

# The Three-Point Revolution: How NBA Offense Changed from 2003-2023

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STAT 228-011



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# Why This Project?

-  The 3-point line was added in 1979
-  Underused for decades, and exploded in the 2000s
-  I'm interested in how the NBA evolved, especially teams like the Boston Celtics

Research Question: Does 3-point shooting efficiency predict a team's success?

# Dataset

🏀 Kaggle: NBA Games Stats (2003–2023) by Nathan Lauga

🏀 Files Included (CSV format):

- games.csv (main file used for this project)
- games\_details.csv
- players.csv
- ranking.csv
- teams.csv

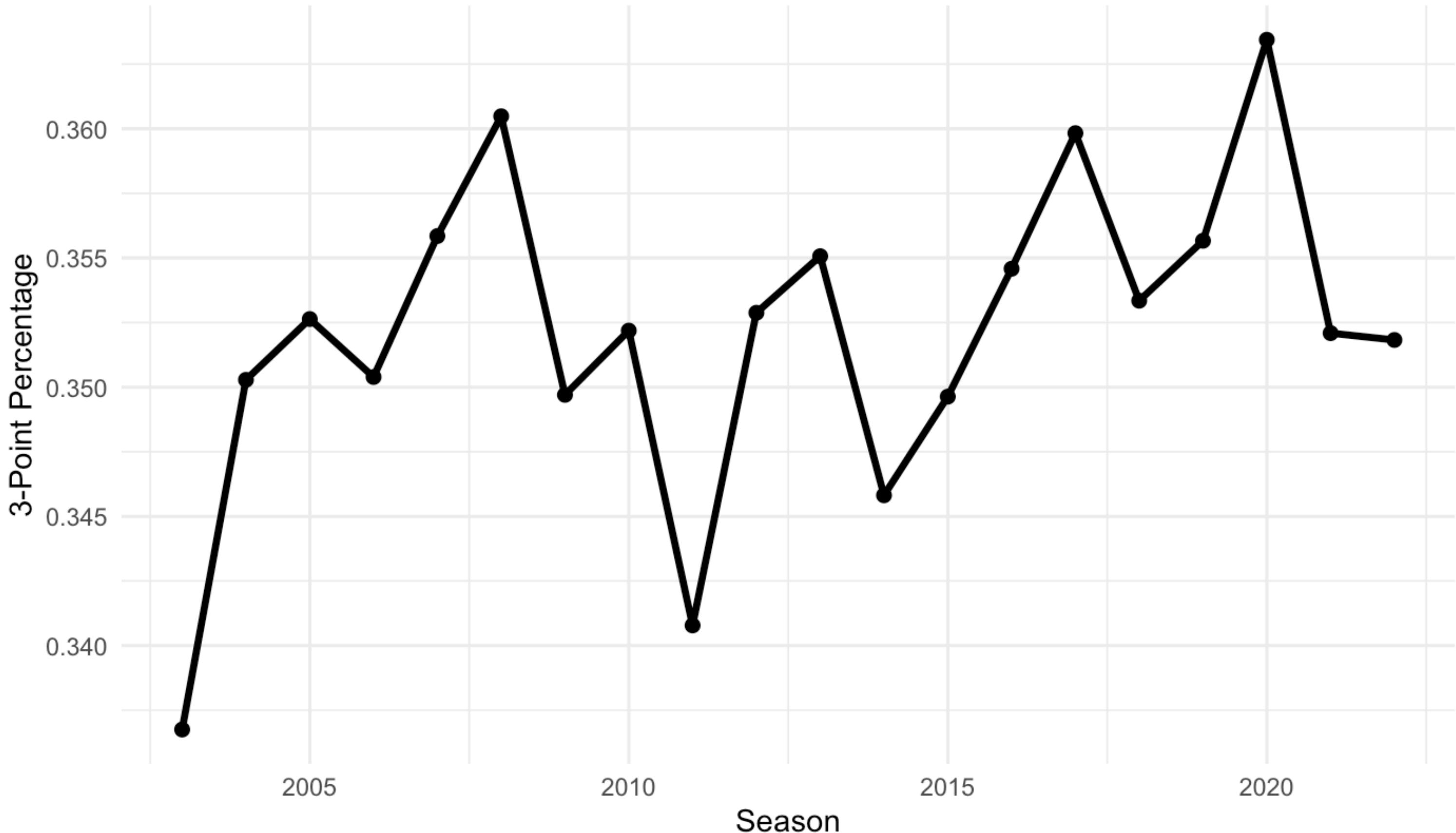
# Key Variables

- 🏀 **HOME\_TEAM\_WINS**: Did the home team win the game? (1 = yes, 0 = no)
- 🏀 **PTS\_home**: Total points scored by the home team
- 🏀 **PTS\_away**: Total points scored by the away team
- 🏀 **FG3M\_home**: Number of three-point shots made by the home team
- 🏀 **FG3M\_away**: Number of three-point shots made by the away team
- 🏀 **GAME\_DATE\_EST**: Date the game was played
- 🏀 **HOME\_TEAM\_ID**: ID number used to identify the home team
- 🏀 **VISITOR\_TEAM\_ID**: ID number used to identify the visiting (away) team

