

Another small example with just observed variables

```
/* path1.sas */
options linesize=79 noovp formdlim='_';
title 'STA2201s06 Path 1 Example';

data path1;
  infile 'path1.dat';
  input X1 X2 Y1 Y2;

proc calis cov vardef=n;
  /* Analyze the covariance matrix (Default is corr) */
  title2 'Full (unrestricted) Model';
  var X1 X2 Y1 Y2; /* Manifest vars are in the data set */
  lineqs          /* Simultaneous equations, separated by commas */
    Y1 = gamma11 X1 + e1,
    Y2 = beta21 Y1 + gamma22 X2 + e2;
  std            /* Variances (not standard deviations) */
    X1 = phi11, /* Optional starting values in parentheses */
    X2 = phi22,
    e1 = psi11,
    e2 = psi22;
  cov           /* Covariances */
    X1 X2 = phi12; /* Unmentioned pairs get covariance zero */
  bounds 0.0 < phi11,
         0.0 < phi22,
         0.0 < psi11,
         0.0 < psi22;

proc calis cov vardef=n; /* Analyze the covariance matrix (Default is corr) */
  title2 'Reduced (restricted) Model: gamma22=0';
  var X1 X2 Y1 Y2; /* Manifest vars are in the data set */
  lineqs          /* Simultaneous equations, separated by commas */
    Y1 = gamma11 X1 + e1,
    Y2 = beta21 Y1 + e2;
  std            /* Variances (not standard deviations) */
    X1 = phi11, /* Optional starting values in parentheses */
    X2 = phi22,
    e1 = psi11,
    e2 = psi22;
  cov           /* Covariances */
    X1 X2 = phi12; /* Unmentioned pairs get covariance zero */
  bounds 0.0 < phi11,
         0.0 < phi22,
         0.0 < psi11,
         0.0 < psi22;
```

```

proc iml;
  title2 'Compute G two ways';
  print " ";
  print "Based on Objective Function";
  G1 = 300*(3.3328270857-0.0227001914); pval1 = 1-probchi(G1,1);
  print "G = " G1 " , df = 1, p = " pval1;
  print " ";
  print "Based on chi-square";
  G2 = 300/299 * (996.5153-6.7874); pval2 = 1-probchi(G2,1);
  print "G = " G2 " , df = 1, p = " pval2;

```

Optimization Results

Iterations	4	Function Calls	6
Jacobian Calls	5	Active Constraints	0
Objective Function	0.0227001914	Max Abs Gradient Element	1.7411686E-6
Lambda	0	Actual Over Pred Change	0.9776138813
Radius	0.000047076		

ABSGCONV convergence criterion satisfied.

STA2201s06 Path 1 Example
Full (unrestricted) Model

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The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function	0.0227
Goodness of Fit Index (GFI)	0.9889
GFI Adjusted for Degrees of Freedom (AGFI)	0.9446
Root Mean Square Residual (RMR)	1.7922
Parsimonious GFI (Mulaik, 1989)	0.3296
Chi-Square	6.7874
Chi-Square DF	2
Pr > Chi-Square	0.0336

Etc.

Compute G two ways

Based on Objective Function

G1	PVAL1
G = 993.03807 , df = 1, p =	0

Based on chi-square

G2	PVAL2
G = 993.03803 , df = 1, p =	0