



NBA SALARY REPORT

A salary
guide/reference to the
National Basketball
Association

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PURPOSE

The purpose of this report:

- Give Player Agents insight on todays player salary market
- Allow general managers and team presidents to better play the salary game
- To provide better information to NBA fans of the salary structure in the NBA

INTRO

- This report will look at:
 - 3 Point snipers and their salary expectations
 - 7ft players evolution and salary expectations
 - Foreign players salary expectations
 - Salary analysis of being on a Winning team Vs Losing Team
 - Winning NBA Media Awards and affect on Salary
 - A multiple linear regression to try to predict salary.

DATA SOURCE

- NBA STATS
 - The official NBA statistics site for player and team statistics
- Basketball Reference
 - A sports reference website that has collected historical data on all sports.
- Patricia Bender
 - A individual who analyzed the state of the last 17 years of the CBA and provided salary information to Basketball Reference.
- CBA
 - Information on the changes and agreements of the collective bargaining agreements.
- NBA Contract
 - Analyzing an NBA contract explaining the different types of contracts as well as NBA player pensions.
- Hoops Hype
 - NBA news site, and salary reference
- Land of Basketball
 - Website containing historical information on awards and nominations of the NBA

DATA WRANGLING AND CLEANING

Full process can be found [here](#)

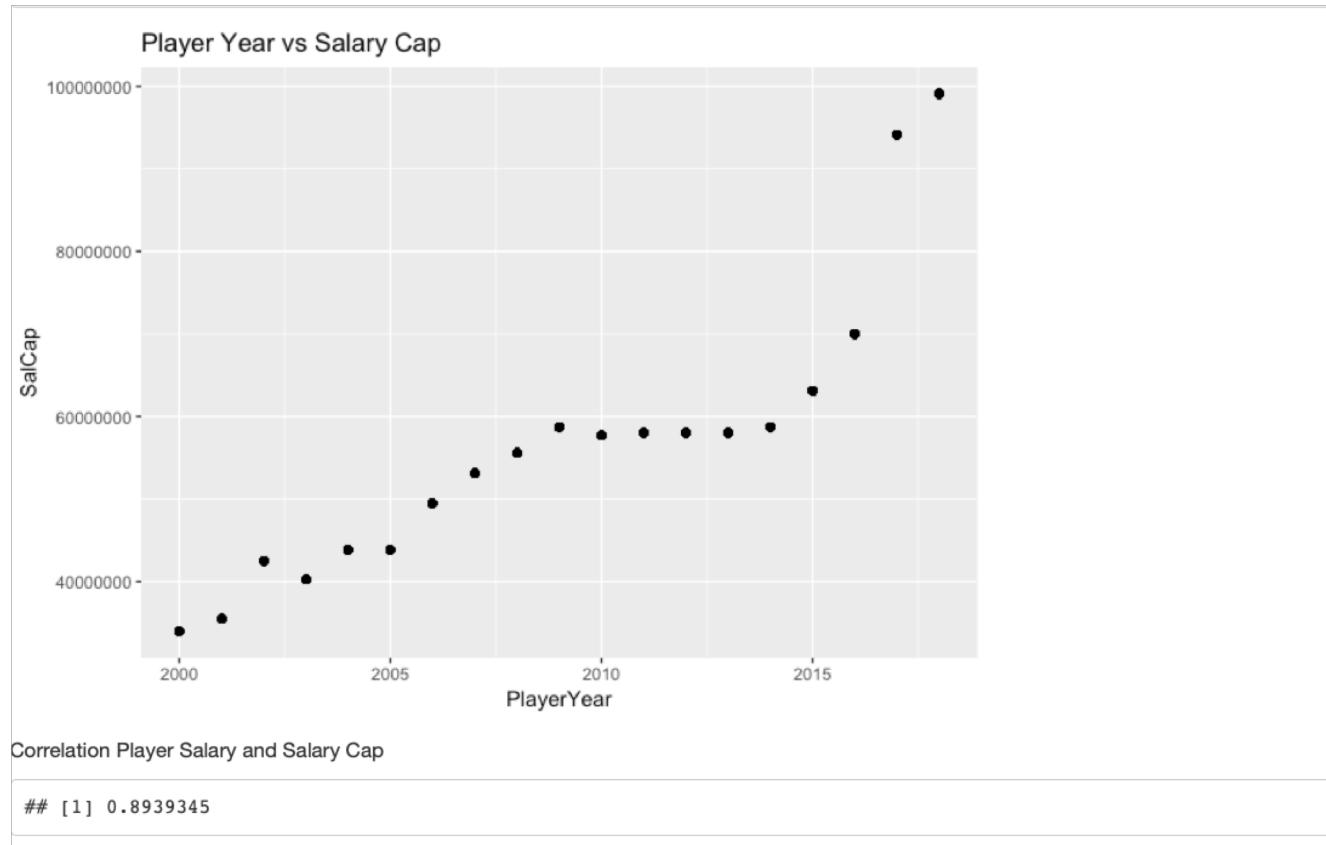
- Salary data was collected on HoopsHype with **rvest** webscraping
- Different sources had different player names, used **gsub** and **grepl** to make sure all names were the same
- **Full Join** and then changed columns to numerics or characters using **stringr**, **data.table** and **tidyverse** package
- Players who were injured waived still showed up on team salary- Ran a **filter** to filter these players out
 - Did not play more than 5 game
 - Less than 5 minutes a game
 - Did not score one point per game
 - Also removed the incomplete 2019 season

DATA EXPLORATION

Full code is [here](#):

- Huge salary cap increase
 - With the newly signed tv deal and globalization of the game major increase in basketball related income.
- Right skew in data
 - Most of the NBA data distribution is right skewed. With a few players taking more of the shots or getting more of the pay.

