

The dynamic stability of coalitionist behaviour for two-strategy bimatrix games

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KeyWords:dynamic stability, coalitionist behaviour

ABSTRACT

Two units I and II of agents are considered with a continued pair-wise conflict between agents of both population modelled by a bi-matrix game. Continuous dynamic models are proposed describing the change of the relative frequency of agents with coalitionist behaviour (having propensity for coalition). The basic idea is to adapt the so-called replicator dynamics describing the time variation of certain behaviour types in a population (Hofbauer and Sigmund 1998, Cressman 1992). (In evolutionary game context replication means that "like begets like": a behaviour type is passed down from parent to offspring.) Adapting the idea sketched in Weibull (1995), see also Hofbauer and Sigmund (1998), the social evolution of behaviour types (strategies) in a population of pair-wise interacting agents, such as individuals of firms or other social or economic units. The replication of carriers of a behaviour type is a result of imitation. An agent is ready to review his strategy at a certain rate depending on the success of another strategy. In the corresponding replicator dynamics the relative time rate of the frequency change of a strategy is positive if this strategy performs better than the average, and negative in the opposite case. We propose dynamic models where in each unit of agents the basic behaviour types are: coalitionist and non-coalitionist. These types may be divided into sub-types according to the strategy choice in conflicts where coalition is not formed.

In the monomorphic dynamic model, based on a two-strategy two-person (bimatrix) game, in the pair-wise conflict of coalitionists a two-person coalition is formed, and always the equilibrium or the maximin strategies are played if at least one of the agents is non-coalitionist (Owen 1968, 1995). In the polymorphic dynamic model, the pair-wise conflict of two coalitionists is again modelled by a two-person coalition game, but if at least one of the agents is non-coalitionist, they use one of the two fixed pure strategies. In both models the imputation is a fixed parameter. The asymptotic behaviour of these models is studied and illustrated by numerical examples.

References

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