Stable copulas as a tool for comparing probability distributions

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We establish a pairwise comparison method for random variables. This comparison results in a probabilistic relation on a given set of random variables.

The transitivity of this probabilistic relation is investigated in the case of independent random variables, as well as when these random variables are pairwisely coupled by means of a copula, more in particular the minimum operator or the Lukasiewicz t-norm.

A deeper understanding of this transitivity, which can be captured only in the framework of cycle-transitivity, allows to identify appropriate strict or weak thresholds, depending upon the copula involved, turning the probabilistic relation into a strict order relation. Using 1/2 as a fixed weak threshold does not guarantee to yield an acyclic relation, but is always one-way compatible with the classical concept of stochastic dominance.

The proposed method can therefore also be seen as a way of generating graded as well as non-graded variants of that popular concept.