Practical and Theoretical Aspects of High-Dimensional Portfolio Selection

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1 Abstract

Optimal asset allocation is considered in a high-dimensional asymptotic regime, namely when the number of assets and the sample size tend to infinity at the same rate. Due to the curse of dimensionality in the parameter estimation process, asset allocation for such portfolios becomes a challenging task. Using the techniques from random matrix theory, new inferential procedures based on the optimal shrinkage intensity for testing the mean-variance efficiency of a high-dimensional portfolio are developed and the asymptotic distributions of the proposed test statistics are derived. In extensive simulations, we show that the suggested tests have excellent performance characteristics for various values of concentration ratio. The practical advantage of the proposed procedures is demonstrated in an empirical study based on stocks included in the SP 500 index. We found periods where one can reject the null hypothesis of mean-variance optimality of the equally weighted portfolio. Moreover, the mean-variance portfolio outperforms the equally weighted portfolio in these periods.