Portfolio Allocation & Performance Evaluation Analysis

Project Backgroud

In Canada, the financial sector plays a vital role in the national economy, with investment management and assets allocation being key components. With market volatility, investors have shown a growing interest in stable assets allocation strategies.This project leverage historical data from 2018 to 2024 to analyze the performance of various assets classes(stocks,bonds,gold,real estate) and evaluate different assets allocations strategies,aiming to provide the practical insights for investors with varying levels of the risk tolerance.

Data Source & Tool

- **Data Source**: Yahoo Finance via yFanance library
- **Time Range**: 2018-01 to 2024-12
- **Asset Classes & Tickers**:
    - SPY: Stock
    - TLT: Bonds
    - GLD:Gold
    - VNQ:Real Estate
- **Tools Used**: Python, Pandas, Matplotlib, Seaborn

Analysis Workflow

Data Collection and Cleaning

I used yfinance library to download the historical price data for stocks, bonds, gold and real estate from Yahoo Finance,covering the period from 2018 to 2024.

I cleaned and transformed the data using Pandas.

Some assets had some missing data on certain days, so I used forward fill to handle the missing values. I aligned all assets by the same date index,keeping only the day when all of them had data. Then, I converted the price into daily returns to compare their performance.

Return Calculation

Used Pandas to calculate the daily log return; Monthly returns were aggregated by the calendar month, and cumulative returns were calculated using cumulative product of daily return.

Three Allocation Strategies

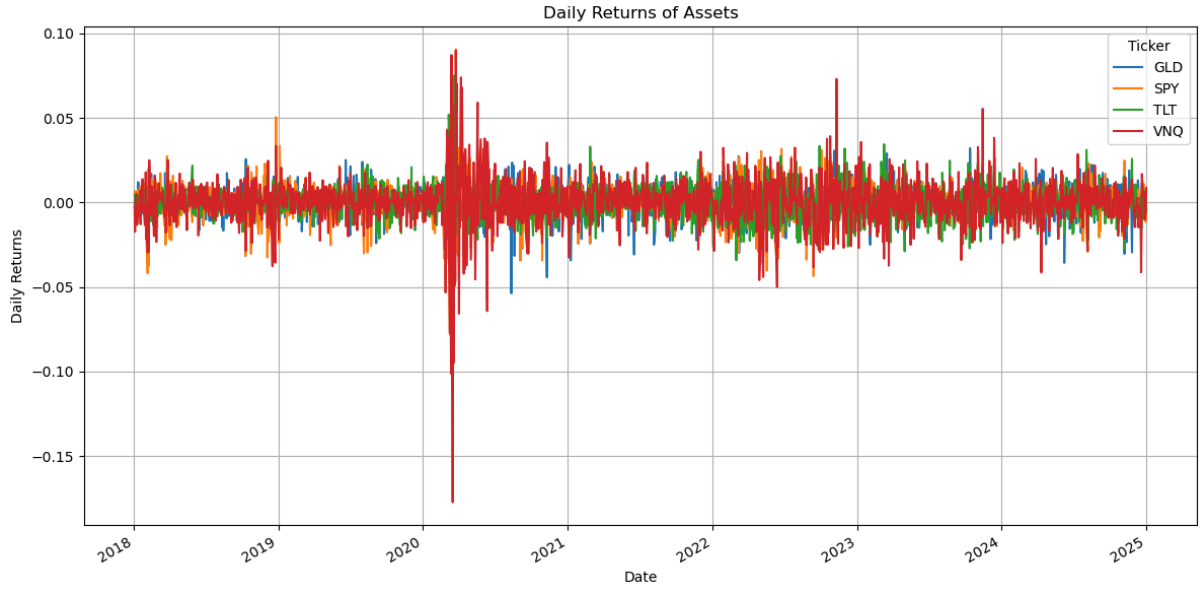
- **Aggressive**: 60%SPY, 10%Bonds, 30%others
- **Balanced**: 40%SPY, 30%Bonds, 30%others
- **Conservation**: 20%SPY, 50%Bonds,30%others

Portfolio Performance Metrics

- Annual Return
- Annualized Volatility
- Sharpe Ratio(assumed risk-free rate =2%)
- Max Dropdown

