Data Visualization Project Report

FWG Consulting: AI-Driven Stock Market Insights for Smarter Investing

By: Felipe Peñuela, George Muttikkal, Mohammed Abdul Wasay Saudagar

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1. Dataset Description

The dataset used for this project is a *five-year historical stock price dataset* gathered from the *Yahoo Finance API*. This dataset covers major publicly listed companies across multiple sectors, providing key financial attributes necessary for comprehensive stock market analysis.

Key Attributes

- *Stock Symbol (Ticker)* – Unique identifier for each company (e.g., AAPL for Apple, TSLA for Tesla).
- *Date* – Trading date for each record.
- *Open Price* – Stock price at the start of the trading session.
- *Close Price* – Stock price at the end of the trading session.
- *High/Low Price* – Intraday price range.
- *Adjusted Close Price* – Price adjusted for corporate actions like dividends and splits.
- *Trading Volume* – Number of shares traded per day.

Covered Sectors

- *Technology & AI*: Apple (AAPL), Microsoft (MSFT), Amazon (AMZN), Tesla (TSLA), Nvidia (NVDA).
- *Finance & Banking*: JPMorgan Chase (JPM), Goldman Sachs (GS), Wells Fargo (WFC).
- *Healthcare & Pharma*: Johnson & Johnson (JNJ), Pfizer (PFE), Merck (MRK).
- *Energy & Utilities:* ExxonMobil (XOM), Chevron (CVX), BP.
- *Automotive*: Ford (F), General Motors (GM), Rivian (RIVN), Nio (NIO).
- *Retail & Consumer Goods*: Walmart (WMT), Target (TGT), Coca-Cola (KO).

The diversity of sectors allows cross-sector comparisons, making the dataset well-suited for comprehensive investment analysis.

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2. Business Scenario

FWG Consulting is a growing financial consulting firm that helps clients navigate the complexity of stock investing. With markets constantly shifting, investors, whether seasoned professionals or beginners, struggle to identify trends, assess risks, and spot opportunities. To solve this, FWG introduces an AI-powered Stock Market Insights Platform, leveraging Tableau visualizations to transform complex stock data into clear, actionable insights.

By using historical stock data, FWG's advisors and clients can track stock performance, compare industries, and assess risk levels all through interactive, data-driven dashboards.

Business Problem

Investors, whether retail traders or professional advisors, face challenges interpreting vast amounts of stock data and identifying meaningful trends across sectors. They need tools to *compare stocks, assess risk, and forecast future performance***.**

Objective

FWG Consulting, a financial consulting firm, addresses this challenge by creating an *AI-driven Stock Market Insights Platform***.** Using *Tableau dashboards*, the platform transforms raw stock data into *interactive visualizations* to:

- Easy-to-read visualizations of stock performance over time
- Risk assessment tools to analyze volatility
- Sector-based comparisons to identify top-performing industries
- Predictive insights using forecasting models

The ultimate goal is to *empower better investment decisions through data-driven insights***.**

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3. Analysis and Insights

Key Findings

- *Technology Dominates* – Technology stocks consistently exhibit higher closing prices and higher volatility**,** especially for Tesla (TSLA).
- *TSLA's Volatility* – Across multiple years, Tesla appears as one of the most volatile stocks, reflected in the bubble chart visualization, where larger, darker bubbles indicate higher daily volatility.
- *Sector Comparison* – The Technology sector leads in total stock value, followed by Finance and Healthcare. The Automotive sector lags, with relatively lower closing price
- *Cross-Sector Trends* – The bar chart comparing sector performance highlights Technology's dominance and the underperformance of Automotive stock*s*.
- *Volatility Insights* – Visual patterns from the bubble chart reveal clear clusters of high-volatility stocks**,** providing investors with critical risk assessment insights.

Patterns and Anomalies

- *High Volatility in Energy and Technology* – While Technology stocks often lead in volatility, Energy stocks also show irregular volatility spikes**,** potentially tied to geopolitical or environmental factors.
- *Steady Growth in Finance and Healthcare* – Finance and Healthcare stocks, while less volatile, show steady upward price trends**,** making them more suitable for conservative investors.

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4. Forecasting

Methodology

The project applied Tableau's built-in forecasting model to project future trends in *high, low, and volume metrics* for selected stocks across different sectors.

