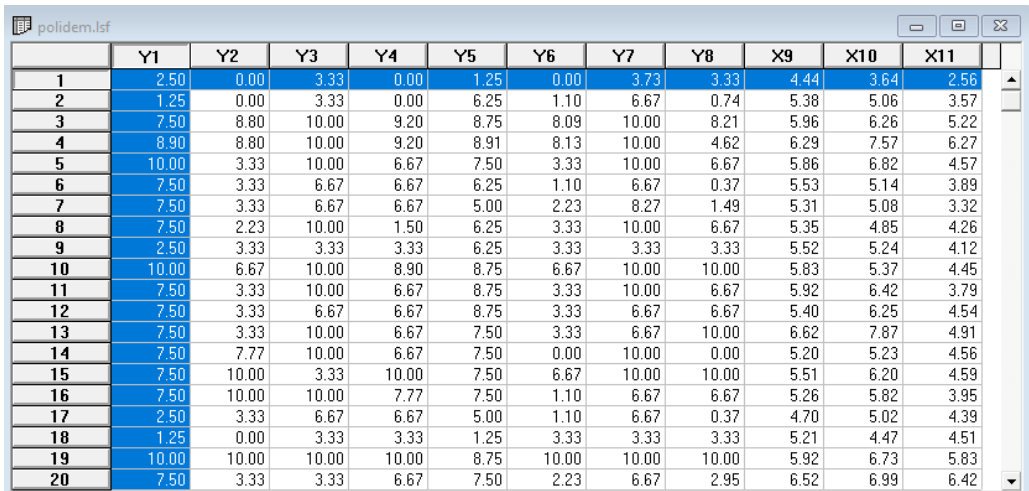


Latent variable scores example: panel model for Political Democracy

1. Introduction

In this example, we use multi-country data for a panel model of political democracy and industrialization. The data was first analyzed by Bollen (1989a, p.17) and is from 75 developing countries. The same model was later used by Bollen and Arminger (1991) in their discussion of observation residuals. These data can be found in the file **polidem.lsf** in the **SIMPLIS Examples\Observational Residuals examples** folder. The first 20 lines from this file are shown below.



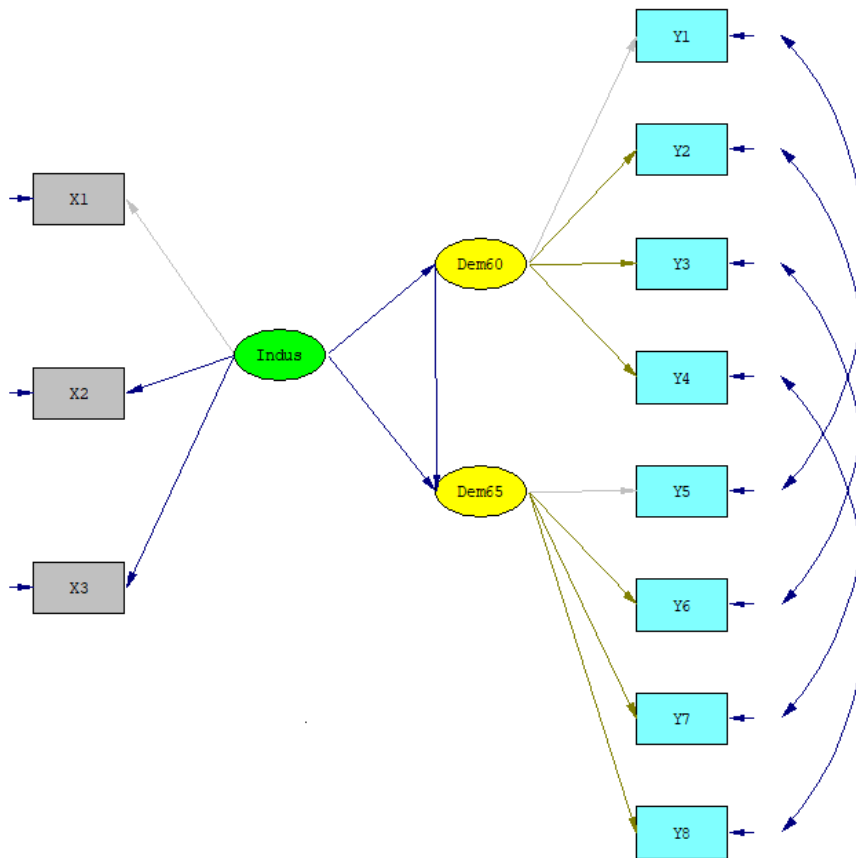
	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	X9	X10	X11
1	2.50	0.00	3.33	0.00	1.25	0.00	3.73	3.33	4.44	3.64	2.56
2	1.25	0.00	3.33	0.00	6.25	1.10	6.67	0.74	5.38	5.06	3.57
3	7.50	8.80	10.00	9.20	8.75	8.09	10.00	8.21	5.96	6.26	5.22
4	8.90	8.80	10.00	9.20	8.91	8.13	10.00	4.62	6.29	7.57	6.27
5	10.00	3.33	10.00	6.67	7.50	3.33	10.00	6.67	5.86	6.82	4.57
6	7.50	3.33	6.67	6.67	6.25	1.10	6.67	0.37	5.53	5.14	3.89
7	7.50	3.33	6.67	6.67	5.00	2.23	8.27	1.49	5.31	5.08	3.32
8	7.50	2.23	10.00	1.50	6.25	3.33	10.00	6.67	5.35	4.85	4.26
9	2.50	3.33	3.33	3.33	6.25	3.33	3.33	3.33	5.52	5.24	4.12
10	10.00	6.67	10.00	8.90	8.75	6.67	10.00	10.00	5.83	5.37	4.45
11	7.50	3.33	10.00	6.67	8.75	3.33	10.00	6.67	5.92	6.42	3.79
12	7.50	3.33	6.67	6.67	8.75	3.33	6.67	6.67	5.40	6.25	4.54
13	7.50	3.33	10.00	6.67	7.50	3.33	6.67	10.00	6.62	7.87	4.91
14	7.50	7.77	10.00	6.67	7.50	0.00	10.00	0.00	5.20	5.23	4.56
15	7.50	10.00	3.33	10.00	7.50	6.67	10.00	10.00	5.51	6.20	4.59
16	7.50	10.00	10.00	7.77	7.50	1.10	6.67	6.67	5.26	5.82	3.95
17	2.50	3.33	6.67	6.67	5.00	1.10	6.67	0.37	4.70	5.02	4.39
18	1.25	0.00	3.33	3.33	1.25	3.33	3.33	3.33	5.21	4.47	4.51
19	10.00	10.00	10.00	10.00	8.75	10.00	10.00	10.00	5.92	6.73	5.83
20	7.50	3.33	3.33	6.67	7.50	2.23	6.67	2.95	6.52	6.99	6.42

