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3 compartment with covariates model code:

```
test(){
  cfMicro(A1, C1 / V, C12 / V, C12 / V2, C13 / V, C13 / V3)
  dosepoint(A1)
  C = A1 / V
  error(CEps = 0.448343)
  observe(CObs = C * (1 + CEps))
  stparm(V = tvV * exp(nV))
  stparm(V2 = tvV2 * exp(dV2dCellLinenum1*(CellLinenum==1)) *
exp(dV2dCellLinenum2*(CellLinenum==2)) * exp(nV2))
  stparm(V3 = tvV3 * exp(dV3dCellLinenum1*(CellLinenum==1)) *
exp(dV3dCellLinenum2*(CellLinenum==2)) * exp(nV3))
  stparm(C1 = tvC1 * exp(dC1dCellLinenum1*(CellLinenum==1)) *
exp(dC1dCellLinenum2*(CellLinenum==2)) * exp(nC1))
  stparm(C12 = tvC12 * exp(nC12))
  stparm(C13 = tvC13 * exp(dC13dCellLinenum1*(CellLinenum==1)) *
exp(dC13dCellLinenum2*(CellLinenum==2)) * exp(nC13))
  fcovariate(CellLinenum())
  fixef(tvV = c(, 27669.7, ))
  fixef(tvV2 = c(, 3060570, ))
  fixef(tvV3 = c(, 16001.1, ))
  fixef(tvC1 = c(, 93445, ))
  fixef(tvC12 = c(, 111078, ))
  fixef(tvC13 = c(, 21211.7, ))
  fixef(dV2dCellLinenum1(enable=c(0)) = c(, -0.0247024, ))
  fixef(dV2dCellLinenum2(enable=c(0)) = c(, -1.40195, ))
  fixef(dV3dCellLinenum1(enable=c(1)) = c(, 1.72244, ))
  fixef(dV3dCellLinenum2(enable=c(1)) = c(, 0.077768, ))
  fixef(dC1dCellLinenum1(enable=c(2)) = c(, -1.57004, ))
  fixef(dC1dCellLinenum2(enable=c(2)) = c(, -0.34285, ))
  fixef(dC13dCellLinenum1(enable=c(3)) = c(, 1.76805, ))
  fixef(dC13dCellLinenum2(enable=c(3)) = c(, 1.09156, ))
  ranef(diag(nV, nV2, nC1, nC12, nV3, nC13) = c(3.3924198E-05, 0.87921569, 0.76057715,
0.24396838, 0.0047016738, 5.3406114E-05))
}
```

3 compartment with covariates model code executed:

# Population:

ELS FOCE/general Laplace engine log file

MAX major iterations = 10  
MAX Niter (line searches per major iteration) = 1000

-----NEW MAJOR ITERATION-----

Major iteration = 1

FOCE Hessian approximation used

Model evaluation ODE level used:  
0=none

Other flags and run conditions/tolerances:

28 NSUB  
21 NUMFREEPARAM  
14 NUMFREEFIXEF  
1 NUMFREEEPS  
6 NUMFREEOMEGAPARAM  
6 NUMRANEF  
1 Allow Gaussian Fit  
5 IDENGINE  
0 IFLAGRESTART  
1 IFLAGSTDERR  
0 IFLAGNP  
1 IFLAGFOCEHESS  
1 NORDERAGQ  
1 NUMPROCS  
13 NDIGITblup  
7 NDIGITlagl  
0.200E-02 tolmodlinz  
0.100E-01 tolstderr  
100 NREP\_PCWRES  
1 NPRESAMPLE  
0 NGETMAPNP  
0 iflaganagrad  
0 iodelevelused  
1 iflagstderr  
1 iflagwhichstderr

Initial parameter values:

0.27669700E+05	1	1	THETA
0.30605700E+07	2	1	THETA
0.16001100E+05	3	1	THETA
0.93445000E+05	4	1	THETA
0.11107800E+06	5	1	THETA
0.21211700E+05	6	1	THETA
-0.24702400E-01	7	1	THETA
-0.14019500E+01	8	1	THETA
0.17224400E+01	9	1	THETA
0.77768000E-01	10	1	THETA
-0.15700400E+01	11	1	THETA
-0.34285000E+00	12	1	THETA
0.17680500E+01	13	1	THETA
0.10915600E+01	14	1	THETA
0.44834300E+00	1	1	EPS_STD_DEV
0.20101145E+00	1	1	EPS_VARIANCE
0.33924198E-04	1	1	OMEGA
0.00000000E+00	2	1	OMEGA
0.87921569E+00	2	2	OMEGA
0.00000000E+00	3	1	OMEGA

