

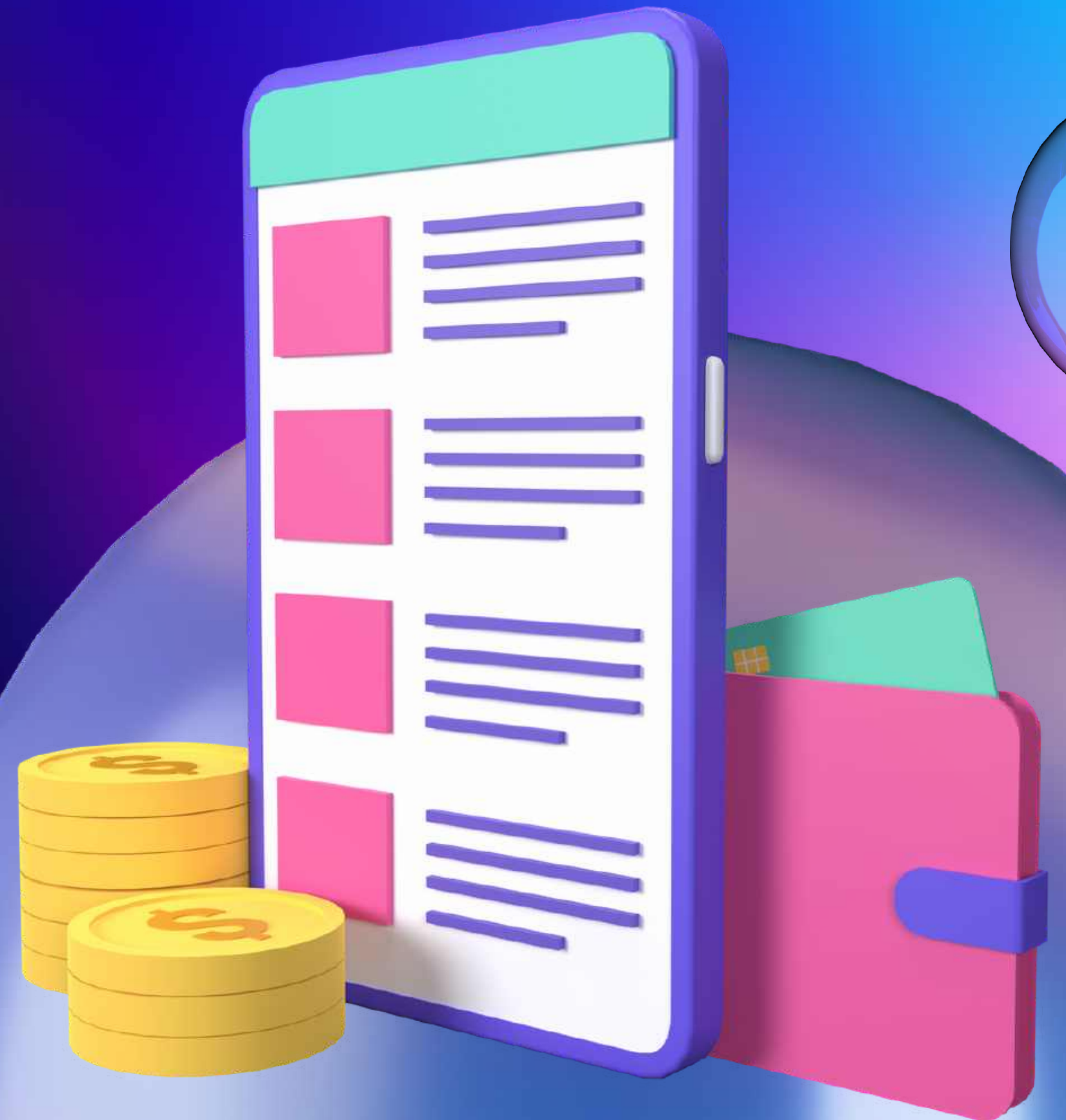


# UNDERSTANDING THE STOCKVISION: A FINANCIAL ANALYSIS AND PREDICTION WEB APPLICATION

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# Introduction

Stock markets generate massive amounts of time-dependent data, and understanding these price movements is essential for investors and analysts. With advancements in data analytics and financial modeling, it has become possible to analyze past stock trends, forecast future price behavior, and evaluate investment risk through quantitative models. This project aims to build a complete end-to-end system that performs stock price analysis, predicts future stock prices using time-series techniques, and calculates expected returns using the Capital Asset Pricing Model (CAPM). A Streamlit web application integrates all these components, making the system interactive and easy for users to explore.







