



Quantile-based optimal portfolio selection

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Abstract

In this paper we introduce the concept of quantile-based optimal portfolio selection and a specific portfolio connected to it, the Conditional Value of Return (CVoR) portfolio. The portfolio selection consists solely of quantile-based risk and return measures. The portfolio has several advantages. It circumvents the estimation problem of mean while still taking the positive part of the return distribution into consideration. It constrains the negative values of the return distribution by a quantile based risk measure. Thus, it takes both tails of the return distribution into account.

Financial institutions that work in the context of Basel 4 use Conditional Value-at-Risk as a risk measure. Under these conditions we provide sufficient and necessary conditions for optimality of the CVoR portfolio under a general distributional assumption. The financial institutions that work in the context of the Solvency 2 insurance regulation must use Value-at-Risk as a risk measure. We provide a verification type theorem for a global optimum under the use of Value-at-Risk as a risk measure. Moreover, we show that the CVoR portfolio is mean-variance efficient when the returns are assumed to follow an elliptically contoured distribution. Under this assumption we derive closed form expressions for the weights and characteristics of the CVoR portfolio.

The introduced methods are illustrated based on weekly stock data, and the results obtained by elliptically contoured asset return distribution are compared with nonparametric CVoR portfolios. For the data at hand, the CVoR portfolio performs best when assuming elliptically contoured distributions in comparison to the nonparametric portfolio.

Keywords: Quantile-based return measure, VaR, CVaR, optimal portfolios, elliptical distributions

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