Robust Identification in Repeated Games*

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Extended Abstract

We develop a method to identify and estimate structural parameters in infinitely repeated games with perfect or imperfect public monitoring. Despite the relevance of repeated interactions in empirical applications, identification results are virtually nonexistent for this class of games, with only Lee and Stewart (2016) and Abito and Chen (2021a,b) as important exceptions. Our approach is robust in two respects. First, the method does not rely on equilibrium selection assumptions besides subgame perfection in repeated games with public monitoring and perfect public equilibrium in repeated games with imperfect public monitoring. Second, the method does not require the analyst to fully specify the informativeness of the game's monitoring structure or agents' patience.

To develop our identification strategy, we build on a result in Awaya and Krishna (2019) according to which the set of Nash equilibrium payoffs in repeated games is a subset of the set of coarse correlated ε-equilibrium (ε-CCE) payoffs of the underlying one-shot game. The value of ε depends on the discount factor and the quality of monitoring. We construct the identified set in the following way. The one-shot deviation principle allows us to rationalize a players' action profile at any (public) history as an inequality involving sums of stage game and equilibrium continuation payoffs. Such continuation payoffs must lie in the intersection between the set of ε-CCE payoffs and the set of feasible and individually rational payoffs of

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the underlying one-shot game. This insight is enough for bounding the frequency of a given action profile and finding conditions for the given action profile to be a Nash equilibrium in a specific normal form game. The identified set consists of the set of parameters that are compatible with the bounds on the frequency of action profiles.

The approach requires the researcher to observe action profiles. Data can come from a cross-section of repeated games, a panel from a single game, or a combination of them. Our method does not rely on a recursive characterization of the set of equilibrium payoffs, which is typically expensive from the computational viewpoint. In contrast, the intersection between the set of ε-CCE payoffs and the set of feasible and individually rational payoffs of the underlying one-shot game can be found by solving linear programs. Thus, our estimation strategy is computationally tractable.

We illustrate our method in the context of simple infinitely repeated games studied to model Industrial Organization applications. We show that the method yields useful bounds on the structural parameters of interest. In particular, the method is useful to recover bounds on payoff parameters, a common discount factor, the informativeness of the monitoring structure, or any combination of them. Although the identified set we construct is not sharp, our method yields bounds on the parameters of interest that are sharper than those under any other existing method which is computationally as simple as ours. This is particularly so if players are not very patient or the monitoring structure is not very informative.

References

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