The variables are:

- y_1 Freedom of the press, 1960
- y_2 Freedom of political opposition, 1960
- y_3 Fairness of elections, 1960
- y_4 Effectiveness of legislature, 1960
- y_5 Freedom of the press, 1965
- y_6 Freedom of political opposition, 1965
- y_7 Fairness of elections, 1965
- y_8 Effectiveness of legislature, 1965

- x_1 GNP per capita, 1960
- x_2 Energy consumption per capita, 1960
- x_3 Percentage of labor force, 1960
- η_1 Democracy in 1960 (Latent variable DEMO60)
- η_2 Democracy in 1965 (Latent variable DEMO65)
- ξ Level of industrialization in 1960 (Latent variable INDUS)

The path diagram for the model is shown below.



In this model, we are using the 4 variables providing data for 1960 as predictors for the latent variable DEMO60. Similarly, the 4 variables with data for 1965 are used as predictors of the latent variable DEMO65, while the 3 economy related variables x_1 , x_2 and x_3 are taken as indicators of the latent variable INDUS, representing the level of industrialization in 1960.

To estimate scores on DEMO60, DEMO65 and INDUS for each of the countries we use the following syntax (**ba1a.spl**).

```

Industrialization-Democracy Example
Raw Data from file POLIDEM.LSF
Latent Variables: Dem60 Dem65 Indus
Relationships:
Y1= 1*Dem60
Y2-Y4 = Dem60
Y5 = 1*Dem65
Y6-Y8 = Dem65
X1 = 1*Indus
X2-X3 = Indus
Dem60 = Indus
Dem65 = Dem60 Indus
Set Dem60 -> Y2 = Dem65 -> Y6
Set Dem60 -> Y3 = Dem65 -> Y7
Set Dem60 -> Y4 = Dem65 -> Y8
Let the errors of Y5 and Y1 be correlated
let the errors of Y6 and Y2 be correlated
Let the errors of Y7 and Y3 be correlated
Let the errors of Y8 and Y4 be correlated
!Let the errors of Y4 and Y2 be correlated
!Let the errors of Y8 and Y6 be correlated
LSFfile POLIDEM.LSF
Path Diagram
End of Problem

```

As the variables y_1 to y_4 represent the same variables as y_5 to y_8 , just at a different point in time, Bollen and Arminger assumed that their loadings on η_1 and η_2 are the same. This is reflected in the syntax file by the lines

```

Set Dem60 -> Y2 = Dem65 -> Y6
Set Dem60 -> Y3 = Dem65 -> Y7
Set Dem60 -> Y4 = Dem65 -> Y8

```

Also note that the loadings of the variables y_1 and y_5 are set to 1. Another assumption made by the authors was that the measurement errors of the corresponding y -variables are correlated. This assumption is set in the syntax by the lines

```

Let the errors of Y5 and Y1 be correlated
let the errors of Y6 and Y2 be correlated
Let the errors of Y7 and Y3 be correlated
Let the errors of Y8 and Y4 be correlated

```

The inclusion of the line

```
LSFfile POLIDEM.LSF
```

leads to the creation of a new *.lsf file named **Polidemnew.lsf**. Note that the file **ba1b.lis** is the LISREL syntax equivalent to the SIMPLIS syntax discussed here. The maximum likelihood results for this analysis are given below.

Measurement Equations

Y1 = 1.000*Dem60, Errorvar.= 2.157 , R ² = 0.680	
Standerr	(0.454)
Z-values	4.747
P-values	0.000

Y2 = 1.318*Dem60, Errorvar.= 6.799 , R² = 0.539
Standerr (0.149) (1.265)
Z-values 8.869 5.374
P-values 0.000 0.000

Y3 = 1.203*Dem60, Errorvar.= 5.452 , R² = 0.549
Standerr (0.133) (1.021)
Z-values 9.034 5.340
P-values 0.000 0.000

Y4 = 1.363*Dem60, Errorvar.= 2.601 , R² = 0.766
Standerr (0.128) (0.669)
Z-values 10.686 3.890
P-values 0.000 0.000

Y5 = 1.000*Dem65, Errorvar.= 2.664 , R² = 0.620
Standerr (0.515)
Z-values 5.172
P-values 0.000

