A TRIAD OF SAS MACROS TO CAPTURE
THE OUTPUT FROM PROC GLM

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One of the current limitations of SAS's GLM procedure is the difficulty of using the statistics produced by that procedure in subsequent programming. This paper introduces a triad of SAS macros which capture the statistics generated by PROC GLM and place them into appropriate SAS data sets. We begin by setting forth the basic design of the macros. This is followed by a description of their use in a program. Finally, some practical applications are highlighted.

PROC GLM does not allow the programmer to retrieve many of the GLM statistics which appear on the printout. These statistics must be read as data directly from the GLM output itself. The triad of SAS macros reads the GLM output into SAS data sets as follows: 1) the macro GLMOUT1 invokes PROC PRINTTO to direct subsequent output to a temporary OS data set instead of the printer. 2) PROC GLM is run. 3) the macro GLMOUT2 causes the temporary OS data set to be read as data. With judicious use of input statements, fields are identified, given variable names, and placed into SAS data sets. 4) optionally, the original GLM output may be printed by using the macro SPILL which copies the temporary data set to the output file.

This approach is merely an extension of an example given in the SAS User's Guide 1979, p. 356. In that example, only one statistic, the mean squared error was captured. The macros described herein capture all of the statistics produced by the basic GLM procedure together with most of those produced by the LSMEANS statement.

Figure 1 demonstrates how the three macros are used. The program in Figure 1 performs PROC GLM, prints the standard output, and then prints the contents of the SAS data sets containing the GLM statistics. This program provides a test of the macros and is recommended as a way to acquaint the user with the names assigned to all of the variables. The reader should note the following features of this program. 1) a temporary data set must be allocated to contain the GLM output. (Line 8). 2) "GLMOUT1" must precede the GLM procedure. (Line 19). 3) "GLMOUT2" should immediately follow the GLM procedure. (Line 36). 4) "SPILL" may be placed anywhere after "GLMOUT2" and before the next "GLMOUT1." 5) Options are specified in line 6. "LS=80" is recommended since modifications in the macros may be necessary for other linesizes. By using the SAS options "NOMACROGEN" and "NOSOURCE" the programmer keeps the SAS log uncluttered by a listing of the macros. The "SOURCE" option is again taken after the macros have been read. Other options are used at the programmer's discretion. 6) notice that the macros are contained in a separate data set to keep the program uncluttered and reduce redundant coding. (Line 11).

One application of these macros to report writing is shown in Figure 3. This table shows the coefficients and significance levels for a regression model which was run separately for each month of data. It was produced after sorting the COEFOUT data sets of the regressions by variable name (VNAME) and merging. These macros are in current use reducing the magnitude of printed output and flagging suspicious results. Other applications of these macros include the generation of F-statistics used in Chow tests, and tabulation of adjusted means. Future goals include and expanded role in model selection and testing.
I. IIRX2UTRID JOB (6318,HT1,5,25,,WARK),COHENR,TIME=(8),MSLEVEL=2
2. //EXECUTE PRINT REMOTE18
3. /// TASK: DEMONSTRATION OF THE GLM TRIAD OF MACRCS
4. /// EXECUTE: TRIAD,PROGS
5. // EXECUTE OPTIONS="LS=80 NOMACROGEN NODATE NOSOURCE",
6. // EXECUTE REGION=390K
7. // EXECUTE UNIT=SYSDA,SPACE=(TRK,(25,10)) TEMP PRINTIC DATA
8. // EXECUTE DSN=CN6318.RX2,OK,ALL,3AS,DISP=SHR DATA
9. // EXECUTE DSN=CN6318.RX2,COHEN,TRIAD,DISP=SHR MACRO DATASET
10. /// EXECUTE DD * 
11. * THIS IS A DEMONSTRATION OF THREE SAS MACRCS WHICH HAVE
12. * BEEN WRITTEN TO GIVE THE USER ACCESS TO NUMBERS FOUND
13. * OR THE PRINTOUT FROM PROC GLM. THESE NUMBERS MAY THEN
14. * BE USED AS INPUT FOR LATER SAS PROCESSING OR REPORT
15. * WRITING.
16. * 
17. * 
18. * 
19. GLMOUT1; * BEGIN PRINTING TO THE TEMPORARY PRINTIO DATASET:
20. **** GLM PROCEDURE *****
21. 
22. PROC GLM DATA=BASEDATA,ALL;
23. CLASSES TRT1 CI;
24. MODEL LPK780S= LINCOME LROOMS LNUMBER
25. CI TRT1
26. CI*LINCOME CI*LROOMS CI*LNUMBER
27. TRT1*LINCOME TRT1*LROOMS TRT1*LNUMBER
28. CI*TRT1
29. 
30. / SOLUTION :
31. LSMEANS TRT1 CI
32. / STDEHR PDIF;
33. 
34. *********************
35. 
36. GLMOUT2; * READ THE TEMPORARY PRINTIC DATASET INTO:
37. 1) MODELOUT - CONTAINING MODEL STATISTICS
38. 2) VARIQUT - CONTAINING VARIABLE STATISTICS
39. 3) COEFOUT - CONTAINING COEFFICIENTS AND
40. STATS FOR EVERY PARAMETER AND
41. CLASS VARIABLE VALUE
42. 4) LSMOUT - CONTAINING LSMEAN STATISTICS
43. 5) LSIJOUT - CONTAINING THE MATRIX CF
44. PROB > ITI HO: LSMEAN(I)=LSMEAN(J);
45. 
46. SPILL; * USED TO GIVE THE OPTION OF PRINTING THE OUTPUT
47. NORMALLY RECEIVED FROM PROC GLM;
48. 
49. PROC PRINT DATA=MODELOUT ; TITLE "MODELOUT" ;
50. PROC PRINT DATA=VARIBOUT ; TITLE "VARIBOUT" ;
51. PROC PRINT DATA=COEFOUT ; TITLE "COEFOUT" ;
52. PROC PRINT DATA=LSMOUT ; TITLE "LSMOUT" ;
53. PROC PRINT DATA=LIIJOUT ; TITLE "LIIJOUT" ;
54. 

