Information and Decision Theoretic Approach to Partial Identification

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Abstract

The available information is usually too complex, insufficient and imperfect to deliver a unique solution for most economic modeling and inference problems. This is particularly true in the social, behavioral and economic sciences as well as other complex and evolving systems. Such problems are called underdetermined. The solution to such problems depends on the assumptions and unobserved information used, as well as on the modeling approach used. One way of handling such problems is by using an Information-Theoretic (IT) decision theoretic approach within a constrained optimization setup. All information enters as constraints and the decision function is an information-theoretic one. Priors (non-sample information) enter in the decision function. Another way to look at such problems is via the partial identification approach, developed mostly since the 1990's by Manski and commonly used in recent economic and econometric studies (Manski, 2003, Tamer, 2010). In that case, one recognizes that in many problems we cannot point-identify the parameters of interest given the (limited) information we have. Instead, conditional on certain information, an identified set can be determined. The potential set of solutions is within that set. In this talk I connect these related, yet very different approaches, for handling partially identified, or underdetermined, problems. To do so, I build on Manski's (2021) recent work on statistical decision theory for evaluating models in decision making. I will present the main results via simple examples accompanied by visual representations of the theory. I will then present simulated experiments to contrast the two approaches for modeling partially identified problems. To analyze these experiments, I will apply the MinMax Regret (MMR) as was proposed by Manski (2021).

Key Words: *Complex Data, Constrained Optimization, Deep Uncertainty, Entropy, Inference, Information Theory, MinMax Regret, Modeling, Partial identification, Sampling Experiments*

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