Quiz 3

Help

Warning: The hard deadline has passed. You can attempt it, but **you will not get credit for it**. You are welcome to try it as a learning exercise.

- [ ] **In accordance with the Coursera Honor Code, I (Dan Nuttle) certify that the answers here are my own work.**

Question 1

Consider the `mtcars` data set. Fit a model with mpg as the outcome that includes number of cylinders as a factor variable and weight as confounder. Give the adjusted estimate for the expected change in mpg comparing 8 cylinders to 4.

- 33.991
- -4.256
- -6.071
- -3.206

Question 2

Consider the `mtcars` data set. Fit a model with mpg as the outcome that includes number of cylinders as a factor variable and weight as confounder. Compare the adjusted by weight effect of 8 cylinders as compared to 4 the unadjusted. What can be said about the effect?.

- Holding weight constant, cylinder appears to have more of an impact on mpg than if weight is disregarded.
- Including or excluding weight does not appear to change anything regarding the estimated impact of number of cylinders on mpg.
- Within a given weight, 8 cylinder vehicles have an expected 12 mpg drop in fuel efficiency.

- Holding weight constant, cylinder appears to have less of an impact on mpg than if weight is disregarded.

Question 3

Consider the `mtcars` data set. Fit a model with mpg as the outcome that considers number of cylinders as a factor variable and weight as confounder. Consider the model with an interaction between cylinders and weight and one without. Give the P-value for the likelihood ratio test comparing the two models and suggest a model using 0.05 as a type I error rate significance benchmark.

- The P-value is larger than 0.05. So, according to our criterion, we would fail to reject, which suggests that the interaction terms is necessary.
- The P-value is small (less than 0.05). Thus it is surely true that there is an interaction term in the true model.
- The P-value is small (less than 0.05). So, according to our criterion, we reject, which suggests that the interaction term is necessary
- The P-value is small (less than 0.05). So, according to our criterion, we reject, which suggests that the interaction term is not necessary.
- The P-value is larger than 0.05. So, according to our criterion, we would fail to reject, which suggests that the interaction terms may not be necessary.
- The P-value is small (less than 0.05). Thus it is surely true that there is no interaction term in the true model.

Question 4

Consider the `mtcars` data set. Fit a model with mpg as the outcome that includes number of cylinders as a factor variable and weight inlcuded in the model as

```
lm(mpg ~ I(wt * 0.5) + factor(cyl), data = mtcars)
```

How is the wt coefficient interpretted?

- The estimated expected change in MPG per one ton increase in weight for a specific number of cylinders (4, 6, 8).

- The estimated expected change in MPG per half ton increase in weight for for a specific number of cylinders (4, 6, 8).
- The estimated expected change in MPG per half ton increase in weight.
- The estimated expected change in MPG per half ton increase in weight for the average number of cylinders.
- The estimated expected change in MPG per one ton increase in weight.

Question 5

Consider the following data set

```
x <- c(0.586, 0.166, -0.042, -0.614, 11.72)
y <- c(0.549, -0.026, -0.127, -0.751, 1.344)
```

Give the hat diagonal for the most influential point

- 0.2287
- 0.2804
- 0.2025
- 0.9946

Question 6

Consider the following data set

```
x <- c(0.586, 0.166, -0.042, -0.614, 11.72)
y <- c(0.549, -0.026, -0.127, -0.751, 1.344)
```

Give the slope dfbeta for the point with the highest hat value.

- -134
- 0.673
- -.00134
- -0.378

Question 7

Consider a regression relationship between Y and X with and without adjustment for a third variable Z. Which of the following is true about comparing the regression coefficient between Y and X with and without adjustment for Z.

- The coefficient can't change sign after adjustment, except for slight numerical pathological cases.
- For the the coefficient to change sign, there must be a significant interaction term.
- It is possible for the coefficient to reverse sign after adjustment. For example, it can be strongly significant and positive before adjustment and strongly significant and negative after adjustment.
- Adjusting for another variable can only attenuate the coefficient toward zero. It can't materially change sign.

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