Test whether a covariance matrix is diagonal

Using R, I got G = 13.66300, df=6, p=0.0336

```
/* testdiag.sas */
options linesize=79 noovp formdlim='_';
title 'Test whether a covariance matrix is diagonal';
title2 'STA2201s06 Assignment 3, except with SAS rather than R';
data path;
     infile 'fourvars.dat.txt';
     input X1-X4;

proc calis  cov vardef=n;
   /*   Analyze the covariance matrix (Default is corr) and divide by n
        rather than (n-1) in covariance matrix, to get pure MLEs  */
     title3 'Fit Reduced (restricted) Model: Full model is saturated';
     var X1-X4;    /* Declare which variables are observed */
                   /* no lineqs!  */
     std  X1-X4 = V1-V4;
     cov  X1-X4 = 6 * 0;     /* Must declare zero (surprise) */
     bounds 0.0 < V1-V4;
```

```
                 Test whether a covariance matrix is diagonal               1
            STA2201s06 Assignment 3, except with SAS rather than R
            Fit Reduced (restricted) Model: Full model is saturated
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                              The CALIS Procedure
           Covariance Structure Analysis: Pattern and Initial Values

                            LINEQS Model Statement


                       Matrix      Rows    Columns    ------Matrix Type-------

Term 1             1    _SEL_          4          4    SELECTION
                   2    _BETA_         4          4    EQSBETA        IMINUSINV
                   3    _GAMMA_        4          4    EQSGAMMA
                   4    _PHI_          4          4    SYMMETRIC


                          The 0 Endogenous Variables

    Manifest
    Latent


                          The 4 Exogenous Variables

    Manifest        X1  X2  X3  X4
    Latent
    Error
```

Variances of Exogenous Variables

Variable	Parameter	Estimate
X1	V1	.
X2	V2	.
X3	V3	.
X4	V4	.

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Fit Reduced (restricted) Model: Full model is saturated
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The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Observations	100	Model Terms	1
Variables	4	Model Matrices	4
Informations	10	Parameters	4

Variable	Mean	Std Dev
X1	5.00900	1.04770
X2	5.16290	0.97713
X3	4.94990	0.96670
X4	4.98600	0.93876

Set Covariances of Exogenous Manifest Variables

X1 X2 X3 X4

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STA2201s06 Assignment 3, except with SAS rather than R
Fit Reduced (restricted) Model: Full model is saturated
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The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Vector of Initial Estimates

	Parameter	Estimate	Type
1	V1	1.09768	Matrix Entry: _PHI_[1:1]
2	V2	0.95478	Matrix Entry: _PHI_[2:2]
3	V3	0.93450	Matrix Entry: _PHI_[3:3]
4	V4	0.88127	Matrix Entry: _PHI_[4:4]

```
                          The CALIS Procedure
    Covariance Structure Analysis: Maximum Likelihood Estimation

                   Levenberg-Marquardt Optimization

                     Scaling Update of More (1978)

                   Parameter Estimates                  4
                   Functions (Observations)            10
                   Lower Bounds                         4
                   Upper Bounds                         0

                          Optimization Start

Active Constraints                    0  Objective Function        0.1366300439
Max Abs Gradient Element   2.376072E-16  Radius                               1



                         Optimization Results

Iterations                            0  Function Calls                       2
Jacobian Calls                        1  Active Constraints                   0
Objective Function         0.1366300439  Max Abs Gradient Element  2.376072E-16
Lambda                                0  Actual Over Pred Change              0
Radius                                1

ABSGCONV convergence criterion satisfied.
```

```
                     The CALIS Procedure
Covariance Structure Analysis: Maximum Likelihood Estimation

Fit Function                                            0.1366
Goodness of Fit Index (GFI)                             0.9384
GFI Adjusted for Degrees of Freedom (AGFI)                   .
Root Mean Square Residual (RMR)                         0.1090
Parsimonious GFI (Mulaik, 1989)                         0.0000
Chi-Square                                             13.5264
Chi-Square DF                                                0
Pr > Chi-Square                                         <.0001
Independence Model Chi-Square                           13.526
Independence Model Chi-Square DF                             6
RMSEA Estimate                                          0.0000
RMSEA 90% Lower Confidence Limit                             .
RMSEA 90% Upper Confidence Limit                             .
ECVI Estimate                                           0.2128
ECVI 90% Lower Confidence Limit                              .
ECVI 90% Upper Confidence Limit                              .
Probability of Close Fit                                     .
Bentler's Comparative Fit Index                        -0.7972
Normal Theory Reweighted LS Chi-Square                 12.9963
Akaike's Information Criterion                         13.5264
Bozdogan's (1987) CAIC                                 13.5264
Schwarz's Bayesian Criterion                           13.5264
McDonald's (1989) Centrality                            0.9346
Bentler & Bonett's (1980) Non-normed Index                   .
Bentler & Bonett's (1980) NFI                           0.0000
James, Mulaik, & Brett (1982) Parsimonious NFI          0.0000
Z-Test of Wilson & Hilferty (1931)                           .
Bollen (1986) Normed Index Rho1                              .
Bollen (1988) Non-normed Index Delta2                   0.0000
Hoelter's (1983) Critical N                                  .


              Variances of Exogenous Variables

                                             Standard
  Variable Parameter      Estimate              Error    t Value

  X1       V1              1.09768            0.15602       7.04
  X2       V2              0.95478            0.13571       7.04
  X3       V3              0.93450            0.13282       7.04
  X4       V4              0.88127            0.12526       7.04
```

```
> 100/99 * 13.5264
[1] 13.66303
> 100 * 0.1366300439
[1] 13.66300
```

Using R, I got G = 13.66300, df=6, p=0.0336