Bootstrap Sampling with Replacement in SAS[1]

The following program includes a macro accesses a data file 15 times, sorts it in random order, and takes the first case. The fifteen cases are collected into a data set named samp&j. The symbols "&j" represent the number of the iteration for J. So, for example, on the second iteration of J, the data set will be named samp2. Proc reg is run on each of these samples (as many are as specified by the J loop, and the information from each of these is collected in a data set called "regall" .

```
** bootst2, a macro to bootstrap with replacement ;
title1 'bootst2, a macro to bootstrap with replacement' ;
data one ; set sasuser.heart ;
%macro bootst2 ;
** change the number following %to to change the number of iterations ;
%do j = 1 %to 5 ;
  ** this do loop draws a sample of 15, with replacement ;
  ** to change the number in the sample, change the "15" to another number;
  %do i = 1 %to 15 ;
    data h1 ; set one ;
   ** Create a random number using time of day for the seed ;
    ransamp = ranuni(-9) ;
   ** sort in random order ;
    proc sort ; by ransamp ;
   ** take the first case of the randomly sorted data set ;
    data samp ; set h1(obs=1) ; run ;
   ** Append the data to the sample -- ending with the number;
   ** of cases specified in the "i" loop above ;
   ** Assign the cases to a dataset that will change name with each
   ** iteration of the "j" loop above ;
    proc append base = samp&j data = samp ;
  %end ;
 ** Run proc reg on each sample ;
 proc reg data = samp&j outest = regout&j ;
 model heart = arterial / noprint ;
 ** Append the results to a data set named regall ;
 ** This data set will collect the information from each proc reg ;
 proc append base = regall data = regout&j ;
%end ;
%mend bootst2 ;
** Execute the macro ;
%bootst2 ;
proc print data = regall ; proc means data = regall ; run ;
```

```
                   bootst2, a macro to bootstrap with replacement                      1

      Obs    _MODEL_    _TYPE_    _DEPVAR_    _RMSE_    Intercept    Arterial    Heart

       1     MODEL1     PARMS      Heart      26.9390    23.156      0.96044      -1
       2     MODEL1     PARMS      Heart      17.7727    46.051      0.71567      -1
       3     MODEL1     PARMS      Heart      21.2739    82.227      0.09689      -1
       4     MODEL1     PARMS      Heart      22.3044    94.688      0.07341      -1
       5     MODEL1     PARMS      Heart      11.7727   100.369      0.04285      -1
```

```
                            The MEANS Procedure

Variable    Label                     N       Mean        Std Dev       Minimum        Maximum
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
_RMSE_      Root mean squared error   5    20.0125419    5.6509134    11.7726970     26.9390201
Intercept   Intercept                 5    69.2984733   33.3421266    23.1557389    100.3693307
Arterial                              5     0.3778520    0.4293537     0.0428486      0.9604362
Heart                                 5    -1.0000000            0    -1.0000000     -1.0000000
```