

## **PROJECT TITLE: STOCK MARKET**

### **INTRODUCTION**

In today's dynamic and data-driven financial world, the stock market serves as a key indicator of economic health, investor sentiment, and corporate performance. Stock market analysis has become an essential practice for businesses, analysts, and investors alike. With the explosion of big data and advanced analytical tools, companies now rely on data-driven insights to make informed decisions about investment strategies, market positioning, and portfolio management.

This internship project was focused on analyzing and visualizing stock price movements of four major technology giants—Apple (AAPL), Microsoft (MSFT), Netflix (NFLX), and Google (GOOG)—over a three-month period. The goal was to conduct an in-depth analysis of their market behavior, price fluctuations, and interrelationships using modern data visualization tools and business intelligence techniques.

As a Business Analyst Intern, my responsibility was to not only clean and manage the dataset but also to transform raw stock data into actionable insights using Excel, SQL, and Tableau Desktop. The analytical process involved trend analysis, calculation of moving averages, volatility measures, and correlation matrices. The final outcome was a comprehensive dashboard in Tableau that presents these insights in an interactive, user-friendly format for effective decision-making.

This project not only provided practical experience in using real-world financial datasets but also offered a platform to enhance technical proficiency in data manipulation, storytelling through visualizations, and interpreting financial trends that influence the global stock market. The experience mirrors the real tasks expected from a business analyst working in the finance or investment domain, equipping me with the necessary tools and techniques to succeed in the financial analytics landscape.

## **PROBLEM STATEMENT**

The financial market is highly volatile and influenced by numerous unpredictable factors such as economic indicators, political events, technological advancements, and investor psychology. Companies and investors need timely, reliable insights to make data-backed investment decisions and mitigate risks. While stock price data is publicly available, the challenge lies in extracting meaningful patterns, trends, and relationships from vast and often unstructured datasets.

In this project, the central problem was:

“How can we analyze and visualize the stock performance of Apple, Microsoft, Netflix, and Google to uncover trends, volatility, and correlations, and present the findings in an intuitive dashboard for financial decision-making?”

To solve this problem, the project was structured around the following sub-questions:

- What are the short-term and medium-term trends in the stock prices of the selected companies?
- How volatile are each company's stock prices during the selected period?
- Are there any significant correlations between the stock prices of the companies under analysis?
- How can we effectively visualize stock data to make it understandable for both technical and non-technical stakeholders?

Several challenges needed to be addressed during the course of the project:

- Ensuring data consistency and accuracy during the cleaning and transformation phases.
- Calculating technical indicators such as moving averages and standard deviations to understand stock behavior.
- Building a Tableau dashboard that integrates multiple visualizations such as line charts, heat maps, and bar graphs to provide a holistic market view.
- Delivering insights that go beyond surface-level metrics and uncover deeper market dynamics.

The problem was approached with a combination of Excel for preprocessing, SQL for querying and exploring data, and Tableau for visualization and dashboard creation. The intent was to not only provide historical analysis but also to showcase patterns that could potentially aid in forecasting and strategic planning.

By the end of the project, the goal was to develop a comprehensive, interactive dashboard that enables users to:

- Compare performance across companies,
- Identify peaks and troughs in stock prices,
- Observe co-movements and anomalies,
- Make informed observations based on historical trends.

## **TECHNIQUES USED TO SOLVE THE PROBLEM**

To effectively analyze stock price data for four major technology companies—Apple, Microsoft, Netflix, and Google—a combination of data preprocessing, statistical analysis, and data visualization techniques were used. These techniques ensured the data was accurate, insights were statistically sound, and the results could be interpreted clearly by decision-makers. The primary tools used were Microsoft Excel, SQL, and Tableau Desktop. Each played a specific role in the analysis process.

### **1. Data Cleaning and Preprocessing (Excel & SQL)**

The first and most critical step in solving the problem was ensuring the quality of the dataset. The raw data often contains

- Missing values,
- Duplicate records,
- Inconsistent formatting.

Techniques used:

- **Handling Missing Values:** We checked for any NULL or NaN entries in closing prices or volume columns. Missing data was either filled using linear interpolation or removed if the gaps were too large.
- **Standardization of Date Format:** Dates were converted to a uniform format (e.g., YYYY-MM-DD) for time series analysis.
- **Removal of Duplicates:** We used Excel filters and SQL DISTINCT queries to remove duplicate rows from the dataset.
- **Data Type Validation:** Ensured that date columns were treated as DATE, and price/volume columns were in FLOAT or INTEGER format.