Y6 = 1.318*Dem65, Errorvar.= 4.301 , R² = 0.637
Standerr (0.149) (0.841)
Z-values 8.869 5.117
P-values 0.000 0.000

Y7 = 1.203*Dem65, Errorvar.= 3.729 , R² = 0.627
Standerr (0.133) (0.724)
Z-values 9.034 5.151
P-values 0.000 0.000

Y8 = 1.363*Dem65, Errorvar.= 2.576 , R² = 0.758
Standerr (0.128) (0.620)
Z-values 10.686 4.158
P-values 0.000 0.000

X1 = 1.000*Indus, Errorvar.= 0.0826 , R² = 0.846
Standerr (0.0199)
Z-values 4.147
P-values 0.000

X2 = 2.180*Indus, Errorvar.= 0.122 , R² = 0.947
Standerr (0.140) (0.0714)
Z-values 15.620 1.702
P-values 0.000 0.089

X3 = 1.819*Indus, Errorvar.= 0.473 , R² = 0.761
Standerr (0.153) (0.0920)
Z-values 11.888 5.138
P-values 0.000 0.000

Error Covariance for Y5 and Y1 = 0.862
(0.370)
2.327

Error Covariance for Y6 and Y2 = 1.978

(0.786)
2.516

Error Covariance for Y7 and Y3 = 1.171
(0.638)
1.836

Error Covariance for Y8 and Y4 = 0.179
(0.478)
0.374

Structural Equations

Dem60 = 1.427*Indus, Errorvar.= 3.659 , R² = 0.202
Standerr (0.378) (0.840)
Z-values 3.772 4.358
P-values 0.000 0.000

Dem65 = 0.845*Dem60 + 0.525*Indus, Errorvar.= 0.367 , R² = 0.915
Standerr (0.0708) (0.213) (0.197)
Z-values 11.929 2.462 1.863
P-values 0.000 0.014 0.062

NOTE: R² for Structural Equations are Hayduk's (2006) Blocked-Error R²

Reduced Form Equations

Dem60 = 1.427*Indus, Errorvar.= 3.659, R² = 0.202
Standerr (0.381)
Z-values 3.747
P-values 0.000

Dem65 = 1.731*Indus, Errorvar.= 2.980, R² = 0.314
Standerr (0.361)
Z-values 4.793
P-values 0.000

Variances of Independent Variables

Indus

0.455
(0.088)
5.172

Covariance Matrix of Latent Variables

	Dem60	Dem65	Indus
Dem60	4.584		
Dem65	4.214	4.342	
Indus	0.648	0.787	0.455

Log-likelihood Values

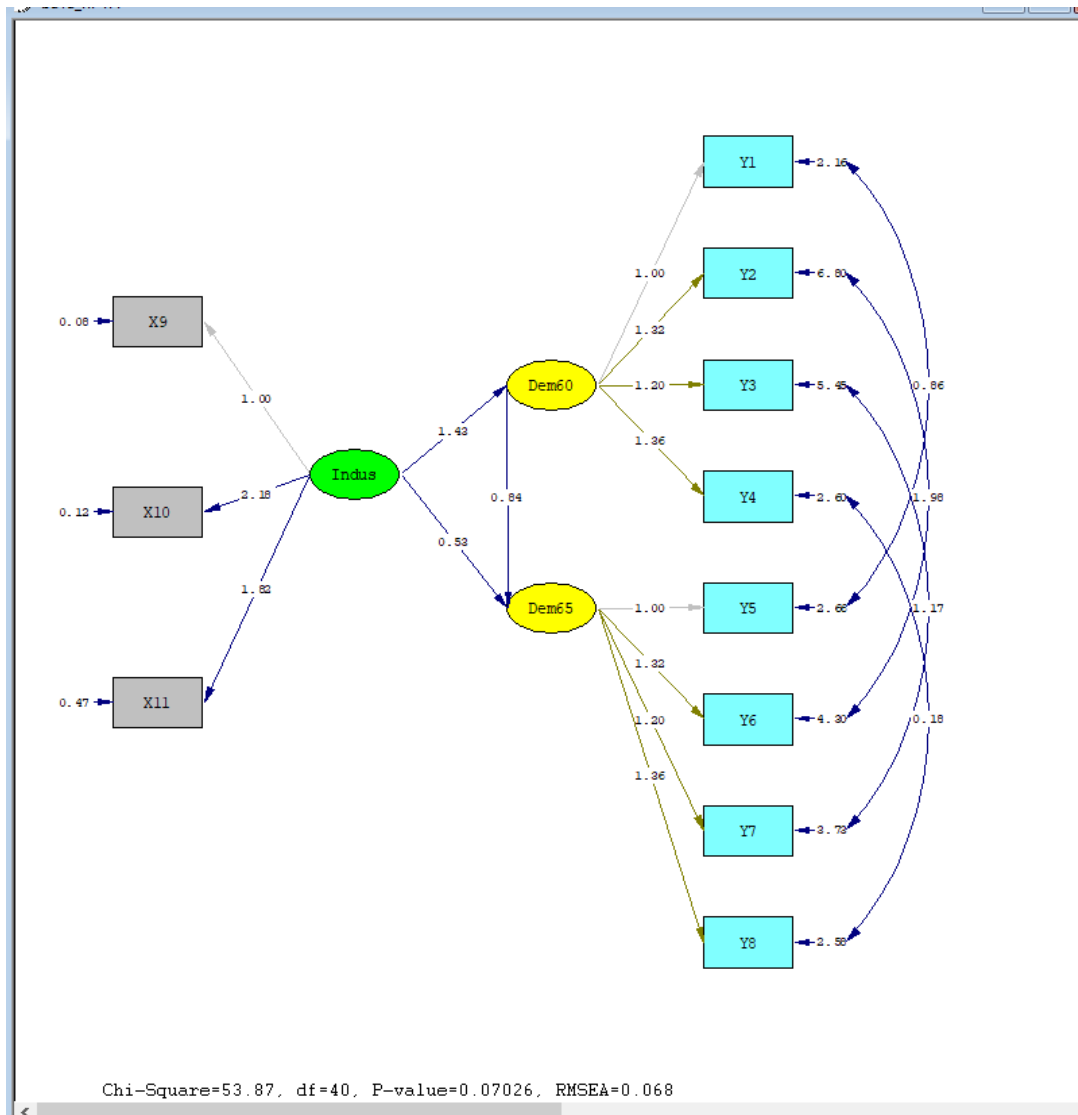
	Estimated Model	Saturated Model
	-----	-----
Number of free parameters(t)	26	66
-2ln(L)	1606.156	1552.282
AIC (Akaike, 1974)*	1658.156	1684.282
BIC (Schwarz, 1978)*	1718.411	1837.236

