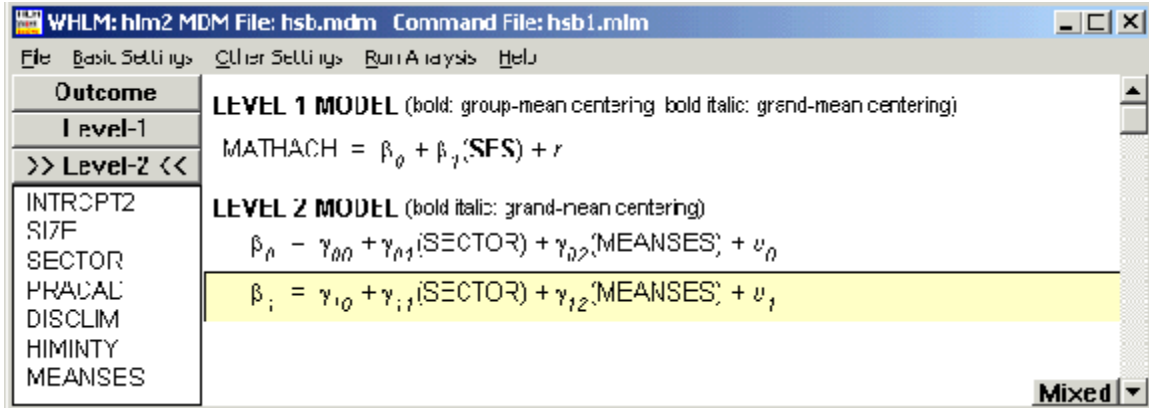


Perform hypothesis testing

- [Multivariate hypothesis tests for fixed effects](#)
- [Testing homogeneity of level-1 variances](#)

In the following sections, we use the model displayed in the figure below to illustrate the hypothesis tests.



Partial output is shown below.

Weighting Specification

	Weighting?	Weight Variable Name	Normalized?
Level 1	no		
Level 2	no		

The outcome variable is MATHACH

The model specified for the fixed effects was:

	Level-1 Coefficients	Level-2 Predictors
	INTRCPT1, B0	INTRCPT2, G00 SECTOR, G01 MEANSES, G02
#*	SES slope, B1	INTRCPT2, G10 SECTOR, G11 MEANSES, G12

'#' - The residual parameter variance for this level-1 coefficient has been set to zero.

'*' - This level-1 predictor has been centered around its group mean.

The model specified for the covariance components was:

Sigma squared (constant across level-2 units)

Tau dimensions

INTRCPT1

hlm6

Summary of the model specified (in equation format)

Level-1 Model

$$Y = B0 + B1*(SES) + R$$

Level-2 Model

$$B0 = G00 + G01*(SECTOR) + G02*(MEANSES) + U0$$

$$B1 = G10 + G11*(SECTOR) + G12*(MEANSES)$$

Note, the middle section of output has been deleted. We proceed directly to the final results page.

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	12.096251	0.198643	60.894	157	0.000
SECTOR, G01	1.224401	0.306117	4.000	157	0.000
MEANSES, G02	5.336698	0.368978	14.463	157	0.000
For SES slope, B1					
INTRCPT2, G10	2.935860	0.150705	19.481	7179	0.000
SECTOR, G11	-1.642102	0.233097	-7.045	7179	0.000
MEANSES, G12	1.044120	0.291042	3.588	7179	0.001

Final estimation of fixed effects
(with robust standard errors)

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
For INTRCPT1, B0					
INTRCPT2, G00	12.096251	0.173691	69.642	157	0.000
SECTOR, G01	1.224401	0.308507	3.969	157	0.000
MEANSES, G02	5.336698	0.334617	15.949	157	0.000
For SES slope, B1					
INTRCPT2, G10	2.935860	0.147580	19.893	7179	0.000
SECTOR, G11	-1.642102	0.237223	-6.922	7179	0.000
MEANSES, G12	1.044120	0.332897	3.136	7179	0.002

Final estimation of variance components:

