My title*

My subtitle if needed

First author Another author

March 29, 2024

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

1 Introduction

You can and should cross-reference sections and sub-sections.

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

2 Data

Some of our data is of penguins (Figure 2), from Horst, Hill, and Gorman (2020).

Year	Tic	EPS	Dividends	Net_Income	Price
2014	ABT	1.49	1363	2284	45.02
2015	ABT	2.92	1464	4423	44.91
2016	ABT	0.94	1547	1400	38.41
2017	ABT	0.27	1947	477	57.07
2018	ABT	1.33	2047	2368	72.33
2019	ABT	2.06	2343	3687	86.86

Figure 1: Bills of penguins

*Code and data are available at: LINK.

```
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```

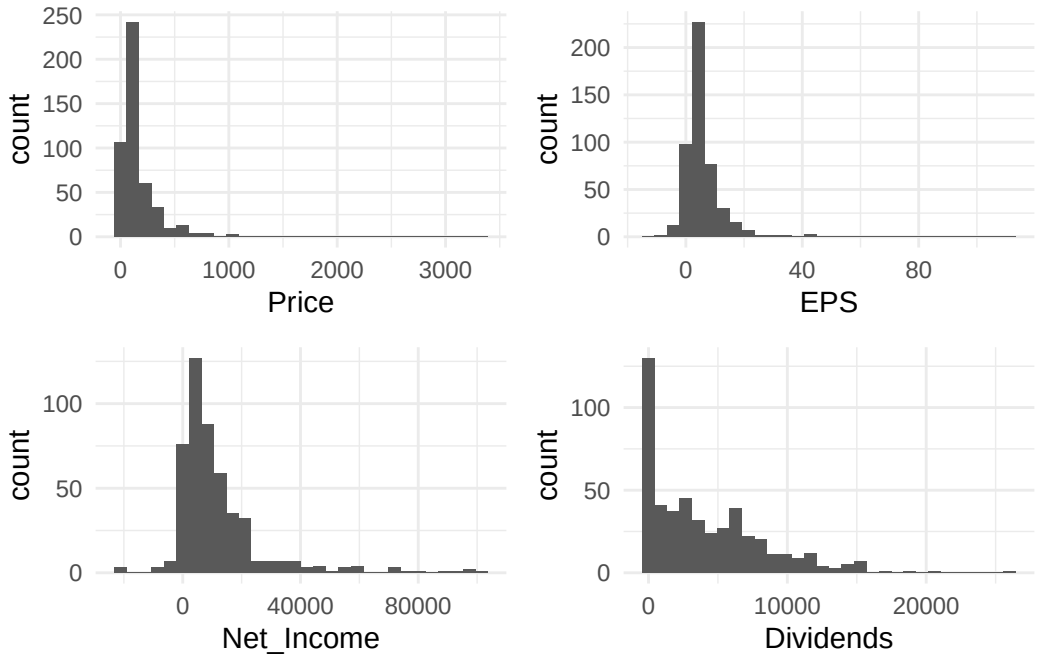


Figure 2: Bills of penguins

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.)

```
summary(analysis_data$Price)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   2.67   62.60  113.91  192.22  190.92 3334.34
```

```
summary(analysis_data$EPS)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
-11.830   2.295   4.560   6.204   7.400 112.200
```

```
summary(analysis_data$Net_Income)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
 -22819    3003    7120   11752   14728   99803
```

