AE 04: Randomization test for the slope

Bikeshare

2024-09-06

> **Important**
>
> - Open RStudio and create a subfolder in your AE folder called "AE-04"
> - Go to the Canvas and locate your `AE 04` assignment to get started.
> - Upload the `ae-04.qmd` and `dcbikeshare.csv` files into the folder you just created. The `.qmd` and PDF responses are due in Canvas no later than Thursday, September 12 at 11:59pm.

```
library(tidyverse)
library(infer)
library(ggformula)
library(broom)
library(openintro)
library(knitr)
```

Data

Our dataset contains daily rentals from the Capital Bikeshare in Washington, DC in 2011 and 2012 filtered to only contain the winter months. It was obtained from the `dcbikeshare` data set in the `dsbox` R package.

We will focus on the following variables in the analysis:

- `count`: total bike rentals
- `temp_orig`: Temperature in degrees Celsius

```r
winter <- read_csv("dcbikeshare.csv") |>
  mutate(season = case_when(
    season == 1 ~ "winter",
    season == 2 ~ "spring",
    season == 3 ~ "summer",
    season == 4 ~ "fall"
  ),
  season = factor(season)) |>
  filter(season == "winter")
```

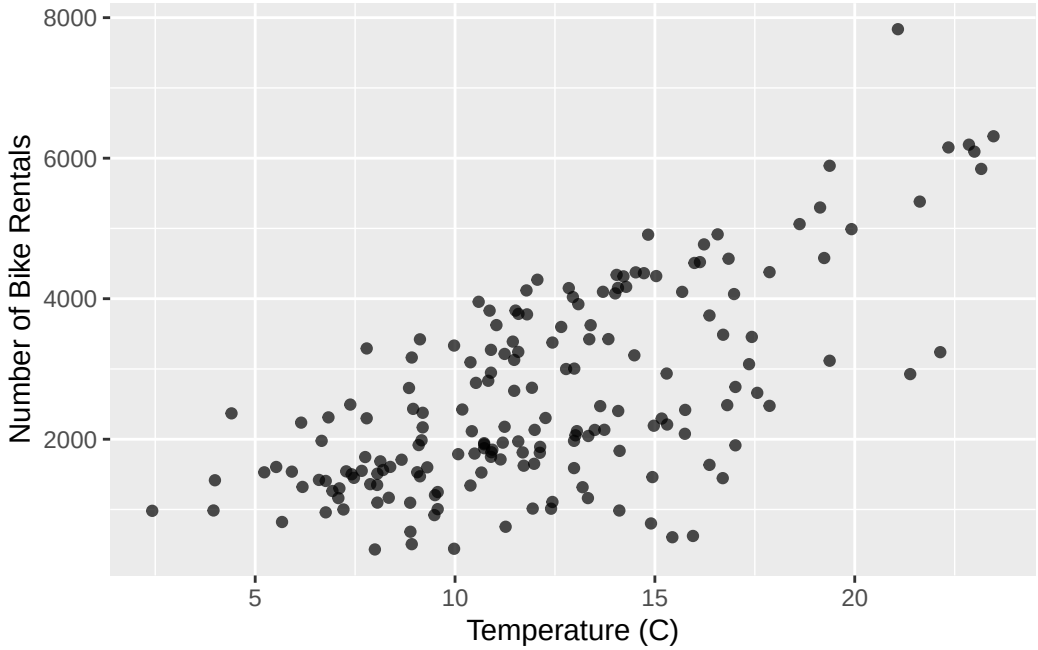
```
Rows: 731 Columns: 17
-- Column specification --------------------------------------------------------
Delimiter: ","
dbl  (16): instant, season, yr, mnth, holiday, weekday, workingday, weathers...
date  (1): dteday

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
glimpse(winter)
```

```
Rows: 181
Columns: 17
$ instant    <dbl> 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, ~
$ dteday     <date> 2011-01-01, 2011-01-02, 2011-01-03, 2011-01-04, 2011-01-05~
$ season     <fct> winter, winter, winter, winter, winter, winter, winter, win~
$ yr         <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,~
$ mnth       <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,~
$ holiday    <dbl> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0,~
$ weekday    <dbl> 6, 0, 1, 2, 3, 4, 5, 6, 0, 1, 2, 3, 4, 5, 6, 0, 1, 2, 3, 4,~
$ workingday <dbl> 0, 0, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 1,~
$ weathersit <dbl> 2, 2, 1, 1, 1, 1, 2, 2, 1, 1, 2, 1, 1, 1, 2, 1, 2, 2, 2, 2,~
$ temp       <dbl> 0.3441670, 0.3634780, 0.1963640, 0.2000000, 0.2269570, 0.20~
$ atemp      <dbl> 0.3636250, 0.3537390, 0.1894050, 0.2121220, 0.2292700, 0.23~
$ hum        <dbl> 0.805833, 0.696087, 0.437273, 0.590435, 0.436957, 0.518261,~
$ windspeed  <dbl> 0.1604460, 0.2485390, 0.2483090, 0.1602960, 0.1869000, 0.08~
$ casual     <dbl> 331, 131, 120, 108, 82, 88, 148, 68, 54, 41, 43, 25, 38, 54~
$ registered <dbl> 654, 670, 1229, 1454, 1518, 1518, 1362, 891, 768, 1280, 122~
$ count      <dbl> 985, 801, 1349, 1562, 1600, 1606, 1510, 959, 822, 1321, 126~
$ temp_orig  <dbl> 14.110847, 14.902598, 8.050924, 8.200000, 9.305237, 8.37826~
```

Exploratory data analysis

```
gf_point(count ~ temp_orig, data = winter, alpha = 0.7) |>
  gf_labs(
    x = "Temperature (C)",
    y = "Number of Bike Rentals",
  )
```



Model

```
model_fit <- lm(count ~ temp_orig, data = winter)

tidy(model_fit) |>
  kable(digits = 2)
```

term	estimate	std.error	statistic	p.value
(Intercept)	-111.04	238.31	-0.47	0.64
temp_orig	222.42	18.46	12.05	0.00

Hypothesis test

> Tip
>
> For code chunks with fill-in-the-blank code, change code chunk option to `#| eval: true` once you've filled in the code.

State the null and alternative hypotheses

[Add hypotheses in mathematical notation]

Generate null distribution using permutation

Fill in the code, then set `eval: true` .

```
n = 100
set.seed(212)

null_dist <- _____ |>
  specify(______) |>
  hypothesize(null = "independence") |>
  generate(reps = _____, type = "permute") |>
  fit()
```

Visualize distribution

```
# Code for histogram of null distribution
```

Calculate the p-value.

```
# get observed fit
observed_fit <- winter |>
  specify(count ~ temp_orig) |>
  fit()

# calculate p-value
get_p_value(
```

```
  ____,
  obs_stat = ____,
  direction = "two-sided"
)
```

- What does the warning message mean?

State conclusion

[Write your conclusion in the context of the data.]

> **!** Important
>
> To submit the AE:
>
> - Render the document to produce the PDF with all of your work from today's class.
> - Upload your PDf and .qmd files to Canvas.