*LISREL uses $AIC = 2t - 2\ln(L)$ and $BIC = t\ln(N) - 2\ln(L)$

Goodness-of-Fit Statistics

Degrees of Freedom for (C1)-(C2)	40
Maximum Likelihood Ratio Chi-Square (C1)	53.874 (P = 0.0703)
Browne's (1984) ADF Chi-Square (C2_NT)	49.938 (P = 0.1349)
Estimated Non-centrality Parameter (NCP)	13.874
90 Percent Confidence Interval for NCP	(0.0 ; 37.146)
Minimum Fit Function Value	0.718
Population Discrepancy Function Value (F0)	0.185
90 Percent Confidence Interval for F0	(0.0 ; 0.495)
Root Mean Square Error of Approximation (RMSEA)	0.0680
90 Percent Confidence Interval for RMSEA	(0.0 ; 0.111)
P-Value for Test of Close Fit (RMSEA < 0.05)	0.256
Expected Cross-Validation Index (ECVI)	1.412
90 Percent Confidence Interval for ECVI	(1.227 ; 1.722)
ECVI for Saturated Model	1.760
ECVI for Independence Model	10.035
Chi-Square for Independence Model (55 df)	730.654
Normed Fit Index (NFI)	0.926
Non-Normed Fit Index (NNFI)	0.972
Parsimony Normed Fit Index (PNFI)	0.674
Comparative Fit Index (CFI)	0.979
Incremental Fit Index (IFI)	0.980
Relative Fit Index (RFI)	0.899
Critical N (CN)	88.485
Root Mean Square Residual (RMR)	0.526
Standardized RMR	0.0595
Goodness of Fit Index (GFI)	0.892
Adjusted Goodness of Fit Index (AGFI)	0.822
Parsimony Goodness of Fit Index (PGFI)	0.541
The Modification Indices Suggest to Add an Error Covariance Between and Decrease in Chi-Square New Estimate	
Y8 Y6 8.6 1.47	

These results correspond to the path diagram



2. Level of democracy in the countries

The file **polidemnew.lsf** created as a result of running the previous analysis contains a number of additional variables. The image below shows the first few lines of this file with most of the additional variables.

	Dem60	Dem65	Indus	R_Y1	R_Y2	R_Y3	R_Y4	R_Y5	R_Y6	R_Y7	R_Y8	R_X1	R_X2	R_X3	R_Dem60
1	-2.62	-2.06	-0.54	-0.35	-0.81	-0.08	-0.88	-1.83	-0.27	0.00	2.09	-0.07	0.03	-0.02	-1.85
2	-2.99	-1.30	0.15	-1.23	-0.32	0.36	-0.38	2.41	-0.17	2.03	-1.54	0.18	-0.06	-0.26	-3.20
3	2.92	3.22	0.75	-0.89	0.69	-0.08	0.76	0.39	0.87	-0.07	-0.22	0.16	-0.16	0.31	1.86
4	2.90	2.63	1.27	0.53	0.72	-0.06	0.79	1.15	1.69	0.65	-3.01	-0.03	0.02	0.41	1.10
5	2.14	1.98	0.84	2.39	-3.75	0.86	-0.70	0.38	-2.26	1.42	-0.08	-0.04	0.18	-0.52	0.94
6	0.56	-0.49	0.21	1.47	-1.66	-0.57	1.45	1.60	-1.23	1.06	-3.01	0.26	-0.12	-0.06	0.26
7	0.74	-0.10	0.12	1.30	-1.89	-0.78	1.21	-0.04	-0.61	2.20	-2.42	0.14	0.03	-0.45	0.57
8	0.26	1.13	0.13	1.78	-2.37	3.12	-3.31	-0.01	-1.13	2.45	1.09	0.16	-0.23	0.47	0.07
9	-1.46	-0.53	0.27	-1.50	1.00	-1.47	0.87	1.64	1.05	-2.23	0.01	0.20	-0.13	0.07	-1.84
10	3.35	3.42	0.40	1.19	-2.00	-0.59	-0.11	0.19	-0.82	-0.31	1.30	0.37	-0.30	0.15	2.77
11	1.61	2.05	0.69	0.43	-3.04	1.51	0.03	1.56	-2.35	1.34	-0.17	0.17	0.13	-1.02	0.62
12	1.17	1.55	0.58	0.86	-2.47	-1.30	0.62	2.07	-1.69	-1.39	0.51	-0.23	0.20	-0.07	0.35
13	1.77	2.26	1.34	0.26	-3.26	1.31	-0.20	0.10	-2.63	-2.25	2.87	0.23	0.16	-1.09	-0.14
14	1.33	-0.03	0.22	0.71	1.76	1.84	0.41	2.40	-2.93	3.84	-4.00	-0.07	-0.04	0.61	1.01
15	2.70	3.18	0.60	-0.66	2.19	-6.47	1.87	-0.82	-0.50	-0.02	1.62	-0.14	0.11	-0.06	1.84
16	2.28	1.22	0.38	-0.25	2.74	0.69	0.21	1.14	-3.49	-1.00	0.96	-0.17	0.21	-0.29	1.74
17	-0.53	-0.87	0.05	-2.43	-0.22	0.74	2.94	0.73	-0.73	1.52	-2.49	-0.40	0.13	0.75	-0.60
18	-2.03	-1.34	-0.01	-2.18	-1.58	-0.78	1.65	-2.55	2.12	-1.25	1.12	0.16	-0.31	0.97	-2.02
19	3.96	4.03	0.92	0.57	0.52	-1.33	0.15	-0.42	1.71	-1.05	0.46	-0.06	-0.07	0.60	2.65
20	0.48	0.49	1.14	1.56	-1.55	-3.81	1.56	1.88	-1.38	-0.11	-1.76	0.33	-0.29	0.79	-1.15

