Case Study 8

Ariane 5 (EU) VS Delta IV (USA)

Background Hello! You have been hired to research the success/failure rates of space launches. Congratulations! Your research will help decide which space program is to inherit large amounts of donations to further advance their space program. Specifically, we would like you to investigate if there are differences in the proportion of successful space launches between the Ariane 5 and Delta IV. To find more information about each space launch vehicle, follow the links below:

Ariane 5: https://en.wikipedia.org/wiki/Ariane_5

Delta IV: https://en.wikipedia.org/wiki/Delta_IV

Learning Objectives

- Collect and understand data from an online table
- Understand how to identify and categorize variables in the context of the problem
- Write out null and alternative hypotheses
- Carry out a an analysis to answer the research question

To investigate the question of interest, please follow the questions below. You will need to download the associated R-script to answer some of the questions. Please download the R-script Space-Launch from D2L.

- In 5-7 sentences, please summarize (in detail) to a general audience descriptions about Ariane 5 and Delta IV.

- Think about how we could perform a statistical test in order to answer the research question above. What two variables should we use? Are each categorical or quantitative? Explanatory? Response?

- Based on your answer to the previous question, should we use proportions or means to summarize our variables?

- Write out the proper null and alternative hypotheses in notation. Define all parameters and subscripts used.

- How many documented space launches has each vehicle performed? Hint: Use the above links.

- How many documented successful launches has each vehicle performed? Hint: Use the above links.

- Based on your answers to the previous two questions, which method of inference (simulation- or theory-based) is most appropriate for these data? Explain why.

- Calculate the appropriate statistic using proper notation.

- Carry out the analysis to answer the research question. We will use simulation methods to calculate the p-value. Calculate the corresponding p-value in R. Hint: Download the Space Launch.R file from D2L and type in your observed statistic from the previous question in the as_extreme_as = argument. Write down the p-value below.

- Interpret the p-value in the context of the problem. How much evidence is there to support the true proportions of successful space launches differs by station.

- In 2-3 sentences, write a letter to your boss giving your recommendation on which space program should receive the donations. Post this letter to the discussion post "Space Suggestions."

- Reflect on the learning objectives above. Post your reflections in the "Space Learning Outcomes" discussion post.