About the Big Bash predictive model

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The predictions made in the paper are based on ratings of each team using the Elo system. Elo rating system is used in competitor-versus-competitor arenas to rank the relative skills of various players / teams. Originally, the system was used to rate chess players. However, in more recent times, the Elo rating system has expanded to rate a wide range of activities such as basketball, American football, world football, rugby league, card games and competitive programming.

At a high level, a player's Elo rating is a numeric score which moves up and down based on the results of matches between other rated players. These ratings may then be used to predict the outcomes of competitive matches. When the favourite (the person with the highest score) wins, their Elo rating moves up by a small margin while the loser's Elo rating moves down by a small margin. However, when the underdog (the person with the lowest score) wins, their Elo rating will increase by a larger margin and vice versa. This phenomenon is exacerbated the wider the margins in Elo rating.

As an example, assume Team A is playing Team B. Team A is full of star players and has been on a long win streak. This has led to an Elo rating of 1,500. Team B, on the other hand, has been struggling and has a below average Elo rating of 750. To determine the chances of Team A beating Team B in a match, the following formula is used.

$$Win\%_A = \frac{10^{\left(\frac{ELO_A}{400}\right)}}{10^{\left(\frac{ELO_A}{400}\right)} + 10^{\left(\frac{ELO_B}{400}\right)}}$$

$$Win\%_A = \frac{10^{\left(\frac{1,500}{400}\right)}}{10^{\left(\frac{1,500}{400}\right)} + 10^{\left(\frac{750}{400}\right)}}$$

$$Win\%_A = 98.7\%$$

As the formula demonstrates, Team A is expected to win almost 99 times out of 100. Each team's Elo rating is then adjusted after the match based on the outcome.

Team Rankings Over Time

By plotting each team's Elo rating over time, the league contenders, roughies and wooden spooners are able to be seen.

At the end of the 2014/15 BBL season, Perth had the highest Elo rating making them the favourites to repeat. Melbourne Stars, Sydney Sixers and the Adelaide Strikers all finished with top 4 Elo ratings. This group would have been considered league contenders.

Hobart Hurricanes and the Melbourne Renegades fall into the second category of roughies. These two teams did not light the league on fire in 2014/15, but managed to record some decent wins.
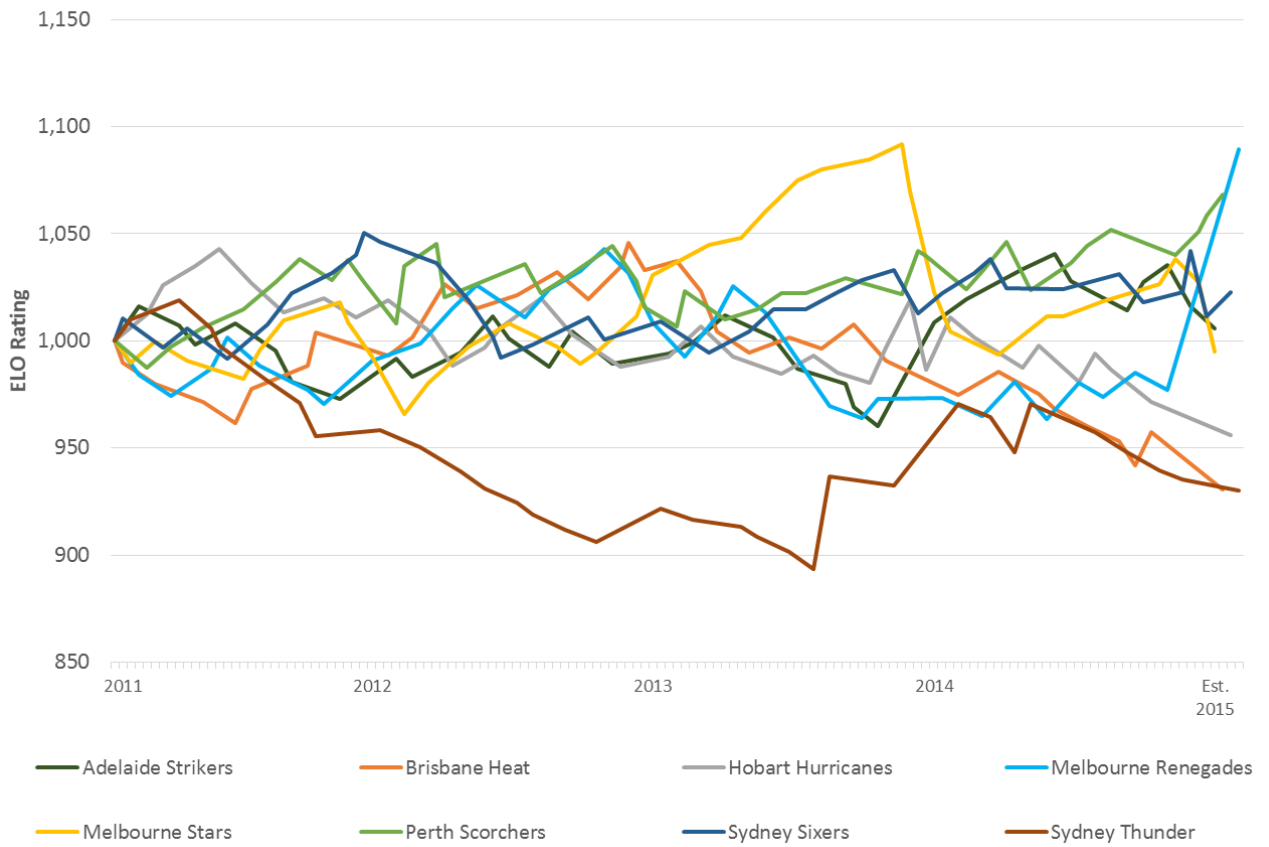
Finally, the Sydney Sixers and Brisbane Heat were the two bottom team, making them the front runners for the wooden spoon (i.e. last place).

