# Passing in the NBA

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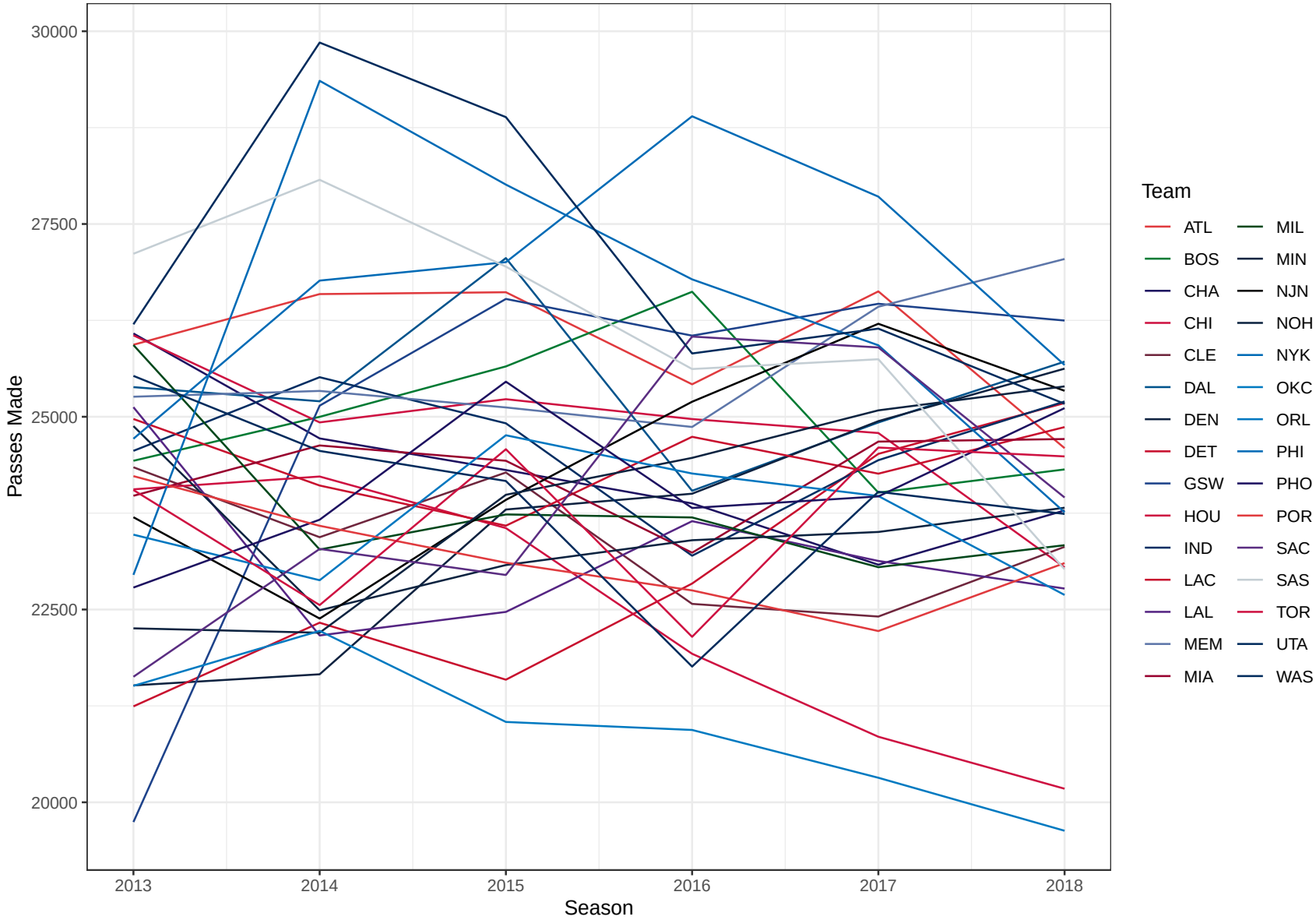
# Questions

- 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:

Table 2: Fixed Effects

| | 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

Table 3: Fixed Effects

| | 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 |

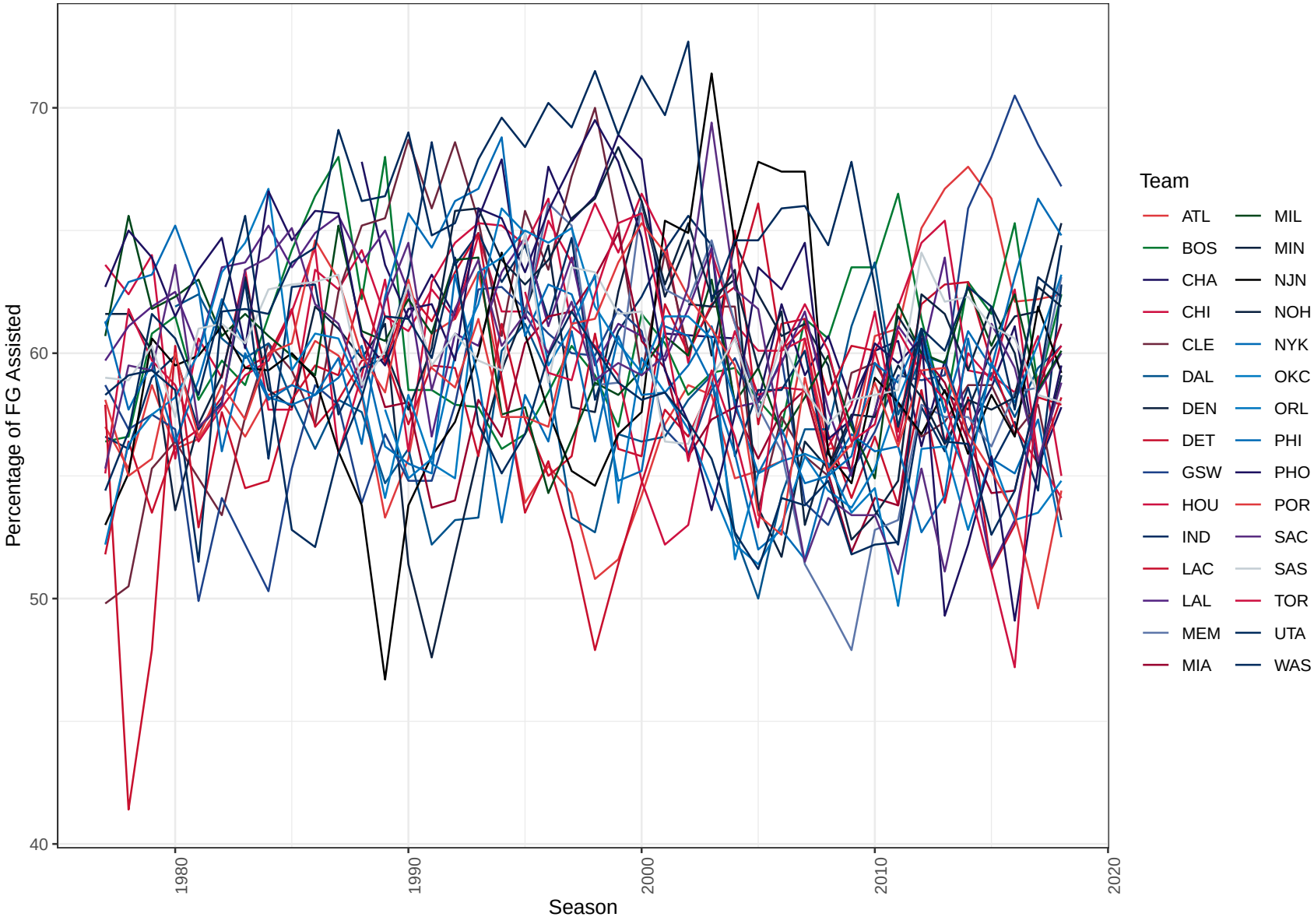
So, the overall passing rate doesn't appear to have changed since 2013.