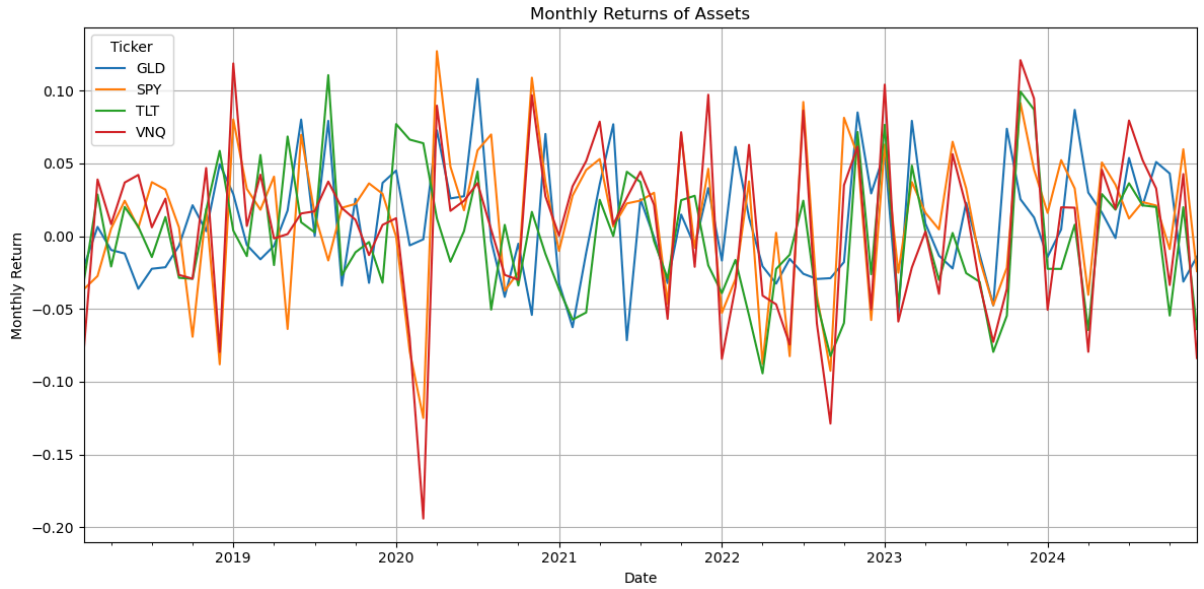
Performance Visualization

Figure 1: Daily Return of Assets



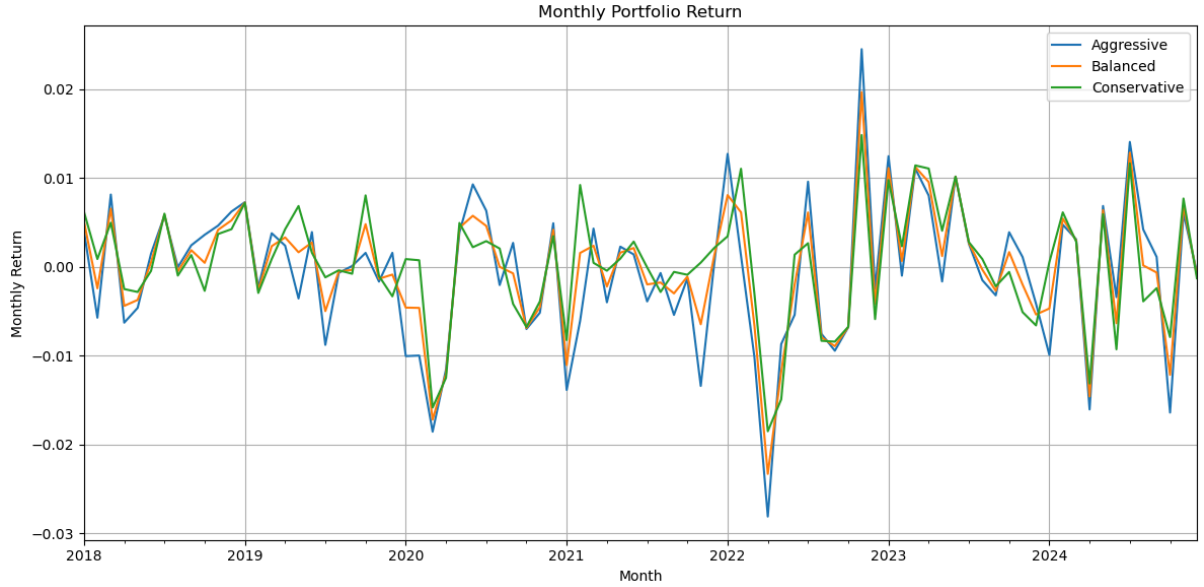
This figure shows the daily return of the 4 assets classes from 2018 to 2014

