ON THE STRONG LAW OF LARGE NUMBERS FOR SEQUENCES OF BLOCKWISE INDEPENDENT AND BLOCKWISE $p$-ORTHOGONAL RANDOM ELEMENTS IN RADEMACHER TYPE $p$ BANACH SPACES

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Abstract: For a sequence of random elements $\{V_n, n \geq 1\}$ taking values in a real separable Rademacher type $p$ ($1 \leq p \leq 2$) Banach space and positive constants $b_n \uparrow \infty$, conditions are provided for the strong law of large numbers $\sum_{i=1}^{n} V_i / b_n \to 0$ almost surely. We treat the following cases: (i) $\{V_n, n \geq 1\}$ is blockwise independent with $E V_n = 0$, $n \geq 1$, and (ii) $\{V_n, n \geq 1\}$ is blockwise $p$-orthogonal. The conditions for case (i) are shown to provide an exact characterization of Rademacher type $p$ Banach spaces. The current work extends results of Móricz [12], Móricz et al. [13], and Gaposhkin [8]. Special cases of the main results are presented as corollaries and illustrative examples or counterexamples are provided.

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