**REPORT**

# Technical Analysis of Stock Data

**Course: FE 520 B**

**Group 23**


**Team Members**

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Under the Prof:

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# I] Introduction:

## Package Info:

- The StockDataAnalyzer package is designed to retrieve and analyze stock market data.
- It provides a range of functions to calculate key financial indicators, plot stock prices, volumes, and technical analysis charts such as Simple Moving Averages (SMA), Exponential Moving Averages (EMA), Moving Average Convergence Divergence (MACD), and the Relative Strength Index (RSI).
- These tools are crucial for investors and analysts to make informed decisions based on historical stock performance.
- The script includes a main block where an instance of StockDataAnalyzer is created.
- The user can input a stock ticker, start and end dates for data retrieval, and the script will fetch the stock data and plot various technical indicators such as SMA, EMA, volume, candlestick chart, MACD, and RSI.

# II] Methodology:

## 1) Role of Functions:

- **fetch_stock_data**: Retrieves historical stock data from Yahoo Finance for a specified ticker between given start and end dates.
- **calculate_sma**: Computes the Simple Moving Average, which is a financial indicator that shows the average stock price over a specific period. The Simple Moving Average (SMA) is a key technical indicator used to smooth out price fluctuations and understand the underlying price trend. It's crucial for identifying potential support and resistance levels
- **calculate_ema**: Calculates the Exponential Moving Average, giving more weight to recent prices and is thus more responsive to new information. Like SMA, it helps in identifying trends and potential turning points in stock prices.
- **calculate_roi**: Return on Investment (ROI) is not a technical indicator but a financial metric. Determines the Return on Investment over a specified period, indicating the percentage change in stock price.

- **plot_stock_data_with_sma_ema**: Visualizes the stock's closing prices along with its SMA and EMA. Visualization is a critical aspect of technical analysis as it helps traders to quickly identify trends and patterns.
- **plot_volume**: Volume is an important aspect of market data. Plots the stock's trading volume alongside its closing price.
- **plot_candlestick**: Creates a candlestick chart that illustrates the stock's open, high, low, and close prices for each day. Candlestick patterns are used to predict future market movements.
- **calculate_macd**: Calculates the MACD, which is used to find trends in the stock's price.
- **plot_macd**: Plots the MACD line along with its signal line.
- **calculate_rsi**: Computes the RSI, an indicator of stock's overbought or oversold condition.
- **plot_rsi:** Displays the RSI values over time on a graph. By plotting the RSI, this function provides a visual means to interpret the RSI values. It helps in understanding when a stock might be overbought (potentially overvalued) or oversold (potentially undervalued).

