

# A new coherent multivariate average-value-at-risk

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## Abstract:

A new operator for handling the joint risk of different sources has been presented and its various properties are investigated. The problem of risk evaluation of multivariate risk sources has been studied, and a multivariate risk measure, so-called multivariate average-value-at-risk,  $mAVaR\alpha$ , is proposed to quantify the total risk. It is shown that the proposed operator satisfies the four axioms of a coherent risk measure while reducing to one variable average-value-at-risk,  $AVaR\alpha$ , in case  $N = 1$ . In that respect, it is shown that  $mAVaR\alpha$  is the natural extension of  $AVaR\alpha$  to the  $N$ -dimensional case maintaining its axiomatic properties. The framework is applicable for Gaussian mixture models with dependent risk factors that are naturally used in financial and actuarial modelling. Examples with numerical simulations are also illustrated throughout.