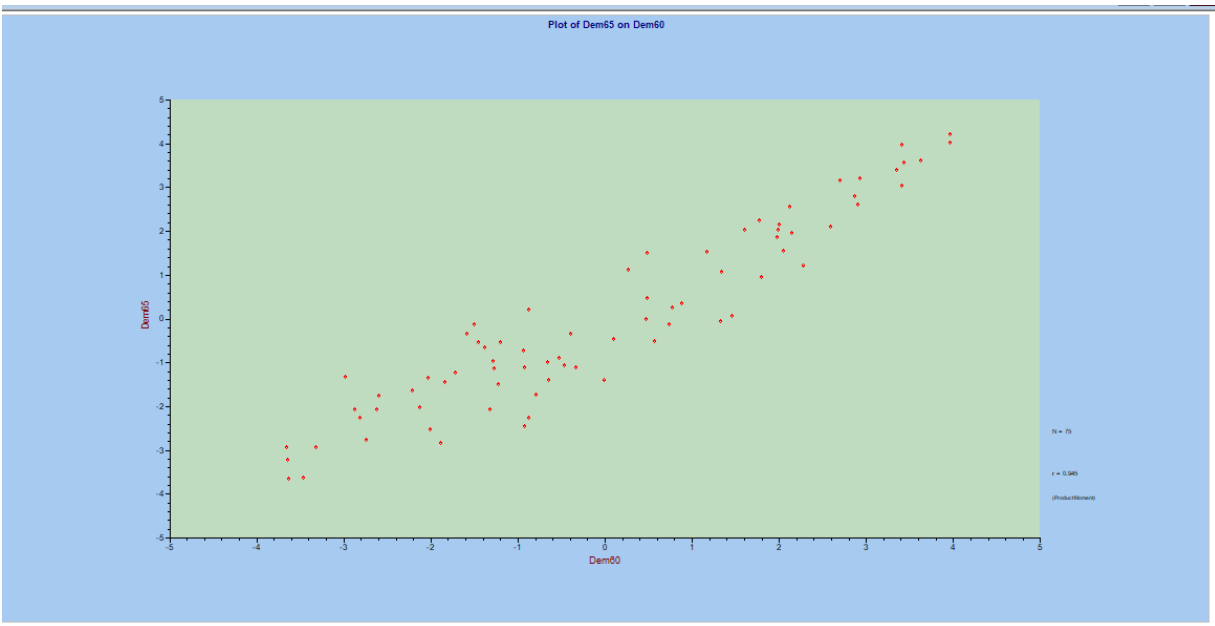
The variables R_Y1 to R_Y5 are the estimates of the measurement errors ε_1 to ε_5 . Similarly, R_X1 to R_X3 are the estimates of the measurement errors δ_1 to δ_3 . The variable R_DEM60 is the estimate of the structural error ζ_1 in the LISREL model.

The univariate statistics, obtained via the **Data Screening** option, for some of these are

Variable	Mean	St. Dev.	Skewness	Kurtosis	Minimum	Freq.	Maximum	Freq.
Dem60	-0.000	2.141	0.132	-1.042	-3.655	1	3.966	1
Dem65	-0.000	2.084	0.342	-0.876	-3.628	1	4.223	1
Indus	0.000	0.674	-0.140	-0.644	-1.341	1	1.339	1
R_Y1	0.000	1.285	0.326	-0.377	-2.434	1	3.270	1
R_Y2	-0.000	2.416	0.566	0.095	-4.870	1	6.596	1
R_Y3	-0.000	2.166	-0.162	0.453	-6.473	1	4.916	1
R_Y4	0.000	1.288	-0.432	0.101	-3.310	1	2.937	1
R_Y5	0.000	1.521	-0.465	0.302	-4.449	1	3.419	1
R_Y6	-0.000	1.860	0.599	0.184	-3.488	1	4.943	1
R_Y7	-0.000	1.743	-0.051	-0.556	-3.792	1	3.946	1
R_Y8	0.000	1.294	-0.618	0.672	-3.998	1	2.875	1
R_X1	0.000	0.257	-0.457	-0.150	-0.673	1	0.527	1
R_X2	-0.000	0.202	0.143	0.153	-0.483	1	0.523	1
R_X3	-0.000	0.645	-0.072	-0.478	-1.534	1	1.330	1

We note that there is quite a bit of variation in the measurements over the countries. Unfortunately, identifying information for the countries are not available. We opt to construct an additional variable named COUNTRY which simply runs between 1 and 75 as proxy for the actual country name.

