Project Proposal: Interactive Stock Prediction Website Using R

Team: London Fog
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Final Product Delivery: an interaction Shiny App

Project Description

This project focuses on creating an interactive website using R Shiny, designed as a practical resource for individual investors. The tool retrieves real-time stock data and calculates key summary statistics – such as volatility, trading volume, returns, and percentage shorted – to compare stocks effectively. Additionally, it provides simple clustering and forecasting of a user's stock portfolio, offering multiple forecasting methods (e.g., k-means, Monte Carlo simulations).

This tool is valuable because many retail investors lack access to the sophisticated tools that institutional investors use. While it doesn't rival platforms like FactSet, it offers novice investors a solid starting point for making more informed investment decisions.

Data and Data Collection

We will use publicly available APIs (e.g., Yahoo Finance, Alpha Vantage) to retrieve historical price data for selected stocks. These APIs also provide live data streams, allowing us to update stock prices and forecasts dynamically. We have verified access to these APIs and are setting up the necessary API keys.

Programming Paradigms

In this project, we will use functional programming paradigms and machine learning paradigms. Specifically, we will use functional programming toolkits like `purrr` in a R Shiny framework to implement our web interface and functions. We will implement clustering and forecasting tools that utilize machine learning algorithms and methods to make predictions.

We will also use reactive programming for building the Shiny App, where user inputs trigger reactive elements. This allows the app to respond dynamically to user actions, updating outputs like data tables and forecast visualizations in real-time. The use of reactive expressions in Shiny helps ensure that the user interface is always consistent with the underlying data, providing a seamless user experience.

Packages and Software

- Software: R and RStudio for development.
- Useful Packages:
    - Shiny package for web application: shinyWidgets, shinytheme

    - Additional R packages: quantmod, forecast, ggplot2, dplyr, tidyr, stringr, plotly, lubridate, yahoofinancer.

Data Analytic Product

The final product of this project is a deployed interactive shiny app hosted on shiny.io. There might be five or six major tabs embedded in our app. Each has its unique features:

- Tab 1: An introduction to the app and general instructions on how to use it.
- Tab 2: An interface that allows users to directly access the data tables, showing stocks' daily opening, closing, highest and lowest prices, as well as the trading volume.
- Tab 3: A summary tab that provides visualizations of the market (histograms, pie charts, and line charts), including the distribution of various sectors among S&P500 and the performance of each sector.
- Tab 4: A stock trend tab that presents the past performance of individual stocks selected by users and comparisons against popular portfolios (SPY, QQQ, DJI).
- Tab 5: A portfolio-building tab that allows users to select multiple stocks to build a portfolio, and show comparisons against some existing portfolios in the market.
- Tab 6 (tentative): A more in-depth portfolio tab where we use more advanced modeling tools to forecast and improve portfolios for users.

Project Timeline

- Nov 11-15: Submit project proposal
- Nov 18-22: Project meeting and finalize plans
- Nov 25-29: Coding (construct shiny app and pull real-time data)
- Dec 2-6: More coding (modeling for forecast) and deploying website
- Dec 9-13: Final project presentation

Task Allocation

Other tasks: implementation of real-time data retrieval; data cleaning and compute metrics/summary stats, etc.

- Angela Zhao: Implement different forecasting algorithms
- Zheng Ren: Further develop key features in the Shiny app, focusing on tabs 2, 3, and 4, and add real-time functionality to the app.
- Yuzi Li: Design better user-interface and further develop key features in the Shiny app, focusing on tabs 5 and 6 of the app.
- Yicheng Shen: Construct the basic framework of the Shiny app.