Random Effect	Standard Deviation	Variance Component	df	Chi-square	P-value
INTRCPT1, U0	1.54118	2.37524	157	604.29895	0.000
level-1, R	6.06351	36.76611			

Statistics for current covariance components model

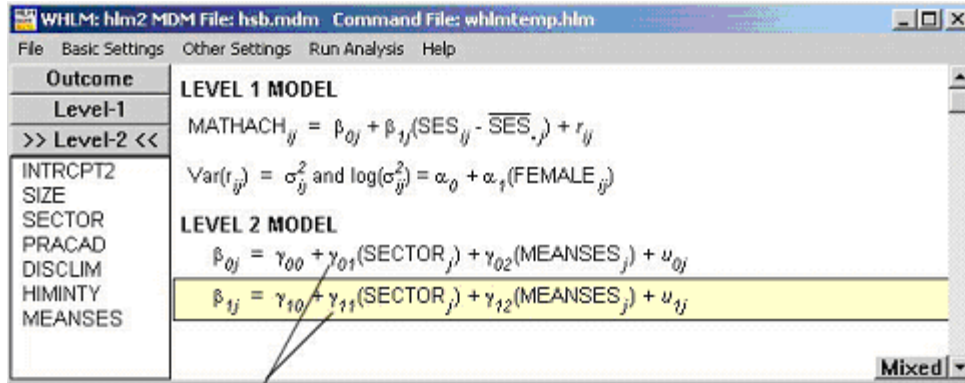
Deviance = 46502.952743
Number of estimated parameters = 2

Multivariate hypothesis tests for fixed effects

Consider the model displayed above, a user can test the following composite null hypothesis:

$$H_0: \gamma_{01} = \gamma_{11} = 0,$$

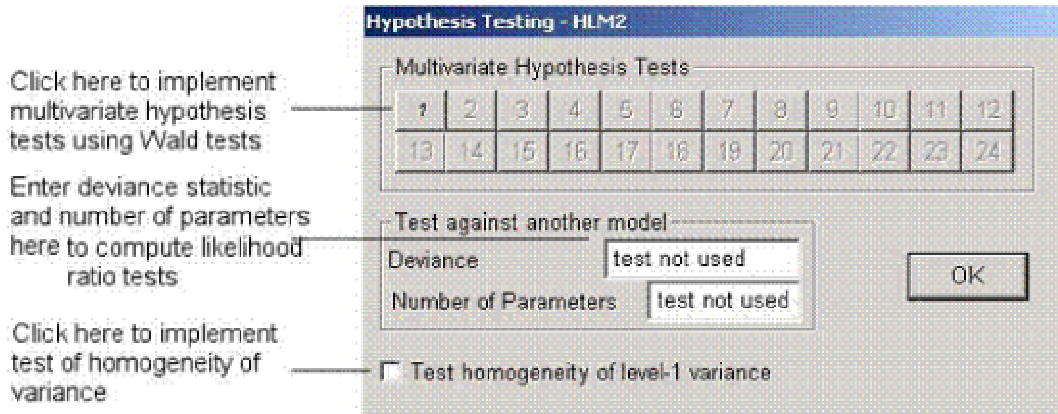
where γ_{01} is the effect of SECTOR on the intercept and γ_{11} is the effect of sector on the SES slope.



