

Dynamic models in economics typically consider preferences defined over sequences of random consumptions, which are represented by the time-additive expected overall utility which discounts future temporal utilities at a constant rate. As has been made clear in the existing literature, this standard utility assumption is restrictive in numerous economic situations. To name just few limitations, 1. in the standard case, the elasticity of intertemporal substitution is equal to the inverse of the risk aversion coefficient and 2. a discount factor is fixed (in particular independent on the current state and decision) and constant over time.

Principle of optimality in dynamic programming together with a Bellman equation assure overall utility from today onward is an affine transformation of today's temporal utility and the overall utility from the future periods. This specification with constant discounting is a special case of the the Koopmans model with a recursive aggregator, that combines today's instantaneous utility with utility from future periods. The formulation of Koopmans allows, however, for the discount rate between consecutive time period be state, decision or time dependent. In particular it allows for a discounting functional that is endogenous. Clearly, this generalization challenges some standard results on optimal intertemporal choice and valuation of future resources to name just a few.

Recursive utility is dynamically consistency. This property is violated in case of generalized recursive utility function, where the aggregator includes utilities of more than just immediate successor. Missing model with closed form solutions limits our understanding of implications of their specification on dynamic economic problems.

Finally, over the last decades there has been a growing interest in the characterization of solutions to dynamic collective decision problems. A central challenge in such collective decision problems is the heterogeneity of individual preferences, most notably with respect to discount factor. Economists have demonstrated that the collective group preferences over sequences of consumptions are typically time-inconsistent. This finding not only questions the validity of the representative household assumption in dynamic macro-models but also requires to answer a more fundamental problem of defining, characterizing and computing the relevant decision rules in such settings.

Taking this literature background, the aim of the project is to: 1. identify the impact of selected forms of recursive aggregators and endogenous discounting functionals on the existence and characterization of optimal decisions in dynamic stochastic economies and 2. develop tools for its constructive analysis, including time-consistent Markov decision rules, with applications to problems of economics and finance.

Realization of these goals require answering few questions, including: can standard results from dynamic programming be obtained for the general form of dynamic preferences with recursive aggregators and endogenous discounting? which forms of the general form of dynamic preferences with recursive aggregators and endogenous discounting allow for analytic analysis, in particular closed-form solutions, what are the properties of optimal policy functions of the above described models? which specifications of dynamic preferences via recursive aggregators lead to time-inconsistency problems of optimal policies? under what conditions some minimal level of consistency can be guaranteed so that the obtained optimal policies are actually followed or used in the future periods? how the above obtained results influence the valuation of future financial or economic resources over time.

Realization of our project would allow economists to better understand economic dynamics resulting from various endogenous discounting functionals and time-inconsistencies of optimal policies as well as their numerical significance. Project has 8 phases, each finalized with one paper (prepared for publication in leading field journals).