# Assists

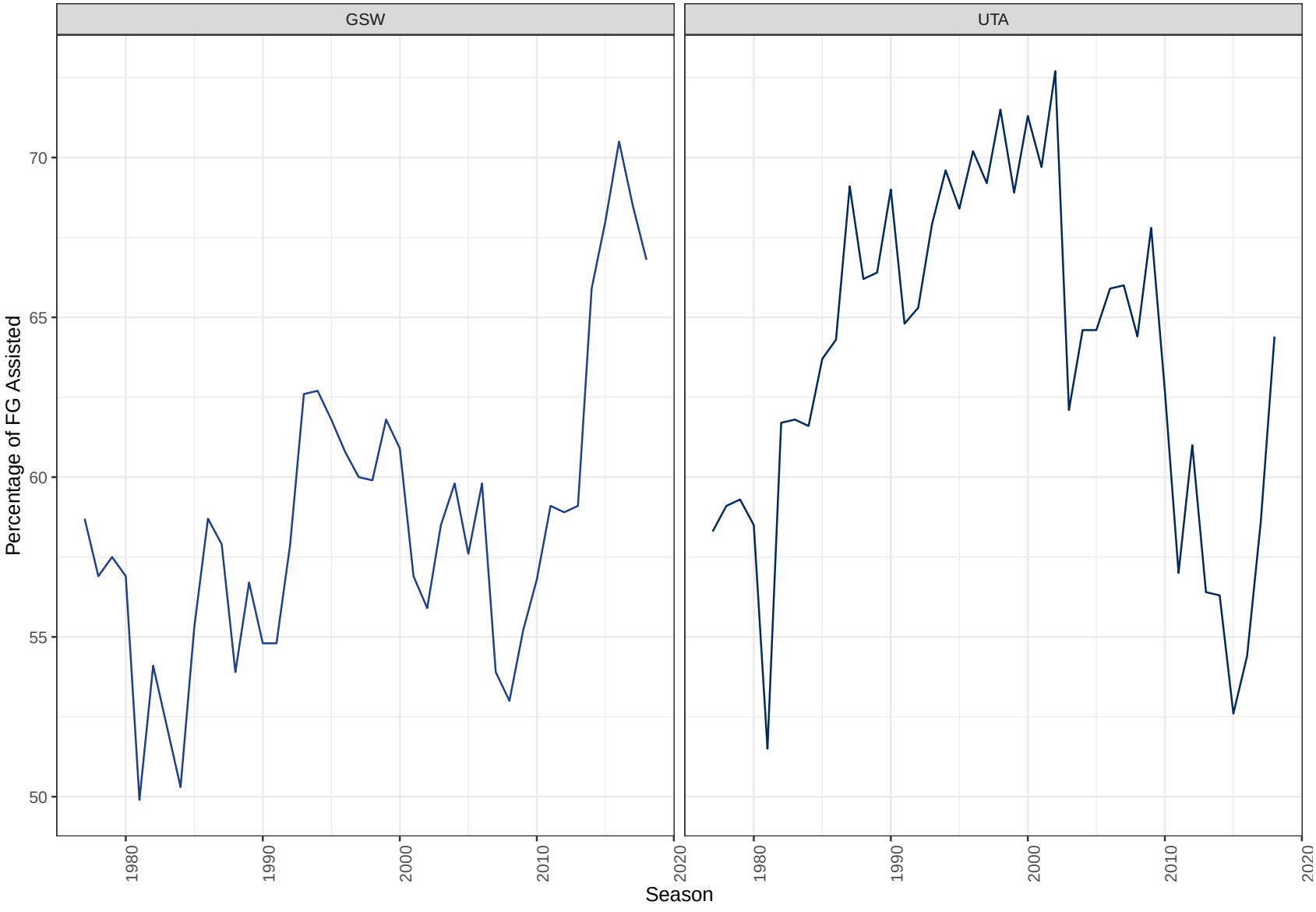
# Raw assist numbers by team and season


There were lockouts in 1998 and 2011.

