Optimal stopping of a risk process in a continuous-time disorder model

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Abstract. An optimal stopping problem in a modified Sparre-Andersen model with continuous-time disorder is considered. The optimal stopping rule along with the corresponding payoff is derived by means of applying dynamic programming.

An insurance company receives premiums and is obliged to pay for claims which occur according to some point process at times $T_1 < T_2 < ..., \lim T_n = \infty$. The initial distribution of random variables $S_i = T_{i+1} - T_i, i \in \mathbb{N}$ is F_1, whereas the distribution of random variables circumscribing applicable claim sizes is H_1. At a random, unobservable time θ the distributions change - the initial to F_2, the latter to H_2.

The risk process $(U_t)_{t\in\mathbb{R}_+}$ is defined as the difference between the income and the total amount of claims up to time t. Hence, the considered optimal stopping problem related to the maximization of company's net gains can be explicitly formulated in the following mathematical framework: find such τ^* that $\mathbb{E}(g(U_{\tau^*})) = \sup\{\mathbb{E}g(U_\tau) : \tau \in \mathcal{C}\}$, where $\mathcal{C}$ is a class of feasible stopping times and g is some utility function.

Keywords Risk Process, Optimal Stopping, Disruption, Dynamic Programming