

Supplement 7.6. SAS computations: Using a statistical model having only one slope

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This supplement provides SAS computation code relevant to Equation (7.7) and used for Chapter 7 examples. See Supplement 7.1 for additional details.

```

/*****
/*
/* N.S. Urquhart; August 28, 2009
/*
/*This program estimates the mixed linear model regression and
/*obtains estimates of components of variance. Output is tables
/*consisting of these estimates as well as other data parameters of
/*interest.
/* This program estimates only one trend; no variance for trends
/*across sites.
/*****

```

```

LIBNAME ODFW2008 'D:\SAS\ODFW2008';
RUN;

```

```

PROC IMPORT OUT= ODFW2008.DATA
FILE= "D:\SAS\ODFW2008\OrPlan_98_08_Reach_Reduced_UTM.xls"
DBMS=EXCEL REPLACE;
SHEET="OP_Habitat_ReachReduced_98_08";
GETNAMES=YES;
MIXED=NO;
SCANTEXT=YES;
USEDATE=YES;
SCANTIME=YES;
RUN;

```

```

PROC sort DATA=ODFW2008.DATA out=ODFW2008.DATA;
by GCG; RUN;

```

```

DATA ODFW2008.DATA;
set ODFW2008.DATA;
if GCG in('1-NC','2-MC','3-MS','5-SC','4-UMP');
TIME = YEAR - 1997;
RUN;

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```

DATA ODFW2008.DATA;
ATTRIB GCG LENGTH=$5 FORMAT=$char5.;
Set ODFW2008.DATA;
RUN;

```

```

PROC contents DATA=ODFW2008.DATA;
RUN;

```

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/*
Create a data set that contains each of the variables as an entry.
For use in macro
*/

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```

DATA ODFW2008.dependent_vars;
input index varnames $16.;
cards;
1 PRICHNLL
2 SECCHNLL
3 PRICHNAREA

```

```

4 SECCHNAREA
5 PCTSCCHNLA
6 GRADIENT
7 VWIRCH
8 WIDTH
9 ACW
10 ACH
11 NOPOOLS
12 PCTPOOLS
13 PCTSCPPOOL
14 PCTSWPOOL
15 SCRPOOLD
16 RIFFLEDEP
17 LRGBLDR
18 PCTSNDR
19 PCTGRAVEL
20 PCTBEDROCK
21 POOL1P_KM
22 CWPOOL
23 PCTSHADE
24 PCTEROSION
25 PCTUNDERC
26 LWDPIECE1
27 LWDVOL1
28 KEYLWD1
29 RESIDPD
30 LRGBLDR1
31 CON_20PLUS
32 CON_36PLUS
33 BVR_DAM
;
RUN;

DATA;
current=time();
put current=time.;
RUN;

%macro odfw;
  %do i = 1 %to 33;

*brings in each of the 33 variables, one at a time;

  DATA _null_;
  set ODFW2008.dependent_vars;
  if index = &i then
    call symput("curr_var",varnames);
  RUN;

*the next two mixed procedures are identical in the;
*analysis. The first calls the 5 separate regions;
*by the line "BY GCG". The second is for all regions. ;

  TITLE "The current variable is &curr_var";
  PROC mixed DATA=ODFW2008.DATA method=type3 noclprint;
    class ID_NUM YEAR;

```

```

model &curr_var = TIME/cl covb s;
random ID_NUM YEAR;
BY GCG;
ODS OUTPUT covparms=ODFW2008.CP SolutionF=ODFW2008.Slope NObs=ODFW2008.NObs1;
RUN;

TITLE2 "ALL REGIONS";
PROC mixed DATA=ODFW2008.DATA method=type3 noclprint;
CLASS ID_NUM YEAR;
MODEL &curr_var = TIME/cl covb s;
RANDOM ID_NUM YEAR;
ods output covparms=ODFW2008.CP2 SolutionF=ODFW2008.Slope2 NObs=ODFW2008.NObs2;
RUN;
TITLE2 " ";

%PUT "Completed Analysis of" , &curr_var, &i, "of 33";

DATA;
current=time();
put current=time.;
RUN;

*Places the label 'all' in the region column;

DATA ODFW2008.CP2;
GCG="ALL";
SET ODFW2008.CP2;
RUN;

*merging the parameter estimates into one temporary data set;

DATA ODFW2008.VarComps_temp;
Variable="&curr_var";
set ODFW2008.CP ODFW2008.CP2;
RUN;

%If &i=1 %then %Do;
DATA ODFW2008.VarComps;
Set ODFW2008.VarComps_temp;
%End;