The Huge Salary Cap increase



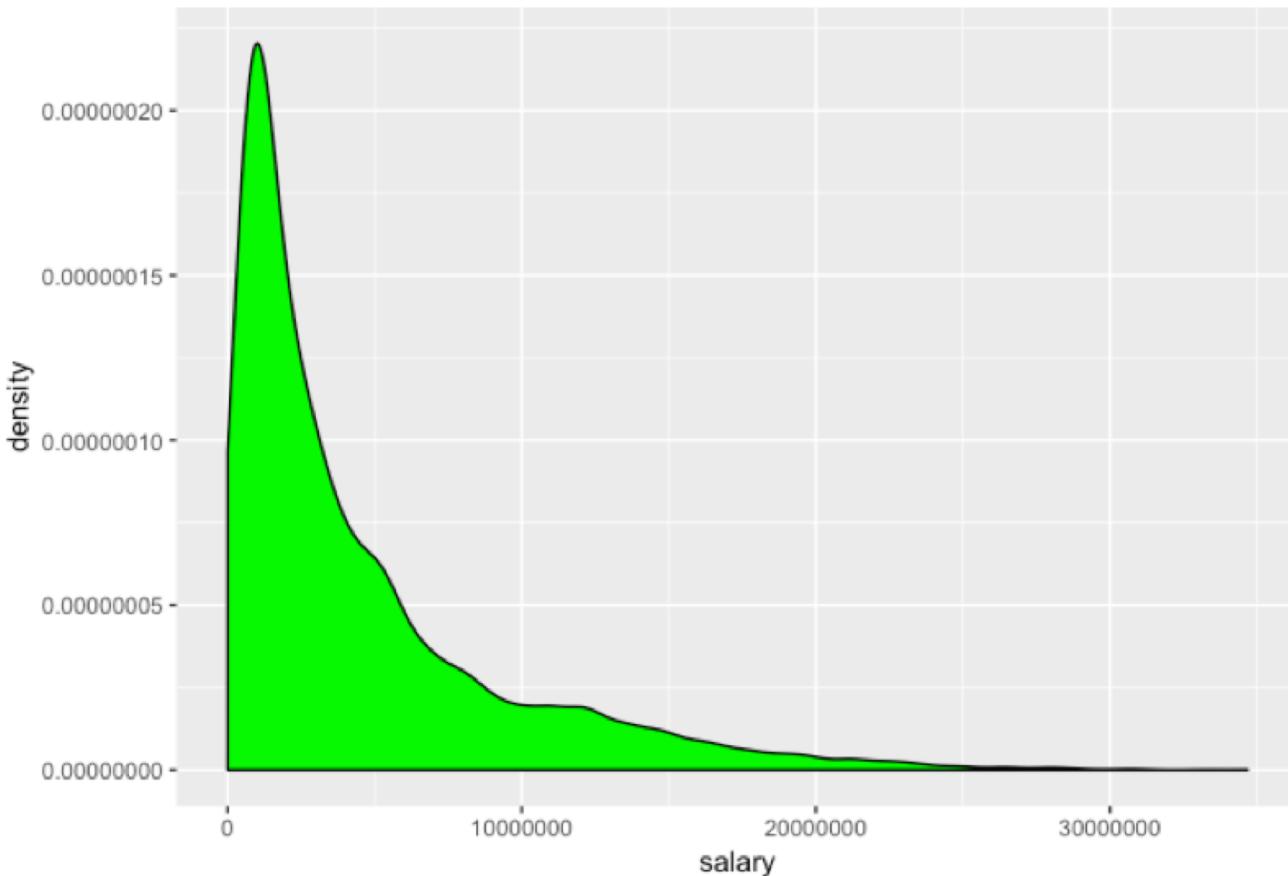
- Huge increase after the 2015 season that is not explained by inflation alone.
- New TV contract increases BRI which players get 51 percent of all basketball related revenue in the NBA



Right Skewed Data

Salary Spread

Salary distribution



- With how max contracts are structured. They take 25 to 35 percent of the teams salary cap.
- Current structure of collective bargaining agreement. Which pays your best player the most and has them take the most shots.