In SQL, basic preprocessing queries were used:

```
SELECT DISTINCT *FROM stock_dataWHERE close_price IS NOT NULL;
```

### **2. Time Series Analysis (Excel)**

Since stock prices are inherently time-dependent, time series analysis formed the backbone of the project. Using Excel, we applied several techniques to extract trends and insights.

#### a) Moving Averages:

To smooth out price fluctuations and identify trends, we calculated:

- Simple Moving Average (SMA): Used to observe price behavior over 7-day and 30-day windows.
- Exponential Moving Average (EMA): Gives more weight to recent prices to identify momentum shifts.

Formula in Excel:

SMA = AVERAGE(Close Price over 7 days)

#### b) Volatility Calculation:

- We calculated standard deviation of daily returns to quantify how much a stock's price varied from its average.
- High standard deviation = High volatility = Riskier stock.

#### c) Percentage Returns:

We derived the daily returns using:

Daily Return (%) = (Today's Price - Yesterday's Price) / Yesterday's Price \* 100

This helped in comparing the performance across all companies on a normalized scale.

### 3. Correlation Analysis (Excel & SQL)

- To understand how the stock prices of these companies move in relation to each other, we performed correlation analysis.
- We created a correlation matrix in Excel using the =CORREL() function between the daily returns of Apple, Microsoft, Netflix, and Google.
- Strong correlations indicate that the stocks tend to move together (e.g., Google and Microsoft may have a high correlation as they are both tech giants).

This analysis provided insights into portfolio diversification and co-movement of stock trends

### 4. Data Querying and Exploration (SQL)

SQL was used to explore, filter, and join data for advanced insights.

Examples include:

- Filtering data by company and time frame.
- Joining datasets if separate files were used for each company.
- Aggregating metrics like average monthly return, max price, or minimum volume.

Example SQL Queries:

```
-- Calculate monthly average closing price for Apple
SELECT
  DATE_FORMAT(date, '%Y-%m') AS Month,
```

```

    AVG(close_price) AS Avg_Close_Price
FROM stock_data
WHERE company = 'Apple'
GROUP BY Month;
-- Correlation input preparation
SELECT
    date,
    a.close_price AS Apple,
    m.close_price AS Microsoft,
    n.close_price AS Netflix,
    g.close_price AS Google
FROM apple_data a
JOIN microsoft_data m ON
a.date = m.date
JOIN netflix_data n ON a.date = n.date
JOIN google_data g ON a.date = g.date;

```

## 5. Data Visualization and Dashboarding (Tableau)

After preprocessing and analysis, the cleaned and structured data was imported into Tableau Desktop for visualization.

### a) Line Charts for Stock Price Trends

- Plotted each company's stock price over time.
- Used different colors and labels to highlight peaks and crashes.
- Enabled users to hover and filter by company or date.

### b) Moving Averages Visualization

- Created dual-axis charts to show both actual prices and 7-day/30-day moving averages.
- Helped identify support/resistance levels in stock prices.

### c) Heat Maps and Correlation Charts

- Used heat maps to highlight days of high trading volume.
- Created a custom correlation visual using color scales to indicate the strength of correlation between different stocks.

### d) Dashboard Filters and Interactivity

- Added filter options by company, date range, and metric (price, volume, return).
- Used parameter controls to let users choose between SMA and EMA.

### e) Performance Summary KPIs

- Displayed average price, max return, highest volume day, and volatility per company in a summarized card format.

## 6. Insights and Business Interpretation

Finally, all the technical outputs were interpreted from a business perspective:

- Which company had the highest average return?
- Which stock was most stable (lowest volatility)?
- What periods showed industry-wide dips or growth?

## **PROJECT WORK**

### **Step 1: Understanding the Project Objective**

The first step was to clearly understand the problem statement and the goal of the analysis. The objective was:

To analyze and compare the stock performance of Apple, Microsoft, Netflix, and Google over a 3-month period, using data analytics techniques to uncover patterns, trends, and correlations, and then present these insights through an interactive Tableau dashboard.

