

# Why Did Tim Duncan Never Win a DPOY

Chenyang Li

Statistics and Actuarial Science

11/15/2023

- The NBA's Defensive Player of the Year Award is an annual National Basketball Association (NBA) award given since the 1982–83 NBA season to the best defensive player of the regular season.
- The winner is selected by a panel of certain sportswriters and broadcasters.
- Each first-place vote is worth five points, second-place votes are worth three points, and a third-place vote is worth one.

- He spent his entire 19-year career with the San Antonio Spurs.
- Nicknamed "the Big Fundamental", he is widely regarded as the greatest power forward of all time and one of the greatest players in NBA history (Quoted by Wikipedia).



- 2× MVP
- 15× All-Star
- 5× NBA Champion
- 3× Finals MVP
- 15× All-NBA
- 15× All-Defensive

- The share of voting is taken as response since the max points a player can get vary over the years.
- Only the DPOY winners from 1990 to 2022 are considered, and the response should be modified as the share of voting conditional on that player wins DPOY.
- Various variables are gathered from the internet, including stats per game, stats of shooting, and some advanced stats.

# Glance of Data

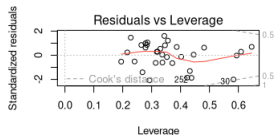
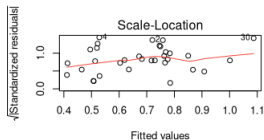
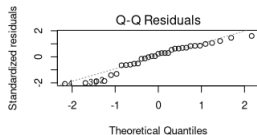
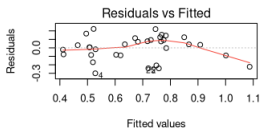
Season	Player	Age	Tm	First	Pts Won	Pts Max	Share	G	MP	PTS	TRE	AST	STL	BLK	FG%	3P%	FT%	WS	WS/48	DWS	DBPM	DRtg	W/L %	MVP Share
1990-91	Dennis Rodman	29	DET	51	51	96	0.531	82	33.5	8.2	12.5	1	0.8	0.7	0.493	0.2	0.631	8.7	0.151	5.2	0.7	101	0.61	0
1991-92	David Robinson	26	SAS	46	46	96	0.479	68	37.7	23.2	12.2	2.7	2.3	4.5	0.551	0.125	0.701	13.9	0.26	6.9	4.6	94	0.573	0.351
1992-93	Hakeem Olajuwon	30	HOU	73	73	98	0.745	82	39.5	26.1	13	3.5	1.8	4.2	0.529	0	0.779	15.8	0.234	8	3.6	96	0.671	0.66
1993-94	Hakeem Olajuwon	31	HOU	23	23	101	0.228	80	41	27.3	11.9	3.6	1.6	3.7	0.528	0.421	0.716	14.3	0.21	7.9	3.3	95	0.707	0.88
1994-95	Dikembe Mutombo	28	DEN	45	45	105	0.429	82	37.8	11.5	12.5	1.4	0.5	3.9	0.556	0	0.654	8.7	0.135	5.2	1.8	103	0.5	0
1995-96	Gary Payton	27	SEA	56	56	113	0.496	81	39	19.3	4.2	7.5	2.9	0.2	0.484	0.328	0.748	11.5	0.174	5.6	1.8	102	0.78	0.087
1996-97	Dikembe Mutombo	30	ALT	60	60	115	0.522	80	37.2	13.3	11.6	1.4	0.6	3.3	0.527	0	0.705	11.3	0.183	6.6	2.4	97	0.683	0.003
1997-98	Dikembe Mutombo	31	ALT	39	39	116	0.336	82	35.6	13.4	11.4	1	0.4	3.4	0.537	0	0.67	10.8	0.177	5.2	1.4	99	0.61	0
1998-99	Alajon Mourning	28	MIA	89	89	118	0.754	46	38.1	20.1	11	1.6	0.7	3.9	0.511	0	0.652	7.9	0.216	3.9	2.2	93	0.66	0.655
1999-00	Alajon Mourning	29	MIA	62	62	121	0.512	79	34.8	21.7	9.5	1.6	0.5	3.7	0.551	0	0.711	12.9	0.226	5.6	2.2	96	0.634	0.303
