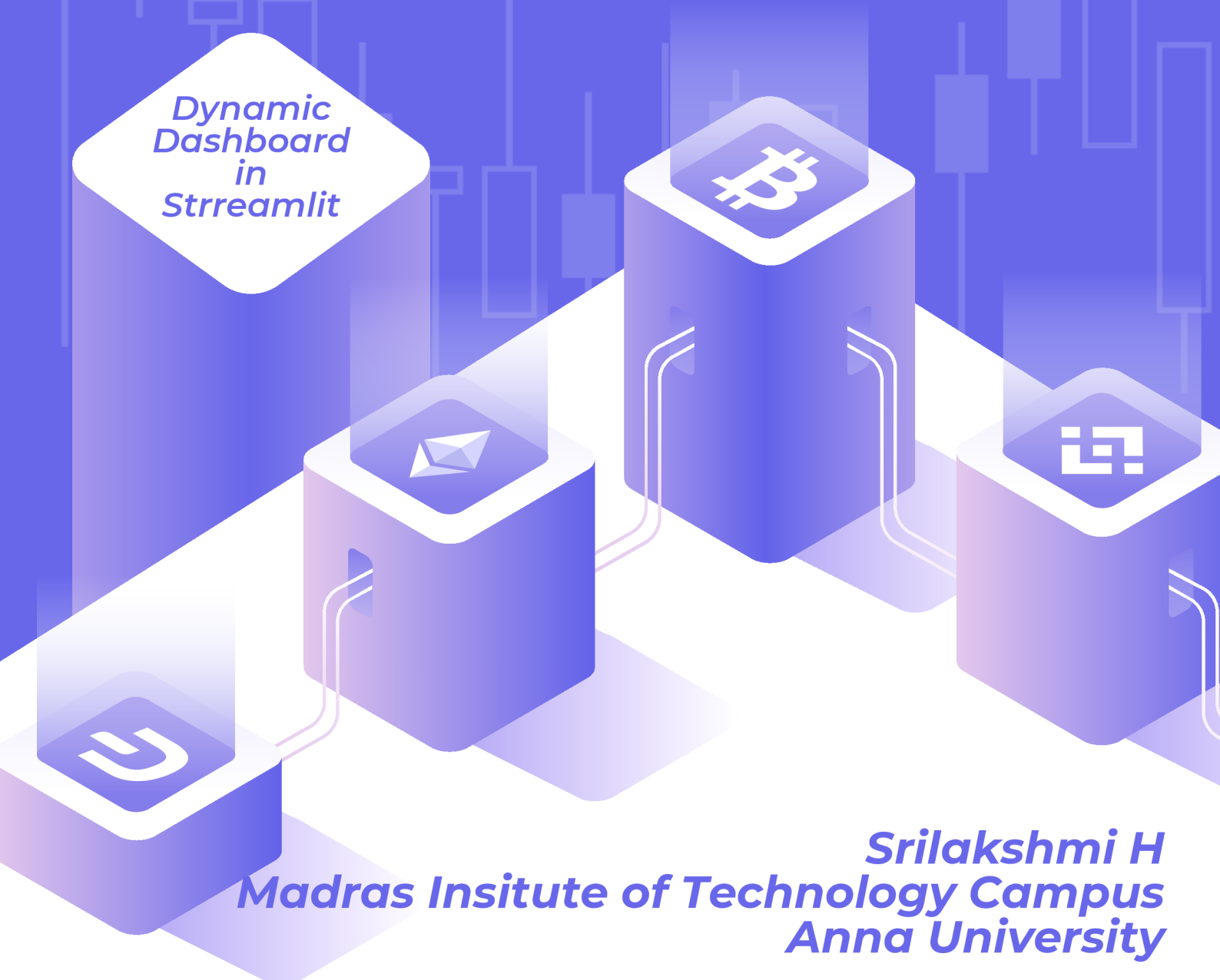
QUANTUM QUOTIENT ANALYSIS

Stock Analysis Dashboard

Dynamic Dashboard in Strreamlit



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DataViz 2025
Transforming Data into Powerful Dashboards

1. Introduction

Quantum Quotient Analytics is an **interactive financial analytics dashboard** designed to provide **detailed stock market analysis** using real-time and historical data. This Streamlit-based platform empowers users with insights into price trends, volatility, market behavior, comparative analysis, and predictive modeling using machine learning.

2. Objectives

- Provide real-time and historical stock data in an interactive manner.
- Implement technical indicators for trend, volatility, and volume-based analysis.
- Enable comparative statistical analysis between multiple stocks.
- Develop a machine learning model (Random Forest Regressor) to predict closing prices.
- Offer data visualization using Plotly for a more intuitive experience.

3. Methodology

The dashboard consists of five key modules, each offering unique insights into stock performance.

1. Basic Information

- **Stock Market Analytics Table:** Displays fundamental stock data.
- **Loading the Data:** Fetches stock data dynamically from Yahoo Finance using yfinance.
- **Additional Information:** Provides company details, sector, and financial metrics.

2. Time Series Analysis

- **Closing Price Over Time:** Tracks stock price trends.
- **Volume Traded Over Time:** Analyzes trading volume fluctuations.
- **Opening vs Closing Prices:** Highlights price movement patterns.
- **Time Series Decomposition:** Breaks time series into trend, seasonality, and residuals.
- **OHLC Chart (Candlestick Chart):** Displays open-high-low-close movements.

3. Technical Indicators & Trend Analysis

Price Trend & Moving Averages

- **Simple Moving Average (SMA) & Exponential Moving Average (EMA):** Identifies trend direction.
- **VWAP (Volume-Weighted Average Price):** Tracks average price based on volume.
- **MACD Indicator:** Measures trend strength and momentum.

Volatility & Risk Metrics

- **Annualized Volatility:** Estimates price fluctuations over time.
- **Average True Range (ATR):** Determines market volatility.
- **Ulcer Index:** A risk indicator for drawdowns.

Momentum & Overbought/Oversold Indicators

- **Relative Strength Index (RSI):** Detects overbought/oversold levels.
- **Stochastic Oscillator & Fisher Transform:** Identifies potential reversals.

Volume-Based Indicators

- **On-Balance Volume (OBV):** Tracks volume momentum.
- **Intraday Intensity Index (IIX) & Chaikin Money Flow (CMF):** Measures buying/selling pressure.

Support, Resistance & Channel-Based Indicators

- **Bollinger Bands, Keltner Channel, Donchian Channels:** Identifies price ranges and breakouts.

Trade & Market Behavior Analysis

- **Number of Trades Over Time:** Evaluates trading activity.
- **Cumulative Return Plot:** Tracks portfolio returns.
- **Relative Performance Comparison:** Compares stock performance.
- **Elder's Force Index (EFI):** Measures trend strength based on price and volume.

4. Comparative & Statistical Analysis

- **Comparative Closing Prices:** Allows stock-to-stock comparisons.
- **Histogram of Returns:** Analyzes stock return distributions.

