**Linear Regression Model Predictions: An application of the moneyball concept to basketball statistics**

**Introduction**

This section should provide relevant background information and justification for the project, including:

a) relevant background information of basketball, including key metrics, position requirements etc *– The NBA regular season see’s 30 teams competing in 2 conferences, west and east, over 82 games where each teams play each other 4 times, 2 away and 2 home. The top 8 teams in their respective conferences then qualifies for the playoffs which is a tournament format. In the playoffs, a round robin elimination format where each team plays each other in a best of 7 series to win can be seen where each team works their way respectively to ultimately become the conference champions. Both conference champions then proceed towards the ultimate price of winning the NBA Champions title in another best of 7 series.*

*When looking at basketball statistics and metrics that wins games, the main ones are often seen as the offensive metrics. These can be seen as 3PA, FT made, Points scored. From a defensive standpoint, a successful team are often correlated to high defensive rebound numbers as well. Therefore, when choosing a starting lineup, specific considerations are required to be suited to each position in order to provide the team with the best opportunity to win games.*

*In the starting line-up, 5 players make up the team. They are split into 5 different positions on court which are point guard (the general of the team), the player that usually dictates the play and organises the team on the floor during offensive plays, the shooting guard (the artillery), the player that usually is most accurate and efficient in playing, small forward (the all-rounder), the player that most often scores but can interchangeably be a defensive and assistive player to set up the shooting guard, the power forward (the front line) is a player that usually makes close range shots and defensively acts as a disruptor to the big guys and also athletic enough to stop guards from making it into the basket with ease, the centre (the tower) is usually the tallest player and versatile on the board, they usually swing the defensive team by either attracting more defenders in and allowing the guards to take shots or when the guards are targeted, required to be accurate in their scoring opportunities, they are often required to contest for rebounds and setting screens for smaller players to work into space.*

b) description of the scenario – *In the 2018/19 season, the bulls finished 27th overall in the NBA and 13th in the eastern conference winning only 22 and losing 60 of their overall 82 games. (*[*https://www.espn.com.au/nba/table/\_/season/2019*](https://www.espn.com.au/nba/table/_/season/2019)*). With a team budget of $118 million, considered one of the lowest in the league, ranking 26th of 30, the general manager has requested for a revamp roster to improve on our previous seasons’ record and look to be competitive for the post-season playoffs.*

c) the aim of the project – *in order to be competitive in the post season, the team is required to finish in the 8th position within the eastern conference to qualify. This means a strong starting team lineup and bench is required to cycle through the season in order to get the best win/loss ratios.*

d) justification and importance – *in order to win, a total of 4 PGs, 4 SGs, and 3 SFs have been shortlisted for the 17 man roster as the offensive (point scoring) positions and 4 PFs and 2 Cs have been shortlisted to be the main defensive (BIGs) positions. Although*

Note that you may choose a different order to present each of the elements listed above.

**3. Exploratory analysis**

Team metrics:

***Possessions = FGA + 0.5 x FTA – OREB + TO – 4***

***Net Efficiency rating - IFF***

Highest average point win games – (a linear regression of scores with win/loses) – to.

confirm our knowledge that highest scoring average wins games (*team)*

How do you win games (scoring metrics?) – net Efficiency rating (*team) and TS%/NBA\_eff (individual)*

Individual player metrics:

Non-scoring metrics attributes and factors affecting win – TurnOvers? Blocks? Steals? Assists? Rebounds? Affect win?

Sorting out the individual from the pack:

Find players with High scoring attributes and non-scoring attributes (defensive) of the game and apply that to BIGs (defensive), guards (scoring \*high points\*)

Does player attributes (age, minutes played, games played) affects win/lose?

**5. Player recommendations**

**This section will be the key part that is presented to the general manager**. Here you should present your recommendations for the best five starting players, but also think about what other important information they would want to know, and how it is best to present that information to them.

The National Basketball Association (NBA) is considered the premier league in the world for men’s basketball. (1) With teams located out of the North American regions, the league is divided into two conferences, Eastern and Western conference, consisting of thirty teams. In an eighty-two games regular season format, each team from their respective conferences competes over several months in order to qualify for the post-season, best of seven games knockout style tournament, also known as the “Playoffs”. (2) With only sixteen spots available, eight teams per conference, a champion from each conference then proceeds onto the Final Series to play for the status of world champions and the Larry O’Brien Trophy.

With a win to loss record of 22 to 60 in the previous 2018/19 season, the Chicago Bulls finished at 27th overall in the league and 13th in their Eastern Conference. (3) Given the lower budget, ranking at 26out of 30, within the NBA, the general manager of Chicago Bulls is looking to restructure the roster for 2019/20 season in order to provide the franchise with a better opportunity to qualify for the post-season playoffs.

As winning games prove to be much more profitable and beneficial for a team in the NBA (1), many teams have shifted their focus on to statistical analysis in order to increase their capabilities of doing so. (4) However, we first need to understand the metrics involved in winning the game and their correlation to individual player metrics in building a roster that fits the coach’s game plan. Whilst a closer look into box scores have shown winning teams are often considered to be efficient in both the offensive and defensive end of the game, building a team with players that can contribute to the teams’ net efficiency rating, the difference between offensive and defensive rating, depends on individual player attributes. (2) Player attributes that have been linked to each teams’ success have also been narrowed down to the following; (2, 4)

* Effective field goal percentages (eFG%)
* Turnover percentages (TOV%)
* Rebound percentages (ORB% + DRB%)
* Free throw rates (FTA/FGM)

\*FTA – Free throw attempts, FGM – Field goals made, ORB% – Offensive rebound percentage, DRB% - Defensive rebound percentage

However, when selecting players for their positions, Point Guard (PG), Shooting Guard (SG), Small Forward (SF), Power Forward (PF), Centre (C), coaches may consider their PGs as the director of the team on the floor whereby they are expected to be creating opportunities for their scorers, SG and SF, to have an attempt at shot. On the defensive end however, coaches may then consider their ‘BIGs’ (PF and C) to be the main players in preventing the opponent from scoring. (5)

**References**

1. Elmore R. Predicting Which Teams Will Make the NBA Playoffs. Available at SSRN 2764482. 2016.

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5. Rangel W, Ugrinowitsch C, Lamas L. Basketball players' versatility: Assessing the diversity of tactical roles. International Journal of Sports Science & Coaching. 2019;14(4):552-61.