Stochastic Choice and Noisy Beliefs in Games[*]

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Abstract

We study an equilibrium model in which players make stochastic choices given their beliefs *and* there is noise in the beliefs themselves. The model primitives are an action-map, which determines a distribution of actions given beliefs, and a belief-map, which determines a distribution of beliefs given opponents' behavior. These are restricted to satisfy axioms that are stochastic generalizations of "best response" and "correct beliefs", respectively. In our laboratory experiment, we collect actions data and elicit beliefs for a family of asymmetric 2-player games with systematically varied payoffs, allowing us to "trace out" both of these mappings. We find that, while both "noise in actions" and "noise in beliefs" are important in explaining observed behaviors, there are systematic violations of the axioms. In particular, although all subjects observe and play the same games, subjects in different roles have qualitatively different belief biases. The data (actions and beliefs jointly) are well described by a modified version of cognitive hierarchy plus risk aversion. Structural estimates suggest that the player role itself induces a higher degree of strategic sophistication in the player with more asymmetric payoffs.

Keywords: beliefs; quantal response equilibrium; noisy belief equilibrium

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