Measurability of Optimal Strategies in the Stochastic Optimal Control Problem with Discrete Time

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Abstract. The paper investigates the existence problem of optimal measurable strategies in the control problem of the stochastic system with discrete time and probability criterion.

Keywords: measurability, the probability criterion, optimal control, dynamic programming method, diversification.

The problem of optimal control of the stochastic system with discrete time and probability criterion is investigated. To solve the problem the dynamic programming method is applied.

Note that it is hard enough to find optimal strategies even for the criterion in the form of mathematical expectation and several steps in stochastic system, since there are numerous difficulties for calculation of Bellman's functions at the each step. That's why investigators focus on obtaining either analytical results or some approximation to optimal strategies. But formal application of the dynamic programming method can generates measureless strategies that imply to uncertainty in the probability functional or mathematical expectation.

At the present paper we state that the continuity of the transition function from a current state to the next state, the lower semi-continuity of the terminal state function, and the independence of random factors that arise at each step are required for existence of optimal measurable strategies in recurrence relations of the dynamic programming method.

An example of the problem of portfolio selection is considered. It's established that Bellman's functions are continuous except for one point.