

On an Alternative to Copula Methodology, Bivariate Case

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Abstract

Given any two univariate survival functions, not necessarily from the same class of the corresponding probability distributions. We present a new method for construction such bivariate survival functions that the two, given in advance, univariates become either the marginal or baseline distributions for it.

The constructed joint survival functions are given in two equivalent product forms which are universal. Each bivariate model can be expressed in either form, one when using baseline distributions, and the other when the marginals are initially given. The simple and nice relationship between the two forms is expressed as the proven theorem. Both representations are always analytical representations of the same bivariate model, and each model possesses both the representations, which in some cases are analytically identical.

The representations yield a powerful tool for construction of new stochastic models with numerous applications such as reliability, biomedical problems and econometric.

The **universality** of both the representations suggests to be an alternative to the copula methodology.

Keywords

arbitrary bivariate survival function's representation, construction of bivariate stochastic models, universality, analogy to copula methodology

Biographies

Jerzy K. Filus received his M.S. degree in Mathematics from the University of Warsaw, Poland and his Ph.D. from the Systems Research Institute of the Polish Academy of Sciences. He was associated, among others, with the System Research Institute of the Polish Academy of Science, the Center for Operations Research and Econometrics, Belgium, the University of Twente, The Netherlands, and the Illinois Institute of Technology, Chicago, USA. Currently he is a retired Lecturer from the Dept. of Mathematics and Computer Sciences, Oakton Community College, Des Plaines, Illinois, USA. His research interests have mainly been focused on applied probability problems with emphasis on reliability modeling, and multivariate probability distributions and their extensions towards stochastic processes as well as fundamental concepts towards physics unification.

Lidia Z. Filus is a Professor and Chair of Mathematics at Northeastern Illinois University in Chicago, Illinois, USA. She received her M.S and Ph.D. in Mathematics from the University of Warsaw, Poland. She was awarded a research fellowships from the Center for Operations Research and Econometrics at the University of Louvain in Belgium, and from the University of Twente in the Netherlands. During her professional career she has worked at the Warsaw School of Economics, the Polish Academy of Sciences, the University of Kansas, and Northeastern Illinois University in Chicago.