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$PROBLEM AN EXAMPLE EFFECT COMPARTMENT MODEL
;DVID = 0 for dose, 1 for PK, 2 for PD
;CMT = 1 for dose, 2 for PK, 4 for PD
$INPUT ID TIME AMT RATE DV DVID CMT MDV KAI CLI VI

$DATA testdata1.csv IGNORE=@ IGNORE=(DVID.EQ.1)

$SUBROUTINES ADVAN13
$PK
;PK parameters
CL = CLI
V = VI
KA = KAI
S2 = V/1000

;PD parameters
TVEMAX = THETA(1)
EMAX = TVEMAX*EXP(ETA(1))
TVEC50 = THETA(6)
EC50 = TVEC50*EXP(ETA(2))
TVKE0 = THETA(3)
KE0 = TVKE0*EXP(ETA(3))

$DES
CP = A(2)/S2 ;Make sure this uses the scaling factor to be in proper units
CE = A(3)
DADT(1) = -KA*A(1)
DADT(2) = KA*A(1) - CL/V*A(2)
DADT(3) = KE0*(CP - CE)

$ERROR
CEFF = A(3) ;Effect compartment concentration needs to be calculated again
EFF = (EMAX*CEFF)/(EC50 + CEFF) ;Drug effect

IF (DVID.LE.1) THEN
  IPRED = CP
  Y = IPRED*(1+ERR(1)) ;Proportional residual error for drug concentration
ENDIF
IF (DVID.EQ.2) THEN
  IPRED = EFF
  Y = IPRED+ERR(2) ;Additive residual error for effect
ENDIF

$THETA
10 ;EMAX
0.3 ;EC50
0.1 ;KE0

$OMEGA
0.05 ;IIV EMAX
0.05 ;IIV EC50
0 FIX ;IIV KE0

$SIGMA
0.02 FIX ;RUVPROPCP - fixed because PK is not estimated
0.2 ;RUVADDEFF - residual PD error

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