

Building a GUI to a Sample Size Program using FRAME

Brian Mitchell, Above Average Consulting, Inc., Westerville, Ohio

Introduction

SAS/AF® Frame entries provide all of the flexibility necessary to make a user-friendly GUI-based variation of the traditional programs used to estimate sample size or power. This particular interface uses an extremely comprehensive and accurate program named UnifyPow, which was written by Dr. Ralph O'Brien of the Cleveland Clinic (O'Brien, 1997). UnifyPow is used for the calculations and the tabular summary of the output. This application provides an on-screen graph of sample size against power for a user-specified range of values. Most of the functionality available in UnifyPow is incorporated into the graphical interface.

UnifyPow

UnifyPow is a freeware SAS module that performs statistical power analysis. It handles unequal group sizes and one and two-tailed tests, when appropriate. The range of statistical tests is impressive, with more being added with each update. The tests included in the current (July 1998) release are listed below:

Tests of Location

- One-sample *t* and Wilcoxon signed-rank
- One-sample Matched-pairs *t* and Wilcoxon
- Two-sample *t* test or Wilcoxon-Mann-Whitney
- Two-sample Matched-pairs, *t* or Wilcoxon
- One-way ANOVA overall *F* test or cell-means model
- *G*-sample tests for differences between matched-pairs
- General *F* test for linear models

Proportions, Logits, and Log-linear Models

- One-sample binomial
- Two independent proportions - conditional or not
- Chi-square and likelihood ratio for association
- Two correlated proportions
- Overall likelihood ratio for *G* independent proportions
- Wald-type for *G* independents logits
- General likelihood ratio

Regression and Correlation

- One-sample for Pearson correlation
- Overall *F* for multiple linear regression
- Individual betas
- Multiple partial correlation
- Linear contrasts

Using UnifyPow

UnifyPow is made available as either a SAS module or a set of macros. The GUI uses the module version just like most of the examples found in the UnifyPow documentation. Parameter input is accomplished with the DATALINES statement followed by lines of keywords and associated values. Finally, a macro is invoked to calculate the requested information.

Program output is in the form of a summary data set which is formatted to the output window using PROC TABULATE. This open structure allows the programmer to add additional processing after the macros

complete execution, to, for example, graph the output.

The FRAMES Program

SAS/AF® Frame Entries were used to build a point-and-click interface to UnifyPow. The wide variety of tests, and hence parameters, that UnifyPow supports, required that the inputs be separated into multiple screens. However, the value of the GUI lies in providing the bulk of the parameters in a single screen to facilitate exploration of the parameter space for a best sample size or power. For this reason, the design was limited to 2 screens with most parameters present on the second screen.

The initial screen (Figure 1) opens with a list box of test categories displayed. The user selects a category which then displays two additional list boxes, one of specific tests for the chosen category and one that allows a choice of a one- or two-tailed hypothesis. With this screen completed, the user clicks an OK button to continue to the next screen (Figure 2). The rest of the parameters are likely to be varied by the user in the exploration of the parameter space and hence must be displayed on the final screen.

On the second screen, the choices from the first screen are displayed at the top and fields for the additional parameters needed for the specific test are provided. In addition, the user can select options such as entering weights or contrasts. Once all the relevant fields are complete, the user clicks on the CALCULATE button to generate the PROC TABULATE output in the output window and create the dataset POWDATA. Clicking on the Display button adds a plot of sample size versus power for the defined parameters. This graph can be printed, or parameters can be changed and the graph regenerated for the new values. The printout also lists all of the parameter selections used in the generation of the graph/TABULATE output. For each run, the PROC TABULATE output is appended to the output window. When the user is satisfied with a particular parameter set, they can return to the first screen and exit the program.

The basic strategy used by the SCL program is to generate the appropriate submit block that would normally be used to run UnifyPow and then add additional processing (graphing) after the submit block is complete. UnifyPow uses either a POWER or NTOTAL statement with one or more values to generate output. The FRAMES program substitutes the input of a range for either power or total sample size. The SCL program behind the second screen generates a suitable POWER or NTOTAL statement for multiple calls to UnifyPow with an even logarithmic spacing over this range. The resulting data set named work.powdata is used to plot the graph.