Forecast Insights

- *Technology Sector Forecast* – Technology stocks (AAPL, TSLA, MSFT) are forecasted to maintain steady growth with periods of heightened volatility, especially for Tesla.
- *Energy Sector Uncertainty* – Forecasted volumes in the Energy sector show greater uncertainty bands, indicating higher volatility and unpredictability.
- *Automotive Sector Modest Growth* – Forecasted prices for Automotive stocks show modest gains, reflecting the sector's relative underperformance.

Forecast Accuracy

The *forecast accuracy* was assessed using Tableau's *cross-validation feature*, which compares historical actuals with forecasted estimates. While *forecasts are reliable for short-term trends*, longer-term projections showed *wider confidence intervals*, particularly in volatile sectors.

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5. Calculated Fields Used

To enrich the dashboard analysis, two primary *calculated fields* were created:

1. Daily Volatility

Formula:
Daily Volatility = [High Price] - [Low Price]
This metric measures *intraday price swings*, directly capturing each stock's volatility.

- Applied to the *bubble chart* to size and color-code bubbles, helping users visually identify high-volatility stocks.
- Provides *critical risk assessment data* for volatility-sensitive investors.

2. Sector Classification

Since the dataset lacked sector tags, a *custom-calculated field* was created:

```
IF [Stock Symbol] IN ("AAPL", "MSFT", "AMZN", "TSLA", "NVDA") THEN "Technology"
ELSEIF [Stock Symbol] IN ("JPM", "GS", "WFC") THEN "Finance"
...
ELSE "Other"
END
```

This enabled:

- Sector-level filtering**.**
- Sector comparisons in bar charts**.**
- A clearer *industry-level perspective* on performance and risk.

Justification

Both fields were essential for:

- Segmenting the data by industry.
- Enhancing cross-sector comparisons**.**
- Providing actionable volatility and sector insights to users.

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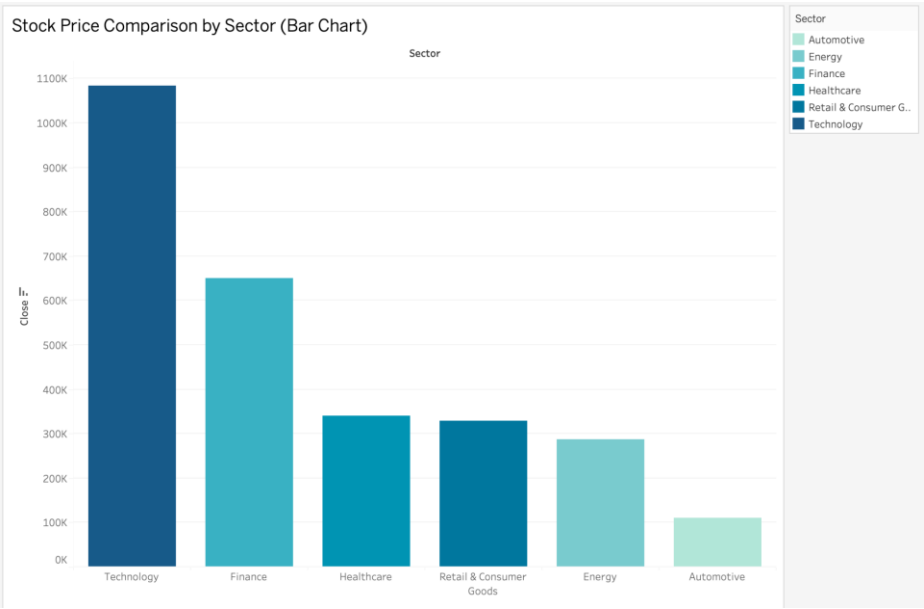
6. Visualization Techniques Used