Figure 2: Monthly Return of Assets



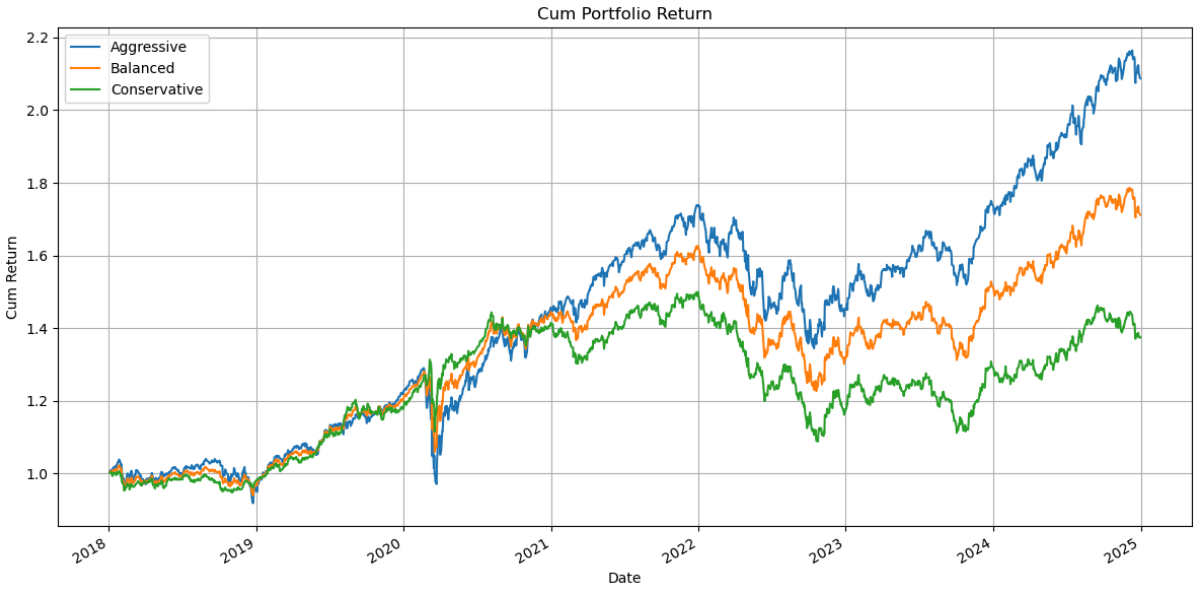
This figure shows the monthly return of 4 assets classes from 2018 to 2014

Figure 3: Monthly Portfolio Return



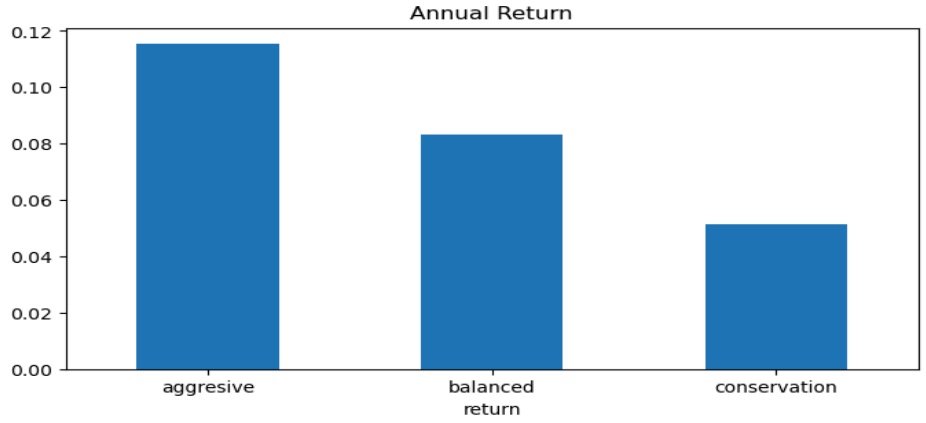
This figure shows the monthly return of 3 types of portfolios—-Aggressive, Balanced, Conservative.

