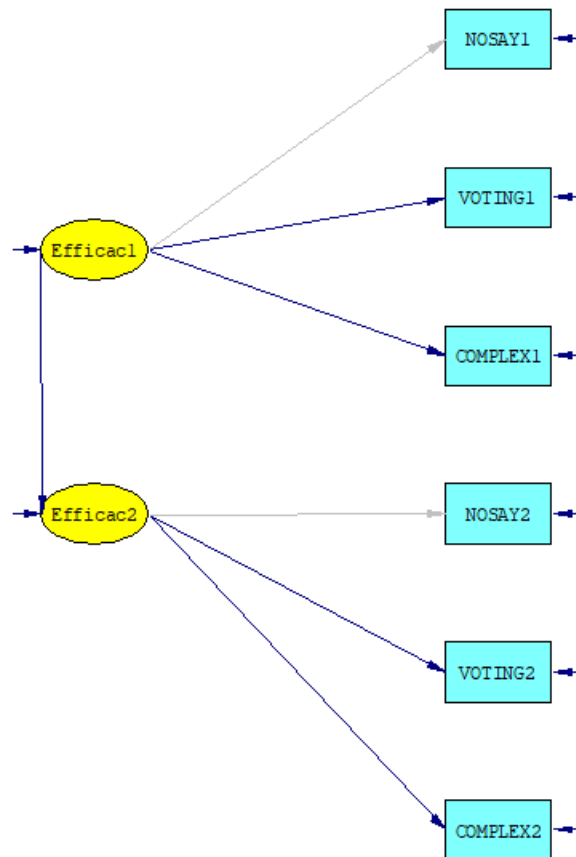


Analysis of ordinal variables: example 2

A study (Aish & Jöreskog (1990)) on political attitudes included three ordinal variables measured on the same people at two occasions. The variables were considered to be indicators of Political Efficacy (see path diagram below).



The attitude questions corresponding to these variables are:

- People like me have no say in what the government does (NOSAY)
- Voting is the only way that people like me can have any say about how the government runs things (VOTING)

- Sometimes politics and government seem so complicated that a person like me cannot really understand what is going on (COMPLEX).

Response to these questions were scored:

1 = agree strongly	4 = disagree strongly
2 = agree	5 = don't know
3 = disagree	9 = no answer

As in the first analysis of ordinal variables, PRELIS was used to compute the matrix of polychoric correlations and the corresponding asymptotic covariance matrix. Score 8 (don't know) and score 9 (no answer) were treated as missing values. Under listwise deletion (necessary to obtain the asymptotic covariance matrix) 410 cases remained in the sample. The correlation matrix for the variables of interest is given in the table below.

	y_1	y_2	y_3	y_4	y_5	y_6
NOSAY1	1					
VOTING1	0.542	1				
COMPLEX1	0.392	0.362	1			
NOSAY2	0.477	0.309	0.210	1		
VOTING2	0.341	0.511	0.308	0.482	1	
COMPLEX2	0.224	0.227	0.525	0.345	0.312	1

The two files produced by PRELIS (**EX72A.PRL**) will now be used as external files for LISREL to analyze a two-wave panel model for political efficacy. The first command file (**EX72A.LIS**) is:

```
LISREL : RUN 1
TWO-WAVE PANEL MODEL FOR POLITICAL EFFICACY
USING DATA: PANEL USA (6 VARIABLES X 2 OCCASIONS)
USING WLS WITH POLYCHORIC CORRELATIONS
AND ASYMPTOTIC COVARIANCE MATRIX OBTAINED IN PRELIS RUN 2
DA NI=12 NO=410 MA=PM
LA=PANEL.LAB
PM=PANELUSA.PME
AC=PANELUSA.ACE
SE
1 2 3 7 8 9 /
MO NY=6 NE=2 BE=SD TE=SY
LE
Efficac1 Efficac2
FR LY 2 1 LY 3 1 LY 5 2 LY 6 2
```

VA 1 LY 1 1 LY 4 2
 OU SE TV MI SS RS ME=WLS

This command file is similar to that for the first analysis of ordinal variables example, but differs from it in the following ways:

- We select 6 variables out of 12 to be analyzed. The selection takes place in the ACP matrix as well as in the PML matrix.
- The model is a LISREL Submodel 3B (the previous example used a Submodel 1).
- We specify TE = SY rather than TE = DI to obtain modification indices for off-diagonal elements of Θ_{ε} .

