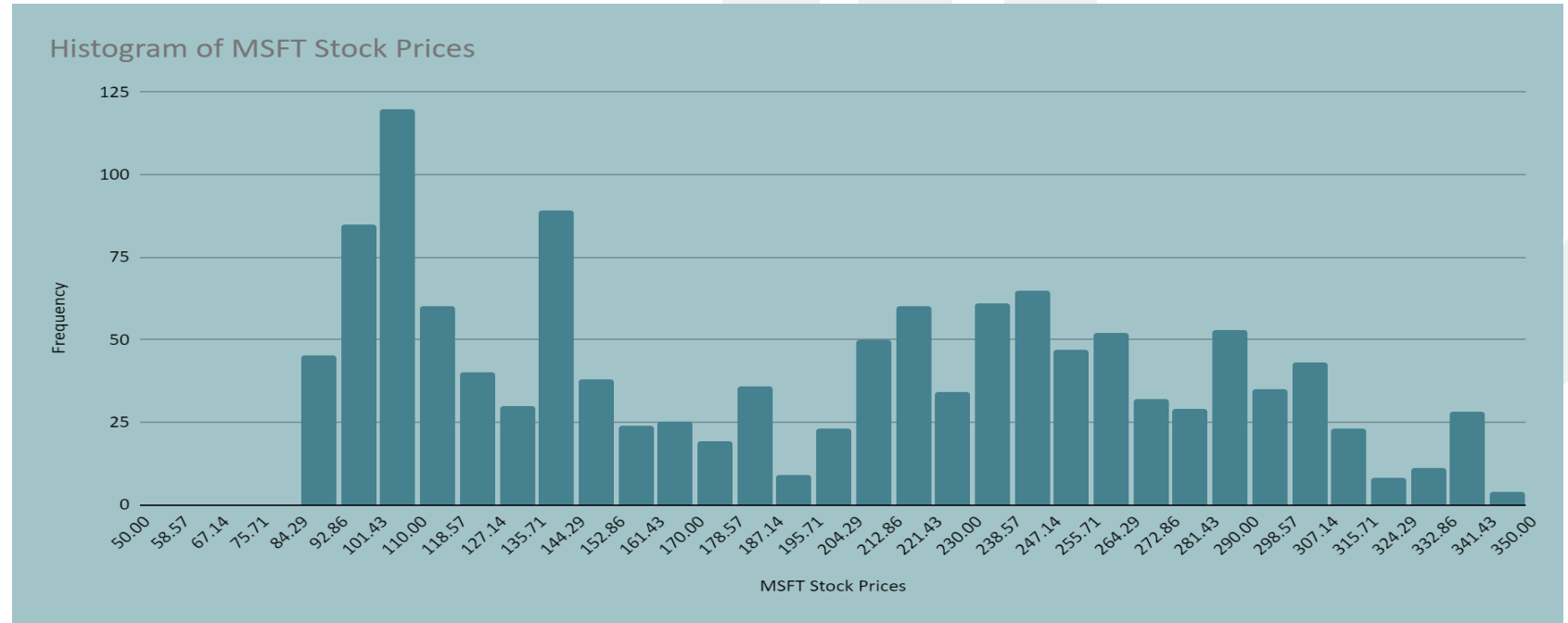


Figure 1

The descriptive statistics reveal key characteristics of a dataset with 1,278 observations. The central tendency is represented by the mean (194.471), median (203.580), and mode (95.140). The dataset exhibits a range from a minimum value of 86.060 to a maximum of 344.620, resulting in a range of 258.560. The dispersion of the data is quantified by the variance (5510.449) and standard deviation (74.232). The distribution displays a slight positive skewness (0.150), indicating a longer tail on the right side, while the negative kurtosis (-1.288) suggests a distribution with lighter tails and a flatter peak than a normal distribution. The standard error is reported at 2.076, providing an estimate of the standard deviation of the sample mean. These statistics collectively offer a comprehensive summary of the dataset's central tendency, spread, and shape.

DESCRIPTIVE STATISTICS

APPLE	
Mean	98.574
Median	95.087
Mode	127.820
Minimum	35.995
Maximum	182.630
Sum	125977.705
Count	1278.000
Range	146.635
Variance	2132.236
Standard Deviation	46.176
Skewness	0.122
Kurtosis	-1.582
Standard Error	1.292

