FIN367 Case 1 Portfolio Construction

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9/22/2024

This report aims to analyze the optimal weights of a two-asset portfolio of U.S. equities and fixed income. After examining the historical correlation between the two assets and their returns and evaluating the performance of different portfolio allocations, I have come to the conclusion that the portfolio should start with an allocation of around 50% equity and 50% fixed income to be the allocation for which the portfolio should be held for thirty years. This allocation matches that of the allocation computing via the maximum Sharpe ratio approach for the date of 12/31/1997.

I chose this allocation over the other weights due to the current market conditions more closely matching that of the market conditions at the end of 1997. Unlike the other portfolio weights calculated for 12/31/2002 and 12/32/2008, the correlation between the two assets is positive when calculating the asset weights for the 1997 portfolio. This matches the current positive rolling correlation of 0.1 calculated between the assets currently. Additionally, the current return on equity is larger than the return on fixed-income assets which was not seen in the 2008 portfolio when the financial recession occurred. The excess returns of equity and the fixed income assets are relatively close for the 2002 portfolio which does not match the current gap between the two returns that is being observed presently. The 1997 portfolio appears to be better off in the current market environment since the financial climate is closer to 1997 than it was then compared to the other two financial environments.

Apart from closer market conditions, the 1997 portfolio weights are chosen due to having better performance than the other two portfolio weights. The 1997 portfolio generated the highest cumulative return of $3,513.40 compared to the $2,003 and $1,593 returns generated by the 2002 and 2008 portfolios respectively. It is however important to remember that this performance metric was done using past data and would not reflect the performance in the future. The 1997 portfolio did better than the other two due to a greater weight in equities. This is beneficial for returns due to the period of low interest rates that followed after 2008 where the returns on equity increased over the fixed-income assets. If the returns of equity are lowered as seen during 2008-2012, the performance of this portfolio would not be as impressive. Therefore the performance of this portfolio allocation is not guaranteed over the expected holding time of thirty years.

Due to the uncertainty of the economic conditions in the next thirty years, a more dynamic allocation where the target allocation should be reassessed based on time and market conditions is preferable over a static allocation. Because of the greater allocation of equities in the 1997 portfolio, a change in the market condition where the returns on equity may turn negative, as seen during the financial recession, will be detrimental to the portfolio's returns when compared to the other two portfolio allocations. As a result,

while a static allocation approach is simpler and less costly to maintain, a more dynamic allocation will be beneficial to the portfolio in its expected thirty-year holding where future financial and economic conditions are not easily predictable and changes could be detrimental to the portfolio's returns. Rebalancing the portfolio whenever the financial environment calls seems to be advisable.

It should also be noted that timing does impact the portfolio construction, performance, and risk. The 2002 and 2008 portfolios were both created during or after a recession. As a result, these portfolios allocate more weight to the fixed-income asset where its volatility is lower than that of the equity asset. As a result, both of these portfolios had lower performance when calculating their accumulated returns from 2008-2024 where the returns of equities rose to levels much higher than that of fixed-income assets. The 1997 portfolio has greater weights in equity and as a result, had better performance in that time. The 1997 portfolio however also has greater risk as its standard deviation is greater than the other two portfolios. These results illustrate that the timing of the portfolio construction does impact the portfolio's performance and risk.

The concern over input sensitivity is a valid concern when constructing a portfolio using the maximum Sharpe ratio approach. Changes in an asset's return and correlation can massively change the calculated optimum weight of the portfolio. This can be seen with the differences between the 1997 portfolio and the 2008 portfolio where the almost opposite correlation coefficients of 0.5 and -0.3 and the negative excess equity returns in 2008 result in an equity allocation of 9.68%, far lower than the 50.37% allocation of the 1997 portfolio. These results show that changes in inputs can dramatically alter a portfolio's allocation.

My analysis of the cumulative return of these portfolios has an assumption that there is no transaction and rebalancing costs. In reality, these costs will be present and the returns of these portfolios in reality may be lower due to these costs. Additionally, my analysis heavily relies on past data and assumes that the more recent economic and financial environment will reflect the short-term future. This however may not be the case as past data is not always representative of the present and future. If the future economic and financial condition differs enough from my portfolio performance evaluation period of 12/31/2008 - 6/30/2024, then my recommended portfolio allocation may change. For example, a recession could occur that may lower the return on equities, and as a result, an allocation with a lower weight in equities may be better.