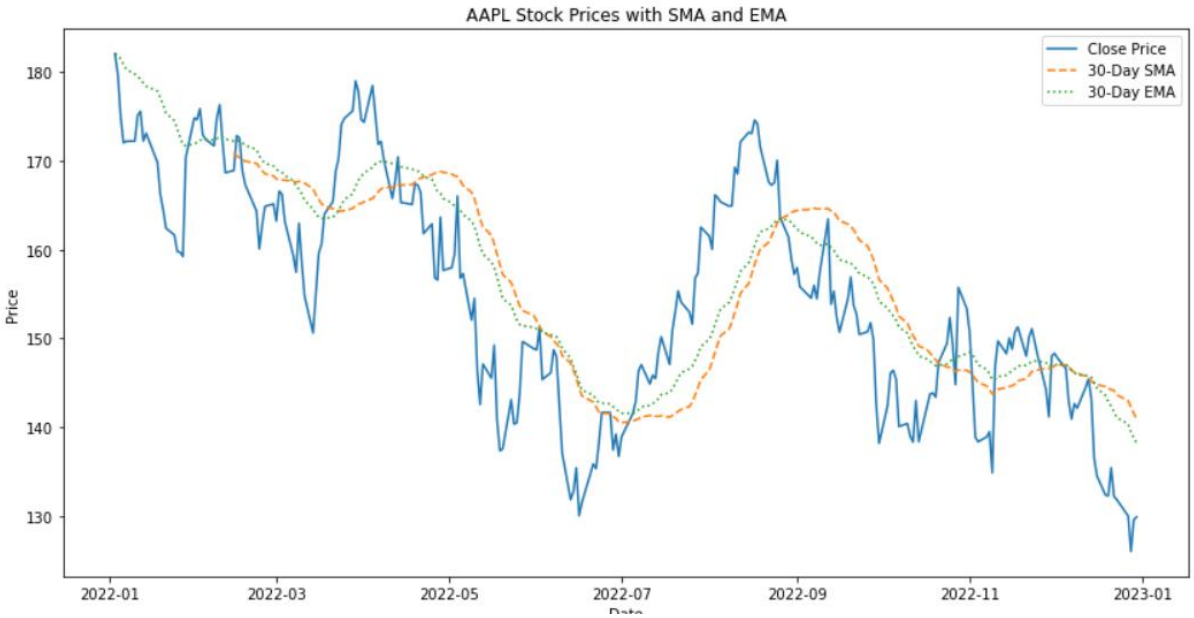


**Fig. SMA and EMA**

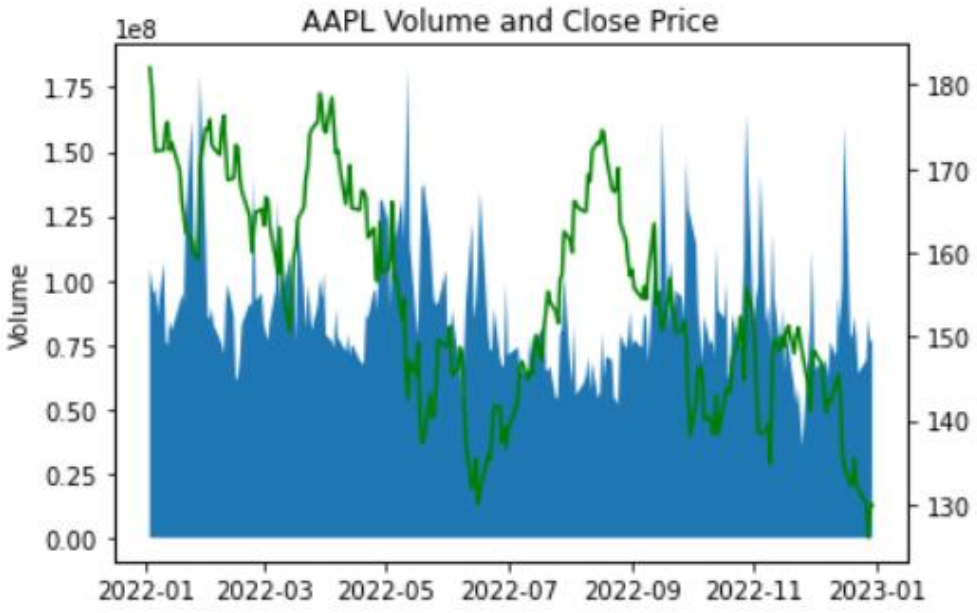


**Fig. AAPL volume and close Price**


**Fig. Candlestick Chart**

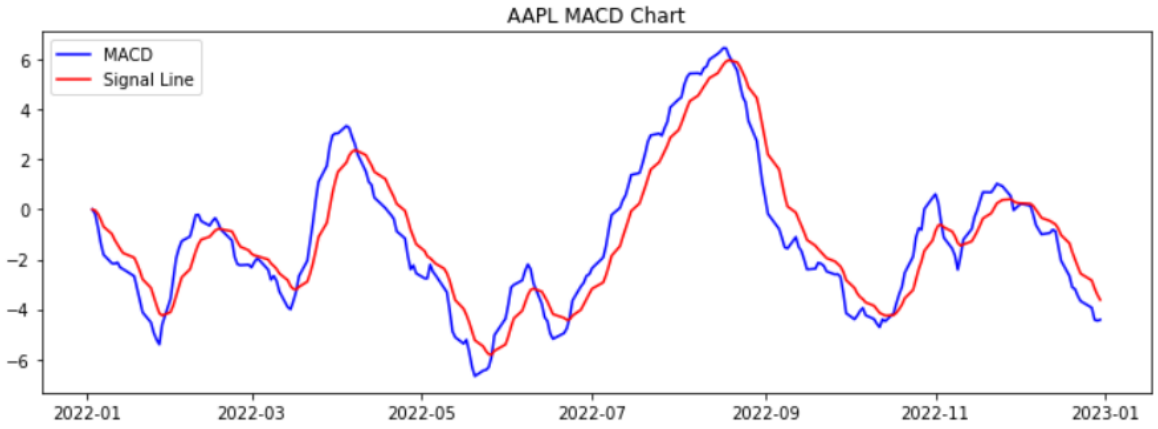


**Fig. MACD Chart**

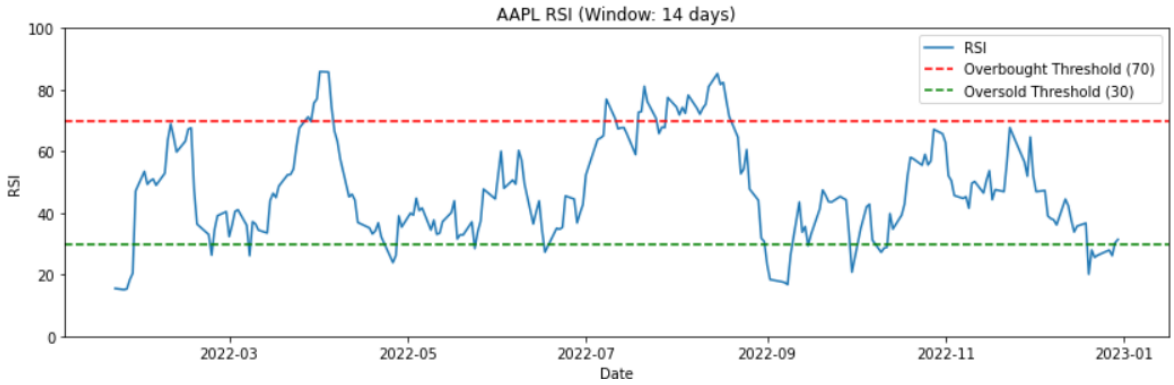


**Fig. AAPL RSI**

**2)** Connection between each Functions:

- All functions are connected through the data they process and contribute to the overall goal of the package, which is stock market analysis.
- The retrieval function (fetch_stock_data) serves as the starting point by obtaining the data.
- This is the starting point. It fetches the necessary stock data, which is the foundation for all subsequent analysis. All other functions rely on the data retrieved by this function.
- The calculation functions (calculate_sma, calculate_ema, calculate_macd, calculate_rsi) process this data to derive indicators, and the plotting functions (plot_stock_data_with_sma_ema, plot_volume, plot_candlestick, plot_macd, plot_rsi) visualize the results for user interpretation.
- Once the data is retrieved, the calculate_sma and calculate_ema functions process it to compute key technical indicators - SMA and EMA. These indicators are essential for trend analysis.
- ROI Calculation: Parallelly, the calculate_roi function provides a basic financial assessment by calculating the Return on Investment, giving an overview of the stock's performance over the selected period.
- Combining Price and Indicators: The plot_stock_data_with_sma_ema function visually combines the stock's closing prices with SMA and EMA, providing insights into trends and potential reversal points.
- Volume Analysis: The plot_volume function adds another layer by plotting trading volumes, crucial for confirming the strength of trends indicated by price movements.
- Detailed Price Analysis: The plot_candlestick function offers a more detailed view of price movements, allowing for the identification of specific patterns that can signal future price behavior.
