COMPREHENSIVE STOCK MARKET ANALYSIS OF LEADING TECH GIANTS

A Comparative Case Study of APPLE, FACEBOOK, GOOGLE, NVIDIA, TESLA and TWITTER

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Introduction

The stock market plays a pivotal role in determining the financial health and growth potential of companies, particularly in the fast-evolving technology sector. This case study focuses on the stock market performance of six leading tech giants: Twitter, Facebook, Tesla, Apple, Google, and Nvidia. These companies, each representing different facets of the technology industry, have demonstrated significant influence on both market trends and global economic patterns. In this study, we aim to explore the stock price movements, trends, and financial performance of these companies over a specified period.

1) Background

This case study presents an in-depth exploration of the stock market performance of six prominent companies—Apple, Google, Facebook, Nvidia, Tesla, and Twitter. These companies are global leaders in their respective industries, making their stock performance a focal point for both institutional and individual investors. The dataset used for this analysis is sourced from Kaggle and contains a wide range of financial metrics that are instrumental in evaluating the behaviour of these companies in the stock market over time. This dataset comprises essential indicators such as opening and closing prices, daily high and low prices, trading volume, and adjusted closing prices, among others.

Such financial data is crucial for understanding the factors influencing the stock market, assessing the financial health of these companies, and predicting future price movements. Analysts, investors, and portfolio managers can leverage this information to make informed decisions, assess risks, and seize opportunities in a highly dynamic market environment.

2) System and Market Limitations

While advanced analytics tools have significantly improved the ability to process and analyze stock market data, several limitations still persist in current systems, which can hinder comprehensive stock market analysis:

- **Data Volume Handling**: The rapid increase in stock market data—driven by high-frequency trading, global market expansion, and new data streams—often challenges existing systems. As datasets grow larger, traditional systems can experience performance bottlenecks, slow query

response times, and even data loss. This is particularly problematic when analyzing large volumes of historical data for trends or forecasting future market behaviour.

- **Complex Query Execution**: Many data analytics tools struggle with executing complex, multi-dimensional queries, which limits the scope and depth of analysis. Stock market analysts frequently need to cross-reference various financial metrics (e.g., price changes, volume, and volatility) and analyze relationships across different time frames or stock indices. The inability to perform these queries efficiently restricts the richness of insights that can be derived from the data.
- **Real-Time Data Processing**: The stock market operates at a fast pace, where prices can fluctuate rapidly within seconds. Current systems often lag in processing real-time data, limiting the ability to make quick, timely decisions. This is a significant drawback in environments where immediate insights are needed to capitalize on market shifts or mitigate losses.

3) Business and Market Need

The business and market demand for enhanced analytical capabilities in stock market data is driven by several factors:

- **Informed Decision-Making**: Investors, portfolio managers, and corporate executives require deep insights into the financial performance of companies to make strategic investment decisions. Whether it's determining the right time to buy or sell stocks or assessing a company's financial health, detailed and accurate data analysis is key to informed decision-making.

- **Trend Identification**: Market trends play a crucial role in predicting future stock performance. Understanding these trends—whether they are short-term fluctuations or long-term movements—enables investors to make proactive decisions that align with market opportunities or mitigate risks. This is especially important for companies like Apple, Tesla, and Google, where stock prices are heavily influenced by market trends and innovations.

- **Performance Metrics**: Businesses need to constantly evaluate their financial performance relative to their competitors. Detailed performance metrics such as trading volume, price volatility, and historical performance help businesses gauge where they stand in the market and refine their strategies accordingly. Comparing performance across sectors or time frames is critical for strategic planning, resource allocation, and competitive positioning.

4) Need for a Data Warehouse

The implementation of a data warehouse can effectively address these limitations by providing a centralized, structured, and scalable framework for stock market data analysis:

- **Centralized Data Storage**: A data warehouse consolidates data from multiple sources into a single, organized repository, facilitating efficient querying and reporting. This centralization is essential for handling large datasets, reducing data redundancy, and improving data accuracy. Analysts can easily access historical and real-time data without performance degradation, allowing them to focus on analysis rather than data retrieval.

- **Enhanced Reporting Capabilities**: With a data warehouse, complex reports involving multiple financial metrics and dimensions can be generated without burdening operational systems. This allows for deeper analysis and faster insights, which are crucial for time-sensitive decision-making. The ability to perform multi-dimensional queries and drill down into granular data points offers stakeholders greater flexibility in exploring stock performance and identifying key trends.

- **Data Visualization Support**: A structured data warehouse seamlessly integrates with data visualization tools such as Tableau. These tools enable analysts to create interactive, visually compelling dashboards that simplify data interpretation. With a data warehouse providing the necessary infrastructure, users can generate visual insights that aid strategic decision-making, from stock price comparisons to performance trends.