Table 2

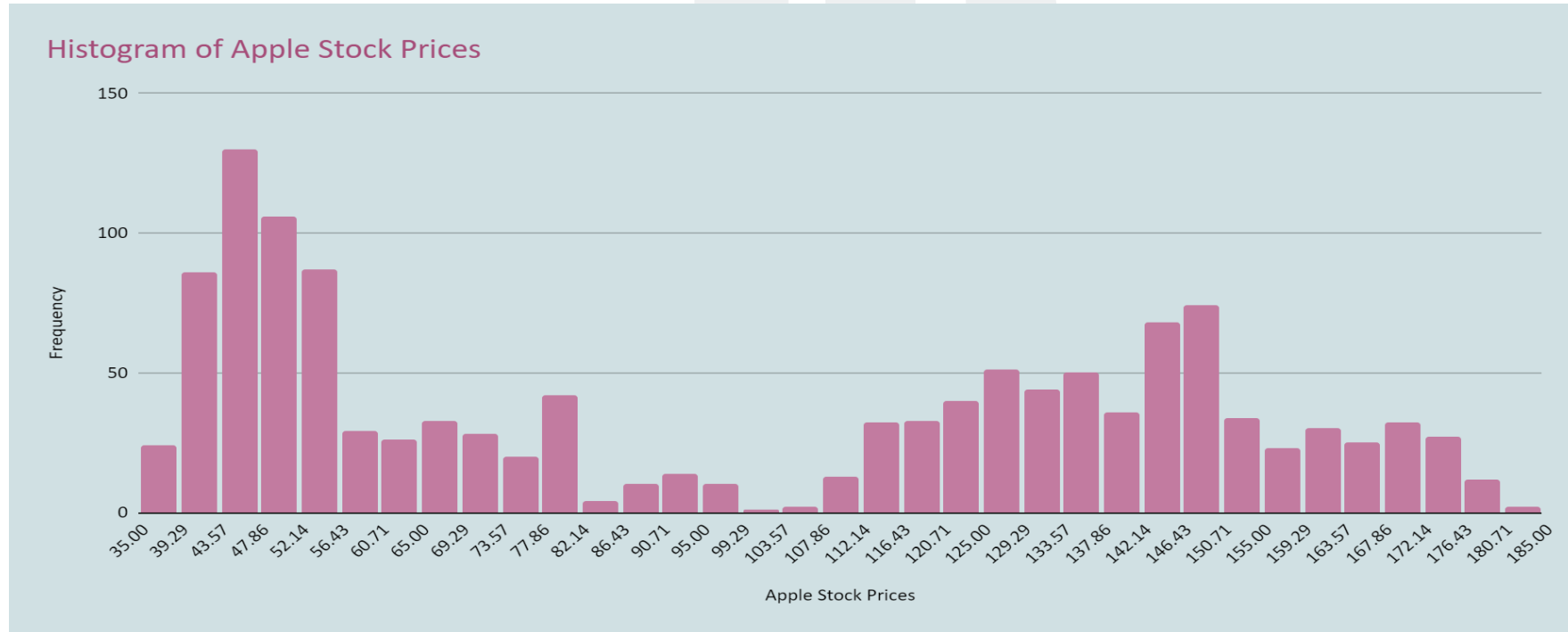


Figure 2

The descriptive statistics for Apple stock, based on 1,278 data points, provide a thorough understanding of its numerical properties. Central tendency measures, including a mean of 98.574, a median of 95.087, and a mode of 127.820, depict the typical values. The stock's range spans from a minimum of 35.995 to a maximum of 182.630, indicating a total range of 146.635. Variability is evident in a variance of 2132.236 and a standard deviation of 46.176. A skewness of 0.122 suggests a minor asymmetry in the distribution, while a kurtosis of -1.582 indicates lighter tails and a flatter peak compared to a normal distribution. The standard error, reported at 1.292, offers an approximation of the standard deviation of the sample mean. These statistics collectively furnish a comprehensive overview of Apple stock, encompassing central tendency, variability, and distribution characteristics.

DESCRIPTIVE STATISTICS

TESLA	
Mean	131.895
Median	96.573
Mode	24.000
Minimum	12.073
Maximum	411.470
Sum	168562.080
Count	1278.000
Range	399.397
Variance	13728.007
Standard Deviation	117.167
Skewness	0.471
Kurtosis	-1.257
Standard Error	3.277

