Johnson & Johnson (JNJ) Stock Analysis

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Johnson & Johnson (JNJ): A leading global healthcare company known for its diverse range of products including pharmaceuticals, medical devices, and consumer health products.

Problem Statement: *Analyze the historical stock performance of Johnson & Johnson (JNJ) over the past three years. The goal is to identify key trends, understand the volatility of the stock, and create aggregated features that provide deeper insights into its historical performance.*

Dataset: Historical stock prices of Johnson & Johnson (JNJ) from Yahoo Finance for the past 3 years (2021-01-01 to 2024-01-01).

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import yfinance as yf
```

```
]:
# Download historical data for Johnson & Johnson (JNJ)
data = yf.download('JNJ', start='2021-01-01', end='2024-01-01')
```

Data Issues Identified

1.Missing data

Description:

- Missing values in the 'Close' and 'Volume' columns.
- Missing data can occur due to non-trading days such as weekends and holidays.

Impact:

- Missing 'Close' prices can disrupt the continuity of price trends and moving averages.
- Missing 'Volume' data can affect the accuracy of volume analysis and trend identification.

Example:

- Missing 'Close' price for a non-trading day might show as `NaN` in the dataset.
- Missing 'Volume' data due to lack of recorded transactions on certain days.

```
# Step 2: Handling Missing Data
# Checking for missing values
print("\nMissing Data Summary:")
print(data.isnull().sum())
```

```
Missing Data Summary:
Open         0
High         0
Low          0
Close        0
Adj Close    0
Volume       0
dtype: int64
```

```
# Verify no missing values
print("\nMissing Data Summary After Imputation:")
print(data.isnull().sum())
```

```
Missing Data Summary After Imputation:
Open         0
High         0
Low          0
Close        0
Adj Close    0
Volume       0
dtype: int64
```

Data Issues Identified

2.Outliers

Description:

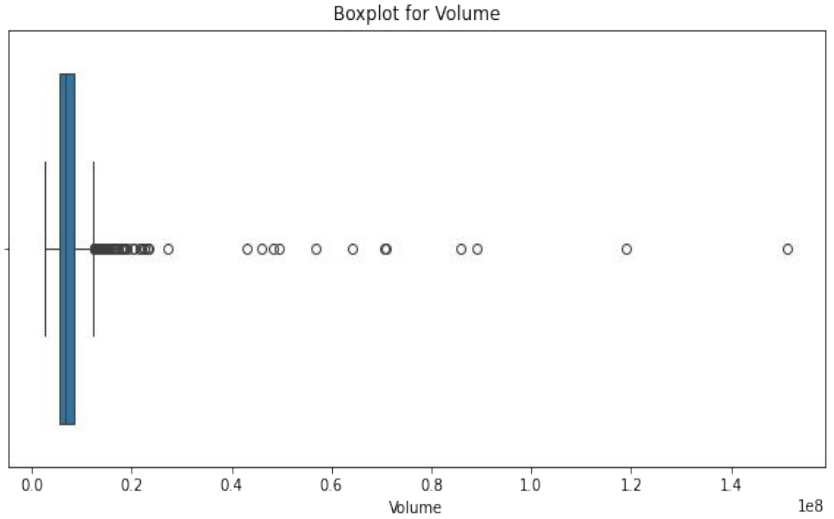
- Unusual spikes in the 'Volume' column.
- These outliers can result from erroneous data entry, market anomalies, or specific events causing abnormal trading volumes.

Impact:

- Outliers can skew the results of statistical analyses and visualizations.
- They can create misleading trends in volume analysis and affect derived features like moving averages and volatility.

Example:

- A single day with an abnormally high trading volume compared to the average, potentially due to a major company announcement or data entry error.

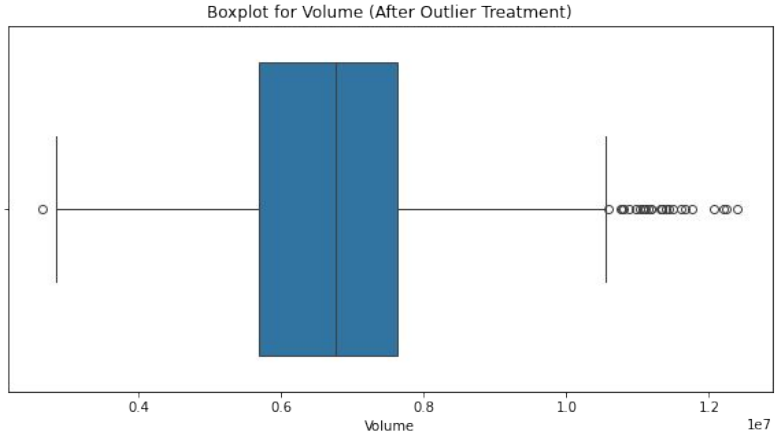


Data Issues Identified

3.Addressing Outliers:

Identification: Using the Interquartile Range (IQR) method to detect outliers in the 'Volume' data.

Treatment: Replacing identified outliers with the median volume to minimize their impact on the overall analysis.