```
summary(analysis_data$Dividends)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
    0.0   353.5  2972.0  4029.6  6249.5 25999.0
```

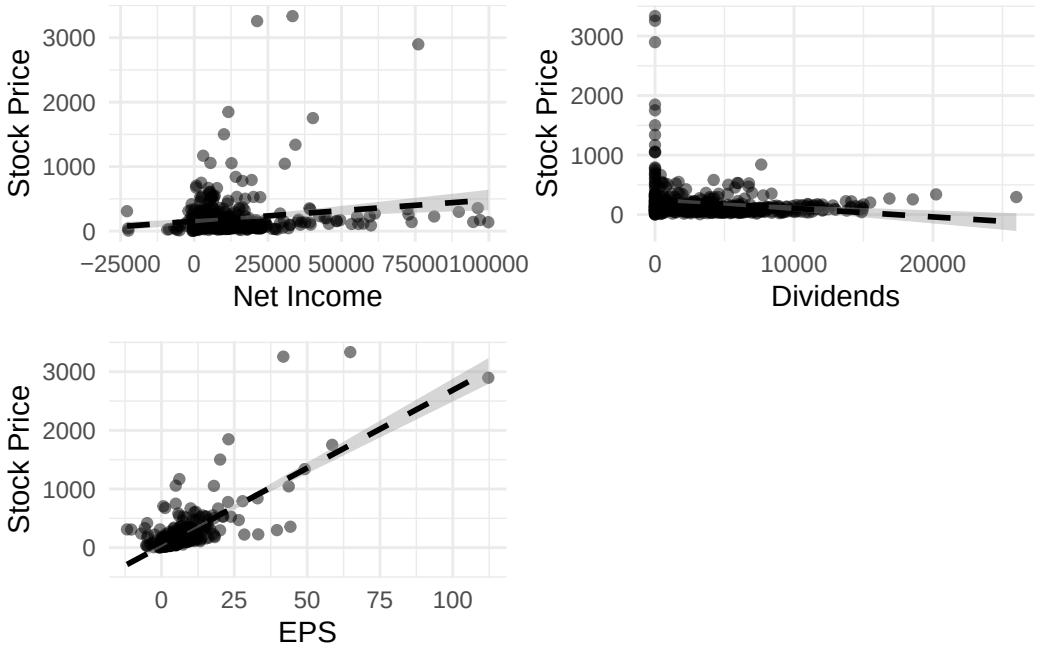


Figure 3: Relationship between me and ur mom

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 number of seconds that the plane remained aloft. Then β_i is the wing width and γ_i is the wing length, both measured in millimeters.

Simple Model

$$y = \beta_0 + \beta_1 X + \epsilon \tag{1}$$
$$Y \sim \text{Normal}(\beta, \sigma^2) \tag{2}$$

Where Y is the stock price and X is earnings per share.

We run the model in R (R Core Team 2022) using the `rstanarm` package of Goodrich et al. (2022). We use the default priors from `rstanarm`.

Multivariable Model

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 - \beta_3 X_3 + \epsilon \tag{3}$$
$$Y \sim \text{Normal}(\beta, \sigma^2) \tag{4}$$

Where X1 is EPS, X2 is net income, and X3 is dividends.

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.

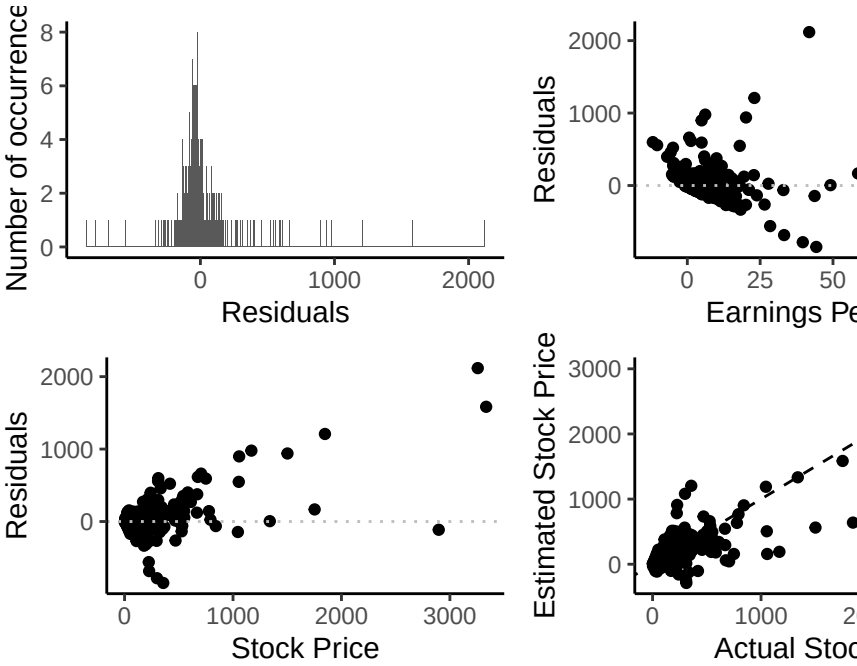
4 Results

Our results are summarized in Table 1.

::: {#tbl-poopy but hole .cell tbl-cap='Explanatory models of flight time based on wing width

Table 1: Explanatory models of flight time based on wing width and wing length

	Net_Income
(Intercept)	27.249
	(11.472)
EPS	26.591
	(1.055)
Num.Obs.	483
R2	0.569
R2 Adj.	0.568
AIC	6526.5
BIC	6539.0
Log.Lik.	−3260.248
F	635.550
RMSE	206.66



and wing length'} ::: {.cell-output-display}
::: :::