0.00000000E+00	3	2 OMEGA
0.76057715E+00	3	3 OMEGA
0.00000000E+00	4	1 OMEGA
0.00000000E+00	4	2 OMEGA
0.00000000E+00	4	3 OMEGA
0.24396838E+00	4	4 OMEGA
0.00000000E+00	5	1 OMEGA
0.00000000E+00	5	2 OMEGA
0.00000000E+00	5	3 OMEGA
0.00000000E+00	5	4 OMEGA
0.47016738E-02	5	5 OMEGA
0.00000000E+00	6	1 OMEGA
0.00000000E+00	6	2 OMEGA
0.00000000E+00	6	3 OMEGA
0.00000000E+00	6	4 OMEGA
0.00000000E+00	6	5 OMEGA
0.53406114E-04	6	6 OMEGA
-0.17046089E+04	1	1 -LOGLIKE
-0.39219854E+04	1	1 ELSOBJ

Total # Subjects = 28  
Total # Observations = 279

-loglike at initial solution  
after initial stabilization = -1704.6088625882091

Main OPTIF9 optimization for engine 5 terminated  
ITRMCD exit code from OPTIF9 = 1  
1,2,3=probable success,4=maxiterations reached

Starting std error computation

-2LL Hessian inverse std error successful

i	internal par(i)	std. error	rel. std. error
1	0.276831E+05	0.223182E+04	0.080620
2	0.305655E+07	0.815136E+06	0.266685
3	0.160072E+05	0.408402E+04	0.255136
4	0.934983E+05	0.238597E+05	0.255188
5	0.111156E+06	0.133762E+05	0.120337
6	0.212235E+05	0.421109E+04	0.198417
7	-0.247059E-01	0.114009E-01	0.461466
8	-0.140210E+01	0.381477E+00	0.272075
9	0.172296E+01	0.270328E+00	0.156898
10	0.777273E-01	0.341233E-01	0.439013
11	-0.156984E+01	0.442076E+00	0.281605
12	-0.342931E+00	0.151701E+00	0.442364
13	0.176776E+01	0.247251E+00	0.139867
14	0.109080E+01	0.394064E+00	0.361263
15	0.448256E+00	0.271243E-01	0.060511
16	0.582394E-02	0.377574E-02	0.648314
17	0.937732E+00	0.160040E+00	0.170668
18	0.872024E+00	0.144851E+00	0.166109
19	0.493714E+00	0.886871E-01	0.179633
20	0.685832E-01	0.435955E-01	0.635659
21	0.730711E-02	0.512304E-02	0.701103

Standard errors of estimated parameters

internal_coords	Param_val	Hessinv	Sandwich	Score
1	0.276831E+05	0.223182E+04	0.192395E+04	0.673319E+04
2	0.305655E+07	0.815136E+06	0.866155E+06	0.239797E+07
3	0.160072E+05	0.408402E+04	0.624424E+04	0.475476E+04

4	0.934983E+05	0.238597E+05	0.192119E+05	0.805001E+05
5	0.111156E+06	0.133762E+05	0.159945E+05	0.186205E+05
6	0.212235E+05	0.421109E+04	0.311962E+04	0.101803E+05
7	-0.247059E-01	0.114009E-01	0.118292E-02	0.596376E+00
8	-0.140210E+01	0.381477E+00	0.354022E+00	0.123236E+01
9	0.172296E+01	0.270328E+00	0.383587E+00	0.326966E+00
10	0.777273E-01	0.341233E-01	0.583719E-02	0.945907E+00
11	-0.156984E+01	0.442076E+00	0.459944E+00	0.115293E+01
12	-0.342931E+00	0.151701E+00	0.635240E-01	0.122391E+01
13	0.176776E+01	0.247251E+00	0.196924E+00	0.523298E+00
14	0.109080E+01	0.394064E+00	0.419760E+00	0.989361E+00
15	0.448256E+00	0.271243E-01	0.336418E-01	0.381471E-01
16	0.582394E-02	0.377574E-02	0.838928E-03	0.243198E+00
17	0.937732E+00	0.160040E+00	0.185836E+00	0.382713E+00
18	0.872024E+00	0.144851E+00	0.152279E+00	0.381116E+00
19	0.493714E+00	0.886871E-01	0.769431E-01	0.215328E+00
20	0.685832E-01	0.435955E-01	0.132987E-01	0.833214E+00
21	0.730711E-02	0.512304E-02	0.214727E-02	0.107418E+00

