

Depth of reasoning models with rational agents

Abstract

In the context of the standard guessing game (or "Beauty Contest Game"), we extend level-k and cognitive hierarchy models to include a class of "rational" agents. Rational agents are defined as those who compute a best response taking into account the presence of low-level types, and also other members of their own type. A free parameter in the model is p_{rb} , being the rational agents' belief concerning the proportion of rational agents in the population. The extended model includes as special cases the standard level-k/cognitive hierarchy model (when $p_{rb} = 0$) and also the Nash equilibrium prediction (when $p_{rb} = 1$). We expect the parameter p_{rb} to be somewhere between these extremes, and, if it happens to equal to the true proportion of rational agents in the population, p_r , we may classify the rational agents as "fully rational", since in this situation their best response is the winning response, and they share the prize. The parameters of the model, including p_{rb} and p_r , are estimated using the finite mixture approach. The method of Maximum Simulated Likelihood (MSL) is used to allow for heterogeneity in the beliefs of rational agents.
