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Mean-variance optimality for semi-Markov decision processes under first passage criteria.

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Summary: This paper deals with a first passage mean-variance problem for semi-Markov decision processes in Borel spaces. The goal is to minimize the variance of a total discounted reward up to the system's first entry to some target set, where the optimization is over a class of policies with a prescribed expected first passage reward. The reward rates are assumed to be possibly unbounded, while the discount factor may vary with states of the system and controls. We first develop some suitable conditions for the existence of first passage mean-variance optimal policies and provide a policy improvement algorithm for computing an optimal policy. Then, two examples are included to illustrate our results. At last, we show how the results here are reduced to the cases of discrete-time Markov decision processes and continuous-time Markov decision processes.

MSC:

[90C40](#) Markov and semi-Markov decision processes

[60J27](#) Continuous-time Markov processes on discrete state spaces

Keywords:

semi-Markov decision processes; first passage time; unbounded reward rate; minimal variance; mean-variance optimal policy

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