# Quantitative Analysis of Stock Market

**Summary**

Quantitative analysis in the stock market is a financial approach that employs mathematical and statistical methods to evaluate stocks and financial markets.

**Steps**

1. Clearly define the objectives and questions to be addressed.
2. Identify the key performance indicators (KPIs) relevant to the analysis.
3. Collect historical stock market data, including prices, volumes, and other pertinent financial indicators.
4. Clean and preprocess the data to manage missing values, outliers, and errors.
5. Conduct an initial analysis to understand data distributions, patterns, and correlations.
6. Implement various strategies based on quantitative analysis.

**Analysis**

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**Output**

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The dataset includes the following columns for stock market data:

* Ticker: The stock ticker symbol.
* Date: The trading date.
* Open: The opening price of the stock for the day.
* High: The highest price of the stock during the day.
* Low: The lowest price of the stock during the day.
* Close: The closing price of the stock for the day.
* Adj Close: The adjusted closing price, reflecting corporate actions such as dividends and stock splits.
* Volume: The number of shares traded during the day.

To conduct a quantitative analysis, we can explore various statistical concepts such as descriptive statistics, time series analysis, correlation analysis, and more.

* Descriptive Statistics: Calculate summary statistics (mean, median, standard deviation, etc.) for each stock.
* Time Series Analysis: Examine trends and patterns over time, particularly focusing on closing prices.
* Volatility Analysis: Assess how much the stock price fluctuates over a given period.
* Correlation Analysis: Determine how the stock prices of different companies are related to each other.
* Comparative Analysis: Compare the performance of different stocks.
* Risk-Return Trade-off Analysis: Analyze the balance between potential risks and rewards of different stocks to aid in portfolio management.

I. Descriptive Statistics

Descriptive statistics will offer summary metrics for each stock in the dataset. We will examine measures such as mean, median, standard deviation, and more for the closing prices:

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Inference:

AAPL (Apple Inc.)

* Count: 62.0 (The number of trading days in the dataset)
* Mean: 158.24 (The average closing price)
* Standard Deviation: 7.36 (The variation in closing prices)
* Minimum: 145.31 (The lowest closing price)
* 25th Percentile: 152.08 (25% of closing prices are below this value)
* Median (50%): 158.06 (The middle value of the closing prices)
* 75th Percentile: 165.16 (75% of closing prices are below this value)
* Maximum: 173.57 (The highest closing price)

GOOG (Alphabet Inc.)

Similar statistics to AAPL, with a mean closing price of 100.63 and a standard deviation of 6.28, indicating less variability in closing prices compared to AAPL.

MSFT (Microsoft Corporation)

The dataset includes the same number of observations for MSFT. It has a higher mean closing price of 275.04 and a higher standard deviation of 17.68, indicating greater price variability than AAPL and GOOG.

NFLX (Netflix Inc.)

NFLX shows the highest mean closing price (327.61) and the highest standard deviation (18.55) among these stocks, indicating the most significant price fluctuation.

II. Time Series Analysis

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**Output**

A graph of different colored lines

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Inference:

The plot above illustrates the time series of closing prices for each stock (AAPL, GOOG, MSFT, NFLX) over the observed period. Key observations include:

* Trend: Each stock displays its unique trend over time, with AAPL and MSFT showing a general upward trend during this period.
* Volatility: There is noticeable volatility in the stock prices, with NFLX exhibiting more pronounced fluctuations compared to the others.
* Comparative Performance: When comparing the stocks, MSFT and NFLX generally trade at higher price levels than AAPL and GOOG in this dataset.

III. Volatility Analysis

Volatility Analysis by calculating and comparing the volatility (standard deviation) of the closing prices for each stock. This will provide insight into how much the stock prices fluctuated over the period.

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Description automatically generated

The bar chart and the accompanying data illustrate the volatility (measured as standard deviation) of the closing prices for each stock. Here's the ranking in terms of volatility:

1. NFLX: Highest volatility with a standard deviation of approximately 18.55.
2. MSFT: Next highest, with a standard deviation of around 17.68.
3. AAPL: Lower volatility compared to NFLX and MSFT, with a standard deviation of about 7.36.
4. GOOG: The least volatile in this set, with a standard deviation of approximately 6.28.

This indicates that NFLX and MSFT stocks experienced more price fluctuations during this period compared to AAPL and GOOG.

IV. Correlation Analysis

A computer screen with text and images

Description automatically generated

**Output**

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The heatmap above shows the correlation matrix for the closing prices of four stocks: AAPL, GOOG, MSFT, and NFLX. Here’s what the correlation coefficients indicate:

1. Values close to +1 signify a strong positive correlation, meaning that as the price of one stock increases, the other stock’s price tends to increase as well.
2. Values close to -1 signify a strong negative correlation, indicating that as the price of one stock increases, the other stock’s price tends to decrease.
3. Values around 0 indicate little to no correlation.

From the heatmap, we can see varying degrees of positive correlations between the stock prices, with some pairs exhibiting stronger correlations than others. For example, AAPL and MSFT appear to have a relatively higher positive correlation.

V. Comparative Analysis

In this step, we will evaluate the performance of various stocks by examining their returns over the specified period. We will calculate the percentage change in closing prices from the beginning to the end of the period for each stock.

A computer screen with text and images

Description automatically generated

**Output**

A graph with blue squares

Description automatically generated

The bar chart and the accompanying data illustrate the percentage change in the closing prices of the stocks from the beginning to the end of the observed period:

1. MSFT: The highest positive change, approximately 16.10%.
2. AAPL: Positive change of around 12.23%, indicating solid performance, though slightly lower than MSFT’s.
3. GOOG: Slight negative change of about -1.69%, indicating a minor decline in its stock price over the observed period.
4. NFLX: The most significant negative change, approximately -11.07%, suggesting a notable decrease in its stock price during the period.

VI. Daily Risk Vs. Return Analysis

To conduct a Risk vs. Return Analysis, we will calculate the average daily return and the standard deviation of daily returns for each stock. The standard deviation will act as a proxy for risk, while the average daily return represents the expected return.

Next, we will plot these values to visually examine the risk-return profile of each stock. Generally, stocks with higher average returns and lower risk (standard deviation) are more desirable, though investment decisions often depend on the investor’s risk tolerance.

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**Output**

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So, AAPL demonstrates the lowest risk along with a positive average daily return, indicating a more stable investment with consistent returns. GOOG, on the other hand, exhibits higher volatility than AAPL and, on average, a slightly negative daily return, making it a riskier and less rewarding investment during this period.

MSFT shows moderate risk with the highest average daily return, suggesting it could be a more rewarding investment, albeit with higher volatility compared to AAPL. NFLX presents the highest risk and a negative average daily return, marking it as the most volatile and least rewarding investment among these stocks over the analyzed period.

**Conclusion**

Quantitative analysis in the stock market is a financial approach that employs mathematical and statistical methods to evaluate stocks and financial markets.