ECO220Y: Homework 14

Required Exercises: Chapter 12: 5, 9, 11, 13, 49, 51, 73, 75, 79

Required Problems:

(1) In Lecture 14 we considered the rejection region approach to hypothesis testing and compared it with the P-value approach. Let's review the P-value, which is an extremely important concept in our course.

(a) Why does the P-value depend on whether the research hypothesis (H_1) specifies >, <, or ≠?

(b) What does a P-value of 0.665 mean on Slide 25 of Lecture 13 (first babies of Indian-born moms)? How can it be so big?

(c) Give an example where the P-value for a two-tailed test is NOT double the P-value for a one-tailed test.

(2) Doing a two- vs. one-tailed test affects what: the rejection region, the test statistic, neither or both?

(3) Recall the Karlan and List (2007) paper "Does Price Matter in Charitable Giving? Evidence from a Large-Scale Natural Field Experiment" discussed in Lecture 12 and Lecture 14.

(a) Suppose a researcher wanted to prove that offering a match *increased* the response rate compared to no match. Write the associated hypotheses using formal notation.

(b) Suppose a researcher wanted to prove that offering a match *decreased* the response rate compared to no match. Write the associated hypotheses using formal notation.

(c) Suppose a researcher wanted to prove that offering a match *affected* the response rate compared to no match. Write the associated hypotheses using formal notation.

(d) For the hypothesis test in Part (a), what does it mean if your P-value is greater than 0.5?

(e) What is the standardized rejection region for the hypothesis test in Part (a) for a 5% significance level?

(f) What is the standardized rejection region for the hypothesis test in Part (b) for a 10% significance level?

(g) What is the standardized rejection region for the hypothesis test in Part (c) for a 1% significance level?

(4) For each of these scenarios, which are variations of cases from Lectures 13 and 14, categorize the results as either: (1) statistically significant, (2) economically significant, (3) significant, or (4) not significant.

(a) A sample of $n = 3{,}000{,}000$ coupons to test H_0: $p = 0.15$ v. H_1: $p > 0.15$ where $\hat{P} = 0.151$ and the P-value ≈ 0.

(b) A sample of births to test H_0: $p = 0.512$ v. H_1: $p > 0.512$ where $\hat{P} = 0.636$ and the P-value = 0.20.

(c) A sample of births to test H_0: $p = 0.512$ v. H_1: $p > 0.512$ where $\hat{P} = 0.533$ and the P-value = 0.0002.

(d) Using two samples to compare the unemployment rates between two groups to test H_0: $p_2 - p_1 = 0$ v. H_1: $p_2 - p_1 > 0$ where $\hat{P}_1 = 0.0541$, $\hat{P}_2 = 0.0780$ and the P-value ≈ 0.

(e) Using two samples to compare calories of a control group (regular menu) and a treatment group (menu gives calories) to test H_0: $\mu_T - \mu_c = 0$ v. H_1: $\mu_T - \mu_c < 0$ where $\bar{X}_T = 1{,}501$, $\bar{X}_C = 1{,}523$ and the P-value is 0.1592.