ON STRONGLY ORTHOGONAL MARTINGALES IN UMD BANACH SPACES

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Abstract. In the present paper we introduce the notion of strongly orthogonal martingales. Moreover, we show that for any UMD Banach space $X$ and for any $X$-valued strongly orthogonal martingales $M$ and $N$ such that $N$ is weakly differentially subordinate to $M$, one has, for all $1 < p < \infty$,

$$
E\|N_t\|^p \leq \chi_{p,X} E\|M_t\|^p, \quad t \geq 0,
$$

with the sharp constant $\chi_{p,X}$ being the norm of a decoupling-type martingale transform and lying in the range

$$
\max\{\sqrt{\beta_{p,X}}, \sqrt{h_{p,X}}\} \leq \max\{\beta^+_{p,X}, \beta^-_{p,X}\} \leq \chi_{p,X} \leq \min\{\beta_{p,X}, h_{p,X}\},
$$

where $\beta_{p,X}$ is the UMD$_p$ constant of $X$, $h_{p,X}$ is the norm of the Hilbert transform on $L^p(\mathbb{R}; X)$, and $\beta^+_{p,X}$ and $\beta^-_{p,X}$ are the Gaussian decoupling constants.

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