

Stock Insight App — Analysis Report

Automated analysis report generated from project source code

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Generated from project files and analysis scripts

Business Problem

The stock market is inherently volatile, and effective investment decision-making requires accurate, timely, and actionable insights. The Stock Insight App aims to:

- Provide in-depth stock analysis including technical indicators, market summary, and historical performance.
- Calculate Beta and expected return using the Capital Asset Pricing Model (CAPM).
- Predict near-term stock prices for the next 30 days using time-series modeling and rolling statistics.
- Offer interactive visualizations and model diagnostics to assist traders and analysts.

Exploratory Data Analysis Insights

1. Stock Profile & Fundamentals - Fetches live company metadata from Yahoo Finance: sector, employee count, revenue per share, profit margin, debt-to-equity, market cap and other fundamentals. - Displays a concise summary table with Market Cap, Beta, EPS and P/E ratio for quick reference.
2. Price Trends & Technical Indicators - Supports candlestick and line charts for flexible visual analysis. - Integrates RSI, MACD, and moving averages for trend and momentum insights. Shows recent daily changes and last-10-day historical snapshots.
3. CAPM Beta & Return Analysis - Beta is calculated from weekly returns against the S&P 500 benchmark to measure market sensitivity. - Annualized return is estimated from average weekly returns scaled to yearly. - CAPM Return formula used: $R = R_f + \text{beta} * (R_m - R_f)$.
4. Stock Price Prediction - Time-series modeling pipeline includes stationarity checks, rolling means, differencing order detection, scaling, model fitting and forecasting. - Produces RMSE as the model accuracy metric and generates 30-day forecasts for closing prices.

Data Filtering & Validation

- Ensures valid ticker input and excludes failed data fetches. - Synchronizes stock time series with benchmark series to compute reliable betas and correlations. - Filters out non-trading days and handles missing values by forward/backward filling where appropriate.

Correlation & Indicator Insights

- Benchmark vs Stock Returns: Quantifies sensitivity and co-movement with the S&P 500 index.
- Volume vs Price Movement: Helps detect unusual trading activity and potential breakouts.
- Technical Indicator Signals: RSI and MACD crossovers provide timing signals, while moving averages indicate trend direction.

Research Questions & Key Findings

1. How volatile is a stock compared to the market? - Beta provides a concise volatility measure: $\beta > 1$ implies the stock is more volatile than the market, $\beta < 1$ implies less. 2. What return can be expected for the risk taken? - CAPM-based expected returns indicate fair returns considering market risk premium; useful for portfolio allocation decisions. 3. Can we predict short-term stock movement? - The forecasting module provides 30-day price predictions with accompanying RMSE to evaluate confidence. 4. Which indicators best explain market timing? - RSI highlights overbought/oversold conditions; MACD identifies trend reversals; combining these with forecasts improves timing.

Final Recommendations

- Use CAPM Beta and expected return to align positions with investor risk tolerance and expected performance. - Combine technical indicators (RSI, MACD, moving averages) with forecasts to generate stronger entry/exit signals. - Monitor RMSE and retrain models periodically using the latest data to maintain forecast accuracy. - Apply multi-stock analysis and diversification to lower portfolio risk and avoid concentration on single high-beta assets. - Log model predictions and realized outcomes to create feedback loops for continuous improvement.

Appendix — How to Run the App

Files of interest: - `Stock_Analysis.py` : Interactive analysis page (candlestick, indicators, fundamentals) - `CAPM_Beta.py` : Beta & Annual Return calculator (weekly returns vs S&P500) - `CAPM_Return.py` : CAPM multi-stock beta and return analysis - `Stock_Prediction.py` : Forecasting pipeline (rolling means, differencing, scaling, model fit & forecast) - `pages/utils/*` : Utility functions for plotting and modeling (used by the app)

Quick start (Streamlit): 1. Install required packages (yfinance, pandas, numpy, streamlit, plotly, pandas_datareader). 2. Run the app: ``streamlit run Stock_Analysis.py`` (or the Streamlit app entry point). 3. Use supported tickers (e.g., AAPL, TSLA, MSFT) and select date ranges and indicators in the UI.