Mixed Model Paper Possible Further Methods

Viviana Lencina, Julio Singer, Ed Stanek

Dear Ed:
I did not understand your suggestion. I will try to explain how I view the problem and maybe you can build on that. Irrespectively of the model (UP or CP) we use to analyse the two factor mixed model, there are two possible test statistics under consideration: MSB/MSAB or MSB/MSE. Both are computed in exactly the same way.

Under the CP model, MSB/MSE tests the hypothesis that sigmaD^2=0 and this is exactly the hypothesis of no random factor main effects. Under the same model MSB/MSAB tests the hypothesis that sigmaD^2=sigmaTauD^2/a which apaprently has no interest. Thus, under the CP model, I am not sure the powers of which tests should we compare.

Julio and Viviana. The CP model is the context in which I was thinking. I'll try to elaborate on what we might do. The idea would be as follows:

1. Generate a population factor structure where there are Factor A effects, zero Factor B effects, and a Factor A*B interaction. Add response error to the parameters from the factorial structure, where response error is normal(0,1).
2. Simulate data for a selection of a sample of levels of B, with replication of response error.
3. Using the sample data, evaluate the statistic F1=MSB/MSE and the statistic F2= MSB/MSAB, and record their values.
4. Repeat step 3 many times, and use the results to tabulate the distribution of F1 and F2. The 95% for F1 should be the 95th percentile of a central F distribution. The 95% of F2 will be some other value, say F2-05, which will serve as the critical value for a test with 0.05 alpha error of a hypothesis of no B effects. The critical value F2-05 will depend on the size of the interaction in the population. We may wish to examine how F2-05 changes with different size interactions.
5. Now we are ready for the power. Different critical values will be used to test the hypothesis of no Factor B effects using F1 or F2. In each case, the critical value will be appropriate in preserving the type I error of the hypothesis test. This step in the process will allow for some level of B main effect, and then evaluate the power of the two statistics. We can calculate a power curve for levels of B main effects.

Under the UP model, MSB/MSAB tests the hypothesis that sigmaB^2=0 and this hypothesis is not what we want to tests. On the other hand, under the same model MSB/MSE tests the hypothesis that sigmaB^2 + sigmaAlphaB/a=0, but this may only happen when both sigmaB^2=0 and sigmaAlphaB=0 which means that the hypothesis of no random factor main effects in the presence of interaction (sigmaAlphaB not equal 0) may not be tested under the UP model.
So, here too, I don't know the powers of what tests should we compare.

I wouldn't do anything under the UP model, since this model doesn't match a 'real' setting.

I have also thought about the motivation for the test of no random factor main effects in the presence of interaction and the best I could come up with was based on the example that is currently in the paper. Suppose that one of the machines is an old one which requires more

ability to operate and the other one is a new one, which is easier to operate. Suppose further, that more qualified workers tend to produce similar results (on the average) with either machine, but that less experienced workers tend to produce different results when working with the old or the new machine (i.e. a machine X worker interaction is expected). We could still be interested in verifying whether (on the average) there are worker main effects, i.e. whether more experienced workers tend to produce different results (on the average across machines) than the less experienced ones . If there are no random factor main effects in the presence of interaction, we would expected something like is presented in Figure 3 in the paper (ordering the workers from the more expereinced to the less experienced) . Otherwise, if there are random factor main effects, we would expect something similar, but with an upward trend.

What do you think about this?
Take care,
Julio

----- Original Message -----
From: Ed Stanek
To: Julio da Motta Singer
Sent: Friday, March 07, 2003 7:05 PM
Subject: Re: Plans for work on Cluster Analysis Methods

I wonder whether we shouldn't just add a simple example to illustrate the power issue. It really isn't a power issue at all, but rather the hypothesis is different. Is the simultation of data set so that we could readily determine the actual level of alpha needed so that a simulated leve of alpha=0.05 for a setting with no block effects, where we have different levels of block by treatment interaction. This isn't a problem for the 'correct' model, but for the other model, to preserve a 5 % rejection rate, the nominal critical value would have to be much larger that the usual 0.05 level. Once we know what the right critical values would be under the null hypothesis, we could then compare the two under an alternative hypothesis with different levels of block effects. We might even display two power curves. Is this hard, or relatively easy to do?

If it's easy, I think we should do it since it might address one of the reviewers concerns.
I'll also look for an example. Hope all is well. Ed

----- Original Message -----
From: Julio da Motta Singer
To: Ed Stanek
Cc: Viviana Beatriz Lencina
Sent: Thursday, March 06, 2003 2:45 PM
Subject: Re: Plans for work on Cluster Analysis Methods

Dear Ed:
I reread the mixed model paper and I think it is fine. I wonder why the associate editor insists on the example and on the power calculations. There is more motivation in our paper than in Voss's, I believe. Viviana and I are trying to find a convenient example. If we can come up with one, I think we should give one more try at TAS, since this is the appropriate journal for it. In that case, I think we could politely ask why the editor wants the power calculations if we have shown that the hypotheses are different. Otherwise, we might as well submit it to another journal. What do you think?
Julio