Large deviations for Levy diffusions in the small noise regime

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Abstract

This article concerns the large deviations regime and the consequent solution of the Kramers problem for a two-time scale stochastic system driven by a common jump noise signal perturbed in small intensity epsilon > 0 and with accelerated jumps by intensity 1/epsilon. We establish Freidlin-Wentzell estimates for the slow process of the multiscale system in the small noise limit epsilon tend to 0 using the weak convergence approach to large deviations theory. The core of our proof is the reduction of the large deviations principle to the establishment of a stochastic averaging principle for auxiliary controlled processes. As consequence we solve the first exit time/ exit locus problem from a bounded domain containing the stable state of the averaged dynamics for the family of the slow processes in the small noise limit.

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