A Poisson Betting Model for with a Kelly Criterion Element for European Football

## Syracuse University Soccer Analytics Club

Abstract

Sports betting has experienced a rapid rise in popularity as accessibility and commercialization of daily fantasy and live betting has increased. In this paper, we attempt to create a model for European Soccer and measure its performance against betting markets to understand if this model can be used to generate profits. The paper shows how we assigned teams an attacking and defensive rating based on their production against their league counterparts which we then utilized to create a Poisson distribution that determined the probability of each event (Win, Lose, Draw). To add another dimension to our model, we used an optimization technique known as Kelly Criterion to determine the optimal amount of money that should be bet on each match. This technique generates bet amounts while also creating a value (KCO Value) that acts as an accurate estimator of the risk associated with each match. By exploring the characteristics of this value, we were able to maximize the success of the model.

Model Aspects

> Predictions

> Poisson Distribution for Probabilities

> A Kelly Criterion to manage the Bankroll

> Evaluating the Model

Goal Predictions for West Brom vs Crystal Palace
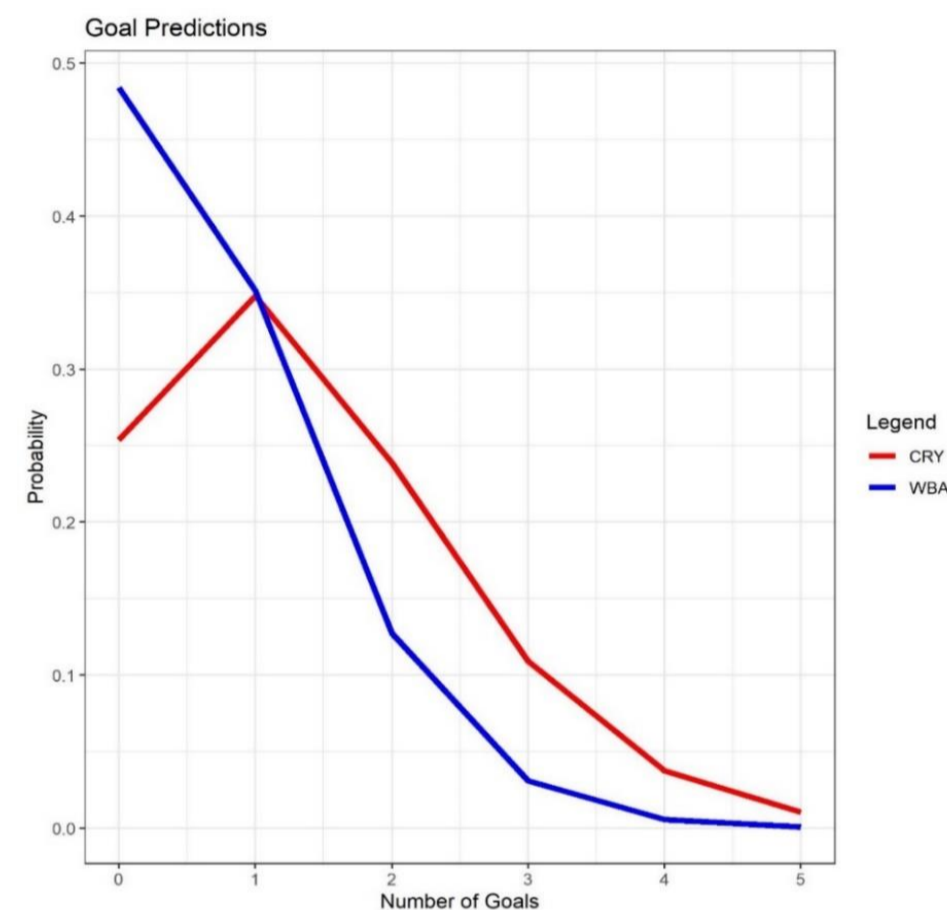

Predictions and Probabilities

> Our model predicts the probability of every score line of a game using a Poisson Distribution.

> We use attacking and defending strengths for these predictions, the strengths are created using average goals statistics with home and away splits

> The final probability of each event is the summation of all the score lines that correspond to that event.

> The probabilities of every score line with the home team scoring more than the away team added up together would be the probability of a home win

The Kelly Criterion

The Kelly Criterion model is a form of probability theory most used by investors that has made its way into the betting world. The goal of the model is to maximize our profit while accounting for the risk associated with a lost bet. This is done by maximizing the logarithm of the potential ending bankrolls after the bet is placed. To accomplish this, we used Microsoft Excel's Solver Add-In to maximize the sum of the products of win probabilities and log of ending bankroll for all 3 possible outcomes of a game (win, loss, draw) by changing the bet amounts.