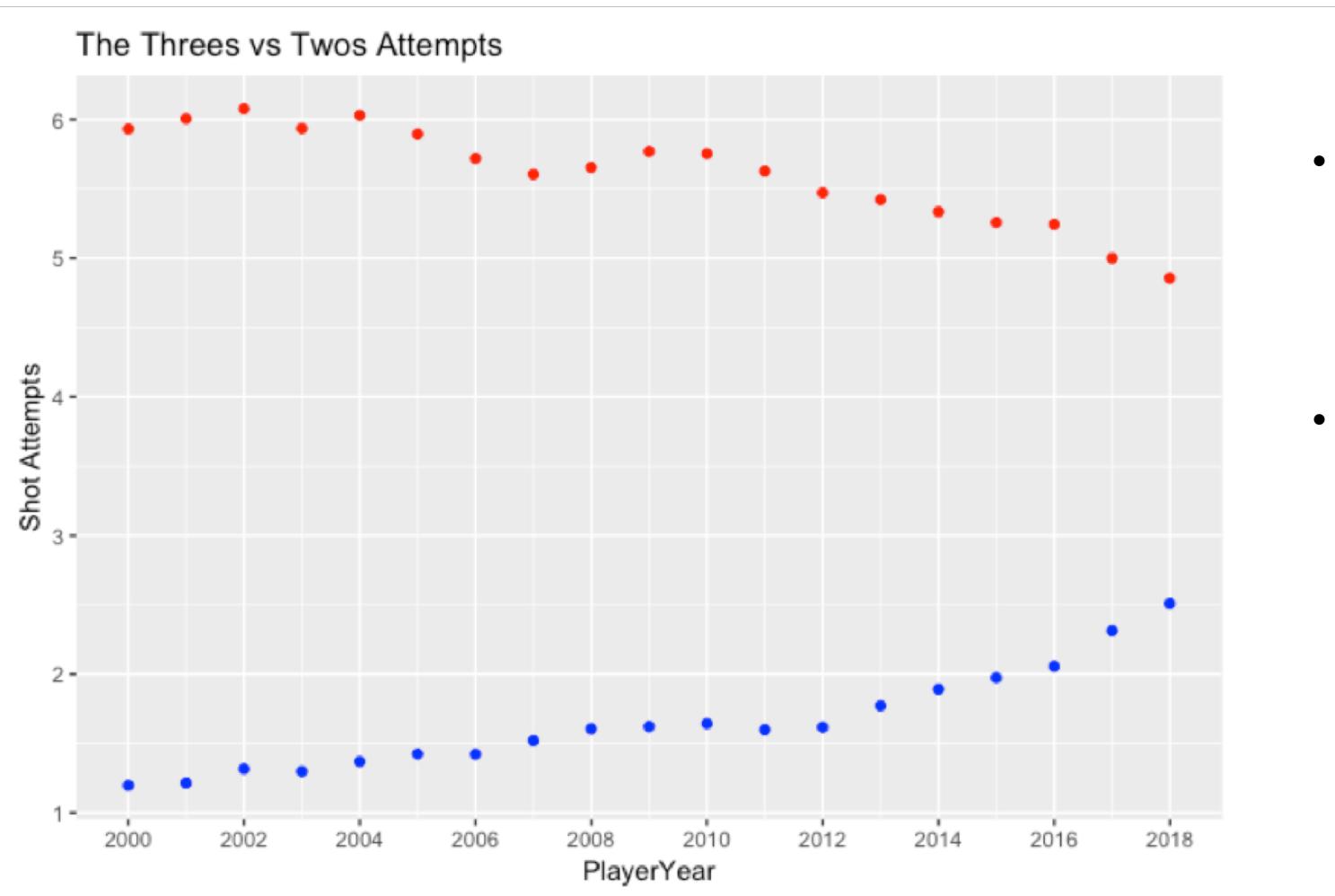


SALARY ANALYSIS

Full code [here](#):

- 3 point shot
- 7 footer
- Foreign
- Winning Vs Losing Teams
- Award Winners and Mid level Exception

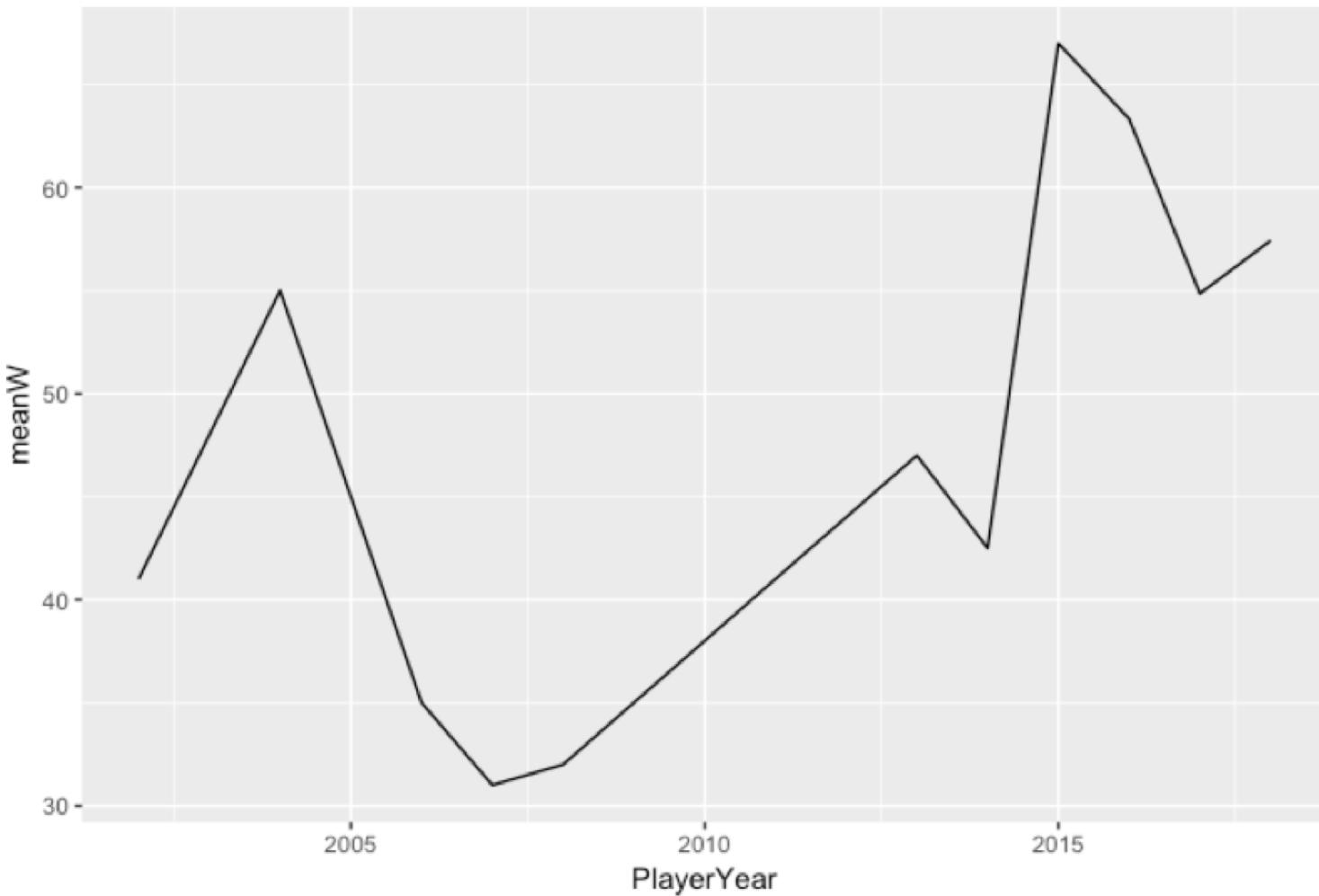
More 3's the better?