Table 3

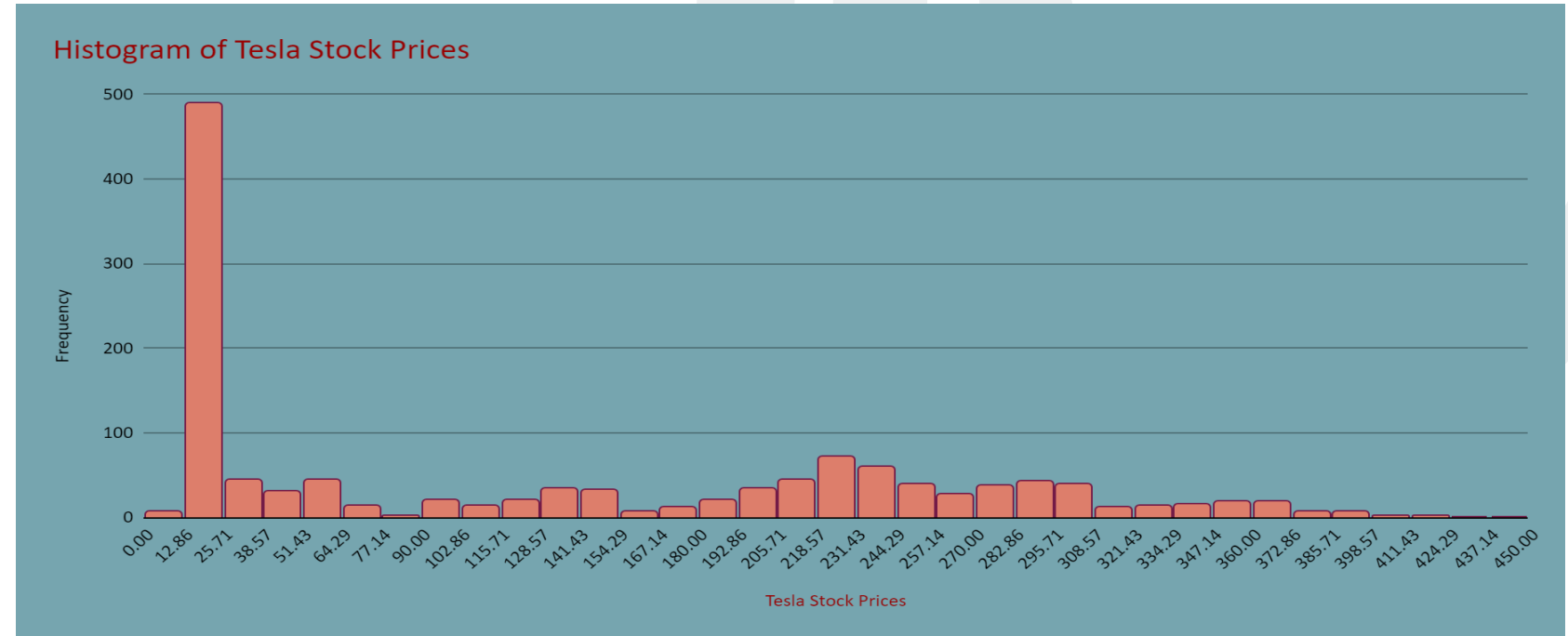


Figure 3

The statistical summary for Tesla stock, derived from 1,278 data points, provides valuable information about its numerical characteristics. Measures of central tendency include a mean of 131.895, a median of 96.573, and a mode of 24.000. The stock demonstrates a wide range, extending from a minimum value of 12.073 to a maximum of 411.470, resulting in a span of 399.397. The variability in the dataset is captured by a variance of 13728.007 and a standard deviation of 117.167. A positive skewness of 0.471 indicates a slight asymmetry with a longer tail on the right side. The kurtosis of -1.257 suggests a distribution with lighter tails and a flatter peak compared to a normal distribution. The standard error is noted at 3.277, providing an approximation of the standard deviation of the sample mean. Collectively, these statistics offer a comprehensive overview of Tesla stock, encompassing its central tendency, variability, and distribution shape.

DESCRIPTIVE STATISTICS

S&P 500	
Mean	131.895
Median	96.573
Mode	24.000
Minimum	12.073
Maximum	411.470
Sum	168562.080
Count	1278.000
Range	399.397
Variance	13728.007
Standard Deviation	117.167
Skewness	0.471
Kurtosis	-1.257
Standard Error	3.277

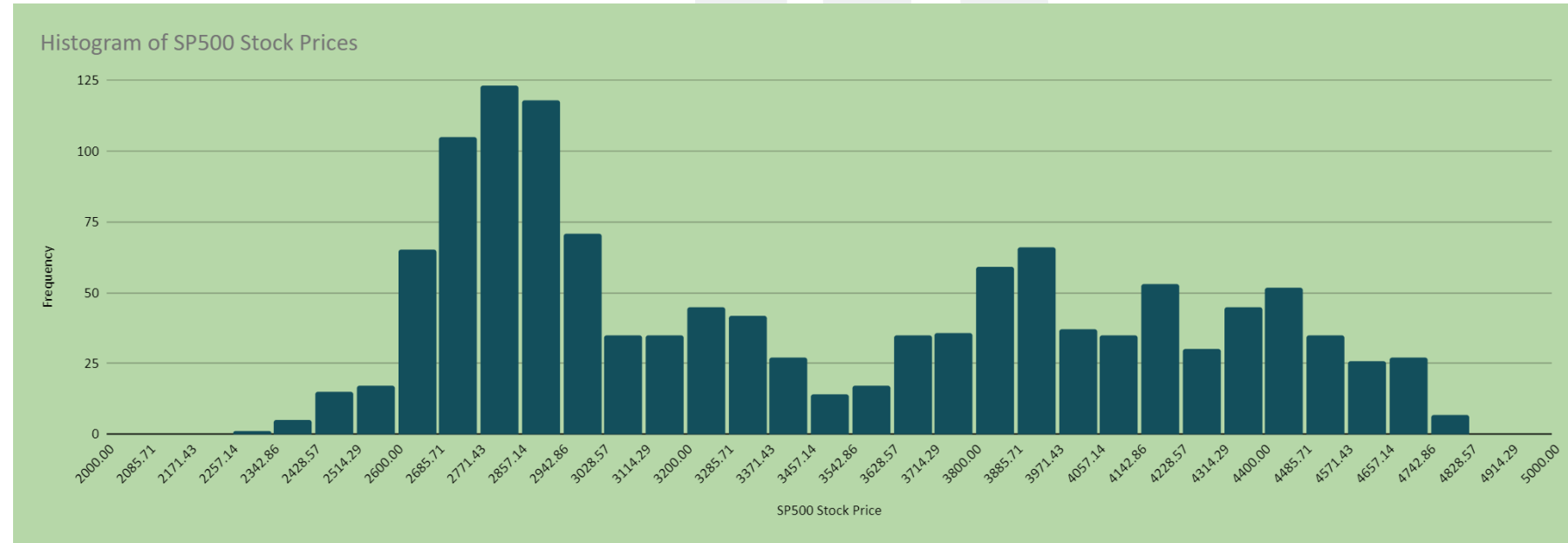


Figure 4

Table 4

The descriptive statistics for the S&P 500, drawn from 1,278 data points, present a thorough summary of its numerical features. Key indicators of central tendency, such as a mean of 3457.034, a median of 3294.670, and a mode of 2832.410, offer understanding into the typical values within the stock index. The range of the index extends from a minimum of 2290.710 to a maximum of 4804.510, resulting in a span of 2513.800. Variability is evident through a variance of 444300.942 and a standard deviation of 666.559. A skewness of 0.333 points to a slight asymmetry in the distribution, while a kurtosis of -1.297 suggests lighter tails and a flatter peak compared to a normal distribution. The standard error, reported at 18.645, provides an estimate of the standard deviation of the sample mean. In combination, these statistics offer a comprehensive understanding of the S&P 500's central tendency, variability, and distribution characteristics.