Premier League Profit Percentage
Success Increase as Model Confidence Increases
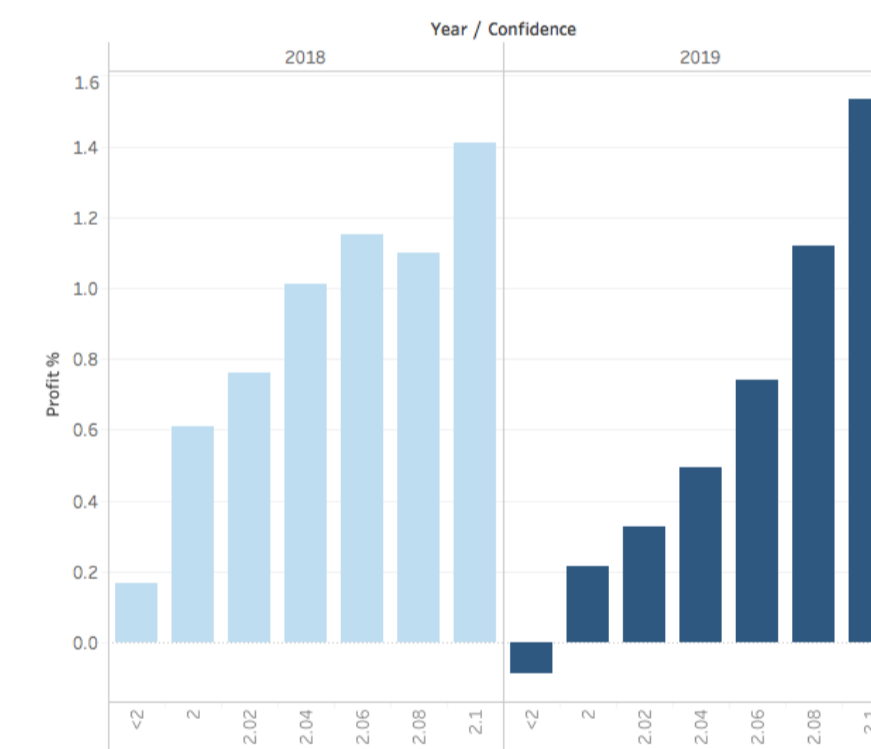
Risk Evaluation

The final objective is the sum of each logarithm value multiplied by the probability of the outcome; therefore, the value is indicative of the amount of risk associated with each bet. There is a greater chance of winning consistently by betting on the higher log values. KCO also incorporates risk by recommending bets on both a win or loss and a draw when this would maximize the profit given the uncertainty of a game. There are also games in which the optimization reveals that no bets should be placed based on the odds and model predictions.

Results

The profit percentage is maximized when examining the Premier League, the league that fit our model best. We believe this is a result of the Premier League being the most competitive league, and thus, the most conducive to varied betting. For our Premier League bets, as the confidence got closer to 2.1 in 2018 and 2019, the profit percentage gradually increased all the way up to 141% and 153% respectively when only betting on the games our model was most confident in

Profit Percentage When Log Value > 2.1
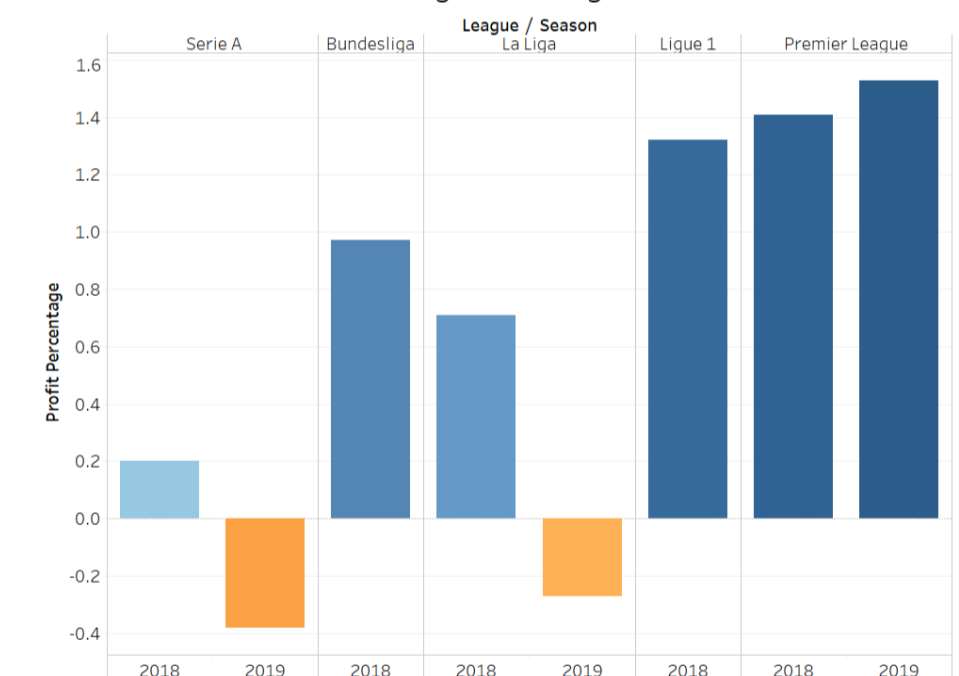
The graph above does not include the profit percentage for the 2019 Bundesliga and Ligue 1 as there were no games with a log value greater than 2.1 If we were to use the model for each of these leagues over 2 years for games that had a log value greater than 2.1, we would have made $6,795.54 in profit with $6,381.11 being risked (Profit Percentage=105.93%).

Contact:
Kushal Shah, President – kshah07@syr.edu
Follow us on Twitter @CuseAnalytics