Key focus areas:

- Trend Analysis (price movements over time)
- Volatility (standard deviation of returns)
- Moving Averages (SMA and EMA)
- Correlation between stock performances
- Visualization of insights for decision-making

### **Step 2: Dataset Collection and Exploration**

The dataset was provided via a Google Drive link, which contained historical daily stock prices for the four companies. The dataset included fields like:

- Date
- Company Name
- Open Price
- High Price
- Low Price
- Close Price
- Adjusted Close Price
- Trading Volume

Actions taken:

- Downloaded the CSV dataset.
- Opened the data in Excel to conduct a preliminary review.
- Identified the range of dates (last 3 months).
- Checked for missing values, null entries, duplicate rows, and formatting issues.

### **Step 3: Data Cleaning and Preprocessing (Excel)**

Before conducting any analysis, the dataset had to be cleaned.

Cleaning steps:

- Removed unnecessary columns like Adjusted Close if it was redundant.
- Ensured all dates were in proper YYYY-MM-DD format.

- Used Excel filters to remove rows with missing prices or volume.
- Sorted data chronologically.
- Created separate sheets for each company for easier analysis and visualization later.

Derived metrics added in Excel:

- Daily Return (%) = (Today's Close - Yesterday's Close) / Yesterday's Close
- 7-day and 30-day SMA using Excel formula =AVERAGE(Range)
- Rolling Standard Deviation (Volatility) using =STDEV.P(Range)

This preprocessing allowed the creation of a new, structured Excel file ready for Tableau and SQL.

Company	Date	Open	High	Low	Close	Adj Close	Volume	Daily Returns
Apple	07-02-2023	150.6399994	155.2299957	150.6399994	154.6499939	154.4142303	83322600	0.026519719
Apple	08-02-2023	153.8800049	154.3300018	151.1699982	151.9199982	151.6884003	64120100	-0.012737241
Apple	09-02-2023	153.7799988	154.3300018	150.4199982	150.8699951	150.6399994	56007100	-0.018923161
Apple	01-03-2023	146.8300018	147.2299957	145.0099945	145.3099976	145.3099976	55479000	-0.010352137
Apple	02-03-2023	144.3800049	146.7100067	143.8999939	145.9100037	145.9100037	52238100	0.010597027
Apple	03-03-2023	148.0399933	151.1100006	147.3300018	151.0299988	151.0299988	70732300	0.020197282
Apple	06-03-2023	153.7899933	156.3000031	153.4600067	153.8300018	153.8300018	87558000	0.000260151
Apple	07-03-2023	153.6999969	154.0299988	151.1300049	151.6000061	151.6000061	56182000	-0.013862921
Apple	08-03-2023	152.8099976	153.4700012	151.8300018	152.8699951	152.8699951	47204800	0.000392628
Apple	09-03-2023	153.5599976	154.3399933	150.2299957	150.5899963	150.5899963	53833600	-0.019340282
Apple	03-04-2023	164.2700043	166.2899933	164.2200012	166.1699982	166.1699982	56976200	0.011566286
Apple	04-04-2023	166.6000061	166.8399963	165.1100006	165.6300049	165.6300049	46278300	-0.005822336
Apple	05-04-2023	164.7400055	165.0500031	161.8000031	163.7599945	163.7599945	51511700	-0.005948834
Apple	06-04-2023	162.4299927	164.9600067	162	164.6600037	164.6600037	45390100	0.013729059
Apple	01-05-2023	169.2799988	170.4499969	168.6399994	169.5899963	169.5899963	52472900	0.001831271
Apple	02-05-2023	170.0899963	170.3500061	167.5399933	168.5399933	168.5399933	48425700	-0.009112841
Apple	03-05-2023	169.5	170.9199982	167.1600037	167.4499969	167.4499969	65136000	-0.012094413
Apple	04-05-2023	164.8899994	167.0399933	164.3099976	165.7899933	165.7899933	81235400	0.005458147
Apple	05-05-2023	170.9799957	174.3000031	170.7599945	173.5700073	173.5700073	113316400	0.015148039
Microsoft	07-02-2023	286.5299988	288.7699989	260.0799866	267.5599976	266.89151	50841400	0.026983452
Microsoft	08-02-2023	273.2000122	276.7600098	266.2099915	266.730011	266.0635986	54686000	-0.023682287
Microsoft	09-02-2023	273.7999878	273.980011	262.7999878	263.6199951	262.9613647	42375100	-0.037180399
Microsoft	01-03-2023	250.7599945	250.3999927	245.7899933	246.2700043	246.2700043	27565300	-0.017905529
Microsoft	02-03-2023	246.5500031	251.3999939	245.6100006	251.1100006	251.1100006	24808200	0.018495224
Microsoft	03-03-2023	252.1900024	255.6199951	251.3899994	255.2899933	255.2899933	30760100	0.012292283
Microsoft	06-03-2023	256.4299927	260.1199951	255.9799957	256.8699951	256.8699951	24109800	0.001715877
Microsoft	07-03-2023	256.2999878	257.6900024	253.3899994	254.1499939	254.1499939	21473200	-0.008388584
Microsoft	08-03-2023	254.0399933	254.3399933	250.8099976	253.6999969	253.6999969	17340200	-0.001383358
Microsoft	09-03-2023	255.8200073	259.5599976	251.5800018	252.3200073	252.3200073	26653400	-0.013681494
Microsoft	03-04-2023	286.519989	288.269989	283.9500122	287.230011	287.230011	24883300	0.002478089