```
prior_summary(model_rstanarm_2)
```

```
Priors for model 'model_rstanarm_2'
------
```

Table 2: Explanatory models of flight time based on wing width and wing length

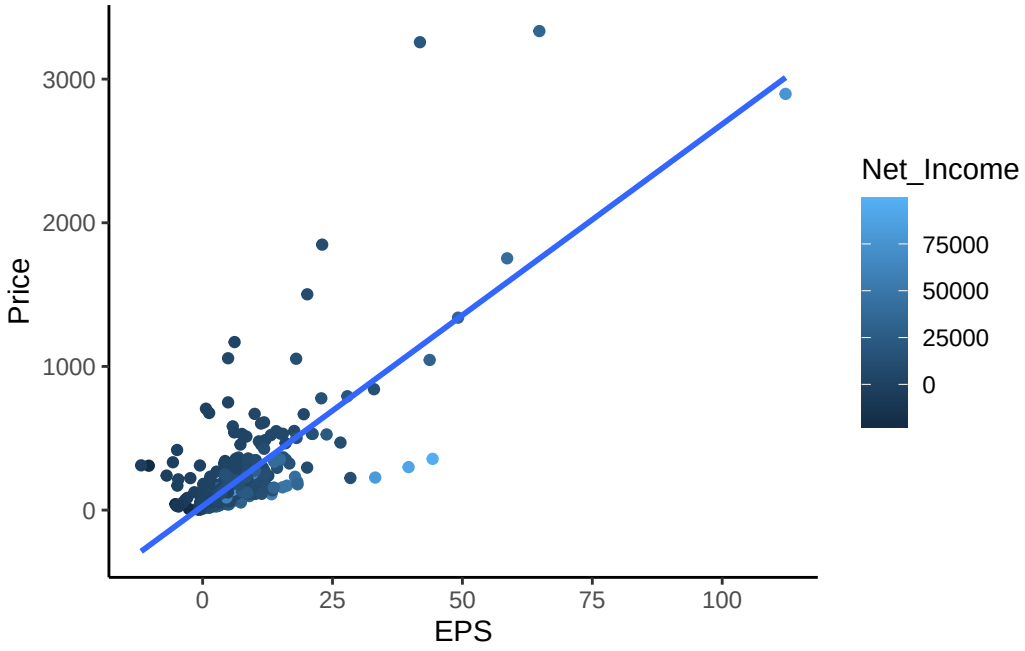


Table 3: Explanatory models of flight time based on wing width and wing length

	EPS Only	With Net Income
(Intercept)	27.25	60.74
	(11.47)	(11.57)
EPS	26.59	30.93
	(1.05)	(1.13)
Net_Income		−0.01
		(0.00)
Num.Obs.	483	483
R2	0.569	0.620
R2 Adj.	0.568	0.618
AIC	6526.5	6468.0
BIC	6539.0	6484.7
Log.Lik.	−3260.248	−3229.981
F	635.550	391.501
RMSE	206.66	194.10

Table 4: priors

	Non-scaled priors	Auto-scaling priors
(Intercept)	−100.48	60.85
EPS	24.32	30.86
Net_Income	0.00	−0.01
Num.Obs.	483	483
R2	0.438	0.619
R2 Adj.	0.208	0.586
Log.Lik.	−3410.327	−3230.747
ELPD	−3424.6	−3248.6
ELPD s.e.	82.7	74.4
LOOIC	6849.2	6497.1
LOOIC s.e.	165.5	148.8
WAIC	6850.8	6501.0
RMSE	270.70	194.10

