P-values

p-values are produced for both fixed and random effects.

Fixed effects:

In the case of fixed effects, the *t*-tests are two-tailed tests. The hypotheses in this case are of the form

$$H_0 : \gamma = 0$$
$$H_1 : \gamma \neq 0$$

If the degrees of freedom is less than 60, the *t* rather than the *z*-value will be used. In the case of the fixed effect tables, the *t,* not the *z*-value is used in all cases.

Random effects:

The alternative hypothesis when testing the null hypothesis that a variance is zero is one- sided, as variances are by definition non-negative.

Note that when a random slope is added to the model, more than one variance component is added to the model. If, for example the following two models are to be compared using the deviance statistic

$$y_{ij} = \beta_{0j} + r_{ij}$$
$$\beta_{0j} = \gamma_{00} + u_{0j}$$

and

$$y_{ij} = \beta_{0j} + \beta_{1j} X_{ij} + r_{ij}$$
$$\beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$

it should be kept in mind that the Tau-matrix for the second model will have three non- duplicated elements: $\text{var}(u_0)$, $\text{var}(u_1)$ and $\text{cov}(u_0, u_1)$.

Using the deviance statistic option provided in HLM to compare these two models will test null hypothesis that both the variance of the random slope and the associated covariances are equal to zero.