

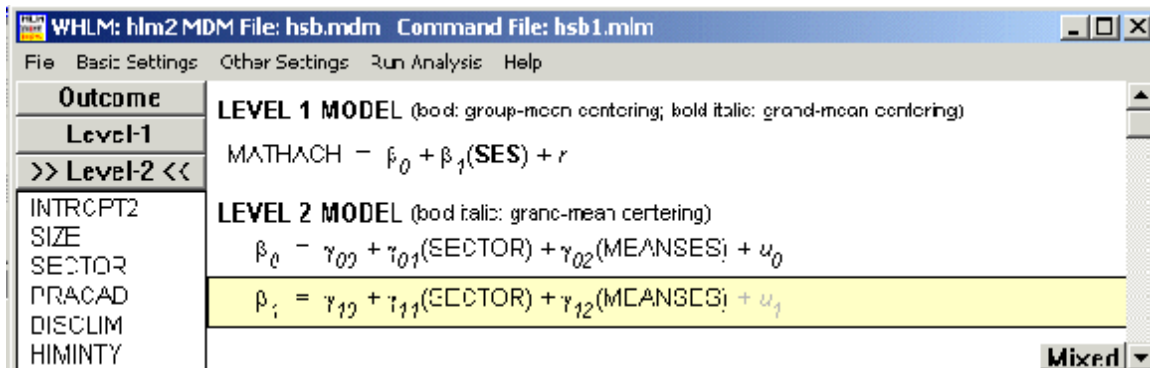
## Compare model fit using deviance statistics

HLM also provides, as an option, a multi-parameter test for the variance-covariance components. This likelihood-ratio test compares the deviance statistic of a restricted model with a more general alternative. The test is based on the difference between the deviance statistics (defined as -2 ln likelihood function value at convergence) of the two models, which has a chi-square distribution with degrees of freedom equal to the difference in the number of parameters estimated in the models being compared. For more on this topic, see *Hierarchical Linear Models*, p. 64.

The deviance statistic comparison option is only available for HLM2 and HLM3 models, as well as HGLM models where Laplace estimation is used. [It is not available when PQL is used as method of estimation for HGLM models](#), for reasons discussed elsewhere.

The user must input the value of the deviance statistic and related degrees of freedom for the alternative specification. Below we compare the variance-covariance components of two Intercept-and-Slope-as-Outcome models. One treats  $u_1$  as random and the other does not.

The first model

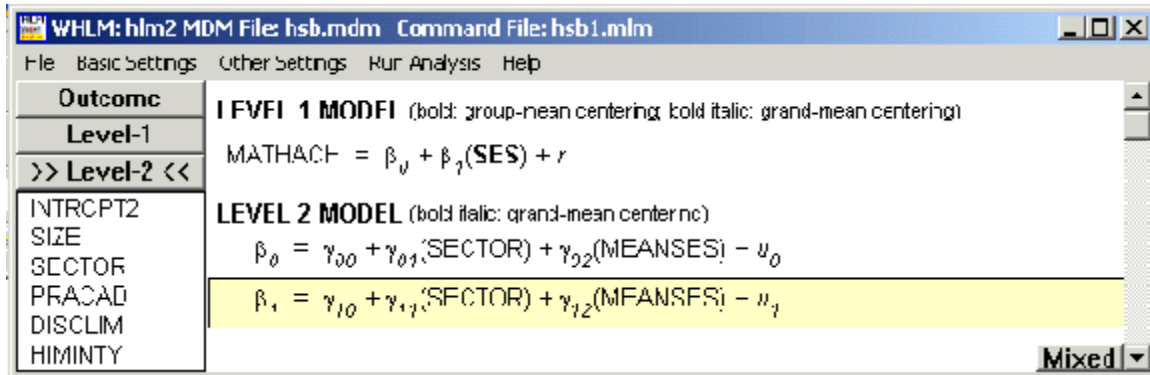


produced a deviance statistic and estimated number of parameters as shown below. This information is printed at the end of the standard HLM output file.

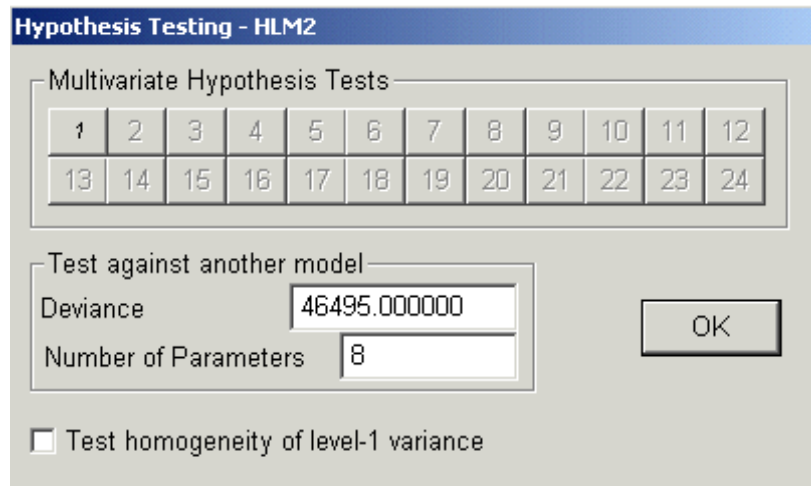
```
Statistics for current covariance components model
-----
Deviance = 46495.596020
Number of estimated parameters = 8
```

In order to evaluate the contribution of the addition of a random slope to the model considered above, the random intercept term  $u_1$  is enabled by selecting the second level-2 equation and clicking on  $u_1$ . Note that, in this comparison, the fixed part of both models is the same - only the number of elements in the level-2 Tau-matrix differs. If models with differing fixed parts are to be compared, full rather than restricted maximum likelihood should be used as method of estimation. This is selected via the **Other Settings, Estimation Settings** option from the main window. Full ML is used in this comparison. For more on this topic, please see [the relevant FAQ](#).

Before running the second model



select the **Hypothesis Settings** option from the **Other Settings** menu to open the **Hypothesis Testing - HLM2** dialog box. Enter the deviance and number of parameters from the first model in the **Test against another model** group box. Click **OK** to return to the main window and click the **Run Analysis** option on the main menu bar to perform the analysis.



In the final section of the output for the second model, the following information is then given:

```

Statistics for current covariance components model
-----
Deviance                               = 46494.592685
Number of estimated parameters = 10

Model comparison test
-----
Chi-square statistic                   =      0.40731
Number of degrees of freedom =      2
P-value                               = > .500

```

The first section provides the deviance and associated number of estimated parameters for the second model, while the second section compares the deviances of the two models. It appears that the addition of the random slope's contribution to the explanation of variation in the outcome was negligible.