NBA Talent Rating based on Field Goal Percentage

ID: 22825

In basketball, field goal refers to a basket (excluding free throws) scored on any shot for two or three points. Field goal (FG) percentage refers to the ratio of field goals made to field goals attempted. Field goal percentage is one of more effective statistic for estimating talent, as it takes into account how likely a player is to make his shot on his attempt. It is crucial that our team scores some points before turning over the ball to the opposing team, as failing to score points on several attempts can quickly turn into a large deficit. Therefore, it would the best of interest for team to measure players' talent using FG%, to determine which players can be depended on for scoring points on possessions.

I have obtained this statistic from NBA Totals Dataset for 2015-16 season from Week 4 Tutorial, but season totals can be easily gathered or obtained from *Basketball-Reference.com*, *ESPN.com*, *CBSSports.com*, or *nbaminer.com*, which already have the totals in a structured format. This dataset contains statistic aggregated over the entire season, such as minutes played, 3-pointers made, free throws made, assists, steals, blocks, etc.

1 Regression to Mean

We use this statistic (FG%) to calculate regression to the mean, using the formulas provided in class.

$$\sigma_T^2 = \frac{\sum_{i=1}^{n} \frac{(S_i-\mu_T)^2-(\sigma_L^2)_i}{2(\sigma_T^2+(\sigma_L^2)_i))^2}}{\sum_{i=1}^{n} \frac{1}{2(\sigma_T^2+(\sigma_L^2)_i))^2}}$$

Player	FG%	Est. Talent
DeAndre Jordan	0.7027559	0.6649327
Rashad Vaughn	0.3045113	0.3415335

When using regression to the mean, we estimate the sampling variance for luck, $\sigma_L^2 = \frac{1}{n}\mu_T(1-\mu_T)$, using the variance formula for binomial variables, since FG% is a binomial percentage. Overall, we estimate the league average field goal percentage to be **0.451**, and the population standard deviation in true talent to be **0.0525**.

2 Analysis

The population standard deviation in true talent is 0.0525, meaning that approximately 68% of the league's players have true talent (of field goal percentage) within [0.3985 ,0.5035], and 95% lie within [0.346, 0.556]. For DeAndre Jordan, the field goal percentage is 0.70, but when taking into account the variance due to luck, his talent is estimated to be a slightly lower at 0.665. On the other hand, for Rashad Vaughn, who has the lowest field goal % in the league ($\geqslant$ 100 FGA), his talent is estimated to be slightly higher than his FG%.

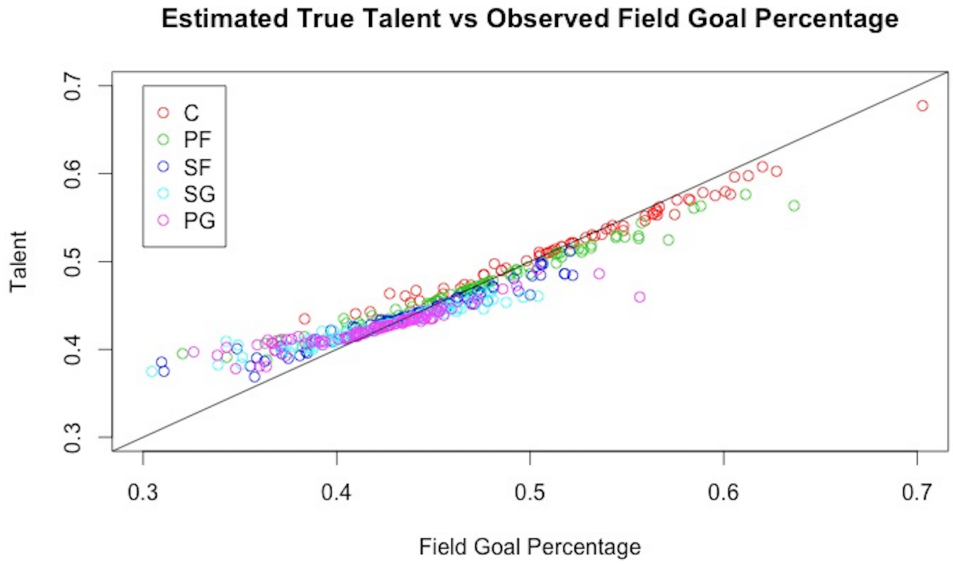
3 Limitation of the Method

One severe limitation to this method is that it is biased towards players who are typically near the basket, such as centers and power forwards, as shown by the top 5 player talent, DeAndre Jordan, Dwight Howard, and Andrew Bogut. These players tend to have a shorter distance for any shot or tap-in, so they are more likely to score on their field goal attempt than guards, who often shoot from the arc.

4 Alternative Method

To account for the limitation described above, one way to improve this method is to perform regression to the mean within each position group, instead of performing regression to the mean for the whole group. This method would reduce the bias for each position and would more accurate estimate of the talent.

Position	League Average	Pop. Standard Dev.	Leader	Est. Talent
Center (C)	0.5186908	0.05547959	DeAndre Jordan	0.6774138
Power Forward (PF)	0.4666008	0.04812764	Ed Davis	0.5762992
Small Forward (SF)	0.4401438	0.03753206	LeBron James	0.5116468
Shooting Guard (SG)	0.4294862	0.02675589	J.J. Reddick	0.4655273
Point Guard (PG)	0.4276132	0.02760368	Stephen Curry	0.4910108



We now achieve better estimates of a player's true talent in relation to players with the same position (e.g. we see that Stephen Curry is approx. 2.3 SD above the mean). We also observe that centers on average have higher talent than guards because they have higher FG% on average. Thus, to more accurately measure and compare talent, we should compare a player with other players in the same position.

5 Future Directions

Another interesting future direction would be to use a different dataset – use the game totals, instead of season totals. The inherent disadvantage of the season totals is aggregation, which causes information loss about individual games. Using game totals, we have a significant advantage, which is that we have multiple samples for a single player, instead of just a single sample per player as we did above using season totals.

6 Appendix: Top 5 Players for Each Position (Est. Talent)

6.1 Center

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DeAndre Jordan :    0.6774138
Dwight Howard :     0.6079358
Andrew Bogut :      0.6027912
Steven Adams :      0.5976438
Hassan Whiteside :  0.5963375
```

6.2 Power Forward

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Ed Davis :          0.5762992
David Lee :         0.5635304
Tristan Thompson :  0.5633448
Amir Johnson :      0.5607577
Kenneth Faried :    0.5441901
```

6.3 Small Forward

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LeBron James :           0.5116468
Kevin Durant :           0.4980907
Giannis Antetokounmpo :  0.4966575
Kawhi Leonard :          0.4964657
Alonzo Gee :             0.4861124
```

6.4 Shooting Guard

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J.J. Redick :       0.4655273
Goran Dragic :      0.4633319
Klay Thompson :     0.4617334
Jonathon Simmons :  0.4604037
Andre Roberson :    0.4592144
```

6.5 Point Guard

```
Stephen Curry :     0.4910108
Shaun Livingston :  0.4860726
Tony Parker :       0.4726031
Darren Collison :   0.4687827
Andre Miller :      0.4596175
```