Optimal betting portfolio for Liiga Playoffs

The due date for the project is **Friday, 13.04.18, at 23:59**.

The due date for the presentation slides is the **night before your presentation at 23:59.**

The Finnish ice hockey league "Liiga" has 15 teams, who each play 60 games (30 at home and 30 away) during the regular season. The regular season ends on March 10th, after which the ten best teams qualify for the playoffs. Real-time data on the regular season can be found at http://liiga.fi/ottelut/2017-2018/runkosarja/.

After the conclusion of the regular season, the best six teams proceed directly to the quarter-finals. Teams placing between 7th and 10th will play preliminary playoffs as best-of-three. In particular, the teams placed 7th and 10th will play against one another, as will the teams placed 8th and 9th. The two winners of these series will take the last two slots in the quarterfinals. After this, all series are best-of-seven. In each series, the home advantage alternates between the two teams. The team with the higher playoff seed holds the home advantage, meaning that they get to play at home first. The winner of a playoff series advances to the next round. To win the "Liiga" championship, a team must therefore win three playoff series (and a potential preliminary playoff).

For the purpose of this project, download the files "`RegularSeasonData.csv`" and "`BettingOdds.csv`" from the course website. The first file contains data (date, home team, visiting team, goals by home team, goals by visiting team, and whether the game went to overtime) on all regular season games played so far. You can complete this file as the regular season proceeds. The other file contains the betting odds (team, decimal odds) for each team to win the championship, understood here as the coefficients by which the bets are multiplied in case the team wins the championship.

The objective of the project is to (i) estimate the probabilities of each team to win the championship based on regular season data and (ii) use these probabilities to optimally allocate a betting budget. In particular, the project is split into seven sub-tasks that should be completed.

Tasks

(a) Model the relative strengths of the teams based on their past performance, i.e., the observed results from the games played during the regular season. Use a Poisson regression model, as described in the lecture slides.

(b) Model the stochastic process representing the number of goals scored by teams during a single game – including the relative strength of the teams and the home advantage.

(c) Estimate the winning probabilities for individual games and playoff series using the above-mentioned model either by using enumeration or Monte Carlo simulation.

(d) Predict the likelihoods of different outcomes for the entire playoff bracket (i.e., different teams winning the championship) by using Monte Carlo simulation and previous results. Note that you can either include the preliminary playoffs in your simulation or wait for them to be finished on March 17th and only include the series beginning from the quarterfinals.

(e) Solve the allocation of a 1000€ betting budget that maximizes the expected value based on the given betting odds, estimated winning probabilities, and the requirement that no more than 50% of the budget should be allocated to any single team.

(f) Propose another allocation based on your group's subjective preferences, compare it to the previous solution, and discuss the differences between the allocations.

(g) Provide a critical assessment of the methods used, their underlying assumptions, and the credibility of the obtained results.