

# My title\*

My subtitle if needed

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

## 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

Talk more about it.

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](#).

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\*Code and data are available at: [LINK](#).

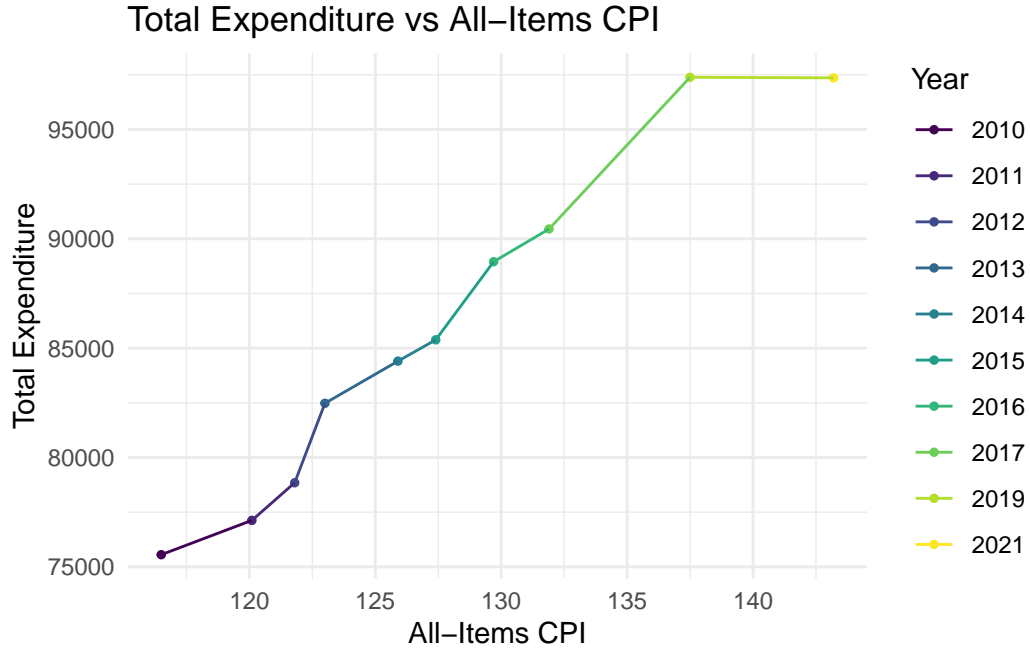


Figure 1: Linear model

### 3.1 Model set-up

#### 3.1.1 Simple linear regression

Define  $y_i$  as the total expenditure in Canadian dollars in year  $i$ . Then  $cpi_i$  is the annual Consumer Price Index (CPI) for year  $i$

$$y_i | \mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \quad (1)$$

$$\mu_i = \beta_0 + \beta_1 \times cpi_i + \epsilon \quad (2)$$

$$\beta_0 \sim \text{Normal}(0, 2.5) \quad (3)$$

$$\beta_1 \sim \text{Normal}(0, 2.5) \quad (4)$$

$$\sigma \sim \text{Exponential}(1) \quad (5)$$

Where

### 3.1.2 Multiple linear regression

$$y_i | \mu_i, \sigma \sim \text{Normal}(\mu_i, \sigma) \quad (6)$$

$$\mu_i = \beta_0 + \beta_1 \times \text{cpi}_i + \beta_2 \text{income}_i + \epsilon \quad (7)$$

$$\beta_0 \sim \text{Normal}(0, 2.5) \quad (8)$$

$$\beta_1 \sim \text{Normal}(0, 2.5) \quad (9)$$

$$\beta_2 \sim \text{Normal}(0, 2.5) \quad (10)$$

$$\sigma \sim \text{Exponential}(1) \quad (11)$$

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`.

