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Geometric Records

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SUMMARY

We consider in this communication the long-term behavior of geometric records from a sequence $\{X_n\}_{n\geq 1}$ of independent, nonnegative, random observations, with common continuous distribution function F. Give a parameter $k > 1$, the n-th observation X_n is a geometric record if $X_n > k \max\{X_1, \ldots, X_{n-1}\}$, that is, if X_n is k times greater than all preceding observations. This concept was introduced by Eliazar in [1], where the question of waiting times was addressed. We study the number N_n of geometric records among $X_1, \ldots, X_n$, and show that N_n increases to a finite random limit N_∞, for very light-tailed F. For medium and heavy-tailed F, we prove that N_n diverges to infinity, establish its growth rate and give conditions for asymptotic normality. We also analyze the values of geometric records, pointing out a relationship with models of paralyzable counters in particle physics. Our results are presented in a discrete-time setting but we show how they can be translated to continuous time Poissonian systems. Examples of applications to common families of distributions, such as Fréchet systems, are also provided.

Keywords: Records; Geometric records; Limit Theorems; Type II counters

AMS Classification: 60G70, 60F05, 60F15.

References

[1] Eliazar, I. (2005). On geometric record times. *Phys. A* **348**, 181–198.

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