AVERAGE OF S&P 500 STOCK PRICE POINTS FROM 2018 TO 2023

Year	Open	Low	High	Close	Adj Close	Volume	SP% chng
2018	2747.9107	2730.2841	693423.9400	2746.2142	2746.2142	3634742988.0478	-0.0002
2019	2911.6276	2899.4399	736752.8300	2913.3564	2913.3564	3558549642.8571	0.0010
2020	3217.7503	3190.4845	820272.5400	3217.8558	3217.8558	4922448418.9723	0.0007
2021	4271.1707	4251.0427	1081553.1500	4273.3856	4273.3856	4417139920.6349	0.0010
2022	4100.6265	4060.9469	1037817.9100	4098.5147	4098.5147	4617723067.7291	-0.0008
2023	3944.7758	3920.3237	75567.5900	3954.5542	3954.5542	4004446842.1053	0.0030
Grand Total	3457.0341	3433.6458	4445387.9600	3457.2301	3457.2301	4227470023.4742	0.0004

Table 5

Throughout the six-year span spanning 2018 to 2023, the S&P 500 index showcased diverse patterns in its opening, lowest, highest, closing, adjusted closing values, and trading volume. In the initial year, 2018, the index initiated at 2747.91, touched a low of 2730.28, peaked at 693423.94, and concluded at 2746.21. The adjusted close and trading volume were similarly documented at 2746.21 and 3634742988.05, respectively, with an unvaried percentage change of 0.00%. Successive years witnessed fluctuations in these metrics, with notable shifts in 2020 when the S&P 500 commenced at 3217.75, marked a low at 3190.48, and reached a zenith at 820272.54. The adjusted close and trading volume for that specific year were 3217.86 and 4922448418.97, correspondingly, with a percentage change of 0.0007148379839. In 2023, the index recorded an opening at 3944.78, a low at 3920.32, and an unusual peak at 75567.59, closing at 3954.55. The adjusted close and trading volume were documented at 3954.55 and 4004446842.11, featuring a conspicuous percentage change of 0.002997521728. The cumulative values of these metrics over the entire period, highlighted in the grand total, furnish a holistic portrayal of the S&P 500's performance throughout this timeframe.

AVERAGE OF TESLA STOCK PRICE POINTS FROM 2018 TO 2023

Year	Open	Low	High	Close	Adj Close	Volume	Tesl% chng
2018	21.1456	20.7035	21.5796	21.1540	21.1540	129181601.5936	0.0010
2019	18.2019	17.9075	18.5100	18.2353	18.2353	137383833.3333	0.0012
2020	96.3695	93.5660	99.0961	96.6657	96.6657	225923862.4506	0.0105
2021	259.9464	254.2360	265.2439	259.9982	259.9982	82174886.9048	0.0023
2022	264.1352	256.5074	270.5677	263.0931	263.0931	86934449.4024	-0.0034
2023	130.6184	126.6226	135.2926	132.1421	132.1421	194632294.7368	0.0230
Grand Total	131.8952	128.5118	134.9584	131.7903	131.7903	133357337.3239	0.0026

Table 6

Over the six-year period from 2018 to 2023, Tesla's stock exhibited varying trends in its opening, lowest, highest, closing, adjusted closing values, and trading volume. In 2018, the stock opened at 21.1456, reached a low of 20.7035, and achieved a high of 21.5796, closing at 21.1540. The adjusted close and trading volume were also reported at 21.1540 and 129181601.5936, respectively, with a percentage change of 0.0010. Subsequent years saw fluctuations in these parameters, with notable changes in 2020 when Tesla's stock opened at 96.3695, marked a low at 93.5660, and reached a high at 99.0961. The adjusted close and trading volume for that specific year were 96.6657 and 225923862.4506, respectively, with a percentage change of 0.0105. In 2023, the stock recorded an opening at 130.6184, a low at 126.6226, and a high at 135.2926, closing at 132.1421. The adjusted close and trading volume were documented at 132.1421 and 194632294.7368, featuring a notable percentage change of 0.0230. The grand total for the entire period, highlighted in the summary, provides a cumulative overview of Tesla's stock performance, encompassing central tendency, variability, and trading activity during this timeframe.

AVERAGE OF MICROSOFT STOCK PRICE POINTS FROM 2018 TO 2023

Year	Open	Low	High	Close	Adj Close	Volume	MS% chng
2018	101.1224	99.9193	102.1141	101.0340	96.0221	31590188.8446	0.0008
2019	130.3390	129.3038	131.2310	130.3820	125.9355	24580994.0476	0.0018
2020	192.9102	190.3774	195.4651	193.0261	188.7168	37659592.4901	0.0016
2021	275.6678	273.4390	278.0180	275.9408	272.3931	26013012.6984	0.0018
2022	269.1050	265.2897	272.4961	268.9171	267.5424	31219290.8367	-0.0012
2023	236.1437	233.5589	239.2321	236.7268	236.7268	33657310.5263	0.0016
Grand Total	194.4709	192.3018	196.5227	194.5105	190.8268	30267789.4366	0.0010

Table 7

Throughout the six-year span from 2018 to 2023, Microsoft's (MSFT) stock demonstrated varied patterns in its opening, lowest, highest, closing, adjusted closing values, and trading volume. In 2018, the stock initiated at 101.1223509, reaching a low of 99.91928312 and a high of 102.1140637, closing at 101.0339841. The adjusted close and trading volume were also indicated at 96.02207146 and 31590188.84, respectively, with a percentage change of 0.0007966836205. Subsequent years experienced fluctuations in these metrics, notably in 2020 when MSFT stock opened at 192.9102371, registered a low at 190.3774308, and attained a high at 195.4651384. The adjusted close and trading volume for that particular year were 188.716793 and 37659592.49, respectively, with a percentage change of 0.001646330481. In 2023, the stock's opening was 236.1436833, with a low at 233.5589464 and a high at 239.2321055, closing at 236.7268421. The adjusted close and trading volume were documented at 236.7268421 and 33657310.53, featuring a noteworthy percentage change of 0.001626418765. The comprehensive summary of the entire period provides an accumulated perspective on MSFT stock performance, covering central tendency, variability, and trading activity over this timeframe.

