

Passing in the NBA

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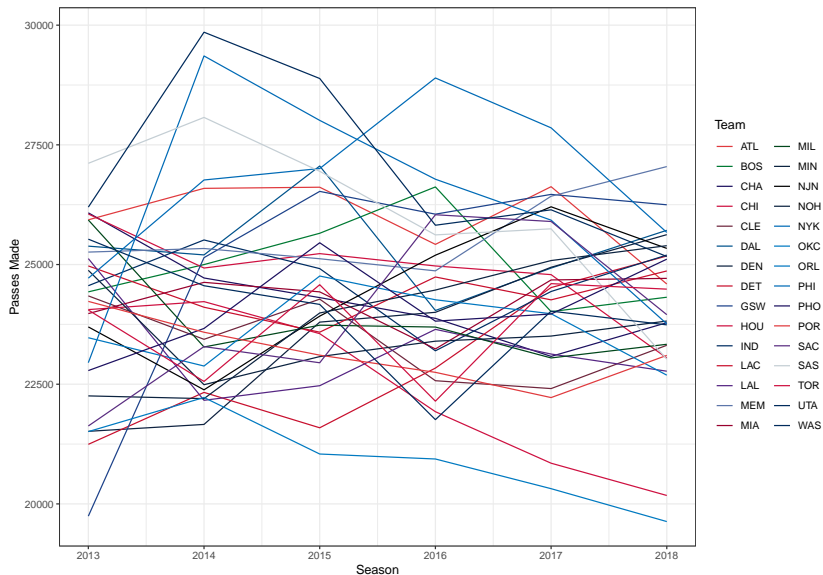
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Questions

- ▶ Has the passing rate increased in the NBA?
- ▶ Do assists correlate with winning percentage?

Passing

Passes made per season



Passing model selection

- ▶ Random intercept (RI) for team only:

```
lme(Passes.Made ~ Season, random = ~1|Team, data =  
passing, method = "ML")
```

- ▶ RI for team and random slope (RS) across season:

```
lme(Passes.Made ~ Season, random = ~Season|Team, data =  
passing, method = "ML")
```

- ▶ RI for team with AR(1) structure for repeated measures:

```
lme(Passes.Made ~ Season, random = ~1|Team, data = passing,  
correlation = corAR1(), method = "ML")
```

- ▶ RI for team and RS across season with AR(1) structure for repeated measures:

```
lme(Passes.Made ~ Season, random = ~Season|Team, data =  
passing, correlation = corAR1(), method = "ML")
```

AIC

	df	AIC
RI Only	4	3159.781
RI and AR(1)	5	3120.225
RI, RS, and AR(1)	7	3124.225

The best model by AIC was random intercept for team with AR(1) structure for repeated measures (RI and RS did not converge without AR(1)). Minutes played did not affect the results.

Passing results

There were no polynomial effects for time:

	Value	Std.Error	DF	t-value	p-value
(Intercept)	24349.989	235.835	146	103.250	<1e-04
poly(Season, 4)1	-40.362	2004.510	146	-0.020	0.984
poly(Season, 4)2	-1941.549	1404.499	146	-1.382	0.169
poly(Season, 4)3	360.020	1088.741	146	0.331	0.741
poly(Season, 4)4	-465.829	925.730	146	-0.503	0.616

Break point

The segmented package in R suggests there's a knot at 2015:

```
## Call: segmented.lm(obj = linmod)
##
## Meaningful coefficients of the linear terms:
## (Intercept)      Season      U1.Season
##   -547034.4      283.7      -421.6
##
## Estimated Break-Point(s):
## psi1.Season
##      2015
```

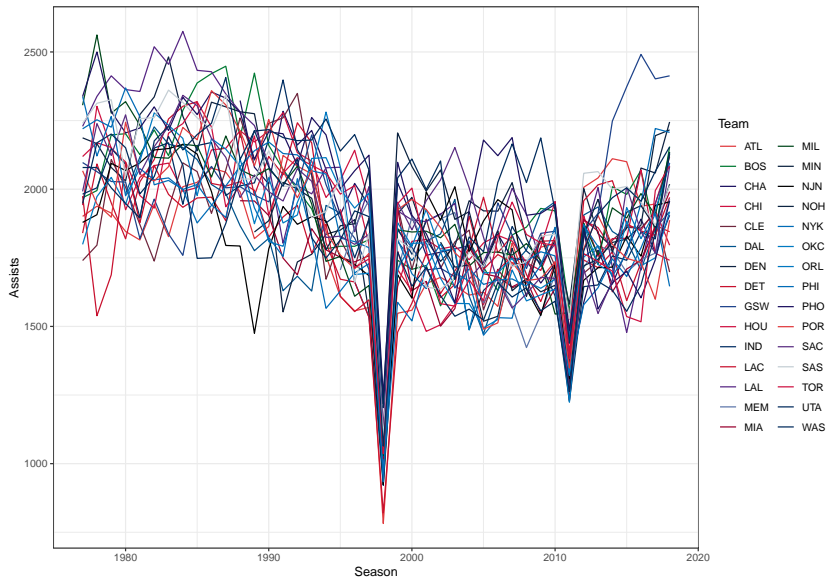

Piecewise model

	Value	Std.Error	DF	t-value	p-value
(Intercept)	164836.019	213588.290	148	0.772	0.441
Season	-69.854	106.029	148	-0.659	0.511
Change in Slope	0.181	0.154	148	1.178	0.241

So, the overall passing rate doesn't appear to have changed since 2013.

