Simulating Exchangeable Multivariate Archimedean Copulas and its Applications

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Owing to the increase in popularity of copulas to measure dependent risks, generating multivariate copulas has become a very crucial exercise. Current methods for generating multivariate Archimedean copulas could become a very difficult task as the number of dimension increases. The resulting analytical procedures suggested in existing literature do not offer much guidance for practical implementation. This paper presents an algorithm for generating multivariate exchangeable Archimedean copulas based on a multivariate extension of a bivariate result. A procedure for generating bivariate Archimedean copulas has been originally proposed in Genest and Rivest (1993) and again later described in Nelsen (1999) and Embrechts, et al. (2001). Using proof that is simply based on fundamental Jacobian techniques for deriving distributions of transformed random variables, we are able to extend the bivariate result into the multivariate case allowing us to develop an interesting algorithm to generate exchangeable Archimedean copulas. As auxiliary results, we are able to derive the distribution function of an n-dimensional Archimedean copula, a result already known in Genest and Rivest (2001) but our approach of proving this result is based on a different perspective. Multivariate exchangeable Archimedean copulas are one of the most popular classes of copulas that are used in actuarial science and finance for modelling risk dependencies and for using them to quantify the magnitude of tail dependence. This paper focuses on this class of copulas that has one generating function and one parameter that characterizes the dependence structure of the joint distribution function.

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