

Inferential Stats Project

Due by midnight on Sunday, August 11

Project Overview

- You will receive a mail with a copy of the Excel data file that you will use for this project. The name of the file will be your first and last initials followed by a single digit. For example, the name of my file would be “HT7”.
 - I will grade your answers based on the file that is assigned to you, so you must let me know if you receive the wrong file.
- You will use the inferential methods of Weeks 8 to 11 to analyze your data.

Submission Guidelines

- Submit this Project as a well-formatted Word document. I expect you to correctly format superscripts and subscripts (such as H_0 and H_A), and to use the “Insert Symbol” feature for the correct Greek characters (such as α , σ , μ) and mathematical operators (such as $\neq$, $\pm$, $\leq$, $\geq$). Use the “Insert Equation” feature in Word to create formulas.
- A total of 2 points on this project will be for formatting and presentation.
- Note that you can use Excel or SPSS to analyze the data for this project. If you use SPSS, then you will need to insert the relevant sections of your SPSS output into your report. If you use Excel, then you need to show all calculations and Excel formulas similar to the examples in the notes.
- Remember to attach your Word document and Excel data file with your submission. Save your Word document as “IS Project” followed by your initials. Save your Excel document as “IS Project data” followed by your initials. They must be submitted as separate documents (not in a ZIP file).
 - Your documents must be saved in Windows format with the “.docx” and “.xlsx” extensions. This means that I can’t accept reports saved in Pages or Google docs.
- The due date is the last day of classes (Sunday, August 11) so late submissions can only be accepted until Tuesday, August 13 and will be graded down by one point (out of 20) for each day late.

Notes on Rounding

- Use four or more decimal places when making calculations. Round values at the end. If you round intermediate calculations you risk making major rounding errors.
- Except where noted, calculated values of the mean, standard deviation, standard error, confidence interval, margin of error should be rounded to one decimal place. P -values should be rounded to three decimal places.

Project Tasks

[2 pts] Format your report so that it looks professional. Try to look at your report from the eyes of an outsider. You might want to ask someone around you for an impartial and honest opinion because that is how I will look at your work. You might even insist that they be brutally honest in their critique – it will help you in the long run.

1. **[9 pts]** An executive at the First National Bank is concerned that the bank is losing customers because mortgage applications are taking too long to be processed. The national average, according to an industry newsletter, is 6.5 business days. If the executive determines that the bank is taking longer than the national average then she will make major changes, including demoting or firing the manager of the mortgage department, even though he has an excellent work history with the bank.

The bank executive has hired you to investigate the situation. You will conduct a hypothesis test to answer the bank executive's questions so you collect a random sample of 108 recent mortgage applications. You record the time to process each application (number of business days). The data are located in your Excel file.

- a) Should your alternative be left-sided, right-sided, or two-sided? Explain.
- b) State your null and alternative hypotheses using correct symbols and notation.
- c) What would a Type I error be in this situation and who would be harmed by it? Be specific – jobs and money are on the line here!
- d) What would a Type II error be in this situation and who would be harmed by it? Be specific – jobs and money are on the line here!
- e) Conduct a one-sample t -test for the mean. Include your SPSS output or show your Excel calculations.
- f) State the P -value and give the conclusion in context using a significance level of 0.05.
- g) Based on the results of the hypothesis test, what decision should the bank executive make? Make sure to state this in a way that can be understood by someone who doesn't know any statistics.
- h) Construct a 95% confidence interval for the mean mortgage processing time. Express the confidence interval in the form: "The average processing time for mortgages is ?? days. This survey is accurate to within $\pm$?? days, ?? times out of ??". Refer to your Chapter 16 Notes (Week 8) or Week 8 discussion for how to convert a confidence level into a "?? times out of ??" statement. Include your SPSS output or show your Excel calculations in your Word document.

2. **[4 pts]** The executive also wants to know if the bank's approval rate for mortgage applications has changed recently. To conduct this hypothesis test you found that out of the 108 applications you sampled, only 61 were approved. Historically the bank approved 65% of all mortgage applications.
- Should your alternative be left-sided, right-sided, or two-sided? Explain.
 - State your null and alternative hypotheses using correct symbols and notation.
 - Calculate the values of $\hat{p}$, $SD(\hat{p})$ and the z test statistic. Report all to 4 decimal places. Include your SPSS output or show your Excel calculations in your Word document.
 - Determine the P -value and give the conclusion in context using a significance level of 0.05.
3. **[5 pts]** The executive is also worried that the bank is losing ground to its major competitor, the Everglades Bank. So the bank executive asked you to determine whether Everglades Bank processes mortgages faster than First National. To conduct this hypothesis test you also collect a random sample of 108 mortgage processing times from Everglades Bank. These data are also located in your Excel file.
- Should your alternative be left-sided, right-sided, or two-sided? Explain.
 - State your null and alternative hypotheses using correct symbols and notation. Make sure to clearly identify the populations.
 - Conduct a two-sample t -test for comparing the difference between two means. Include your SPSS output or show your Excel calculations in your Word document.
 - State the P -value and give the conclusion in context using a significance level of 0.05.