```
.libPaths("~/Rlibs/lib")
library(mrgsolve)
library(ggplot2)
library(dplyr)
library(metrumrg)
library(parallel)
library(knitr)
opts_chunk$set(comment='.',echo=FALSE, message=FALSE)

mod <- mread("opg")
om <- omat(mod)
sg <- smat(mod)

mod %<>% mrgsolve:::collapse_omega() %>% mrgsolve:::collapse_sigma()

est <- c(TVCL=168,TVVC=2800,TVP1=443,TVP2=269,TVQ1=15.5,
         TVQ2=3.02,TVKA=0.0131,TVVMAX=13300,TVKM=6.74,TVFSC=0.0719)

rse <- c(3,2,16,14,16,13,4,13,11,0)
var <- (rse*est/100)^2

estt <- c(TVKSYN=0.864,TVKDEG=0.0204,TVIC50=5.38)
rsee <- c(8,6,21)
varr <- (rsee*estt/100)^2


theta <- c(est,estt)
Sigma <- diag(c(var,varr))
omega <- as.matrix(omat(mod))
sigma <- as.matrix(smat(mod))
dimnames(omega) <- list(NULL,NULL)
dimnames(sigma) <- list(NULL,NULL)
```

Fixed effect estimates:

```
.      Name Estimate     variance
. 1    TVCL 1.68e+02 2.540160e+01
. 2    TVVC 2.80e+03 3.136000e+03
. 3    TVP1 4.43e+02 5.023974e+03
. 4    TVP2 2.69e+02 1.418276e+03
. 5    TVQ1 1.55e+01 6.150400e+00
. 6    TVQ2 3.02e+00 1.541348e-01
. 7    TVKA 1.31e-02 2.745760e-07
. 8  TVVMAX 1.33e+04 2.989441e+06
. 9    TVKM 6.74e+00 5.496740e-01
. 10  TVFSC 7.19e-02 0.000000e+00
. 11 TVKSYN 8.64e-01 4.777574e-03
. 12 TVKDEG 2.04e-02 1.498176e-06
. 13 TVIC50 5.38e+00 1.276448e+00
```

Between subject variability

```
. $...
.          [,1]   [,2]   [,3]   [,4]   [,5]   [,6]  [,7]
. ECL:   0.0391 0.0000 0.0000 0.0000 0.0000 0.0000 0.000
. EVC:   0.0000 0.0102 0.0000 0.0000 0.0000 0.0000 0.000
. EVP1:  0.0000 0.0000 0.0144 0.0000 0.0000 0.0000 0.000
. EVP2:  0.0000 0.0000 0.0000 0.0333 0.0000 0.0000 0.000
. EQ1:   0.0000 0.0000 0.0000 0.0000 0.0379 0.0000 0.000
. EKA:   0.0000 0.0000 0.0000 0.0000 0.0000 0.0457 0.000
. EFSC:  0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.263
.
. $...
.           [,1]   [,2] [,3]
. EKSYN:  0.2810 0.0867 0.00
. EKDEG:  0.0867 0.0325 0.00
. EIC50:  0.0000 0.0000 1.18
```

Residual error

```
. $...
.           [,1]  [,2]
. ADDIV:  0.0193 0.000
. ADDSC:  0.0000 0.733
.
. $...
