

A stochastic maximum principle in mean-field optimal control problems for jump diffusions

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Abstract

This paper is concerned with the study of a stochastic control problem, where the controlled system is described by a stochastic differential equation (SDE) driven by a Poisson random measure and an independent Brownian motion. The cost functional involves the mean of certain nonlinear functions of the state variable. The inclusion of this mean terms in the running and the final cost functions introduces a major difficulty when applying the dynamic programming principle. A key idea of solving the problem is to use the stochastic maximum principle method (SMP). In the first part of the paper, we focus on necessary optimality conditions while the control set is assumed to be convex. Then we prove that these conditions are in fact sufficient provided some convexity conditions are fulfilled. In the second part, the results are applied to solve the mean-variance portfolio selection problem in a jump setting.

Keywords : Stochastic systems with jumps; Mean-field control problem; Stochastic maximum principle; Optimal control

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