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A strong law of large numbers with applications to self-similar stable processes. (English)

Zbl 1274.60098
Acta Sci. Math. 76, No. 3-4, 697-711 (2010).

Summary: Let $p \in (0, \infty)$ be a constant and let $\{\xi_n\} \cup L^p(\Omega, \mathcal{F}, \mathbb{P})$ be a sequence of random variables. For any integers $m, n \geq 0$, denote $S_{m,n} = \sum_{k=m}^{m+n-1} \xi_k$. It is proved that, if there exist a nondecreasing function $\varphi : \mathbb{R}_+ \to \mathbb{R}_+$ (which satisfies a mild regularity condition) and an appropriately chosen integer $a \geq 2$ such that

$$\sum_{n=0}^{\infty} \sup_{k \geq 0} \mathbb{E} \left| \frac{S_{k,a^n}}{\varphi(a^n)} \right|^p < \infty,$$

then

$$\lim_{n \to \infty} \frac{S_{0,n}}{\varphi(n)} = 0 \quad \text{a.s.}$$

This extends Theorem 1 in [*S. Chobanyan* et al., Electron. Commun. Probab. 10, 218–222 (2005; Zbl 1112.60024)] and can be applied conveniently to a wide class of self-similar processes with stationary increments including stable processes.

MSC:

60F15 Strong limit theorems

Keywords:

strong law of large numbers; moment inequality; self-similar processes; stable processes

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