5. Predictive Modeling

- **Random Forest Regressor Model:**
  - Users input feature values.
  - The model predicts closing prices.
  - Displays Mean Squared Error (MSE) & R-Squared Score.
  - Interactive evaluation metrics plots visualize model performance.

4. Technology Stack

- **Python** for data processing and ML.
- **Streamlit** for the web-based interactive dashboard.
- **yfinance** for stock data retrieval.
- **Plotly** for interactive visualization.
- **Scikit-learn** for machine learning models.
- **Pandas & NumPy** for data manipulation.

5. Impact & Use Cases

- **Investors & Traders:** Helps make informed trading decisions.
- **Financial Analysts:** Assists in comparative market studies.
- **Academics & Researchers:** Provides a platform for financial data analysis.
- **Students & AI Enthusiasts:** Serves as a practical implementation of AI in finance.

6. Challenges & Solutions

- **Handling large financial datasets** - Optimized data processing techniques.
- **Ensuring real-time data updates** - Integrated yfinance API effectively.
- **Model accuracy for price prediction** - Tuned hyperparameters of Random Forest.
- **Performance issues with multiple indicators** - Used caching and efficient plotting techniques.

7. Future Scope

- Integration of LSTM models for better stock price forecasting.
- Incorporating more financial indicators for deeper insights.
- Enhancing UI/UX for improved user experience.
- Allowing real-time alerts for trading signals.

8. Conclusion

Quantum Quotient Analytics is a **powerful, data-driven financial analytics dashboard** designed to provide deep insights into **market trends, stock behavior, and predictive modeling.** With its interactive capabilities and AI-powered predictions, it serves as a valuable tool for both traders and analysts in **decision-making and investment strategy formulation.**

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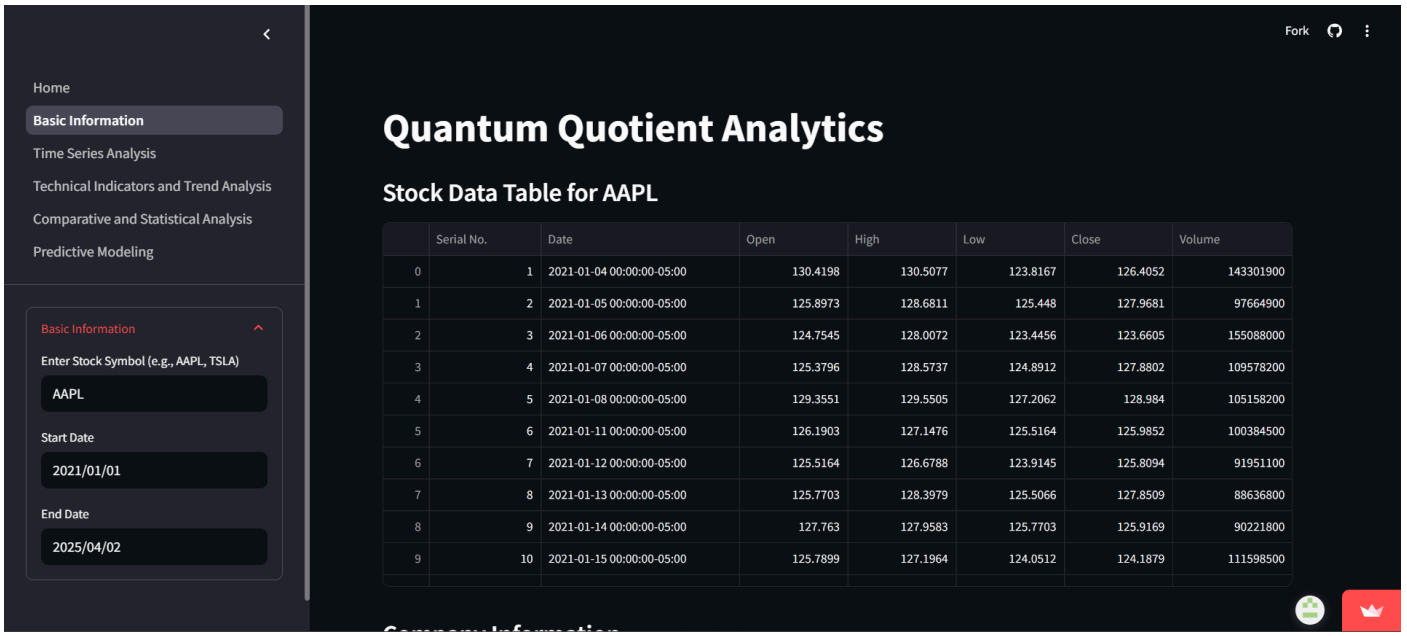
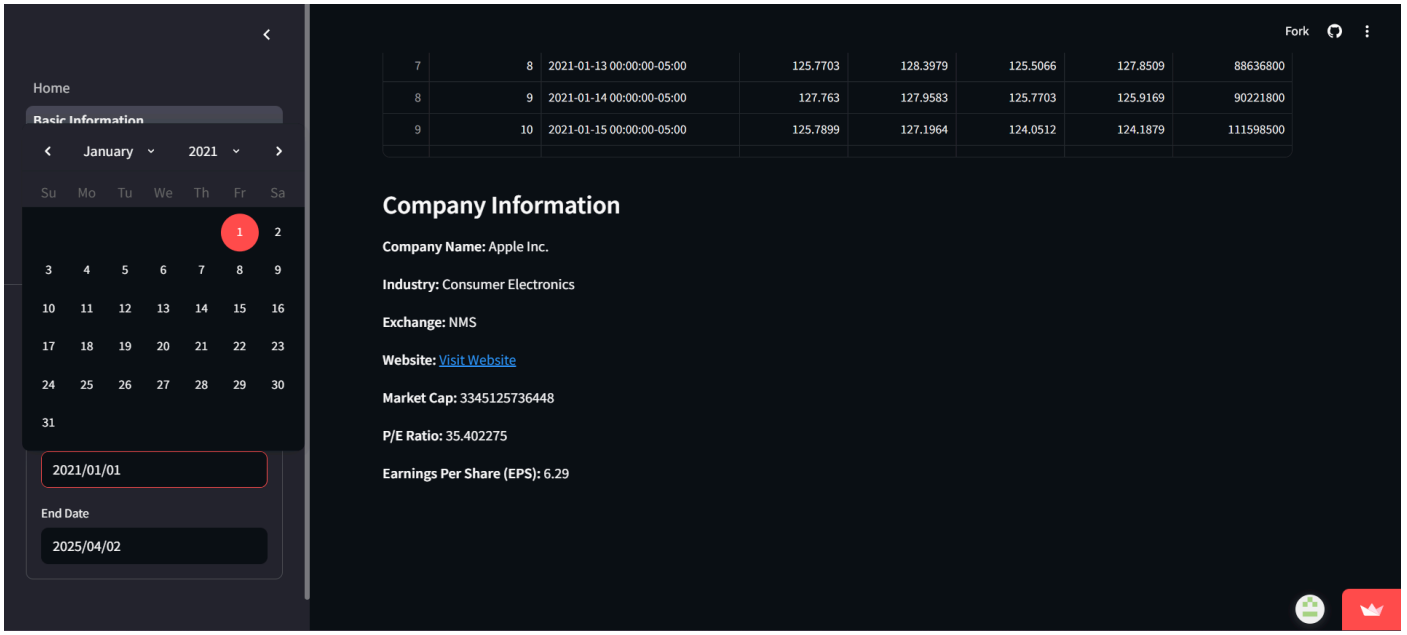
9. Snapshots of the Dashboard and the visualizations

