ODDS AND PROBABILITIES

Laxbytes.com generates odds or probabilities that (1) teams will win there conference tournament, (2) be selected to the NCAA Championship Tournament and (3) become the NCAA Champion. A description of the method we use to calculate these probabilities and a list of assumptions and limitations to this method are discussed below. While reference is made to the math, preference is given to readers who want a simple explanation rather than an in depth explanation of the mathematical details.

The short answer for describing the method is that we use a "***Monte Carlo***" simulation to predict all outcomes.

"***Monte Carlo methods****, or* ***Monte Carlo experiments***, are a broad class of computational algorithms that rely on repeated random sampling to obtain numerical results. The underlying concept is to use randomness to solve problems that might be deterministic in principle. They are often used in physical and mathematical problems and are most useful when it is difficult or impossible to use other approaches. Monte Carlo methods are mainly used in three problem classes:[1] optimization, numerical integration, and generating draws from a probability distribution." --- Wikipedia

So let's apply this to lacrosse, and specifically predicting (1) what are the chances that a team will win its conference; (2) be selected to the NCAA tournament and (3) be crowned champion.

What we know?: We know a team's regular season schedule and scores of games already played. In addition, we know what teams are in each conference and how many teams will play in the conference tournament. The NCAA tells us what conferences receive automatic qualifying (AQ's) and the criteria for a fixed number of invites (at-large selections) to the championship tournament. This criteria includes RPI and SOS among others factors. The NCAA also lets us know the seeding for the tournament and the path leading up to and including the championship game.

What we do not know?: We don't know the outcome of games yet to be played for the remainder of the season and post season tournament games

If we can predict the scores of games to be played, we can predict who will be the automatic qualifiers, who will be the at-large selections, what the seeds will be for the championship tournament and who will be champion! ***But we obviously cannot predict the future*** so where do we go from here? The answer is we use some basic assumptions and hypotheses that, if true, will predict a probable outcome when computed over a large enough sample. So let me repeat this in sport's lingo. Every team plays a schedule of games and we guess at the score of each game that have not been played for the remainder of the season. Based on these scores, we predict who will get in the tournaments and advance to their final destination.

Now ***how do we predict the game score of a game yet to be played***? We use a random number to generate the winner for each game but we bias the score based on the strength of the two teams playing each other. In this way, the outcome is semi-random, but favors the better team. How do we know the strength of each team? We use the power ratings based on goal margins computed by Laxbytes.com to tell us which team is better and by how many goals. What this means is that if a team A is much better than team B, team A will randomly win a d*isproportionate* number of games to team B. On the other hand, if team A and B are of equal strength, then team A and B will win about the same number of games. Thus for a particular game a weak team will occasionally beat a stronger team, but if we were to generate this game score multiple times the better team will win more often.

So if we apply this technique to one entire season and predict the outcome of remaining games, then we will get results but they will be at the mercy of the random numbers selected and final results will not be accurate. But what if we applied this technique to **100,000 seasons or simulations**, where each season is replayed with new random outcomes of game scores. Then the results are no longer dependent on the random number but rather by the validity of the power ratings and other assumptions. In short, we made an assumption that the power ratings accurately predict the strength of teams and that by running 100,000 simulations we managed to collect results that satisfy other guidelines (e.g., the NCAA selection criteria) to predict the final outcome. So it's possible that a weak team can get lucky in defeating stronger teams all the way to the championship. It is highly unlikely though and that team will have a low or zero probability of being champion. So no team is completely left out.

How do we get the final probabilities? We count for each simulation how many times a team (a) wins the conference tournament and (b) is selected for the championship tournament and (c) wins the tournament. Then we divide these results by the total number of simulations. As an example, team A wins the championship 10,000 times out of 100,000 simulations. Then team A has a 10% chance {10,000/100,000)* 100} of being champion.

Where does this method break down? If fails if (1) the power ratings (based on goal margin of victory for games already played) does not accurately represent the true strength of teams; (2) the NCAA selection committees ignore the NCAA selection guidelines; (3) the seeding is done arbitrarily; (4) the sample size of 100,000 is not sufficient to reach '*convergence*' (the results stop changing with an increased sample size) and possibly other poor assumptions.

So let's try an example:

Johns Hopkins is in the Big Ten. Johns Hopkins will make the NCAA tournament if it wins the Big 10 tournament and becomes an automatic qualifier or, if not, it earns one of the 8 at-large bids. Now, let's assume the season is half over. The remaining games for Hopkins are assigned a win or loss based on Hopkins power rating and each of its opponent's power rating, the home-field advantage and a random number. The random number is between 0.0 and 1.0. If Hopkins is favored over its opponent by 3 goals, then if the random number lies between 0.0 and 0.7, then Hopkins wins that game. If the random number is between 0.7 and 1.0, then the opponent wins the game. If Hopkins and the opponent have the same power rating and play on a neutral field, then if the random number lies between 0.0 and 0.5, Hopkins wins and if the random number lies between 0.5 and 1.0, then the opponent wins. Now after the regular season is completed, and the B10 tournament teams are selected and seeded, the program then plays thru each game of the tournament until a champion is determined. If Hopkins is the AQ, then they are in the NCAA tournament. If not, then the NCAA selection criteria for the tournament is evaluated (RPI, SOS and Quality wins) and the 8 teams with the best results are selected. If Hopkins is one of those 8 teams, then they get an at-large selection. If Hopkins is in the championship tournament, we play through the tournament based on predicted seeds and this determines the schedule for this tournament. If Hopkins keeps winning up to and including the final game, then they are the champion. Now all of the above calculations are repeated 10,000 to 100,000 times to make the sample large enough so that a probability for all teams is calculated where the random numbers influence disappears. This is similar to gambling in Vegas where you might occasionally win in Vegas, but if you persist in gambling, you'll eventually lose because the house has an advantage. Now, the question arises, why not just consider the teams power ratings to determine who are the best. This is not the case because the total calculation takes into account NCAA criteria for selection and seeding which are both devoid of any power rating's influence. So it's a combination of influencers.

The Monte Carlo technique formulates and solves problems numerically based on a set of clearly defined conditions and assumptions where there may not be any other mathematical or numerical alternative. These results are based on data, an algorithm and NCAA guidelines. In the final analysis, these results are just an unbiased opinion and should be treated as such.