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| Program: | HLM 7 Hierarchical Linear and Nonlinear Modeling |
| Authors: | Stephen Raudenbush, Tony Bryk, & Richard Congdon |
| Publisher: | Scientific Software International, Inc. (c) 2010 |
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| Module: | HMLM.EXE (7.00.21105.10001) |
| Date: | 10 May 2013, Friday |
| Time: | 13:13:11 |

## Specifications for this HMLM run

Problem Title: Indistinguishable with Correlated Errors  
  
The data source for this run = Acitelli\_Indistinguishable  
The command file for this run = C:\Users\NSOE-CTC\AppData\Local\Temp\whlmtemp.hlm  
Output file name = C:\Users\NSOE-CTC\Desktop\hmlm.html  
The maximum number of level-1 units = 296  
The maximum number of level-2 units = 148  
The maximum number of iterations = 100  
  
The outcome variable is SAT\_A   
  
The model specified for the fixed effects was:

#### The model specified for the fixed effects

|  |  |
| --- | --- |
| Level-1 Coefficients | Level-2 Predictors |
| INTRCPT1, *π0* | INTRCPT2, *β00* |
| # OPOS\_A slope, *π1* | INTRCPT2, *β10* |
| # OPOS\_P slope, *π2* | INTRCPT2, *β20* |

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

## Output for the Unrestricted Model

### Summary of the model specified

#### Level-1 Model

*SAT\_Ami* = (*HUSBANDmi*)\**SAT\_A1i*\* + (*WIFEmi*)\**SAT\_A2i*\*  
  
    *SAT\_Ati*\* = *π0i* + *π1i*\*(*OPOS\_Ati*) + *π2i*\*(*OPOS\_Pti*) + *εti*

#### Level-2 Model

*π0i* = *β00*  
    *π1i* = *β10*  
    *π2i* = *β20*  
  
  
Var(*εi*) = **Δ**  
**Iterations stopped due to small change in likelihood function**

### Final Results - Iteration 3

**Δ**

|  |  |  |
| --- | --- | --- |
| HUSBAND | 0.14048 | 0.08035 |
| WIFE | 0.08035 | 0.20387 |

Standard errors of **Δ**

|  |  |  |
| --- | --- | --- |
| HUSBAND | 0.01633 | 0.01540 |
| WIFE | 0.01540 | 0.02370 |

**Δ** (as correlations)

|  |  |  |
| --- | --- | --- |
| HUSBAND | 1.000 | 0.475 |
| WIFE | 0.475 | 1.000 |

The value of the log-likelihood function at iteration 3 = -1.381800E+002

#### Final estimation of fixed effects:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *d.f.* | *p*-value |
| For INTRCPT1, *π0* | | | | | |
| INTRCPT2, *β00* | 0.682269 | 0.313332 | 2.177 | 147 | 0.029 |
| For OPOS\_A slope, *π1* | | | | | |
| INTRCPT2, *β10* | 0.402654 | 0.046496 | 8.660 | 147 | <0.001 |
| For OPOS\_P slope, *π2* | | | | | |
| INTRCPT2, *β20* | 0.283729 | 0.045570 | 6.226 | 147 | <0.001 |

#### Statistics for the current model

Deviance = 276.360008  
Number of estimated parameters = 6

## Output for Random Effects Model with Homogeneous Level-1 Variance

### Summary of the model specified

#### Level-1 Model

*SAT\_Ami* = (*HUSBANDmi*)\**SAT\_A1i*\* + (*WIFEmi*)\**SAT\_A2i*\*  
  
    *SAT\_Ati*\* = *π0i* + *π1i*\*(*OPOS\_Ati*) + *π2i*\*(*OPOS\_Pti*) + *εti*

#### Level-2 Model

*π0i* = *β00* + *r0i*  
    *π1i* = *β10*  
    *π2i* = *β20*  
  
  
Var(*εi*) = Var(**A*r****i* + e*i*) = **Δ** = **AτA'** + σ2**I**  
**A**

|  |  |
| --- | --- |
| HUSBAND | 1.00000 |
| WIFE | 1.00000 |

**Iterations stopped due to small change in likelihood function**

### Final Results - Iteration 4

|  |  |  |
| --- | --- | --- |
|  | Parameter | Standard Error |
| σ2 | 0.09181 | 0.010673 |

τ

|  |  |
| --- | --- |
| INTRCPT1,*r0* | 0.08034 |

Standard error of τ

|  |  |
| --- | --- |
| INTRCPT1,*r0* | 0.01562 |

**Δ**

|  |  |  |
| --- | --- | --- |
| HUSBAND | 0.17215 | 0.08034 |
| WIFE | 0.08034 | 0.17215 |

**Δ** (as correlations)

|  |  |  |
| --- | --- | --- |
| HUSBAND | 1.000 | 0.467 |
| WIFE | 0.467 | 1.000 |

The value of the log-likelihood function at iteration 4 = -1.414420E+002

#### Final estimation of fixed effects:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Fixed Effect | Coefficient | Standard error | *t*-ratio | Approx. *d.f.* | *p*-value |
| For INTRCPT1, *π0* | | | | | |
| INTRCPT2, *β00* | 0.669754 | 0.320252 | 2.091 | 147 | 0.036 |
| For OPOS\_A slope, *π1* | | | | | |
| INTRCPT2, *β10* | 0.400423 | 0.047052 | 8.510 | 293 | <0.001 |
| For OPOS\_P slope, *π2* | | | | | |
| INTRCPT2, *β20* | 0.287970 | 0.047052 | 6.120 | 293 | <0.001 |

#### Statistics for the current model

Deviance = 282.884090  
Number of estimated parameters = 5

### Summary of Model Fit

|  |  |  |
| --- | --- | --- |
| Model | Number of Parameters | Deviance |
| 1. Unrestricted | 6 | 276.36001 |
| 2. Homogeneous σ2 | 5 | 282.88409 |

|  |  |  |  |
| --- | --- | --- | --- |
| Model Comparison | χ2 | *d.f.* | *p*-value |
| Model 1 vs Model 2 | 6.52408 | 1 | 0.010 |