Learning in repeated games: evidence from tennis

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Research goal: there is massive research starting from Walker and Wooders (2001) that tests if tennis players play payoff-maximizing mixed strategies. The main test is usually the comparison of winning probabilities across the types of serves used in the same match. If the difference in probabilities is non-significant, then we do not reject correct game by players. One of the main problems of such test is the aggregation of serves by type inside one game.

Consider Figure 1. It is clear that Rafael Nadal changes his serving strategy from serving from center to serving to width and body first and then returning to the serves towards the center. We think that the observed change in behavior might be explained either by learning by Rafael Nadal and adjusting of his serving strategy or by changing strategy of his opponent. In any case, there is a room for the research about the learning process in the repeated game based on the availability of empirical data on tennis.

The main statistical method is regression of the following form:

\[ Y_i = \beta_1 + \beta_2 succ_{i-1} + \beta_3 rat_i + \beta_4 opprat_{-i} + \epsilon_i \]

Where \( Y_i \) is the probability of \( i^{th} \) serve to be of a specific type, \( succ_{i-1} \) is the outcome of the previous serve, \( rat_i \) is the rating of the server and \( opprat_{-i} \) is the rating of the opponent. The main hypotheses are:

1. players learn during the game and prefer to use the serves that have higher probability of success.
2. The speed of adjustment depends on the skills of the players and better players in general adjust faster.

Data: we currently have data from two sources (Jeff Sackman’s database and Match Charting project) that jointly allow us to answer the research question.

Practical significance of the research: on the one hand, the literature on learning in the repeated games is limited to the laboratory experiments and tennis provide perfect setting for such analysis, while on the other hand this paper can deal with the false tennis modelling in which researchers assume that all points are identical to players and that players have perfect knowledge of potential probabilistic outcomes of all serves.