

Re: Help! SAS NLMIXED. The final Hessian matrix is not positive definite?

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- *From:* vontressms@xxxxxx
 - *Date:* Thu, 29 Nov 2007 10:43:56 -0800 (PST)
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On Nov 28, 2:03 pm, "sphuang via MathKB.com" <u39394@uwe> wrote:

Hi, there,

I am currently running sas PROC NLMIXED to analyze my data. My sample are 27 animals. Their running speed were repeatedly measured at 9 temperature treatments. The running speed is tested whether it can be predicted by temperatures using a logistic-exponential function. Therefore, the function I wrote in SAS code is an logistic-exponential.

My sas code is listed as following text(A). The problem I faced is that there is a warning in log page, which is as following text(B). Could anyone give me any suggestion to patch it on? any suggestions would be highly appreciated. many many thanks.

Shu-Ping

text(A), My sas code:

```
proc nlmixed data= sprint_30s method=firo ;
parms b1=0.04 b6=4.5 b2=0.2 b4=0.2 U1=0 U2=0 VAR=0.1 t11=0.1 t22=0 t12=0;
bounds VAR>=0;
LOW=1/(0.015+U1+b6*exp(-b2*(Temp-2))); HIGH=1-exp(b4*(Temp-43.1)+U2);
pred=b1*LOW*HIGH;
VAR1=t11*t11;
cov12=t11*t12;
VAR2=t12*t12+t22*t22;
model speed_m~normal (pred,VAR);
random U1 U2 ~normal ([0,0],[VAR1, cov12,VAR2]) subject=ID;
run;
```

text B:

WARNING: The final Hessian matrix is not positive definite, and therefore the estimated covariance matrix is not full rank and may be unreliable. The variance of some parameter estimates is zero or some parameters are linearly related to other parameters.

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Message posted via <http://www.mathkb.com>

Shu-ping,

I have a three suggestions. First, make sure that sprint_30s is sorted by ID. The second thing that may be causing the problem is that your covariance matrix is odd. The statements

```
VAR1=t11*t11;  
cov12=t11*t12;  
VAR2=t12*t12+t22*t22;
```

show that var2 is a covarinace squared plus a variance. That is odd. Why did you do it that way? I've never done it before, so I'm not sure what it means. The correlation between cov12 and var2 may be the thing that is causing the Hessian to have an eigenvalue less than or equal to zero. I would drop the term in VAR2 and just estimate the variance you want by

```
VAR1=t11*t11;  
cov12=t11*t12;  
VAR2=t22*t22;
```

```
estimate "variance of interest" var2+cov12;
```

The third thing is that you have a problem with the variable VAR. You can get rid of the bounds statement if you model var as a standard deviation instead, i.e.

```
model speed_m~normal (pred,VAR*VAR);
```

I have found that this stabilizes the estimation routine by reducing the magnitude of the parameter to be estimated and then, the derivatives wrt to VAR are more numerically stable.

here are my revisions:

```
proc sort data=sprint_30s; by id;  
run  
proc nlmixed data= sprint_30s method=firo ;  
parms b1=0.04 b6=4.5 b2=0.2 b4=0.2 U1=0 U2=0 VAR=0.1 t11=0.1  
t22=0 t12=0;  
LOW=1/(0.015+U1+b6*exp(-b2*(Temp-2))); HIGH=1-  
exp(b4*(Temp-43.1)+U2);  
pred=b1*LOW*HIGH;  
model speed_m~normal (pred,var*var);  
random U1 U2 ~normal ([0,0],[t11*t11,t12,t22*t22]) subject=ID;  
estimate "variance of interest (VAR2) " t22*t22+t12*t12;
```

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```
estimate "VAR1" t11*t11;  
run;
```

You might be able to get rid of the firo if you use this code.

Mark

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