- Number of 3 point attempts increasing vs 2 point attempts
- Correlation is weak for salary and 3s.
 - 0.28 for 3's made
 - 0.28 for 3's attempted
 - 0.04 for 3 point percentage



Shooting more than three 3's win trend



- Separating players who made more than 3 threes a game to those who don't
 - Past 2015 shows winning at least 50 games
 - Less than 3 a game only win about 40-42 games
- **Benefit:**
 - Scarce 27 obs out of 7978!
- **Costs:**
 - Trending upwards more players will be able to shoot and make more 3's increasing the supply and possibly deteriorating the win percentage.



7 footer

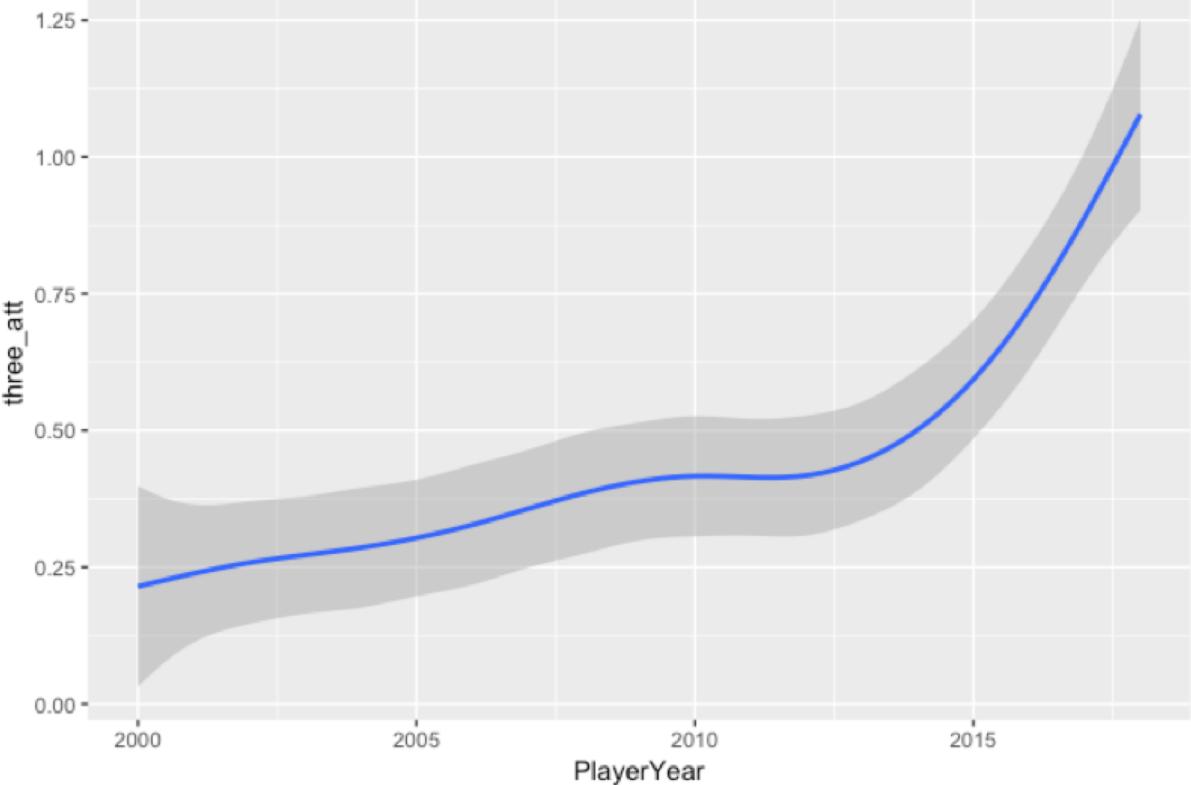
```
##          name    salary   ppg  three t_reb block
## 1      Andre Drummond 23775506 15.0    0.0  16.0    1.6
## 2      Hassan Whiteside 23775506 14.0    0.0  11.4    1.7
## 3      Dwight Howard 23500000 16.6    0.0  12.5    1.6
## 4      Brook Lopez 22642350 13.0    1.5    4.0    1.3
## 5      DeAndre Jordan 22642350 12.0    0.0  15.2    0.9
## 6      Marc Gasol 22642350 17.2    1.5    8.1    1.4
## 7      Steven Adams 22471911 13.9    0.0    9.0    1.0
## 8 Giannis Antetokounmpo 22471911 26.9    0.6  10.0    1.4
## 9      LaMarcus Aldridge 21461010 23.1    0.4    8.5    1.2
## 10     Greg Monroe 21384175 10.3    0.0    6.9    0.5
```

- 10 Top paid 7 footers are paid to rebound and defend the rim.
- Mean salary is 14,437,429 while median salary is 3,589,566, top big men considered good being paid more.