```
# Outlier detection using IQR method
Q1 = data['Volume'].quantile(0.25)
Q3 = data['Volume'].quantile(0.75)
IQR = Q3 - Q1
lower_bound = Q1 - 1.5 * IQR
upper_bound = Q3 + 1.5 * IQR
outliers = data[(data['Volume'] < lower_bound) | (data['Volume'] > upper_bound)]
print("\nDetected Outliers in Volume:")
print(outliers)
```

```
Detected Outliers in Volume:
                 Open        High         Low       Close   Adj Close  \
Date
2021-01-26  169.699997  173.649994  169.389999  170.479996  154.823425
2021-01-27  169.119995  170.919998  167.449997  167.880005  152.462265
2021-01-29  164.259995  166.000000  160.550003  163.130005  148.148468
2021-02-26  162.000000  162.410004  157.970001  158.460007  144.804703
2021-03-19  160.690002  161.500000  159.470001  160.039993  146.248566
...                ...         ...         ...         ...         ...
2023-08-28  165.000000  166.210007  163.169998  164.289993  160.459564
2023-08-31  163.369995  163.570007  161.279999  161.679993  157.910416
2023-09-15  163.979996  164.820007  161.210007  161.449997  157.685791
2023-11-30  152.259995  155.139999  151.919998  154.660004  152.263748
2023-12-15  155.490005  156.690002  153.759995  155.160004  152.756012

              Volume
Date
2021-01-26  14205700
2021-01-27  14207300
2021-01-29  22505900
2021-02-26  14417500
2021-03-19  14891500
...              ...
2023-08-28  18458000
2023-08-31  15333000
2023-09-15  13388900
2023-11-30  12481900
2023-12-15  21712500

[62 rows x 6 columns]
```

```
# Handling outliers by replacing with median volume
data['Volume'] = np.where((data['Volume'] < lower_bound) | (data['Volume'] > upper_bound),
                          data['Volume'].median(), data['Volume'])
```

Feature Engineering

1.7-Day and 30-Day Moving Averages

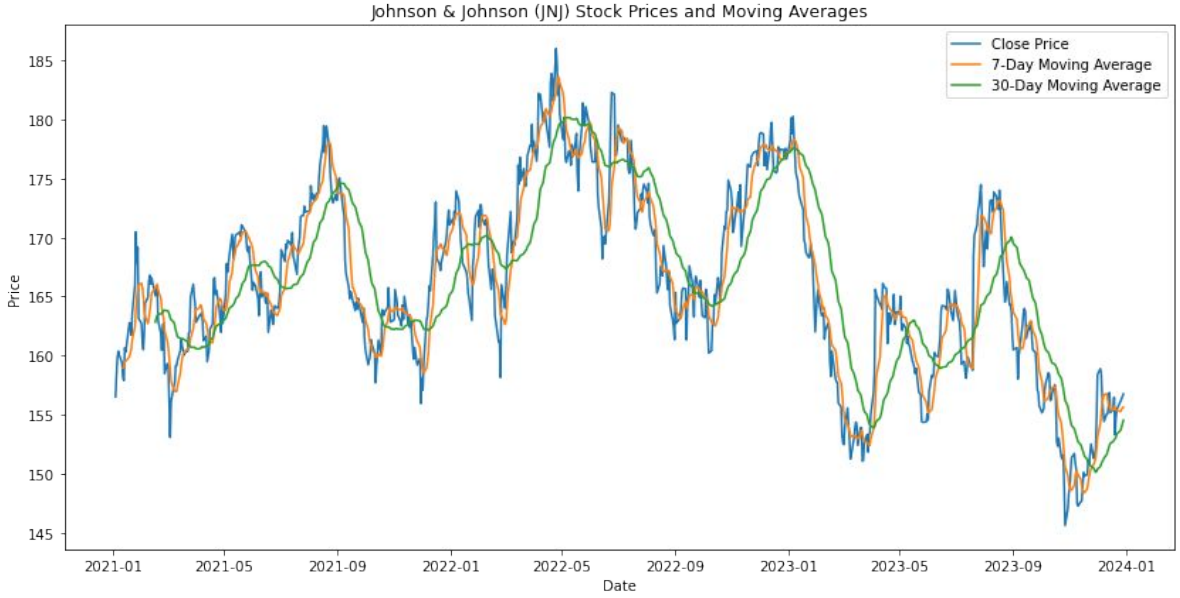
Purpose: Smooth out short-term fluctuations and highlight longer-term trends in stock prices

Explanation:

- **7-Day Moving Average (MA_7):** Averages the 'Close' prices over the past 7 days to show short-term trends.
- **30-Day Moving Average (MA_30):** Averages the 'Close' prices over the past 30 days to show longer-term trends.

Insight: These features help in identifying whether the stock is in an upward or downward trend over different periods.