Appendix: Figures and Tables

Figure 1: Rolling 10-Year Excess Returns

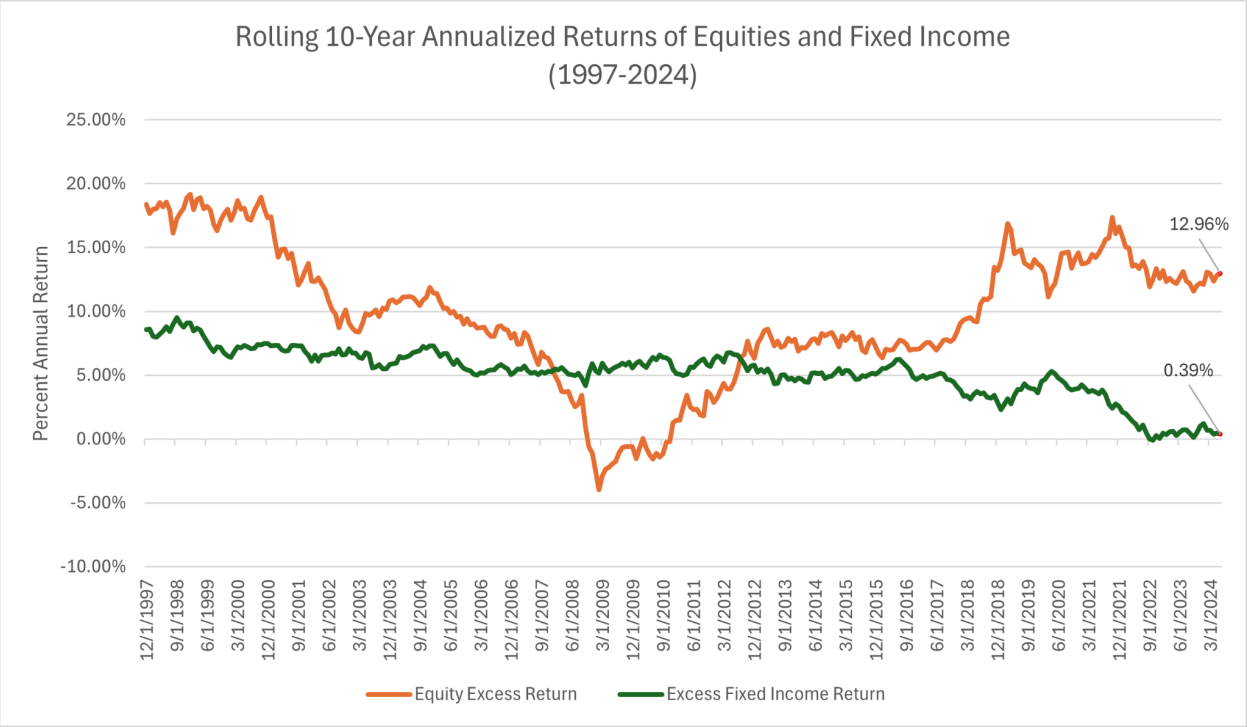

Figure 2: Rolling 10-Year Correlation

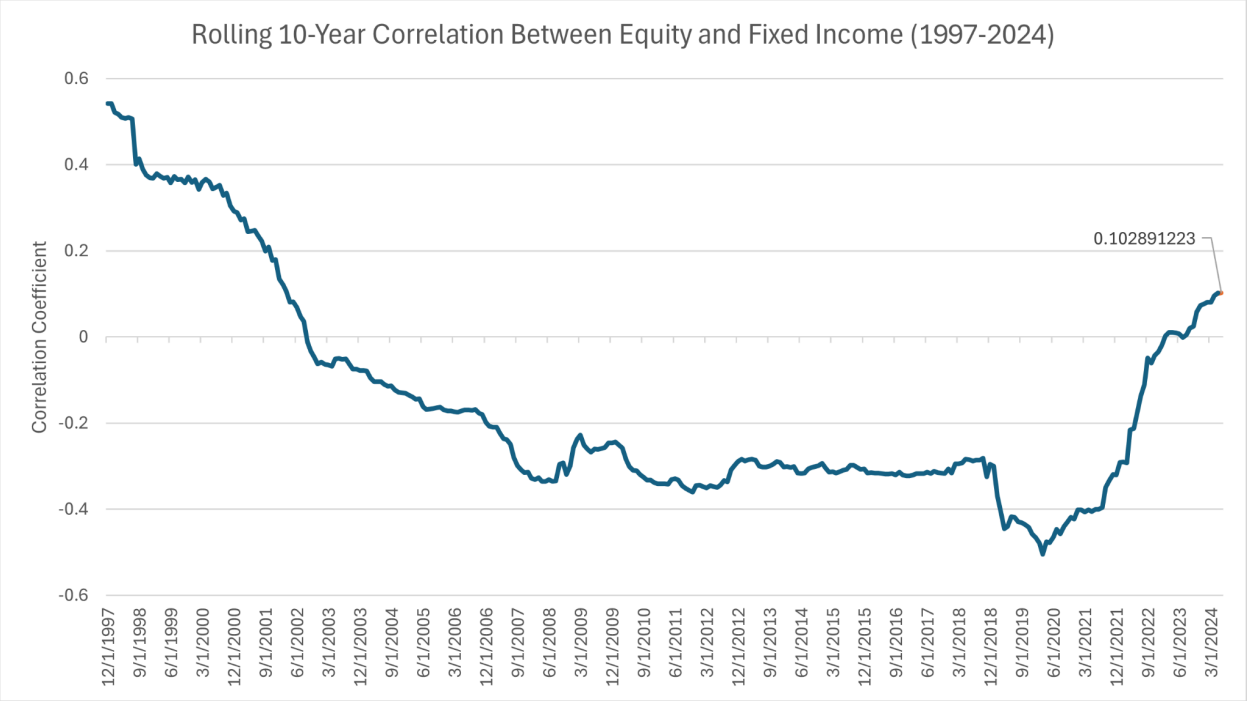

Figure 3: Weights of Blended Portfolios

Portfolio Year	Equity Weight	Fixed Income Weight	Sharpe Ratio
12/31/1997	50.37%	49.63%	1.60
12/31/2002	21.05%	78.95%	1.23