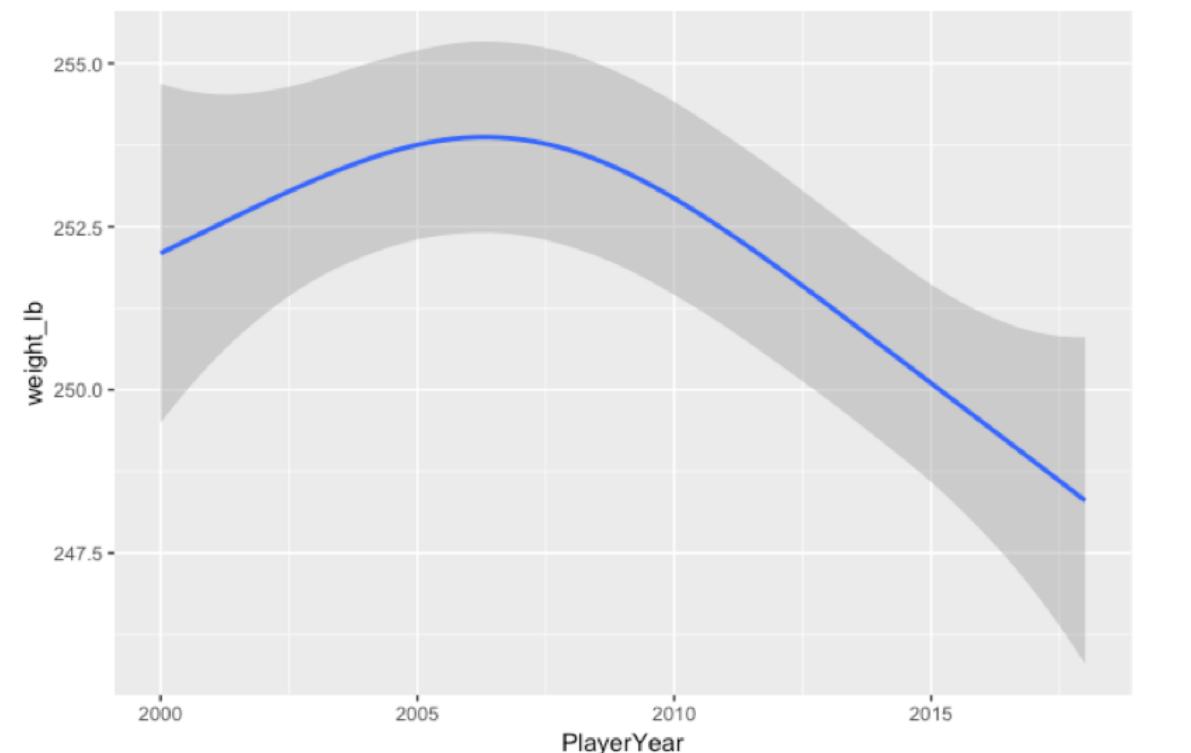


7ft Trend

7ft 3 point attempt Trend



7ft Weight Trend

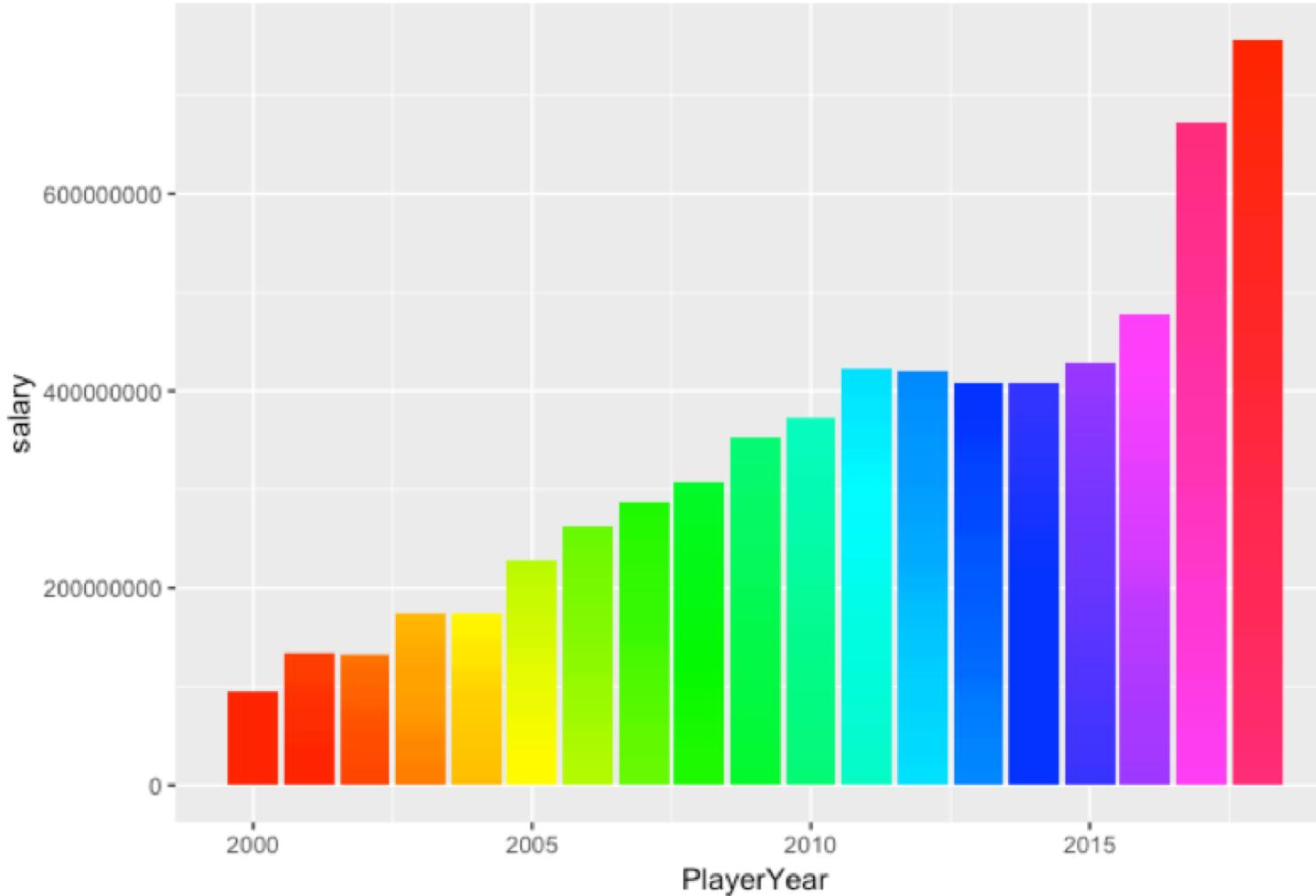


- 7 footers are shooting more 3's and slimming down to run the floor.
- **Benefit:**
 - A modern big man who can shoot and space the floor is a unicorn in the league
- **Cost:**
 - Signing a bad “apple” bigman into a bad contract is costly due to high demand or injury.