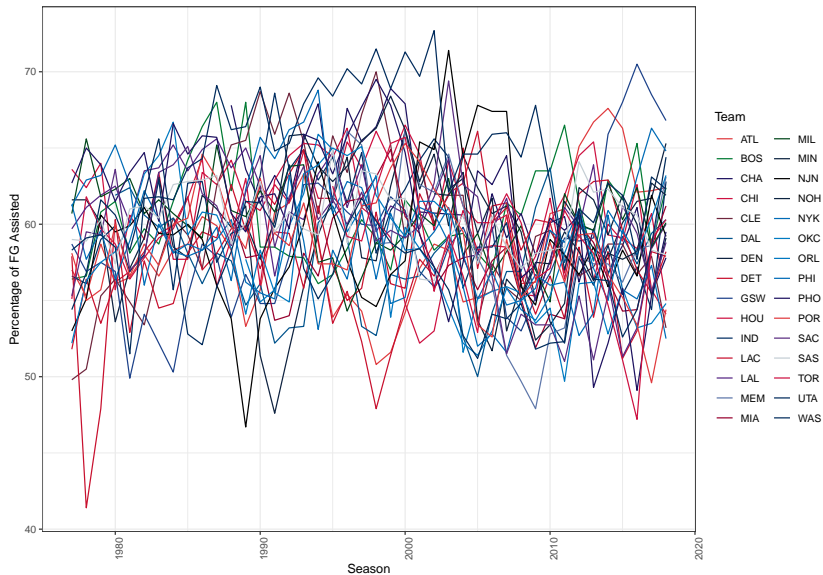
Assists

Raw assist numbers by team and season

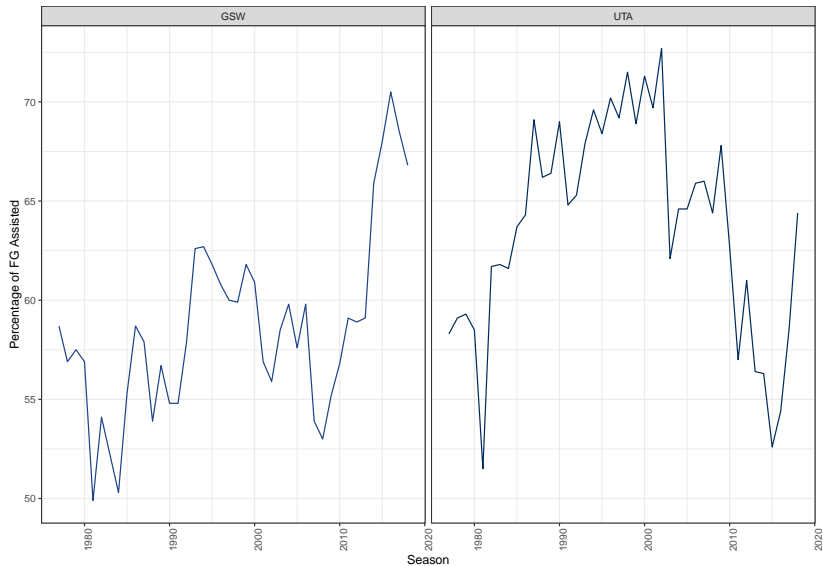


There were lockouts in 1998 and 2011.

Percentage of FG Assisted



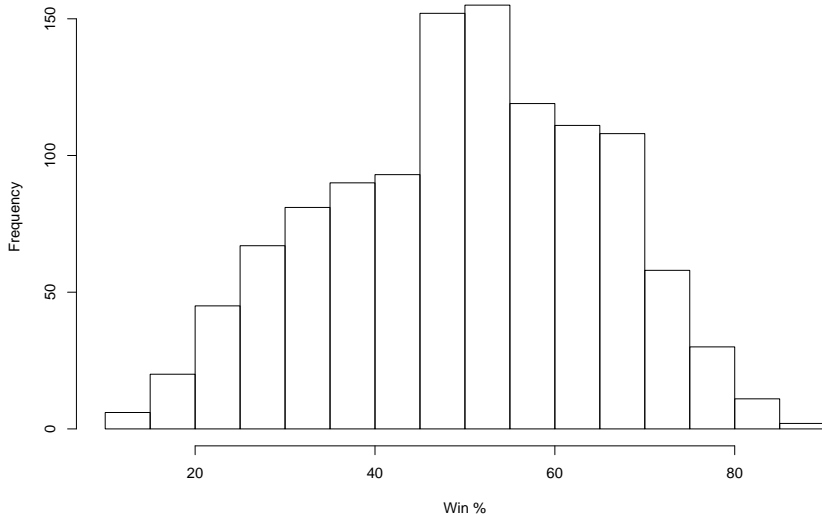
Steph Curry and John Stockton



Do assists help you win?

