A METHOD TO CONSTRUCT RADIALLY SYMMETRIC TRIVARIATE COPULAS

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We recall the concept of radial symmetry of a random vector, its probabilistic interpretation and highlight that for continuous random vectors, the property of radial symmetry can be fully characterized by the marginal distributions of the random variables and the copula associated to their joint distribution function. Additionally, we show that the n-dimensional extension of the Frank 2-copula, which is obtained by applying the associativity property of Archimedean 2-copulas, is no longer radially symmetric for $n \geq 3$, showing that jointly requiring associativity and radial symmetry is too restrictive in higher dimensions. In order to extend the number of radially symmetric 3-copulas in literature, we propose a method to construct a 3-dimensional symmetric function that is radially symmetric, using two symmetric 2-copulas, with one of them being also radially symmetric. We study the properties of our construction method for some families of copulas, and provide several examples in which our construction method yields a 3-copula. Finally, we discuss a possible generalization of our construction method for dimensions $n \geq 4$.

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