Is it time for an NBA expansion?*

My subtitle if needed

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First sentence. Second sentence. Third sentence. Fourth sentence.

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*Code and data are available at: https://github.com/Mezhi18/NBAExpansion .

1 Introduction

You can and should cross-reference sections and sub-sections. We use R Core Team (2023) and Wickham et al. (2019).

The remainder of this paper is structured as follows. Section 2….

2 Data

Some of our data is of penguins (**?@fig-bills**), from Horst, Hill, and Gorman (2020).

Talk more about it.

And also planes (**?@fig-planes**). (You can change the height and width, but don't worry about doing that until you have finished every other aspect of the paper - Quarto will try to make it look nice and the defaults usually work well once you have enough text.)

Talk way more about it.

3 Model

The goal of our modelling strategy is twofold. Firstly,…

Here we briefly describe the Bayesian analysis model used to investigate… Background details and diagnostics are included in Appendix B.

3.1 Model set-up

Define y_i as the average number of points per game scored by a team through out the NBA season. Then α is the average assists per game, ρ the average rebounds per game, β is blocks per game, ψ is steals per game and lastly, τ is turnovers per game.

$$y_i|\mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \tag{1}$$
$$\mu_i = \alpha + \rho_i + \beta_i + \xi_i + \tau_i \tag{2}$$
$$\alpha \sim \text{Normal}(0, 2.5) \tag{3}$$
$$\rho \sim \text{Normal}(0, 2.5) \tag{4}$$
$$\beta \sim \text{Normal}(0, 2.5) \tag{5}$$
$$\psi \sim \text{Normal}(0, 2.5) \tag{6}$$
$$\tau \sim \text{Normal}(0, 2.5) \tag{7}$$
$$\sigma \sim \text{Exponential}(1) \tag{8}$$
$$\tag{9}$$

```r
# Simulating data
set.seed(123)  # For reproducibility
sim_nba_data <- data.frame(
  Year = rep(1980:2023, times = 10),  # Simulate 10 records per year
  Num_teams = c(rep(22, each = 1 * 10),
                rep(23, each = 8 * 10),
                rep(25, each = 1 * 10),
                rep(27, each = 6 * 10),
                rep(29, each = 9 * 10),
                rep(30, each = 19 * 10)),  # Adjusted each parameter as needed
  PTS = rnorm(440, mean = mean(full_nba_data$PTS), sd = sd(full_nba_data$PTS)),
  AST = rnorm(440, mean = mean(full_nba_data$AST), sd = sd(full_nba_data$AST)),
  TRB = rnorm(440, mean = mean(full_nba_data$TRB), sd = sd(full_nba_data$TRB)),
  STL = rnorm(440, mean = mean(full_nba_data$STL), sd = sd(full_nba_data$STL)),
  BLK = rnorm(440, mean = mean(full_nba_data$BLK), sd = sd(full_nba_data$BLK)),
  TOV = rnorm(440, mean = mean(full_nba_data$TOV), sd = sd(full_nba_data$TOV))
)
# Add a column for PPG that depends on the year and number of teams,
# as well as other factors. Adjust the coefficients as needed for your simulation.
sim_nba_data_1 <- sim_nba_data %>%
  mutate(PPG = (PTS / 82) + (Year - 1980) * 0.2 - (Num_teams - 22) * 0.1 +
              0.1 * AST + 0.05 * TRB - 0.05 * STL + 0.05 * BLK - 0.05 * TOV)

# Fit a multiple linear regression model
nba_model <- lm(PTS ~ Year * Num_teams + AST + TRB + STL + BLK + TOV, data = sim_nba_data)
nba_model_1 <- lm(PTS ~ Year * Num_teams + AST + TRB + STL + BLK + TOV, data = sim_nba_data_1

# Summary of the linear model
msummary(nba_model_1,
```

```
        fmt = 2)
```

```
msummary(nba_model)
```

We run the model in R (R Core Team 2023) using the **rstanarm** package of Goodrich et al. (2022). We use the default priors from **rstanarm**.
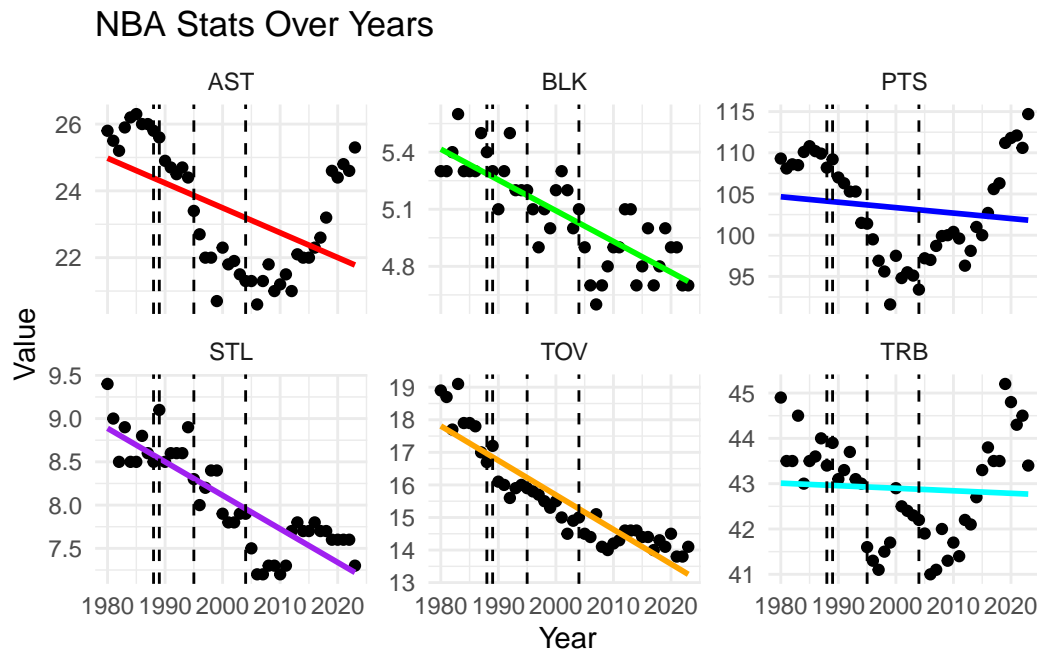
3.1.1 Model justification

We expect a positive relationship between the size of the wings and time spent aloft. In particular...

