

## Mathematics &gt; Probability

# Extreme(ly) mean(ingful): Sequential formation of a quality group

Abba M. Krieger, Moshe Pollak, Ester Samuel-Cahn

*(Submitted on 15 Nov 2010)*

The present paper studies the limiting behavior of the average score of a sequentially selected group of items or individuals, the underlying distribution of which,  $F$ , belongs to the Gumbel domain of attraction of extreme value distributions. This class contains the Normal, Lognormal, Gamma, Weibull and many other distributions. The selection rules are the "better than average" ( $\beta=1$ ) and the " $\beta$ -better than average" rule, defined as follows. After the first item is selected, another item is admitted into the group if and only if its score is greater than  $\beta$  times the average score of those already selected. Denote by  $\bar{Y}_k$  the average of the  $k$  first selected items, and by  $T_k$  the time it takes to amass them. Some of the key results obtained are: under mild conditions, for the better than average rule,  $\bar{Y}_k$  less a suitable chosen function of  $\log k$  converges almost surely to a finite random variable. When  $1-F(x)=e^{-[x^\alpha+h(x)]}$ ,  $\alpha>0$  and  $h(x)/x^\alpha \rightarrow 0$ , then  $T_k$  is of approximate order  $k^2$ . When  $\beta>1$ , the asymptotic results for  $\bar{Y}_k$  are of a completely different order of magnitude. Interestingly, for a class of distributions,  $T_k$ , suitably normalized, asymptotically approaches 1, almost surely for relatively small  $\beta \geq 1$ , in probability for moderate sized  $\beta$  and in distribution when  $\beta$  is large.

Comments: Published in at [this http URL](#) the Annals of Applied Probability ([this http URL](#)) by the Institute of Mathematical Statistics ([this http URL](#))

Subjects: **Probability (math.PR)**

Journal reference: Annals of Applied Probability 2010, Vol. 20, No. 6, 2261-2294

DOI: [10.1214/10-AAP684](https://doi.org/10.1214/10-AAP684)

Report number: IMS-AAP-AAP684

Cite as: [arXiv:1011.3320v1](https://arxiv.org/abs/1011.3320v1) [math.PR]

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[v1] Mon, 15 Nov 2010 09:18:43 GMT (67kb)

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