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Time-preference and commitment

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Abstract

We study how the extent of commitment ability influences equilibrium allocations in one-sector growth models in which households have non-geometric discounting functions. Our analysis covers the standard model, in which the economy approaches a stationary equilibrium, and the AK model, which allows for perpetual growth of per-capita output. We demonstrate that higher commitment ability implies a higher level (in the standard model) and a higher growth rate (in the AK model) of long-run per-capita output. Unlike similar studies, we assume that the commitment technology is stochastic and that the non-geometric nature of time-preference is caused by idiosyncratic shocks to households.

JEL classification: D91; O41

Keywords: One-sector growth model; Quasi-geometric discounting; Commitment

1. Introduction

A commonly made assumption in intertemporal economic models is that decision makers have constant time-preference rates. Formally, this means that an agent deciding at time t discounts utility that is derived at time $s \geq t$ by the factor $d(s;t) = \mathrm{e}^{-\rho(s-t)}$, where ρ is a positive real number (the time-preference rate). This model of time-preference is called geometric (or exponential) discounting. Experimental studies of time-preference, however, suggest that the time-preference rate is a decreasing function of $s - t$; see, for example, Ainslie (1992), Loewenstein and Prelec (1992), Loewenstein and Thaler (1989), and Thaler (1981). These experiments, together with the theoretical results derived by Strotz (1956), imply that there exists a problem of dynamic

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inconsistency. In other words, if decision makers use discounting functions that differ from the geometric one and if they are not able to precommit their decisions fully at time t, then they will not stick to these decisions but re-optimize their plans if given the opportunity. This shows that the availability of commitment technologies may have important implications for the behavior of individual agents and for the development of the economy in general, a fact that has already been pointed out by several economists including Strotz (1956), Laibson (1997), and Barro (1999). Following this line of reasoning, the present paper studies how the extent of commitment ability influences equilibrium allocations in one-sector growth models in which households have non-geometric discounting functions.

Our study is closely related to the work of Barro, but differs from the latter in the specific models of time-preference and commitment ability that are used to describe household behavior. Whereas Barro considers a representative consumer with deterministic preferences and access to a deterministic commitment technology, our approach is an extension of the stochastic model proposed by Harris and Laibson (2000). In our model, households are subject to idiosyncratic time-preference shocks such that, at any given point in time, some households behave patiently while others are more impatient. Furthermore, we do not restrict ourselves to the standard model of Ramsey (1928), Cass (1965), and Koopmans (1965) but consider the AK model as well, which allows for perpetual growth of per-capita output. Our approach allows for a simple characterization of the long-run effects of time-preference and commitment ability on economic performance.

The present paper uses a continuous-time framework. Two approaches have been suggested in the literature to deal with the dynamic inconsistency created by non-geometric discounting functions in continuous time. According to the deterministic approach, an agent at time t can precommit decisions over the interval $[t, t + T]$, where T is a fixed non-negative number. The case $T = 0$ corresponds to the absence of any commitment technology, a positive but finite T reflects partial commitment, and $T = +\infty$ corresponds to full commitment. Since the agent at time t has to respect decisions made at earlier times, he or she can effectively only decide what happens at time $t + T$. This approach has been used, for example, by Barro. The second approach has been proposed by Harris and Laibson, who assume that agents are able to revise their plans only at countably many discrete decision points that form a stochastic process. The interpretation of this assumption is that every single agent consists of countably many different selves, each one being in control of the agent's behavior over a finite time period that we call the commitment horizon of that self. At the start of its commitment horizon, the self chooses a policy function that determines the agent's actions throughout the commitment horizon. When the next self takes control, it is not bound by the decisions of the previous selves but is free to choose its own policy. The arrivals of new selves (i.e., the starting points of the commitment horizons) correspond to the decisions points of the agent. As shown by Harris and Laibson, this modelling device leads to an analytically tractable model and removes most of the peculiarities that typically arise in discrete-time models.

Harris and Laibson assume furthermore that each self-values utility derived during its commitment horizon discretely more than utility derived beyond its commitment horizon. This implies, of course, that the distribution of the decision points reflects both the extent of commitment ability and the non-geometric structure of the agents' time-preference. In the present paper, we propose a model that describes the commitment technology and the structure of time-preference by two different processes. More specifically, we assume that the future at any given point of time is subdivided into the immediate future and the distant future. For ease of notation we refer to the immediate future at any decision point as the youth of the self that takes control at that point. Analogously, we refer to the distant future at a decision point as the old age of the corresponding