Estimating asymptotic variances and covariances, MA = CM

This is the first of three examples illustrating how to obtain estimates of asymptotic variances and covariances of the estimated variances, covariances, or correlations between the variables. They are based on generated data consisting of 200 cases on five variables, where the first two variables are continuous and the last three are ordinal. Variables 3, 4, and 5 have 2, 3, and 4 categories, respectively. The data were generated from a population in which all variances were 1.0 and all intercorrelations were 0.5. The files **ACOV.CM6**, **ACOV.KM6**, and **ACOV.PM6** used in the examples are files where the asymptotic covariance matrices are stored (see the **PRELIS Examples** folder). These can be read directly by LISREL and used with the WLS option.

In this example, we estimate:

1. Variances and covariances of the variables using normal score for the ordinal variables,
2. The asymptotic covariance matrix of these variances and covariances, and
3. The relative multivariate kurtosis.

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EXAMPLE 6A: TESTING ASYMPTOTIC VARIANCES AND COVARIANCES MA=CM
DA NI=5;RA FI=DATA.EX6;CO 1 2;OU MA=CM SA=ACOV.CM6 PA
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Output for this example follows:

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Univariate Summary Statistics for Continuous Variables

 Variable      Mean   St. Dev.   Skewness   Kurtosis   Minimum Freq.   Maximum Freq.
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    VAR 1     0.084      1.042      0.035      0.052    -2.920     1     3.040     1
    VAR 2     0.010      1.015      0.166      0.873    -2.850     1     4.060     1
```

Test of Univariate Normality for Continuous Variables

	Skewness		Kurtosis		Skewness and Kurtosis	
Variable	Z-Score	P-Value	Z-Score	P-Value	Chi-Square	P-Value
VAR 1	0.208	0.835	0.302	0.763	0.134	0.935
VAR 2	0.978	0.328	2.075	0.038	5.263	0.072

Relative Multivariate Kurtosis = 1.110

Test of Multivariate Normality for Continuous Variables

Skewness			Kurtosis			Skewness and Kurtosis	
Value	Z-Score	P-Value	Value	Z-Score	P-Value	Chi-Square	P-Value
0.058	-0.674	0.500	8.879	1.567	0.117	2.909	0.234

Covariance Matrix

	VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
VAR 1	1.086				
VAR 2	0.498	1.030			
VAR 3	0.521	0.499	1.000		
VAR 4	0.505	0.404	0.548	1.016	
VAR 5	0.847	0.809	0.860	0.869	2.624

Total Variance = 6.756 Generalized Variance = 0.559

Largest Eigenvalue = 4.267 Smallest Eigenvalue = 0.436

Condition Number = 3.129

These correlations essentially agree with those reported by Christoffersson (1975). The largest difference is two units in the third decimal.

Means

VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
0.084	0.010	0.151	0.745	1.306

Standard Deviations

VAR 1	VAR 2	VAR 3	VAR 4	VAR 5
1.042	1.015	1.000	1.008	1.620

Asymptotic Covariance Matrix of Variances and Covariances

	S(1,1)	S(2,1)	S(2,2)	S(3,1)	S(3,2)	S(3,3)
S(1,1)	0.01179					
S(2,1)	0.00368	0.00642				
S(2,2)	0.00211	0.00704	0.01482			
S(3,1)	0.00474	0.00279	0.00173	0.00492		
S(3,2)	0.00140	0.00316	0.00532	0.00212	0.00483	
S(3,3)	0.00089	0.00094	0.00096	0.00156	0.00151	0.00190
S(4,1)	0.00587	0.00287	0.00192	0.00363	0.00155	0.00182
S(4,2)	0.00194	0.00350	0.00481	0.00175	0.00337	0.00167
S(4,3)	0.00199	0.00144	0.00157	0.00290	0.00232	0.00355
S(4,4)	0.00603	0.00228	0.00384	0.00392	0.00280	0.00554
S(5,1)	0.00885	0.00460	0.00367	0.00556	0.00226	0.00290
S(5,2)	0.00234	0.00600	0.00878	0.00226	0.00513	0.00217
S(5,3)	0.00312	0.00223	0.00274	0.00487	0.00405	0.00605
S(5,4)	0.01042	0.00457	0.00762	0.00661	0.00470	0.00911
S(5,5)	0.01341	0.00593	0.01043	0.00930	0.00598	0.01527

Asymptotic Covariance Matrix of Variances and Covariances

	S(4,1)	S(4,2)	S(4,3)	S(4,4)	S(5,1)	S(5,2)
S(4,1)	0.01023					
S(4,2)	0.00377	0.00821				
S(4,3)	0.00517	0.00421	0.00908			
S(4,4)	0.00867	0.00670	0.01033	0.02640		
S(5,1)	0.01297	0.00502	0.00656	0.01180	0.02397	
S(5,2)	0.00469	0.01043	0.00465	0.00776	0.00901	0.02057
S(5,3)	0.00670	0.00512	0.01108	0.01272	0.01246	0.00902
S(5,4)	0.01389	0.01008	0.01469	0.03175	0.02208	0.01570
S(5,5)	0.01916	0.01393	0.02033	0.04391	0.03537	0.02878

Asymptotic Covariance Matrix of Variances and Covariances

	S(5,3)	S(5,4)	S(5,5)
S(5,3)	0.02460		
S(5,4)	0.02375	0.05337	
S(5,5)	0.04382	0.08460	0.19457

The covariance matrix has 15 independent elements, so the asymptotic covariance matrix of these 15 elements is a symmetric matrix of order 15 x 15. The lower half of this matrix, including the diagonal, contains 15 x 16/2 elements and is printed in sections.

The matrix stored in the file named **ACOV.CM6** is equal *N* times the asymptotic covariance printed in the output file (*N* is the sample size; in this case, *N* – 200). It is written in lines of 6 numbers, each in the format 6D13.6.

To obtain WLS estimates with LISREL, one needs only include the command AC FI = ACOV.CM6 in the command file.