Optimal Consumption Policy in a Carbon-Conscious Economy: A Machine Learning Approach

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Due to the significant carbon emissions generated by various sectors of the economy, fast economic growth can hinder efforts to combat climate change. We study this trade-off by considering an optimal control problem based on the single-good economy model of Borissov/Bretschger (2022) in discrete time. There, a social planner looks for the optimal consumption policy while ensuring simultaneously that the economy grows and overall emissions do not breach a given climate budget. We use a machine learning approach to find an approximate optimal solution to the social planner's control problem. In addition, we present a formal proof demonstrating that the solution for the finite horizon problem converges to the solution for the infinite horizon problem. By integrating the transmission of economic fluctuations into our analysis, we consider the stochastic version of the model.

Keywords: carbon pollution, climate budget, optimal consumption policy, intertemporal utility, optimal control, machine learning.