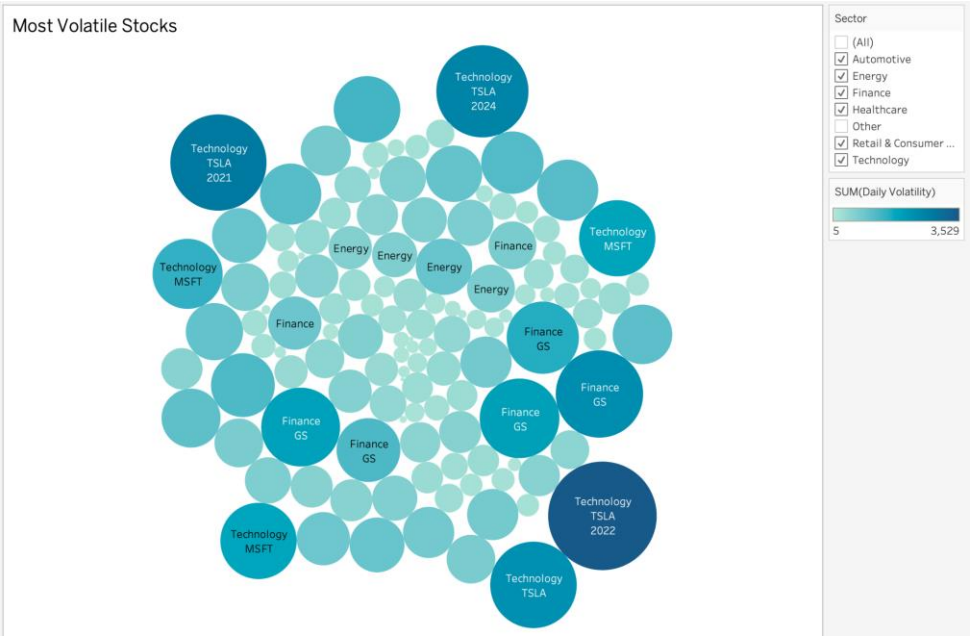
1. Bar Chart – *Sector Comparison*

- Compares total closing prices across sectors.
- Helps identify top-performing industries.
- Justification: Simple and clear, ideal for cross-sector analysis**.**



2. Bubble Chart – *Most Volatile Stocks*

- Bubble size = Daily Volatility
- Color intensity = Volatility level
- Justification: Visually conveys *volatility at a glance*, helping investors quickly assess risk.

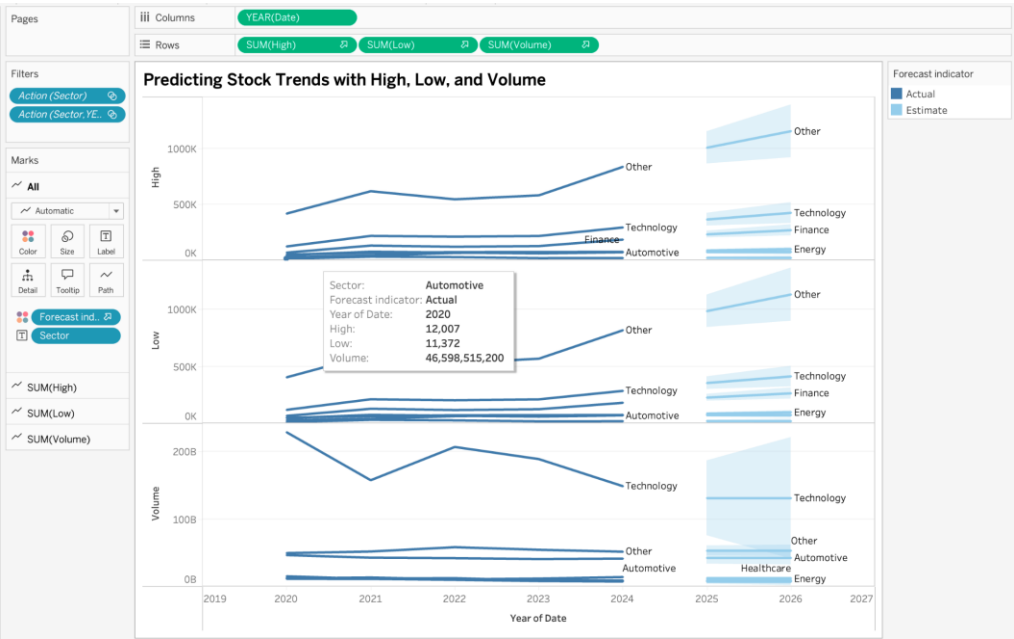


3. Dual-Axis Time Series Chart – *Daily Price Change vs Moving Average*

- Tracks closing price vs. trading volume over time.
- Justification: Combines price trends with liquidity insights, showing how trading activity correlates with price movements.

