A Smooth Model of Decision Making Under Ambiguity

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We propose and axiomatize a model of preferences over acts such that the decision maker prefers act f to act g if and only if $\mathbb{E}_\mu \phi\left(\mathbb{E}_\pi u \circ f\right) \geq \mathbb{E}_\mu \phi\left(\mathbb{E}_\pi u \circ g\right)$, where $\mathbb{E}$ is the expectation operator, u is a vN-M utility function, ϕ is an increasing transformation, and μ is a subjective probability over the set Π of probability measures π that the decision maker thinks are relevant given his subjective information. A key feature of our model is that it achieves a separation between ambiguity, identified as a characteristic of the decision maker's subjective information, and ambiguity attitude, a characteristic of the decision maker's tastes. We show that attitudes towards risk are characterized by the shape of u, as usual, while attitudes towards ambiguity are characterized by the shape of ϕ. We also derive $\phi(x) = -\frac{1}{\alpha} e^{-\alpha x}$ as the special case of constant ambiguity aversion. Ambiguity itself is defined behaviorally and is shown to be characterized by properties of the subjective set of measures Π. One advantage of this model is that the well-developed machinery for dealing with risk attitudes can be applied as well to ambiguity attitudes. The model is also distinct from many in the literature on ambiguity in that it allows smooth, rather than kinked, indifference curves. This leads to different behavior and improved tractability, while still sharing the main features (e.g., Ellsberg's Paradox, etc.). The Maxmin EU model (e.g., Gilboa and Schmeidler (1989)) with a given set of measures may be seen as a limiting case of our model with infinite ambiguity aversion. Two illustrative applications to portfolio choice are offered.