### 3.1.3 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  $\theta$ .

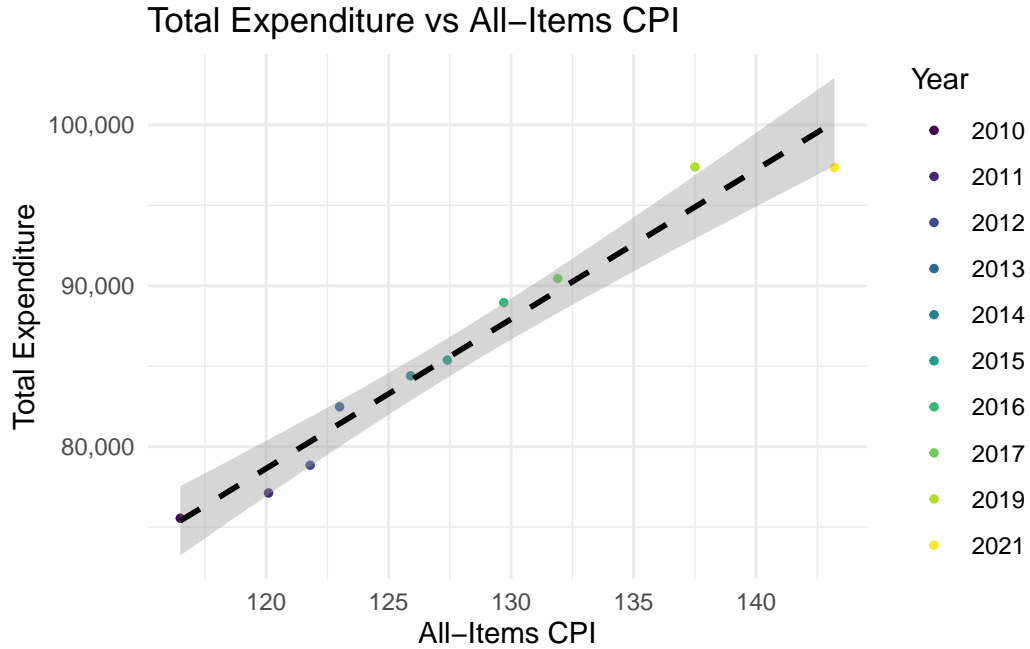


Figure 2: Linear model

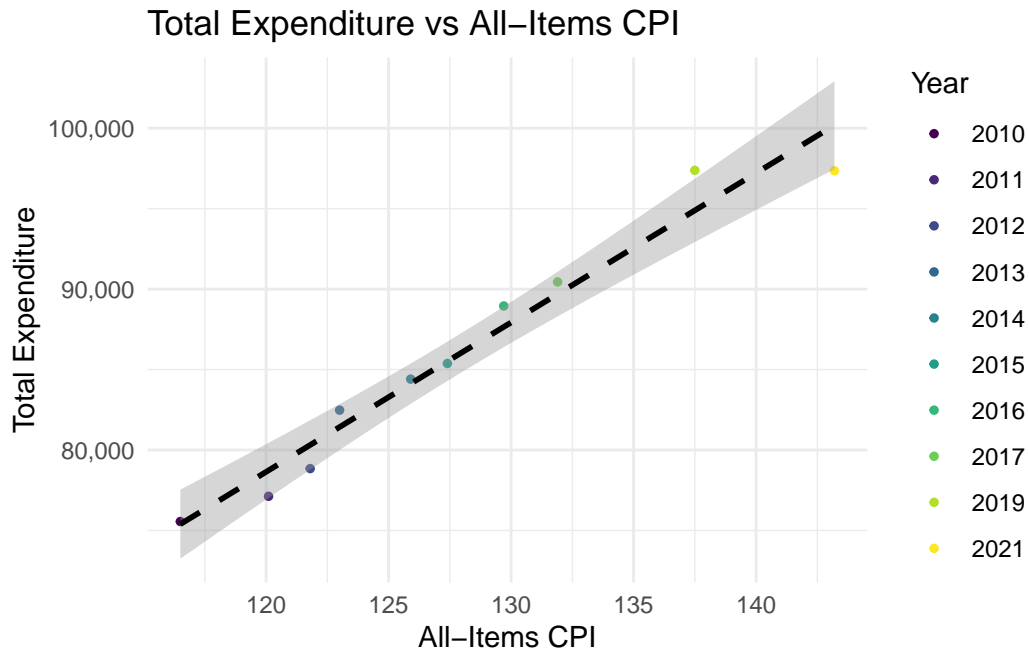


Figure 3: Linear model

## 4 Results

Our results are summarized in Table 1.

## 5 Discussion

### 5.1 First discussion point

If my paper were 10 pages, then should 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.

Table 1: Explanatory models of

	First model	Second model
(Intercept)	−32 899.89 (9842.07)	−59 979.55 (18 660.19)
cpi	928.77 (76.80)	225.52 (437.28)
income		0.01 (0.01)
Num.Obs.	10	10
R2	0.944	0.955
R2 Adj.	0.920	0.932
Log.Lik.	−88.550	−87.273
ELPD	−92.0	−91.1
ELPD s.e.	3.1	2.3
LOOIC	184.1	182.1
LOOIC s.e.	6.1	4.6
WAIC	182.4	180.5
RMSE	1501.29	1326.89

## Appendix

### A Additional data details

### B Model details

#### Posterior predictive check

- Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2022. “Rstanarm: Bayesian Applied Regression Modeling via Stan.” <https://mc-stan.org/rstanarm/>.
- 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 Golemund, et al. 2019. “Welcome to the tidyverse.” *Journal of Open Source Software* 4 (43): 1686. <https://doi.org/10.21105/joss.01686>.