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On the minimum of a random number of independent random variables having power function distribution

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SUMMARY

The distribution of the minimum of a random number of random variables having power function distribution defined on the unit interval is established in three cases, in which the resulting models are unit distributions obtained from well-known probability models. To be more precise, let $Z_1, Z_2, \ldots$ be a sequence of independent random variables following a common power function distribution defined on the unit interval. The following characterization results are provided.

(i) Let N be a random variable having geometric distribution which is independent of $Z_1, Z_2, \ldots$ The random variable $T_N = \min\{Z_1, \ldots, Z_N\}$ has unit exponential-geometric distribution (cf. [1, 5]).

(ii) Let M be a random variable having shifted Poisson distribution which is independent of $Z_1, Z_2, \ldots$ The random variable $T_M = \min\{Z_1, \ldots, Z_M\}$ has unit shifted Gompertz distribution (cf. [2, 3]).

(iii) Let W be a random variable having zero-truncated Poisson distribution which is independent of $Z_1, Z_2, \ldots$ The random variable $T_W = \min\{Z_1, \ldots, Z_W\}$ has right truncated Weibull distribution on the unit interval (cf. [4]). Moreover, this result can be extended to an arbitrary interval $(0, c)$ if $Z_1, Z_2, \ldots$ are defined on $(0, c)$, $c > 0$.

Keywords: Minimum of random variables, power function distribution, geometric distribution, Poisson distribution, exponential-geometric distribution, Gompertz distribution, Weibull distribution.

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