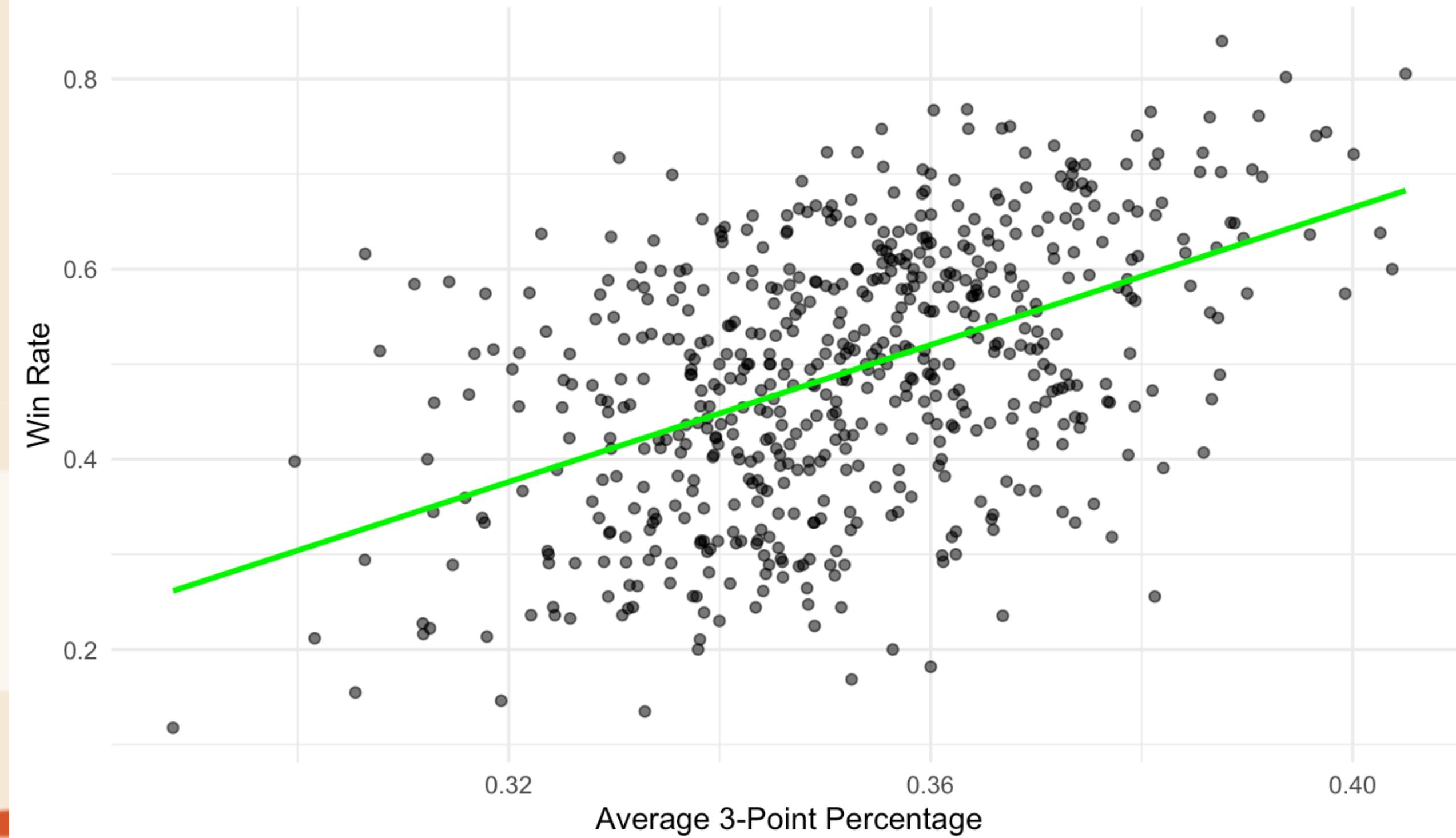
# Methods

- 🏀 Focused on comparing home vs. away team three-point shooting
- 🏀 Aggregated game-level data by home/away status
- 🏀 Explored patterns using visualizations (e.g., scatterplots, density plots)
- 🏀 Fit a linear regression model to predict win rate from the average 3P%
- 🏀 No train/test split: project focused on exploratory analysis, not prediction

# Average 3-Point Percentage in the NBA (2003–2023)



## Relationship Between 3-Point Percentage and Win Rate



# Model Summary

Outcome: win\_rate (continuous)

Predictor: avg\_fg3\_pct

Model: lm(win\_rate ~ avg\_fg3\_pct)

Coefficient: 3.6,  $R^2 = 0.23$

Interpretation: For every 1% increase, in 3P% = ~3.6% increase in win rate.  
23% of win rate explained by 3P shooting

Call:

```
lm(formula = win_rate ~ avg_fg3_pct, data = nba_clean)
```

Residuals:

| Min      | 1Q       | Median  | 3Q      | Max     |
|----------|----------|---------|---------|---------|
| -0.34134 | -0.09006 | 0.00442 | 0.09145 | 0.30307 |

Coefficients:

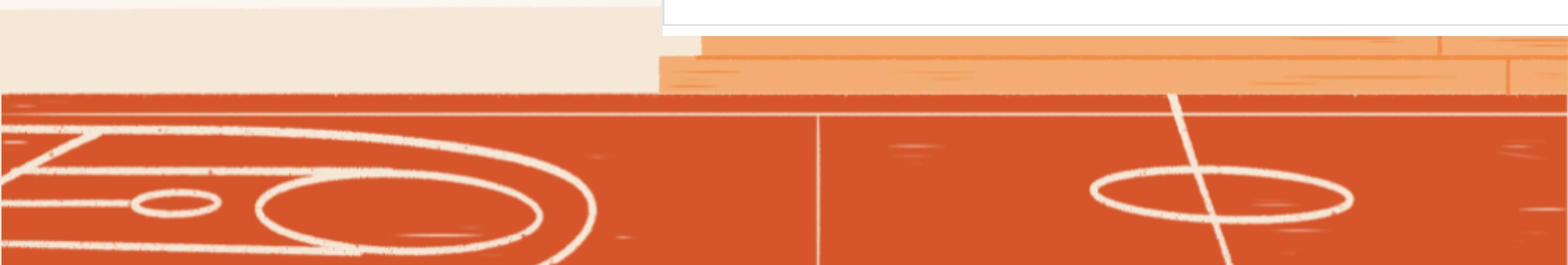
|             | Estimate | Std. Error | t value | Pr(> t )     |
|-------------|----------|------------|---------|--------------|
| (Intercept) | -0.77719 | 0.09407    | -8.262  | 9.29e-16 *** |
| avg_fg3_pct | 3.60411  | 0.26673    | 13.512  | < 2e-16 ***  |
| ---         |          |            |         |              |

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.1208 on 597 degrees of freedom

Multiple R-squared: 0.2342, Adjusted R-squared: 0.2329

F-statistic: 182.6 on 1 and 597 DF, p-value: < 2.2e-16



# Conclusions and Future Work



## Key Takeaway:

- Three-point efficiency is not just important, it's one of the strongest predictors of team success in today's NBA.



## Findings:

- Teams that shoot more accurately from three gain a statistically significant advantage in win rate.



## Limitations:

- Did not include how often teams shoot (3-point attempts per game).
- Did not account for defense, turnovers, or rebounding.



## Future Directions:

- Analyze three-point attempt rates (3PA) to see if volume matters as much as accuracy.
- Include additional predictors like defensive rating, turnovers, and rebounding to build a more complete model.



# Thank you!

References: Lauga, N. (2023). NBA Games Stats (2003–2023) [Data set].  
Kaggle. <https://www.kaggle.com/datasets/nathanlauga/nba-games>