The FRAME Entries

Both Frames use the HIDE/UNHIDE functions to only present the needed screen objects per the user request. Although this eliminates some clutter, any object that would potentially be used, must be defined in the frame. Unfortunately, the same screen space cannot be used by different objects depending on user input. Another approach would be to prepare multiple variations of the second frame but that seemed prone to error and more difficult to maintain.

In order to work for any of the myriad of tests possible, the input of parameters had to be made generic. This was accomplished by setting up a series of parameter name text boxes and parameter value input boxes. The parameter names were then loaded from a permanent SAS data set. This approach means that the user does not have to remember the keywords (and which are applicable) for each of the individual

tests.

These parameter keywords and values are converted to macro variables that are then SUBMITTED as part of a typical run of UnifyPow. The UnifyPow program graciously handles multiple values for a given parameter with BY group processing in the PROC TABULATE output. These multiple values would have added another layer of complication to the second frame, so the it DOES NOT accept multiple values for any single parameter. The second frame does generate multiple executions of UnifyPow, but only over the specified range of power or sample size, in order to generate a plot.

SAS/GRAPH is used to generate both the sample size/power plot and a textual summary (PROC GSLIDE) of the user's request. These two graphical entries are then combined on a single page for printing with PROC GREPLAY. In this way, the user has the desired plot complete with adequate documentation of what it represents.

The rest of the code resolves some inconsistencies in the keywords used for different tests and handles some error-checking. Most of the checking is left to the UnifyPow program which has its own validation routines for the input parameters. The only known glitch at the time this was written is that clicking on the CALCULATE button brings the program editor window to the foreground. You will have to return to the AF window to continue. Because the second screen is so crowded, you will need to set the font size in Preferences to be fairly small (I use 7 point on a 17" monitor).

Validation and User Input

The frames have been extensively tested but given the incredibly variety of possible inputs, not exhaustively validated. The interface program has only been tested in a single environment (Windows 95, SAS 6.12) and as such users may find difficulties in using it in their own milieu. I would be happy to assist you if problems arise or to hear your suggestions for improvements.

Example

Consider an ordinary two-sample t-test. Let the sample means be -0.86 and -0.42, respectively, and the estimate of a common standard deviation be 0.45. For a two-tailed test at the 0.05 level of significance, the first and second screens will look like Figures 1 and 2, respectively.

Getting the Programs

The source code, test files, and usage notes for UnifyPow are distributed from the website

<http://www.bio.ri.ccf.org/power.html>

The SAS/AF frame entries are also available from this website or my own

<http://www.aboveaverageconsulting.com>

Legal Disclaimer

The frame entries are freeware. You may give them to others at no charge, but you may not charge a "service fee" for this distribution. Use them at your own risk.

THIS FREWARE COMES WITHOUT ANY WARRANTY WHATSOEVER. BRIAN MITCHELL AND ABOVE AVERAGE CONSULTING, INC. DO NOT AND CANNOT WARRANT THE PERFORMANCE OR RESULTS THAT YOU MAY OBTAIN BY USING THIS FREWARE AND ITS DOCUMENTATION. IN NO EVENT WILL BRIAN MITCHELL OR ABOVE AVERAGE CONSULTING, INC. BE LIABLE TO YOU FOR ANY CONSEQUENTIAL, INCIDENTAL, OR SPECIAL DAMAGES, INCLUDING LOST PROFITS OR LOST SAVINGS, EVEN IF BRIAN MITCHELL OR ABOVE AVERAGE CONSULTING, INC. HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY THIRD PARTY.

References

O'Brien RG (1997), "UnifyPow: A SAS Macro for Sample-Size Analysis," *Proceedings of the 22nd SAS Users Group International Conference*, Cary, NC, SAS Institute, 1353-1358.

SAS, SAS/AF, and SAS/GRAPH are registered trademarks or trademarks of SAS Institute, Inc. in the USA and other countries.

