

The first goal is the deepest: Can mathematics predict the match outcome?

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Jack Brimberg and Bill Hurley of The Royal Military College of Canada, Kingston, Ontario, point out that sports commentators will often argue the importance of scoring the first goal and often suggest that a team improves its chances of winning considerably by scoring it. This kind of punditry more commonly arises during playoff games which tend to be played more defensively.

However, although the total number of goals scored in a soccer or hockey match is usually small, Brimberg and Hurley wanted to find out whether that first goal is all important or not. They have done this by calculating the [probability](#) of the first-goal team winning at discrete points in the match after the first goal is scored based on the number of minutes remaining in the game. They also take overtime into account to adjust the weighting on their formula appropriately.

Team X is playing team Y. Team X scores first and there are T minutes left in regulation time. They then assume that goal scoring follows the law of statistics known as a Poisson distribution, which for hockey and soccer it does. Scoring in other sports, such as tennis and baseball follow a different set of statistical rules as there are different scoring factors and more "goals" scored in a match.

Therefore, the number of goals scored, N, follows the Poisson pattern and has a probability of a certain number being scored in total by both sides of "lambda". If both teams are playing hard, to win, then there is an equal chance of them scoring after that first goal. However, there are factors such as league position and seasonal performance to take into account, so each of those has a parameter in the final formula.

The formula breaks down as follows: From the first whistle, team X has a 50:50 chance of winning. However, if the team scores at just 5 minutes of play, with 55 minutes left to play in the first period of a hockey match, then the team's chances rise to

7 to 3 (70%). However, if they score the first goal much later in the game, with say, 25 minutes remaining in the second period, then their chances of winning the match rises to 4 to 1 (80%).

Of course, probability and statistics are notoriously difficult to pin down in real life, so it is best to take any such mathematical punditry with a pinch of salt when watching the fortunes or misfortunes of your team. That applies whether you're catching the Toronto Maple Leafs in hockey or your flight of fancy is The Newcastle Magpies in soccer.

The researchers' ultimate aim is not to see sports pundits out of a job, but to provide an interesting example of how statistics problems might be taught in the classroom. The current example requires explanation and understanding of several important topics in statistics, they explain, including the exponential, Poisson, and binomial distributions, probability trees, and the use of conditioning to calculate complex probabilities.

More information: "A note on the importance of the first goal in a National Hockey League game" in the *International Journal of Operational Research*, 2009, 6, 282-287

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