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ERRATUM : An introduction to a general records theory both for dependent and high dimensions

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Abstract. We mistakenly report the joint cumulative function of the partial maximum values of a sequence of random variables at the place of the record values in Theorem 3 in (Lo G.S. and Ahsanullah M. (2019). An introduction to general records theory both for dependent and high dimensions. *Afrika Statistika*. Vol. 14 (2), pp. 2019-2056. Doi : http://dx.doi.org/10.16929/as/2019.2019.147). The right result is given here.

Key words: partially ordered space; record values and times; probability law; characterization of probability laws
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Résumé. Dans le théorème 3 dans (Lo G.S. and Ahsanullah M. (2019). An introduction to general records theory both for dependent and high dimensions. *Afrika Statistika*. Vol. 14 (2), pp. 2019-2056. Doi : dx.doi.org/10.16929/as/2019.2019.147), nous avons donné la loi de probabilité conjointe des maxima partiels d'une suite de variables aléatoires à la place de celle des valeurs records. Nous procédons à la correction ici.

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1. Major Correction

Theorem 3 in Lo and Ahsanullah (2019) was supposed to give the general joint cumulative distribution function of the record values. Actually, the given result is the general joint cumulative distribution function of the sequence of the maxima. We are going replace Subsection 3.1 in Lo and Ahsanullah (2019) by the following text, which has two theorems now.

First, we focus on the sequences of the maxima : $M_n = \max_{1 \leq j \leq n} X_j$, $n \geq 1$. We have

Theorem 1. *For each $n \geq 1$, we have :*

(a) The joint cdf of the partial maxima $(M_1, M_2, \cdots, M_n)^T$ is given, for any $y = (y_1, ..., y_n) \in \mathbb{R}^n$, by

$$\mathbb{P}(M_1 \leq y_1, \cdots, M_n \leq y_n) = \prod_{i=j}^{n} F\left(y_i^*\right). \quad (PEX1)$$

where $y_i^* = \wedge_{j=i}^{n} y_j = min(y_i, \cdots, y_n)$, $1 \leq i \leq n$.

(b) For a k-tuple $(n_1, \cdots, n_k = n)$, $1 \leq k \leq n$ with $n_0 = 0 < 1 \leq n_1 < \cdots < n_k$, for any $y = (y_1, ..., y_k) \in \mathbb{R}^k$, we have

$$\mathbb{P}(M_{(n_1)} \leq y_1, \cdots, M_{(n_k)} \leq y_k) = \prod_{j=1}^{k} F^{(n_j - n_{j-1})}\left(\bigwedge_{i=j}^{k} y_i\right). \quad (PEX2)$$

Proof. We repeat the proof of Theorem 1 in Lo and Ahsanullah (2019) (page 2025) to get (a) by applying the principle described in Formula Lo and Ahsanullah (2019) (page 2026). The formula in (b) represents a marginal law of *dcf* in (a). It is get by taking $x - j = +\infty$ in (a) for $j \notin \{n_1, \cdots, n_k\}$. $\square$.

To link this with record values, we notice that $(Y^{(1)}, \cdots, Y^{(n)}) = (M_{U(1)}, \cdots, M_{U(n)})$, for $n \geq 1$. We find a gain the joint *cdf* for records values as by condition by $(U(1) = n_1, \cdots, U(n) = n_k)$, and on that event, we have

$$(X^{(1)}, \cdots, X^{(n)}) = (M_{n_1}, \cdots, M_{n_k})$$

and applying (b) in Theorem 1 allows us get the conditional law. So we have :

Theorem 2. *Suppose that the sequence $(X_j)_{j \geq 1}$ is iid with commun distribution function F. Let $n \geq 1$. Define*

$$\Gamma_n = \{(\ell_1, \cdots, \ell_n) \in (\mathbb{N} \setminus \{0\})^n, \ \ell_1 = 1 < \ell_2 < \cdots < \ell_n\}.$$

The joint cdf of the records values $(Y^{(1)}, \cdots, Y^{(n)})^T$ is given, for any $y = (y_1, ..., y_n) \in \mathbb{R}^n$, by

$$\mathbb{P}(Y^{(1)} \leq y_1, \cdots, Y^{(b)} \leq y_n) = \sum_{(\ell-1,\cdots,\ell_n)\in\Gamma_n} \prod_{i=j}^{n} F\left(y_i^*\right)\ \mathbb{P}(U(1)=\ell_1,\cdots,U(n)=\ell_n),$$

where $y_i^* = \wedge_{j=i}^{n} y_j = min(y_i, \cdots, y_n)$, $1 \leq i \leq n$.

2. Minor correction

At some place in Lo and Ahsanullah (2019), the superscripts in the record values notations $Y^{(\circ)}$ are put in subscripts $Y_{(\circ)}$ and the record times $U(\circ)$ is denoted as $U_{(\circ)}$. The rule is to use superscripts for the record values and a function notation $U(\circ)$ for the time records.

References

Lo G.S. and Ahsanullah M. (2019). An introduction to general records theory both for dependent and high dimensions. *Afrika Statistika*. Vol. 14 (2), pp. 2019-2056. Doi : dx.doi.org/10.16929/as/2019.2019.147.