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Graduation Term:FS 2017
Department:Economics
Degree:PhD
Title:ESSAYS ON DECISION MAKING UNDER UNCERTAINTY: STOCHASTIC DOMINANCE

Decision making under uncertainty is certainly the most important task of an economics agent and it is often a very difficult one. In most cases, the goal of further analysis of uncertainty is not necessarily to reduce it, but to better understand it and its implications for the decision makers. In this regard, this dissertation focuses on an useful concept called stochastic dominance (SD) and its econometric inference on various applications. SD is not only a comprehensive measure of risk and uncertainty, but has strong implications for the welfare and utility of economic agents.

The dissertation consists of three chapters.The first chapter proposes a nonparametric Bayesian method for providing probabilistic measurement on stochastic dominance (SD) of any order. We use the approach of Rubin (1981) for implementing the model of Ferguson (1973,1974) with an improper noninformative Dirichlet process prior. The posterior is not only logically coherent among all orders of SD, but relevant for decision making under uncertainty in welfare analysis. Monte Carlo results show our Bayesian procedure outperforms other nonparametric frequentist tests in terms of Bayes risk in many cases. We extend the model to consider sample weights and clustered sampling error. The results are illustrated using data from the Panel Study of Income Dynamics.

Chapter two discusses the improper use of ordinal data as a measure of health in empirical research. In particular, we focus on a kind of questions, in which its qualitative nature in measurement restricts the scope of questions it can answer. To illustrate this limitation, we present two examples using ordinal self-reported health status (SRHS). In the first example of age effect on health, we find SRHS alone may not be adequate for inferring health inequality or dispersion. It shows only that average health declines with age. We also study the inter-cohort trend in health inequality (i.e., cohort effect). The main findings are 1) the elderly are reported healthier today than before and 2) the health of the Black elderly are largely improved over years and becomes less unequal since year 2010. Appropriate statistical inferences on ordinal data are recommended.

Chapter three proposes and implements an enhanced indexing strategy based on the stochastic dominance (SD) decision criteria, nonparametric Bayesian (NPB) inference and stochastic optimization algorithm. SD and NPB share a distribution-free assumption framework which allows a robust approach for non-normal return distributions. Further, NPB provides the probabilistic basis for optimization when uncertainty is present in problems of decision making. In particular, SD/NPB method can be applied by constructing a optimization problem constrained by stochastic dominance relations. We discuss the uncertainties around these relation and find the optimal portfolio using the mixed-integer linear programming (MILP) algorithm. Our method yields important ex-ante performance improvements relative to heuristic diversification, Mean-Variance optimization and widely-used Standard & Poor 500 index (SP500). Relative to SP500, our method improves average out-of-sample return by more than nine percentage points per annum, with higher Sharpe ratio, three-month re-balancing and no short sales.