Home page:

Basic Information Page:

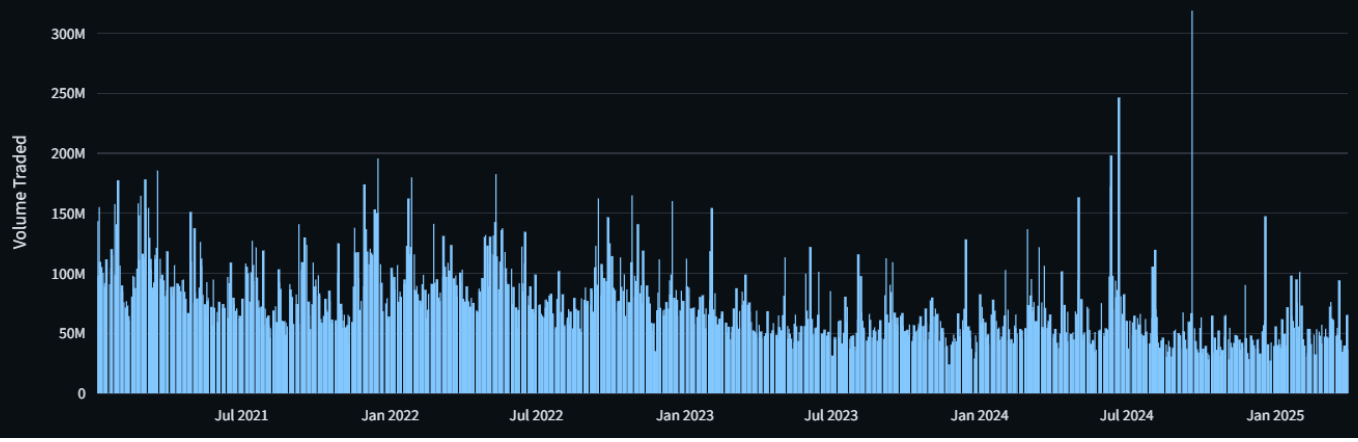




Time Series Analysis page:

Volume Traded Over Time

This bar chart represents the number of shares traded daily. A sudden increase in volume may indicate strong investor interest and potential price movement.