#### Step 4: Data Exploration with SQL

To perform more structured querying and transformation, the cleaned Excel file was imported into a SQL database (e.g., MySQL or PostgreSQL). Each sheet (Apple, Microsoft, etc.) was stored as a table.

SQL tasks completed:

- Queried monthly average and maximum stock prices.
- Joined multiple tables on Date to compare company data side-by-side.
- Extracted top-performing days based on highest return.
- Grouped data by month to analyze stock performance trends.

Example query:

```
SELECT
    DATE_FORMAT(date, '%Y-%m') AS month,
    AVG(close_price) AS avg_price,
```

MAX(close\_price) AS max\_price FROM apple\_stock GROUP BY month;  
SQL enabled fast and scalable data aggregation before importing into Tableau.

#### Step 5: Connecting Tableau to the Dataset

Using Tableau Desktop, the cleaned and enriched dataset was connected in two ways:

- Direct Excel Import: Connected to the cleaned Excel workbook.
- SQL Connector: For dynamic querying, a live connection was established to the SQL database.

Data blending was applied to bring together data from all four companies for comparative analysis.

#### Step 6: Creating Visualizations in Tableau

A range of visualizations were created to display trends, comparisons, and key metrics. Below are the key charts and their purposes:

##### A) Line Charts

- Stock Price Over Time for each company.
- Used color to differentiate companies.
- Showed volatility by highlighting steep rises/falls.

##### B) Moving Average Charts

- Dual-axis line charts displaying Close Price and 30-day SMA.
- Helped identify momentum, trends, and breakouts.

##### C) Volatility Comparison

- Bar charts showing standard deviation of daily returns for each company.
- High bars indicated high-risk, high-reward stocks.

##### D) Correlation Matrix

- Created using heat map logic to show how closely stock prices move together.
- Green shades = positive correlation; red shades = inverse.