This first model assumes that the ε 's are uncorrelated. For this model, the χ^2 goodness-of-fit measure is:

Goodness-of-Fit Statistics

Degrees of Freedom for C(1),C(6) 8
 Weighted Least Squares Chi-Square (C1) 60.876 (P = 0.0000)

indicating a rather poor fit. The standardized residuals are:

Standardized Residuals

	NOSAY1	VOTING1	COMPLEX1	NOSAY2	VOTING2	COMPLEX2
NOSAY1	- -					
VOTING1	-2.043	- -				
COMPLEX1	-4.603	-4.996	- -			
NOSAY2	0.893	-2.492	-4.084	- -		
VOTING2	-2.476	2.881	-1.802	-0.588	- -	
COMPLEX2	-4.525	-4.217	5.288	-3.384	-4.602	

Note that the standardized residuals for cells (4,1), (5,2), and (6,3) are all positive and significant. This indicates that the error terms might be correlated over time for the same variable. This can also be seen in the modification indices for elements of Θ_{ε} and their estimated changes. Note that the estimated change is positive for these three elements.

Modification Indices for THETA-EPS

	NOSAY1	VOTING1	COMPLEX1	NOSAY2	VOTING2	COMPLEX2
NOSAY1	- -					
VOTING1	6.277	- -				
COMPLEX1	0.568	7.730	- -			
NOSAY2	6.524	2.133	9.609	- -		
VOTING2	10.950	18.041	3.340	1.353	- -	
COMPLEX2	2.512	1.475	39.684	3.866	7.557	- -

Expected Change for THETA-EPS

	NOSAY1	VOTING1	COMPLEX1	NOSAY2	VOTING2	COMPLEX2
	-----	-----	-----	-----	-----	-----
NOSAY1	- -					
VOTING1	0.188	- -				
COMPLEX1	0.042	-0.146	- -			
NOSAY2	0.174	-0.071	-0.141	- -		
VOTING2	-0.158	0.236	0.094	0.087	- -	
COMPLEX2	-0.077	-0.054	0.449	0.134	-0.165	- -

Maximum Modification Index is 39.68 for Element (6, 3) of THETA-EPS

To run the model with autocorrelated error terms, insert the following command

```
FR TH 1 1 TH 2 2 TH 3 3
```

between the MO and OU commands in the command file (see **EX72B.LIS**):

```
!LISREL : RUN 2
!TWO-WAVE PANEL MODEL FOR POLITICAL EFFICACY
!USING DATA: PANEL USA (6 VARIABLES X 2 OCCASIONS)
!USING WLS WITH POLYCHORIC CORRELATIONS
!AND ASYMPTOTIC COVARIANCE MATRIX OBTAINED IN PRELIS RUN 2
DA NI=12 NO=410 MA=PM
LA FI=PANEL.LAB
PM FI=PANELUSA.PME
AC FI=PANELUSA.ACE
SE
7 8 9 1 2 3 /
MO NY=3 NX=3 NE=1 NK=1
LE
Efficac2
LK
Efficac1
FR LY 2 LY 3 LX 2 LX 3
VA 1 LY 1 LX 1
FR TH 1 1 TH 2 2 TH 3 3
PD
OU RS SS ME=WLS
```

The resulting solution is entirely satisfactory.

GAMMA

```

Efficac1
-----
Efficac2    0.652
```

Squared Multiple Correlations for Structural Equations

Efficac2

0.425

Goodness-of-Fit Statistics

Degrees of Freedom for C(1),C(6)	5
Weighted Least Squares Chi-Square (C1)	4.322 (P = 0.5041)

It has a goodness-of-fit measure of 4.322 with 5 degrees of freedom and no significant standardized residuals or modification indices. The standardized regression coefficient is estimated as 0.65. The squared multiple correlation for Efficac2 on Efficac1 is 0.43.