Above Average Consulting
255 Baldwin Court
Westerville OH 43082
Telephone: (614) 901-9053
Fax: (614) 901-9054
E-mail: bmitch@aboveaverageconsulting.com
WWW: www.aboveaverageconsulting.com

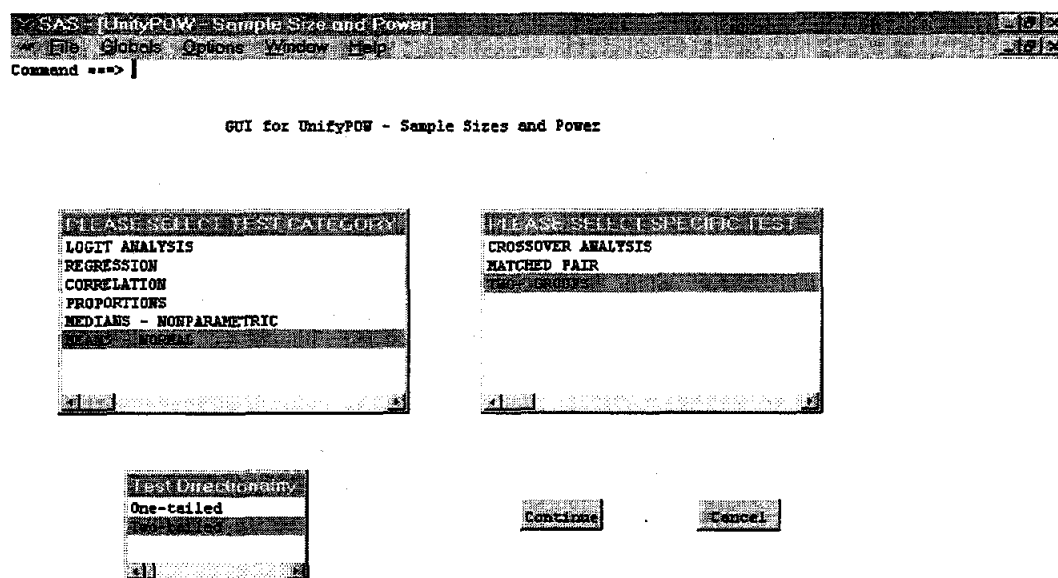


Figure 1.

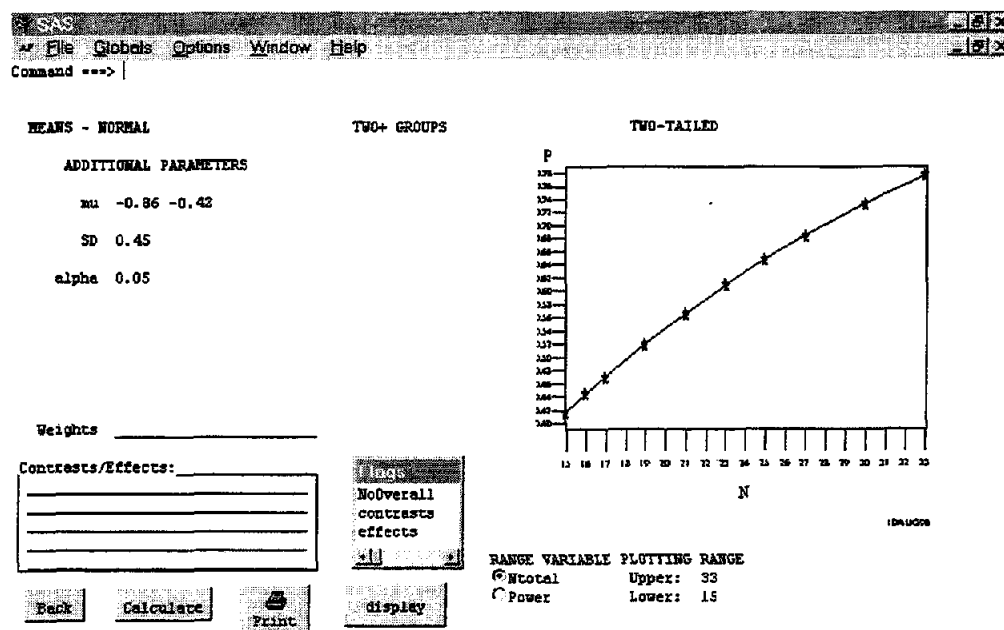


Figure 2.