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INTERIM CORRELATED RATIONALIZABILITY IN INFINITE GAMES

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Abstract. In a Bayesian game, assume that the type space is a complete, separable metric space, the action space is a compact metric space, and the payoff functions are continuous. We show that the iterative and fixed-point definitions of interim correlated rationalizability (ICR) coincide, and ICR is non-empty-valued and upper hemicontinuous. This extends the finite-game results of Dekel, Fudenberg and Morris (2007), who introduced ICR. Our result applies, for instance, to discounted infinite-horizon dynamic games.

JEL Numbers: C72, C73.

1. Introduction

Interim correlated rationalizability (henceforth ICR) has emerged as the main notion of rationalizability for Bayesian games. Among other reasons, it has the following two desirable properties: Firstly, it is upper hemicontinuous in types, i.e., one cannot obtain a substantially new ICR solution by perturbing a type. Secondly, two distinct definitions of ICR coincide: The fixed-point definition states that ICR is the weakest solution concept with a specific best-response property, and this is the definition that gives ICR its epistemological meaning, as a characterization of actions that are consistent with common knowledge of rationality. Under an alternate definition, ICR is computed by iteratively eliminating the actions that are never a best response (type by type), and this iterative definition is often more amenable for analysis.

The above properties were originally proven for games with finite action spaces and finite sets of payoff parameters (by Dekel, Fudenberg, and Morris (2006, 2007), who introduced ICR). However, in many important games these sets are quite large. For example, in the infinitely repeated prisoners' dilemma game, the set of outcomes is uncountable. Hence, the

In earlier versions of the paper, the results were confined to compactly metrizable type spaces. We thank an anonymous referee for detailed comments and for providing the main arguments that extended our proofs to the type spaces that are completely metrizable and separable.