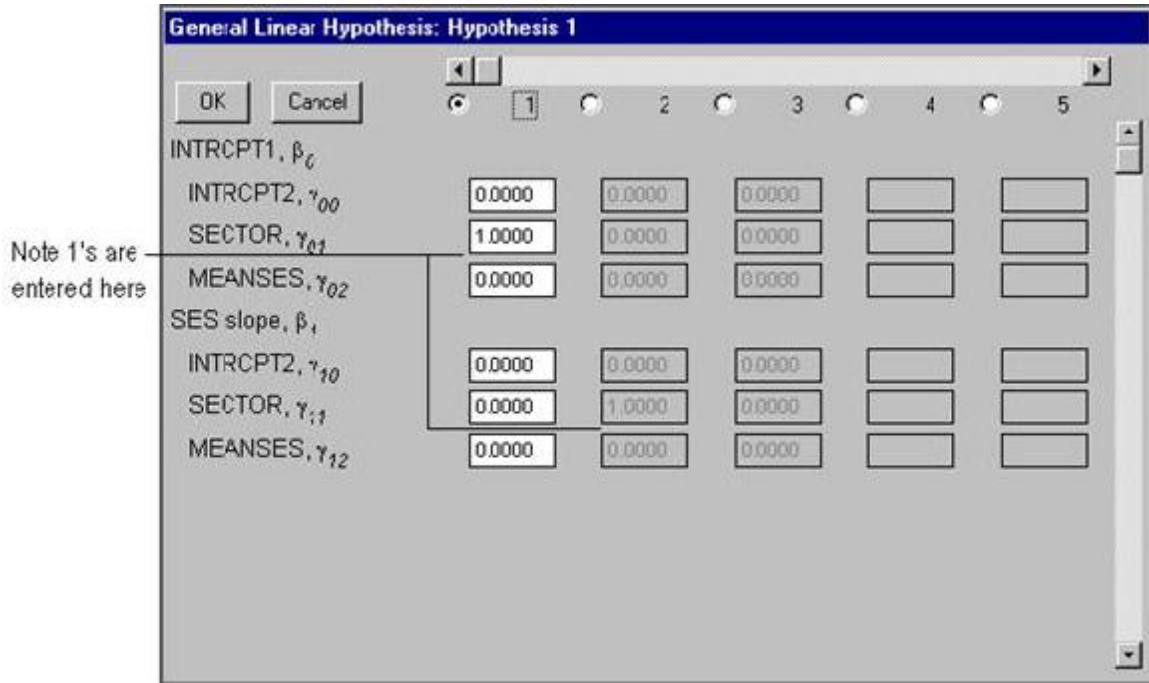
Test if these two fixed effects are both zero

Below is a procedure that illustrates a Windows execution of the hypothesis test.

To pose a multivariate hypothesis test among the fixed effects, open the **Other Settings** menu and select the **Estimation Settings** option to open the **Hypothesis Testing – HLM2** dialog box.



Click "1" to open the **General Linear Hypothesis: Hypothesis 1** dialog box and to specify the first hypothesis (see the figure below for the contrast comparing the effect of SECTOR on the intercept and on the SES slope). Click **OK**.



The HLM2 output associated with this test is as follows.

Results of General Linear Hypothesis Testing

		Coefficients		Contrast	
For	INTRCPT1, B0				
	INTRCPT2, G00	12.096251	0.000	0.000	
	SECTOR, G01	1.224401	1.000	0.000	
	MEANSES, G02	5.336698	0.000	0.000	
For	SES slope, B1				
	INTRCPT2, G10	2.935860	0.000	0.000	
	SECTOR, G11	-1.642102	0.000	1.000	
	MEANSES, G12	1.044120	0.000	0.000	

Chi-square statistic = 60.527852
 Degrees of freedom = 2
 P-value = 0.000000

The table above is a reminder of the multivariate contrast specified. The chi-square statistic and associated p-value indicate that it is highly unlikely that the observed estimates for G01 and G11 could have occurred under the specified null hypothesis.

Testing homogeneity of level-1 variances

HLM2 assumes homogeneity of residual variance at level 1. That is, it specifies a common σ^2 within each of the J level-2 units. As an option, HLM2 tests the adequacy of this assumption.

Consider again the same model shown above, to test homogeneity of level-1 variances, click the **Test homogeneity of level-1 variance** box.

Hypothesis Testing - HLM2

Multivariate Hypothesis Tests

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24

Test against another model

Deviance

Number of Parameters

Test homogeneity of level-1 variance

OK

The HLM2 output associated with this test is shown below. (For a further discussion of this test see *Hierarchical Linear Models*, pp. 263-267.)

```

Test of homogeneity of level-1 variance
-----
Chi-square statistic      =    244.08638
Number of degrees of freedom =    159
P-value                  =    0.000

```

These results indicate that there is variability among the ($J = 160$) level-2 units in terms of the residual within-school (*i.e.*, level-1) variance.