

# A stochastic optimal control problem in the economics of renewable resources: general logistic growth, general harvesting and numerical solution

Nuno M. Brites <sup>1,\*</sup>

<sup>1</sup>*ISEG-School of Economics and Management, Universidade de Lisboa; REM - Research in Economics and Mathematics, CEMAPRE.*

**Abstract** This paper considers stochastic differential equations to describe the growth dynamics of a stock modelled by a generalized logistic growth under a general harvesting function. The latter adds diminishing marginal productivity to effort increases, whereas the former includes several well-known growth functions as specific cases. A Crank-Nicolson discretization scheme, necessary to obtain optimal policies, is derived for the general models. To a particular harvested stock, we apply the optimal control theory to compute the optimal harvesting policy and compare the expected net present value of the harvester's total profit earned across policies.

**Keywords** Cobb-Douglas function, Crank-Nicolson, Generalized logistic, Net present value, Optimal control, Profit optimization, Stochastic differential equations

**AMS 2010 subject classifications** 60H10, 92D25, 93E20, 60H35