5) Fact and Dimensions Tables

Fact Table: Stock Market Facts

Column	Description
Date	Foreign key from Date Dimension
Company ID	Foreign key from Company Dimension
Open Price	Opening price of the stock on the given date
High Price	Highest price of the stock on the given date
Low Price	Lowest price of the stock on the given date
Close Price	Closing price of the stock on the given date
Adjusted Close Price	Adjusted closing price of the stock
Volume	Trading volume on the given date
Previous Day Price	Trading price on the previous day
Change in Price	Change in price from the previous day
Percentage Change in Price	Percentage change in stock price from the previous day
Previous Day Volume	Trading volume on the previous day
Change in Volume	Change in volume compared to the previous day
Percentage Change in Volume	Percentage change in volume from the previous day

Dimension Table: Date Dimension

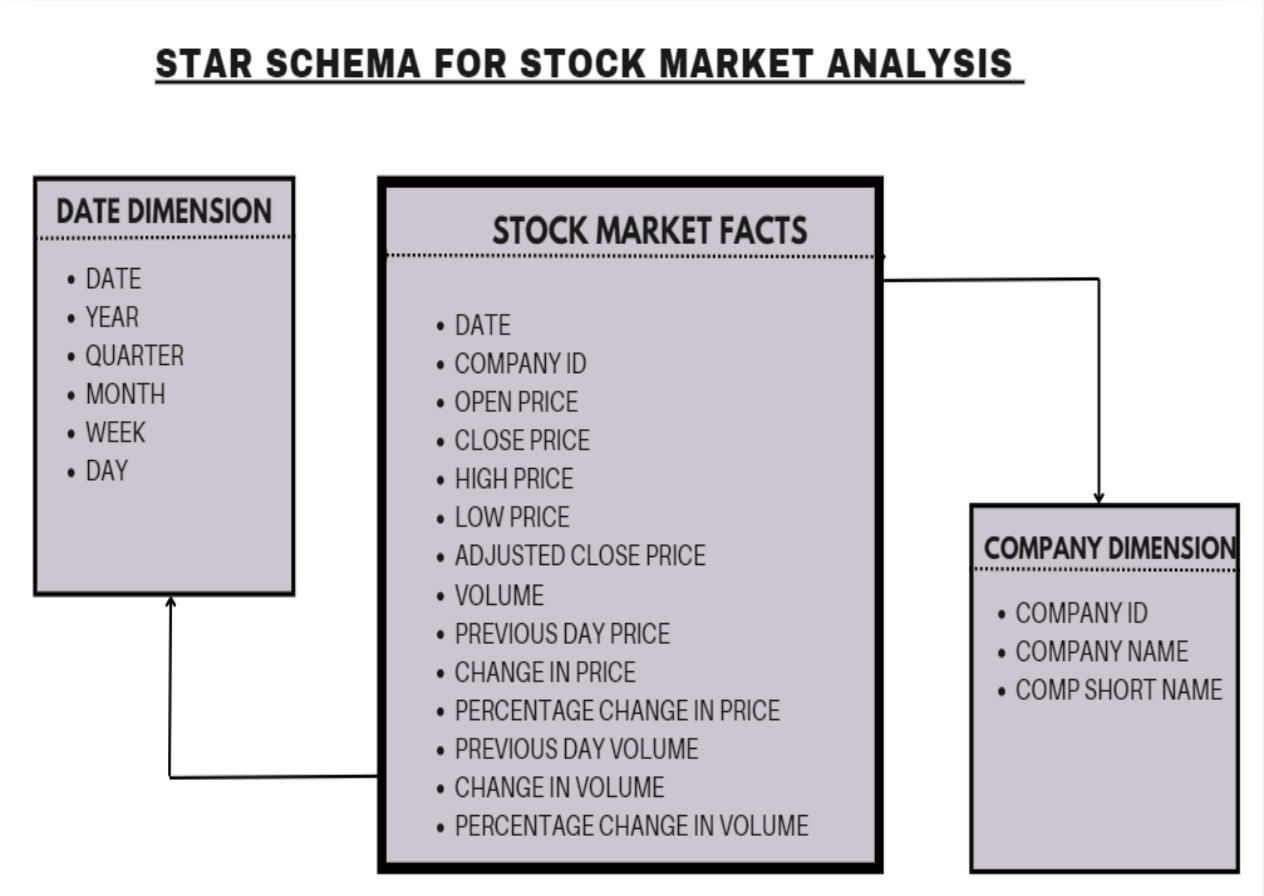
Column	Description
Date	Primary key for the Date Dimension
Year	Year value
Quarter	Quarter value (Q1, Q2, Q3, Q4)
Month	Month value
Week	Week number of the year
Day	Day of the week

Dimension Table: Company Dimension

Column	Description
Company Id	Primary key
Company Name	Name of the company
Company Short Name	Short name of the company

6) Proposed Data Warehouse

- It pulls out information from the data warehouse.
- The data is neatly organized using something called a Star Schema which can be seen below.
- It makes use of Fact and Dimensional Tables to help with this organization.



7) Dashboards and Visualizations

To enhance the analysis and presentation of stock market data, dashboards have been developed using Tableau. These dashboards will offer interactive, user-friendly visualizations of key financial metrics, making it easier for stakeholders to grasp complex data and draw actionable insights.The key features of these dashboards include:

- **Stock Price Trends**: Line charts will display historical stock price movements, including opening, closing, high, and low prices over specified time periods. These visuals will enable users to track price fluctuations over time, identify trends, and correlate external factors (e.g., economic events, company announcements) with price changes.

- **Volume Analysis**: Bar graphs will illustrate the trading volume alongside price movements, providing insights into market activity. Understanding the relationship between trading volume and price changes helps investors identify periods of high or low market interest, which can inform investment decisions.

- **Performance Comparison**: Comparative charts, such as side-by-side bar graphs or radar charts, will allow stakeholders to evaluate the performance of different companies. This enables direct comparisons of key metrics like stock price growth, volatility, and trading volume, offering a comprehensive view of how each company stacks up against its peers.

