Contribution ID: **104** Type: **not specified**

Copula Shrinkage and Portfolio Allocation in Ultra-High Dimensions

Wednesday, June 29, 2022 10:40 AM (20 minutes)

The problem of allocation of large portfolios requires modeling joint distributions, for which the copula machinery is most convenient. While currently copula-based settings are used for a few hundred variables, we explore and promote the possibility of employing dimension-reduction tools to handle the problem in ultra-high dimensions, up to thousands of variables that use up to 30 times shorter sample lengths.

Recently, statistics research focused on developing covariance matrix estimators robust to and well-conditioned under the data dimensionality growing along with the sample size. One approach is to adjust the traditional sample correlation matrix by directly restricting its eigenvalues to achieve better properties under high data dimensionality. These advances rather conveniently match the structure of Gaussian and t copulas, which allows one to use shrinkage estimators to estimate the matrix parameters of Gaussian and t copulas in high dimensional datasets.

We apply the method to a large portfolio allocation problem and compare emerging portfolios to those from a multivariate normal model and traditional copula estimators. Using daily data on prices of U.S. stocks, we construct portfolios of up to 3600 assets and simulate buy-and-hold portfolio strategies. The joint distributional models of asset returns are estimated over a period of six months, i.e. 120 observations. The comparisons show that the shrinkage-based estimators applied to t copula based models deliver better portfolios in terms of both cumulative return and maximum downfall over the portfolio lifetime than the aforementioned alternatives.

Keywords

portfolio allocation, shrinkage, high dimensionality

Primary authors: ANATOLYEV, Stanislav (CERGE-EI); PYRLIK, Vladimir (CERGE-EI)

Presenter: ANATOLYEV, Stanislav (CERGE-EI)

Session Classification: CONTRIBUTED Finance, Business and Consulting

Track Classification: Finance