Sep 03, 07 4:46 **x3_2_2.sas** Page 1/1

```
/* x3_2_2.sas */
/* Purpose:  */

title1 'Section 3.2.2. Note: special notation used in the GLM analysis.';

data a;
  input y a b;
  x=(b-5)/1;
  x2=x*x;
  cards;
0.606 1 2
0.660 1 4
0.984 1 6
0.908 1 8
0.761 0 2
0.933 0 4
1.072 0 6
0.979 0 8
;

proc print;
title2 'List of data.';

proc glm data=a;
  class a;
  model y=a x(a) x2(a) /noint xpx inverse solution;
title2 'Full model. "M".';

proc glm data=a;
  class a;
  model y=a x(a) /noint xpx inverse solution;
title2 'Reduced model. "H1".';

proc glm data=a;
  class a;
  model y=a x /noint xpx inverse solution;
title2 'Reduced model. "H2".';

proc glm data=a;
  model y=x /xpx inverse solution;
title2 'Reduced model. "H3".';

proc glm data=a;
  model y= /xpx inverse solution;
title2 'Reduced model. "H4".';

run;
```

Section 3.2.2. Note: special notation used in the GLM analysis. 1
List of data.

Obs	y	a	b	x	x2
1	0.606	1	2	-3	9
2	0.660	1	4	-1	1
3	0.984	1	6	1	1
4	0.908	1	8	3	9
5	0.761	0	2	-3	9
6	0.933	0	4	-1	1
7	1.072	0	6	1	1
8	0.979	0	8	3	9

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Section 3.2.2. Note: special notation used in the GLM analysis. 2
Full model. "M".

The GLM Procedure

Class Level Information

Class	Levels	Values
a	2	0 1

Number of Observations Read	8
Number of Observations Used	8

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Section 3.2.2. Note: special notation used in the GLM analysis. 3
Full model. "M".

The GLM Procedure

The X'X Matrix

	a 0	a 1	x(a) 0	x(a) 1
a 0	4	0	0	0
a 1	0	4	0	0
x(a) 0	0	0	20	0
x(a) 1	0	0	0	20
x2(a) 0	20	0	0	0
x2(a) 1	0	20	0	0
y	3.745	3.158	0.793	1.23

The X'X Matrix

	x2(a) 0	x2(a) 1	y
a 0	20	0	3.745
a 1	0	20	3.158
x(a) 0	0	0	0.793
x(a) 1	0	0	1.23
x2(a) 0	164	0	17.665
x2(a) 1	0	164	15.27
y	17.665	15.27	6.152791

Section 3.2.2. Note: special notation used in the GLM analysis. 4
Full model. "M".

The GLM Procedure

X'X Inverse Matrix

	a 0	a 1	x(a) 0	x(a) 1
a 0	0.640625	0	0	0
a 1	0	0.640625	0	0
x(a) 0	0	0	0.05	0
x(a) 1	0	0	0	0.05
x2(a) 0	-0.078125	0	0	0
x2(a) 1	0	-0.078125	0	0
y	1.0190625	0.830125	0.03965	0.0615

X'X Inverse Matrix

	x2(a) 0	x2(a) 1	y
a 0	-0.078125	0	1.0190625
a 1	0	-0.078125	0.830125
x(a) 0	0	0	0.03965
x(a) 1	0	0	0.0615
x2(a) 0	0.015625	0	-0.0165625
x2(a) 1	0	0.015625	-0.008125
y	-0.0165625	-0.008125	0.02442505

Section 3.2.2. Note: special notation used in the GLM analysis. 5
Full model. "M".

The GLM Procedure

Dependent Variable: y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	6.12836595	1.02139433	83.63	0.0119
Error	2	0.02442505	0.01221252		
Uncorrected Total	8	6.15279100			

R-Square	Coeff Var	Root MSE	y Mean
0.875614	12.80722	0.110510	0.862875

Source	DF	Type I SS	Mean Square	F Value	Pr > F
a	2	5.99949725	2.99974863	245.63	0.0041
x(a)	2	0.10708745	0.05354373	4.38	0.1857
x2(a)	2	0.02178125	0.01089063	0.89	0.5286

Source	DF	Type III SS	Mean Square	F Value	Pr > F
a	2	2.69673505	1.34836753	110.41	0.0090
x(a)	2	0.10708745	0.05354373	4.38	0.1857
x2(a)	2	0.02178125	0.01089063	0.89	0.5286

Parameter		Estimate	Standard Error	t Value	Pr > |t|
a	0	1.019062500	0.08845139	11.52	0.0074
a	1	0.830125000	0.08845139	9.39	0.0112
x(a)	0	0.039650000	0.02471085	1.60	0.2498
x(a)	1	0.061500000	0.02471085	2.49	0.1306
x2(a)	0	-0.016562500	0.01381379	-1.20	0.3533
x2(a)	1	-0.008125000	0.01381379	-0.59	0.6160

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Section 3.2.2. Note: special notation used in the GLM analysis. 6
Reduced model. "H1".