The dashboard answers several key questions regarding the stock performance:

1. What are the percentage changes in stock prices for each company over the analysis period?

2. How did the trading volume for each stock change over time?

3. What were the previous day's closing prices for each stock?

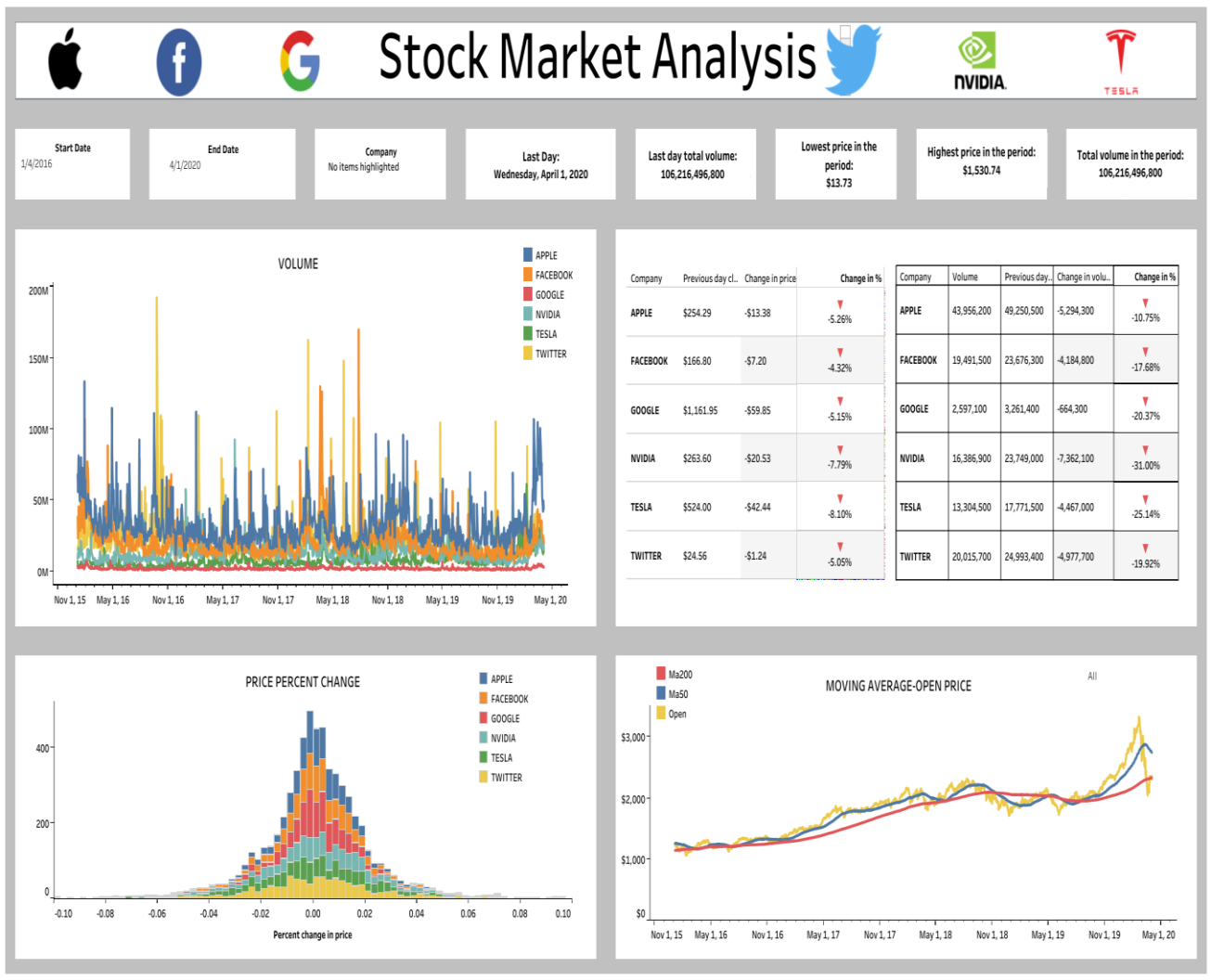
4. What was the absolute change in price and percentage change for each stock on the last day recorded?

