Asset Management Project: Simulated Portfolios

Akshat Johari (aj32864), Aritra Chowdhury (ac79277), Brandt Green (bwg537)

Main Steps and Assumptions

We created a Simulated Portfolio on 5 different ETFs with the target weights, rebalanced monthly. We used a Monte Carlo simulation to find the portfolio weights resulting in the maximum Sharpe Ratio. The simulation engine supports different parameters for weights, dates, rebalancing frequency, and portfolio strategies. Assumptions: no risk-free rate, trading costs, or capital gains tax.

Result: Performance of Individual ETFs and portfolios

ticker	DBC	IEI	IGOV	VEA	VTI	Target Portfolio	Optimal Portfolio
Annualized Return	-0.056404	0.029328	0.019766	0.059081	0.137654	0.061403	0.055471
Annualized Standard Deviation	0.159661	0.030485	0.078033	0.187952	0.175693	0.104547	0.049828
Sharpe Ratio	-0.353275	0.962048	0.2533	0.314342	0.78349	0.587326	1.113245
Sortino Ratio	-0.478523	1.374306	0.351455	0.41663	1.053201	0.778169	1.51873
Skew	-0.546755	0.126827	-0.175788	-1.020486	-0.674023	-1.052182	-0.595636
Kurtosis	3.839162	2.508051	1.8744	12.383283	15.432661	12.254021	8.759378
Daily Value at Risk (1% Threshold)	-0.075113	-0.010253	-0.022912	-0.1109	-0.109638	-0.062357	-0.027815
Conditional Value at Risk (1% Threshold)	-0.077844	-0.010951	-0.02298	-0.111803	-0.113809	-0.062503	-0.029328
Maximum Drawdown	-0.661409	-0.044884	-0.157839	-0.357344	-0.350003	-0.222669	-0.091484
Maximum Drawdown Days	3307 days 00:00:00	680 days 00:00:00	497 days 00:00:00	787 days 00:00:00	33 days 00:00:00	66 days 00:00:00	19 days 00:00:00
Proportion of Positive Returns	0.500794	0.524623	0.517077	0.534154	0.555997	0.54448	0.548451

Fig 1: Statistical Measures (left)

Fig 2: Optimal Weights (below)

Weight (DBC)	0.000276
Weight (IEI)	0.446090
Weight (IGOV)	0.233108
Weight (VEA)	0.007261
Weight (VTI)	0.313265

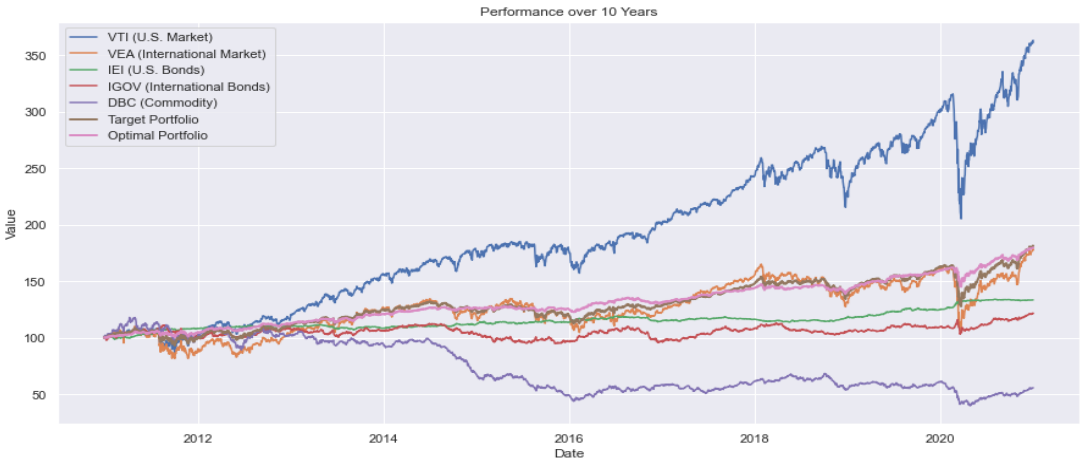

Fig 3: Cumulative Performance Comparison (left)

1. The Monte Carlo approach used to create the optimal portfolio is flawed for two reasons: one being that we are looking at future data that we would not have had at the time to determine the optimal portfolio, and two being that we are using a simulation of 100,000 portfolios instead of using a Lagrangian optimizer to determine the ideal weights for each asset class.
2. The Maximum Sharpe Ratio Port differed substantially from the target. In particular, for the optimal portfolio, the weights on the commodity ETF (DBC) and on the international market ETF (VEA) were essentially zero. These two ETFs had the two worst sharpe ratios out of the chosen options so it appears that their diversification benefits failed to offset poor performance.
3. A key assumption is that the statistical properties exhibited by this particular data series of returns is relatively stationary and provides a robust indication of future patterns. This is important because our portfolio has been optimized for these past characteristics and if these estimates are incorrect, our constructed portfolio will not actually be the optimal one.