We can use maths by including latex between dollar signs, for instance θ.

4 Results

Our results are summarized in **?@tbl-modelresults**.

NBA Stats Over Years

	(1)
(Intercept)	−49.34
	(535.29)
Year	0.09
	(0.27)
Num_teams	7.50
	(19.16)
AST	−0.15
	(0.13)
TRB	−0.33
	(0.17)
STL	0.15
	(0.32)
BLK	−0.42
	(0.39)
TOV	0.07
	(0.19)
Year × Num_teams	0.00
	(0.01)
Num.Obs.	440
R2	0.017
R2 Adj.	−0.001
AIC	2997.1
BIC	3038.0
Log.Lik.	−1488.559
RMSE	7.13

	(1)
(Intercept)	−49.339
	(535.291)
Year	0.085
	(0.268)
Num_teams	7.500
	(19.164)
AST	−0.154
	(0.132)
TRB	−0.327
	(0.166)
STL	0.153
	(0.320)
BLK	−0.417
	(0.385)
TOV	0.073
	(0.193)
Year × Num_teams	−0.004
	(0.010)
Num.Obs.	440
R2	0.017
R2 Adj.	−0.001
AIC	2997.1
BIC	3038.0
Log.Lik.	−1488.559
RMSE	7.13

NBA Stats Over Years (Post–2004)
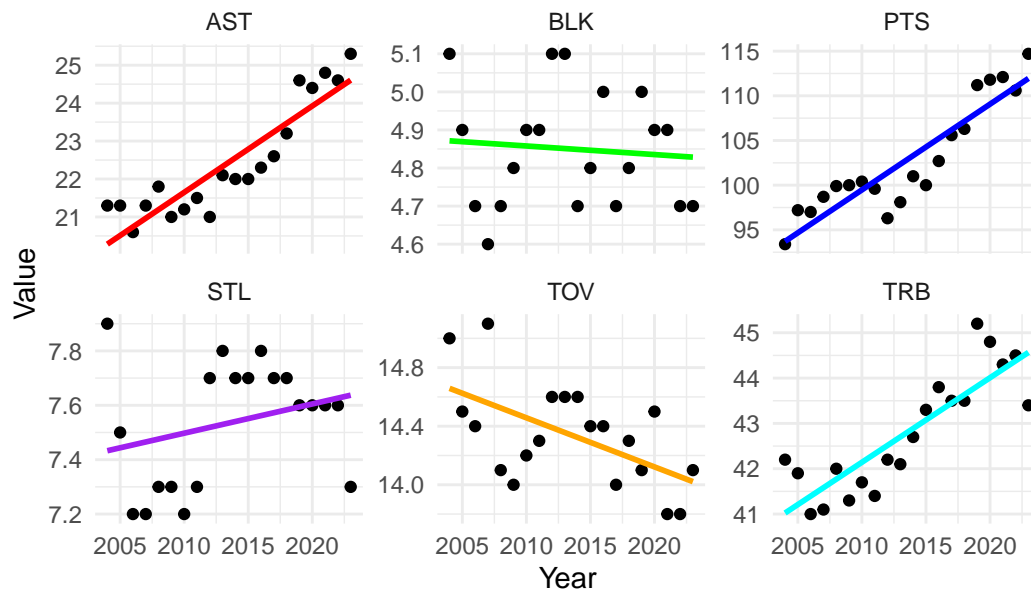
5 Discussion

5.1 First discussion point

If my paper were 10 pages, then should be be at least 2.5 pages. The discussion is a chance to show off what you know and what you learnt from all this.

5.2 Second discussion point

5.3 Third discussion point

5.4 Weaknesses and next steps

Weaknesses and next steps should also be included.

Appendix

A Additional data details

B Model details

B.1 Posterior predictive check

In **?@fig-ppcheckandposteriorvsprior-1** we implement a posterior predictive check. This shows...

In **?@fig-ppcheckandposteriorvsprior-2** we compare the posterior with the prior. This shows...

B.2 Diagnostics

?@fig-stanareyouokay-1 is a trace plot. It shows... This suggests...

?@fig-stanareyouokay-2 is a Rhat plot. It shows... This suggests...

References

Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2022. "Rstanarm: Bayesian Applied Regression Modeling via Stan." https://mc-stan.org/rstanarm/.

Horst, Allison Marie, Alison Presmanes Hill, and Kristen B Gorman. 2020. *Palmerpenguins: Palmer Archipelago (Antarctica) Penguin Data.* https://doi.org/10.5281/zenodo.3960218.

R Core Team. 2023. *R: A Language and Environment for Statistical Computing.* Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Wickham, Hadley, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, et al. 2019. "Welcome to the tidyverse." *Journal of Open Source Software* 4 (43): 1686. https://doi.org/10.21105/joss.01686.