Estimating Sample Sizes Needed for Type I and Type II Error Control

The beginning researcher soon learns about the relationship between a dependent variables standard deviation and the errors of inference for samples of various size. Unfortunately, many beginning researchers only attend to the probability of rejecting a hypothesis about their variable due to random sampling variability that occurs from sample to sample drawn from a population. They should, of course, be equally concerned about accepting a null hypothesis when, in fact, in the population sampled they should reject the null hypothesis. These two types of error are often known as Type I and Type II errors and each may have different costs and consequences. The cost, for example, in human lives by accepting the null hypothesis that two drug treatments are equally effective when, in fact, one is more effective may be a greater cost than the accidental rejection of the null hypothesis for two equally effective treatments.

One can estimate the sample size needed to control for BOTH Type I and Type II errors for many statistical analyses. Books and articles abound for estimating these sizes depending on the statistical test to be used. Frequently however, one can obtain a reasonable estimate if the statistic to be employed can be approximately transformed into a z-test between two means. For example, in completing an Analysis of Variance, the F ratio of variability between groups to the variability within groups is used as the test statistic. However, if one considers two of the groups to be contrasted, a z-test could be used for inferring whether or not there means differ beyond that expected due to random sampling variability. Thus the sample size may be determined for all of the groups by simply specifying the Type I and Type II error controls desired for any two groups and using the standard deviation estimated by the square root of the pooled within group variance.

Shown below is the specifications form for this procedure and the output obtained for an example:

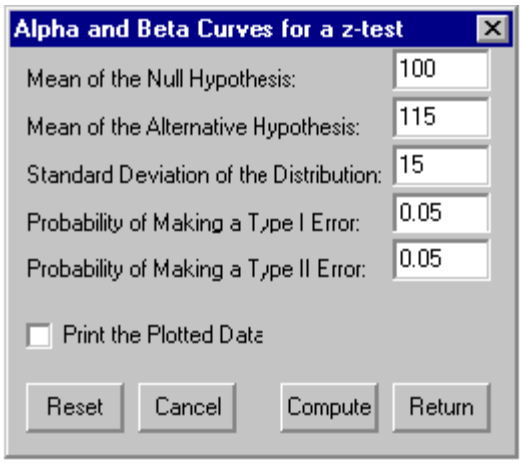

Figure 1 Dialog for Alpha and Beta (Type I and Type II) Curves

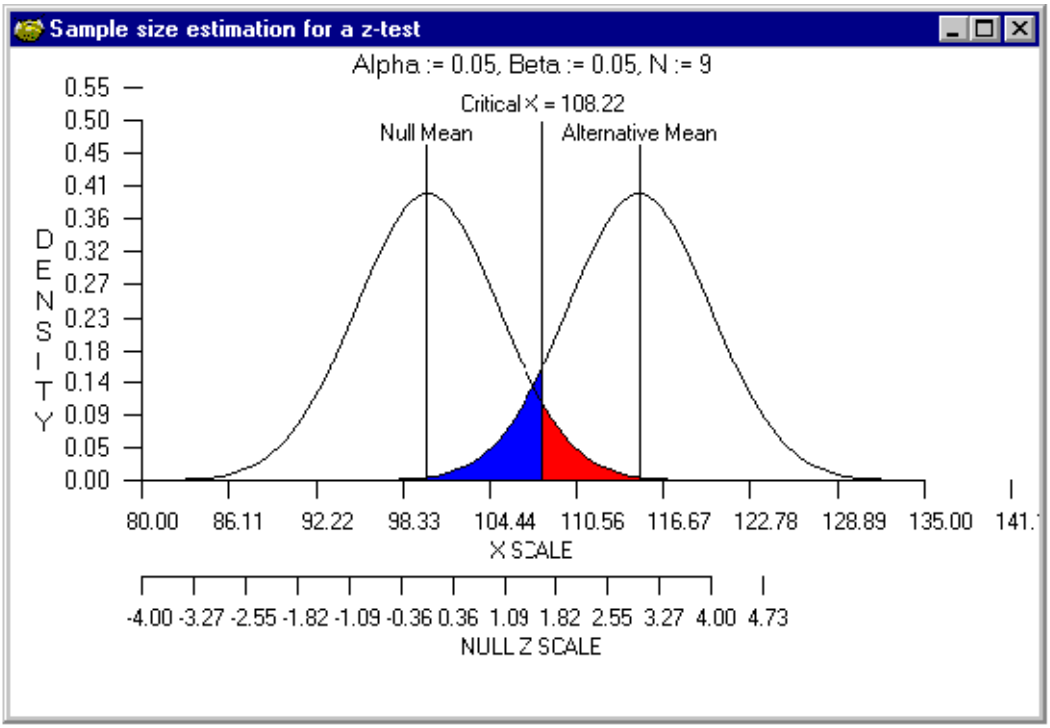

Figure 2 Normal Curves for Type I and Type II Error