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Induced uncertainty, market price of risk, and the dynamics of consumption and wealth ☆

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Abstract

In this paper we examine the implications of model uncertainty or robustness (RB) for consumption and saving and the market price of uncertainty under limited information-processing capacity (rational inattention or RI). First, we show that RI by itself creates an additional demand for robustness that leads to higher "induced uncertainty" facing consumers. Second, if we allow capacity to be elastic, RB increases the optimal level of attention. Third, we explore how the induced uncertainty composed of (i) model uncertainty due to RB and (ii) state uncertainty due to RI, affects consumption and wealth dynamics, the market price of uncertainty, and the welfare losses due to incomplete information. We find that induced uncertainty can

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better explain the observed consumption-income volatility and market price of uncertainty – low attention increases the effect of model misspecification.

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1. Introduction

Hansen and Sargent (1995) first introduced robustness (RB, a concern for model misspecification) into linear-quadratic (LQ) economic models.[1] In robust control problems, agents do not know the true data-generating process and are concerned about the possibility that their model (denoted the approximating model) is misspecified; consequently, they choose optimal decisions as if the subjective distribution over shocks was chosen by an evil nature in order to minimize their expected utility.[2] Robustness (RB) models produce precautionary savings but remain within the class of LQ models, which leads to analytical simplicity. The effects of RB can be understood by viewing decisions through a related model, namely the risk-sensitive (RS) framework from Hansen and Sargent (1995) and Hansen et al. (1999) (henceforth HST). In the RS model agents effectively compute expectations through a distorted lens, increasing their effective risk aversion by overweighting negative outcomes. The resulting decision rules depend explicitly on the variance of the shocks, producing precautionary savings, but the value functions are still quadratic functions of the states. As shown in Hansen and Sargent (2007), risk-sensitive preferences can be used to interpret the desire for robustness as both models lead to the same consumption-saving decisions and similar asset pricing implications.[3]

Sims (2003) first introduced rational inattention into economics and argued that it is a plausible method for introducing sluggishness, randomness, and delay into economic models. In his formulation agents have finite Shannon channel capacity, limiting their ability to process signals about the true state of the world. As a result, an impulse to the economy induces only gradual responses by individuals, as their limited capacity requires many periods to discover just how much the state has moved. Since RI introduces additional uncertainty, the endogenous noise due

[1] See Hansen and Sargent (2007) for a textbook treatment on robustness. For decision-theoretic foundations of the robustness preference, see Maccheroni et al. (2006) and Strzalecki (2011) for detailed discussions. It is worth noting that both the preference for "wanting robustness" proposed by Hansen and Sargent and "ambiguity aversion" proposed by Epstein and his coauthors (e.g., Epstein and Wang, 1994) can be used to capture the same idea of the multiple priors model of Gilboa and Schmeidler (1989). See Epstein and Schneider (2010) for a recent review on this topic. In this paper, we use Hansen and Sargent's "wanting robustness" specification to introduce model misspecification.

[2] The solution to a robust decision-maker's problem is the equilibrium of a max–min game between the decision-maker and nature.

[3] An alternative tractable setup is constant absolute risk aversion preferences (CARA). Although both RB (or RS) and CARA preferences (i.e., Caballero, 1990 and Wang, 2003) increase the precautionary savings premium via the intercept terms in the consumption function, they have distinct implications for the marginal propensity to consume out of permanent income (MPC). Specifically, CARA preferences do not alter the MPC relative to the LQ case, whereas RB or RS increases the MPC. That is, under RB, in response to a negative wealth shock the consumer would choose to reduce consumption more than that predicted in the CARA model (i.e., save more to protect themselves against the negative shock).