

SUBJECTIVE EXPECTED UTILITY IN GAMES

ALFREDO DI TILLIO

ABSTRACT. The specification of a payoff function for each player is all that is needed to define a game with complete information in the usual way, the interpretation of a player's payoffs being that they are von Neumann-Morgenstern utilities. But the latter axiomatic derivation was devised for single person decision problems involving *objective* lotteries over outcomes, and thus it seems not completely adequate when applied to games of strategy — where, by definition, the only uncertainty a player has is about the other players' choices. In this paper it is argued that, in order to obtain sound foundations for expected utility maximization in games, what one should really care about is how players rank *subjective* lotteries over outcomes (or “acts”) and that, therefore, a more appropriate paradigm of uncertainty in games should be one that parallels that of Savage, rather than that of von Neumann and Morgenstern. But in Savage-like models utility numbers are invariably accompanied by “beliefs”, which in turn suggests that the standard description of a game is, in a sense, incomplete, and brings further motivation and justification to the “modern”, decision-theoretic approach to game theory — advocated by several authors, most notably Aumann, in recent years.

In this paper an interactive decision theoretic analysis is carried out in the spirit of Savage. Particular care is required in deciding what the description of a state of the world should include and how to axiomatically derive the subjective probabilities and utilities, and in establishing what a “common assumption of rationality” by the players means and implies. Results are still preliminary but seem to point in the right direction: there is indeed a natural way to extend the subjective expected utility paradigm to the multi-person case — this is done by means of a “universal space of acts” that is generated from the data of the game — which makes the entangled relationship between preferences, beliefs and behavior in the game more transparent.

Address: Department of Economics
University of Pennsylvania
3718 Locust Walk
Philadelphia, PA 19104-6297
USA

E-Mail: adtillio@ssc.upenn.edu

Phone: +1 215 573 3381

Date: March 31, 2003. This extended abstract has been prepared for submission to the Organizers of the 14th Summer Festival on Game Theory, SUNY at Stony Brook, July 21–25, 2003.