Foreign Players

Foreign Salary over the years

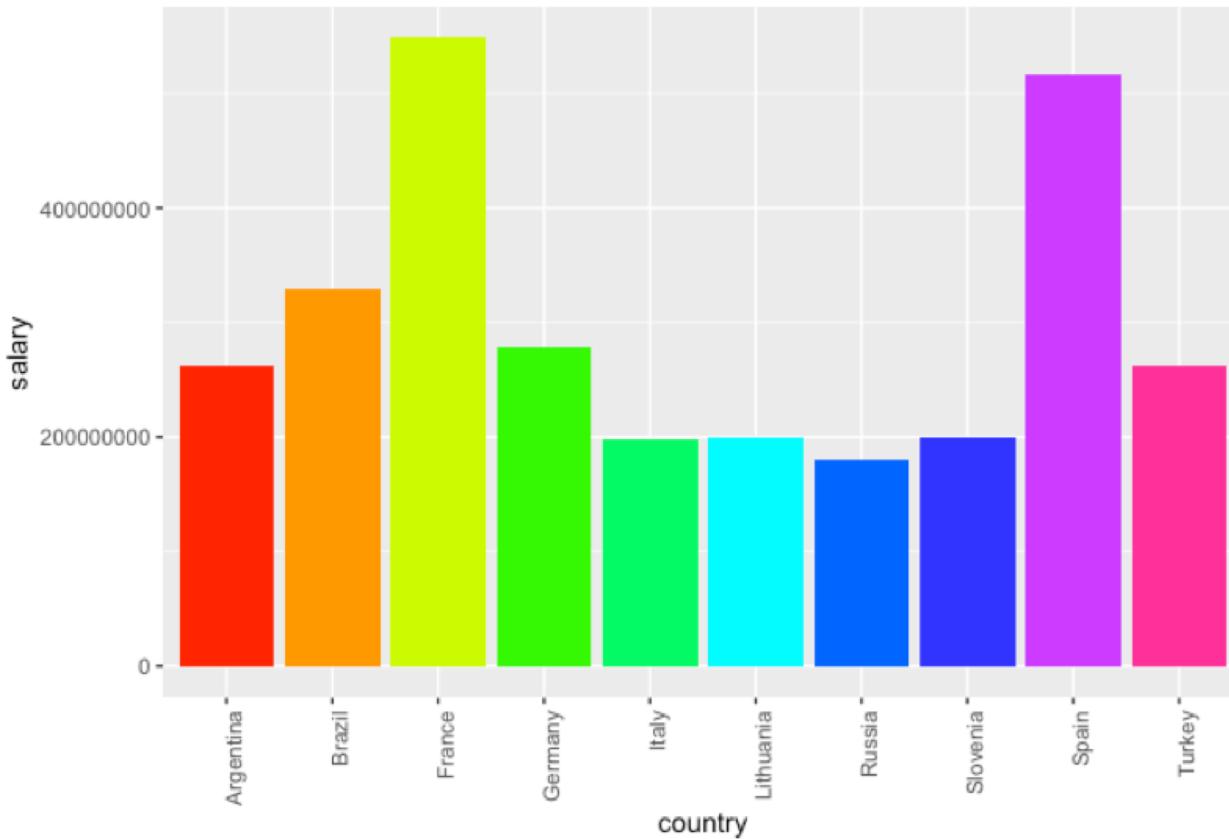


- NBA becoming a global sport
- More teams pouring money into international players over the years.



Foreign Players

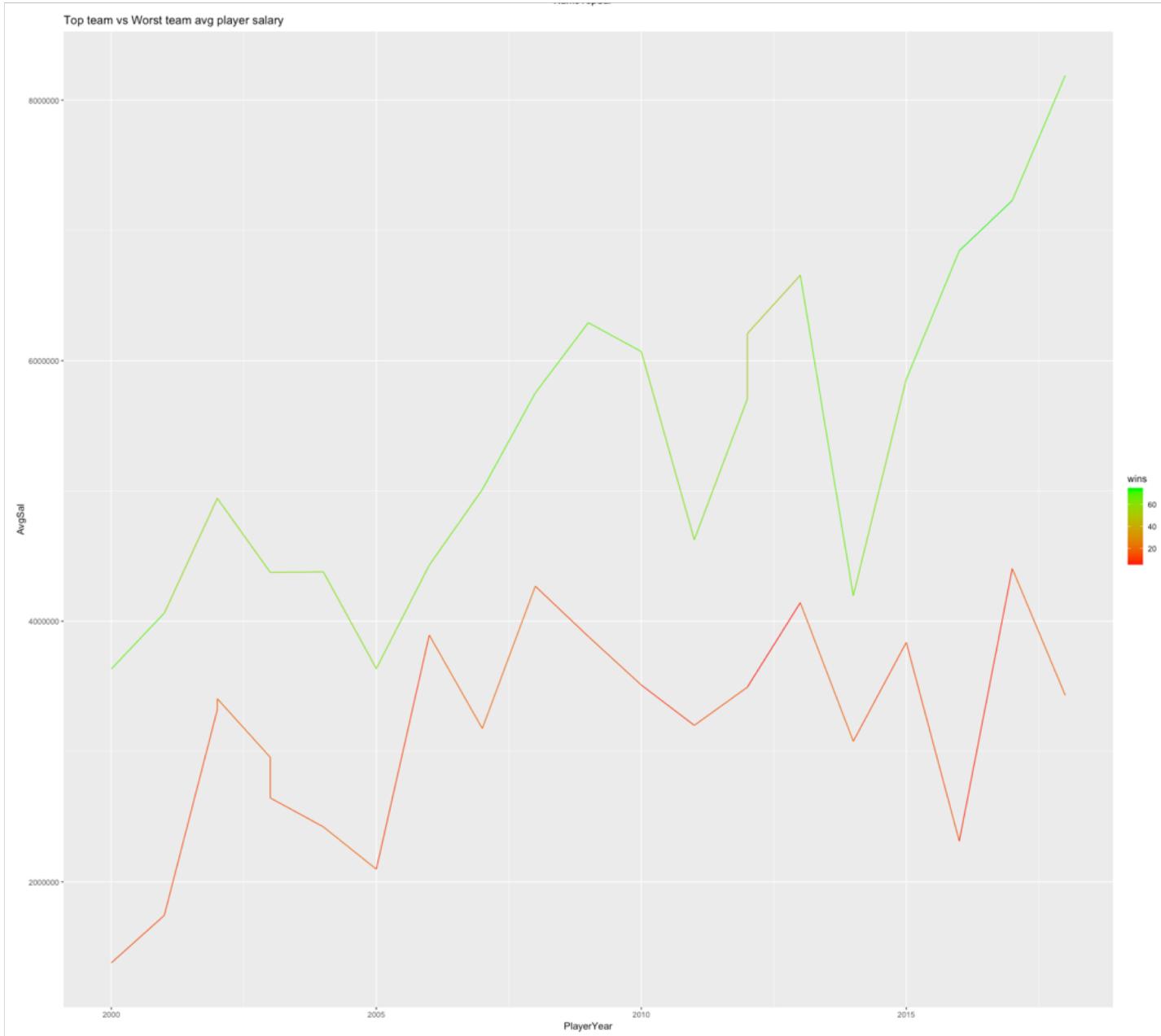
Top 10 International Countries and their Salaries



