ECO220Y: Homework 16

Note: Do all calculations *without* software. Instead, *use the statistical tables from our course website*. Use approximation based on these tables when necessary.

Required Exercises: Chapter 13: 1, 3, 5, 9, 11, 13, 19, 41, 49, 55

Required Problems:

(1) Recall Karlan and List (2007) "Does Price Matter in Charitable Giving? Evidence from a Large-Scale Natural Field Experiment," which we first discussed in Lecture 12. If we focus on the people in the control group (those offered no match) who gave money to the charity in response to the solicitation we obtain this STATA summary of the amount donated (in dollars).

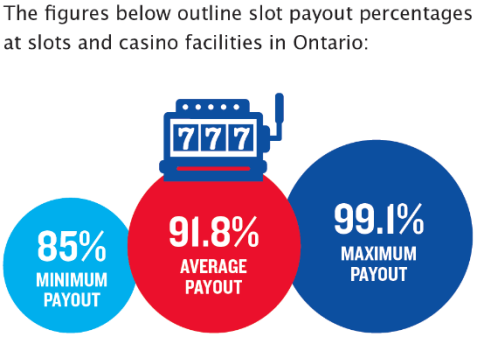
```
. summarize amount if (gave==1 & control==1), detail

                            amount
-------------------------------------------------------------
      Percentiles      Smallest
 1%             3              2
 5%            10              2
10%            10              3       Obs                 298
25%            20              5       Sum of Wgt.         298

50%            25                      Mean           45.54027
                        Largest         Std. Dev.      41.37982
75%            55            150
90%           100            160       Variance        1712.29
95%           125            250       Skewness       1.906669
99%           160            300       Kurtosis       8.734306
```

(a) Does the "Nearly Normal Condition" hold in this example? Explain why or why not. Should we be concerned? Can we proceed and use the standard statistical formulas presented in Chapter 13?

(b) Compute the 80% Confidence Interval Estimator of the mean. Fully interpret it. Finally, how does it compare with the percentiles from the STATA summary above? Why?

(2) The Alcohol and Gaming Commission of Ontario (AGCO) requires that slot machines have a minimum theoretical payout standard of 85%. In other words, for every dollar played, the machine must pay out to the player a minimum of 85 cents on average. Random number generators drive slot machines, which means that there is natural variation in the payout. In other words, if you play $10, you could end up with less than $8.50 in payout even if the slot machine meets the performance standard. The OLG brochure "Your Guide to Playing Slots" (http://www.olg.ca/assets/documents/responsible_gaming/RG_GuideToPlayingSlots_2016_4panel_brochure_EN2.pdf) explains:

EXCERPT: In Ontario, the payout for slot machines has to be set at 85 per cent or higher. This figure is set and controlled by the Alcohol and Gaming Commission of Ontario (AGCO), the independent body that regulates specified OLG activities. Eighty-five per cent is the minimum payout rate and most machines are preset for higher levels. Keep in mind, this doesn't mean that for every $10 you put into a slot machine that you will get $8.50 returned to you. The payout of 85 per cent is based on the long-term return of the machine, which could include hundreds of thousands or even millions of spins.



(a) If a casino owner must prove that each slot machine is in compliance with the minimum payout standard, how do you write the hypothesis test? Use formal notation. Next, in plain English, explain what a Type I and what a Type II error would be. Finally, presuming $n = 5{,}000$ plays of the machine, what is the rejection region for a 5% significance level? Explain the meaning of the rejection region and what it would take to get into it.

(b) If the AGCO must prove that a slot machine is out of compliance with the minimum payout standard, how do you write the hypothesis test? Use formal notation. Next, in plain English, explain what a Type I and what a Type II error would be. Finally, presuming $n = 5{,}000$ plays of the machine, what is the rejection region for a 5% significance level? Explain the meaning of the rejection region and what it would take to get into it.

(c) If you are most concerned about protecting players, which way should the hypotheses be set up? If you are most concerned about protecting the profits of the casinos, which way should the hypotheses be set up?

(d) Suppose a casino wants to advertise that a particular slot machine is more generous than the average payout percentage at slots and casino facilities in Ontario. To prove this claim, what are the hypothesis (using formal notation)? Next, in plain English, explain what a Type I and what a Type II error would be.

(e) For part (d), what can be done to limit the chance of a Type I error? Do you think the casino would appreciate this suggestion?

(f) For part (d), what can be done to limit the chance of a Type II error? Do you think the casino would appreciate this suggestion?

(g) For part (d), other things equal, which situation would correspond to a higher chance of a Type II error: having a machine that is only marginally more generous than average or having a machine that is substantially more generous than average? Why?

(3) Consider testing $H_0: \mu = 0$ versus $H_1: \mu \neq 0$.

(a) In a random sample with nineteen observations, you obtain a sample mean of -0.421 and a sample standard deviation of 1.244. Using the appropriate table (*not* software), what is the P-value? Are these results statistically significant at α of 0.10, 0.05, 0.01, or 0.001?

(b) In a random sample with thirty observations, you obtain a sample mean of 0.321 and a sample standard deviation of 0.501. Using the appropriate table (*not* software), what is the P-value? Are these results statistically significant at α of 0.10, 0.05, 0.01, or 0.001?

(c) In a random sample with 1,900 observations, you obtain a sample mean of 0.053 and a sample standard deviation of 1.351. Using the appropriate table (*not* software), what is the P-value? Are these results statistically significant at α of 0.10, 0.05, 0.01, or 0.001?