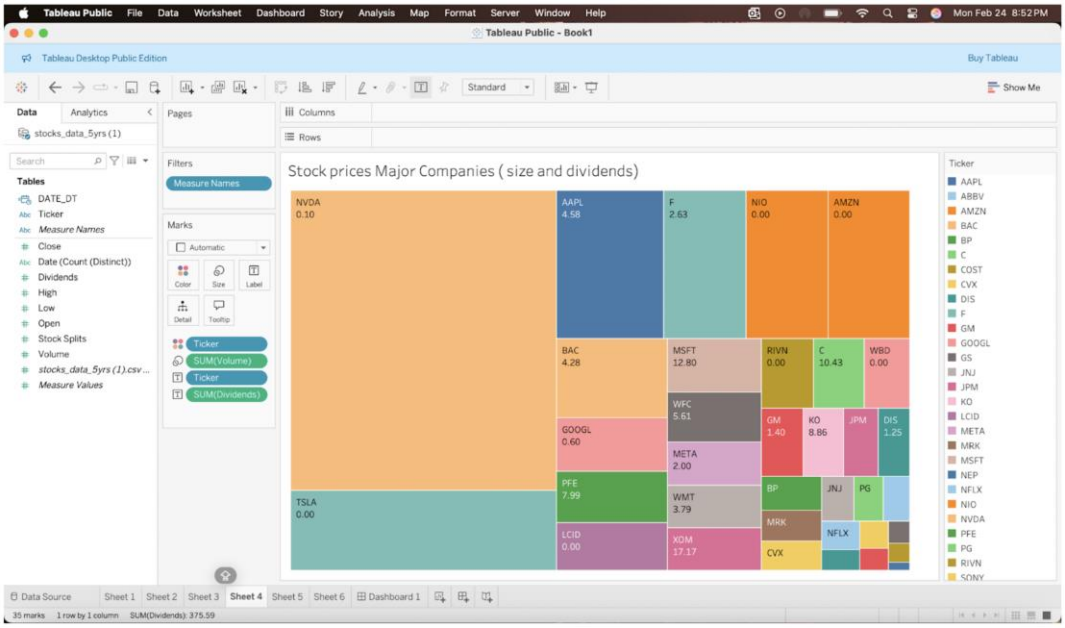
4. Forecast Line Chart – *Predicting Stock Trends with High, Low and Volume*

- Plots actual and forecasted high, low, and volume over time.
- Justification: Gives – Sector Comparison, supporting investment planning.



5. Treemap – *Stock Size & Dividends*

- Block size = Trading volume
- Color = Dividend yield
- Justification: Highlights high-activity stocks and dividend leaders simultaneously.



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7. Interactivity and Dashboard Design