- Momentum Indicators: The MACD and RSI are momentum indicators, calculated and visualized by plot_macd, calculate_rsi, and plot_rsi. They help in identifying potential buy/sell signals and overbought/oversold conditions.

3) Potential errors the user could create, and handling these errors:

- Potential user errors could includes entering an invalid stock ticker symbol: This should be caught by checking if the returned data is empty or not.
- Providing incorrect date formats: Validating the date format before attempting to retrieve data can prevent this error.
- Trying to plot data when none is available: Guard clauses can be used in plotting functions to check if the data exists.
- Out of range errors when calculating ROI: Ensuring the user does not request more days back than available in the dataset is important.
- The package could include exception handling to manage these errors gracefully, providing clear messages to the user about what went wrong.

4) Implementation on a dataset (real or simulated data):

- The script provided seems to implement the StockDataAnalyzer package on real stock data, specifically for Apple Inc.
- (AAPL) from January 1, 2022, to January 1, 2023.
- The ROI for the past 75 days is calculated, and various charts are plotted to visualize the stock's performance.

III] Conclusion:

- The project represents a versatile and comprehensive tool for the technical analysis of stock data.
- By encompassing a range of functionalities from data retrieval to advanced technical indicators and visualizations, it caters to various needs within the realm of stock market analysis.
- It particularly valuable for investors, traders, and financial analysts seeking to derive actionable insights from stock market data.

IV] Contribution:

| Siddharth | Mehul |
|---|---|
| Fetching Stock Data | Volume |
| SMA | Candlestick |
| EMA | MACD |
| ROI | RSI |
| PPT | PPT |
| Report | Report |