Optimal stopping: Bermudan strategies meet non-linear evaluations

Miryana Grigorova
University of Warwick

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Abstract:

We address an optimal stopping problem over the set of Bermudan-type strategies Θ (which we understand in a more general sense than the stopping strategies for Bermudan options in finance) and with non-linear operators (non-linear evaluations) assessing the rewards, under general assumptions on the non-linear operators ρ. We provide a characterization of the value family V in terms of what we call the (Θ, ρ)-Snell envelope of the the pay-off family. We establish a Dynamic Programming Principle. We provide an optimality criterion in terms of a (Θ, ρ)-martingale property of V on a stochastic interval. We investigate the (Θ, ρ)-martingale structure and we show that the "first time" when the value family coincides with the pay-off family is optimal. The reasoning simplifies in the case where there is a finite number n of pre-described stopping times, where n does *not* depend on the scenario ω. We provide examples of non-linear operators entering our framework.