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Marcinkiewicz-type law of large numbers for double arrays

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Abstract

Chatterji strengthened version of a theorem for martingales which is a generalization of a theorem of Marcinkiewicz proving that if Xn is a sequence of independent, identically distributed random variables with E|X n|p < ∞, 0 < p < 2 and EX1 = 0 if 1 ≤ p ≤ 2, then n-1/p ∑i=1 n → 0 a.s. and in Lp. In this paper, we prove a version of law of large numbers for double arrays. If {Xij} is a double sequence of random variables with E|X11|p log+ |X 11|p < ∞, 0 < p < 2, then lim mVn→∞ ∑i=1 m ∑ j=1 n (Xij-aij/(mn)1/p = 0 a.s. and in Lp, where aij = 0 if 0 < p < 1, and a ij = E[Xij|Fij] if 1 ≤ p ≤ 2, which is a generalization of Etemadi's Marcinkiewicz-type SLLN for double arrays. This also generalize earlier results of Smythe, and Gut for double arrays of i.i.d. r.v's.

Keywords

Double arrays, Lp convergence, Strong law of large numbers