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LAW OF THE ITERATED LOGARITHM - CLUSTER POINTS OF DETERMINISTIC AND RANDOM SUBSEQUENCES

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Abstract: Let $\{X_k\}_{k=1}^{\infty}$ be a sequence of i.i.d. random variables with mean 0 and finite, positive variance σ^2 and let

$$S_n = \sum_{k=1}^{n} X_k, \quad n \geq 1.$$

Further, let

$$\varepsilon^*(\{n_k\}) = \inf\{\varepsilon > 0; \sum_{k=3}^{\infty} (\log n_k)^{-\varepsilon^2/2} < \infty\},$$

where $\{n_k\}_{k=1}^{\infty}$ is a strictly increasing subsequence of the positive integers. Then the set of cluster points of $\{S_{n_k}/\sqrt{n_k \log\log n_k}\}_{k=3}^{\infty}$ equals $[-\sigma\sqrt{2}, \sigma\sqrt{2}]$ a.s. if $\liminf_{k\to\infty} n_k/n_{k+1} > 0$, and $[-\sigma\varepsilon^*(\{n_k\}), \sigma\varepsilon^*(\{n_k\})]$ a.s. if $\limsup_{k\to\infty} n_k/n_{k+1} < 1$. These results are then applied to randomly indexed partial sums.

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