# Percent assisted

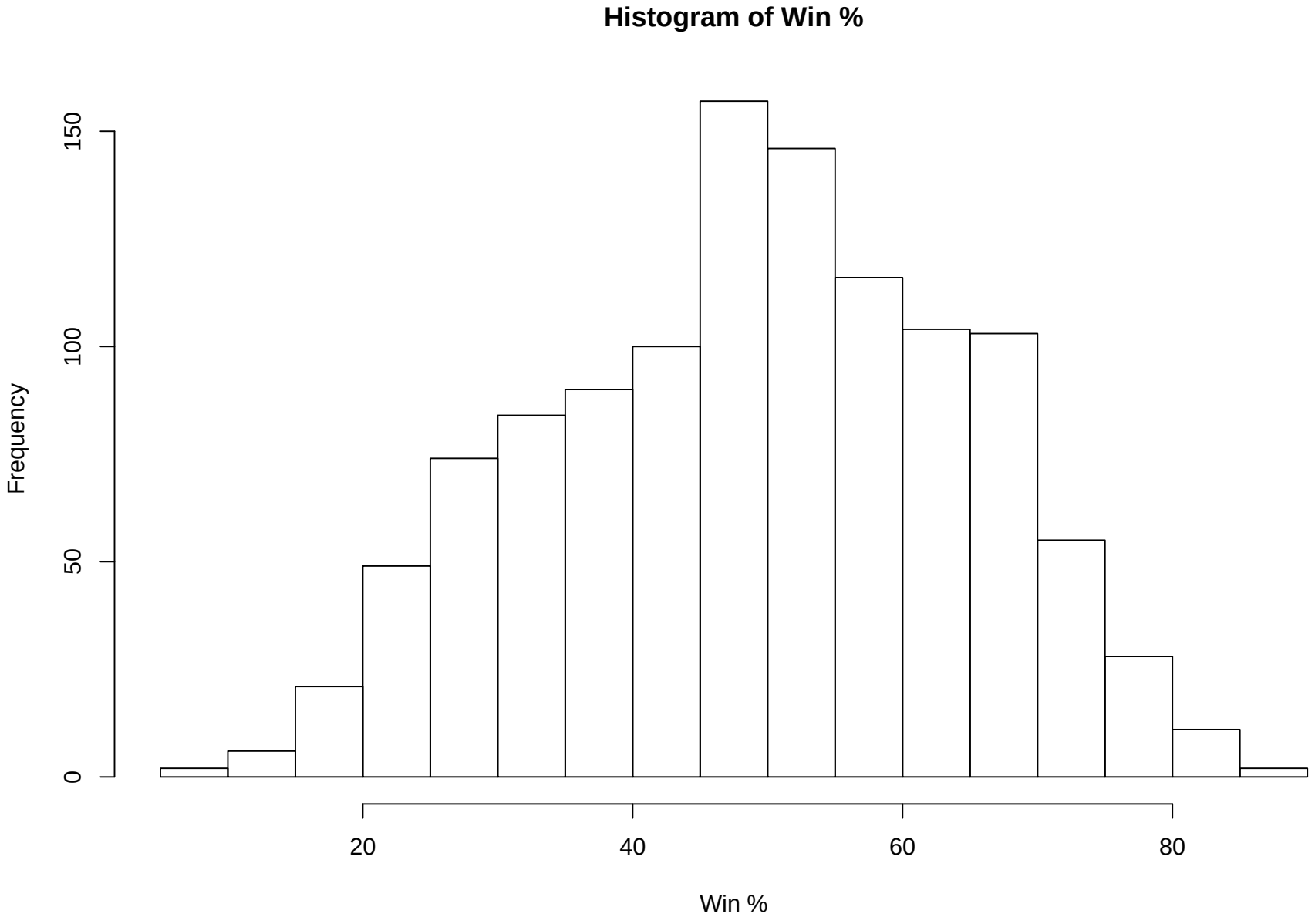


# Steph Curry and John Stockton



# Do assists help you win?

Modeled winning percentage using normal theory mixed models.



