Competency

In this project, you will demonstrate your mastery of the following competency:

- Apply statistical techniques to address research problems
- Perform hypothesis testing to address an authentic problem

Overview

In this project, you will apply inference methods for means to test your hypotheses about the housing sales market for a region of the United States. You will use appropriate sampling and statistical methods.

Scenario

You have been hired by your regional real estate company to determine if your region's housing prices and housing square footage are significantly different from those of the national market. The regional sales director has three questions that they want to see addressed in the report:

1. Are housing prices in your regional market higher than the national market average?
2. Is the square footage for homes in your region different than the average square footage for homes in the national market?
3. For your region, what is the range of values for the 95% confidence interval of square footage for homes in your market?

You are given a real estate data set that has houses listed for every county in the United States. In addition, you have been given national statistics and graphs that show the national averages for housing prices and square footage. Your job is to analyze the data, complete the statistical analyses, and provide a report to the regional sales director. You will do so by completing the Project Two Template located in the What to Submit area below.

Directions

Introduction

1. **Purpose:** What was the purpose of your analysis, and what is your approach?
    a. Define a random sample and two hypotheses (means) to analyze.
2. **Sample:** Define your sample. Take a random sample of 100 observations for your region.
    a. Describe what is included in your sample (i.e., states, region, years or months).
3. **Questions and type of test:** For your selected sample, define two hypothesis questions and the appropriate type of test hypothesis for each. Address the following *for each hypothesis*:
    a. Describe the population parameter for the variable you are analyzing.
    b. Describe your hypothesis in your own words.
    c. Describe the inference test you will use.
        i. Identify the test statistic.
4. **Level of confidence:** Discuss how you will use estimation and conference intervals to help you solve the problem.

1-Tail Test

1. **Hypothesis:** Define your hypothesis.
    a. Define the population parameter.

b. Write null (Ho) and alternative (Ha) hypotheses.
c. Specify your significance level.

2. **Data analysis:** Analyze the data and confirm assumptions have not been violated to complete this hypothesis test.
    a. Summarize your sample data using appropriate graphical displays and summary statistics.
        i. Provide at least one histogram of your sample data.
        ii. In a table, provide summary statistics including sample size, mean, median, and standard deviation.
        iii. Summarize your sample data, describing the center, spread, and shape in comparison to the national information.
    b. Check the conditions.
        i. Determine if the normal condition has been met.
        ii. Determine if there are any other conditions that you should check and whether they have been met.
3. **Hypothesis test calculations:** Complete hypothesis test calculations, providing the appropriate statistics and graphs.
    a. Calculate the hypothesis statistics.
        i. Determine the appropriate test statistic (*t*).
        ii. Calculate the probability (*p* value).
4. **Interpretation:** Interpret your hypothesis test results using the p value method to reject or not reject the null hypothesis.
    a. Relate the *p* value and significance level.
    b. Make the correct decision (reject or fail to reject).
    c. Provide a conclusion in the context of your hypothesis.

2-Tail Test

a. **Hypotheses:** Define your hypothesis.
    1. Define the population parameter.
    2. Write null and alternative hypotheses.
    3. State your significance level.
b. **Data analysis:** Analyze the data and confirm assumptions have not been violated to complete this hypothesis test.
    a. Summarize your sample data using appropriate graphical displays and summary statistics.
        i. Provide at least one histogram of your sample data.
        ii. In a table, provide summary statistics including sample size, mean, median, and standard deviation.
        iii. Summarize your sample data, describing the center, spread, and shape in comparison to the national information.
    b. Check the assumptions.
        i. Determine if the normal condition has been met.
        ii. Determine if there are any other conditions that should be checked on and whether they have been met.
c. **Hypothesis test calculations:** Complete hypothesis test calculations, providing the appropriate statistics and graphs.
    a. Calculate the hypothesis statistics.
        i. Determine the appropriate test statistic (*t*).
        ii. Determine the probability (*p* value).
d. **Interpretation:** Interpret your hypothesis test results using the *p* value method to reject or not reject the null hypothesis.
    a. Relate the *p* value and significance level.
    b. Make the correct decision (reject or fail to reject).

c. Provide a conclusion in the context of your hypothesis.

e. **Comparison of the test results:** See Question 3 from the Scenario section.
   a. Calculate a 95% confidence interval. Show or describe your method of calculation.
   b. Interpret a 95% confidence interval.

Final Conclusions

1. **Summarize your findings:** Refer back to the Introduction section above and summarize your findings of the sample you selected.
2. **Discuss:** Discuss whether you were surprised by the findings. Why or why not?

What to Submit

To complete this project, you must submit the following:

Project Two Template: Use this template to structure your report, and submit the finished version as a Word document.

Supporting Materials

The following resources may help support your work on the project:

Data Set: House Listing Price by Region
Use this data for input in your project report.

Document: National Statistics and Graphs
Use this data for input in your project report.