12/31/2008	9.68%	90.32%	0.80

Figure 4: Time Series of the Cumulative Portfolio Returns

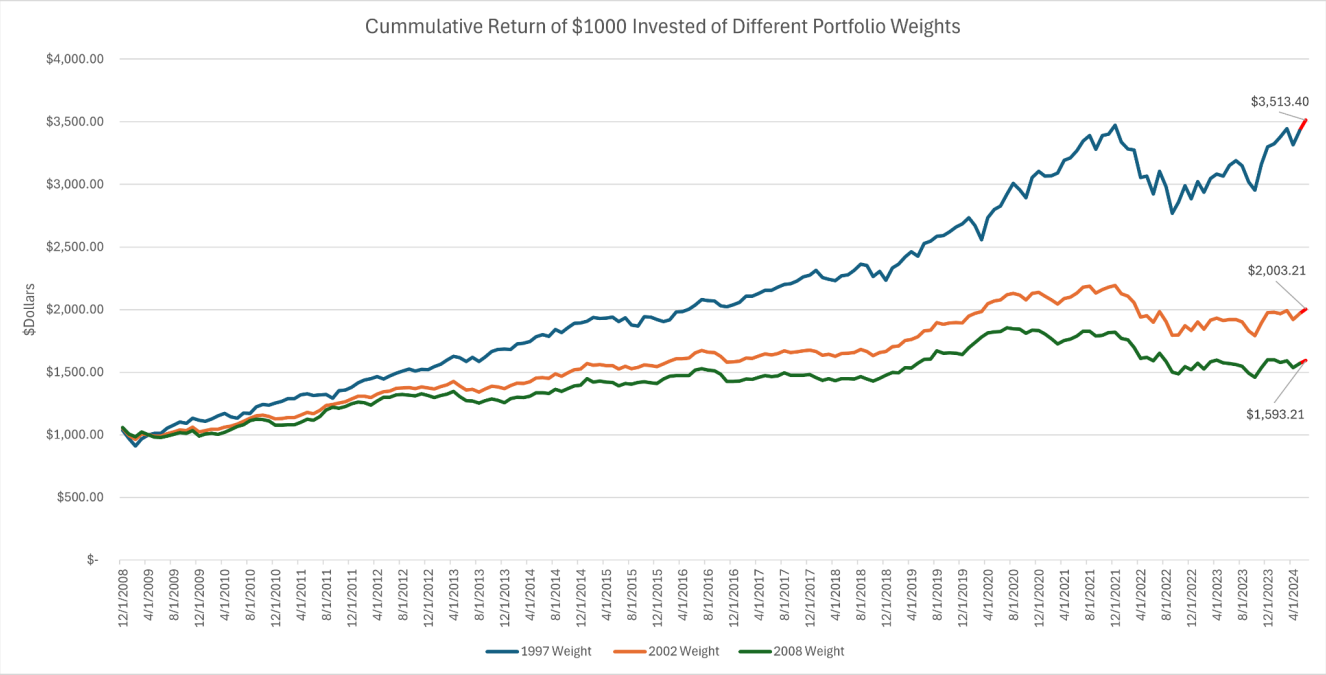

Figure 5: Annualized Return, Volatility, and Sharpe Ratio

Portfolio	Return	Standard Deviation	Risk Free	Sharpe Ratio
1997	13.39%	8.34%	0.12%	1.590735443
2002	7.19%	6.52%	0.12%	1.084909177
2008	4.77%	6.77%	0.12%	0.68674954