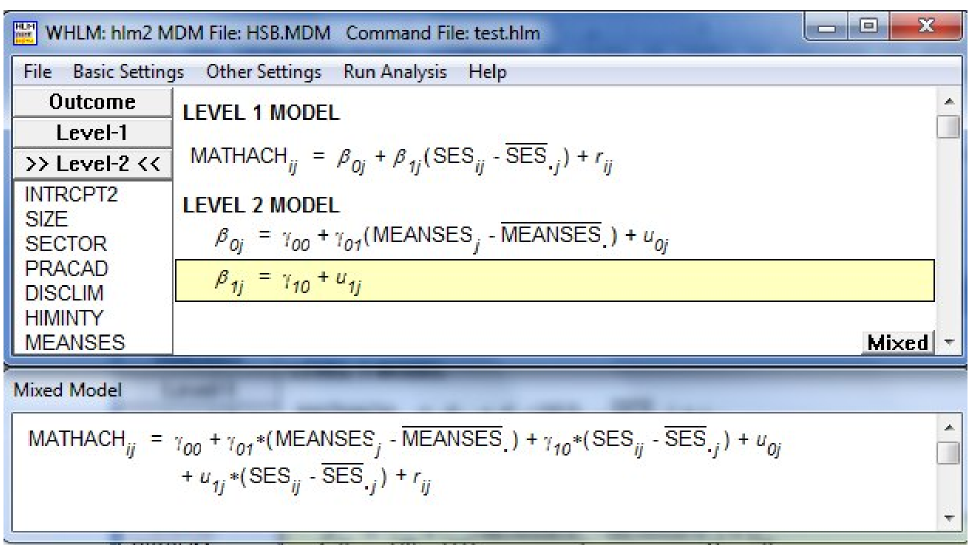
Calculating cross-level correlations

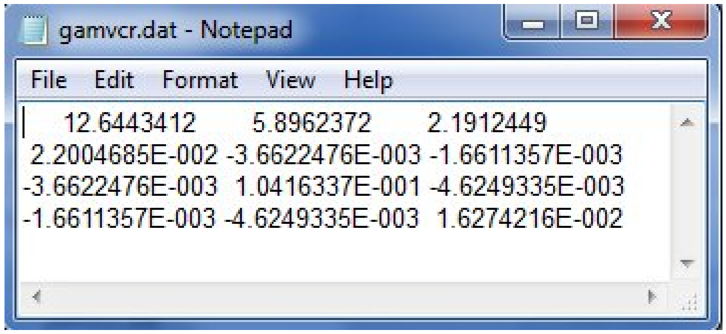
To calculate cross-level correlations, request the variance-covariance matrices of estimates of fixed effects and variance-covariance parameters in HLM2 or HLM3 by checking the **print variance-covariance matrices** option in the **Output Settings** dialog box accessed via the **Other Settings** menu. The keyword PRINTVARIANCE-COVARIANCE facilitates the same purpose in batch mode.

The file needed is **gamvcr.dat** which contains the gamma and the gamma variance covariance matrix used to compute the robust standard errors.

For the model



the **gamvcr.dat** file shown below is obtained:



gamvcr.dat - Notepad

File Edit Format View Help

```
    12.6443412       5.8962372       2.1912449
 2.2004685E-002 -3.6622476E-003 -1.6611357E-003
-3.6622476E-003  1.0416337E-001 -4.6249335E-003
-1.6611357E-003 -4.6249335E-003  1.6274216E-002
```

Gamvcr.dat contains level-2 fixed effects (the gammas), and the gamma variance-covariance matrix used to compute the robust standard errors. From the output, we have

$$\begin{array}{lll} \hat{\text{var}}(\gamma_{00}) & & \\ \hat{\text{cov}}(\gamma_{01},\gamma_{00}) & \hat{\text{var}}(\gamma_{01}) & \\ \hat{\text{cov}}(\gamma_{10},\gamma_{00}) & \hat{\text{cov}}(\gamma_{10},\gamma_{01}) & \hat{\text{var}}(\gamma_{10}) \end{array}$$

Once you have **gamvcr.dat**, you can calculate the correlations between any two variables X (level-1) and Z (level-2) by taking the covariance associated with these two, and dividing it by the square root of the product of the variances of X and Z. In this example, the correlation between the group-mean centered level-1 variable SES and the level-2 variable $MEANSES$ can be calculated by using the estimated variances of γ_{01} and γ_{10} and the associated covariance as

$$\frac{\hat{\text{cov}}(\gamma_{01},\gamma_{10})}{\sqrt{\hat{\text{var}}(\gamma_{01})\,\hat{\text{var}}(\gamma_{10})}} = \frac{-0.0046249}{\sqrt{0.10416 \times 0.016274}} = -0.1123$$

To get the associated p-value, you will have to use a table of critical values for the $r(n)$ distribution where n is the number of level-2 observations.