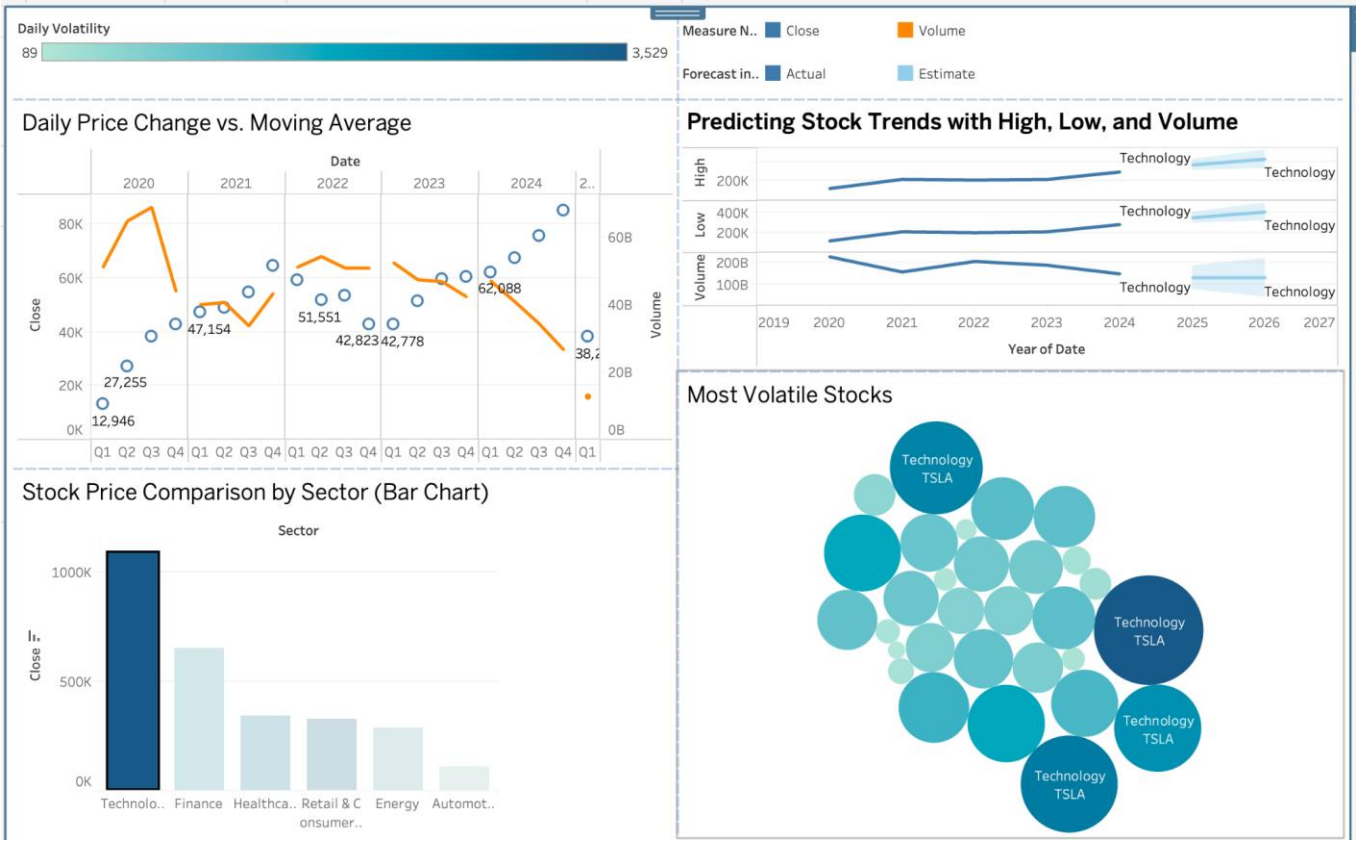
Interactive Features

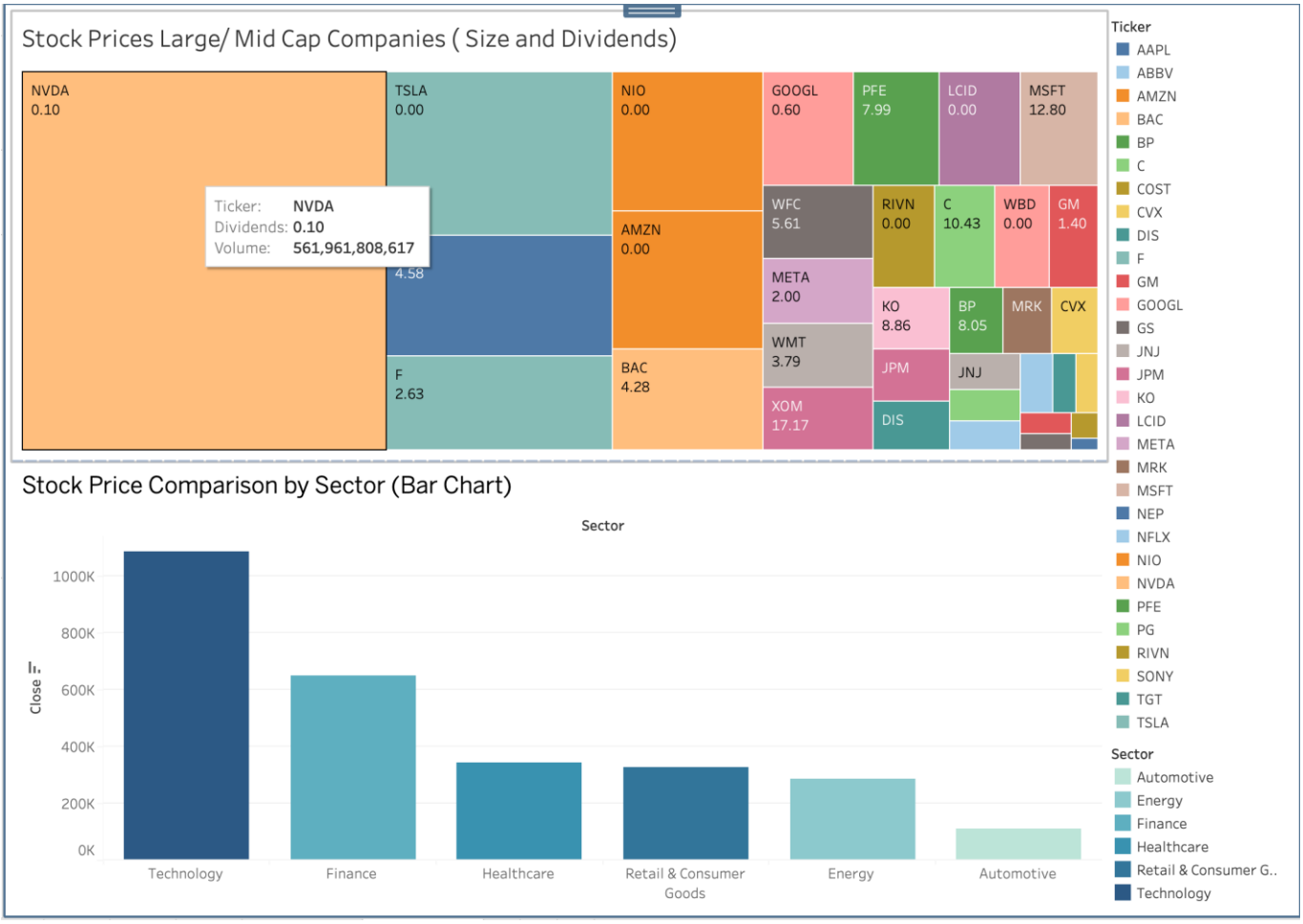
- **Sector Filter** – Users can isolate specific industries (Technology, Finance, etc.).
- **Date Range Filter** – Enables time-period focus.
- **Hover Tooltips** – Displays stock details, daily volatility, and volume.
- **Dynamic Forecasting** – Users can switch between actual and forecasted data.