##### E) KPI Cards

###### Average Price

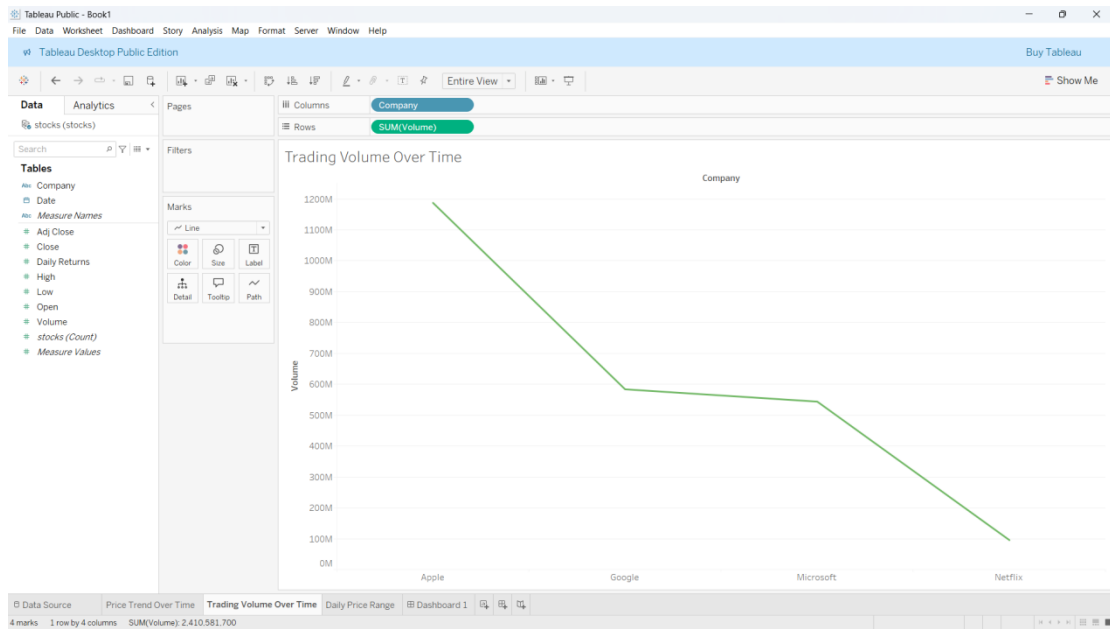
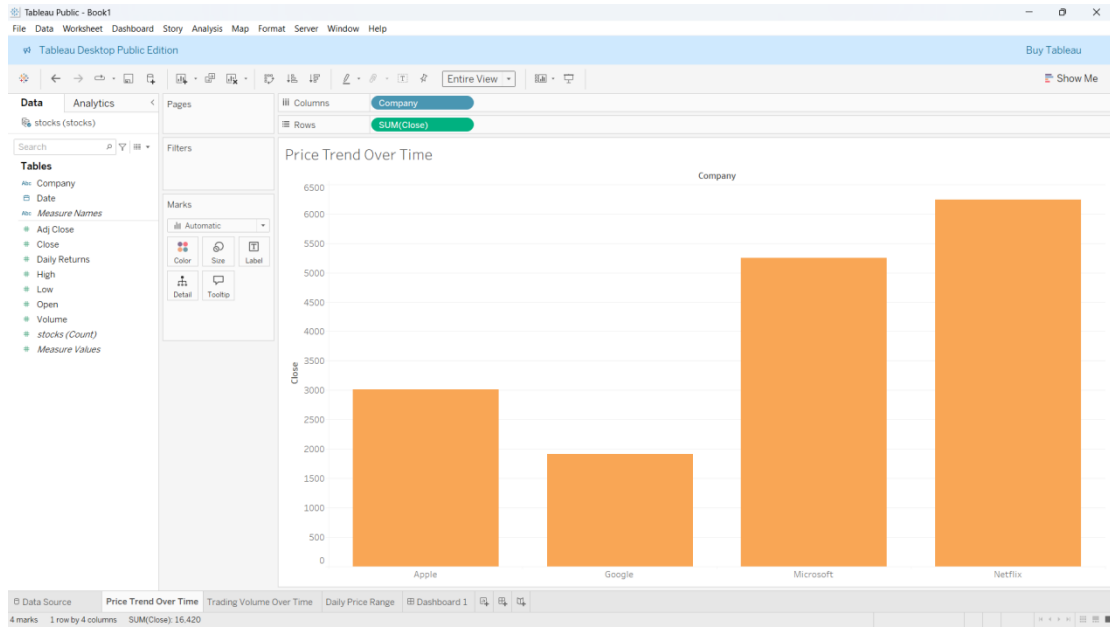
- Highest Return Day
- Total Volume Traded
- Volatility Score

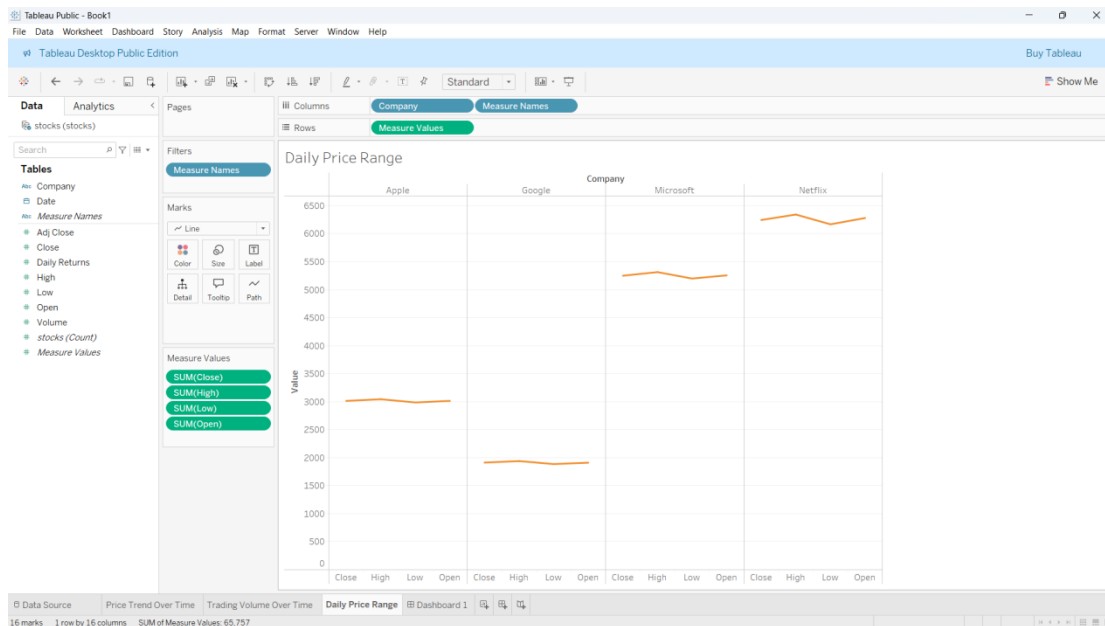
These KPIs gave quick business-level summaries.