.            [,1] [,2]
. PDPROP:  0.0407  0.0
. PDADD:   0.0000 20.7
```

Simulation of posterior

```
simpost <- function(n) {
  post <- metrumrg::simpar(n,
                           theta,
                           covar=Sigma,
                           omega=omega,
                           sigma=sigma,
                           odf=100,sdf=1000)
  post <- post %>% as.data.frame
  nam <- names(post)
  nam <- sub(".", "", nam, fixed=TRUE)
  thetas <- which(grepl("TH",nam))
  nam[thetas] <- names(theta)
  nam <- sub("OM", "OMEGA",nam,fixed=TRUE)
  nam <- sub("SG", "SIGMA",nam,fixed=TRUE)
  names(post) <- nam
  post
}
```

```
set.seed(111)
simpost(10)
```

```
.     TVCL TVVC  TVP1  TVP2  TVQ1  TVQ2    TVKA TVVMAX  TVKM  TVFSC TVKSYN
. 1  162.1 2820 430.7 151.8 15.98 2.527 0.01373  13710 7.499 0.0719 1.0060
. 2  162.3 2819 414.2 233.5 19.35 2.711 0.01364  12730 7.093 0.0719 0.8979
. 3  161.1 2811 573.8 321.7 17.77 3.189 0.01308  12760 6.243 0.0719 0.7443
. 4  170.4 2791 470.9 208.0 16.39 2.872 0.01383   9319 6.858 0.0719 0.9131
. 5  171.7 2818 499.5 183.7 15.93 2.543 0.01195  13000 6.456 0.0719 0.8650
. 6  168.1 2834 332.0 312.8 13.40 3.424 0.01303  13540 7.434 0.0719 0.7672
. 7  169.7 2697 436.9 264.6 17.93 3.189 0.01241  10710 6.272 0.0719 0.9510
. 8  171.2 2952 417.5 281.6 19.98 2.531 0.01235  11550 6.667 0.0719 0.8552
. 9  180.5 2811 358.4 245.6 15.80 2.783 0.01356  11660 7.505 0.0719 0.8136
. 10 177.9 2727 468.8 219.7 15.18 3.279 0.01331  12450 7.028 0.0719 0.7803
.     TVKDEG TVIC50 OMEGA11   OMEGA21  OMEGA22   OMEGA31   OMEGA32 OMEGA33
. 1  0.02113  5.135 0.03035 -0.000147 0.009361 -0.004667  0.000778 0.01970
. 2  0.01898  7.014 0.03803 -0.000810 0.009800  0.005436  0.001400 0.01708
. 3  0.02094  5.843 0.04715 -0.003769 0.010780  0.002308 -0.000428 0.01675
. 4  0.02065  6.409 0.04634 -0.000852 0.009886 -0.001207 -0.000068 0.01596
. 5  0.01954  6.996 0.04839  0.003881 0.011650  0.001021 -0.001415 0.01476
. 6  0.01927  4.949 0.04334  0.001410 0.011230 -0.001342 -0.001399 0.01529
. 7  0.01916  5.609 0.04364 -0.000951 0.011180 -0.002380 -0.000016 0.01643
. 8  0.02114  4.469 0.04032  0.001150 0.010960  0.001632 -0.001167 0.01807
. 9  0.02252  5.713 0.04394  0.001132 0.010270  0.000457 -0.000713 0.01775
. 10 0.01997  6.967 0.03735  0.005160 0.013410  0.002755  0.001414 0.01550
.      OMEGA41   OMEGA42   OMEGA43 OMEGA44   OMEGA51   OMEGA52   OMEGA53
. 1   0.001877 -0.001554 -0.000027 0.04174  0.005343  0.000727  0.000136
. 2  -0.000195  0.000482  0.001605 0.03773 -0.001123  0.000773  0.001965
. 3  -0.000746  0.001018 -0.000720 0.03133  0.003579 -0.000850  0.007200
. 4  -0.000568  0.000666  0.001117 0.03274  0.007392 -0.000646  0.004514
. 5  -0.000626 -0.004065 -0.001029 0.04603 -0.009824 -0.000629 -0.001181
. 6  -0.000661 -0.000840  0.007558 0.03961 -0.000265 -0.000534  0.002545
. 7   0.002217 -0.002192  0.001470 0.03024 -0.003398 -0.002396  0.001597
. 8  -0.000175 -0.000571 -0.000954 0.03149  0.002528 -0.000007 -0.000685
. 9   0.005208  0.000247  0.000820 0.03389  0.006394 -0.004547  0.002493
. 10 -0.004048 -0.000763 -0.000446 0.02997  0.009603  0.003392 -0.001004
.      OMEGA54 OMEGA55   OMEGA61   OMEGA62   OMEGA63   OMEGA64   OMEGA65
. 1   0.007865 0.03160  0.000567  0.000324 -0.001055  0.004745 -0.002439
. 2  -0.004322 0.03732  0.000042 -0.003421  0.000153 -0.006376 -0.001418
. 3   0.000749 0.04242  0.000682 -0.001892  0.003572 -0.004848  0.000726
