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Non-commitment in continuous time

This paper characterizes differentiable subgame perfect equilibria in a continuous time intertemporal decision optimization problem with non-constant discounting. The equilibrium equation takes two different forms, one of which is reminiscent of the classical Hamilton–Jacobi–Bellman equation of optimal control, but with a non-local term. We give a local existence result, and several examples in the consumption saving problem. The analysis is then applied to suggest that non-constant discount rates generate an indeterminacy of the steady state in the Ramsey growth model. Despite its indeterminacy, the steady state level is robust to small deviations from constant discount rates.