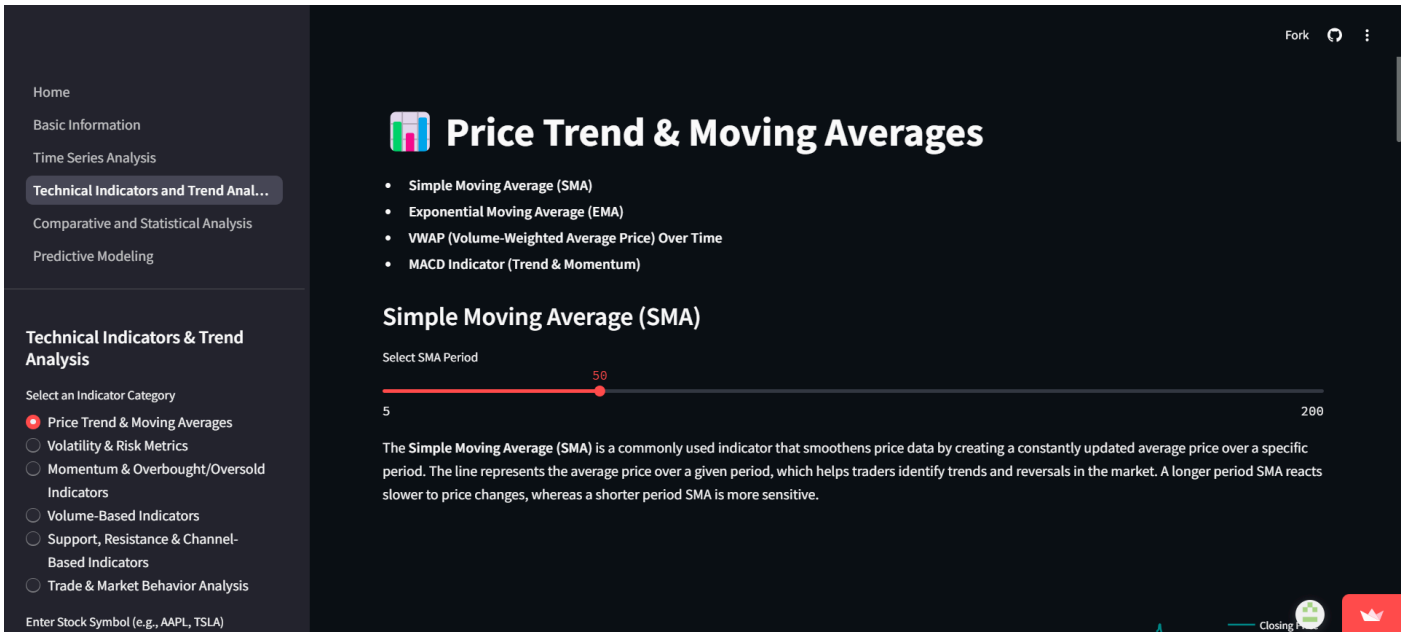
Opening vs Closing Prices Over Time

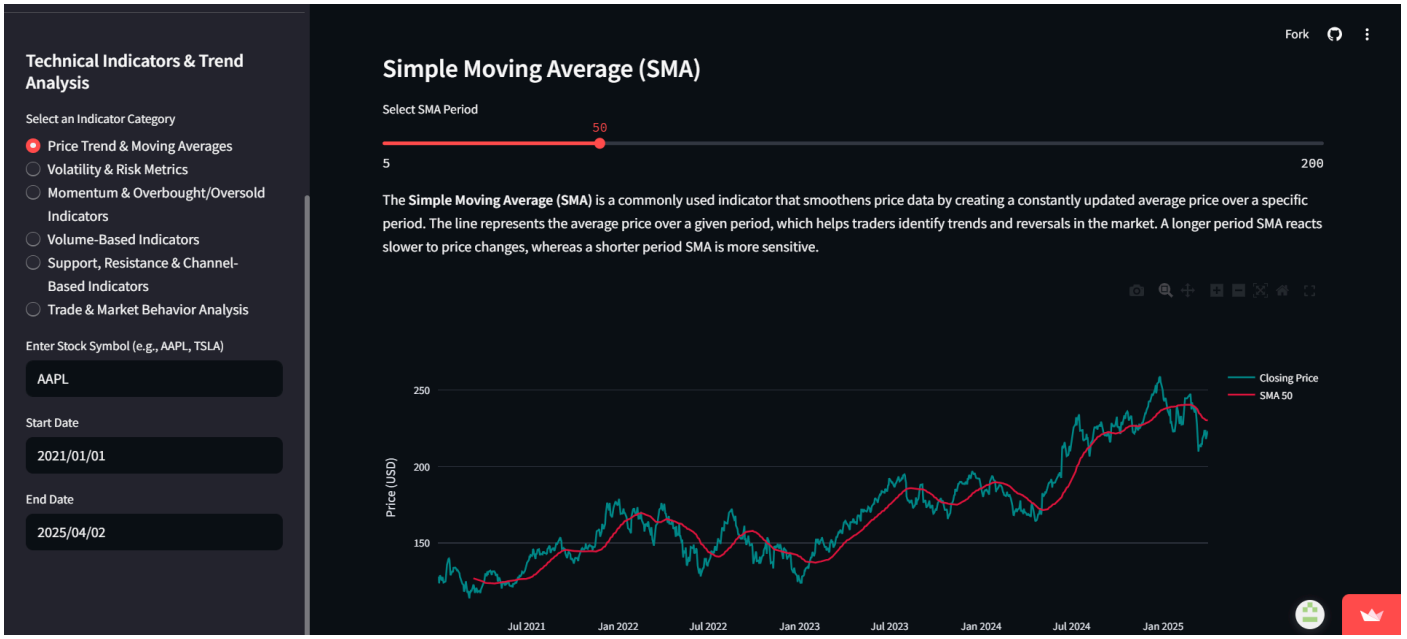
This graph compares the stock's opening and closing prices each day. A significant difference between them may indicate high volatility and investor reactions to market news.

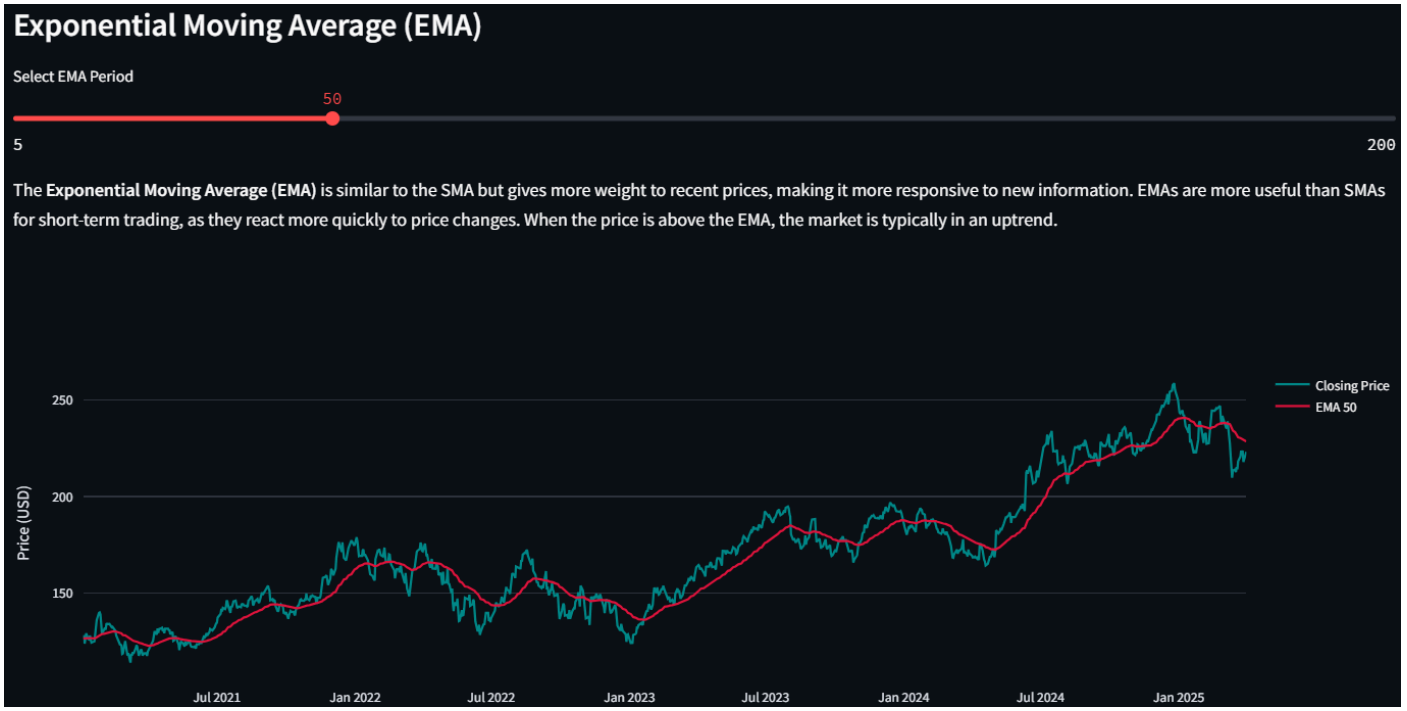
Time Series Decomposition

Time series decomposition breaks down the stock price into trend, seasonal, and residual components. The trend shows the long-term movement, the seasonal component captures periodic patterns, and the residual reveals unexplained fluctuations.

Technical Indicators and Trend Analysis page:





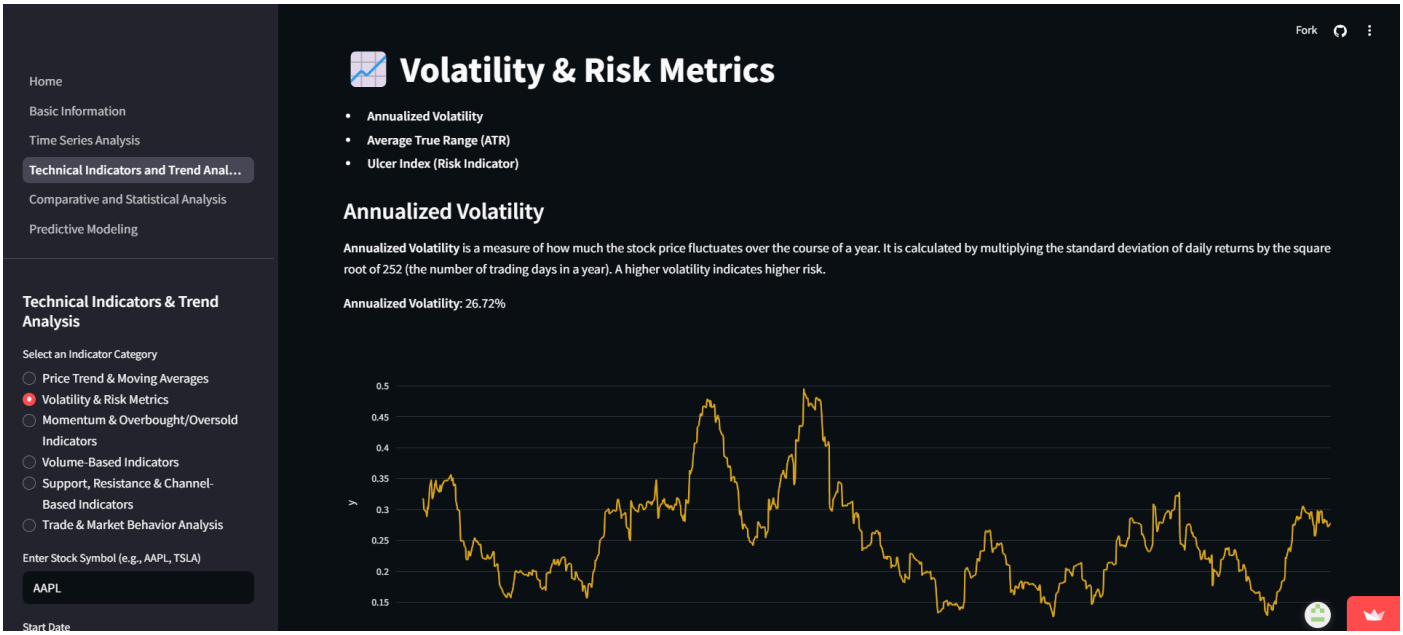


VWAP (Volume-Weighted Average Price)

VWAP (Volume-Weighted Average Price) is an important indicator used by traders to measure the average price a security has traded at throughout the day, based on both volume and price. It's a great indicator for assessing the overall trend of a stock throughout the trading day. VWAP is commonly used to gauge the efficiency of a trade.

MACD Indicator (Trend & Momentum)

The **MACD (Moving Average Convergence Divergence)** is a trend-following momentum indicator that shows the relationship between two moving averages of a security's price. The MACD is calculated by subtracting the 26-period EMA from the 12-period EMA. The signal line is the 9-period EMA of the MACD. The MACD can help identify potential buy and sell signals.

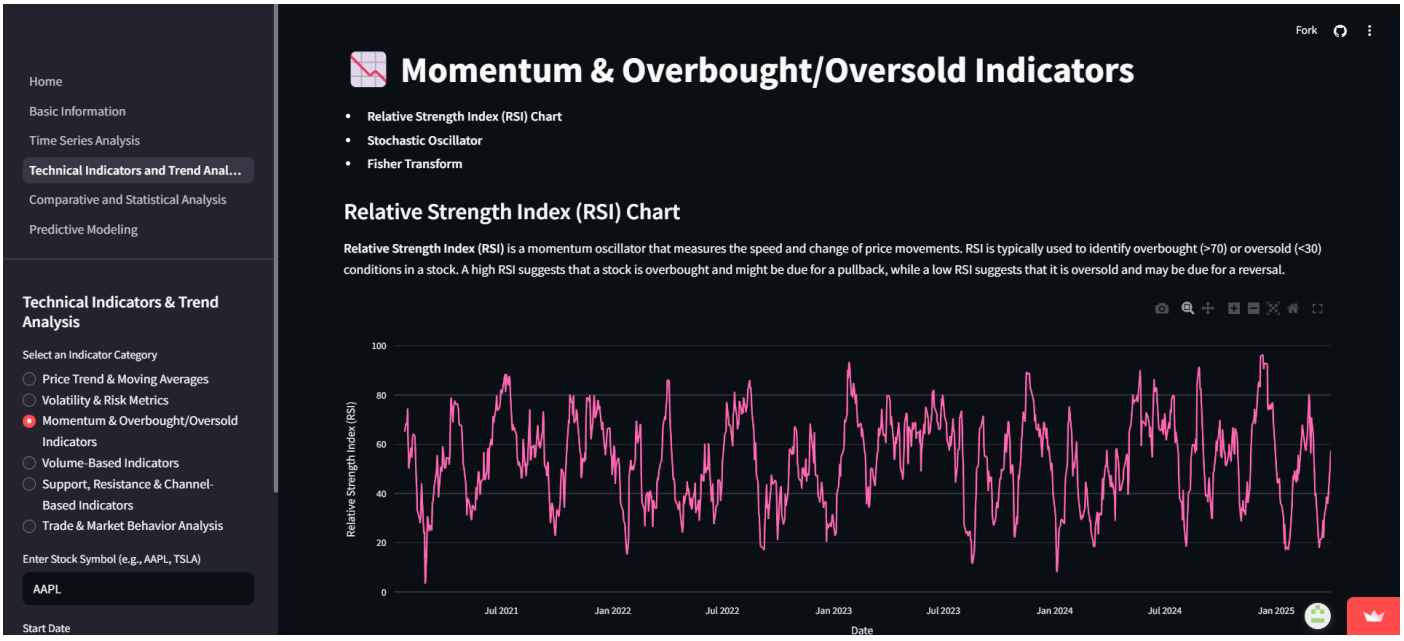


Average True Range (ATR)

Average True Range (ATR) is a volatility indicator that measures market volatility by decomposing the entire range of an asset for that period. It is the average of the true ranges over a specified period (typically 14 days). ATR helps to understand price movement and potential risk.

Ulcer Index (Risk Indicator)

Ulcer Index (Risk Indicator) is a risk metric that focuses on the severity and duration of drawdowns. It calculates the square root of the average squared drawdown over a given period. The higher the Ulcer Index, the higher the risk (as it indicates a greater decline in asset value from its peak).

