Hüsler, J.

Limit distributions of multivariate extreme values in nonstationary sequences of random vectors. (English) Zbl 0697.62016

Extreme value theory, Proc. Conf., Oberwolfach/FRG 1987, Lect. Notes Stat. 51, 234-245 (1989).

[For the entire collection see Zbl 0667.00025.]

The paper deals with the limit distributions of suitably normalized multivariate extreme values in stationary sequences of random vectors. In order to avoid that any distribution can be taken as a limit distribution conditions are used some of them first introduced by *M. R. Leadbetter* [Z. Wahrscheinlichkeitstheor. verw. Geb. 28, 289-303 (1974; Zbl 0265.60019)]. They mainly concern the uniform asymptotic negligibility and the asymptotic independence with respect to the extreme behaviour both of the random vectors and of their components. Different combinations of these conditions lead to different statements concerning the asymptotic independence of the normalized random vectors, the asymptotic independence of the components and independence relations between the vectors and the components:

Let {

X$_i$; $i \geq 1\}$ be a sequence of d-dimensional random vectors and {

u$_{in}$; $i \leq n$, $n \geq 1\}$, $n \in \mathbb{N}$,

u$_{in} \in \mathbb{R}^d$, any normalization such that $P\{$

X$_i \leq$

u$_{in}$; $i \leq n\}$ converges. Then results of the following kind are obtained:

$$(i) \quad P($$

X$_i \leq$

u$_{in}$; $\quad i \leq n) - \prod_{i=1}^n P($

X$_i \leq$

u$_{in}$)$0, \quad n\infty,$

$$(ii) \quad \prod_{i=1}^n P($$

X$_i \leq$

u$_{in}$) $- \prod_{i=1}^n \prod_{j=1}^d P(X_{ij} \leq u_{inj})0, \quad n\infty,$

$$(iii) \quad P($$

X$_i \leq$

u$_{in}$; $\quad i \leq n) - \prod_{i=1}^n \prod_{j=1}^d P(X_{ij} \leq u_{inj})0, \quad n\infty,$

$$(iv) \quad P(X_i \leq$$

u$_{in}$; $\quad i \leq n) - \prod_{j=1}^d P(X_{ij} \leq u_{inj}; \quad i \leq n)0, \quad n\infty,$depending on different conditions. Using these results, some characterizations of the nondegenerate limit distributions for the extreme values

M$_n = (M_{n1}, ..., M_{nd})$ with

$$M_{nj} = \max\{X_{1j}, ..., X_{nj}\}, \quad 1 \leq j \leq d,$$

are given under an affine-linear normalization

$u_n($

$z)=$

a_n

$z+$

b_n. A possible nondegenerate limit distribution G(

z) with

$$P($$

$M_n \leq$

a_n

$z+$

$b_{n)}^{d} G($

z)

is characterized and is shown (under different suitable conditions) to be positive lower orthant dependent. Also a result concerning the asymptotic independence of the components of

M_n is obtained. Briefly, the paper contains extensions of known results for multivariate Gaussian sequences to non-Gaussian ones.

Reviewer: B.Rauhut

MSC:

62E20 Asymptotic distribution theory in statistics

62H05 Characterization and structure theory for multivariate probability distributions; copulas

Cited in **2** Documents

Keywords:

non-Gaussian sequences; limit distributions; normalized multivariate extreme values; stationary sequences of random vectors; uniform asymptotic negligibility; asymptotic independence; independence relations; affine-linear normalization; positive lower orthant dependent