AVERAGE OF APPLE STOCK PRICE POINTS FROM 2018 TO 2023

Year	Open	Low	High	Close	Adj Close	Volume	App% chng
2018	47.2779	46.7959	47.7485	47.2634	45.3122	136080258.1673	-0.0001
2019	51.9673	51.5679	52.4579	52.0640	50.7024	112122788.8889	0.0025
2020	95.2677	93.9128	96.6618	95.3471	93.9164	157564646.6403	0.0029
2021	140.8619	139.4741	142.3478	140.9894	139.8008	90524627.3810	0.0013
2022	154.8027	152.6913	156.9078	154.8351	154.3819	87910083.2669	-0.0010
2023	134.7274	133.2874	136.8995	135.3311	135.3311	72488215.7895	0.0065
Grand Total	98.5741	97.4227	99.7780	98.6465	97.3882	116220544.8357	0.0012

Table 8

Over the span of six years, from 2018 to 2023, Apple's stock (AAPL) displayed various trends in its opening, lowest, highest, closing, adjusted closing values, and trading volume. In 2018, the stock began at 47.2779, with a low of 46.7959 and a high of 47.7485, closing at 47.2634. The adjusted close and trading volume were also reported at 45.3122 and 136080258.1673, respectively, with a percentage change of -0.0001. Subsequent years witnessed fluctuations in these metrics, notably in 2020 when AAPL stock opened at 95.2677, reached a low of 93.9128, and achieved a high at 96.6618. The adjusted close and trading volume for that specific year were 93.9164 and 157564646.6403, respectively, with a percentage change of 0.0029. In 2023, the stock recorded an opening at 134.7274, a low at 133.2874, and a high at 136.8995, closing at 135.3311. The adjusted close and trading volume were documented at 135.3311 and 72488215.7895, featuring a notable percentage change of 0.0065. The grand total for the entire period, highlighted in the summary, provides a cumulative overview of AAPL stock performance, encompassing central tendency, variability, and trading activity during this timeframe.

