Statistique bayésienne avec R

Exercice méta-analyse

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On s'intéresse à la survenue d'infections chez les prématurés (septicémie), et l'effet d'injection intraveineuse d'immunoglobuline.

```
etude=c('Bussel','Chirico','Clapp','Conway','Fanaroff','Haque','Ratrisawadi','Sandberg','Tanzer','Weisma
annee=c(1990,1987,1989,1990,1994,1986,1991,2000,1997,1994)
sepsis_t=c(20,2,0,8,186,4,10,19,3,40)
total_t=c(61,43,56,34,1204,100,68,40,40,372)
sepsis_c=c(23,8,5,14,209,5,13,13,8,39)
total_c=c(65,43,59,32,1212,50,34,41,40,381)
sepsis=data.frame(etude,annee,sepsis_t,total_t,sepsis_c,total_c)
```

On commence par définir les données

```
data <- list(n=cbind(total_t,total_c),y=cbind(total_t-sepsis_t,total_c-sepsis_c),N=length(etude))
```

puis on définit les initialisations et les modèles

```
inits1 <- list(list(delta = c(NA,.5),alpha=rep(0,10)),list(delta = c(NA,-.5),alpha=rep(0,10)))
library(rjags)
```

```
## Loading required package: coda
```

```
## Linked to JAGS 4.3.0
```

```
## Loaded modules: basemod,bugs
```

```
m1 <- jags.model('Rcode/metaanalyse.txt', data = data, inits = inits1, n.chains = 2, quiet=TRUE)
```

```
inits2 <- list(list(delta = 0,sd.mu=5,alpha=rep(0,10)),list(delta = -0.5,sd.mu=2,alpha=rep(0,10)))
library(rjags)
m2 <- jags.model('Rcode/metaanalyse2.txt', data = data, inits = inits2, n.chains = 2, quiet=TRUE)
```

Puis on lance les itérations MCMC

```
update(m1, 3000,progress.bar="none")
mcmc1 <- coda.samples(m1, variable.names = c("delta","alpha"), n.iter = 2000,progress.bar="none")
update(m2, 3000,progress.bar="none")
mcmc2 <- coda.samples(m2, variable.names = c("delta","alpha"), n.iter = 2000,progress.bar="none")
```

On peut alors comparer les critères DIC (il faudrait au préalable vérifier la convergence des chaines)

```
dic.samples(m1,n.iter=1000)
```

```
## Mean deviance:  115.7
## penalty 11.24
## Penalized deviance: 127
```

```
dic.samples(m2,n.iter=1000)
```

```
## Mean deviance:  102.7
## penalty 17.2
## Penalized deviance: 119.9
```

qui est meilleur pour le modèle à effets aléatoires

```
summary(mcmc1)
```

```
##
## Iterations = 4001:6000
## Thinning interval = 1
## Number of chains = 2
## Sample size per chain = 2000
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##              Mean      SD Naive SE Time-series SE
## alpha[1]   0.7738 0.18988 0.003002       0.004421
## alpha[2]   2.1732 0.34556 0.005464       0.006783
## alpha[3]   3.2912 0.46520 0.007355       0.009831
## alpha[4]   0.8080 0.28076 0.004439       0.006046
## alpha[5]   1.7406 0.07085 0.001120       0.002394
## alpha[6]   2.8740 0.35791 0.005659       0.007339
## alpha[7]   1.3182 0.24144 0.003817       0.004834
## alpha[8]   0.5418 0.23977 0.003791       0.005001
## alpha[9]   1.9835 0.34238 0.005413       0.007217
## alpha[10]  2.2589 0.12521 0.001980       0.003082
## delta[1]   0.0000 0.00000 0.000000       0.000000
## delta[2]  -0.2056 0.08752 0.001384       0.003165
##
## 2. Quantiles for each variable:
##
##               2.5%     25%     50%     75%    97.5%
## alpha[1]   0.40665  0.6470  0.7703  0.8976  1.15093
## alpha[2]   1.52770  1.9304  2.1643  2.3884  2.88271
## alpha[3]   2.46551  2.9622  3.2654  3.5868  4.30338
## alpha[4]   0.28398  0.6170  0.7994  0.9917  1.38195
## alpha[5]   1.59980  1.6936  1.7405  1.7882  1.87812
## alpha[6]   2.24510  2.6248  2.8550  3.0982  3.63063
## alpha[7]   0.85733  1.1573  1.3139  1.4674  1.82693
## alpha[8]   0.07076  0.3822  0.5400  0.7025  1.00901
## alpha[9]   1.35648  1.7439  1.9714  2.2025  2.69437
## alpha[10]  2.01439  2.1760  2.2579  2.3415  2.51198
## delta[1]   0.00000  0.0000  0.0000  0.0000  0.00000
## delta[2]  -0.37875 -0.2637 -0.2058 -0.1465 -0.02615
```

```
summary(mcmc2)
```

```
##
## Iterations = 4001:6000
## Thinning interval = 1
## Number of chains = 2
## Sample size per chain = 2000
```

```
##
## 1. Empirical mean and standard deviation for each variable,
##    plus standard error of the mean:
##
##              Mean      SD Naive SE Time-series SE
## alpha[1]   0.7835 0.27216 0.004303       0.009663
## alpha[2]   2.7038 0.57183 0.009041       0.025192
## alpha[3]   3.9647 0.78474 0.012408       0.037101
## alpha[4]   1.1042 0.35877 0.005673       0.012427
## alpha[5]   1.7095 0.08137 0.001287       0.002834
## alpha[6]   3.1470 0.44129 0.006977       0.012402
## alpha[7]   1.6570 0.31094 0.004916       0.009932
## alpha[8]   0.2834 0.30855 0.004879       0.010199
## alpha[9]   2.3698 0.47367 0.007489       0.018026
## alpha[10]  2.1586 0.16644 0.002632       0.005689
## delta     -0.5539 0.32663 0.005164       0.011698
##
## 2. Quantiles for each variable:
##
##              2.5%      25%     50%     75%   97.5%
## alpha[1]   0.2591  0.59939  0.7855  0.9700 1.31736
## alpha[2]   1.7298  2.30223  2.6587  3.0345 3.96679
## alpha[3]   2.7208  3.41698  3.8759  4.4278 5.77828
## alpha[4]   0.4211  0.85926  1.0900  1.3410 1.82455
## alpha[5]   1.5519  1.65411  1.7079  1.7636 1.86773
## alpha[6]   2.3462  2.84460  3.1243  3.4247 4.08703
## alpha[7]   1.1096  1.43860  1.6444  1.8627 2.30798
## alpha[8]  -0.3322  0.07519  0.2807  0.5009 0.87281
## alpha[9]   1.5179  2.04198  2.3437  2.6573 3.40946
## alpha[10]  1.8488  2.04453  2.1515  2.2711 2.49119
## delta     -1.2929 -0.74425 -0.5260 -0.3495 0.01568
```