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Median-Based Nonparametric Estimation of Returns in Mean-Downside Risk Portfolio Frontier

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Abstract : The Downside Risk (DSR) model for portfolio optimisation allows to overcome the drawbacks of the classical mean-variance model concerning the asymetry of returns and the risk perception of investors. This model optimization deals with a positive definite matrix that is endogenous with respect to portfolio weights. This aspect makes the problem far more difficult to handle. For this purpose, Athayde (2001) developped a new recurcive minimization procedure that ensures the convergence to the solution. However, when a finite number of observations is available, the portfolio frontier presents an appearance which is not very smooth. In order to overcome that, Athayde (2003) proposed a mean kernel estimation of the returns, so as to create a smoother portfolio frontier. This technique provides an effect similar to the case in which we had continuous observations. In this paper, taking advantage on the the robustness of the median, we replace the mean estimator in Athayde's model by a nonparametric median estimator of the returns. Then, we give a new version of the former algorithm (of Athayde (2001, 2003)). We eventually analyse the properties of this improved portfolio frontier and apply this new method on real examples.

Keywords : Downside Risk, Kernel Method, Median, Nonparametric Estimation, Semivariance
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