Loss Rate Asymptotics

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Keywords: Lévy process, reflection, loss rate, asymptotics, heavy tail, asymptotics.

AMS: 60G51 62P30

Abstract

We consider a Lévy process $\{S_t\}$ which is reflected at 0 and $K > 0$. The reflected process $\{V_t^K\}$ is given as a solution to a Skorokhod problem, which implies a representation $V_t^K = V_0 + S_t + L_t^0 - L_t^K$, where $\{L_t^0\}$ and $\{L_t^K\}$ are the local times at 0 at K, respectively. The regenerative structure of $\{V_t^K\}$ yields a stationary distribution denoted π_K and the loss rate is defined as the mean of L_1^K in the stationary situation. The loss rate was studied in Asmussen & Pihlsgård [1], where it was expressed in terms of the characteristic triplet of $\{S_t\}$ and π_K, and asymptotics of the loss rate as $K \to \infty$ was derived in the case of negative drift and light tails. Asymptotics for positive drift is straightforward by reversing the role of the barriers 0 and K and using a conservation law.
We use the expression for the loss rate from [1] to derive asymptotics in the case of negative drift and heavy tails, as well as in the case of zero drift. In the zero drift case, functional limit theorems (with a Brownian or stable limit) play an important role and are based on continuity properties of the loss rate.

References

[1] Asmussen, S. and Pihlsgård, M. (2007) *Loss rates for Lévy processes with Two Reflecting Barriers* to appear in Mathematics of Operations Research.

[2] Asmussen, S. *Applied probability and queues* Springer, New York, 2003