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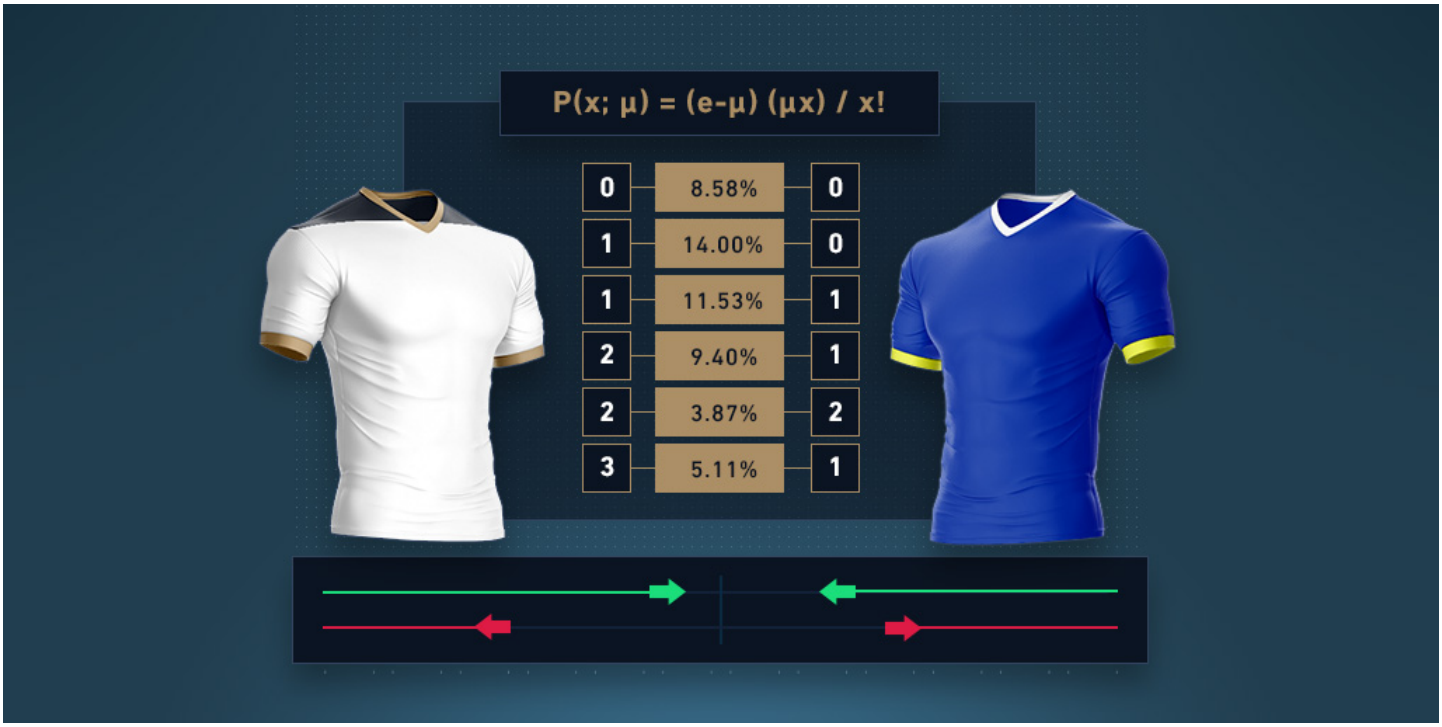
BENJAMIN CRONIN SOCCER APR 27, 2017

Poisson Distribution: Predict the score in soccer betting

How to use Poisson Distribution to predict soccer scores
Using Defence Strength & Attack Strength values
Calculate the most likely score-line
Converting estimated chance into odds



Poisson Distribution, coupled with historical data, provides a simple and reliable method for calculating the most likely score in a soccer match which can be applied to betting. This simple walk-through shows how to calculate the necessary Attack/Defence Strength measures along with a handy shortcut to generate the Poisson Distribution values. In no time you'll be predicting soccer scores using the Poisson Distribution.

Poisson Distribution is a mathematical concept for translating mean averages into a probability for variable outcomes across a distribution. For example, if we know Manchester City average 1.7 goals per game, so by

putting the Poisson Distribution formula tells us that this average equates to Manchester City scoring 0 goals 18.3% of the time, 1 goal 31% of the time, 2 goals 26.4% of the time and 3 goals 15% of the time.

Poisson Distribution - Calculating score-line probabilities

Before we can use Poisson to calculate the most likely score-line of a match, we need to calculate the average number of goals each team is likely to score in that match. This can be calculated by determining the "Attack Strength" and "Defence Strength" for each team and comparing them.

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Selecting a representative data range is vital when calculating Attack Strength and Defence Strength – too long and the data will not be relevant for the team's current strength, while too short may allow outliers to skew the data. The 38 games played by each team in the 2015/16 EPL season will provide a sufficient sample size to apply the Poisson Distribution.

How to calculate Attack Strength

The first step in calculating Attack Strength based upon last season's results is to determine the average number of goals scored per team, per home game, and per away game.

Calculate this by taking the total number of goals scored last season and dividing it by the number of games played:

- Season total goals scored at home / number of games (in season)
- Season total goals scored away / number of games (in season)

In 2015/16 English Premier League season, there were 567/380 at home and 459/380 away, equalling an average of 1.492 goals per game at home and 1.207 away.

- Average number of goals scored at home: 1.492
- Average number of goals scored away: 1.207

The ratio of a team's average and the league average is what constitutes **"Attack Strength"**.

How to calculate Defence Strength

We'll also need the average number of goals an average team concedes. This is simply the inverse of the above numbers (as the number of goals a home team scores will equal the same number that an away team concedes):

- Average number of goals conceded at home: 1.207
- Average number of goals conceded away from home: 1.492

The ratio of a team's average and the league average is what constitutes **"Defence Strength"**.

