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Title	Enhanced Mean-Variance Optimization for Hedge Fund Portfolios		
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Abstract

This study investigates hedge fund portfolio optimization by assessing the estimation error problem that burdens the traditional mean-variance analysis. One of the major drawbacks of the traditional mean-variance optimization is that it completely ignores the non-normality of the data, and often leads to highly concentrated portfolios that overweight assets with high mean returns and low variances. Problems arise, as such extreme events are more likely due to estimation error than actual performance. That is, when returns are not normal, but rather skewed to one side or another and kurtotic, the mean of returns is no longer a good representative of the entire population.

Two alternative optimization methods, namely Bayes-Stein shrinkage and nonparametric resampling, are proposed in an attempt to provide more reliable solutions for hedge fund portfolio allocation. In Bayes-Stein shrinkage estimation the inputs are shrunk toward a prior (in this study the portfolio weights are shrunk toward the global mean-variance portfolio and market portfolio). Resampling, which is based on drawing with replacement from the sample, is done directly on Sharpe and Sortino ratios. Both methods aim at reducing the error in input estimates, and work particularly well for hedge funds that tend to display skewness and excess kurtosis in their returns. These methods allow to form mean-variance efficient portfolios without knowing the true return distribution. The portfolios are constructed based on the monthly data of the Credit Suisse/Tremont hedge fund strategy indices from 1994 to 2006, and are compared against two benchmarks, the general Credit Suisse/Tremont hedge fund index and naïve, equally-weighted portfolio.

According to the results of this study the Bayes-Stein shrinkage and nonparametric resampling portfolios yield greater risk-return tradeoffs than the traditional mean-variance portfolio. This suggests that the methods proposed are able to enhance the accuracy of the estimates, and therefore, offer more efficient portfolio allocation for hedge funds. Furthermore, there is indication that these methods can lead to portfolios that are able to outperform their passive benchmarks. The results are supported by the 7-month out-of-sample test.

Key words	Hedge fund, Portfolio Selection, Mean-Variance Analysis, Estimation Error, Bayes-Stein Shrinkage, Bootstrap Resampling
Further information	