Another question of interest is whether the level of democracy increased in these countries over the five-year period for which we have data. From a scatterplot of the values of Dem65 against Dem60 it seems as if, generally speaking, a higher level of democracy in 1960 is associated with an increased observation of democracy five years later.



To construct a file containing the additional variables, we use the PRELIS syntax file **ba2.prl**.

```

L ba2.prl
SY=POLIDEMnew.LSF
New COUNTRY=TIME
New Diff=Dem65-Dem60
CO ALL
Select COUNTRY Dem60 Dem65 Diff
OU RA=DEMDIFF.LSF

```

We set COUNTRY equal to TIME. TIME is a variable always available in LISREL that automatically assigns values 1, 2, ..., N. While mostly intended for use in time series analyses, it serves nicely to create a variable here to represent the 75 countries. Note the use of the keyword New to create the additional variables in the data.

To gauge the increase or decrease in democracy in the countries over the measurement period, we simultaneously create a variable DIFF. The line

$$\text{NEW DIFF} = \text{Dem65} - \text{Dem60}$$

On the output line, we request the creation of a new LSF file named **DEMDIFF.LSF**. Note that this file will only contain the variables requested via use of the **Select** statement.

The univariate statistics obtained for the 4 selected variables are as follows:

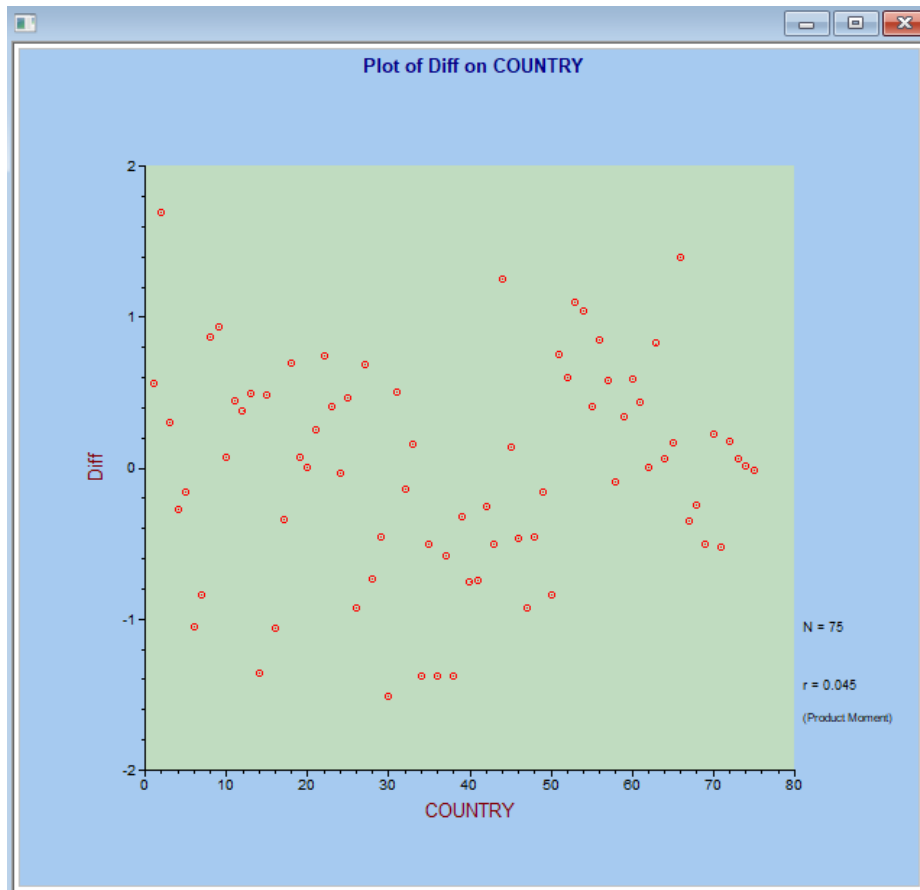
Univariate Summary Statistics for Continuous Variables

Variable	Mean	St. Dev.	Skewness	Kurtosis	Minimum	Freq.	Maximum	Freq.
COUNTRY	38.000	21.794	0.000	-1.200	1.000	1	75.000	1
Dem60	-0.000	2.141	0.132	-1.042	-3.655	1	3.966	1
Dem65	-0.000	2.084	0.342	-0.876	-3.628	1	4.223	1
Diff	-0.000	0.705	-0.139	-0.336	-1.510	1	1.689	1

The contents of the new LSF file are shown below. Inspection of the data shows that country 2 made the most progress towards increased democratization (1.39). Countries 44, 51, 52, 60 and 66 almost made noticeable progress. On the other hand, it seems as if the level of democratization decreased in countries 14, 16, 34, 38 and most of all in country 30 (-1.51).

