ES Bootstrap: Correlated Groups
Directions for Use

Introduction

ES Bootstrap: Correlated Groups is a windows-based program that provides Bootstrapped confidence intervals for four variations of Cohen's *d* measure of effect size. These four variations include:

Pooled estimator:
$$\hat{\delta} = \frac{\overline{Y}_1 - \overline{Y}_2}{\sqrt{(S_1^2 + S_2^2)/2}}$$
(1)

Pooled robust estimator:
$$\hat{\delta}_R = 0.642\left[\frac{\overline{Y}_{t1} - \overline{Y}_{t2}}{\sqrt{(S_{w1}^2 + S_{w2}^2)/2}}\right]$$
(2)

Nonpooled estimator:
$$\hat{\delta}_j = \frac{\overline{Y}_1 - \overline{Y}_2}{S_j}$$
(3)

Nonpooled robust estimator:
$$\hat{\delta}_{Rj} = 0.642\left[\frac{\overline{Y}_{t1} - \overline{Y}_{t2}}{S_{wj}}\right]$$
(4)

Formatting Data for Import

The imported data file must contain only numeric entries, and be in text format (have a ".txt" extension). Each row of the text file corresponds to a case, and each column corresponds to a variable. One of three different delimiters may be used to delineate the variables in the data base: a space, a comma, or a tab. For example, if our data file consists of three cases and five variables, then the data file could be space-delimited:

```
1 1 1 1 1
2 2 2 2 2
3 3 3 3 3
```

Or comma-delimited:

```
1,1,1,1,1
2,2,2,2,2
3,3,3,3,3
```

Or tab-delimited:

```
1    1    1    1    1
2    2    2    2    2
3    3    3    3    3
```

The same delimiter must be used throughout the data file. In addition, the data must begin in the first row. As a result, variable names should **not** be included in the data file to be imported. ES Bootstrap will identify variables by their column placement.

ES Bootstrap can read in up to 100 variables and 10,000 cases. **Two** ~~One~~ of the variables must correspond to the repeated measurements under investigation, given by Y_1, and Y_2 in Equations 1, 2, 3, and 4 above.

Importing Data

The top portion of the main window of ES Bootstrap is devoted to importing the data file. To import the data:

(A) Specify the type of formatting used in delimiting the data file in the box on the far left-hand side of the Main Window called "Type of Delimiter". Three options are provided: space-delimited, comma-delimited, and tab-delimited. The default setting is space-delimited. If the appropriate type of delimiter is not provided, the data will not be read in.

(B) Specify the directory (drive and folder) and the file name of the data file to be imported.

(C) Click the "Import Selected Data File" button towards the right-hand side of the Main Window. Upon clicking the "Import Selected Data File" button, a message should appear in the Output Window that specifies the path of the selected file, the number of cases, and the number of variables.

For example, the message might look like:

```
Opened the text file: C:\Analysis\Data100.txt
Number of Cases: 200
Number of Variables: 2
```

Running Descriptive Analyses

To obtain descriptive statistics for each variable (e.g., mean, standard deviation, etc.), select "Descriptives" from the Analyses Menu, and the select all desired variables. The results will be printed in the Output Window.

Construct Bootstrapped Confidence Intervals

To obtain bootstrapped confidence intervals for each of the four variations of the effect size estimator, do the following:

(A) Select "Effect Size Bootstrap" from the Analyses Menu. This will result in the appearance of the Effect Size Bootstrap Window.

(B) Select the first level of the repeated measure (Y_1) in the "Pick Variable 1" list.

(C) Select the second level of the repeated measure (Y_2) in the "Pick Variable 2" list.

(D) Select the number of bootstrap trials (from 600 to 2000). The current trial number will be displayed in the "Trial number" box during the analysis.

(E) Select the level of confidence desired (90%, 95%, 99%).

For example, running the bootstrapped confidence intervals with 600 trials and a 95% confidence interval yields the following output:

```
GROUP-LEVEL STATISTICS
-----------------------------------------------
Statistic                   Var 1           Var 2
-----------------------------------------------
Sample Size                    50              50

Mean                          4.5            5.62
Trimmed Mean                4.433             5.9

Variance                    7.969          10.771
Wins. Var.                  6.988           7.992
-----------------------------------------------
Var1 = Var 2; Var2 = Var 1


EFFECT SIZE ESTIMATES AND 95% CI
-------------------------------------------------
Pooled variance = 9.37
Pooled Winsorized variance = 7.49

Pooled Cohen's D = 0.366
Pooled Robust Cohen's D = 0.344
Nonpooled Cohen's D = 0.397
Nonpooled Robust Cohen's D = 0.357

95% CI for population pooled D = (0.181, 0.565)
95% CI for population pooled Robust D = (0.154, 0.578)
95% CI for population nonpooled D = (0.197, 0.597)
95% CI for population nonpooled Robust D = (0.174, 0.632)
-------------------------------------------------
Nonpooled variance obtained from Varaible 2
Number of attempted bootstrap trials = 600
Number of valid pooled D bootstrap trials = 600
Number of valid pooled robust D bootstrap trials = 600
Number of valid nonpooled D bootstrap trials = 600
Number of valid nonpooled robust D bootstrap trials = 600
```

Note that the appearance of "9999999" for any of the statistics values indicates that the statistic could not be computed (usually due to lack of variance).

Save Output

To save the contents of the Output Window, select "Save Output" from the File Menu. A window will appear that will permit you to select the directory where you wish to save the output. The output file will be saved as a text document (with extension ".txt").

Open Output

You may open the output of a previous ES Bootstrap session in the Output Window of ES Bootstrap by selecting "Open Output" from the File Menu. Note that opening an output file in ES Bootstrap will cause any output currently in the Output Window to be replaced by the contents of the opened file.