Can We Fix the Match-Fixing Problem? – An Agent-Based Analysis

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Aim

Our research deals with the implementation of a computer program using the technique of Agent-Based Modelling that simulates the background proceedings of match fixing as an approach to detect and analyse different factors that are influencing the match fixing decision. The overall goal of the simulation is to deliver recommendations for action to more effectively fight the problem.

Theoretical Background and Literature Review

Match fixing has existed for decades, resulting in collapsed football leagues (Hill, 2010), allegations of widespread match fixing in tennis (Cox, 2016) and a variety of global scandals risking the integrity of sports and society. However, despite being aware of the issue, the proceedings surrounding illegal gambling and corruption in sports, as well as the extent to which matches are fixed, remain relatively unknown. While athletes play a key role on the pitch, deliberately manipulating the outcome of a match, Hill (2010) mentions the existence of large illegal gambling networks that offer bribes to athletes, officials or referees in order to get them to fix a match, where money appears to be the main motivation for all involved parties (Hill, 2009; Deutscher, Dimant & Humphreys, 2017). High-ranked sports institutions are actively fighting the seemingly increasing phenomenon of match fixing and seeking to safeguard the integrity of sports and prevent corruption, resulting in three key parties that we determine as most relevant and that are involved in the proceedings surrounding corruption in sports: athletes, a gambling mafia and a control authority.

Research Design and Data Analysis

For the first time, we introduce the technique of computer simulation via Agent-Based Modelling as a way to develop more efficient strategies in the fight against match fixing. An Agent-Based Model (ABM) is a computer program in which an artificial model of a real-world system is created. On the micro-level, heterogeneous agents with diverse characteristics interact with each other and their environment with the overall goal of forming the patterns seen in the real world and then drawing conclusions from such interaction (Hamill & Gilbert, 2015), which, on the macro-level, leads to an emergent system of interactions that cannot be derived directly from the decision algorithms of the individual athletes (Epstein, 1999). Our multi-period match fixing ABM is designed for sports in which participants compete as individuals rather than in teams, such as tennis, and simulates the interactions of the three above mentioned objectives, namely (i) Athletes, (ii) a Gambling Mafia, and (iii) a Control-Authority. Athletes are assigned to one of three Behavioural Types with distinct decision criteria that influence their match fixing decision. Athletes are therefore classed as one of 'rational', using a utility function to make a decision; 'social', where the decision is based on behaviour patterns in the respective social network; or 'ethical', strictly following the rules and consistently refusing to participate in match fixing. In every period, pairs of athletes compete against each other and create a competition result. The Control Authority sets a win bonus for those competitions as well as fines and bans for those convicted of match fixing. Furthermore, the Control Authority investigates a specific number of competitions in every period, leading to fines and bans when athletes are detected fixing matches. The Gambling

Mafia tries to gain economic advantage through illegally manipulating the competition. They target specific athletes and offer a bribe to get them to fix a match.

Results and Discussion
During the analysis, a simulation was run over 100 periods with changing circumstances and altered variable values, with the goal of seeing the respective outcome in the behavioural types' specific match fixing decisions when key attributes are modified. The analysis showed that the Gambling Mafia has the power to dramatically influence the match fixing decisions of the rational type, which also has network effects and thus affects the social type. The Control Authority has the option to counteract that effect by introducing a higher Win Bonus or setting a higher Ban for those detected. Both measurements resulted in a drop in the number of athletes participating in match fixing, even though that effect appears to decrease if the Bribe offered by the Gambling Mafia is high enough. Interestingly, a one-time Fine, impartial of its amount, did not have a significant influence. Furthermore, the Control Authority appears to be able to achieve a higher detection rate, but only with significantly greater effort.

Conclusion and Implications
In general, the analysis emphasized the importance of educating athletes and actively undertaking prevention efforts. The goal of our research is to refine the simulation model in the future and thus create a computer simulation as close to reality as possible, which, in the long term, allows recommendations for actions to sustainably fight match fixing in sports.

References

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