##### F) Daily Return Distribution

- Used histogram to visualize frequency of daily returns.







## Step 7: Building the Tableau Dashboard

All the created visualizations were combined into a single, interactive dashboard in Tableau.

Dashboard Elements:

Header with project title: “Stock Market Performance Dashboard”

Filters for:

- Company selection
- Date range
- Metrics (Price, Volume, Return)

Interactive charts:

- Line chart (Price Trends)
- Dual-axis (Price + Moving Average)
- Heat map (Correlation)
- KPI cards
- Bar chart (Volatility)

Interactivity added:

- Dynamic filters: Selecting a company updates all charts.
- Tooltips: Show data values on hover.
- Annotations: Important spikes or drops were explained with context.

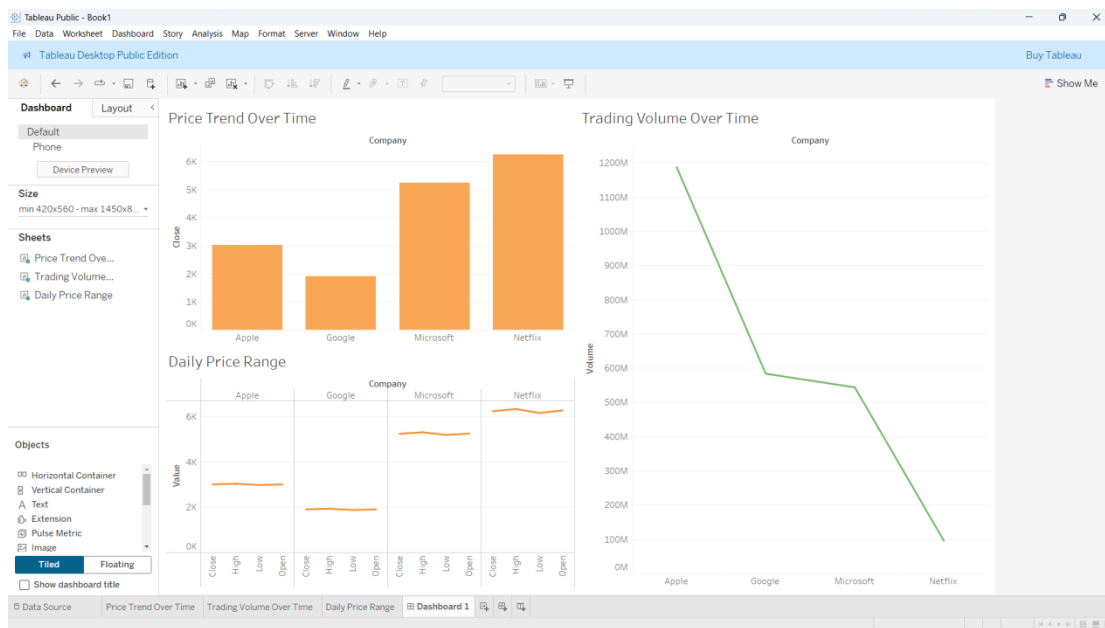
## Step 8: Insight Generation and Business Recommendations

- After completing the dashboard, several actionable insights were documented:
- Apple showed stable growth with relatively low volatility.
- Netflix had high volatility, suggesting it's more sensitive to market news.

