

On necessary and sufficient conditions for near-optimal singular stochastic controls

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Abstract

In this paper we discuss the necessary and sufficient conditions for near-optimal singular stochastic controls for the systems driven by a nonlinear stochastic differential equations (SDEs in short). The proof of our result is based on Ekeland's variational principle and some delicate estimates of the state and adjoint processes. It is well known that optimal singular controls may fail to exist even in simple cases. This justifies the use of near-optimal singular controls, which exist under minimal conditions and are sufficient in most practical cases. Moreover, since there are many near-optimal singular controls, it is possible to choose suitable ones, that are convenient for implementation. This result is a generalization of Zhou's stochastic maximum principle for near-optimality to singular control problem.

Keywords : Near-optimal singular stochastic control ; Maximum principle ; Necessary and sufficient conditions ; Ekeland's variational principle

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