



Normal scores

1. Introduction

The analysis of continuous non-normal variables in structural equation models is problematic in several ways. If the maximum likelihood (ML) method is used, standard errors and χ^2 may be incorrect. In theory, weighted least squares (WLS or ADF) with a correct weight matrix should produce correct estimates of standard errors and chi-squares, but this requires a very large sample. Sometimes a reasonable compromise is to use ML despite the non-normality and correct for the bias in standard errors, but this too requires a large sample.

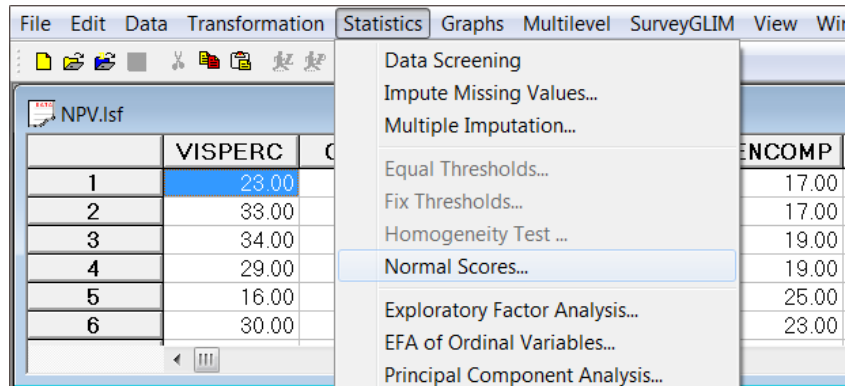
Another solution to non-normality is to normalize the variables before analysis. Normal scores offer an effective way of normalizing a continuous variable for which the origin and unit of measurement have no intrinsic meaning, such as test scores.

2. Normalizing nine Psychological Variables

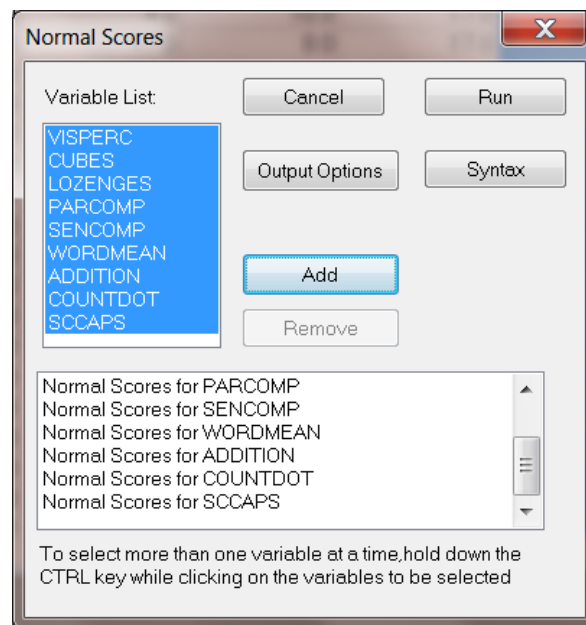
To normalize the raw scores of the nine psychological variables in file **npv.isf**, we proceed as follows.

Select the **File, Open** option and select **LISREL system file (*.isf)** from the **Files of type** drop-down list box. Select the file **npv.isf** from the **PRELIS Examples** folder. Click **Open** to proceed.

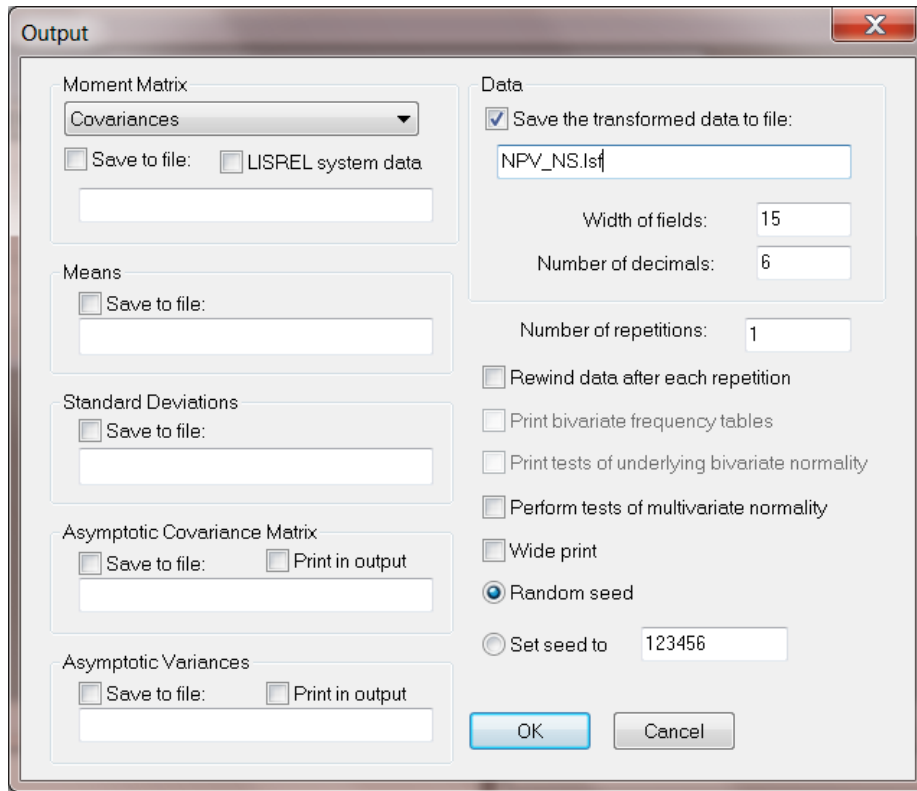
Note that normal scores may be calculated for both ordinal and continuous variables. From the **Statistics** menu, select the **Normal Scores** option to obtain the **Normal Scores** dialog box.



Select all 9 variables and click **Add**. A variable may be removed by clicking on the specific variable in the bottom dialog box and then using the **Remove** button. When all the variables for which normal scores are to be computed are selected, click **Output Options** to save the normal scores to an external file.



On the **Output** dialog box, check the **Save the transformed data to file** check box and enter the file name **npv_ns.raw**. The data can also be saved as **npv_ns.lsf**.



When done, click **OK** and then **Run** on the **Normal Scores** dialog box. The first ten rows of normal scores for the nine variables are shown below.

	VISPERC	CUBES	LOZENGES	PARCOMP	SENCOMP	WORDMEAN	.
1	23.15	17.04	0.29	10.63	16.77	8.97	
2	32.67	22.32	18.60	7.85	16.77	8.97	
3	33.69	24.26	22.17	11.66	18.85	20.53	
4	28.68	23.35	9.85	9.27	18.85	11.06	
5	15.29	25.38	11.10	7.85	25.46	24.36	
6	29.70	25.38	21.17	10.63	22.45	19.37	
7	35.74	31.65	39.14	15.83	25.46	39.42	
8	27.45	25.38	9.85	10.63	17.67	11.06	
9	29.70	25.38	12.33	11.66	20.71	6.94	
10	21.24	25.38	4.78	9.27	20.71	17.21	