TRADE VOLUME ANALYSIS

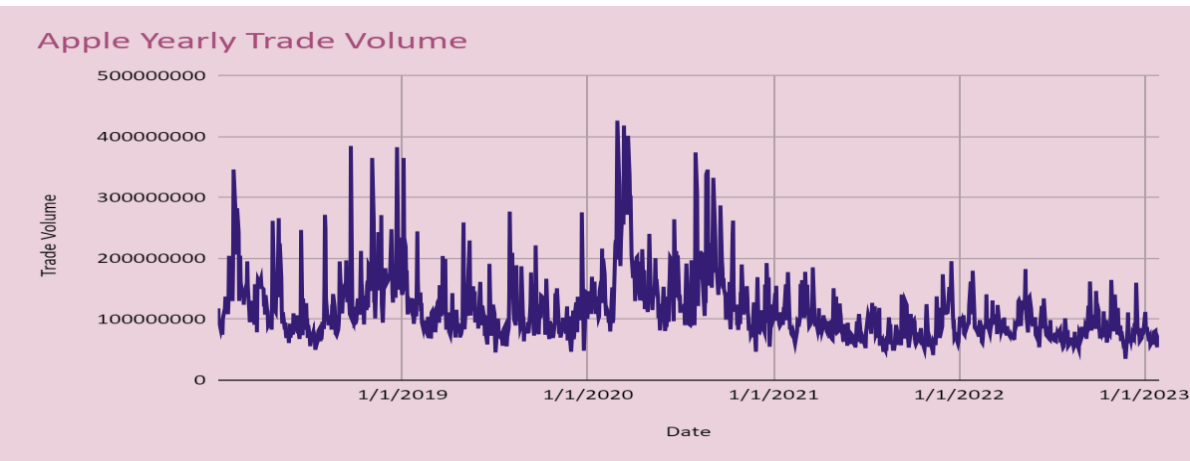


Figure 5

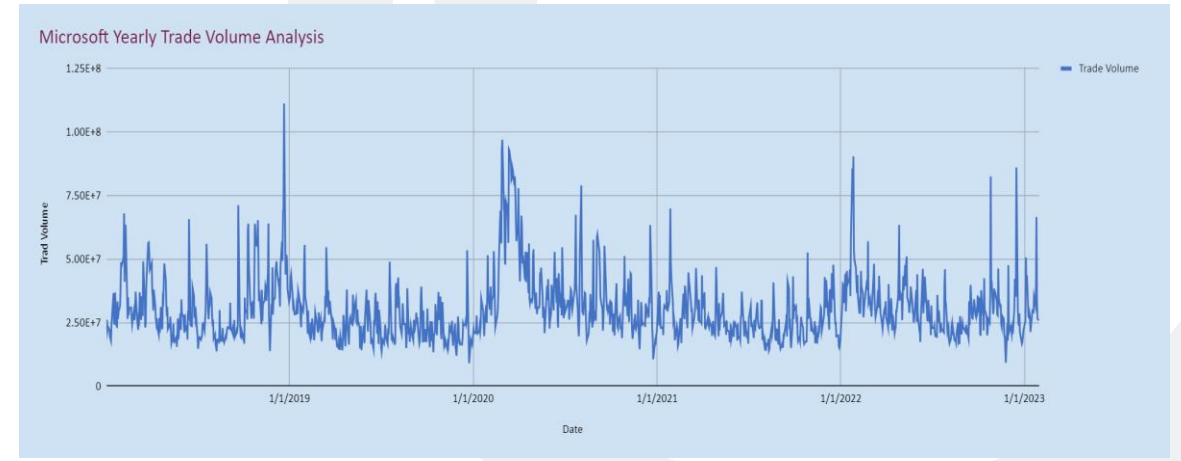


Figure 6

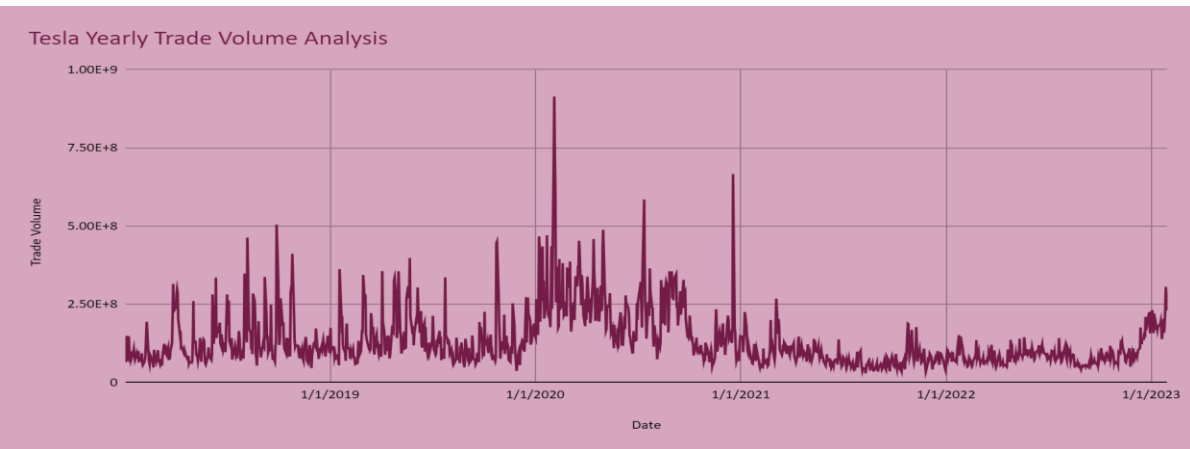


Figure 7

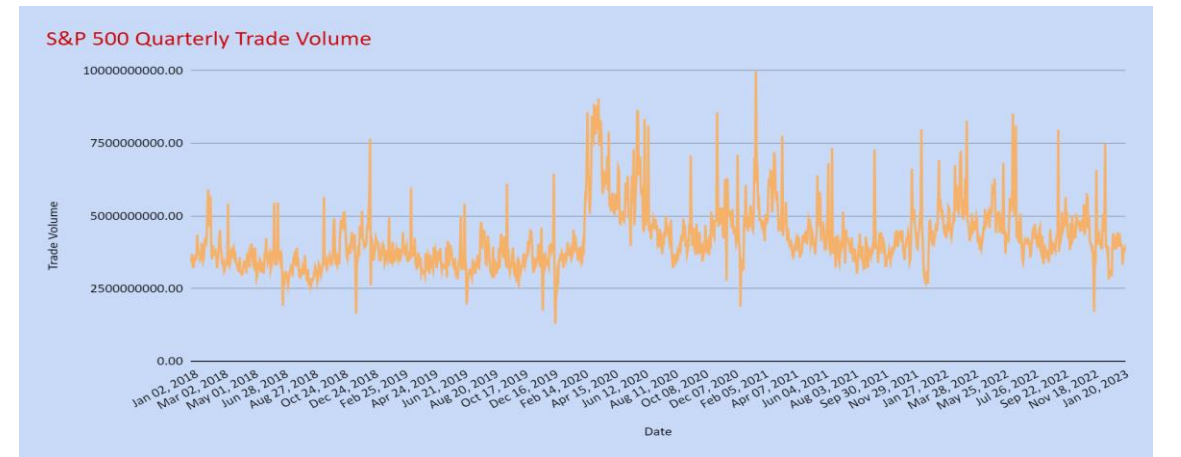


Figure 8

TIME SERIES ANALYSIS

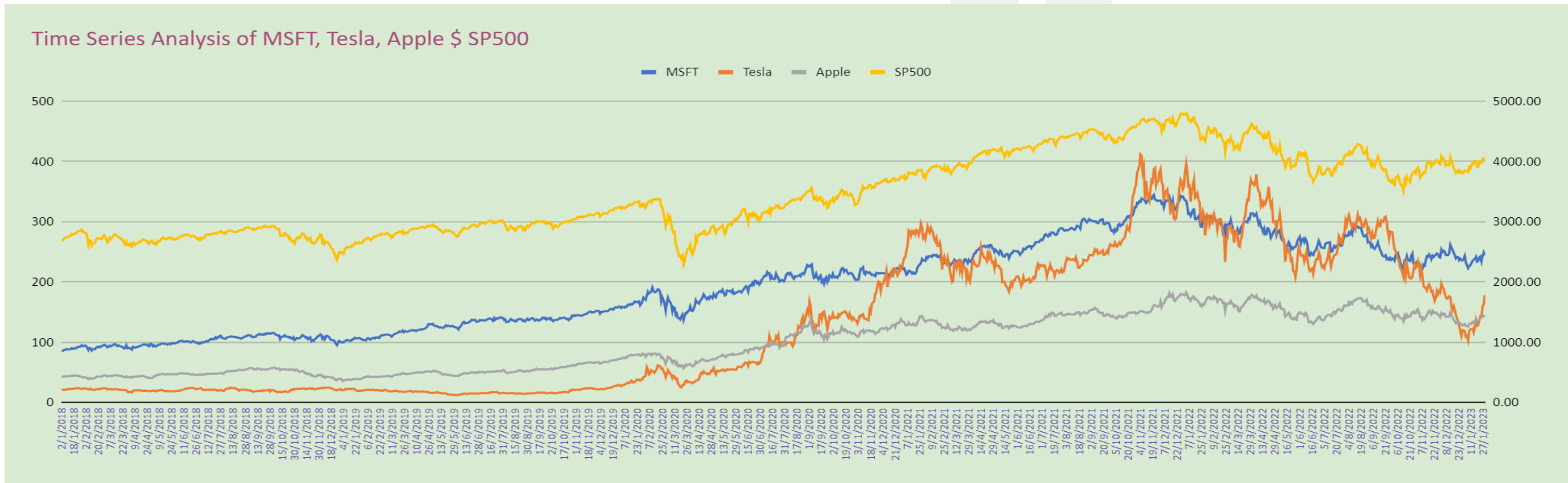


Figure 9

All stock prices listed here follows a positive continual trend indicating a spike in stock prices over the years. Tesla's stock prices are lowest in 2018 followed by Apple. However, Tesla's stock price increases in 2020 surpassing Apple in 2020 and surpassing Microsoft which is the highest of the three in 2021. The increase in Tesla's stock prices could be attributed to its inclusion in the S&P 500 which led to an increased demand for its shares from institutional investors and index funds. This inclusion heightened Tesla's visibility and credibility in the financial markets, attracting more investors. Another crucial factor is the anticipation and realization of increased demand for electric vehicles. Tesla's leadership in the EV market, combined with growing global awareness and support for sustainable and clean energy solutions, contributed to the surge in its stock price. Tesla's stock price declines significantly in 2022. Shares sank about 65% from the start of the year, amounting to a loss of more than \$700 billion in market value. According to Craig Irwin, an analyst at Roth Capital Partners, most of the stock's weakness in 2022 is due to indicators showing flagging demand globally.

All stock prices experience a sharp decline in 2020 due to the Covid 19 epidemic and in 2022 due to higher inflation, expectations of tighter monetary policy from Federal Reserve and a serious spike in bond yields.