- Microsoft and Google had a high positive correlation, likely due to their similar tech sector dynamics.
- Days with high volume often aligned with news releases or earnings reports.

#### Business Recommendations:

- Risk-averse investors may prefer Apple or Microsoft.
- Growth-focused investors may benefit from short-term Netflix opportunities.
- A balanced portfolio could include low- and high-volatility stocks for diversification.



## CONCLUSION

This internship project, focused on analyzing stock market performance using historical data from Apple, Microsoft, Netflix, and Google, provided a real-world application of business analytics in the finance domain. Through this comprehensive analysis, we successfully transformed raw data into meaningful, interactive insights using tools such as Excel, SQL, and Tableau. The project not only fulfilled its initial objectives but also extended beyond by uncovering patterns in volatility, price trends, and inter-stock relationships.

The analysis began with a deep dive into the raw dataset, followed by careful preprocessing using Excel. We handled missing values, standardized formats, and calculated additional metrics such as daily returns and moving averages. SQL was then utilized to extract deeper insights, like monthly trends and comparative performance. This stage also helped prepare the data for visualization by consolidating values across the four companies.

The visualization and dashboarding phase in Tableau allowed us to bring the data to life. Interactive line charts, dual-axis moving averages, correlation heatmaps, and KPI cards made the findings easily accessible to decision-makers. The use of dashboard filters allowed dynamic exploration by users based on company or time frame.

Some of the most critical observations were:

- Apple and Microsoft displayed relatively stable trends with low volatility, making them suitable for long-term investment.
- Netflix showed significant short-term spikes and dips, indicating higher risk and higher return potential.
- Google's price movements closely followed Microsoft's, suggesting strong correlation and potential for co-investment or hedging strategies.
- The volume of trade surged around specific news events or earnings calls, aligning with typical market behavior patterns.

Overall, the project helped answer key questions related to stock performance, investor risk profiles, and optimal portfolio combinations. The Tableau dashboard created as the final product stands as a powerful analytical tool that can support strategic financial decision-making in a business environment.

## **LEARNING OUTCOMES**

This internship project offered a broad spectrum of practical learnings that bridged the gap between academic knowledge and industry-level application. The experience was highly enriching, both technically and professionally.

### **1. Technical Skills Development**

#### **a) Excel Proficiency:**

- Learned how to clean and structure real-world financial datasets.
- Gained hands-on experience in calculating moving averages, standard deviations, and percentage returns
- Applied formulas dynamically across large datasets with accuracy.

#### **b) SQL for Data Analysis:**

- Strengthened my understanding of SQL querying.
- Practiced data grouping, aggregation, joins, and filters.
- Extracted actionable insights such as monthly price trends and average returns per company.

#### **c) Tableau Dashboarding:**

- Mastered Tableau's interface and learned how to connect data from Excel and SQL sources.
- Created different types of visualizations including line charts, heat maps, stacked bars, and KPI indicators.
- Designed a functional, interactive dashboard by integrating multiple visual components.
- Implemented filters and parameters to improve user experience and storytelling.

### **2. Analytical Thinking**

- Understood the importance of choosing the right metric (e.g., volatility vs. return).
- Interpreted market behaviors through technical indicators such as moving averages.
- Developed the ability to detect patterns and outliers through visual and statistical cues.
- Practiced hypothesis-driven analysis by comparing companies and validating trends with data.

### 3. Business & Financial Acumen

- Gained exposure to how stock markets function, how companies are evaluated by price movements, and how volatility affects investor decisions.
- Understood the relationship between corporate events (earnings, product launches) and market reactions.
- Learned how to align data-driven insights with business strategy, such as risk profiling and investment recommendations.

### 4. Project Management & Communication

- Followed a structured approach from objective definition to final delivery.
- Documented every stage of the analysis for reproducibility and reporting.
- Created a polished Tableau dashboard suitable for stakeholder presentations.
- Gained experience explaining complex data insights in simple, business-oriented language.

### 5. Real-World Exposure

This project replicated the exact challenges a business analyst faces in real-world settings:

- Working with incomplete or unstructured data.
- Deciding which KPIs and visualizations matter to the audience.
- Balancing depth of analysis with clarity of presentation.

The hands-on experience helped me build confidence in handling data independently and delivering insights that are both technically accurate and strategically relevant.