- France and Spain getting most of the NBA salary
- **Benefit of Foreign player:**
 - Foreign player can be stashed abroad and doesn't count towards team cap.
- **Cost**
 - International Clubs buyout
 - Complex salary structure might be stolen by another team



Signing with Winning vs Losing Team



- Winning teams pay more salary than losing teams.
 - Winning is green line
 - Losing is red line
- Top Player on average is paid more for winning team than losing team



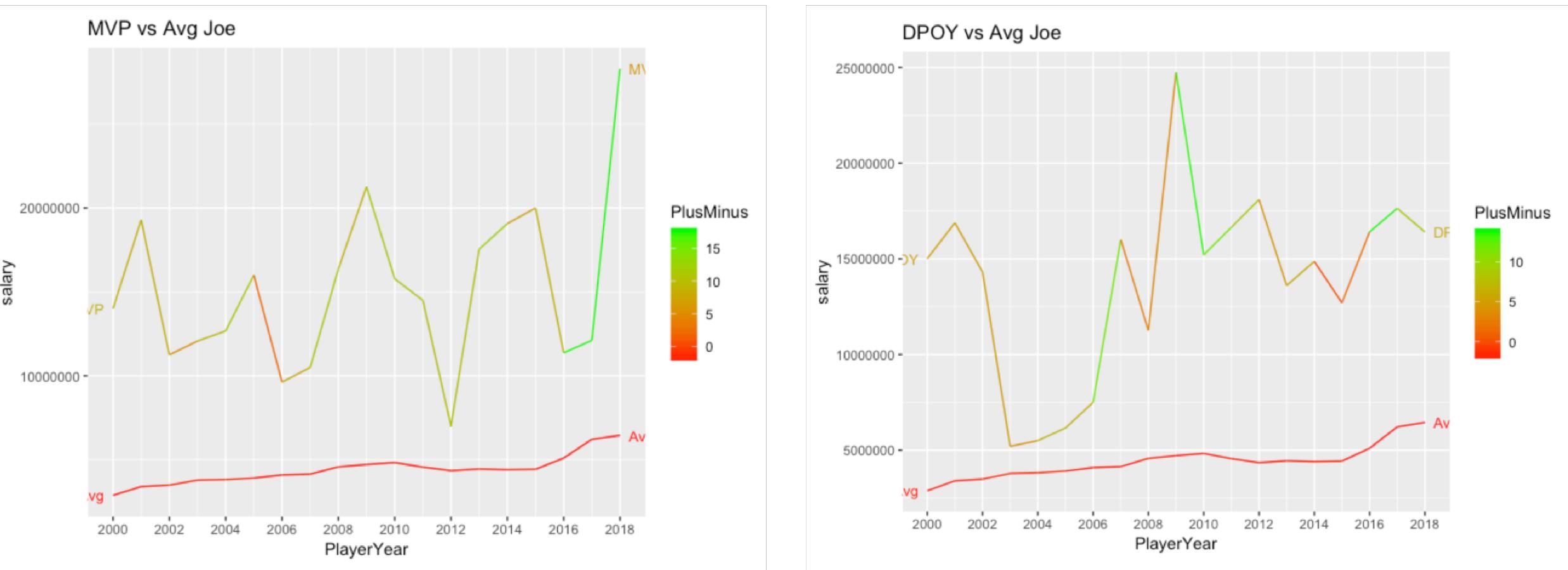
Signing with Winning vs Losing Team

	Salary Win	Salary Lose
## mean	5122276	4041735
## max	34682550	30453000
## min	2853	6000
## median	3033000	2446600
## stdev	5387179	4335375

- Benefit:
 - Team Culture benefit of winning and more fan attendance
 - More national televised games more publicity
- Cost:
 - Over the luxury cap pay double for every dollar over
 - Players signed to short contracts no long term protection