external_coords	Param_val	Hessinv	Sandwich	Score
1	0.276831E+05	0.223182E+04	0.192395E+04	0.673319E+04
2	0.305655E+07	0.815136E+06	0.866155E+06	0.239797E+07
3	0.160072E+05	0.408402E+04	0.624424E+04	0.475476E+04
4	0.934983E+05	0.238597E+05	0.192119E+05	0.805001E+05
5	0.111156E+06	0.133762E+05	0.159945E+05	0.186205E+05
6	0.212235E+05	0.421109E+04	0.311962E+04	0.101803E+05
7	-0.247059E-01	0.114009E-01	0.118292E-02	0.596376E+00
8	-0.140210E+01	0.381477E+00	0.354022E+00	0.123236E+01
9	0.172296E+01	0.270328E+00	0.383587E+00	0.326966E+00
10	0.777273E-01	0.341233E-01	0.583719E-02	0.945907E+00
11	-0.156984E+01	0.442076E+00	0.459944E+00	0.115293E+01
12	-0.342931E+00	0.151701E+00	0.635240E-01	0.122391E+01
13	0.176776E+01	0.247251E+00	0.196924E+00	0.523298E+00
14	0.109080E+01	0.394064E+00	0.419760E+00	0.989361E+00
15	0.448256E+00	0.271243E-01	0.336418E-01	0.381471E-01
16	0.339182E-04	0.439794E-04	0.977173E-05	0.283274E-02
17	0.879341E+00	0.300150E+00	0.348528E+00	0.717764E+00
18	0.760425E+00	0.252626E+00	0.265581E+00	0.664684E+00
19	0.243753E+00	0.875720E-01	0.759757E-01	0.212621E+00
20	0.470366E-02	0.597984E-02	0.182414E-02	0.114289E+00
21	0.533939E-04	0.748693E-04	0.313806E-04	0.156984E-02

Engine Convergence Summary:  
Convergence achieved

OPTIF9 ITRMCD value on last iteration = 1  
NLME7 return code= 1

Optimal parameters:

0.27683136E+05	1	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.30565508E+07	2	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.16007238E+05	3	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.93498288E+05	4	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.11115596E+06	5	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.21223484E+05	6	1	THETA	BOUNDS:	-0.100+101	0.100+101
-0.24705900E-01	7	1	THETA	BOUNDS:	-0.100+101	0.100+101
-0.14021015E+01	8	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.17229560E+01	9	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.77727348E-01	10	1	THETA	BOUNDS:	-0.100+101	0.100+101
-0.15698417E+01	11	1	THETA	BOUNDS:	-0.100+101	0.100+101
-0.34293142E+00	12	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.17677641E+01	13	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.10907973E+01	14	1	THETA	BOUNDS:	-0.100+101	0.100+101
0.44825609E+00	1	1	EPS_STD_DEV	BOUNDS:	0.100E-02	0.100+101
0.20093352E+00	1	1	EPS_VARIANCE			

0.33918246E-04	1	1	OMEGA
0.00000000E+00	2	1	OMEGA
0.87934107E+00	2	2	OMEGA
0.00000000E+00	3	1	OMEGA
0.00000000E+00	3	2	OMEGA
0.76042537E+00	3	3	OMEGA
0.00000000E+00	4	1	OMEGA
0.00000000E+00	4	2	OMEGA
0.00000000E+00	4	3	OMEGA
0.24375324E+00	4	4	OMEGA
0.00000000E+00	5	1	OMEGA
0.00000000E+00	5	2	OMEGA
0.00000000E+00	5	3	OMEGA
0.00000000E+00	5	4	OMEGA
0.47036575E-02	5	5	OMEGA
0.00000000E+00	6	1	OMEGA
0.00000000E+00	6	2	OMEGA
0.00000000E+00	6	3	OMEGA
0.00000000E+00	6	4	OMEGA
0.00000000E+00	6	5	OMEGA
0.53393923E-04	6	6	OMEGA
-0.17046094E+04	1	1	-LOGLIKE
-0.39219865E+04	1	1	ELSOBJ
engine runtime (secs) =			1.109
stderr runtime (secs) =			6.844

#### SHRINKAGES

eps-shrinkage	=	0.11931
eta-shrinkage( 1)	=	0.98788
eta-shrinkage( 2)	=	0.12678
eta-shrinkage( 3)	=	0.14688
eta-shrinkage( 4)	=	0.13362
eta-shrinkage( 5)	=	0.87521
eta-shrinkage( 6)	=	0.98909

#### RUNTIMES

engine runtime (secs) =	1.109
stderr runtime (secs) =	6.844

EXITCODE 1