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THE DUAL SPACE OF THE SPACE BMO FOR A STOCHASTIC POINT PROCESS

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1. Introduction. Let (Ω, F, P) be a complete probability space endowed with a non-decreasing right continuous family $(F_t)_{t\geqq 0}$ of sub σ-fields of F with $F = \bigvee_{t\geqq 0} F_t$ such that F_0 contains all null sets. Let λ be a non-negative predictable process such that $P\left(\int_0^t \lambda_s ds < \infty\right) = 1$ for all t. An F_t-adapted process $N = (N_t)$ is called a stochastic point process with the intensity λ if N has right continuous paths taking values in $Z_+ = \{0, 1, 2, \cdots\}$ with $N_0 = 0$, $\Delta N_t = N_t - N_{t-} = 0$ or 1, and if $\hat{N}_t = N_t - \int_0^t \lambda_s ds$ is a local martingale. Throughout, we assume that the stochastic point process N with the intensity λ satisfies the following conditions:

(S) $F_t = \sigma(N_s, s \leqq t)$, i.e., F_t is the completion of the σ-field generated by $(N_s, s \leqq t)$,

(B) $\hat{N}$ belongs to the space BMO.

Then we can define the finite measure μ on the σ-field Ξ of all predictable subsets A of $[0, \infty) \times \Omega$ by

$$\mu(A) = E\left[\int_0^\infty I_A \lambda_s ds\right]. \tag{1}$$

We shall adopt the following notations and definitions:

(2) $L^1(\mu)$ denotes the set of all predictable processes f with $\|f\|_{L^1(\mu)} < \infty$;

$$L^\infty(\mu) = \{f \in L^1(\mu);\ \|f\|_{L^\infty(\mu)} < \infty\}; \tag{3}$$

(4) Φ denotes the set of all real valued set functions ν on $([0, \infty)\times\Omega, \Xi, \mu)$ such that $\nu(A\cup B) = \nu(A)+\nu(B)$ if $A, B \in \Xi$ and $A \cap B = \emptyset$, $\|\nu\| = \sup\{\sum_{i=1}^n |\nu(A_i)|; \{A_1, \cdots, A_n\}$ is a measurable partition of $[0, \infty)\times\Omega\} < \infty$, and $\nu(A) = 0$ if $A \in \Xi$ and $\mu(A) = 0$;

$$U(f)(t) = \int_0^t f_s d\hat{N}_s \quad \text{for} \quad f \in L^1(\mu); \tag{5}$$