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Small-time expansions for state-dependent local jump-diffusion models with infinite jump activity.

Motivated by the European call option pricing, we construct a jump-diffusion process $\{X_t\}_{t\geqslant 0}$, starting from $x \in \mathbb{R}$ and solving a stochastic differential equation (SDE), which is driven by a Brownian motion and an independent pure jump component exhibiting state-dependent jump intensity and infinite jump activity. We obtain the second order expansion, in a small time t, of the tail probability $\mathbb{P}[X_t \geqslant x + y]$, for any $y > 0$. A numerical example shows the accuracy of this expansion. As an application of this expansion and a suitable change of the underlying probability measure, we obtain the second order expansion, in a short maturity t, of out-of-the-money European call option prices when the underlying stock price is modeled as the exponential of the jump-diffusion process $\{X_t\}_{t\geqslant 0}$ under the risk-neutral probability measure. (Received August 22, 2014)