Doubts and variability: A robust perspective on exotic consumption series [☆]

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Abstract

Consumption-based asset-pricing models have experienced success in recent years by augmenting the consumption process in 'exotic' ways. Two notable examples are the Long-Run Risk and rare disaster frameworks. Such models are difficult to characterize from consumption data alone. Accordingly, concerns have been raised regarding their specification. Acknowledging that both phenomena are naturally subject to ambiguity, we show that an ambiguity-averse agent may behave as if Long-Run Risk and disasters exist even if they do not or exaggerate them if they do. Consequently, prices may be misleading in characterizing these phenomena since they encode a pessimistic perspective of the data-generating process.
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1. Introduction

A principal challenge for the early generations of consumption-based asset pricing models was to generate sufficiently high prices and quantities of risk while respecting a plausible degree of risk aversion and the apparent smoothness in consumption growth from period to period (Mehra and Prescott, 1985 and Hansen and Jagannathan, 1991). One popular response to this challenge has been to introduce 'exotic' elements in consumption dynamics. Notably, the Long-Run Risk (LRR) model of Bansal and Yaron (2004) asserts a small but persistent component in consumption growth that allows the process to exhibit considerable risk over longer horizons without introducing counterfactual volatility at high frequencies. An alternative strategy is to appeal to rare disasters in consumption growth (Rietz, 1988; Barro, 2006; Gourio, 2012; Gabaix, 2012; Nakamura et al., 2013 and Wachter, 2013). However, despite the success of these approaches, concerns have been raised as to their specification, or even existence. By definition, direct evidence of the LRR component is hard to detect in post-war consumption data, leading to the question of whether the component actually exists (Hansen et al., 2008; Marakani, 2009; Beeler and Campbell, 2012 and Croce et al., 2015). With regard to disasters, as noted in Dolmas (2013), the rarity of the phenomenon in question undermines empirical analysis.

We take a different approach. Rather than positing the existence of Long-run Risk or taking a firm stance on the calibration of rare disasters we show that an ambiguity averse agent's fear of model misspecification can generate or exaggerate these phenomena endogenously in the mind of the agent. Consequently, one explanation for why these exotic properties appear to be encoded in prices, but are simultaneously difficult to identify in consumption data directly, is that prices reflect not only the true model of consumption but also the agent's fear of misspecification.

Our agent does not fully trust her 'benchmark' model of consumption growth and the probability distributions it implies. She acknowledges that the benchmark is an approximation to the true data generating process but fears it is misspecified in some unknown way. She expresses these fears by envisaging alternative probability distributions (implicitly capturing misspecifications in her benchmark), which she thinks may plausibly describe consumption. Formally, we endow the agent with a desire for robustness to model misspecification, as captured by the multiplier preferences of Hansen and Sargent (2008). To construct a robust evaluation of random payoffs the agent envisages adverse misspecifications, balancing the damage they could cause against their plausibility. A particular 'worst case' distribution emerges from the agent's optimization problem, allowing insight into the sort of misspecifications against which she desires robustness. The agent then evaluates risky payoffs *as if* this worst case is generating the data. We show that this worst case will naturally encode phenomena akin to LRR and disasters.

We begin with a specification of the benchmark that features white noise consumption growth with persistent variation in conditional variance. The worst case reflects a fear of misspecifications that would imply lower growth and higher volatility, as represented by negative and positive mean shifts in the marginal distributions for endowment and volatility innovations, respectively. Most importantly, the agent's pessimism becomes more extreme when volatility is high, as captured by a greater negative distortion to the mean of the endowment innovation. Since the volatility process is persistent, the consumption growth process under the worst case inherits this persistence. Consequently, the worst case exhibits the hallmark of LRR models – a small but persistent component in consumption growth. The association of high volatility with low growth