Ann Inst Stat Math (2019) 71:599–626
https://doi.org/10.1007/s10463-018-0657-x

Testing for a δ-neighborhood of a generalized Pareto copula

Stefan Aulbach[1] · **Michael Falk**[1] · **Timo Fuller**[1]

Received: 2 April 2014 / Revised: 5 February 2018 / Published online: 17 April 2018

Abstract A multivariate distribution function F is in the max-domain of attraction of an extreme value distribution if and only if this is true for the copula corresponding to F and its univariate margins. Aulbach et al. (*Bernoulli* 18(2), 455–475, 2012. https://doi.org/10.3150/10-BEJ343) have shown that a copula satisfies the extreme value condition if and only if the copula is tail equivalent to a generalized Pareto copula (GPC). In this paper, we propose a χ^2-goodness-of-fit test in arbitrary dimension for testing whether a copula is in a certain neighborhood of a GPC. The test can be applied to stochastic processes as well to check whether the corresponding copula process is close to a generalized Pareto process. Since the p value of the proposed test is highly sensitive to a proper selection of a certain threshold, we also present graphical tools that make the decision, whether or not to reject the hypothesis, more comfortable.

Keywords Multivariate max-domain of attraction · Multivariate extreme value distribution · Copula · D-norm · Generalized Pareto copula · χ^2-goodness-of-fit test · Max-stable processes · Functional max-domain of attraction

Stefan Aulbach was supported by DFG Grant FA 262/4-2.

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s10463-018-0657-x) contains supplementary material, which is available to authorized users.

✉ Stefan Aulbach
stefan.aulbach@uni-wuerzburg.de

[1] Institute of Mathematics, University of Würzburg, Emil-Fischer-Str. 30, 97074 Würzburg, Germany