# Problem Statement

Investors often struggle to combine different dimensions of stock evaluation, fundamental analysis, technical analysis, price prediction, and financial risk modelling into a single platform. Existing tools are either too complex or lack integration between forecasting and financial models. Therefore, the problem addressed in this project is:

"How to create a unified system that analyses stock fundamentals, visualises technical indicators, predicts future stock prices, and computes expected returns using CAPM in one accessible web application?"

# Literature Survey

Stock price forecasting has long been studied using statistical time-series models such as ARIMA, exponential smoothing, and rolling averages. These models rely on identifying trends, seasonality, and noise in historical data to generate future predictions. Technical indicators such as RSI, MACD, and Moving Averages are widely used in financial analysis to understand market momentum and trend reversals.

The CAPM model, introduced by Sharpe (1964), remains one of the most influential models for calculating expected returns based on systematic risk (beta). Beta is typically obtained through regression between stock returns and market returns, a method implemented in many financial libraries. Literature emphasizes that combining prediction models with financial theory provides a more complete decision-making framework.

This project draws from these established methods and integrates them into a practical, interactive application using Python, Yahoo Finance API, and data visualization libraries.





# Methodology

The methodology followed in this project can be divided into three major components:  
**(a) Stock Analysis, (b) Stock Price Prediction, and (c) CAPM-based Return Calculation.**

## Stock Analysis

Fundamental metrics such as market cap, beta, EPS, PE ratio, profit margins, and sector information are extracted using the Yahoo Finance API. Technical indicators like RSI, MACD, Moving Averages, and candlestick charts are computed and visualized to help users understand market trends.  
(Source: stock\_Analysis.py)

## Stock Price Prediction

A time-series forecasting pipeline is implemented, where data is first smoothed using rolling averages, then differencing is applied to remove trends, and the values are scaled for model efficiency. A forecasting function predicts the next 30 days of closing prices, and RMSE is used to measure model performance.  
(Source: stock\_prediction.py)

## CAPM Return Calculation

Historical stock prices and S&P 500 market data are downloaded from Yahoo Finance and FRED. Daily returns are computed, and beta values are calculated using linear regression between stock returns and market returns. Expected return is then computed using the CAPM formula.  
(Sources: CAPM\_return.py & CAPM\_functions.py)  
All three modules are integrated into a single Streamlit application that allows users to interact with each part seamlessly.  
(Source: Trading\_App.py)



# Input

The inputs required for the system include:

- Stock Ticker Symbol (e.g., TSLA, AAPL, MSFT)
- Date Range for analysis
- Number of Years of historical data for CAPM
- Technical Indicators selected by the user
- Market Index choice for beta calculation

These inputs are collected through the Streamlit UI and passed into the respective modules for analysis, forecasting, and financial modeling.







# Output

The outputs generated by the system include:

- Fundamental Analysis Report: Market cap, beta, EPS, PE ratio, financial ratios
- Technical Analysis Charts: RSI, MACD, Moving Averages, candlestick charts
- Historical Data Table for selected periods
- 30-Day Forecasted Prices with visual time-series graphs
- Beta Values and CAPM Expected Returns for selected stocks
- Interactive Charts for normalized prices, daily returns, and stock comparisons

These outputs help users understand stock performance, future expectations, and risk-adjusted returns.

# Demonstration

This end-to-end demonstration highlights the complete workflow from writing the Python code, executing it through the terminal, and finally making it available on a live URL for public use.







# Conclusion

This project successfully integrates stock analysis, time-series forecasting, and CAPM financial modeling into a unified, user-friendly web application. The system provides investors with fundamental insights, technical indicators, future price predictions, and expected return calculations all essential for informed decision-making. Future improvements could include incorporating LSTM or Prophet models for enhanced forecasting accuracy, portfolio optimization tools, and real-time financial news sentiment analysis. Deploying the application to cloud platforms would also allow broader accessibility and practical use.

# Thank You!

