Estimating large Markowitz portfolios' spanning set

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Abstract

Estimating large Markowitz portfolios implies estimating high-dimensional moments of stock returns, whose large number increases estimation errors. Thus, managing such large portfolios can be burdensome as their transaction costs increase with estimation errors. Nevertheless, researchers have recently provided empirical evidence of the sparsity of the mean-variance efficient frontier of the U.S. stock market. This result pleads for applying the canonical parsimony principle in the estimation of Markowitz portfolios. However, there is no formal statistical test in the literature of the null hypothesis of sparse stock market mean-variance efficient frontier. The existing feasible test statistics require constructing non-overlapping sub-portfolios. Nonetheless, we show that this pre-processing step introduces an aggregation bias and leads to misleading conclusions. The objective of this paper is to propose a desegregate test. First, we present a general framework for valid portfolio and model selection in high dimensions, using moment conditions with type I error control. We introduce a significance test for high-dimensional linear statistics based on subseries methods and a robust p-value aggregation method. Finally, we illustrate the relevance of the new framework on simulated and real data.

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