. 4   0.000652 0.04009 -0.005951 -0.000223  0.003469 -0.001024 -0.000659
. 5   0.001860 0.04142  0.000902 -0.000407 -0.000826 -0.005042 -0.003569
. 6  -0.004158 0.03363  0.001254 -0.002300  0.000598  0.001223  0.002232
. 7  -0.000800 0.03894  0.004867  0.004166 -0.003375  0.003496 -0.004146
. 8   0.001462 0.03924  0.000917  0.003114  0.001023 -0.001746 -0.001203
. 9   0.002247 0.04394 -0.005700 -0.000111 -0.004640  0.008052 -0.003072
. 10 -0.010230 0.06161  0.002998  0.001556 -0.001993  0.000527  0.013140
.    OMEGA66   OMEGA71   OMEGA72   OMEGA73   OMEGA74   OMEGA75   OMEGA76
. 1  0.05145 -0.002532  0.002480 -0.007059 -0.009142 -0.004270 -0.005716
. 2  0.04904 -0.016460  0.002800 -0.000516 -0.003484  0.004952  0.002848
. 3  0.05620  0.019060  0.001993 -0.005558 -0.011370  0.018130  0.029910
. 4  0.04962  0.002079  0.002859 -0.000200 -0.001815 -0.013040 -0.015380
. 5  0.04421 -0.027340 -0.003606  0.000022  0.012590  0.016330 -0.017210
```

```
. 6  0.04862  0.014670 -0.005639  0.009244  0.010610  0.003575  0.030540
. 7  0.06270  0.016860  0.000010 -0.014170  0.006331 -0.006276 -0.000133
. 8  0.06430  0.014150  0.003974  0.007074 -0.010040  0.021280 -0.017650
. 9  0.05696 -0.005401 -0.003285  0.005070 -0.001293  0.012580 -0.012570
. 10 0.06587  0.011010  0.004236 -0.013830 -0.002462 -0.002906  0.018520
.    OMEGA77   OMEGA81   OMEGA82   OMEGA83   OMEGA84   OMEGA85   OMEGA86
. 1   0.2595 -0.003323 -0.004208 -0.012850  0.009484 -0.007981 -0.005628
. 2   0.3362  0.016790  0.002710  0.000174  0.004323  0.012320  0.008690
. 3   0.3698 -0.016690  0.001545  0.002945  0.007354  0.018950 -0.002882
. 4   0.2323 -0.004722  0.005804  0.003380  0.005462 -0.009989  0.006848
. 5   0.2839  0.011720  0.008781 -0.000802 -0.026790  0.001935  0.023820
. 6   0.3712  0.011900 -0.005524 -0.004649  0.007558 -0.011920  0.010660
. 7   0.3115  0.003651  0.007634 -0.007320 -0.004657 -0.007816  0.016720
. 8   0.3300  0.011230  0.010690  0.002349 -0.002478  0.000155  0.004045
. 9   0.2980 -0.020450  0.006798  0.005416 -0.010780 -0.017460 -0.000186
. 10  0.2770 -0.011280 -0.004359 -0.001081  0.017160 -0.023540 -0.035860
.     OMEGA87 OMEGA88   OMEGA91   OMEGA92   OMEGA93   OMEGA94   OMEGA95
. 1   0.017400  0.2986 -0.001590 -0.000295 -0.004228  0.001368 -0.002757
. 2   0.008011  0.3203  0.004583  0.000153 -0.000287 -0.002350  0.002330
. 3  -0.054240  0.2884 -0.004101 -0.000931  0.001807  0.002102  0.008261
. 4  -0.013330  0.3286 -0.003141  0.002535  0.000868  0.002581 -0.003425
. 5  -0.011150  0.3821  0.005690  0.004650  0.000102 -0.016160  0.000760
. 6  -0.048100  0.2654  0.005807 -0.001157 -0.000625  0.002908 -0.002919
. 7  -0.001891  0.3127  0.003470  0.001072 -0.001795 -0.000882  0.001647
. 8   0.013350  0.2459  0.005089  0.003496  0.002779  0.001930  0.000987
. 9   0.033520  0.4367 -0.008503  0.002098  0.003089 -0.003784 -0.004513
. 10 -0.033200  0.3430 -0.002692 -0.000577 -0.000256  0.005007 -0.007967
.     OMEGA96   OMEGA97 OMEGA98 OMEGA99  OMEGA101  OMEGA102  OMEGA103
. 1  -0.003597  0.007777 0.09761 0.03878  0.000143  0.002827 -0.002748
. 2   0.002933  0.000886 0.09503 0.03437 -0.009631 -0.011890 -0.018660
. 3  -0.000184 -0.012250 0.09768 0.03858  0.015180  0.007044 -0.010630
. 4   0.004203 -0.005590 0.11100 0.04357  0.023650  0.006986 -0.012670
. 5   0.010130 -0.006560 0.13220 0.05501  0.037020 -0.003671  0.011300
. 6   0.002205 -0.007466 0.08021 0.03039  0.016070  0.003538 -0.003888
