



Three Level Fixed Intercept and Random Coefficient (FIRC) model

There are three data files for the HLM3 FIRC analysis: the student-, classroom-, and school-level files.

Level-1 file. The level-1 file, **STAR1.SAV** has math and reading proficiency data of 5,786 students participated in STAR. The variables are:

- MATH a math test in IRT scale score metric
- READING a reading test in an IRT scale score metric

Level-2 file. The level-2 file, **STAR2.SAV** has class treatment type data collected from 325 classrooms that the students attended. The variable is:

- CLASSTYP an indicator of class type (1 = small with 13-17 students, 0 = other)

Level-3 file. The level-3 file, **STAR3.SAV** has data collected from 79 schools that the students attended. The variable is:

- SIZE school size

Note that CLASSTYP is now a classroom-level variable. Using HLM3, the MDM file **STARHM3.MDM** is created.

The command file, **STARHM3A.HLM**, contains the model specification input responses for the fixed intercepts and a fixed treatment coefficient model. Figure 5 displays the model specified.

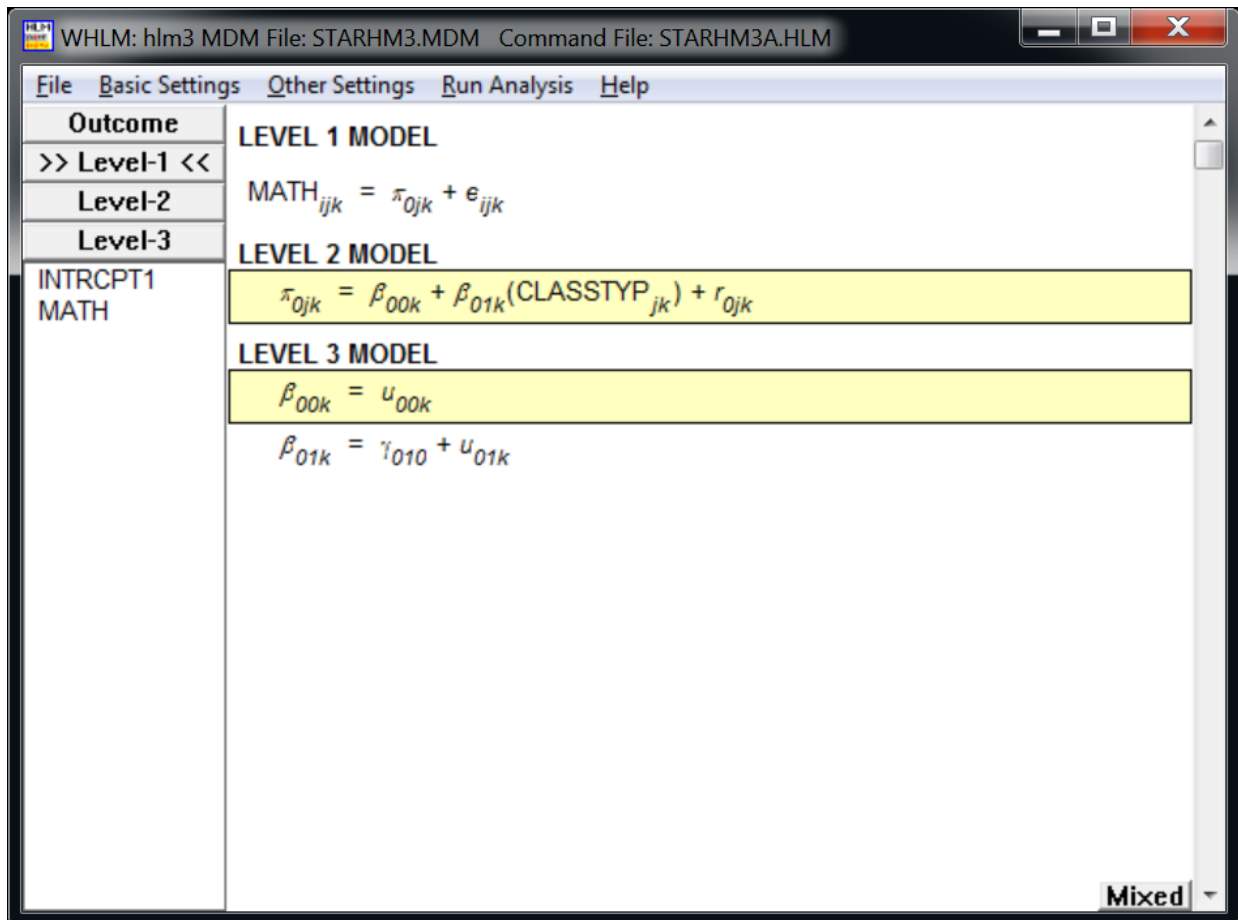


Figure 5 The fixed intercepts and a random treatment coefficient model specification for the STARHM3 example

Here is the output:

Specifications for this HLM3 run

Problem Title: Fixed Intercepts and a Random Treatment Coefficient Model

The data source for this run = STARHM3.MDM
 The command file for this run = STARHM3A.HLM
 Output file name = STARHM3A.HTML

The maximum number of level-1 units = 5786
 The maximum number of level-2 units = 325
 The maximum number of level-3 units = 79
 The maximum number of iterations = 100
 Method of estimation: full maximum likelihood

The outcome variable is MATH

Summary of the model specified

Level-1 Model

$$MATH_{ijk} = \pi_{0jk} + e_{ijk}$$

Level-2 Model

$$\pi_{0jk} = \beta_{00k} + \beta_{01k} * (CLASSTYP_{jk}) + r_{0jk}$$

Level-3 Model

$$\beta_{00k} = u_{00k}$$

$$\beta_{01k} = \gamma_{010} + u_{01k}$$

Mixed Model

$$MATH_{ijk} = \gamma * CLASSTYP_{jk} + r_{0jk} + u_{01k} + u_{01k} * CLASSTYP_{jk} + e_{ijk}$$

For starting values, data from 5786 level-1 and 325 level-2 records were used

Final Results - Iteration 46

Iterations stopped due to small change in likelihood function

Standard errors for σ^2 , τ_{π} , and τ_{β} are not computable.

$$\sigma^2 = 1597.25481$$

τ_{π}

INTRCPT1, π_0	262.45362
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τ_{β}

INTRCPT1	
CLASSTYP, β_{01}	
68.18371	
τ_{β} (as correlations)	
INTRCPT1/CLASSTYP, β_{01}	1.000

Random level-2 coefficient	Reliability estimate
INTRCPT1/CLASSTYP, β_{01}	0.149

The value of the log-likelihood function at iteration 46 = -2.955771E+004

Final estimation of fixed effects:

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, π_0 For CLASSTYP, β_{01} INTRCPT3, γ_{010}	8.744220	2.406371	3.634	78	<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, π_0 For CLASSTYP, β_{01} INTRCPT3, γ_{010}	8.744220	2.386153	3.665	78	<0.001

Final estimation of level-1 and level-2 variance components

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1, r_0 level-1, e	16.20042 39.96567	262.45362 1597.25481	167	684.59376	<0.001

Final estimation of level-3 variance components

Random Effect	Standard Deviation	Variance Component	d.f.	χ^2	p-value
INTRCPT1/CLASSTYP, u_{01}	8.25734	68.18371	78	87.77158	0.210

Note that the between-school variance of the treatment effect is now 68.18, as compared to 301.76 when the classroom level was ignored.

Statistics for the current model
Deviance = 59115.4