ON BIVARIATE COPULA MAPPINGS

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Copulas play a central role in modeling multivariate dependence and linking univariate marginal distributions together to form a multivariate distribution. So it is of great interest to be able to construct new copulas from already known ones with specific properties to fit available data in applications. Inspired by many examples from the literature, in this work we are concerned with a particular method of bivariate copula construction, namely, for a given copula $C : [0, 1]^2 \to [0, 1]$ and a function $f : [0, 1] \to \mathbb{R}^+$ we let $H_f(C)(x, y) := C(x, y)f(C(x, y))$, where $C(x, y) := 1 - x - y + C(x, y), \ (x, y) \in [0, 1]^2$, is the survival function associated with copula $C$. To classify the functions $f$ based on the properties of $H_f(\cdot)$, we call a particular function $f$

- **eligible** if $H_f(C)$ is a copula for any bivariate copula $C$;
- **conditionally-eligible** if $H_f(C_1)$ is a copula but $H_f(C_2)$ is not a copula for some bivariate copulas $C_1, C_2$; and
- **non-eligible** if $H_f(C)$ is not a copula for any bivariate copula $C$.

We then provide necessary and sufficient conditions for $f$ to be eligible, and illustrate with examples. Some of the statistical properties of $H_f(C)$ for eligible $f$ are also discussed at the end.

This talk is based on the article [1].

References


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