Projection Method for Infinite-Horizon Economic Growth Problems

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Abstract—A projection method is proposed for infinite-horizon economic growth problems. Exponentially discounted orthogonal Laguerre polynomials are used as the basis functions for the parameterization of the solution. The convergence of the method is studied numerically for integrable cases in the Ramsey model. It is shown that the best convergence of the method is achieved if the parameter in the exponent is chosen to be equal to the negative eigenvalue of the linearization matrix of the Hamiltonian system around a steady state at infinity. In the considered examples, the projection method leads to a system of equations with a small number of unknowns, in contrast to the methods using finite difference approximation.

Keywords: Galerkin method, Gauss–Laguerre quadrature, infinite-horizon control problem, transversality conditions, Ramsey model, CRRA utility function, Bernoulli transformation.

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