

STRATEGIC INTERACTION WITH SOPHISTICATED AGENTS

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Abstract

In the context of the standard guessing game, we extend level-k and cognitive hierarchy models to create a hybrid model which includes a class of "sophisticated" agents. Sophisticated agents are agents who believe that apart from lower-level types there are other sophisticated agents (using the same cognitive process as themselves) in the population and best-respond to this belief. The Finite mixture modelling framework is used, with a parameter p_s representing the proportion of sophisticated agents in the population. A free parameter in the model is \tilde{p}_s , representing a sophisticated agent's belief about the proportion of other sophisticated agents in the population. Our hybrid model nests the standard level-k and cognitive hierarchy models (when $\tilde{p}_s=0$) as well as the Nash equilibrium prediction (when $\tilde{p}_s=1$) as special cases. Furthermore, if a sophisticated agent's belief happens to coincide with the actual proportion of sophisticated agents in the population, i.e. if $\tilde{p}_s=p_s$, we may classify this agent as "clairvoyant sophisticated", since in this situation their best response is the winning response. Allowance for the presence of sophisticated agents greatly improves the explanatory power of the mixture model. The fit is further improved by allowing heterogeneity of beliefs (\tilde{p}_s) among sophisticated agents. The estimates imply that around 24% of the population are sophisticated, but that these sophisticated agents tend to over-estimate this proportion when computing their best response. This is interpreted as a manifestation of the Dunning-Kruger effect.

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