However, player movement has seen a shift in these expectations. The Perth Scorchers and Melbourne Renegades improved to put themselves in the lead for premiership contention.

Sydney Sixers, Melbourne Stars and Adelaide Strikers remain in the hunt for the top 4, giving themselves an outside chance of the premiership.

Bringing up the rear is the Hobart Hurricanes, Brisbane Heat and the Sydney Thunder. Of these, the Heat and Thunder are front runners for the wooden spoon, with a single Elo point separating the teams at the start of the season.

Elo scores - Big Bash League 2011/12 to 2014/15

Legend:
- Adelaide Strikers
- Brisbane Heat
- Hobart Hurricanes
- Melbourne Renegades
- Melbourne Stars
- Perth Scorchers
- Sydney Sixers
- Sydney Thunder

Margin of Victory

Duckworth Lewis Method

In the RWC, an expected margin of victory was able to be calculated based on the Elo ratings of each team coming into the match. Comparing the model predictions with the actual outcomes was relatively straight forward as each match is played for the full time limit.

However, limited overs cricket differs from traditional sports. During limited over games, a team does not always utilise its full resources (wickets and overs) to achieve a result. This occurs under two scenarios:

- The team batting second reaches the target runs before the allocated overs have been completed
- Disruption to play reduces the number of overs allocated to team/s

In the first scenario, the team is announced victors with the remaining resources noted in the result. This result does not consider the potential accumulated runs of the innings, rather the margin of victory considers the number of wickets remaining with the more wickets remaining, the larger the victory.

For a disruption in play, match adjudicators apply the "Duckworth Lewis" method which was developed by Frank Duckworth and Tony Lewis and successfully trialled by the International Cricket Council (ICC) in 1997. This method takes a holistic approach to a team's available wickets and overs remaining at any given point in a match and allocates a resource percentage to the match circumstances by setting revised targets. In this analysis, the method has been adapted to 20/20 cricket and applied to both of the above scenarios in the model to determine projected final run totals. Once a team's score has been projected under the utilisation of full resources, the teams can be directly compared.
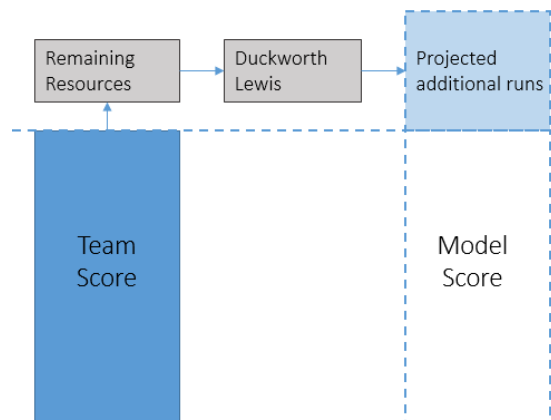
Projecting Team Scores

A team's projected score can only be applied to batting teams with a combination of wickets remaining and overs remaining. If a team has only one resource available it is impossible for them to better their score and, therefore, their recorded score remains. Match scores excluded from projected score methodology include:

- A team being 'bowled out' before using its full allocation of overs.
- A team with remaining wickets but have fully used their allocated overs.

If the resulted team is neither of these and has resources remaining at the conclusion of the match, the model projects the team's 'predicted' scores by applying the DWL method in the following way:

$$\text{Proj Score} = \frac{\text{Team Score}}{(100\% - \text{DWL Remaining resources}\%)} \times 100\%$$

The below diagram illustrates this method.

This adjusted model score is then used in determining the margin of victory multiplier.

Margin of Victory Multiplier

The purpose of introducing a margin of victory multiplier is to account for autocorrelation. Autocorrelation relates to time series data in which historical and future values are correlated.

Elo ratings already account for the favourites winning more often than they lose. Someone with a high Elo rating (e.g. Perth Scorchers) gain less from a victory against an average than someone with a low Elo rating (e.g. Sydney Thunder).

However, not only to better teams win more often, they also typically win by larger margins. To account for this, a margin of victory multiplier is introduced. In essence, the margin of victory is further discounted when the team with a higher rating wins and increase it when the lower rating team wins.

Model Assumptions

An overview of the key assumptions underpinning the Elo ratings and subsequent analysis are provided below:

- The Elo ratings for the Big Bash teams have been based on 272 games since the 2011/12 season.

- The k factor used in the analysis has assumed to be 20. As discussed earlier, the k factor determines the importance of more recent matches compared to older matches, with larger k factors relying on more recent matches more strongly.

- The initial Elo rating for teams entering the competition is 1,000. This is also the rating of the "average" Big Bash team.

- No home field advantage has been assumed. Over the four seasons, the home team won 48% of the matches and, in no seasons, did the home team, on average, win at a rate significant greater than 50%.

- An adjustment has been made to limit the impact of multi-collinearity by implementing the margin of victory multiplier

- An adjustment has been made to each teams score to account for player movement. A portion of the leagues total points were adjusted to reflect recruitment and loss of players based on their index scores. Broadly, 3 index points equate to 1 Elo point. Given Elo ratings are a 0 sum game, the league average of 1,000 points is maintained after the player movement adjustment has been made.

Based on the approach taken, there are some limitations which may impact the results. At a high level, these limitations include the following:

- The player movement adjustments assume that players play all (or at least a vast majority) of matches. It has been the case that big name players sign with a team, then focus on international duties and do not play a significant amount of BBL games. This is particularly relevant to Chris Gayle due to his large contribution to both the improvement in the Melbourne Renegades and the league itself.

About NineSquared

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