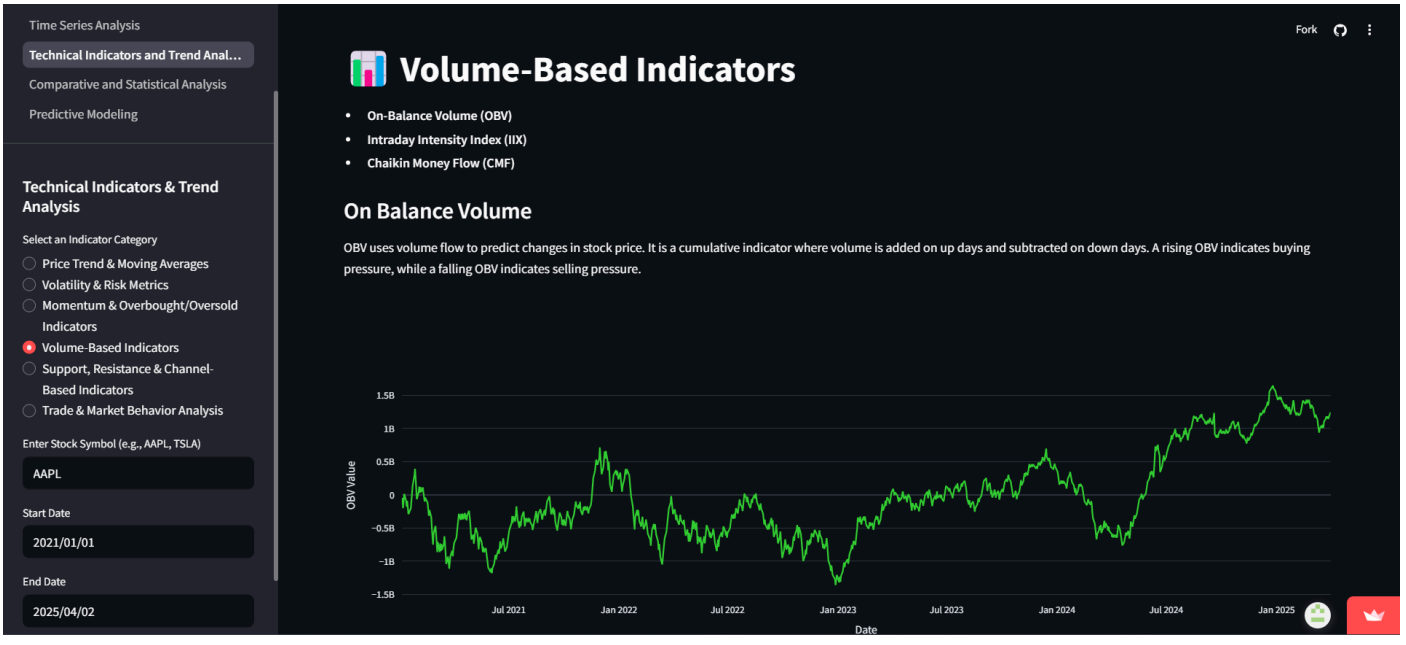


Stochastic Oscillator

The **Stochastic Oscillator** is a momentum indicator that compares a security's closing price to its price range over a given time period. The %K line measures the current closing price in relation to the range, and the %D line is a 3-period moving average of %K. When %K crosses above %D, it indicates upward momentum, and when %K crosses below %D, it indicates downward momentum.

Fisher Transform

The **Fisher Transform** is a technical analysis indicator that converts prices into a Gaussian normal distribution. It is designed to identify turning points in the market by measuring the deviation of the price from a defined price range. Positive values indicate upward momentum, while negative values suggest downward momentum.

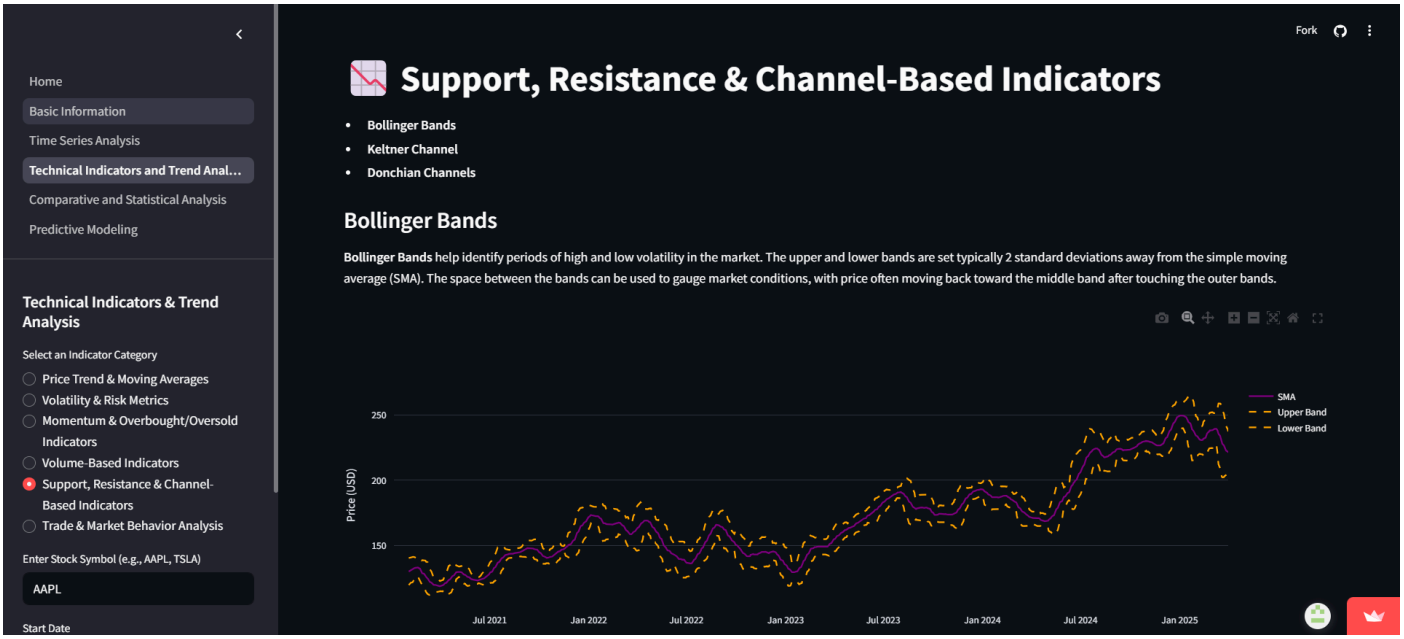


Intraday Intensity Index (IIX)

The Intraday Intensity Index measures the strength of price movement based on volume. A higher IIX value indicates stronger buying interest, while a lower value indicates weaker buying or selling activity.

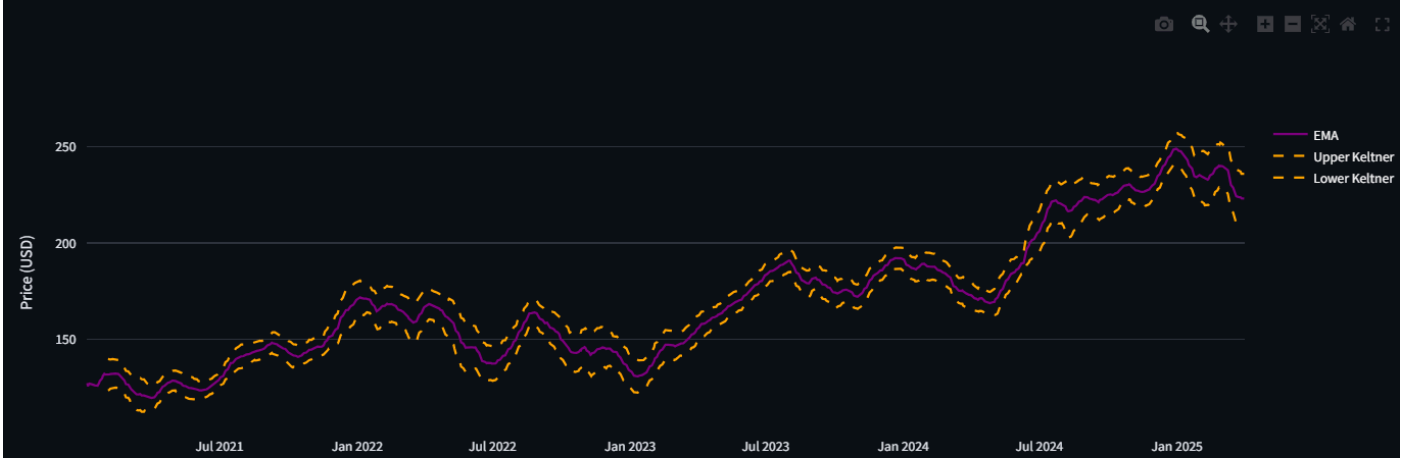
Chaikin Money Flow (CMF)