. 7   0.001974  0.000784 0.09356 0.03524 -0.015500  0.002724 -0.005691
. 8   0.004481 -0.003442 0.07318 0.02883 -0.008392  0.000914  0.027920
. 9  -0.001116  0.019560 0.13780 0.05042  0.026590  0.016370 -0.022600
. 10 -0.012860 -0.009197 0.10500 0.03753  0.009022  0.004675 -0.011730
.     OMEGA104  OMEGA105  OMEGA106 OMEGA107 OMEGA108  OMEGA109 OMEGA1010
. 1   0.044230  0.002774 -0.016400  0.04446  0.14460  0.036790     1.462
. 2   0.009455 -0.044090 -0.020830 -0.02654  0.01480  0.004273     1.508
. 3   0.001687  0.013840 -0.028600  0.14690 -0.04866 -0.024830     1.479
. 4   0.013240 -0.012240  0.006266 -0.03720  0.06510  0.015520     1.427
. 5  -0.028750 -0.023920  0.015690 -0.08070  0.15190  0.079240     1.322
. 6   0.019140  0.001711  0.013840 -0.04734 -0.01059 -0.006742     1.066
. 7  -0.009024 -0.000031  0.009094  0.01073  0.05711  0.009758     1.058
. 8  -0.005050 -0.010030 -0.030140  0.14040 -0.01732 -0.003927     1.710
. 9   0.049300 -0.065810  0.052290 -0.08807  0.03165 -0.001640     1.454
. 10 -0.007800  0.025410  0.022860  0.03919 -0.04872 -0.022930     1.105
.    SIGMA11   SIGMA21 SIGMA22   SIGMA31   SIGMA32 SIGMA33   SIGMA41
. 1  0.01812  0.000430  0.7735  0.000561  0.001501 0.04109 -0.018460
. 2  0.01957  0.000286  0.7055  0.001262 -0.000234 0.04075 -0.007937
. 3  0.01896  0.000700  0.6970 -0.000842 -0.009558 0.04163 -0.014700
. 4  0.01979 -0.000582  0.7424  0.000620 -0.014310 0.04050  0.016480
```

```
. 5  0.01931 -0.000157  0.7268  0.001570 -0.004815 0.03973  0.007179
. 6  0.01880 -0.003490  0.7358  0.001434 -0.003089 0.04060  0.029510
. 7  0.01902  0.006391  0.7044 -0.000054  0.003521 0.04312  0.000437
. 8  0.01875 -0.003698  0.7547 -0.000908  0.001922 0.04077  0.036400
. 9  0.01958  0.003039  0.7815  0.000357 -0.003758 0.04217  0.009313
. 10 0.01943 -0.004838  0.7048  0.000351 -0.003724 0.04349 -0.033000
.      SIGMA42   SIGMA43 SIGMA44
. 1   0.002667 -0.010460   21.42
. 2   0.124900  0.001838   20.27
. 3  -0.178200  0.046580   21.83
. 4  -0.018730  0.001553   19.91
. 5   0.050810 -0.020520   21.77
. 6   0.096240 -0.010380   21.67
. 7  -0.060050 -0.035380   18.75
. 8  -0.053530 -0.030290   19.19
. 9  -0.315500 -0.020740   19.42
. 10  0.026330 -0.039360   20.61
```

```
if(FALSE) {
  set.seed(22222)
  saveRDS(simpost(1000), file="opgpost.RDS")
}
```

Session Info

```
. R version 3.3.0 (2016-05-03)
. Platform: x86_64-apple-darwin13.4.0 (64-bit)
. Running under: OS X 10.9.5 (Mavericks)
.
. locale:
. [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
.
. attached base packages:
. [1] parallel  grid      stats     grDevices utils     datasets  graphics
. [8] methods   base
.
. other attached packages:
. [1] knitr_1.14          metrumrg_5.57       MASS_7.3-45
. [4] XML_3.98-1.4        lattice_0.20-34     reshape_0.8.5
. [7] dplyr_0.5.0         ggplot2_2.1.0       mrgsolve_0.7.6.9028
.
. loaded via a namespace (and not attached):
.  [1] Rcpp_0.12.7               magrittr_1.5
.  [3] munsell_0.4.3             colorspace_1.2-6
.  [5] R6_2.2.0                  RcppArmadillo_0.7.400.2.0
.  [7] stringr_1.1.0             plyr_1.8.4
.  [9] tools_3.3.0               gtable_0.2.0
. [11] DBI_0.5-1                 htmltools_0.3.5
. [13] yaml_2.1.13               lazyeval_0.2.0
. [15] assertthat_0.1.0.99       digest_0.6.10
. [17] tibble_1.2                formatR_1.4
. [19] evaluate_0.9              rmarkdown_1.0
```

```
. [21] stringi_1.1.1             scales_0.4.0
```