Justification

These features:

- Enhance explorability, allowing investors to personalize their analysis.
- Support drill-down analysis**,** ensuring users can move from macro (sector-level) to micro (stock-level) views.
- Facilitate real-time decision-making**,** aligning with FWG Consulting's goal of empowering smarter investing**.**


Daily Volatility
89
3,529
Measure N..
Close
Volume
Forecast in..
Actual
Estimate
Daily Price Change vs. Moving Average
Date
2020
2021
2022
2023
2024
Close
Volume
80K
60K
40K
20K
0K
60B
40B
20B
0B
27,255
12,946
47,154
51,551
42,823
42,778
62,088
Q1 Q2 Q3 Q4
Predicting Stock Trends with High, Low, and Volume
High
Low
Volume
200K
400K
200K
200B
100B
Technology
2019
2020
2021
2022
2023
2024
2025
2026
2027
Year of Date
Most Volatile Stocks
Technology
TSLA
Stock Price Comparison by Sector (Bar Chart)
Sector
1000K
500K
0K
Close
Technolo..
Finance
Healthca..
Retail & C onsumer..
Energy
Automot..


Stock Prices Large/ Mid Cap Companies (Size and Dividends)
NVDA
0.10
TSLA
0.00
NIO
0.00
GOOGL
0.60
PFE
7.99
LCID
0.00
MSFT
12.80
Ticker: NVDA
Dividends: 0.10
Volume: 561,961,808,617
4.58
AMZN
0.00
WFC
5.61
RIVN
0.00
C
10.43
WBD
0.00
GM
1.40
META
2.00
KO
8.86
BP
8.05
MRK
CVX
WMT
3.79
JPM
JNJ
F
2.63
BAC
4.28
XOM
17.17
DIS
Ticker
AAPL
ABBV
AMZN
BAC
BP
C
COST
CVX
DIS
F
GM
GOOGL
GS
JNJ
JPM
KO
LCID
META
MRK
MSFT
NEP
NFLX
NIO
NVDA
PFE
PG
RIVN
SONY
TGT
TSLA
Stock Price Comparison by Sector (Bar Chart)
Sector
1000K
800K
600K
400K
200K
0K
Close
Technology
Finance
Healthcare
Retail & Consumer Goods
Energy
Automotive
Sector
Automotive
Energy
Finance
Healthcare
Retail & Consumer G..
Technology

8. Conclusion

The *FWG Consulting Stock Market Insights Dashboard* effectively transforms complex stock data into *clear, actionable insights.* By combining *historical analysis, sector comparisons, risk assessment, and forecasting*, the dashboard provides investors with an *interactive, data-driven toolkit* to make smarter investment decisions.

The calculated fields and visualizations enhance usability, while interactive features ensure that both retail investors and financial advisors can *tailor their analyses* to suit individual needs. This project highlights the value of *data visualization in financial decision-making*, demonstrating how *AI-powered tools* can transform the way investors engage with stock markets.