5. What are the moving averages for open prices (50-day and 200-day) for each company?

6. What were the highest and lowest stock prices during the analysis period?

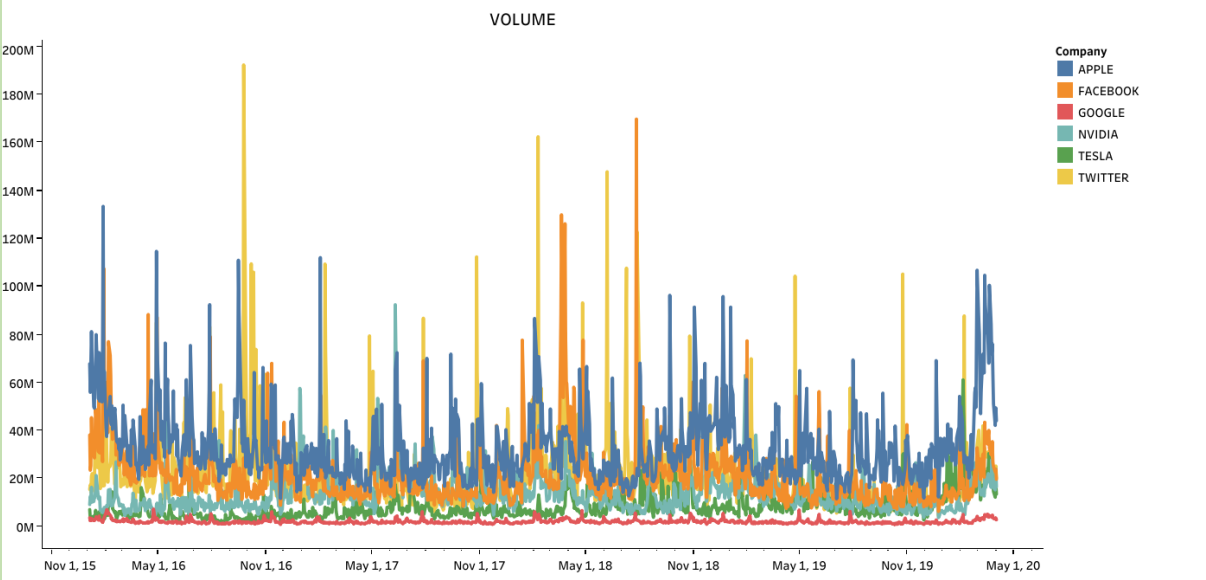
7. What was the total trading volume across all stocks during the specified timeframe?

Stock Market Analysis Dashboard of Tech Giants



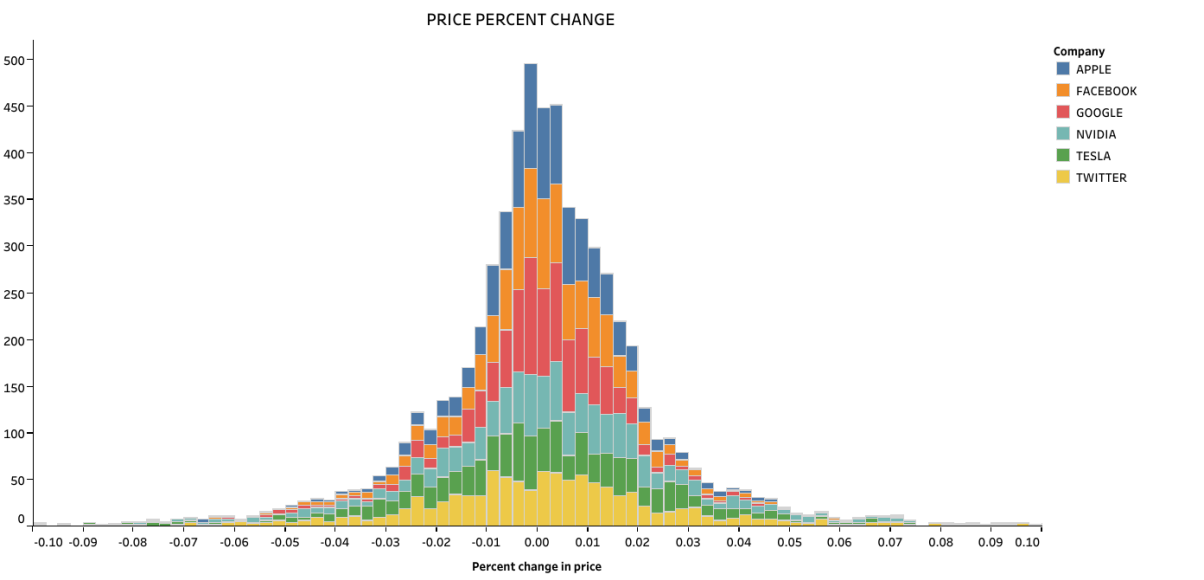
The dashboard provides a comprehensive analysis of stock performance for Twitter, Facebook, Tesla, Apple, Google, and Nvidia from January 4, 2016, to April 1, 2020. The key metrics include price changes, volume, and moving averages. The dashboard illustrates the percentage change in stock prices over the specified period. Notably, all companies experienced declines on the last recorded day, with Tesla showing the most significant drop at -8.10%. It also highlights trading volumes, indicating a downward trend across all stocks. For instance, Apple's volume decreased by 10.75%, while Nvidia saw a notable decline of 31%. The moving average lines for open prices help visualize trends over time, aiding in understanding market momentum. This dashboard offers valuable insights into market dynamics and individual stock performance trends during a volatile period, helping investors make informed decisions based on historical data.

- **Analysis of Trading Volume**



The chart compares stock trading volumes for Apple, Facebook, Google, Nvidia, Tesla, and Twitter from November 2015 to May 2020, highlighting differences in trading activity. Apple has the highest trading volume, with frequent peaks exceeding 100 million shares, likely driven by major events like product launches or earnings. Despite these surges, the stock generally stabilizes afterward, reflecting steady demand. Facebook's volume fluctuates between 10 and 80 million shares, with significant spikes around 2017 and 2018, likely tied to major events like the Cambridge Analytica scandal. However, its trading activity is relatively stable overall. Google shows low and steady trading volumes, usually below 20 million shares. The lack of large spikes suggests long-term investor interest and less speculative trading activity. Nvidia sees moderate volume with occasional spikes above 20 million shares, especially in late 2017 and early 2018, likely linked to product releases and developments in gaming or AI. Its volume is more volatile due to its fast-moving sectors. Tesla has moderate to low trading volumes, generally below 20 million shares. Periodic fluctuations occur, likely linked to announcements about new models or production updates, reflecting steady but variable interest. Twitter experiences the largest volume spikes, sometimes exceeding 180 million shares, driven by major corporate events or controversies. This volatility indicates Twitter's stock is highly reactive to market sentiment. Apple leads in overall trading volume with steady activity and periodic peaks. Facebook and Twitter show notable spikes, with Twitter displaying higher volatility. Google maintains a steady, low-volume pattern, while Nvidia and Tesla exhibit moderate volumes with occasional bursts tied to business events.

