MSAN 631: Design and Analysis of Experiments

Lab 2: Sample Size Calculators
Due: Tuesday June 13th, 2017

Problem Description:
Sample size calculations are a necessary first step when designing an A/B test. Without a sufficient number of observations the conclusions drawn from the experiment will be associated with an increased level of uncertainty.

The two most common types of hypotheses tested within an A/B test are

- t-tests to compare means in two independent conditions A and B, i.e.,
$$H_0: \mu_A = \mu_B \text{ versus } H_A: \mu_A \neq \mu_B$$

- z-tests to compare proportions in two independent conditions A and B, i.e.,
$$H_0: \pi_A = \pi_B \text{ versus } H_A: \pi_A \neq \pi_B$$

In self-selected groups, you will create a sample size calculator implemented in Shiny for both of these tests. In particular, I expect the calculator to suggest a common sample size n for each condition based on the following inputs:

- the significance level α
- the power of the test $1 - \beta$
- the effect size δ / true parameter values

If a user would like to input a range of values for any of these inputs, the calculator will need to generate a plot of n vs. that given input. For example, a user may wish to specify a significance level α and an effect size δ, but may want to investigate different sample sizes for different levels of power. In this case the calculator would generate a plot of n vs. $1 - \beta$ for fixed levels of α and δ.

Note that this calculator should be able to handle both one and two-sided alternatives.

Deliverable:
The deliverable here is the sample size calculator (Shiny app) as described above. Please have one member of your group electronically submit the R file with your code.

Grading:
The members of each group will receive a common grade out of 20. Groups will be graded on the validity and accuracy of the calculations that are performed and the overall functionality and esthetic of the calculator.