Qbild

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How to get Qbild?

- Download the qbldcpp folder from the **GitHub repo**,
- Run the following commands :-
  - R CMD build qbild
  - R CMD install qbildcpp_1.0.tar.gz

After finishing the steps:

Load and Manipulate Data

```
library(qbild)
library(knitr)

set.seed(10)

###############
## Loading and manipulation of the data set
###############

data <- readRDS("~/airpollution.rda")

## extract names for fixed variables, to be used in plots/summary
names_fixed <- names(data[,3:5])

### response variable, check that we have 4 outcomes per id
y = matrix(data[,2],nrow=4) ## y is of the form m*n, here m = 4

### for numeric entries
x1 = matrix(data[,3],nrow=4)
x3 = matrix(data[,5],nrow=4)

### for factor entries, convert to numeric
data[,4] = as.numeric(levels(data[,4]))[data[,4]]
x2 = matrix(data[,4],nrow=4)

fixed = cbind(x1,x2,x3) #of the form m*kn; where k is the number of covariates

##### if no random(fixed) covariates present, add an intercept matrix as follows
random = matrix(1,nrow=4,ncol=ncol(y)) #of the form m*ln; where k is the number of covariates
```

```
##Set Parameters
nsim = 5000
p = 0.25 ##default for the sampler as well
fixed_intercept = TRUE #add the column of 1s to model matrix
random_intercept = FALSE #already added as a matrix

### Note : b0, B0, c1, d1 are set by default and need not be specified
#### Burn is set to 0 buy default
### Summarize prints the summary and is TRUE by default
#### Method defaults to blocked, and uses regex to avoid issues with capitalizations
```

Blocked

Running the sampler

```
time_a = Sys.time()
out <- model.qbld(nsim=nsim, p=p, y=y, fixed=fixed, random=random,
                  fixed_intercept=fixed_intercept,
                  random_intercept=random_intercept, method = "block",
                  summarize = TRUE, names_fixed=names_fixed)
```

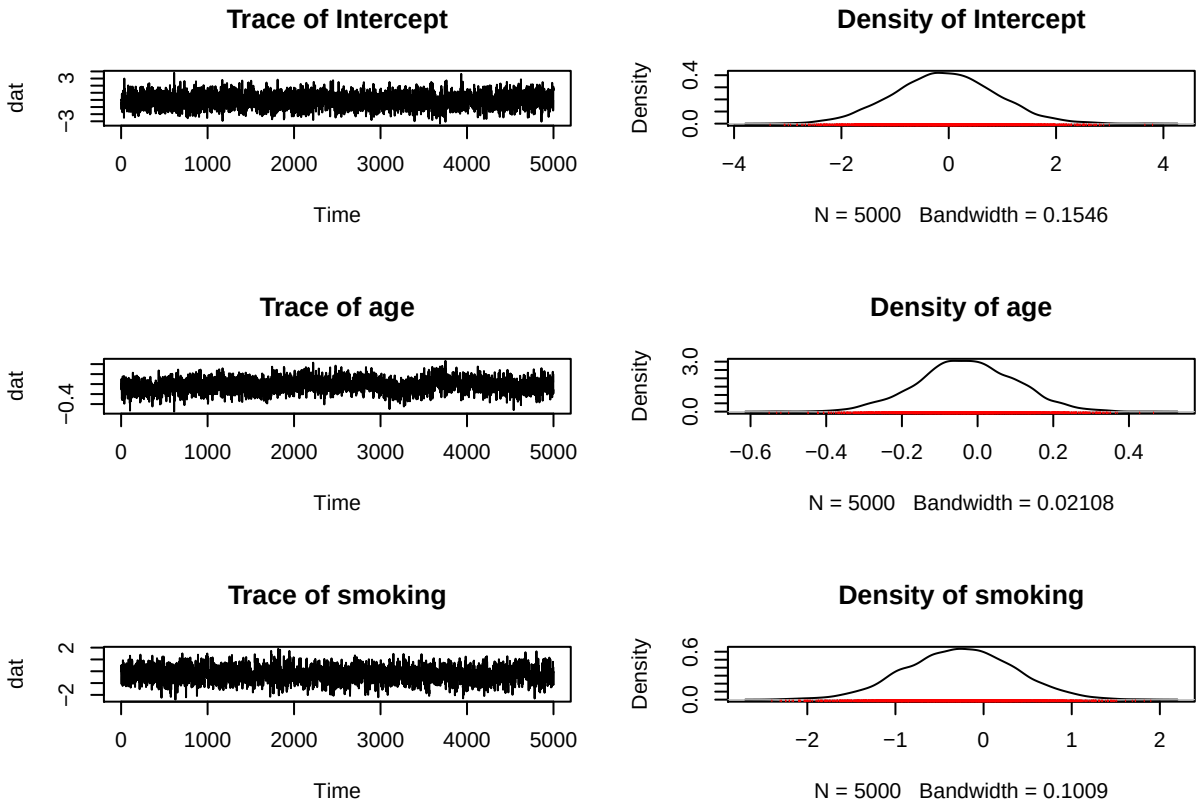
```
##
## Quantile used = 0.25
##
## No. of Iterations = 5000 samples
## Type of Sampler = block
## Burn-in Used? = FALSE
##
## 1. Statistics for each variable,
##            Mean   SD     ESS GR Diagnostic  MCSE
## Intercept -0.07 0.94 2200.83         1.001 0.020
## age       -0.03 0.13  170.05         1.002 0.010
## smoking   -0.27 0.62 1589.78         1.000 0.015
## counts    -0.21 0.09    8.95         1.015 0.029
## Varphi2    1.01 0.43  775.13         1.000 0.015
##
##
## 2. Quantiles for each variable,
##             2.5%    25%    50%    75%  97.5%
## Intercept -1.917 -0.715 -0.079  0.549  1.798
## age       -0.286 -0.112 -0.028  0.060  0.227
## smoking   -1.479 -0.685 -0.266  0.145  0.923
## counts    -0.379 -0.270 -0.227 -0.140 -0.054
## Varphi2    0.454  0.715  0.918  1.206  2.125
##
## MultiESS value = 848.3944 775.1308
##
## 3. Model Selection Criterion
## Log likelihood = -76.98894
## AIC = 163.9779
## BIC = 180.3175
```