2000-01	Dikembe Mutombo	34	TOT	48	48	123	0.39	75	34.5	10	13.5	1	0.4	2.7	0.484	0	0.725	8.1	0.151	4.7	1.3	97	0.573	0
2001-02	Ben Wallace	27	DET	116	116	120	0.967	80	36.5	7.6	13	1.4	1.7	3.5	0.531	0	0.423	11.6	0.19	7.2	3.3	93	0.61	0.019
2002-03	Ben Wallace	28	DET	100	531	585	0.908	73	39.4	6.9	15.4	1.6	1.4	3.2	0.481	0.167	0.45	10.6	0.176	7.9	3.5	90	0.61	0.028
2003-04	Meta World Peace	24	IND	80	476	605	0.787	73	37.2	18.3	5.3	3.7	2.1	0.7	0.421	0.31	0.733	8	0.141	5.2	1.9	96	0.744	0
2004-05	Ben Wallace	30	DET	45	339	625	0.542	74	36.1	9.7	12.2	1.7	1.4	2.4	0.453	0.111	0.428	8.5	0.153	6.7	2.6	94	0.659	0
2005-06	Ben Wallace	31	DET	58	420	620	0.677	82	35.2	7.3	11.3	1.9	1.8	2.2	0.51	0	0.416	10.1	0.168	6.9	3.1	95	0.78	0
2006-07	Marcus Camby	32	DEN	70	431	650	0.663	70	33.8	11.2	11.7	3.2	1.2	3.3	0.473	0	0.729	7.6	0.155	5.1	3.9	97	0.549	0
2007-08	Kevin Garnett	31	BOS	90	493	620	0.795	71	32.8	18.8	9.2	3.4	1.4	1.3	0.539	0	0.801	12.9	0.265	6.2	3.5	94	0.805	0.532
2008-09	Dwight Howard	23	ORL	105	542	595	0.911	79	35.7	20.6	13.8	1.4	1	2.9	0.572	0	0.594	13.8	0.234	7.6	2.4	95	0.72	0.271
2009-10	Dwight Howard	24	ORL	110	576	610	0.944	82	34.7	18.3	13.2	1.8	0.9	2.8	0.612	0	0.592	13.2	0.223	7.1	2.8	95	0.72	0.389
2010-11	Dwight Howard	25	ORL	114	585	600	0.975	78	37.6	22.9	14.1	1.4	1.4	2.4	0.593	0	0.596	14.4	0.235	7.7	2.4	94	0.634	0.531
2011-12	Tyson Chandler	29	NYK	45	311	605	0.514	62	33.2	11.3	9.9	0.9	0.9	1.4	0.679	0	0.689	9.5	0.22	3.6	1.1	99	0.545	0
2012-13	Marc Gasol	28	MEM	30	212	605	0.35	80	35	14.1	7.8	4	1	1.7	0.494	0.071	0.848	11.5	0.197	5.4	3.1	98	0.683	0.001
2013-14	Joakim Noah	28	CHI	100	555	625	0.888	80	35.3	12.6	11.3	5.4	1.2	1.5	0.475	0	0.737	11.2	0.19	6.6	3.6	96	0.585	0
2014-15	Kawhi Leonard	23	SAS	37	333	645	0.516	64	31.8	16.5	7.2	2.5	2.3	0.8	0.479	0.349	0.802	8.6	0.204	4.4	3.1	96	0.671	0.001
2015-16	Kawhi Leonard	24	SAS	84	547	650	0.842	72	33.1	21.2	6.8	2.6	1.8	1	0.506	0.443	0.874	13.7	0.277	5.5	3	96	0.817	0.484
2016-17	Draymond Green	26	GSW	73	434	500	0.868	76	32.5	10.2	7.9	7	2	1.4	0.418	0.308	0.709	8.2	0.16	5.4	3.9	99	0.817	0
2017-18	Rudy Gobert	25	UTA	89	466	505	0.923	56	32.4	13.5	10.7	1.4	0.8	2.3	0.622	0	0.682	8.1	0.214	3.9	2.5	99	0.585	0
2018-19	Rudy Gobert	26	UTA	65	411	500	0.822	81	31.8	15.9	12.9	2	0.8	2.3	0.669	0	0.636	14.4	0.268	5.7	2.5	100	0.61	0.001
2019-20	Giannis Antetokounmpo	25	MIL	75	432	500	0.864	63	30.4	29.5	13.6	5.6	1	1	0.553	0.304	0.633	11.1	0.279	5	4.1	97	0.767	0.952
2020-21	Rudy Gobert	28	UTA	84	464	500	0.928	71	30.8	14.3	13.5	1.3	0.6	2.7	0.675	0	0.623	11.3	0.248	5.2	2.8	101	0.722	0.008
2021-22	Marcus Smart	27	BOS	37	257	500	0.514	71	32.3	12.1	3.8	5.9	1.7	0.3	0.418	0.331	0.793	5.6	0.116	3.7	1.7	107	0.622	0
2022-23	Jaren Jackson Jr	23	MEM	56	391	500	0.782	63	28.4	18.6	6.8	1	1	3	0.506	0.355	0.788	6.6	0.177	3.8	2	105	0.622	0