Award Vs Average Joe

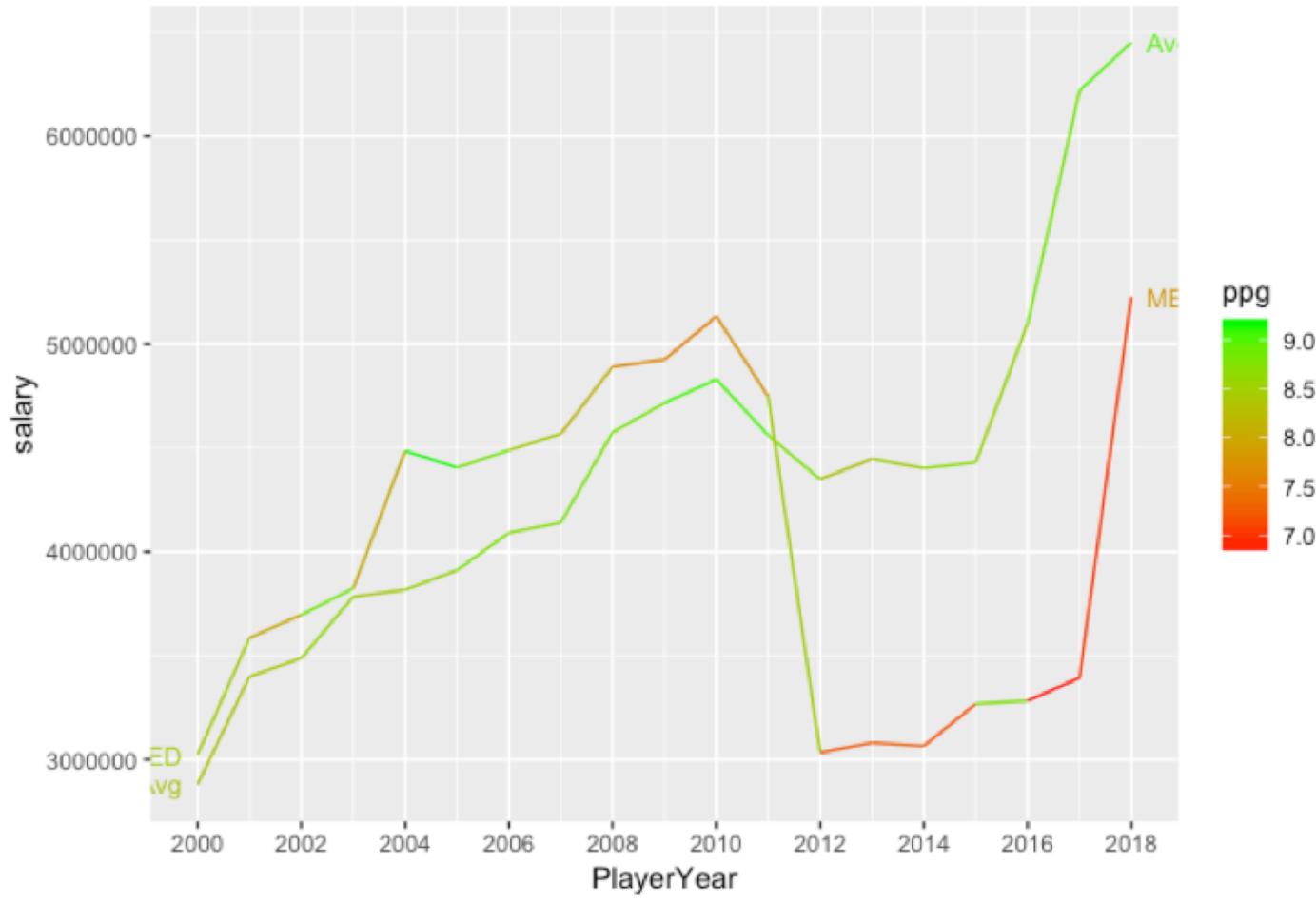


- Playing offense nets players more money than playing defense.
- Same thing for all defense an all NBA
 - CBA contract only awards max for DPOY not all defense selections



Mid-level exception

Mid Level Except vs AvgJoe



- Amount of money available to MLE decreased after 2011 CBA
- Can sign lower quality players
- **Benefit:**
 - Able to sign a player that doesn't count towards the cap
- **Cost:**
 - Player might want more money and go to another team since avg salary increased.



MULTIPLE LINEAR REGRESSION

Full code [here](#):

- Multiple Linear Regression model
 - Training Data (2000-2014 seasons)
 - Test Data (2015-2018 seasons)
 - Explanatory variables
 - Age
 - Total rebounds
 - Games played
 - Points Per Game
 - Number of Years Played
 - Box Cox Transformation to get rid of heteroscedasticity

Multiple Linear Regression

```
##  
## Call:  
## lm(formula = salary^(0.2) ~ Age + t_reb + Games + ppg + NumYears,  
##      data = nbaTrain)  
##  
## Residuals:  
##       Min     1Q   Median     3Q    Max  
## -12.2817 -1.8732  0.0329  1.9742 11.2124  
##  
## Coefficients:  
##             Estimate Std. Error t value Pr(>|t|)  
## (Intercept) 4.914164  0.250658 19.605 <2e-16 ***  
## Age         0.331697  0.008417 39.409 <2e-16 ***  
## t_reb        0.344405  0.018640 18.477 <2e-16 ***  
## Games        0.000609  0.001986  0.307   0.759  
## ppg          0.279825  0.008587 32.588 <2e-16 ***  
## NumYears     0.209825  0.010383 20.209 <2e-16 ***  
## ---  
## Signif. codes:  0 '****' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1  
##  
## Residual standard error: 2.855 on 6155 degrees of freedom  
## Multiple R-squared:  0.55, Adjusted R-squared:  0.5496  
## F-statistic: 1504 on 5 and 6155 DF, p-value: < 0.000000000000022
```

- Training model R squared was 0.5496 but predicting using test set this number fell to 0.4437.
- 2017 CBA with huge salary cap increase due to increased BRI could be a major factor in the prediction worsening



FINAL THOUGHTS

- The limits of our data
 - Team specific compensation structure
 - Playing a number of games
 - Holding an average points, rebounds or assists
 - Player pensions
 - Social influences
 - Brand building outside of the team
- What to explore in the Future
 - Player options and Team options
 - Home town discounts
 - Social media influence and media coverage paying an average player the max contract – Andrew Wiggins
 - How modern day science is extending an NBA players life cycle.