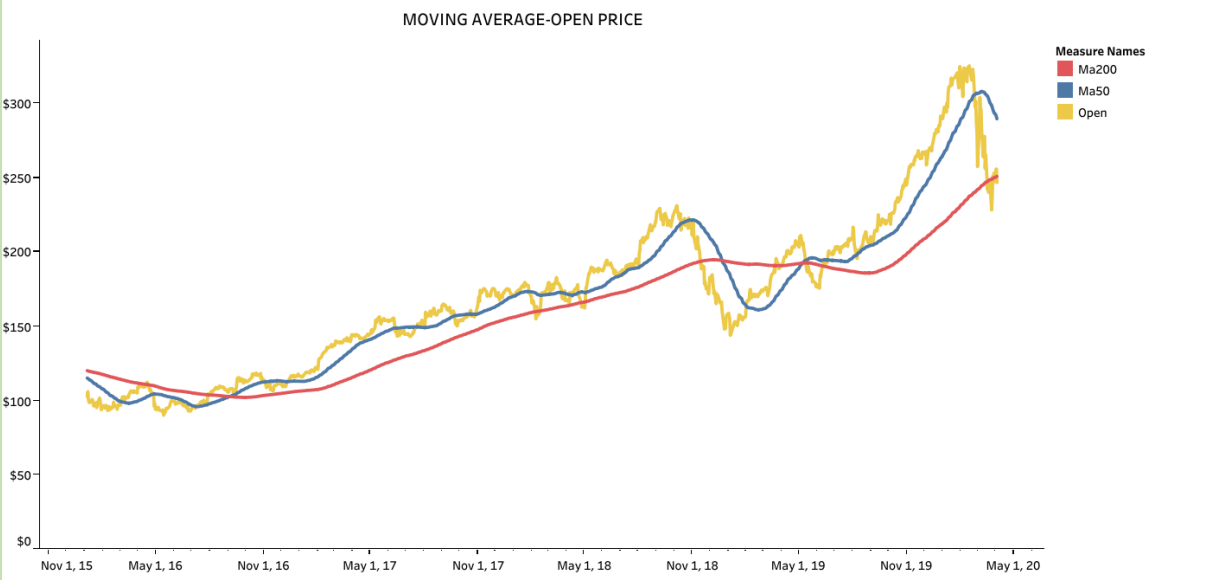
- **Analysis of Price Percentage Change**



The chart highlights the distribution of percentage price changes for six companies—Apple, Facebook, Google, Nvidia, Tesla, and Twitter—indicating how often certain price changes occurred. Apple, Google, and Facebook exhibit the most stability, with the majority of price changes clustering around 0%. Their stock price changes generally fall between -3% and +3%, suggesting low volatility and consistent daily performance. These companies experience fewer significant price movements, making them relatively stable investments.

Nvidia shows moderate volatility, with price changes more frequently ranging between -4% and +4%. Its broader distribution reflects the company's exposure to rapidly evolving sectors like technology and gaming, where new developments can cause larger price swings. Tesla and Twitter stand out as the most volatile stocks in the chart. Both have a wide range of price changes, from -5% to +5% and beyond. Tesla frequently experiences price movements exceeding 3%, reflecting its high-risk, high-reward nature driven by market sentiment, innovation, and production updates. Twitter, on the other hand, has the widest distribution, with frequent large swings, often over 4%, indicating high reactivity to market events and news. Overall, Apple, Google, and Facebook are low-risk, stable stocks, while Nvidia exhibits moderate risk. Tesla and Twitter show the highest volatility, making them the most unpredictable and risky investments.

- **Analysis of Moving Average**



The chart displays the open price and moving averages (50-day and 200-day) for a stock from 2016 to 2020, showing overall upward momentum despite a correction in 2018. Golden Crosses (where the 50-day average crosses above the 200-day average) in 2016 and 2019 signalled bullish trends, while a Death Cross during 2018 indicated a temporary downturn. The 200-day average acted as support during corrections, and the 50-day average highlighted short-term changes. The stock showed strong performance post-2018, with rising prices peaking in 2020, though large deviations from the averages suggested occasional overbought conditions.