- Since the number of observations are quite small, and according to my understanding about basketball, the variables related to shooting don't have to be considered when it comes to defense.
- W/L % and MVP Share are not listed on the website I used to collect data, so they are ignored at first.

## Defensive Player of the Year (Hakeem Olajuwon Trophy) [Share & Export](#) [Glossary](#)

Rank	Player	Age	Tm	Voting			G	Per Game						Shooting			Advanced				
				First	Pts Won	Pts Max		Share	MP	PTS	TRB	AST	STL	BLK	FG%	3P%	FT%	WS	WS/48	DWS	DBPM
1	<a href="#">Dikembe Mutombo</a>	34	TOT	48.0	48.0	123	0.390	75	34.5	10.0	13.5	1.0	0.4	2.7	.484	.725	8.1	.151	4.7	1.3	97

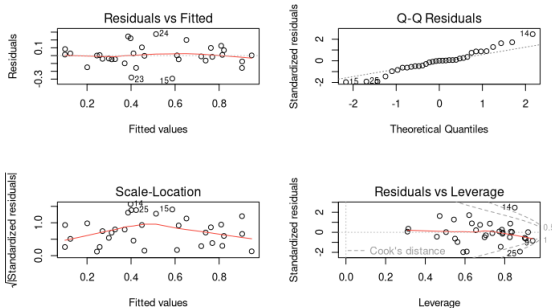
- According to the brief check on the original data set, transformation and quadratic terms are required.





# Transformation & Outliers

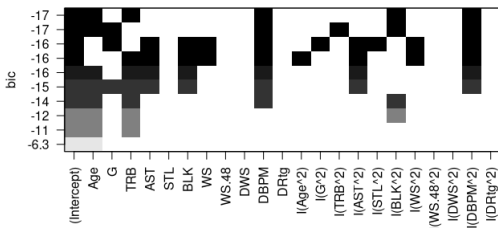
- After squaring the share and adding quadratic terms, two outliers are found.



- 14: Metta World Peace
- 25: Kawhi Leonard
- Surprisingly, Gary Payton (6) is not an outlier.

# Model Selection

- After taking out two outliers, the model selection is done by BIC.
- The model on the top, which has the smallest BIC and fewest variables, is selected.



# Regression Results

- All the variables are significant, but  $R^2$  is only 0.7044.

```
Call:
lm(formula = Share^2 ~ Age + TRB + DBPM + I(BLK^2) + I(DBPM^2),
    data = DPOY[-c(14, 25), ])
```

```
Residuals:
    Min       1Q   Median       3Q      Max
-0.38600 -0.10685  0.02427  0.11105  0.28004
```

```
Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.90848    0.43805   2.074 0.048537 *
Age          -0.05432    0.01201  -4.521 0.000129 ***
TRB           0.04966    0.01241   4.003 0.000492 ***
DBPM          0.48822    0.16772   2.911 0.007470 **
I(BLK^2)     -0.01780    0.00634  -2.807 0.009546 **
I(DBPM^2)    -0.07580    0.03100  -2.445 0.021863 *
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.1718 on 25 degrees of freedom
Multiple R-squared:  0.7044,    Adjusted R-squared:  0.6453
F-statistic: 11.91 on 5 and 25 DF,  p-value: 5.744e-06
```

# What about Tim Duncan?

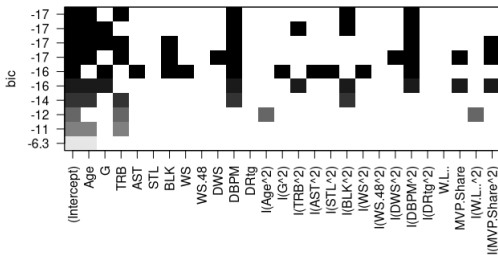
- Firstly, we assume TD21 won the DPOY.
- Thus, we can predict the share of voting he can get according to his stats.
- Then, we compare the predicted share of voting with that of the award winner.
- Under this idea, he should've won DPOY in his first 4 seasons and his 8th season.

