Predicting NBA Salaries from the 2019 Offseason using Various NBA Statistics

Joe Baum
MTH 441
12/6/2019

Abstract

The salary that an NBA player and an NBA organization believes that a player is worth can be two very different numbers. A player’s statistics may be able to be used to help predict their salary. Statistics from the 2018-19 NBA season were used to conduct a Multiple Linear Regression analysis to try and predict the square root of their 2019-20 Salary. The data was selected with certain criteria and a model was found to be significant at the 1% level. Variables such as Points, Rebounds, Assists, and Turnovers were found to be significant. Also, the model was very good at predicting the variability in the square root of Salary. Some unmeasurable factors could also be affecting a player’s salary, such as potential. This study could also be done on many other contract negotiations in the sports world.

Introduction

The value of an object or service can be very different for two people. This is true for many different situations, such as the price of an old car, the price of a haircut, or the salary
someone should receive for their job. In the National Basketball Association (NBA), players and organizations enter contract negotiations every year during the offseason and this problem becomes apparent. The players want to try to maximize their salary based on how much they think they're worth, while the organizations would like to pay as little as possible to try and stay financially flexible, so they can capitalize on future projects or propositions. A player’s statistics are recorded every game and their stats could be used to help figure out what their salary should be. We used Multiple Linear Regression to try and predict a player’s salary for the 2019-20 season based off their statistics from the 2018-19 season.

**Methods**

We collected statistics from players who entered free agency in the 2019 Offseason and the salary they will be making in the 2019-20 season. The players we deemed eligible for the study must have signed a new contract in the 2019 Offseason and returned to the NBA for the 2019-20 season, so they could not have signed with an organization in a different league or retired. Also, the player must have played in a minimum of 70% of their team’s games in the prior season, which is a total of 58 games out of the 82 game season. The variables we collected on these eligible players to try and predict salary were Minutes, Points, Rebounds, Assists, Steals, Blocks, and Turnovers. We ran a Multiple Linear Regression analysis and to try and find a model that was significant at the 5% level. We transformed the variable of Salary to the square root of Salary and removed some outliers to help better satisfy the assumptions of regression.
Results

After running a Multiple Linear Regression analysis, we came up with a model that was significant at the 1% level and had an R-squared value that was over 90%. Also, every predictor in the model was significant at the 1% level. The variables, coefficients, p-values, and r-squared value can be seen in Figure 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>242.53</td>
<td>4.59E-16</td>
</tr>
<tr>
<td>Rebounds</td>
<td>153.33</td>
<td>8.24E-05</td>
</tr>
<tr>
<td>Assists</td>
<td>481.69</td>
<td>4.05E-09</td>
</tr>
<tr>
<td>Turnovers</td>
<td>-1164.29</td>
<td>3.24E-05</td>
</tr>
</tbody>
</table>

P-value of Overall Model: 2.2E-16
R-squared: 0.9728

Table 1: Output of Multiple Linear Regression Analysis

We can see that Points, Rebounds, and Assists contribute positively to the square root of Salary and Turnovers contribute negatively. Next, we looked at the regression assumptions which can be seen in Figure 1.
From Figure 1, we can see that the regression assumptions are loosely satisfied. This means that the regression equation is valid and can be used for predictions.

**Discussion**

The variables that we found out to be positive significant predictors towards the square root of Salary were Points, Rebounds, and Assists. This should not seem as a surprise as all these statistics positively impact the team towards winning a basketball game. While the other significant predictor, Turnovers, can negatively impact a team towards winning a basketball game, so it should not be a surprise that it negatively affects
the square root of Salary. There may be many other factors that influence the square root of Salary, such as the potential of the player and how much they can improve their game. Also, the character of the person or how well they work together with teammates could be significant toward the square root of Salary, but these are unmeasurable variables. This study can help players and organizations come to a middle ground and help determine how much a player should be making based solely off these general basketball statistics. Also, players can now see how to improve their worth, by improving the statistics that will increase the square root of Salary and limiting the statistics that decrease the square root of Salary. This study can be expanded to include other variables that may impact the square root of Salary or finding a way to measure the previously mentioned variables that may impact the square root of Salary, but aren’t exactly measurable. Also, this study could be done for many different sports leagues or any types of contract negotiations.
References


“Season Leaders.” NBA Stats, stats.nba.com/leaders/?Season=2018-19&SeasonType=Regular%2BSeason.