Individual Assignment 1  
Apple Inc. Stock Price Visualization



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# 1.Executive Summary

This project report describes a thorough study and visualization of Apple Inc. (AAPL) stock prices utilizing two powerful tools: Python for data analysis and visualization, and Tableau for creating interactive dashboards. The project, which extends from 2014 to 2023, intends to identify trends, patterns, and anomalies in Apple's stock performance using a mix of time series analysis, technical indicators, and interactive visual exploration. The findings of this research are meant to help investors, financial analysts, and supporters better understand AAPL's stock behavior and make informed decisions.

# 2. Introduction

## 2.1. Background

In the world of technology huge corporations, Apple stands out as a genuine colossus, its impact extending well beyond its Cupertino origins. To understand Apple's market domination, one must first examine the complicated network of its influence on GAFAM stocks (Google, Apple, Facebook, Amazon, Microsoft). From the viewpoint of investors and market experts, Apple's position is crucial, altering the environment in ways that reverberate across sectors. The volatility and patterns in its stock prices provide a fascinating glimpse at the impact of market forces, new releases, and global economic events on a premier technology business.

## 2.2. Problem Statement

Getting around the intricacies of the stock market may be quite difficult, especially when it comes to large-cap equities like Apple Inc. (AAPL), whose price is influenced by a variety of variables. This initiative focuses on two primary problems:

* **Understanding Apple's Stock Price Dynamics**: The price of AAPL fluctuates in response to a number of variables, such as news about the firm, market trends, and economic developments. A sophisticated method of data analysis is needed to identify the factors influencing price fluctuations.
* **Developing Financial Insights**: Many investors, particularly those who lack sophisticated analytical abilities, may find it overwhelming to deal with the volume of financial data. Tools that transform data into useful insights and make stock market research more accessible to a larger audience are desperately needed.

This study uses Tableau for interactive visuals and Python for deep analysis in an effort to address these problems. The goal is to make sense of AAPL's stock patterns from 2014 to 2023 and provide information to stakeholders so they may make informed decisions.

## 2.3. Objectives

This project uses Tableau for interactive visualization and Python for data analysis to provide an accessible but thorough examination of Apple Inc.'s stock performance from 2014 until 2023. Key objectives consist of:

* **Trend Analysis**: Over the given time frame, determine the major trends, patterns, and anomalies in Apple's stock values.
* **Impact Assessment**: Determine how Apple's stock has been affected by world events, new product releases, and changes in GAFAM stocks.
* **Technical Analysis**: To get a better understanding of stock behavior and possible investing opportunities, use technical indicators.
* **Interactive Visualization**: Build Tableau dashboards that let users customize their analysis and explore data in real-time.
* **Strategic Insights**: Using the data analysis, provide suggestions and actionable insights for analysts and investors.
* **Tool Demonstration**: Display how well Tableau and Python perform in the analysis and display of financial data.

These goals are set up to direct a targeted investigation that provides stakeholders with information on the dynamics of Apple's stock and aids in well-informed decision-making.

# 3. Data Preprocessing

## 3.1. Data Sources

The dataset for this project was sourced from Yahoo Finance, offering comprehensive historical stock price data for Apple Inc. (AAPL) spanning from 2014 to 2023 [1]. This period was chosen to capture a wide range of market activities, including product launches, financial announcements, and global economic events, providing a rich dataset for analysis.

The dataset consists of Apple Stock Price from January 2014 to December 2023. And the feature in the dataset is described by:

**Target**: Price trend for next day - Multi Class Classification

* bullish - If price increases more than 0.5%
* bearish - If price fall more than 0.5%
* neutral - If price movement stay with -0.5% to +0.5% range

Following technical indicators included:

* SMA: Simple Moving Average. Aid in determining if an asset price will continue or if it will reverse a bull or bear trend.
* EMA: Exponential Moving Average. Shows how the price of an asset or security changes over a certain period of time. The EMA is different from a simple moving average in that it places more weight on recent data points
* RSI: Relative Strength Index. RSI measures the speed and magnitude of a security's recent price changes to evaluate overvalued or undervalued conditions in the price of that security.
* Bollinger Band: Generate oversold or overbought signals
* MACD: Moving Average Convergence Divergence. A trend-following momentum indicator that shows the relationship between two exponential moving averages.
* CCI: Commodity Channel Index. A technical indicator that measures the difference between the current price and the historical average price.
* TR: True Range. Measures the daily range plus any gap from the closing price of the preceding day.
* ATR: Average True Range. Average of true ranges over the specified period. ATR measures volatility, considering any gaps in the price movement.

## 3.2. Data Preparation

**1. Data Cleaning**

* Handling Missing Values: There is no null value in the chosen dataset but since the market is not open on weekends and public holidays, leading to the gaps in the date sequence. By avoiding the necessity for imputation or addressing missing data, this guarantees a smoother time series analysis that makes it easier to discern trends and patterns.
* Duplicated Values: There are no duplicated records in the dataset.

**2. Feature Engineering**

* Feature Creation: Take advantages of the ‘date’ variable to create column ‘year’ which will help us visualize the stock price trending each year. Create the ‘Signal Line’ variable: The 9-day EMA of the MACD values, for the prediction analysis.
* Ensuring all data types were correctly formatted for analysis.
* The pandas’ module for Python served a key role in preprocessing, enabling effective manipulation and getting the dataset ready for further analysis.

# 4. Methodology

This research uses a combination of methods to examine the dynamics of Apple Inc.'s stock price over a ten-year period (2014–2023) by combining quantitative analysis with sophisticated data visualization. There are 2 main steps to the methodology:

1. **Python (Quantitative Analysis):**

* Data preprocessing: Cleaning and preparing the dataset using the pandas’ library, assuring the accuracy of the data by identifying any abnormalities, missing values. Creating more insightful attributes to make visualization process more straight-forward and easy to understand.
* Trend analysis: Examining underlying trends, seasonal patterns, and possible cyclical tendencies in the price of AAPL's stock by using time series analytic tools. Visualizing the correlation among continuous attributes and applying some of the python library like ‘plotly’ and ‘dataprep’ to visualize the volume and the price trending of the Apple Stock Price.

1. **Tableau (Interactive Visualization):**

* **Dashboard Creation**: Makes dynamic dashboards in Tableau that let you explore stock price data in a more engaging way. With these tools, you can look at different dates, fluctuations in prices, and technical indications simultaneously to get the complete picture.
* **Calculation of Technical Indicators:** Using Tableau, the analysis includes making pictures of important technical indicators like Moving Averages (MAs), Relative Strength Index (RSI), and Moving Average Convergence Divergence (MACD), etc. This change takes advantage of Tableau's ability to determine and display these factors in real time, which is very important for finding possible buy or sell signs and figuring out how the market responds.
* **Dashboard Creation:** Makes dynamic dashboards in Tableau that let you explore stock price data in a more engaging way. With these tools, you can look at different dates, fluctuations in prices, and technical indications simultaneously to get the complete picture.

# 5. Analysis and Findings

## 5.1. Python

## 5.2. Tableau

# 6. Discussion

# 7. Conclusion

# 8. References

<https://fastercapital.com/content/Apple-s-Market-Dominance--How-it-Impacts-GAFAM-Stocks.html>

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# 9. Appendix

## 9.1. Python

## 9.2. Tableau