	OUNTR	Dem60	Dem65	Diff
1	1.00	-2.62	-2.06	0.56
2	2.00	-2.99	-1.30	1.69
3	3.00	2.92	3.22	0.30
4	4.00	2.90	2.63	-0.28
5	5.00	2.14	1.98	-0.16
6	6.00	0.56	-0.49	-1.05
7	7.00	0.74	-0.10	-0.84
8	8.00	0.26	1.13	0.87
9	9.00	-1.46	-0.53	0.94
10	10.00	3.35	3.42	0.07
11	11.00	1.61	2.05	0.44
12	12.00	1.17	1.55	0.38
13	13.00	1.77	2.26	0.49
14	14.00	1.33	-0.03	-1.36
15	15.00	2.70	3.18	0.48
16	16.00	2.28	1.22	-1.06
17	17.00	-0.53	-0.87	-0.34
18	18.00	-2.03	-1.34	0.69
19	19.00	3.96	4.03	0.07
20	20.00	0.48	0.49	0.01
21	21.00	3.97	4.22	0.26
22	22.00	-3.65	-2.91	0.75
23	23.00	-1.84	-1.43	0.41
24	24.00	2.86	2.82	-0.04
25	25.00	2.12	2.58	0.46
26	26.00	-0.79	-1.72	-0.92
27	27.00	-1.20	-0.51	0.69
28	28.00	-1.33	-2.06	-0.74
29	29.00	0.47	0.01	-0.46
30	30.00	-0.92	-2.43	-1.51
31	31.00	-1.73	-1.22	0.51
32	32.00	-3.47	-3.60	-0.14
33	33.00	-1.27	-1.11	0.16
34	34.00	-0.88	-2.26	-1.38
35	35.00	0.77	0.26	-0.51
36	36.00	1.46	0.09	-1.38
37	37.00	-0.47	-1.05	-0.58
38	38.00	-0.01	-1.39	-1.38
39	39.00	-0.66	-0.98	-0.32
40	40.00	-0.33	-1.08	-0.75
41	41.00	-0.65	-1.39	-0.74
42	42.00	1.34	1.08	-0.26
43	43.00	0.88	0.38	-0.50
44	44.00	-1.59	-0.33	1.25
45	45.00	-2.14	-2.00	0.14
46	46.00	2.04	1.58	-0.46
47	47.00	-1.89	-2.82	-0.92
48	48.00	2.59	2.13	-0.46
49	49.00	-0.93	-1.08	-0.16
50	50.00	1.80	0.96	-0.84
51	51.00	-1.39	-0.63	0.76
52	52.00	-2.22	-1.62	0.60
53	53.00	-0.88	0.22	1.10
54	54.00	0.48	1.52	1.04
55	55.00	-3.32	-2.92	0.41
56	56.00	-2.60	-1.75	0.85
57	57.00	-2.82	-2.24	0.58
58	58.00	1.98	1.89	-0.09
59	59.00	-1.28	-0.94	0.34
60	60.00	3.41	4.00	0.59
61	61.00	-3.65	-3.21	0.44
62	62.00	-3.63	-3.63	0.00
63	63.00	-2.88	-2.05	0.83
64	64.00	-0.40	-0.33	0.06
65	65.00	3.43	3.59	0.16
66	66.00	-1.51	-0.12	1.39
67	67.00	3.41	3.06	-0.35
68	68.00	-1.23	-1.47	-0.24
69	69.00	-2.01	-2.51	-0.50
70	70.00	-0.94	-0.71	0.23
71	71.00	0.09	-0.43	-0.53
72	72.00	2.00	2.18	0.18
73	73.00	1.98	2.04	0.06
74	74.00	3.62	3.64	0.02
75	75.00	-2.74	-2.76	-0.02

A graph of the difference in democratization against country number shows that while just over half of the countries (40) did show an increase, 23 showed a decrease and for one country no change was observed.



