Making Markowitz Portfolio Mean-Variance Principle Practically Useable by RMT

Z. D. Bai
Northeast Normal University, Changchun, China

Abstract

The traditional estimated return for the Markowitz mean-variance optimization by plug-in the sample mean vector and covariance matrix has been demonstrated to seriously depart from its theoretic optimal return. In this work, it is proved that this phenomenon is natural and the estimated optimal return is always $\sqrt{r}$ times larger than its theoretic counterpart where $r = 1/(1 - y)$ with y as the ratio of the dimension to sample size. Thereafter, we develop new bootstrap-corrected estimations for the optimal return and its asset allocation and prove that these bootstrap-corrected estimates are proportionally consistent with their theoretic counterparts. The theoretical results are further confirmed by simulations, which show that the essence of the portfolio analysis problem could be adequately captured by our proposed approach. This greatly enhances the practical uses of the Markowitz mean-variance optimization procedure.