Optimal Discrete Decisions under Model Uncertainty*

Timothy Christensen† Hyungsik Roger Moon‡ Frank Schorfheide§

November 11, 2021

Abstract

We derive optimal statistical decision rules for discrete choice problems when the decision maker is unable to discriminate among a set of payoff distributions. A leading example is treatment assignment under partial identification, where observational studies may be used to bound—but not point-identify—the average treatment effect. In this decision problem, the decision maker must confront both model uncertainty (about the identity of the true payoff distribution) and statistical uncertainty (the set of payoff distributions must be estimated from data). We derive *efficient-robust decision rules* which minimize maximum risk or regret over the set of payoff distributions and which use the data to learn efficiently about features of the set of payoff distributions germane to the choice problem. Using a limits of experiments framework, we show that efficient-robust decision rules are (i) optimal under average maximum risk and regret criteria and (ii) can dominate seemingly natural alternatives.

Keywords: Model uncertainty, statistical decision theory, partial identification, treatment assignment

JEL codes: C10, C18, C21, C44, D81

*We are grateful to X. Chen, J. Porter, Q. Vuong, and E. Vytlacil for helpful comments and suggestions. The theory and methodology developed in this paper is based on and supersedes the preprint `arXiv:2011.03153` (Christensen, Moon, and Schorfheide, 2020). This material is based upon work supported by the National Science Foundation under Grants No. SES-1919034 (Christensen), SES-1625586 (Moon), and SES-1851634 (Schorfheide).

†Department of Economics, New York University. `timothy.christensen@nyu.edu`

‡Department of Economics and Schaeffer Center, University of Southern California, and Yonsei University. `moonr@usc.edu`

§Department of Economics, University of Pennsylvania, CEPR, NBER, and PIER. `schorf@ssc.upenn.edu`