# Something More

- To win a DPOY, leading the team to wins would be an important factor, so I include W/L %.
- All the DPOY winners helped team win at least half of games in that season.
- There is a rumor that TD21 can never win a DPOY because he was always a potential MVP winner so that his defense was payed less attention to, so MVP Share should also be taken into consideration.
- Hakeem Olajuwon in 1993-94 and Giannis Antetokounmpo in 2019-20 won both MVP and DPOY, but this never happened during TD21's career.

# Model Selection

- After adding extra two variables, together with their quadratic terms, the model selection is again done by BIC.
- Different from the criterion we used above, including at least one of the new variables is prior to parsimoniousness, so the 3rd and 4th models are selected.



# Regression Results

- All the variables are significant, and  $R^2$  increases to 0.7584.

```
Call:
lm(formula = Share^2 ~ Age + G + TRB + BLK + DBPM + I(DBPM^2) +
    I(MVP.Share^2), data = DPOY[-c(14, 25), ])

Residuals:
    Min       1Q   Median       3Q      Max
-0.35228 -0.08704  0.02536  0.07774  0.26927

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  1.143915   0.444731   2.572  0.017038 *
Age          -0.049050   0.011648  -4.211  0.000333 ***
G            -0.007451   0.003642  -2.046  0.052347 .
TRB          0.062433   0.012975   4.812  7.44e-05 ***
BLK          -0.101247   0.031514  -3.213  0.003859 **
DBPM         0.618095   0.164223   3.764  0.001010 **
I(DBPM^2)   -0.096838   0.030169  -3.210  0.003886 **
I(MVP.Share^2) -0.254334   0.143874  -1.768  0.090368 .
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.162 on 23 degrees of freedom
Multiple R-squared:  0.7584,    Adjusted R-squared:  0.6848
F-statistic: 10.31 on 7 and 23 DF,  p-value: 8.248e-06
```

# Regression Results

- All the variables are significant, and  $R^2$  increases to 0.8061.

```
Call:
lm(formula = Share^2 ~ Age + TRB + BLK + DWS + DBPM + I(DWS^2) +
    I(DBPM^2) + MVP.Share + I(MVP.Share^2), data = DPOY[-c(14,
    25), ])
```

```
Residuals:
    Min       1Q   Median       3Q      Max
-0.33277 -0.07218 -0.01417  0.09520  0.31611
```

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   1.55945    0.63509   2.455 0.022869 *
Age           -0.03889    0.01183  -3.288 0.003510 **
TRB            0.07831    0.01424   5.502 1.85e-05 ***
BLK           -0.13192    0.03247  -4.062 0.000560 ***
DWS           -0.49240    0.21502  -2.290 0.032471 *
DBPM           0.71068    0.16477   4.313 0.000307 ***
I(DWS^2)      0.03605    0.01797   2.006 0.057892 .
I(DBPM^2)     -0.10386    0.02922  -3.554 0.001877 **
MVP.Share     0.82921    0.36887   2.248 0.035444 *
I(MVP.Share^2) -1.26273    0.46872  -2.694 0.013589 *
```

```
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
Residual standard error: 0.1518 on 21 degrees of freedom
Multiple R-squared:  0.8061,    Adjusted R-squared:  0.7231
F-statistic: 9.703 on 9 and 21 DF,  p-value: 1.053e-05
```



# What about Tim Duncan?

- We use the same idea as we used before.
- This time, we apply his data into the more parsimonious model.
- Under different models, we come up with the same conclusion.

- The competition among different DPOY nominees is ignored.
- The number of observations is not large enough.
- Voting is subjective, and the criterion each voter uses may vary over the years.

Questions?