The GLM Procedure

Class Level Information

Class	Levels	Values
a	2	0 1

Number of Observations Read 8
Number of Observations Used 8

Section 3.2.2. Note: special notation used in the GLM analysis. 7
Reduced model. "H1".

The GLM Procedure

The X'X Matrix

	a 0	a 1	x(a) 0	x(a) 1	y
a 0	4	0	0	0	3.745
a 1	0	4	0	0	3.158
x(a) 0	0	0	20	0	0.793
x(a) 1	0	0	0	20	1.23
y	3.745	3.158	0.793	1.23	6.152791

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Section 3.2.2. Note: special notation used in the GLM analysis. 8
Reduced model. "H1".

The GLM Procedure

X'X Inverse Matrix

	a 0	a 1	x(a) 0	x(a) 1	y
a 0	0.25	0	0	0	0.93625
a 1	0	0.25	0	0	0.7895
x(a) 0	0	0	0.05	0	0.03965
x(a) 1	0	0	0	0.05	0.0615
y	0.93625	0.7895	0.03965	0.0615	0.0462063

```
       Section 3.2.2. Note: special notation used in the GLM analysis.        9
                             Reduced model. "H1".

                              The GLM Procedure

Dependent Variable: y

                                           Sum of
 Source                      DF          Squares    Mean Square   F Value   Pr > F

 Model                        4       6.10658470     1.52664618    132.16   0.0002

 Error                        4       0.04620630     0.01155157

 Uncorrected Total            8       6.15279100


              R-Square     Coeff Var      Root MSE        y Mean

              0.764692      12.45583      0.107478      0.862875


 Source                      DF        Type I SS    Mean Square   F Value   Pr > F

 a                            2       5.99949725     2.99974863    259.68   <.0001
 x(a)                         2       0.10708745     0.05354373      4.64   0.0909


 Source                      DF      Type III SS    Mean Square   F Value   Pr > F

 a                            2       5.99949725     2.99974863    259.68   <.0001
 x(a)                         2       0.10708745     0.05354373      4.64   0.0909


                                             Standard
      Parameter           Estimate              Error    t Value    Pr > |t|

      a          0     0.9362500000       0.05373913      17.42      <.0001
      a          1     0.7895000000       0.05373913      14.69      0.0001
      x(a)       0     0.0396500000       0.02403287       1.65      0.1743
      x(a)       1     0.0615000000       0.02403287       2.56      0.0627

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       Section 3.2.2. Note: special notation used in the GLM analysis.       10
                             Reduced model. "H2".

                              The GLM Procedure

                           Class Level Information

                        Class         Levels    Values

                        a                  2    0 1


                    Number of Observations Read           8
                    Number of Observations Used           8
```



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       Section 3.2.2. Note: special notation used in the GLM analysis.       11
                             Reduced model. "H2".

                              The GLM Procedure

                               The X'X Matrix

                         a 0             a 1              x               y

 a 0                       4               0              0           3.745
 a 1                       0               4              0           3.158
 x                         0               0             40           2.023
 y                     3.745           3.158          2.023        6.152791

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       Section 3.2.2. Note: special notation used in the GLM analysis.       12
                             Reduced model. "H2".