The Chaikin Money Flow indicator measures the amount of Money Flow Volume over a specific period. It combines both price and volume to evaluate buying and selling pressure. A positive CMF indicates buying pressure, while a negative CMF suggests selling pressure.



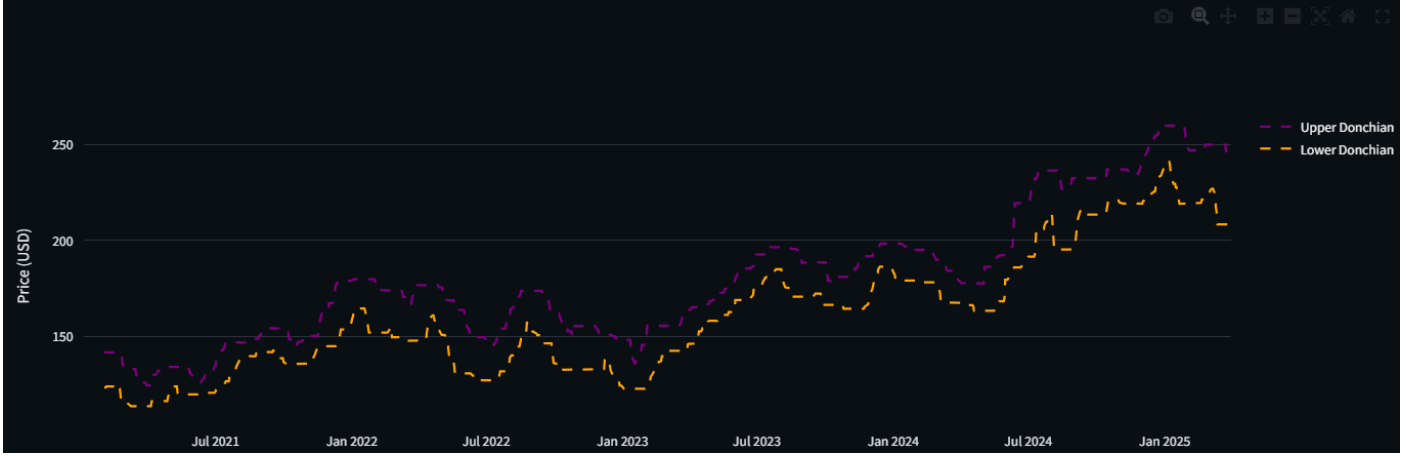
Keltner Channel

Keltner Channels are volatility-based envelopes around a central moving average. The upper and lower bands are created using the Exponential Moving Average (EMA) and the Average True Range (ATR). These channels are used to identify potential buy or sell signals based on price behavior within the channels.



Donchian Channels

Donchian Channels show the highest high and the lowest low over a set period, typically 20 periods. They are useful for identifying breakouts and volatility in the market. The upper and lower channels represent key levels of support and resistance.



Cumulative Return Plot

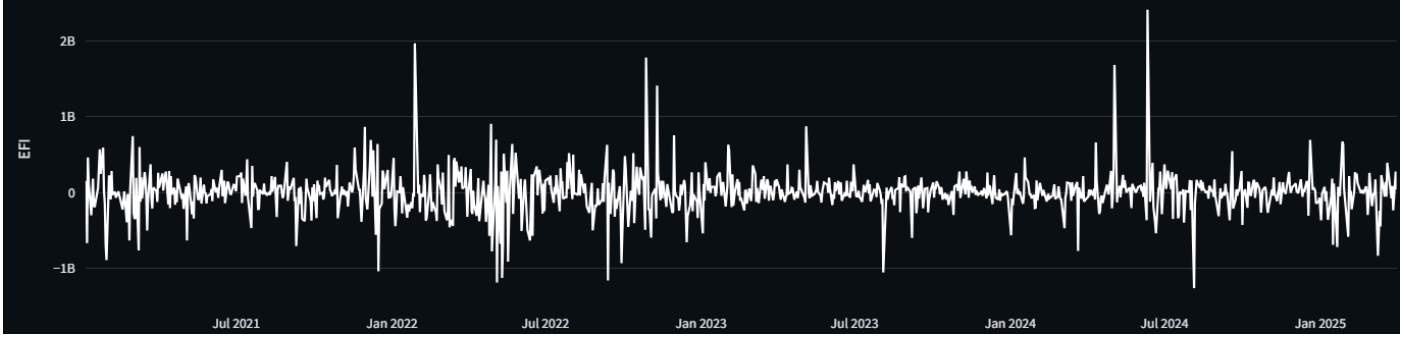
This shows the cumulative return of an investment over time, which is calculated by compounding the percentage returns each day.