We can now use the numbers above to calculate the Attack Strength and

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Defence Strength of both Tottenham Hotspur and Everton (as of 1st March 2017).

Predicting Tottenham Hotspur's goals

Calculate Tottenham's Attack Strength:

1. **Step - 1:** Take the number of goals scored at home last season by the home team (Tottenham: 35) and divide by the number of home games (35/19): 1.842.
2. **Step - 2:** Divide this value by the season's average home goals scored per game (1.842/1.492) to get an "Attack Strength" of 1.235.

(35/19) / (567/380) = 1.235

Calculate Everton's Defence Strength:

1. **Step - 1:** Take the number of goals conceded away from home last season by the away team (Everton: 25) and divide by the number of away games (25/19): 1.315.
2. **Step - 2:** Divide this by the season's average goals conceded by an away team per game (1.315/1.492) to get a "Defence Strength" of 0.881.

(25/19) / (567/380) = 0.881

We can now use the following formula to calculate the likely number of goals Tottenham might score (this is done by multiplying Tottenham's Attack Strength by Everton's Defence Strength and the average number of home goals in the Premier League):

1.235 x 0.881 x 1.492 = 1.623

Predicting Everton's goals

To calculate the number of goals Everton might score, simply use the above formulas but replace the average number of home goals with the average number of away goals.

Everton's Attack Strength:
(24/19) / (459/380) = 1.046

Tottenham's Defence Strength:
(15/19) / (459/380) = 0.653

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In the same way we predicted the number of goals Tottenham will score, we can calculate the likely number of goals Everton might score (done by multiplying Everton's Attack Strength by Tottenham's Defence Strength and the average number of away goals in the Premier League):

1.046 x 0.653 x 1.207 = 0.824

Poisson Distribution – Predicting multiple outcomes

Of course, no game ends 1.623 vs. 0.824 – this is simply the average. Poisson Distribution, a formula created by French mathematician Simeon Denis Poisson, allows us to use these figures to distribute 100% of probability across a range of goal outcomes for each side.

Poisson Distribution formula:
P(x; μ) = (e-μ) (μx) / x!

However, we can use online tools such as a Poisson Distribution Calculator to do most of the equation for us.

All we need to do is enter the different event occurrences - in our case goals outcomes from 0-5 - and the expected occurrences which are the likelihood of each team scoring - in our example Tottenham at 1.623 is their average rate of success, and Everton 0.824; the calculator will output the probability of the score for the given outcome.

Poisson Distribution for Tottenham vs. Everton

This example shows that there is a 19.73% chance that Tottenham will fail to score, but a 32.02% chance they will score a single goal and a 25.99% chance they'll score two. Everton, on the other hand, is at 43.86% not to score, 36.14% to score one and 14.89% to score two. Hoping for a side to score five? The probability is 1.85% for Tottenham or 0.14% for Everton - or 2% for either team to score 5.

As both scores are independent (mathematically-speaking), you can see that the expected score is 1–0 - pairing the most probable outcomes for each team. If you multiply those two probabilities together, you'll get the probability of the 1-0 outcome – (0.3202*0.4386) =0.1404 or 14.04%.

Now you know how to calculate score-line probabilities using Poisson Distribution for betting, you can compare your measures to a bookmaker's odds and see if there are discrepancies to take advantage of, especially if

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you factor in your own assessment of relevant situational factors such as weather, injury or HFA.

Converting estimated chance into odds

The above example showed us that a 1-1 draw has an 11.53% chance (0.3202*0.3614) of occurring when the Poisson Distribution formula is applied. But what if you wanted to know the predicted odds on the "draw", rather than on individual draw outcomes? You'd need to calculate the probability for *all* of the different draw scorelines – 0-0, 1-1, 2-2, 3-3, 4-4, 5-5 etc.

nce you calculate e chances of each utcome, you convert em into odds and ompare them to a ookmaker's odds in der to find potential alue bets.

To do this, simply calculate the probability of all possible draw combinations and add them together. This will give you the chance of a draw occurring, regardless of the score.

Of course, there are actually an infinite number of draw possibilities (both sides could score 10 goals each, for example) but the chances of a draw above 5-5 are so small that it's safe to disregard them for this model.

Using the Tottenham vs. Everton example, combining all of the draws gives a probability of 0.2472 or 24.72% - this would give true odds of 4.05 (1/0.2472).

The limits of Poisson Distribution

Poisson Distribution is a simple predictive model that doesn't allow for numerous factors. Situational factors – such as club circumstances, game status etc. – and subjective evaluation of the change of each team during the transfer window are completely ignored.

In this case, the above Poisson formula calculation fails to quantify any effect Everton's new manager (Ronald Koeman) might have had on the team. It also fails to take Tottenham's potential fatigue into consideration now that they are playing close to a Europa League fixture.

Correlations are also ignored; such as the widely recognised pitch effect that shows certain matches have a tendency to be either high or low scoring.

These are particularly important areas in lower league games, which can give bettors an edge against bookmakers. It is harder to gain an edge in major leagues such as the Premier League given the expertise and resources that modern bookmakers have at their disposal.

Last, but not least, these odds do not factor in the margin a bookmaker charges which are hugely important to the whole process of finding value.

Want to apply the Poisson Distribution to soccer betting? Get the best Premier League odds and highest limits at Pinnacle.

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Benjamin studied English with Creative Writing (BA) before pursuing a career that combined his love of sport and fascination with betting. An avid fan of numerous sports, his writing now covers anything from in-depth major sporting event previews, to examining betting trends and techniques.

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