# Win model selection

| | df | AIC |
|---|---|---|
| RI Only | 4 | 9397.703 |
| RI and RS | 6 | 9401.703 |
| RI and AR(1) | 5 | 8991.621 |
| RI, RS, and AR(1) | 7 | 8995.621 |

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

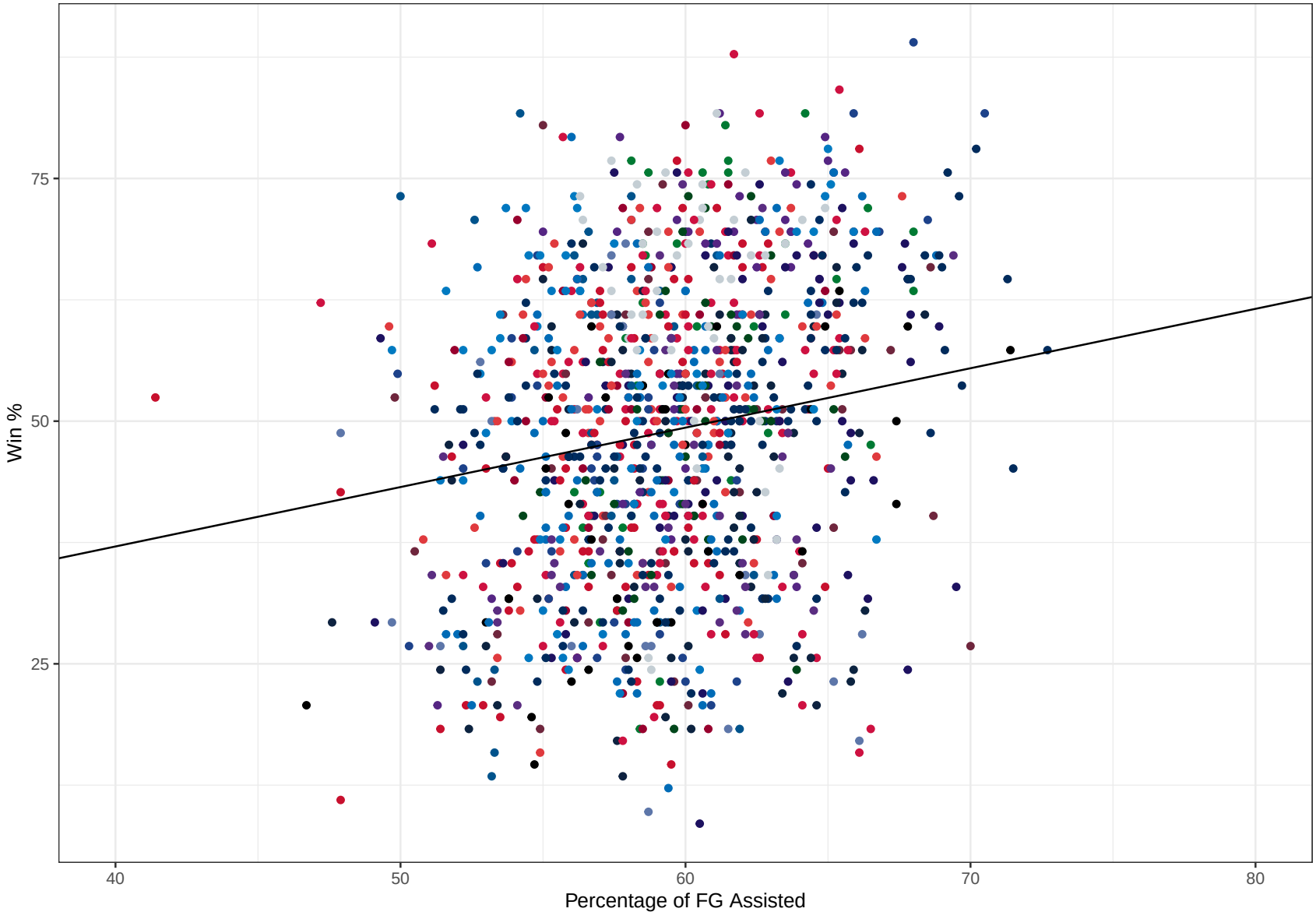
# Win model results

Table 5: Fixed Effects

| | Value | Std.Error | DF | t-value | p-value |
|---|---|---|---|---|---|
| (Intercept) | 12.609 | 6.914 | 1117 | 1.824 | 0.068 |
| % of FG Assisted | 0.612 | 0.115 | 1117 | 5.318 | <1e-04 |

An increase of 10 points in percentage of FGs assisted can lead to an approximately 6 point increase in winning percentage on the season. So, about 5 games per season.

# Wins by percentage assisted



# Wins by percentage assisted