Portfolio selection with ambiguity aversion and model ambiguity

Corina Birghila

Otto-von-Guericke University Magdeburg
Universitätsplatz 2, 39106, Magdeburg
Germany

We study the mean-variance portfolio selection problem when both ambiguity attitude and model ambiguity of a decision maker are present. We consider an alpha-maxmin criterion that describes the mixture of ambiguity aversion and ambiguity seeking attitude of the decision maker. The uncertainty around the partial information about the underlying distribution of asset returns is captured by the Gelbrich ambiguity set, characterized by a reference mean and variance-covariance matrix. Extreme distributions (worst-case and best-case) in the ambiguity set associated with the minimal and maximal mean-variance portfolio values are obtained in closed form. The distributions provide valuable insights into the impact of the decision maker's ambiguity on the structure of extreme distributions. Depending on the risk aversion coefficient alpha, the optimal portfolio can be obtained via convex programming or difference of convex functions programming. Of particular interest are portfolios composed of heavy-tailed returns. In this case, we analyse existing methods to estimate the reference variance-covariance matrix from the data and discuss their influence on the optimal allocation. A numerical example illustrates the efficiency frontier of the portfolio and the sensitivity of the frontier to model uncertainty.