```
data['MA_7'] = data['Close'].rolling(window=7).mean()
data['MA_30'] = data['Close'].rolling(window=30).mean()
```



Feature Engineering

2.Volatility

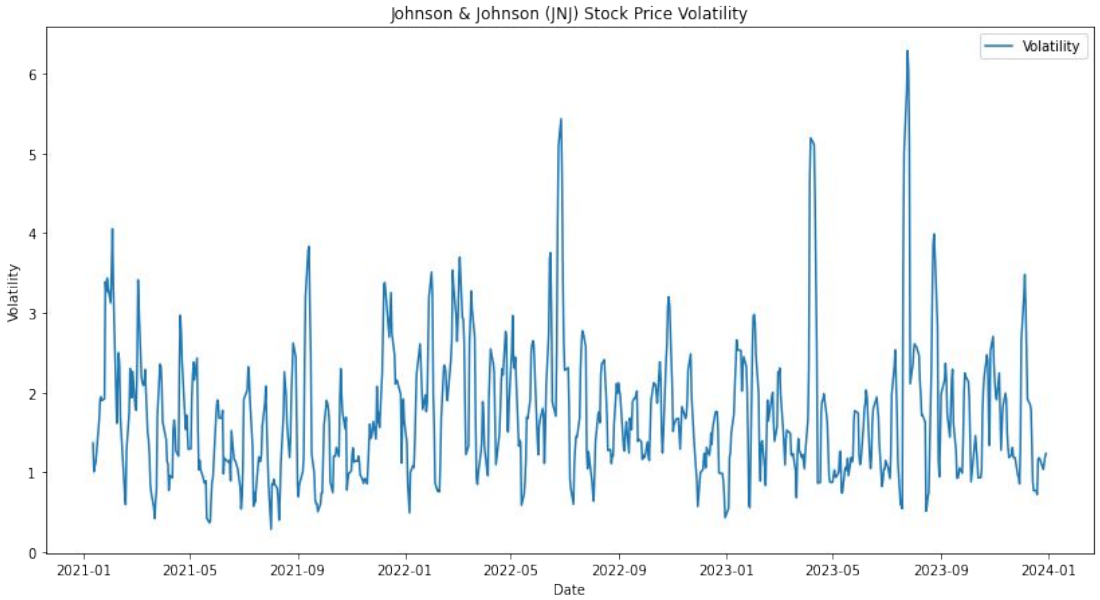
Purpose: Measure the degree of variation in stock prices, indicating periods of high uncertainty or risk.

Explanation:

- **Volatility:** Calculated as the rolling standard deviation of 'Close' prices over a 7-day window.

Insight: High volatility often corresponds to significant market events or company-specific news impacting the stock price.

```
data['Volatility'] = data['Close'].rolling(window=7).std()
```



Feature Engineering

3. Daily returns

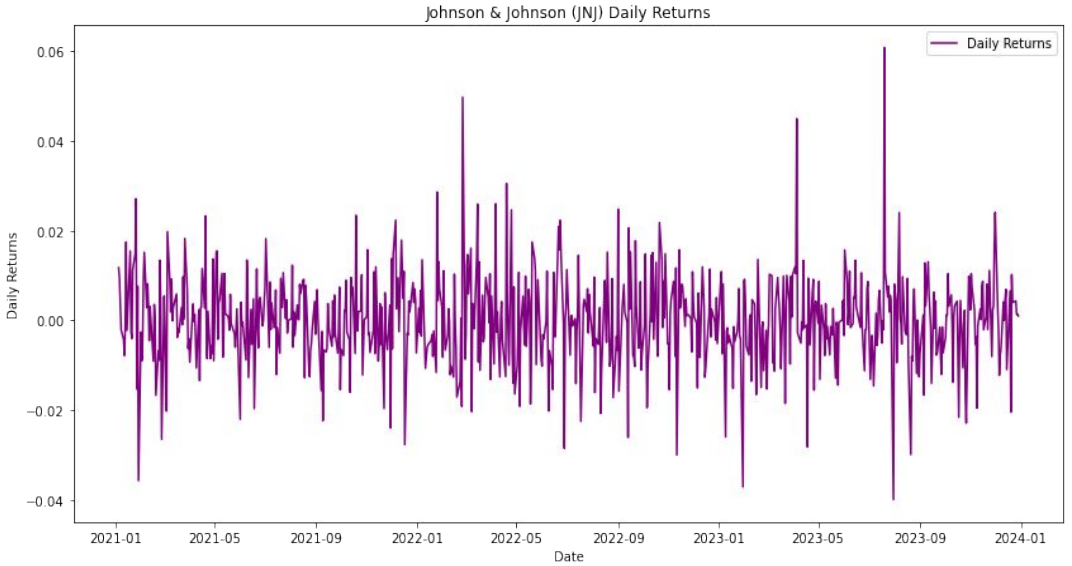
Purpose: Percentage change between the closing prices of consecutive days

Explanation:

- **Daily returns:** Represents the daily percentage change in the stock's closing price. Useful for understanding the day-to-day performance of the stock.

Insight: valuable tool for both short-term traders and long-term investors, providing insights into the stock's performance and helping to inform investment decisions based on historical price movements.

