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# Testable implications of consumption-based asset pricing models with incomplete markets<sup>☆</sup>

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## Abstract

This paper studies the testable implications of consumption-based asset pricing models with incomplete markets when idiosyncratic income shocks are permanent. It is shown that the theory places no testable restrictions (beyond absence of arbitrage) on either the macroeconomic data or the first  $N$  moments of the cross-sectional distribution of consumption growth even if the one-period utility function (degree of risk aversion) is known. More precisely, this paper shows that any “observed” joint process of aggregate consumption, arbitrage-free asset returns, and  $N$  moments of the cross-sectional distribution of consumption growth is an equilibrium outcome for some pure discount factor and some process of individual income. The proof is based on the construction of a personal-disaster process (process of extreme idiosyncratic events) which allows for arbitrary variations in idiosyncratic risk without affecting the first  $N$  moments of the cross-sectional distribution of consumption growth.

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## 1. Introduction

This paper studies the testable implications of asset pricing models with incomplete markets. The analysis is based on an infinite-horizon, one-good exchange economy with ex-ante identical, infinitely-lived agents who have CRRA-preferences and face uninsurable idiosyncratic income (endowment) risk. The paper shows that any “observed” joint process

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<sup>☆</sup> Formerly “Consumption-Based Asset Pricing With Incomplete Markets”.

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of aggregate consumption, arbitrage-free asset returns, and  $N$  moments of the cross-sectional distribution of consumption growth is an equilibrium outcome for some pure discount factor and some process of individual income. Thus, without further distributional assumptions, the basic consumption-based asset pricing model imposes no testable restrictions (beyond absence of arbitrage) on the joint behavior of aggregate and cross-sectional data even if the degree of risk aversion is known.

The proof of the main result proceeds in three steps. First, it is shown that if idiosyncratic income shocks are permanent, then there exists an equilibrium in which agents do not trade any assets with payoffs that only depend on aggregate shocks. In particular, agents will not use borrowing and lending (trading of the risk-free asset) to smooth out idiosyncratic income shocks. From an economic point of view, this step shows which income shocks are important for understanding equilibrium consumption and asset returns. The second step uses this no-trade result to show by construction that any joint process of aggregate consumption and arbitrage-free asset returns is an equilibrium outcome for some pure discount factor and some individual income process. This step heavily relies on the fact that the Euler equations can be made to hold for any joint process of aggregate consumption and arbitrage-free asset return if idiosyncratic risk varies with the aggregate state in the appropriate way. Finally, it is shown that the variation in idiosyncratic risk that is required to satisfy the Euler equations can be achieved for arbitrary cross-sectional moments if one allows for extreme idiosyncratic events that have a very small probability of occurrence (personal disasters).

This paper is closely related to the macroeconomic literature on asset pricing. Previous work in this literature has revealed that the basic version of the consumption-based asset pricing model (Lucas, 1978) has encountered several empirical difficulties.<sup>1</sup> However, in a highly influential paper, Constantinides and Duffie (1996) have shown that the combination of market incompleteness and permanent income shocks can go a long way towards reconciling the theory with the data. More precisely, Constantinides and Duffie (1996) prove that any joint process of aggregate consumption and arbitrage-free asset returns is an equilibrium outcome, and in this sense the theory places no restrictions on macroeconomic data. However, within the lognormal-distribution framework employed by Constantinides and Duffie (1996), there is a strong relationship between asset returns and the second moments of the cross-sectional distribution of consumption growth. In contrast, this paper shows that once we move beyond the assumption of lognormally distributed random variables, the theory places no restrictions on the joint behavior of asset returns and second (higher) moments of the cross-sectional distribution of consumption growth.<sup>2</sup> This result seems particularly important in light of recent empirical work that rejects these second moment restrictions for moderate degrees of relative risk aversion (Brav et al., 2002; Cogley, 2002).

Another strand of the literature has investigated the observable restrictions of general equilibrium models with multiple goods in static (Brown and Matzkin, 1996; Chiappori et al., 2002) and dynamic settings (Kubler, 2003). This literature has usually assumed that

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<sup>1</sup> See, for example, Constantinides (2002) for a recent survey.

<sup>2</sup> There is an additional difference between this paper and Constantinides and Duffie (1996), namely that in this paper the pure discount factor is a free variable. Hence, the pricing kernel condition derived in Constantinides and Duffie (1996) is not required here.

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