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Evaluating random slopes for an HMLM model

HMLM and HMLM2 do not produce final tables for the variance components and χ^2 - statistics for individual components as is the case with HLM2 and HLM3. Consider the model for NYS data given in the HLM manual:

Model 1:

Level-1 Model

```
Y=IND1*Y1+IND2*Y2+IND3*Y3+IND4*Y4+IND5*Y5
Y*=B0+B1(AGE13)+R
```

Level-2 Model

```
B00=G00+U0
B1=G10
```

Now consider the modified model with both a random intercept and a random AGE13 slope:

Model 2:

Level-1 Model

```
Y=IND1*Y1+IND2*Y2+IND3*Y3+IND4*Y4+IND5*Y5
Y*=B0+B1(AGE13)+R
```

Level-2 Model

```
B00=G00+U0
B1=G10+U1
```

To evaluate the random slope in the second model, fit both models as shown above: that is, models with and without the random slope of interest.

The deviance statistic for the unrestricted model is the same for both cases, namely

Deviance = -378.256523
Number of estimated parameters = 17

The deviance statistic for the model 1 (only one random effect at level-2) is

Deviance = -228.997813
Number of estimated parameters = 4

while the deviance statistics for the model 2 (2 random effects at level-2) is

Deviance = -338.065855
Number of estimated parameters = 6

The difference between the two deviance statistics obtained for the respective models has a χ^2 -distribution with degrees of freedom equal to the difference in the number of parameters estimated. In this case, the τ -matrix for model 2 has three non-duplicated elements

$$\begin{array}{ll} \mathrm{var}(u_0) & \\ \mathrm{cov}(u_0, u_1) & \mathrm{var}(u_1) \end{array}$$

compared to the τ for model 1 with only one element u_0. The difference in the number of parameters estimated is thus equal to 2. Note that by using this approach, the researcher is essentially testing that all variance-covariance components associated with the level-1 predictor are making a significant contribution to the explanation of variation in the outcome.