- **Analysis of Detailed Price Table**

DETAILED PRICE TABLE

Company	Close	Previous day close price	Change in price	Change in %
APPLE	$172.43	$172.99	-$0.56	▼ -0.32%
FACEBOOK	$177.36	$179.96	-$2.60	▼ -1.44%
GOOGLE	$1,095.50	$1,091.36	$4.14	▲ 0.38%
NVIDIA	$243.84	$246.50	-$2.66	▼ -1.08%
TESLA	$335.49	$334.07	$1.42	▲ 0.43%
TWITTER	$33.06	$33.61	-$0.55	▼ -1.64%

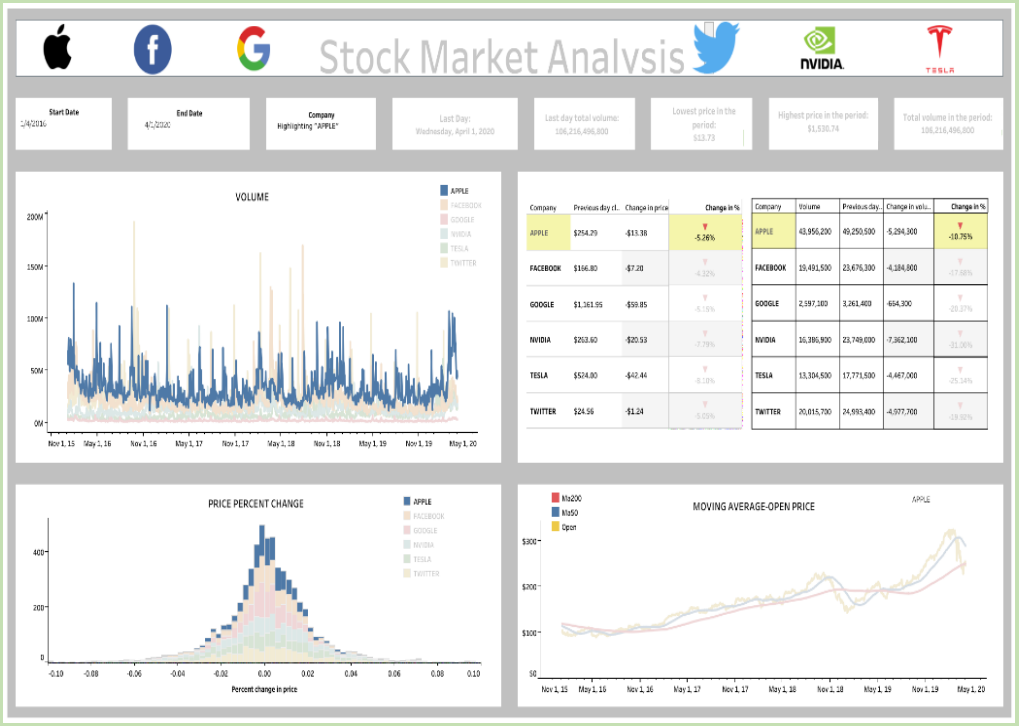
- **Analysis of Detailed Volume Table**

DETAILED VOLUME TABLE

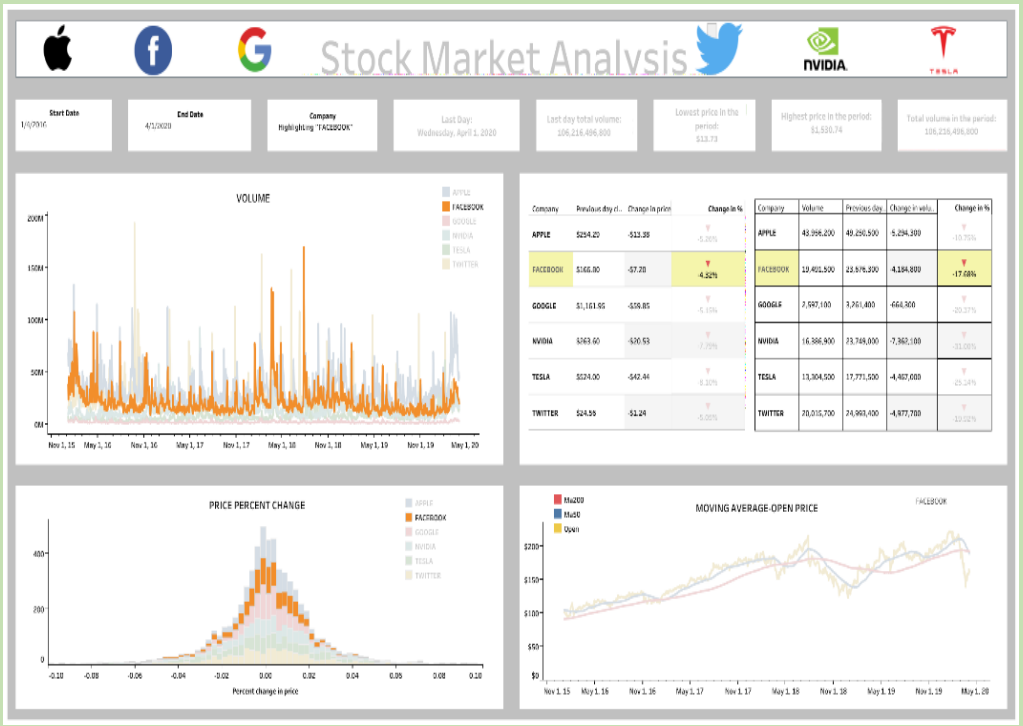
Company	Volume	Previous day volume	Change in volume	Change in %
APPLE	43,956,200	49,250,500	-5,294,300	▼ -10.75%
FACEBOOK	19,491,500	23,676,300	-4,184,800	▼ -17.68%
GOOGLE	2,597,100	3,261,400	-664,300	▼ -20.37%
NVIDIA	16,386,900	23,749,000	-7,362,100	▼ -31.00%
TESLA	13,304,500	17,771,500	-4,467,000	▼ -25.14%
TWITTER	20,015,700	24,993,400	-4,977,700	▼ -19.92%