%Else %Do;
DATA ODFW2008.VarComps;
set ODFW2008.VarComps ODFW2008.VarComps_temp;
%End; RUN;

DATA ODFW2008.Slope2;
GCG="ALL";
SET ODFW2008.Slope2;
RUN;

*merging the slope estimates into one temporary data set;

DATA ODFW2008.Slopes_temp;
Variable="&curr_var";
set ODFW2008.Slope ODFW2008.Slope2;

```

```

RUN;

%If &i=1 %then %Do;
    DATA ODFW2008.SlopesOut;
        Set ODFW2008.Slopes_temp;
    %End;

%Else %Do;
DATA ODFW2008.SlopesOut;
    set ODFW2008.SlopesOut ODFW2008.Slopes_temp;
%End; RUN;

DATA ODFW2008.NObs2;
    GCG="ALL ";
    SET ODFW2008.NOBS2;
    RUN;

DATA ODFW2008.NObs_temp;
    Variable="&curr_var";
    set ODFW2008.NObs1 ODFW2008.NObs2;
    RUN;

%If &i=1 %then %Do;
    DATA ODFW2008.NObsOut;
        Set ODFW2008.NObs_temp;
    %End;

%Else %Do;
DATA ODFW2008.NObsOut;
    set ODFW2008.NObsOut ODFW2008.NObs_temp;
%End; RUN;

%end;
%mend odfw;
RUN;

%odfw; RUN;

    *end of macro;

/* mean and variance of full DATA */

PROC means DATA=ODFW2008.DATA var;
TITLE "OVERALL SUMMARY";
var PRICHNLL SECCHNLL PRICHNAREA SECCHNAREA PCTSCCHNLA GRADIENT VWIRCH WIDTH ACW ACH
    NOPOOLS PCTPOOLS PCTSCPOOL PCTSWPOOL SCRPOOLD RIFFLEDEP LRGBLDR PCTSNDOR
    PCTGRAVEL PCTBEDROCK POOL1P_KM CWPOOL PCTSHADE PCTEROSION PCTUNDERC LWDPIECE1
    LWDVOL1 KEYLWD1 RESIDPD LRGBLDR1 CON_20PLUS CON_36PLUS BVR_DAM;
RUN;

/* mean and variance by region */

PROC means DATA=ODFW2008.DATA var;
TITLE "REGIONAL SUMMARIES";
var PRICHNLL SECCHNLL PRICHNAREA SECCHNAREA PCTSCCHNLA GRADIENT VWIRCH WIDTH ACW ACH
    NOPOOLS PCTPOOLS PCTSCPOOL PCTSWPOOL SCRPOOLD RIFFLEDEP LRGBLDR PCTSNDOR

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PCTGRAVEL PCTBEDROCK POOL1P_KM CWPOOL PCTSHADE PCTEROSION PCTUNDERC LWDPIECE1
LWDVOL1 KEYLWD1 RESIDPD LRGBLDR1 CON_20PLUS CON_36PLUS BVR_DAM;

by GCG;
RUN;

PROC print DATA=ODFW2008.varcomps;
    TITLE "ESTIMATES OF VARIANCE COMPONENTS";
    RUN;

PROC print DATA=ODFW2008.SlopesOut;
    TITLE "ESTIMATES OF SLOPES AND ALLIED QUANTITIES";
    RUN;

/* The following four data steps extract only the desired information
from the macro data sets and places it into one final data set
in table 4. */

DATA ODFW2008.Table1;
    SET ODFW2008.Varcomps;
    IF CovParm="ID_NUM" THEN DO;
        Site=Estimate; RETAIN Site;
    END;
    ELSE IF CovParm="YEAR" THEN DO;
        Year=Estimate; RETAIN Year;
    END;
    ELSE IF CovParm="Residual" THEN DO;
        Residual=Estimate; SiteRes=Site+Residual;
        OUTPUT;
        End;
    Drop CovParm Estimate;
    RUN;

DATA ODFW2008.Table2;
    SET ODFW2008.SlopesOut;
    IF Effect="TIME" THEN DO;
        Slope=Estimate; KEEP Variable GCG Slope;
        OUTPUT;
    END;
    ELSE PUT;
    RUN;

DATA ODFW2008.Table3;
    SET ODFW2008.NObsOut;
    IF Label="Number of Observations Read" THEN DO;
        KEEP Variable GCG NObsRead NObsUsed;
        OUTPUT;
    END;
    ELSE PUT;
    RUN;

DATA ODFW2008.Table4;
    MERGE ODFW2008.Table3 ODFW2008.Table2 ODFW2008.Table1;
    RUN;

```