

Approaching the Frontier in Large Risky-Asset Universes: Direct Portfolio Estimation via CORE

Xinghua Zheng

Department of ISOM,
Hong Kong University of Science and Technology

Constructing mean-variance efficient portfolios in large asset universes consisting solely of risky assets is a central problem in financial economics and a cornerstone of empirical asset pricing. We propose CORE (CONstrained sparse Regression for Efficient portfolios), a direct portfolio estimation framework built on a novel linearly constrained regression representation of the optimal portfolio, which bypasses the error-prone estimation of high-dimensional mean vectors and covariance matrices. Theoretically, we establish asymptotic mean-variance efficiency in a regime where the cross-sectional dimension and the sample size proportionally approach infinity, while allowing aggregate gross exposure to grow with the size of the asset universe. We further show that CORE serves as a unified framework encompassing the major portfolio paradigms, including global minimum variance estimation (GMV-CORE), quadratic utility maximization (Utility-CORE), and active index enhancement (IndEnh-CORE). In extensive empirical evaluations, CORE portfolios consistently outperform a broad set of benchmarks including those combining nonlinear shrinkage of the covariance matrix with Bayes-Stein mean shrinkage, as well as factor-augmented alternatives, both gross and net of transaction costs.

Based on joint work with Leheng Chen and Yingying Li.