Modeled winning percentage using normal theory mixed models.

Histogram of Win %



Win model selection

	df	AIC
RI Only	4	9356.368
RI and RS	6	9360.368
RI and AR(1)	5	8873.770
RI, RS, and AR(1)	7	8877.770

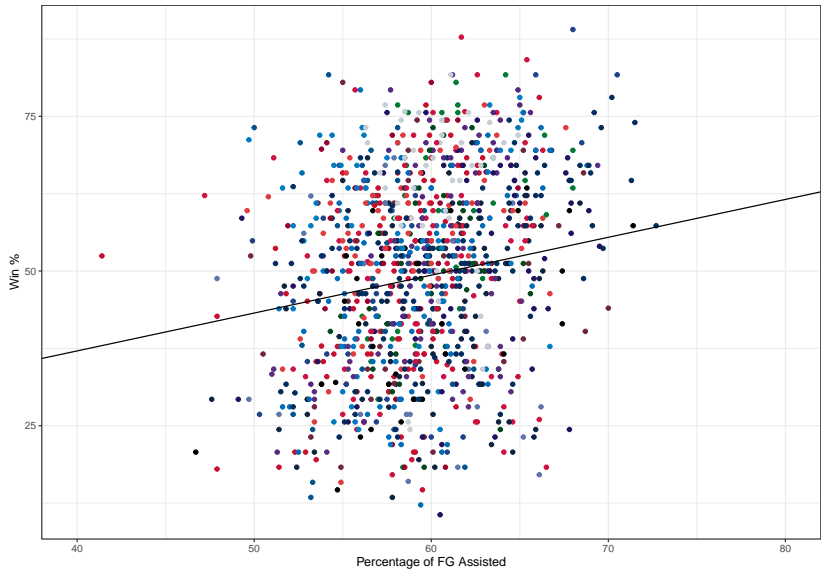
Compared the same general model types as for the passing model.

Win model results

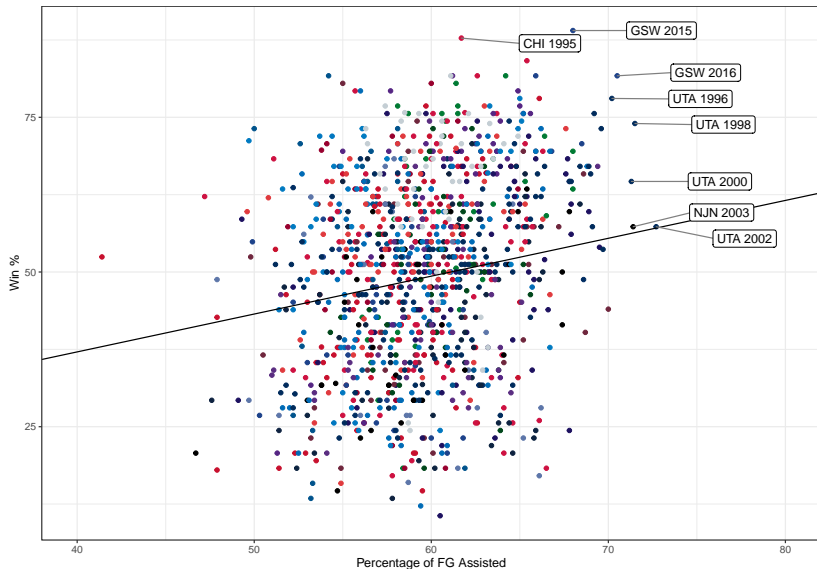
	Value	Std.Error	DF	t-value	p-value
(Intercept)	17.779	6.605	1117	2.692	0.007
% of FG Assisted	0.536	0.110	1117	4.886	<1e-04

An increase of 10 points in percentage of FGs assisted can lead to an approximately 5 point increase in winning percentage (or about 4 games) on the season.

Wins by percentage assisted



Wins by percentage assisted



Conclusions

- ▶ Passing hasn't increased since 2013.
- ▶ Assists are helpful! But they won't necessarily win you a championship.

Limitations

- ▶ Assists are a very subjective measure.
- ▶ Assists also depend on the shooting percentage of the player receiving a pass.
- ▶ These analyses were not adjusted for any defensive measures, which leaves out a big part of team success and winning percentage.
- ▶ They were also not adjusted for opponent defensive measures.
- ▶ Passing data does not go back very far.