**FIGURE 1. DEMONSTRATION PROGRAM**
MACRO GLMOUT1
  OPTIONS NOCENTER NONUMBER ; * TEMPORARY DATA SET: FT20F001;
  PROC PRINTTO UNIT=20 NEW ;
%
MACRO GLMOUT2
  OPTIONS ERROWS=0;
  PROC PRINTTO;
  TITLE ;
DATA MODELOUT (KEEP=DEPVAR M_OF M_SSE M_MSE M_F E_DF
  E_SSE E_MSE T_OF T_SSE M_PROBF R2 CV
  STDEV DEPMEAN )
  VAROUT1 (KEEP=VNAME V_DATE V_SS V_IF V_PF)
  VAROUT2 (KEEP=VDATE ASTER V_4SS V_4F V_4PF)
  COEFOUT (KEEP=VNAME CLASSVAR COEF BIAS)
  LSMOUT (KEEP=VNAME CLASSES LSMEAN L3ST ELS PROBT LSNUM
  DEPVAR DEPMEAN )
  LSJOUT (KEEP=VNAME LSX IJ DEPMEAN DEPVAR)
; LENGTH VNAME VTENP CLASS VAL $ 12 ;
INFORMAT LD1-L020 Iq. ;
FORMAT LSX 3.2 ;
RETAIN DEPVAR M_OF M_SSE M_MSE M_F E_DF E_SSE E_MSE
  T_OF T_SSE M_PROBF R2 CV STDEV DEPMEAN NUMVAR
  VTENP LSX 1LS JLS ;
RETAIN LCOUNT;
ARRAY LD (J) LD1-L020 ;
INFILE FT20F001 MISSOVER ;
NUMVAR=0 ;
TOP: INPUT @2 NAME S9. < ;
  IF NAME="DEPENDENT" THEN DO;
    INPUT @22 DEPVAR $ ; END;
  IF NAME="MODEL" THEN DO;
    INPUT M_OF M_SSE M_MSE M_F ; END;
  IF NAME="ERROR" THEN DO;
    INPUT E_DF E_SSE E_MSE ; END;
  IF NAME="CORRECTED" THEN DO;
    INPUT DUM1 S I_OF T_SSE M_PROBF ; END;
  IF NAME="R-SQUARE" THEN DUM;
    INPUT // R2 CV STDEV DEPMEAN;
  OUTPUT MODELOUT; END;
  IF NAME="SOURCE" THEN DO;
    INPUT DUM2 $ FLAG & 510. ;
    IF FLAG=TYPE I SS' THEN DO;
      INPUT ;
      READY: INPUT @2 VNAME $ V_DATE V_SS V_IF V_PF
        IF V_DATE, THEN GO TO READY;
      OUTPUT VAROUT1;
      SUMDF1=SUM(SUMDF1, V_DATE,0) ;
      NUMVAR=NUMVAR+1 ;
      IF SUMDF1<M_DF-1 THEN GO TO READY;
      END;
      IF FLAG=TYPE IV SS' THEN DO;
      INPUT ;
      READY4: INPUT @2 VNAME $ V_DATE 27-2B ASTER $ 29
        V_4SS V_4F V_4PF ;
      IF VNAME="PARAMETER" THEN GO TO COEFINI;
      IF V_DATE, THEN GO TO READY4;

FIGURE 2. MACROS LISTING
FIGURE 2. MACROS LISTING (CONT.)
IF LDUM1="" THEN GO TO LSIN10;
IJFLAG=0;
COLLOOP: INPUT IJ $ @;
JLS=JLS+1;
LSX=ILS+JLS;
IF IJ = "" AND IJFLAG=1 THEN GO TO ROWLOOP;
IF IJ = "" THEN IJFLAG=1;
OUTPUT LSIJOUT;
GO TO COLLOOP;
GO TO LSIN10;
END;
DATA VARIBOUT; MERGE VAROUT1 VAROUT2;
%MACRO SPILL
DATA _NULL_;
FILE PRINT NOPRINT;
INFILE FT20FOOI;
INPUT; PUT _INFILE_;
%
OPTIONS SOURCE;

FIGURE 2. MACROS LISTING (CONT.)
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**FIGURE 3. TABLE OF REGRESSION COEFFICIENTS**