3. Standardized latent variables

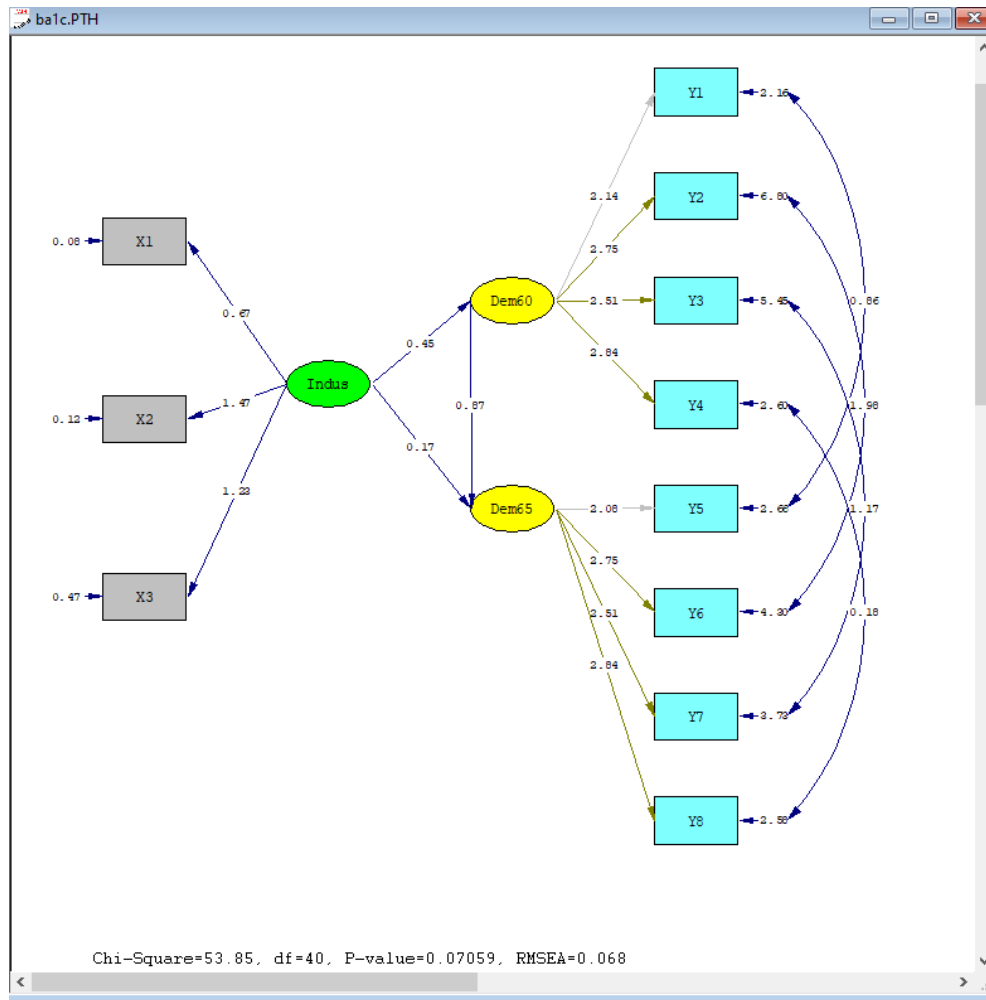
One can also obtain estimates of the standardized latent variables. The syntax files **ba1c.spl** shown below is essentially the same as **ba1a.spl**, with one difference: the * in the equations in the Relationships paragraph have been removed.

```

ba1c.spl
Industrialization-Democracy Example
Raw Data from file POLIDEM.LSF
Latent Variables: Dem60 Dem65 Indus
Relationships:
Y1= Dem60
Y2-Y4 = Dem60
Y5 = Dem65
Y6-Y8 = Dem65
X9 = Indus
X10-X11 = Indus
Dem60 = Indus
Dem65 = Dem60 Indus
Set Dem60 -> Y2 = Dem65 -> Y6
Set Dem60 -> Y3 = Dem65 -> Y7
Set Dem60 -> Y4 = Dem65 -> Y8
Let the errors of Y5 and Y1 be correlated
let the errors of Y6 and Y2 be correlated
Let the errors of Y7 and Y3 be correlated
Let the errors of Y8 and Y4 be correlated
LSFfile POLIDEM.LSF
Estimate Residuals
Path Diagram
End of Problem

```

The path diagram for this model is shown below.



Partial output for this model is given below:

Structural Equations

Dem60 = 0.449*Indus, Errorvar.= 0.798 , R ² = 0.202
Standerr (0.123) (0.184)
Z-values 3.659 4.348
P-values 0.000 0.000

Dem65 = 0.868*Dem60 + 0.170*Indus, Errorvar.= 0.0846 , R ² = 0.915
Standerr (0.0736) (0.0703) (0.0459)
Z-values 11.803 2.416 1.842
P-values 0.000 0.016 0.065

NOTE: R² for Structural Equations are Hayduk's (2006) Blocked-Error R²

Reduced Form Equations

Dem60 = 0.449*Indus, Errorvar.= 0.798, R ² = 0.202
Standerr (0.124)

Z-values 3.635
P-values 0.000

Dem65 = 0.560*Indus, Errorvar.= 0.686, R² = 0.314
Standerr (0.122)
Z-values 4.576
P-values 0.000

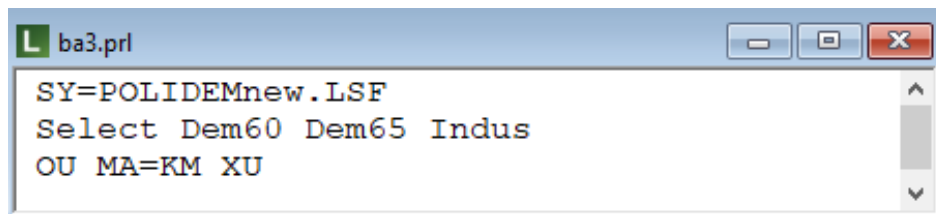
Correlation Matrix of Independent Variables

```
      Indus
-----
      1.000
```

Covariance Matrix of Latent Variables

	Dem60	Dem65	Indus
	-----	-----	-----
Dem60	1.000		
Dem65	0.945	1.000	
Indus	0.449	0.560	1.000

As the estimation of residuals was also requested in this analysis, the new file **Polidemnew.lsf** created now also contains the estimates of the standardized latent variables. To obtain the correlation matrix of the latent variable scores, use the syntax file **ba3.prl**:



```
L ba3.prl
SY=POLIDEMnew.LSF
Select Dem60 Dem65 Indus
OU MA=KM XU
```

The output obtained for this model shows that this correlation matrix is indeed equal to the correlation matrix of the latent variables obtained in the model.

```
ba3.OUT
SY=POLIDEMnew.LSF
Select Dem60 Dem65 Indus
OU MA=KM XU

Total Sample Size(N) =      75

Correlation Matrix

          Dem60      Dem65      Indus
-----
Dem60      1.000
Dem65      0.945      1.000
Indus      0.449      0.560      1.000

Total Variance = 3.000 Generalized Variance = 0.0675
Largest Eigenvalue = 2.329 Smallest Eigenvalue = 0.046
Condition Number = 7.083

Means

          Dem60      Dem65      Indus
-----
          -0.000      -0.000      0.000

Standard Deviations

          Dem60      Dem65      Indus
-----
          1.000      1.000      1.000
```