A SIMPLE LINEAR REGRESSION

Relationship Between Daily % Change in Tesla and S&P 500 Stock Prices

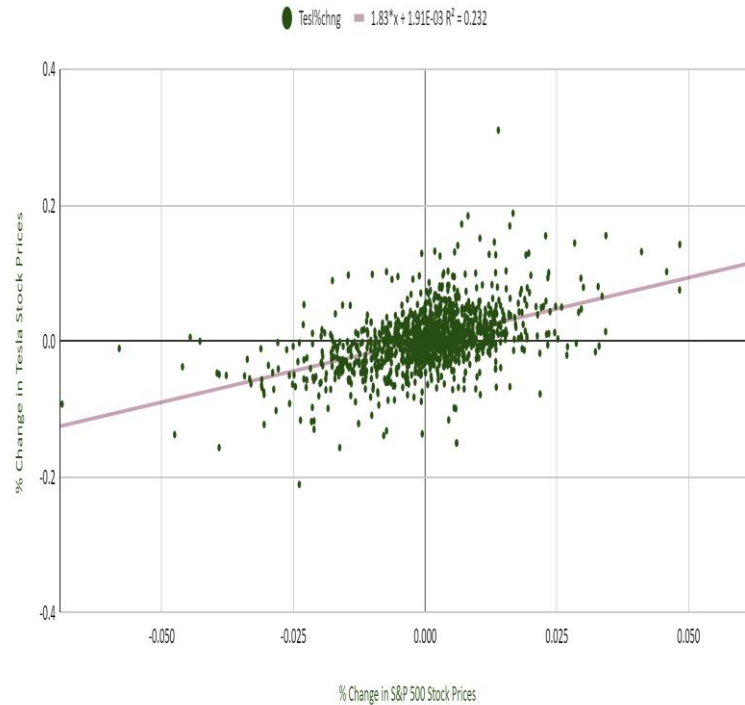


Figure 10

Relationship Between Daily % Change in Apple and S&P 500 Stock Prices

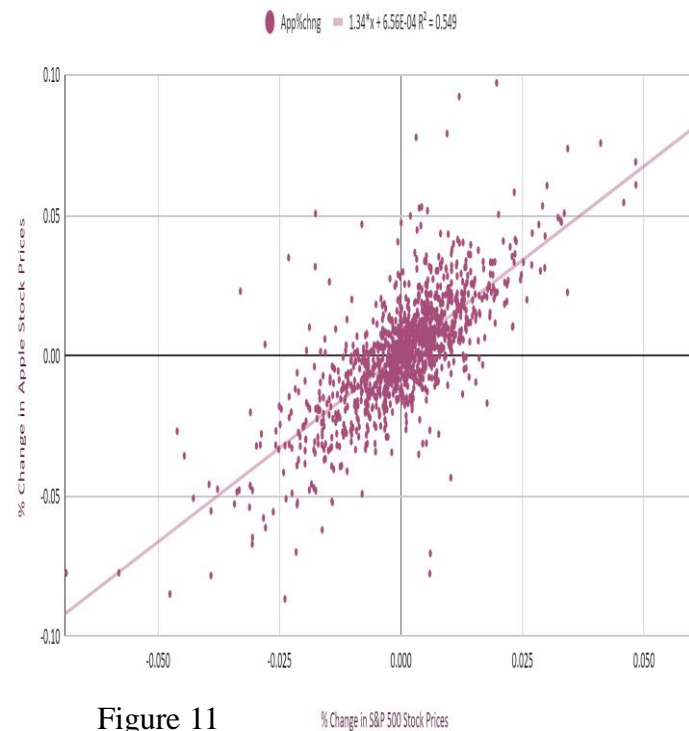


Figure 11

Relationship Between Daily % Change in Microsoft and S&P 500 Stock Prices

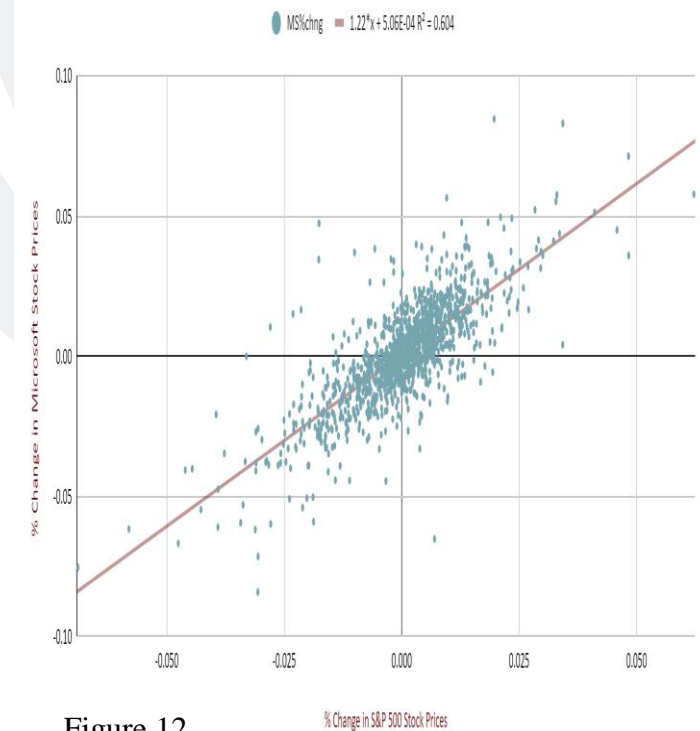


Figure 12

An R value of 0.4814 suggests a mild positive correlation between the returns of Tesla and S&P 500. The corresponding R squared value of 0.232 indicates that approximately 23.2% of the variability in Tesla's returns can be accounted for by the explanatory variable, S&P 500. Tesla exhibits a high beta of 1.832, indicating a considerable level of volatility in comparison to the broader market.

An R value of 0.741 signifies a robust positive correlation between the returns of Apple and S&P 500. With an R squared value of 0.549, approximately 54.9% of the variability in Apple's returns can be attributed to the explanatory variable, S&P 500. Apple displays a high beta of 1.338, indicating notable volatility in comparison to the broader market.

An R squared value of 0.778 signifies a robust positive correlation between the returns of Microsoft and S&P 500. With an R squared value of 0.604, approximately 60.4% of the variability in Microsoft's returns can be attributed to the explanatory variable, S&P 500. Microsoft exhibits a high beta of 1.222, indicating notable volatility compared to the broader market.

SUMMARY

Microsoft is deemed a stable choice for risk-averse investors due to its low beta and moderate correlation, aligning well with broader market trends. The company's stock is perceived as a reliable option for those prioritizing stability in their investment portfolios. On the other hand, Apple, with a substantial correlation and a balanced risk-return profile, offers a middle ground. This makes it an attractive option for investors seeking market alignment along with a degree of stability. In contrast, Tesla, characterized by a high beta and weak correlation, is considered riskier. While it presents significant growth potential, its volatility makes it less aligned with broader market trends.

For long-term investors looking for a combination of stability and balanced growth, Microsoft or Apple may be preferable choices. Microsoft, with its stability, or Apple, with its balanced risk-return profile, could provide consistent returns over an extended period. For short-term traders aiming for higher profit potential, Tesla becomes an appealing option due to its volatility, which can lead to more significant short-term gains. Diversification is also emphasized as a strategy for investors with varying risk tolerances, providing a means to achieve financial stability and growth prospects by spreading investments across different assets and sectors.

APPENDIX

The background of the slide is a dark blue-grey color. It features a faint, light-grey grid pattern. Overlaid on this grid is a financial candlestick chart. The chart consists of numerous vertical bars, some solid and some hollow, representing price movements. A thin, light-grey line, likely a moving average, curves across the chart from the upper left towards the lower right. The overall aesthetic is professional and data-oriented.

GLOSSARY

Date: The Specific Day on which the Stock is recorded

Open : The price of the stock at the beginning of the trading day

High: The Highest price of the stock during the trading day

Close Price: The price of the stock at the end of the trading day

Adjusted Close Price: The closing price adjusted for any corporate actions (e.g., dividends, stock splits)

Volume: The number of shares traded during the day

Percentage Change(%chng): The percentage change in the stock's price from the previous trading day.

S&P 500: a market-capitalization-weighted index that measures the performance of 500 large-cap stocks listed on stock exchanges in the United States



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