Investment Strategies Comparison Report

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Introduction

Background

In this report, we compare different investment strategies based on ChatGPT portfolio selection and the Markowitz mean-variance portfolio optimization model. The use of generative AI models, such as ChatGPT, for selecting investment strategies has gained significant attention since its launch in November 2022.

Dataset, Models, and Questions

The purpose of this assignment is to compare investment strategies using a trading universe of 20 stocks obtained from GPT-3.5 model. The dataset consists of stocks from the S&P500 market index. We will compare four investment strategies:

1. "GPT-weighted" portfolio
2. "Minimum variance" portfolio strategy
3. "Maximum expected return" portfolio strategy
4. Custom strategy portfolio (on the mean-variance efficient frontier)

We will assess these strategies based on reward/performance measures (expected return, Sharpe ratio, etc.) and risk measures (standard deviation of portfolio returns, maximum drawdown, worst-case loss return, Value-at-Risk, etc.).

Data Collection and Preprocessing

Obtaining the Trading Universe

We obtained a trading universe of 20 stocks from ChatGPT, ensuring that the stocks belong to the S&P500 market index. This trading universe will serve as the basis for our investment strategies.

Data Cleaning and Transformation

We collected 5 years of weekly data from Yahoo Finance, with the in-sample period ending on March 31, 2023, and the out-of-sample period starting on April 1, 2023. The data includes the expected weekly return, standard deviation of return, and correlation between the returns of different stocks. We computed the return vector and covariance matrix using this data.

Investment Strategies

GPT-Weighted Portfolio

In this strategy, asset weights are assigned by ChatGPT.

Minimum Variance Portfolio

We used the Markowitz mean-variance portfolio optimization model to create a portfolio with minimum variance. This strategy aims to minimize risk.

Maximum Expected Return Portfolio

Similar to the minimum variance portfolio, we used the Markowitz model to create a portfolio with maximum expected return.

Custom Strategy Portfolio

We designed a custom strategy that aims to be on the mean-variance efficient frontier, such as a "maximum Sharpe ratio" strategy.

Performance Analysis

We evaluated the performance of these strategies based on various performance and risk measures, including expected return, Sharpe ratio, standard deviation, maximum drawdown, worst-case loss return, and Value-at-Risk. These measures allow us to assess the strategies' effectiveness.

Comparison of Investment Strategies

We compared the strategies using both in-sample and out-of-sample data. By assessing their performance in different time periods, we can understand how the strategies adapt to changing market conditions.

Conclusion

Preferred Investment Strategy

Based on our analysis, we recommend a preferred investment strategy that best suits the investor's goals. This recommendation is supported by an evaluation of performance and risk measures.

S&P500 Market Index Comparison

We also consider investing in the S&P500 market index ETF as an alternative. We compare this option to our strategies (i)-(iv) to determine its viability.

Appendix

Please refer to the Jupyter (IPython) Notebook for detailed analysis and implementation of the strategies in Python.

This report provides an overview of our investment strategies, their performance, and a recommendation for the preferred strategy. The detailed analysis, code, and visualizations can be found in the accompanying Jupyter Notebook.