Use these tutorials for support with the Excel functions you will use in the project:

- **Tutorial:** Random Sampling in Excel
- **Tutorial:** Scatterplots in Excel
- **Tutorial:** Descriptive Statistics in Excel
- **Tutorial:** Creating Histograms in Excel

Project Two Rubric

Criteria	Exemplary	Proficient	Needs Improvement	Not Evident	Value
Introduction: Purpose	Exceeds proficiency in an exceptionally clear manner (100%)	Defines a random sample and two hypotheses to analyze, and provides a brief overview of the report (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include missing or inaccurate samples or hypotheses (55%)	Does not attempt criterion (0%)	5

Criteria	Exemplary	Proficient	Needs Improvement	Not Evident	Value
Introduction: Sample	N/A	Describes what is included in the defined random sample (i.e., states, regions, or the period of time used) (100%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or very limited descriptions of what is included in the random sample (55%)	Does not attempt criterion (0%)	5
Introduction: Questions and Type of Test	Exceeds proficiency in an exceptionally clear and insightful manner (100%)	Defines two hypothesis questions and the appropriate type of test hypothesis for each for the defined random samples, addressing the population parameters for the variables, a description of the created hypotheses in their own words, and a description of the inference test to be used (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include missing or inaccurate descriptions, definitions, or questions (55%)	Does not attempt criterion (0%)	5
Introduction: Level of Confidence	Exceeds proficiency in an exceptionally clear, insightful, or sophisticated manner (100%)	Discusses how estimation and conference intervals will be used to help solve the problem (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include missing or inaccurate examples of how estimation and conference intervals will be used to help solve the problem (55%)	Does not attempt criterion (0%)	10
1-Tail Test: Hypothesis	N/A	Defines the hypothesis by defining the population parameter, writing null and alternative hypotheses, and specifying the significance level (100%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include missing or inaccurate definitions and specifications (55%)	Does not attempt criterion (0%)	5

Criteria	Exemplary	Proficient	Needs Improvement	Not Evident	Value
1-Tail Test: Data Analysis	Exceeds proficiency in an exceptionally clear, insightful, or sophisticated manner (100%)	Analyzes the data to confirm that assumptions have not been violated to complete the hypothesis test, summarizes sample data using appropriate graphical displays and summary statistics, and checks the conditions (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or insufficient analyses, summaries, or condition checks (55%)	Does not attempt criterion (0%)	5
1-Tail Test: Complete Hypothesis Test Calculations	N/A	Completes the hypothesis test calculation and provides appropriate statistics and graphs (100%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or inappropriate calculations, statistics, and/or graphs (55%)	Does not attempt criterion (0%)	5
1-Tail Test: Interpretation	Exceeds proficiency in an exceptionally clear, insightful manner (100%)	Interprets hypothesis test results using the p value method to reject or not reject the null hypothesis by relating the p value and significance level, making the correct decision to reject or fail to reject, and providing a contextualized conclusion (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or insufficient interpretations or conclusions (55%)	Does not attempt criterion (0%)	5
2-Tail Test: Hypotheses	N/A	Defines the hypothesis by defining the population parameter, writing null and alternative hypotheses, and stating the significance level (100%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include missing or inaccurate definitions and specifications (55%)	Does not attempt criterion (0%)	5

Criteria	Exemplary	Proficient	Needs Improvement	Not Evident	Value
2-Tail Test: Data Analysis	Exceeds proficiency in an exceptionally clear, insightful, or sophisticated manner (100%)	Analyzes the data and confirms assumptions have not been violated to complete the hypothesis test by summarizing sample data using appropriate graphical displays and summary statistics and checking the assumptions (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or insufficient analysis, summaries, or condition checks (55%)	Does not attempt criterion (0%)	5
2-Tail Test: Hypothesis Test Calculations	N/A	Completes the hypothesis test calculation by providing the appropriate statistics and graphs (100%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or inappropriate calculations, statistics, and/or graphs (55%)	Does not attempt criterion (0%)	5
2-Tail Test: Interpretation	Exceeds proficiency in an exceptionally clear, insightful manner (100%)	Interprets hypothesis test results using the p value method to reject or not reject the null hypothesis by relating the p value and significance level, making the correct decision to reject or fail to reject, and providing a contextualized conclusion (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or insufficient interpretations or conclusions (55%)	Does not attempt criterion (0%)	10
2-Tail Test: Comparison of the Test Results	N/A	Calculates and interprets a 95% confidence interval (100%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate calculations or interpretations (55%)	Does not attempt criterion (0%)	5

Criteria	Exemplary	Proficient	Needs Improvement	Not Evident	Value
Final Conclusions: Summarize Your Findings	Exceeds proficiency in an exceptionally clear, insightful, sophisticated manner (100%)	Summarizes findings of selected sample through the context of Step One (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include inaccurate or insufficient interpretations and/or conclusions (55%)	Does not attempt criterion (0%)	10
Final Conclusions: Discuss	Exceeds proficiency in an exceptionally clear, insightful, or sophisticated, manner (100%)	Discusses whether the findings were surprising and why (85%)	Shows progress toward proficiency, but with errors or omissions; areas for improvement may include providing more details and evidence to support the response (55%)	Does not attempt criterion (0%)	10
Articulation of Response	Exceeds proficiency in an exceptionally clear, insightful, sophisticated, or creative manner (100%)	Clearly conveys meaning with correct grammar, sentence structure, and spelling, demonstrating an understanding of audience and purpose (85%)	Shows progress toward proficiency, but with errors in grammar, sentence structure, and spelling, negatively impacting readability (55%)	Submission has critical errors in grammar, sentence structure, and spelling, preventing understanding of ideas (0%)	5
				Total:	100%