Relative Performance Comparison

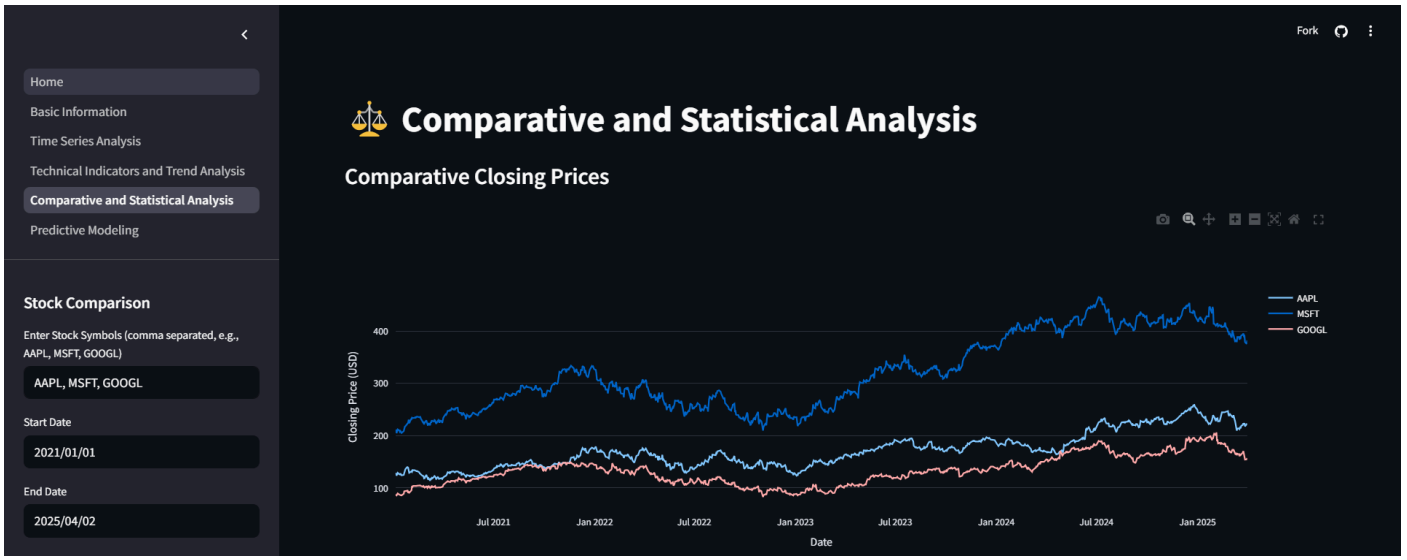
This compares the performance of a stock relative to a benchmark (e.g., S&P 500). It helps to identify whether the stock is outperforming or underperforming the benchmark.

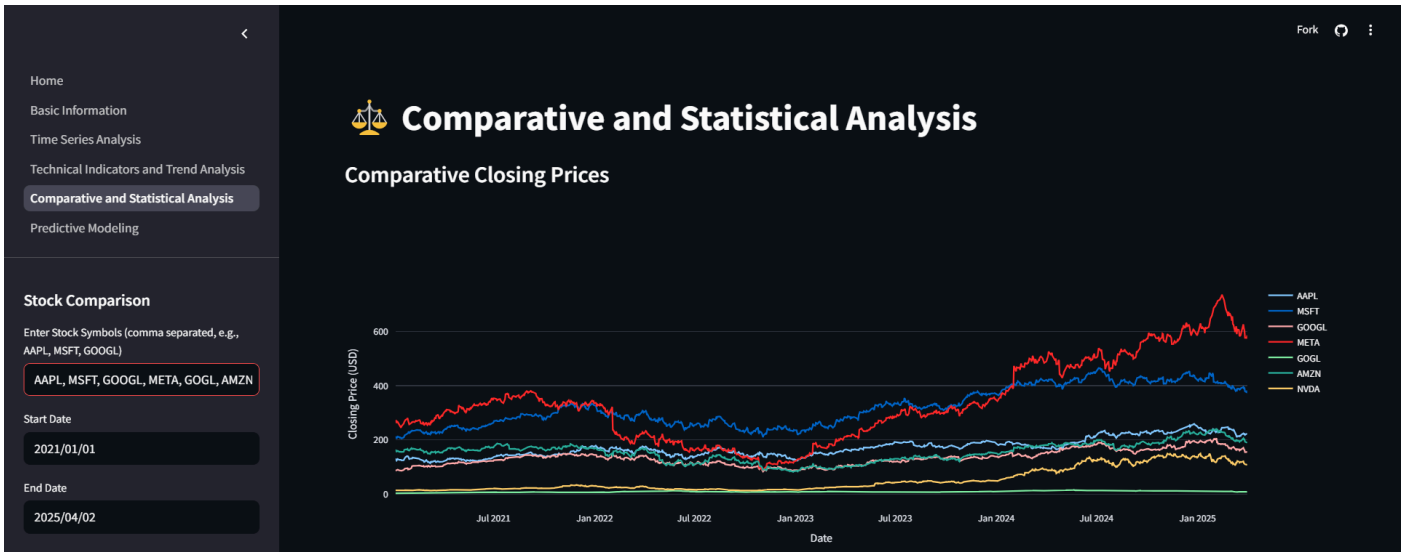
Elder’s Force Index (EFI) (Trend Strength)

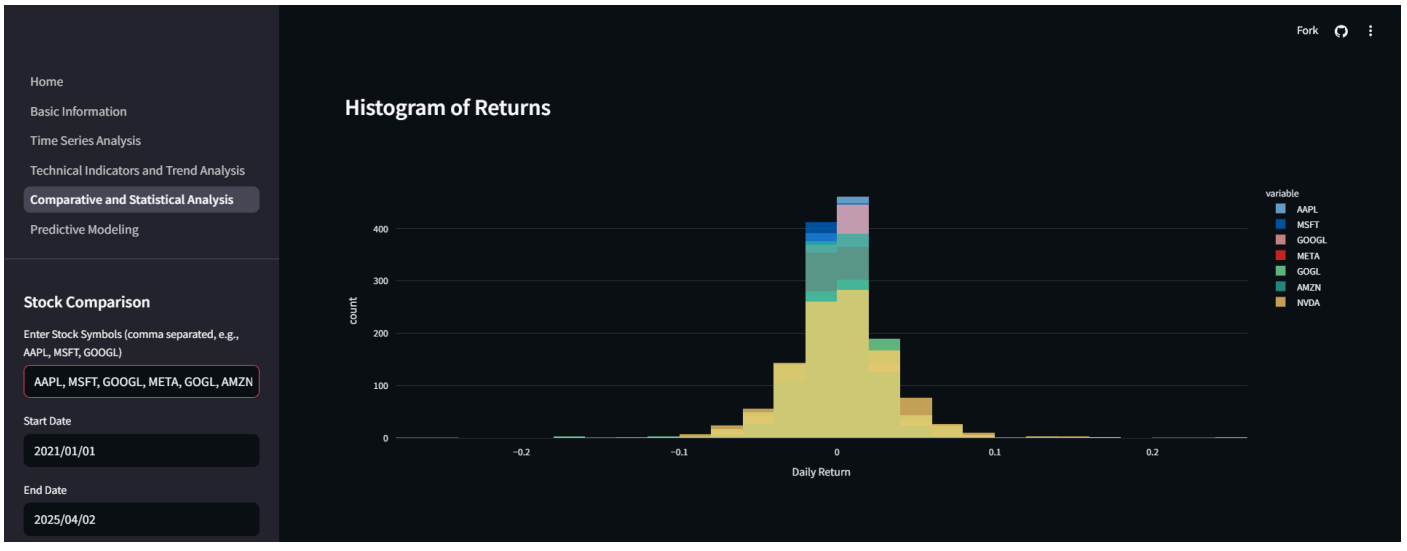
The **Elder's Force Index (EFI)** is used to measure the strength of a trend by combining price and volume. It can help identify whether a trend is strong enough to continue or likely to reverse.



Comparative and Statistical Analysis page:







Stock Predictive Modeling page: