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Portfolio optimisation in very high dimension based on copula association modelling

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Portfolio optimisation requires insight into the joint distribution of the asset returns, in particular the association or dependence between the individual returns. Classical approaches use the covariance matrix for association modelling. However, the usage of copulae is the most flexible way of fitting joint distributions to data. In recent years, the problem of applying copulae to high dimensions has been approached with Vine copulae. Nevertheless, the application in portfolio optimisation with a very large number of assets in the order of several thousands is an open research field. Our approach is dividing the assets into smaller groups, thereby breaking the problem down into a number of smaller portfolio problems. We use three grouping methods: random, or by a sector or by an industry classification of the assets. As portfolio risk measures we consider either the MAD (mean absolute deviation) or the CVaR (conditional value at risk). The resulting algorithms are applied to real world financial data. Every algorithm turns out to have a practically useful run-time. Particularly the approach of dividing the assets by sector classification leads to excellent results in terms of risk aversion and return.

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