Test 2

Econometrics 3112.003, Spring 2019
Belk College of Business, UNCC
Ercan Karadas

[1] A large random sample of 81 filtered cigarettes is obtained, and the tar content of each cigarette is measured. The sample has a mean ($\overline{Y}$) of 23.0 mg and a standard deviation (s_Y) of 6.7 mg. We are interested in testing the claim that the mean tar content of filtered cigarettes is greater than 21.1 mg, which is the mean for unfiltered cigarettes.

a) Formulate the appropriate null and alternative hypotheses.

b) What is the distribution of $\overline{Y}$?

c) Calculate the appropriate test statistic and conclude the test at $\alpha = 0.05$?

d) Find the p-value of the test in the previous part?

[2] In any year, the weather may cause damages to a home. On a year-to-year basis, the damage is random. Let Y denote the dollar value of damages in any given year. Suppose that during 95% of the year $Y = \$0$, but during the other 5% $Y = 20,000$.

a) What are the mean and standard deviation of damages caused in a year?

For the rest of the problem, consider an "insurance pool" of 100 people whose homes are sufficiently dispersed so that, in any year, the damage to different homes can be viewed as independently distributed random variables. Let $\overline{Y}$ denote the average damage caused to these 100 homes in one year.

b) What is the expected value of the average damage $\overline{Y}$?

c) What is the probability that $\overline{Y}$ exceeds \$2,000? (Hint: Use the central limit theorem to compute an approximate answer.)

[3] A soda vendor at UNC Charlotte football games observes that more sodas are sold the warmer the temperature at game time is. Based on 32 home games covering five years, the vendor estimates the relationship between soda sales and temperature to be

$$\widehat{Y} = -240 + 8\,X, \qquad R^2 = 0.34, \qquad SER = 12.8$$

where Y is the number of sodas she sells and X is temperature in degrees Fahrenheit.

a) Interpret the estimated slope and intercept. Do the estimates make sense? Why, or why not?

b) Interpret R^2 and SER.

c) On a day when the temperature at game time is forecast to be 80 degrees Fahrenheit, predict how many sodas the vendor expects to sell?

d) Below what temperature are the predicted sales zero?

e) Sketch a graph of the estimated regression line.

f) Suppose that another researcher uses the same dataset but instead of measuring the temperature in Fahrenheit, she measures in Celsius. In that case, which of the following would change: $\widehat{\beta}_0$, $\widehat{\beta}_1$, R^2, SER.

[4] Suppose that a researcher, using data on class size (CS) and average test scores from 50 third-grade classes, estimates the OLS regression:

$$\widehat{\text{Test Score}} = 640.3 - 4.93 \times \text{CS}, \qquad R^2 = 0.11, \qquad SER = 8.7$$

a) A classroom has 28 students. What is the regressions prediction for that classrooms average test score?

b) Last year a classroom had 25 students, and this year it has 21 students. What is the regression's prediction for the change in the classroom average test score?

c) The sample average class size across the 50 classrooms is 22.8. What is the sample average of the test scores across the 50 classrooms? (Hint: Review the formulas for the OLS estimators.)

d) What is the sample standard deviation of test scores across the 50 classrooms? (Hint: Review the formulas for the R^2 and SER.)

[5] R Questions.

a) Suppose I have a vector `x <- 1:5` and `y <- 3:4`. What is produced by the expression `x + y`.

b) Suppose I have a vector `x <- c(5, 3, 8, 12, 2, -1)` and I want to set all elements of this vector that are greater than 7 to be equal to zero. Write an R code that achieves this.

c) Consider the following expression

```
x <- 5
y <- if (x<3) {
NA
}else{
10
}
```

What is the value of `y` after evaluating this expression.