Introductory Statistics

Design the Study

1. List the Group Members with Both First and Last Names:

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1. Explain the purpose of your study.

We are trying to determine if the average depreciation of cars after five years is different than 49.1%

1. Determine whether this be a Designed Experiment or an Observational Study? Explain.

This is an observational study because we are merely observing what has changed over the past five years in car values, and we are not exercising any control over the response variable.

1. Identify the response variable(s). (Tip: carefully consider what you are going to observe and record) Determine whether the response variable is numeric or categorical. (Lesson 2 Section 4.4)

The response variable is the value of the car models. The value change will give us the information that we need in order to conduct a hypothesis test. Larger or smaller depreciations will help support our alternative hypothesis (Ha).  If we find sufficient evidence to support that the average car value depreciation is different than 49.1% in the first five years of ownership then we will conclude rejecting the null hypothesis (Ho).

1. Identify the population.

The population is cars across the United States

1. Identify the population parameter of interest.

The population parameter is the average depreciation of car values across the US

1. State your Null and Alternative Hypothesis in words and symbols.

Null Hypothesis - The average depreciation of car values is 49.1%

H0 = 49.1%

Alternate Hypothesis

Ha ≠ 49.1%

1. State and Define your Planned Sampling Method. (Lesson 2 Section 4.3)

We will use a systematic sample selecting every 10th car price today versus its original MSRP.

1. How will you apply the planned sampling method?

We will go onto multiple websites where cars are listed such as Carvana, cars.com, Autotrader, and Carmax. We will collect as many observations as we can find in our categories, collect and list the data in excel, and then we will input the observations into a randomizer program that will enable us to select every 10th car price to gather our sample.

1. Explanation on why you chose this type of method.

We believe that using this method will reduce sampling bias and allow us to gather a well balanced collection of samples.

Collect the Data

1. What did you learn in Data collection? We saw that it appears that a large majority of the cars in our sample did not depreciate the anticipated 49%. The vast majority were below, if not far below that point. A contributing factor may possibly be shortages in the car market due to world events.
2. Describe how sampling was completed. Each member found 50 samples of each car, Toyota Camry and Nissan Altima 2017. Found price the cars cost now versus what they costed in 2017.
3. Describe things you did not anticipate.

We did not anticipate the price to be higher now than in 2017 for some 2017 cars.

1. List the Sample Sizes Gathered by Group.

Sample size 200 for 2017 Toyota Camry

Sample size 200 for 2017 Nissan Altima

Describe the Data

1. Provide Numerical Summaries.

Mean = .18

Median = .17

Standard Deviation = .103

1. Provide Graphical Summaries.

Chart, histogram

Description automatically generated

Chart, scatter chart

Description automatically generated

1. Make a statement comparing the groups or the one group to the null hypothesis based on your numerical and graphical summaries.

There is sufficient evidence to conclude the average depreciation of car value is not 49.1%

Make Inference

1. Describe the method used and why you used the method.
2. Check the requirements of the statistical method.
3. State the null and alternative hypotheses in words and symbols.
4. State the level of significance.
5. State the test statistics and degrees of freedom.
6. State the p-value.
7. Make a statement on rejecting or not rejecting the null hypothesis by comparing the p-value to the level of significance.
8. Make a concluding statement and referencing the alternative hypothesis when making the concluding statement.
9. Calculate and interpret the confidence interval.
10. Compare the confidence interval to the null hypothesis to determine whether the null hypothesis should be rejected.

Take Action

1. What action item would you take given the results you obtained?