Football fever: self-affirmation model for goal distributions

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Analyzing football score data with statistical techniques, we investigate how the highly co-operative nature of the game is reflected in averaged properties such as the probability distributions of scored goals for the home and away teams. It turns out that especially the tails of the distributions are *not* well described by the Poissonian or binomial model assuming uncorrelated random events. Instead, a less basic but good effective description of the data is provided by negative binomial or generalized extreme value distributions. To understand this behavior from first principles, we propose to modify the Bernoulli random process underlying the Poissonian model to include a simple component of *self-affirmation* which describes the data surprisingly well and allows to interpret the observed deviation from Gaussian statistics. The phenomenological distributions used before can be understood as special cases within this framework. We analyzed historical football score data from many leagues in Europe as well as from international tournaments, including data from all past tournaments of the "FIFA World Cup" series, and found the proposed models to be applicable rather universally. In particular, here we analyze the results of the German women's premier football league and consider the two separate German men's premier leagues in the East and West during the cold war times and the unified league after 1990 to see how scoring in football and the component of self-affirmation depend on cultural and political circumstances.

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