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Time-inconsistent stochastic control: solving the extended HJB system is a necessary condition for regular equilibria

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Abstract

Time-inconsistent stochastic control stochastic control is a game-theoretic generalization of standard stochastic control. An important result of standard stochastic control is the characterization of the optimal value function as the solution to the Hamilton-Jacobi-Bellman equation. Time-inconsistent stochastic control offers a similar possibility: Björk, Khapko and Murgoci (2016) [2] introduce a system of PDEs, the extended HJB system, and prove a verification theorem saying that *if* the extended HJB system has a solution then it is an equilibrium of a corresponding time-inconsistent stochastic control problem. In the present paper we show that a *regular* equilibrium is necessarily a solution to the extended HJB system.

Keywords: Dynamic inconsistency, Extended HJB system, Equilibrium, Hamilton-Jacobi-Bellman, Time inconsistent preferences, Time-inconsistent stochastic control.

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