                              The GLM Procedure

                             X'X Inverse Matrix

                         a 0             a 1              x               y

 a 0                    0.25               0              0         0.93625
 a 1                       0            0.25              0          0.7895
 x                         0               0          0.025        0.050575
 y                   0.93625          0.7895       0.050575     0.050980525
```

Section 3.2.2. Note: special notation used in the GLM analysis. 13
Reduced model. "H2".

The GLM Procedure

Dependent Variable: y

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	6.10181048	2.03393683	199.48	<.0001
Error	5	0.05098052	0.01019610		
Uncorrected Total	8	6.15279100			

R-Square	Coeff Var	Root MSE	y Mean
0.740379	11.70225	0.100976	0.862875

Source	DF	Type I SS	Mean Square	F Value	Pr > F
a	2	5.99949725	2.99974863	294.21	<.0001
x	1	0.10231323	0.10231323	10.03	0.0249

Source	DF	Type III SS	Mean Square	F Value	Pr > F
a	2	5.99949725	2.99974863	294.21	<.0001
x	1	0.10231323	0.10231323	10.03	0.0249

Parameter		Estimate	Standard Error	t Value	Pr > |t|
a	0	0.9362500000	0.05048788	18.54	<.0001
a	1	0.7895000000	0.05048788	15.64	<.0001
x		0.0505750000	0.01596567	3.17	0.0249

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Section 3.2.2. Note: special notation used in the GLM analysis. 14
Reduced model. "H3".

The GLM Procedure

Number of Observations Read	8
Number of Observations Used	8

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Section 3.2.2. Note: special notation used in the GLM analysis. 15
Reduced model. "H3".

The GLM Procedure

The X'X Matrix

	Intercept	x	y
Intercept	8	0	6.903
x	0	40	2.023

	Intercept	x	y
y	6.903	2.023	6.152791

```
       Section 3.2.2. Note: special notation used in the GLM analysis.       16
                            Reduced model. "H3".

                             The GLM Procedure

                            X'X Inverse Matrix

                          Intercept                 x                 y

     Intercept                0.125                 0          0.862875
     x                            0             0.025          0.050575
     y                     0.862875          0.050575        0.09405165

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       Section 3.2.2. Note: special notation used in the GLM analysis.       17
                            Reduced model. "H3".

                             The GLM Procedure

Dependent Variable: y

                                            Sum of
 Source                      DF            Squares     Mean Square    F Value    Pr > F

 Model                        1         0.10231323      0.10231323       6.53    0.0432

 Error                        6         0.09405165      0.01567527

 Corrected Total              7         0.19636487


               R-Square     Coeff Var      Root MSE        y Mean

               0.521036      14.50974      0.125201      0.862875


 Source                      DF          Type I SS     Mean Square    F Value    Pr > F

 x                            1         0.10231323      0.10231323       6.53    0.0432


 Source                      DF        Type III SS     Mean Square    F Value    Pr > F

 x                            1         0.10231323      0.10231323       6.53    0.0432


                                            Standard
       Parameter         Estimate              Error    t Value    Pr > |t|

       Intercept     0.8628750000         0.04426522      19.49      <.0001
       x             0.0505750000         0.01979601       2.55      0.0432

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       Section 3.2.2. Note: special notation used in the GLM analysis.       18
                            Reduced model. "H4".

                             The GLM Procedure

                    Number of Observations Read           8
                    Number of Observations Used           8
```



```
       Section 3.2.2. Note: special notation used in the GLM analysis.       19
                            Reduced model. "H4".

                             The GLM Procedure

                              The X'X Matrix

                                  Intercept                 y

              Intercept                   8             6.903
              y                       6.903          6.152791

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       Section 3.2.2. Note: special notation used in the GLM analysis.       20
                            Reduced model. "H4".

                             The GLM Procedure

                            X'X Inverse Matrix

                                  Intercept                 y

              Intercept               0.125          0.862875
              y                    0.862875       0.196364875

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       Section 3.2.2. Note: special notation used in the GLM analysis.       21
                            Reduced model. "H4".

                             The GLM Procedure

Dependent Variable: y

                                            Sum of
 Source                      DF            Squares     Mean Square    F Value    Pr > F

 Model                        1         5.95642613      5.95642613     212.33    <.0001

 Error                        7         0.19636487      0.02805212

 Uncorrected Total            8         6.15279100


               R-Square     Coeff Var      Root MSE        y Mean

               0.000000      19.41042      0.167488      0.862875


 Source                      DF          Type I SS     Mean Square    F Value    Pr > F

 Intercept                    1         5.95642613      5.95642613     212.33    <.0001


 Source                      DF        Type III SS     Mean Square    F Value    Pr > F

 Intercept                    1         5.95642613      5.95642613     212.33    <.0001


                                            Standard
       Parameter         Estimate              Error    t Value    Pr > |t|

       Intercept     0.8628750000         0.05921584      14.57      <.0001
```