```
Intercept (after predictors centered)
  Specified prior:
    ~ normal(location = 0, scale = 2.5)
  Adjusted prior:
    ~ normal(location = 0, scale = 788)

Coefficients
  Specified prior:
    ~ normal(location = [0,0], scale = [2.5,2.5])
  Adjusted prior:
    ~ normal(location = [0,0], scale = [88.11, 0.05])

Auxiliary (sigma)
  Specified prior:
    ~ exponential(rate = 1)
  Adjusted prior:
    ~ exponential(rate = 0.0032)
------
See help('prior_summary.stanreg') for more details
```

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

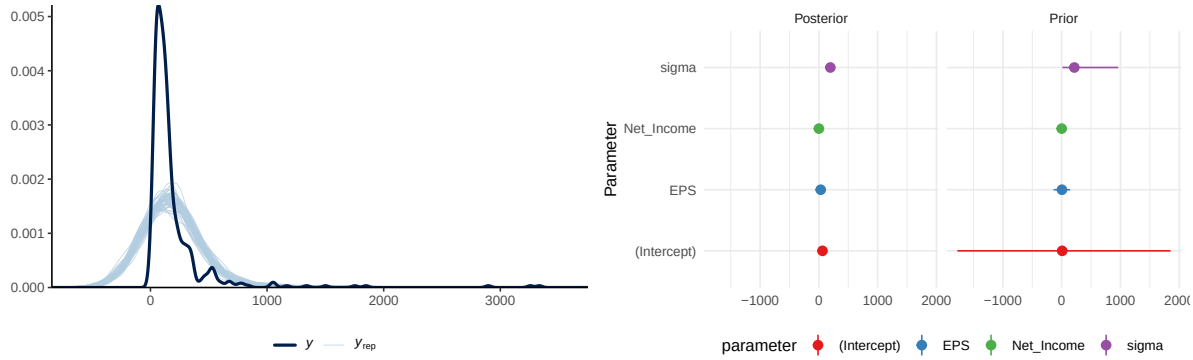
A Additional data details

B Model details

B.1 Posterior predictive check

In Figure 4a we implement a posterior predictive check. This shows...

In Figure 4b we compare the posterior with the prior. This shows...



(a) Posterior prediction check

(b) Comparing the posterior with the prior

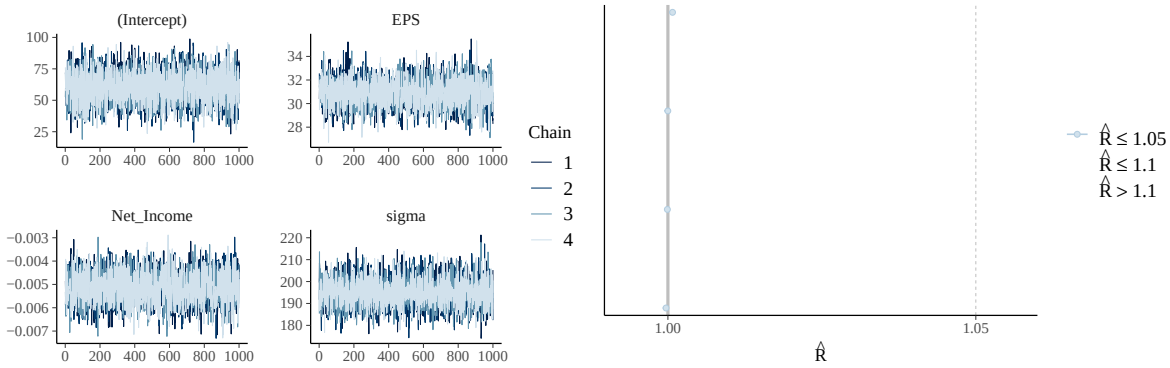
Figure 4: Examining how the model fits, and is affected by, the data

B.2 Diagnostics

Figure 5a is a trace plot. It shows... This suggests...

Figure 5b is a Rhat plot. It shows... This suggests...

“‘



(a) Trace plot

(b) Rhat plot

Figure 5: Checking the convergence of the MCMC algorithm

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. 2022. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.