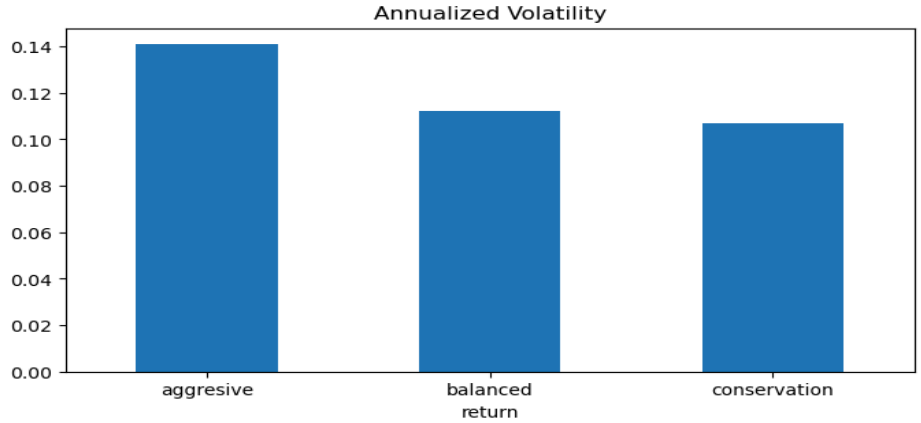
Figure 4: Cum Portfolio Return

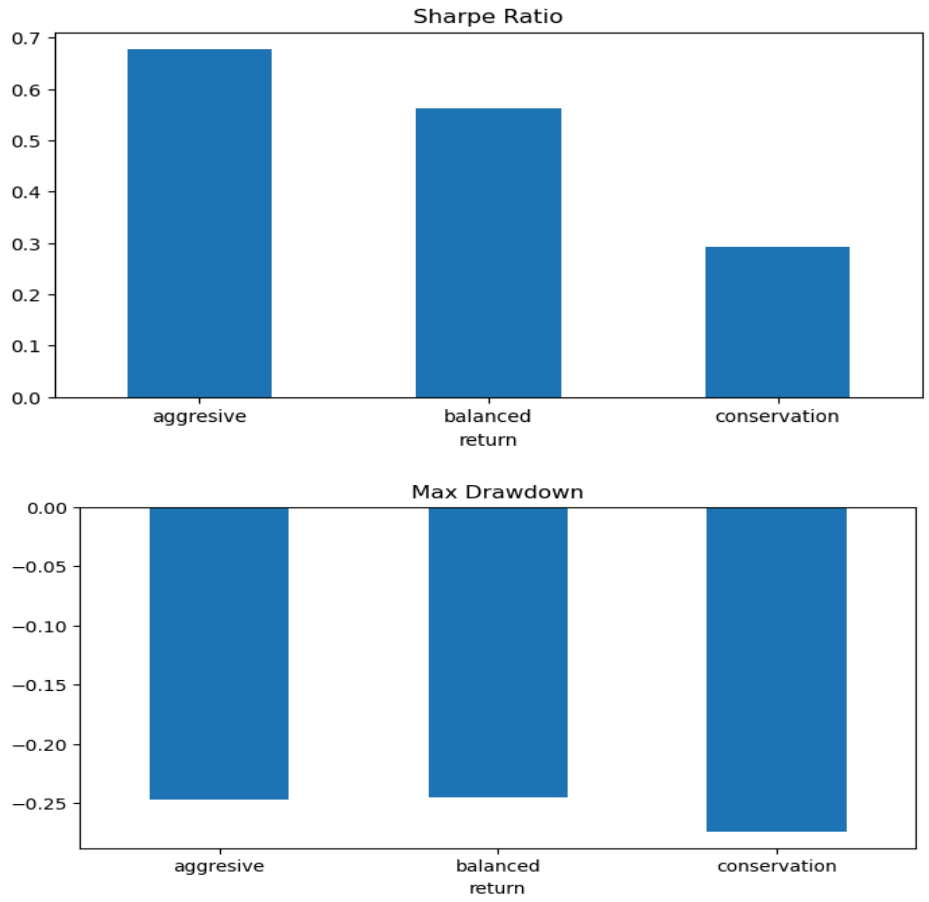


This figure shows the cumulative portfolio return of 3 types of portfolios—-Aggressive, Balanced, Conservative.

Figure 5: Annual Return, Annualization volatility, Sharpe Ratio, Max Dropdown

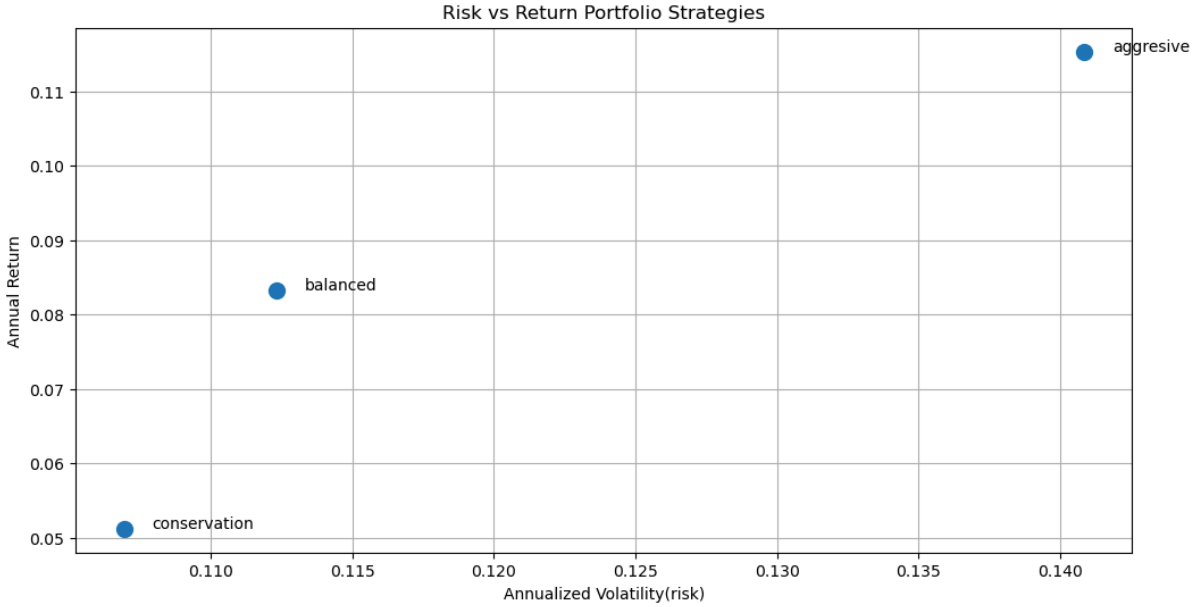






These four figures show the Annual Return, Annualization volatility, Sharpe Ratio and Max Dropdow of 3 types of portfolios—-Aggressive, Balanced, Conservative.

Figure 6: Risk vs Return Portfolio Strategies



The figure shows the relationship of return and per unit risk

Key Insights & Finding

- From 2018 to 2014, the aggressive portfolio achieved the highest return, but also carried the highest risk.
- During stressful periods such as the 2020 pandemic and 2022 inflation spike, the conservative portfolio showed the lowest volatility and dropdown.
- The balanced portfolio had the highest sharpe ratio, which indicates the highest return per unit risk.

Investment Recommendation

- If you are pursuing high return and can tolerate high volatility, the aggressive strategy may suit you.
- If you prefer a balance of risk and return, go with the balanced strategy.
- If you are risk-averse or close to retirement, the conservative approach is safer.

Project Summary

This project integrated the financial knowledge and data analysis skills, allowing me to practice building portfolio,evaluate risk and measuring performance using Python tools.