

"Empirical Challenges for Optimal Portfolio Selection"

Markowitz' (1952) portfolio selection requires reliable estimates of the vector of expected returns and the covariance matrix of returns. In practice the investor encounters a large variety of assets and a limited amount of time series data as the two moments of the return vector are time varying. These pitfalls are well known and we argue that the list of empirical challenges for applying Markowitz' portfolio selection includes two additional stylized facts that are difficult to handle: First, mean returns are typically small relative to their standard errors resulting in extremely unstable and unreliable estimates of the weights. Indeed, the estimated weights often exceed 100 percent but are nevertheless insignificantly different from zero. By casting Markowitz' optimization problem into a (IV) regression format we argue that the poor statistical properties are due to the problem of weak identification. Second, the statistical properties suffer from the normalization of the weights to unity, as the unnormalized sum of weights is typically close to zero. In practice these problems can be sidestepped by ignoring the information in the first moments, that is, by setting the mean return of all assets equal to some common mean. This results in the well known global minimum variance portfolio. To improve the small sample properties of the estimated weights we consider factor models as well as the LASSO approach. Our empirical demonstrates that such refinements substantially improve the performance of the minimum variance portfolio.