Posted on Monday, March 10, 2014 - 6:57 pm

Hi,
Is it possible to estimate between-level differences in within-level variances using a "random factor loadings" approach in cases where there is only a single outcome/indicator variable? I would like both intercept and variance of the random loading to be freely estimated on the between level (in order to enter between-level predictors). Below is what I tried (without person covariates). To avoid poor mixing, I fixed the residual within-level variance at an arbitrary value >0 (but smaller than the within-variance from a simple multilevel "null" model), and estimated the mean within-person variance (mwvar) as this residual plus the estimated mean loading (squared). The resulting model estimates do not appear completely unreasonable. However, (a) the value for “mwvar” always seems lower when using random loadings than when using a fixed loading, and (b) “mwvar” differs depending on the selected value of the residual variance. Especially (b) makes me believe I am doing something wrong. Your input would be greatly appreciated!

```
ANALYSIS:
estimator = bayes;
MODEL:
%within%
sigma | f by y;
f@1; y@0.1;
%between%
[sigma] (p1); sigma; y;
MODEL CONSTRAINT:
new (mwvar);
mwvar = 0.1 + p1**2;
```

Tihomir Asparouhov posted on Tuesday, March 11, 2014 - 5:03 pm

Our favorite model for this purpose has been

```
MODEL:
%within%
sigma | f by y;
f; y@0;
%between%
[sigma@1]; sigma; y;
```

see equation
(24) and (25) in
http://statmodel.com/download/NCME_revision2.pdf

The entire section 5 in that paper discusses this issue but for a latent variable. Your model also seems fine but I think the above model mixes better. This approach means that

Var(y)= (sigma_j)^2

As a measure of stability of the model Var(sigma_j) should be small ... smaller than 0.25 so that sigma_j>0 (otherwise interpretation would be hard). Now you can easily add predictors both for the random intercept and for the random variance.

For your model, in your Model Constraint command you inherently are making the mistake regarding this statement

* if X and Y are independent
Var(XY) is not E(X)*E(X)*Var(Y)

it is var(x)*var(y) + E(X)*E(X)*Var(Y)+E(Y)*E(Y)*Var(x)

Now applying to your case

mwvar = 0.1 + p1**2+v;

where v=Var(Sigma)

%between%
sigma (v);