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PROJECT TITLE: "Fatalistic Choice Rules"

MOTIVATION AND MODELING

Maxmin (choosing an alternative with the highest minimal outcome) and *maxmax* (choosing an alternative with the highest maximal outcome) have played an important role as tools and concepts in the choice literature. They have been used as assumptions and derived as solutions to optimization problems in a wide range of applications: individual decision making under risk and uncertainty, social choice, analysis of political elections, games, to mention the most prominent. Curiously, there does not exist a concept that captures less extreme choice behavior. The closest existing approaches are *α-maxmin* (Arrow and Hurwicz, 1972), *combination of expected utility and maxmin* (Gilboa (1988), Jaffray (1988)) and *neo-additive capacities* (Chateauneuf, Eichberger and Grant, 2002). The first one is a weighted average of minimal and maximal outcome and therefore the preferences that it induces do not depend on any intermediate values. The other concepts rely on expected utility optimization and thus, require much stronger restrictions on preferences and beliefs than the original maxmin and maxmax.

The goal of this project is to develop a formal way of modeling choice of decision makers who anticipate an intermediate level between maxmin and maxmax. We call the reasoning underlying such choice behavior *fatalistic*. Specifically, consider a decision maker choosing among uncertain alternatives. We say that she chooses fatalistically if, given her beliefs about outcomes, she evaluates an alternative by a quantile ($\tau \in [0,1]$) of the corresponding beliefs distribution (for example, a median). She is a τ-quantile maximizer if she is choosing an alternative with the highest τ^{th} quantile payoff. Thus, the concept unifies the existing approaches and generalizes them in a smooth way.

The decision rule we define has a number of appealing features.

(a) In contrast to reasoning based on expectation, the optimal choices are determined by the interaction of cardinal properties of beliefs and only *ordinal* properties of outcomes.

(b) By introducing a new primitive, it allows to weaken the role of beliefs in modeling and making predictions.

(c) The model delineates the relative role of the structure of payoffs and beliefs on the optimal choices. It generates and formalizes heterogeneity in reasoning across individuals with different anticipation levels (τ).

MAIN RESULTS

(1) We characterize properties of fatalistic best-response correspondences and use them to derive testable restrictions on choice behavior (without restricting beliefs). In particular, we ask: Which actions and outcomes will be observed if individuals reason fatalistically? What are the bounds to identification as a function of properties of event space?

(2) We contrast predictions of fatalistic reasoning with models imposing other assumptions on rationality, taking the standard Bayesian rationality as a benchmark.

(3) To provide decision-theoretic foundations for fatalistic reasoning, we axiomatize τ-maximization and derive functional representation of preferences. We use Savagean setting and also relate our characterization to the axioms behind probabilistic sophistication (Machina and Schmeidler, 1992).

(4) One of the main applications we provide involves strategic interactions.

When a horizon of play is short, it is more likely that the players know each other's anticipation level (τ) than that they know each other's beliefs. Taking this view, identifying restrictions on choice

behavior under fatalistic reasoning that come from (possibly different orders of) knowledge without imposing any conditions on beliefs should increase the (low) predictive power of the decision-making model in short-run games.

Since the conditions we impose on choices are very mild, we cannot use standard solution concepts. We propose set-valued methods of modeling outcomes and use them to derive predictions for outcomes of games among players who reason fatalistically. We relate the implied sets of outcomes to subsets of the rationalizable set that we define and characterize for our framework. We also investigate an interaction of fatalistic and expectation-based reasoning and propose a tool to study them jointly in strategic context. Further, we ask how the model allows to strengthen predictions compared to those assuming expectation-based reasoning.

KEY BIBLIOGRAPHY

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