The Level-Crossing Process as a Markov Process

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Abstract. For the classical risk process $R(t)$ that is linear increasing with slope 1 between downward jumps of i.i.d. random sizes at the points of a homogeneous Poisson process we consider the level-crossing process $C(x) = (L(x), (A_i(x), B_i(x))_{1 \le i \le L(x)})$, where $L(x)$ is the number of jumps from (x, ∞) to $(-\infty, x]$ and $A_i(x)$ ($B_i(x)$) are the distances from x to $R(t)$ after (before) the ith jump of this kind. It is shown that if $R(\cdot)$ has a drift toward infinity, $C(\cdot)$ is a stationary Markov process; its transition probabilities are determined. As an application we derive the expected value $E(L(x)L(x+y))$.