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Consumption dynamics in general equilibrium: A characterisation when markets are incomplete

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Abstract

We introduce a methodology for analysing infinite horizon economies with two agents, one good, and incomplete markets. We provide an example in which an agent's equilibrium consumption is zero eventually with probability one even if she has correct beliefs and is marginally more patient. We then prove the following general result: if markets are effectively incomplete forever then on any equilibrium path on which some agent's consumption is bounded away from zero eventually, the other agent's consumption is zero eventually—so either some agent vanishes, in that she consumes zero eventually, or the consumption of both agents is arbitrarily close to zero infinitely often. Later we show that (a) for most economies in which individual endowments are finite state time homogeneous Markov processes, the consumption of an agent who has a uniformly positive endowment cannot converge to zero and (b) the possibility that an agent vanishes is a robust outcome since for a wide class of economies with incomplete markets, there are equilibria in which an agent's consumption is zero eventually with probability one even though she has correct beliefs as in the example. In sharp contrast to the results in the case studied by Sandroni (2000) [29] and Blume and Easley (2006) [8] where markets are complete, our results show that when markets are incomplete not only can the more patient agent (or the one with more accurate beliefs) be eliminated but there are situations in which neither agent is eliminated.
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1. Introduction

This paper introduces a methodology for analysing the asymptotic behaviour of individual consumption in general equilibrium in economies where the asset market is incomplete. The case where markets are dynamically complete and endowments are bounded has been analysed extensively and the picture that emerges is that the degree of impatience and the accuracy of beliefs are the key elements that determine whether some limit point of an agent's consumption is strictly positive, i.e. "survives", thereby ensuring that in the long run she matters for asset pricing; attitudes toward risk are irrelevant. This is significant because it appears to validate the market selection hypothesis (henceforth, MSH) which, in the weak form due to Alchian [1] and Friedman [17], requires that only agents whose behaviour is consistent with rational and informed maximisation of returns can survive and affect prices in the long run.[1] The fact that survival depends only on discount factors and the accuracy of beliefs could reflect an intrinsic property of competitive markets; it could also be driven by the assumption that markets are dynamically complete. Very little is known about this and that is the question we address.

We consider an infinite horizon economy with only one good, two agents, a single short lived inside asset, and dynamically incomplete markets. Our assumptions on the structure of uncertainty are quite general since we only require that one of a fixed and finite number of states is realised each period and that the one period ahead conditional probability of the occurrence of a state is uniformly positive. Our assumptions on beliefs are also quite general (see Section 2.6). We use a standard notion of equilibrium in which agents maximise subject to a sequence of budget constraints and the requirement that the value of debt be uniformly bounded across dates and events.[2] Our formulation includes recursive equilibria that can be represented by a Markov chain (Duffie et al. [14] and Ljungqvist and Sargent [24]), a particularly important case in macroeconomics. Our interest is in the asymptotic behaviour of equilibrium consumption and it is well known that studying that is equivalent to studying the evolution through time of the ratio of the values of the derivatives of the Bernoulli functions of the two agents, y_t.

For pedagogical reasons, we briefly return to the special case that arises when markets are dynamically complete and endowments are bounded. In such a framework, equilibrium allocations are Pareto optimal and so, at an interior allocation, the utility gradients of the different agents point in the same direction. When preferences are additively separable across time, the key implication is that the ratio of (the one-period ahead intertemporal) marginal rates of substitution of the two agents weighted by the discount factors is one independent of the date and event; equivalently, y_t can be written as the product of the ratio of the discount factors, the ratio of the beliefs, and an initial condition. So if both the agents have correct beliefs (or even identical incorrect beliefs) and the same discount factor then consumption of both is uniformly positive eventually, while if agents differ in their degree of impatience, then only the most patient agent has uniformly positive consumption eventually—a result conjectured by Ramsey [28, pp. 558–559] and proved by Becker [2], Rader [27] and Bewley [7]. With heterogeneous beliefs, Sandroni [29] showed that among agents with the same discount factor, traders who eventually accurately predict infinite horizon events, and only those traders, have positive wealth eventually; in the absence of such accurate predictors, the entropy of beliefs determines survival and investors whose forecasts are persistently wrong vanish in the presence of a learner. Sandroni considered a Lucas-tree econ-

[1] Cootner [12] and Fama [15] offered a stronger version of the MSH which claims that markets select for investors with correct beliefs, which can be inferred from long run equilibrium prices.

[2] For more on the boundedness property see Magill and Quinzii [25] and Levine and Zame [22].

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