```
# Calculate Daily Returns
data['Daily_Returns'] = data['Close'].pct_change()
```



Interpretation

7-day and 30-day Moving Averages

Short-Term vs. Long-Term Trends:

- **7-Day Moving Average (orange):** Displays recent trends, smoothing out short-term fluctuations.
- **30-Day Moving Average (green):** Highlights overall direction by smoothing out longer-term trends.

Trend Identification:

- **Upward Trend:** Indicated when the 7-day MA crosses above the 30-day MA.
- **Downward Trend:** Indicated when the 7-day MA crosses below the 30-day MA.

Market Events:

- **Peaks and Troughs:** Reflect reactions to market events or company-specific news.
- **Notable Peaks:** Observed in mid-2021 and early 2022, followed by declines.

Interpretation

Volatility

Volatility Trends:

- **Fluctuating Volatility:** With notable spikes indicating periods of high market activity or uncertainty.
- **High Volatility Periods:** Especially around mid-2022 and mid-2023.

Market Reactions:

- **Spikes in Volatility:** Typically follow major announcements or economic changes.
- **Low Volatility Periods:** Suggest market stability and predictability.

Investment Implications:

- **High Volatility:** Presents opportunities for active trading due to larger price swings.
- **Low Volatility:** Suitable for long-term investments due to more predictable price movements.

Interpretation

Daily returns

Daily Returns Distribution:

- **Fluctuations:** Around the zero line, indicating day-to-day changes in the stock price.
- **Range:** Most daily returns fall within -0.02 to 0.02, showing relatively small daily changes.

Impact of Market Events:

- **Significant Spikes:** Notable around mid-2022 and mid-2023, representing days with significant price changes.

Investment Strategy:

- **Short-Term Trading:** Daily returns analysis helps identify profitable trading opportunities.
- **Long-Term Investment:** Understanding daily returns assists in managing risk and focusing on stable periods for more predictable returns.

Conclusion

Comprehensive Understanding:

- The analysis of Johnson & Johnson (JNJ) stock offers a thorough understanding of its historical performance, key trends, and risk profile.

Key Insights:

- **Trend Analysis:** Utilizing 7-day and 30-day moving averages to identify short-term and long-term trends.
- **Volatility Assessment:** Understanding periods of high and low volatility to gauge market stability and activity.
- **Daily Returns Evaluation:** Analyzing day-to-day performance to inform both short-term trading and long-term investment strategies.

Informed Decisions:

- Investors can make better-informed decisions by combining trend analysis, volatility assessment, and daily returns evaluation.

Optimized Investment Strategies:

- The insights help in optimizing investment strategies and effectively managing risk.

Value for Traders and Investors:

- The analysis is beneficial for navigating the complexities of the stock market, whether for short-term trading or long-term investment.

References

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   - *Yahoo Finance*
     - *Historical stock prices for Johnson & Johnson (JNJ) from January 2021 to January 2024.*
     - *URL: Yahoo Finance - JNJ*
2. ***Analysis Tools:***
   - ***Pandas Library:***
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3. ***Methodologies:***
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     - *Explanation of moving averages and their significance in trend analysis.*
     - *URL: Investopedia - Moving Averages*
   - ***Volatility:***
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     - *URL: Investopedia - Volatility*
   - ***Daily Returns:***
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     - *URL: Investopedia - Daily Returns*

THANK YOU

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