Common cause effects in portfolio loss estimation

In the present article, a methodology for the consideration of common cause effects in portfolio analysis is shown. A hierarchical approach is proposed which is especially useful for the modelling of large portfolios. It allows evaluating the performance of each single asset in the portfolio conditionally independent. In many cases, the performance of assets can be described using two states, namely failure and survival. For such assets, the analysis can be performed almost independent of the size of the portfolio by using a binomial model. A special focus is set on the different sources of common cause effects and their influence on the loss distribution in portfolios is shown and analysed. The results indicate a distinct influence of such effects especially in portfolios where the consequences are described by a nonlinear function. Common cause effects do not only arise from common load situation in the same geographical regions but also from common models used for the design of infrastructure facilities. In a general sense, dependencies in a portfolio can be considered as representing the system characteristics of the portfolio loss exceedance function. The identification of the main indicators influencing the loss exceedance curve for portfolios can help to optimise decisions for loss reduction, to understand system mechanisms and to identify and implement effective risk reducing measures. The present article aims to model, assess and discuss the effects influencing the loss exceedance function for a portfolio of assets with dependencies. A hierarchical approach is presented which facilitates the consideration and determination of the dependency structure in portfolios. The different effects on the portfolio loss exceedance function are investigated and discussed and illustrative examples are given.

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