When beliefs about future create future - belief distorted Nash equilibria and their applications in economics
Extended abstract

Agnieszka Wiszniewska-Matyszkiel
Institute of Applied Mathematics and Mechanics
Warsaw University

This paper presents new concepts of equilibria which can be applicable in dynamic game theoretic problems which differ from situations usually taken into account in game theory.

The class of games under consideration are discrete time dynamic games in which players have imperfect information about the game thay play.
Players can observe the state variable changing in response to a statistic of players' decisions and past values of this statistics, and form some expectations about its future values based on their observations and best respond to their expectations. Expectations may have various forms. A general model is built, encompassing both games with finitely many players as well as games with infinitely many players.

Notions of belief-distorted Nash equilibrium (BDNE) and self-verification of beliefs are introduced. The relations between BDNE and Nash or subjective Nash equilibria are examined as well as the existence.

The following examples can be used to illustrate the concepts and their properties.

1. A simple ecosystem constituting a common property of its users. We assume that the number of users is large and that every player may have problems with assessing his/her marginal influence on the aggregate extraction and, consequently, the future trajectory of the state of the resource.

2. A repeated minority game being a modification of the El Farol problem. There are players who choose each time whether to stay at home or to go to the bar. If the bar is overcrowded, then it is better to stay at home, the less it is crowded the better it is to go.

3. A model of a market describing either Cournot oligopoly or competitive market (considering these two cases as one model is not a coincidence). Players may have problems with assessing their actual share in the market and, therefore, their actual influence on prices.

4. A repeated prisoners dilemma. At each stage each of two players assesses possible future reactions of the other player to his/her decision to cooperate or defect at this stage.

Keywords: multi stage and repeated games, games with continuum of players, n-player dynamic games, Nash equilibrium, belief-distorted Nash equilibrium, subjective equilibrium, self-verification of beliefs, common ecosystem, Cournot oligopoly, competitive equilibrium, minority game, prisoner's dilemma.