Company Specific Dashboards

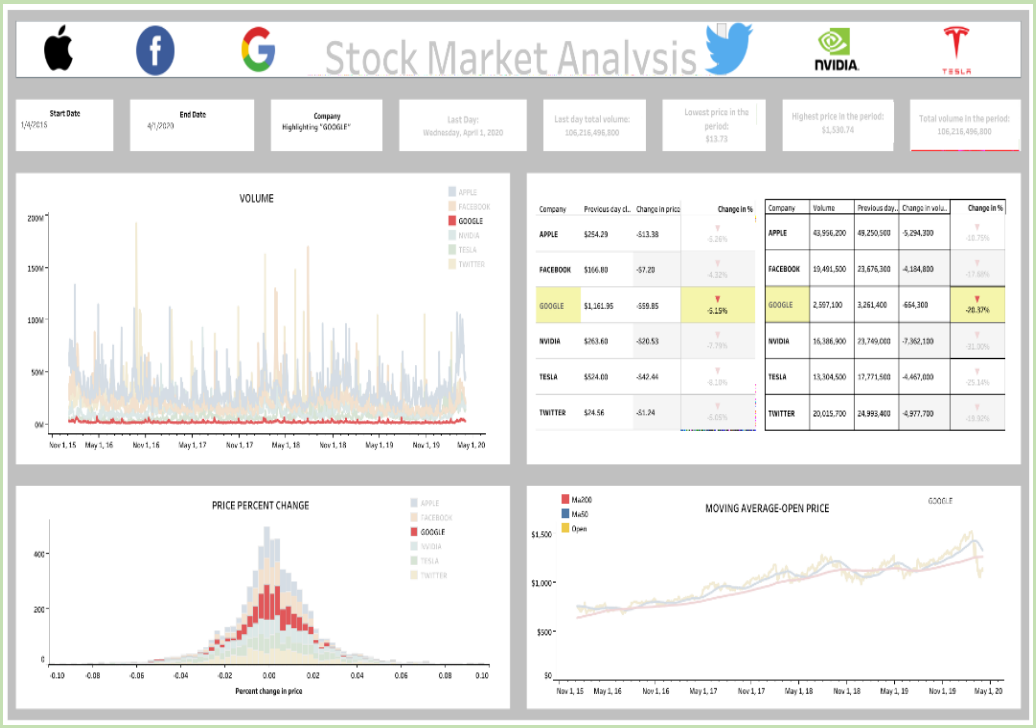
1) APPLE



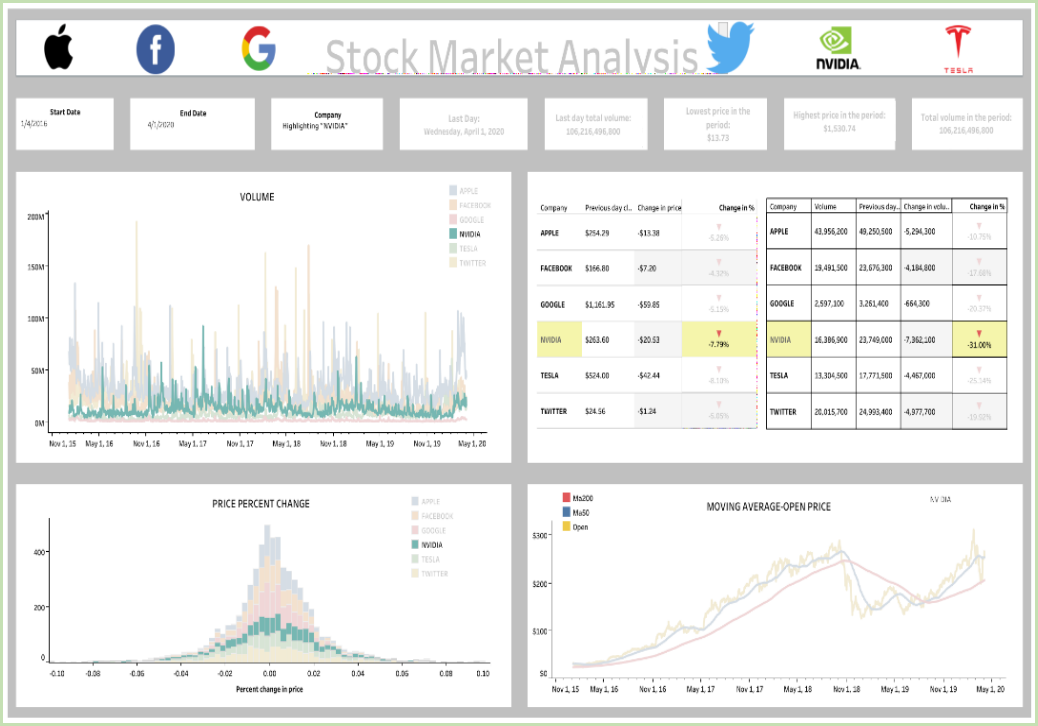
2) FACEBOOK



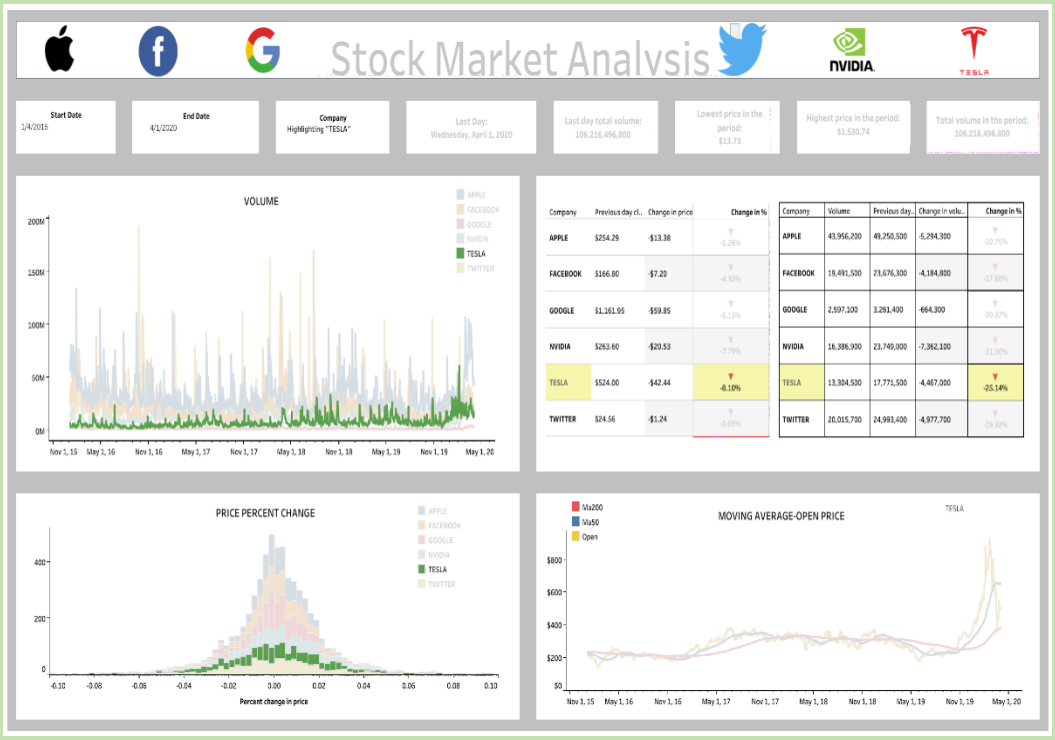
3) GOOGLE



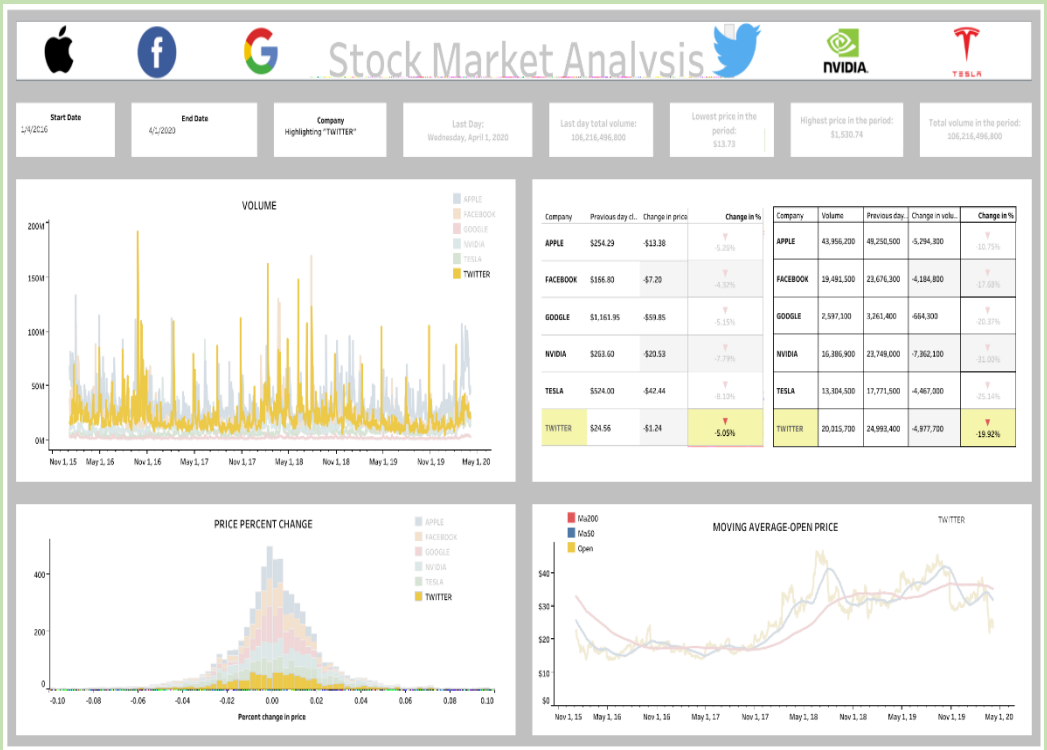
4) NVIDIA



5) TESLA



6) TWITTER



Conclusion

This case study highlights the critical role of a well-designed data warehouse and advanced dashboarding tools in stock market analysis. By organizing and centralizing stock market data efficiently, and leveraging powerful visualization techniques, businesses can derive valuable insights into market dynamics. These insights enable more strategic decision-making, improve operational efficiency, and ultimately lead to better investment outcomes. Integrating an effective analytical framework positions businesses to navigate the complexities of the stock market with greater precision and success.