

On the tail mean-variance optimal portfolio selection

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Abstract

The classical Mean-Variance (MV) portfolio theory uses all the information about the distribution of risks and does not pay any special attention to their tail behavior. A growing interest in risk theory based on the tails of distributions is, however, now being observed among insurance and investment experts. This is resulting in the multipurpose use of the Tail Condition Expectation (TCE) (or Expected Short Fall) and recently introduced Tail Variance (TV).

In the present paper we propose the Tail Mean-Variance (TMV) model, based on TCE and TV, as a subject for optimal portfolio selection. We show that under multivariate normal underlying distribution TMV-model reduces to a functional that is more complicated than quadratic and represents of the combination of a linear, square root of quadratic and quadratic functionals. We show, however, that under general linear constraints the solution of the optimization problem still exists and in the case where short selling is possible we provide the analytical closed form solution, which looks more "robust" than the classical MV solution. The results are extended for more general multivariate elliptical distributions of risks.

Key words: Tail Condition Expectation, Tail Variance, Tail Mean-Variance model, optimal portfolio selection, square root of quadratic functional, quartic equation.

References

- [1] Boyle, P.P, Cox, S.H,...[et. al]. *Financial Economics: With Applications to Investments, Insurance and Pensions*, Actuarial Foundation, Schaumburg, 1998
- [2] Landsman, Z. (2008). "Minimization of the root of a quadratic functional under a system of affine equality constraints with application to portfolio management". *Journal of Computational and Applied Mathematics*. 2008, **216**, 2, 319-327.