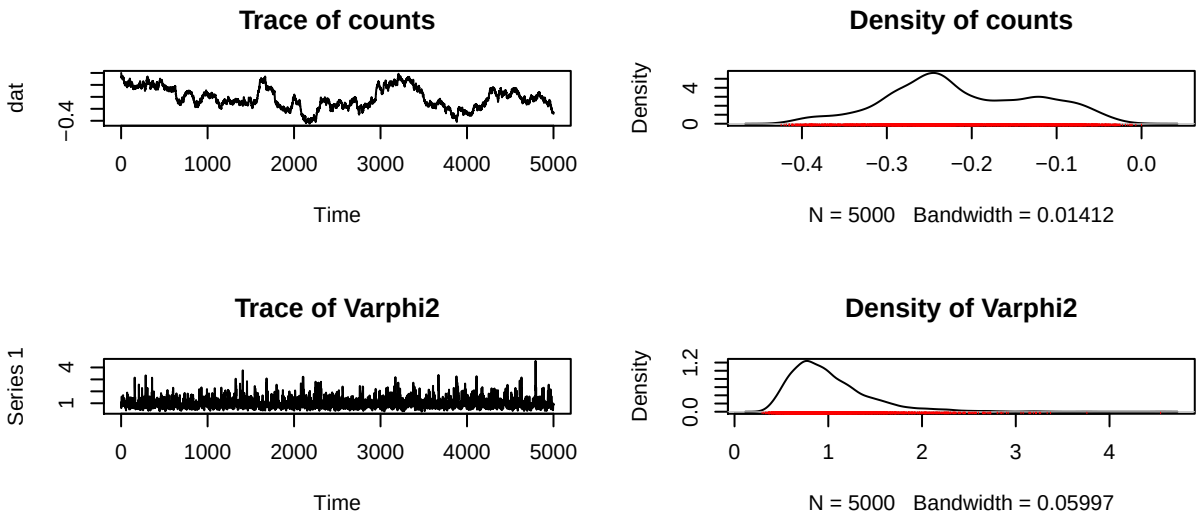
```
time_b = Sys.time()
paste0("Time elapsed = ",round(time_b-time_a,2)," sec")
```

```
## [1] "Time elapsed = 2.83 sec"
```

Plotting the output

```
plot(out) #rugplot allows for coda type points concentration
```





Unblocked

Running the sampler

```
time_a = Sys.time()
out2 <- model.qbld(nsim=nsim, p=p, y=y, fixed=fixed, random=random,
                   fixed_intercept=fixed_intercept,
                   random_intercept=random_intercept, method = "Unblock",
                   summarize = TRUE,names_fixed = NULL) #names not added and will be auto generated
```

```
##
## Quantile used = 0.25
##
## No. of Iterations = 5000 samples
## Type of Sampler = Unblock
## Burn-in Used? = FALSE
##
## 1. Statistics for each variable,
##             Mean   SD     ESS GR Diagnostic  MCSE
## Intercept -0.10 0.94 2121.70         1.000 0.020
## beta1     -0.01 0.13  295.38         1.005 0.007
## beta2     -0.30 0.62  363.39         1.002 0.032
## beta3     -0.24 0.07    5.66         1.043 0.031
## Varphi2    1.02 0.44  675.02         1.001 0.017
##
```

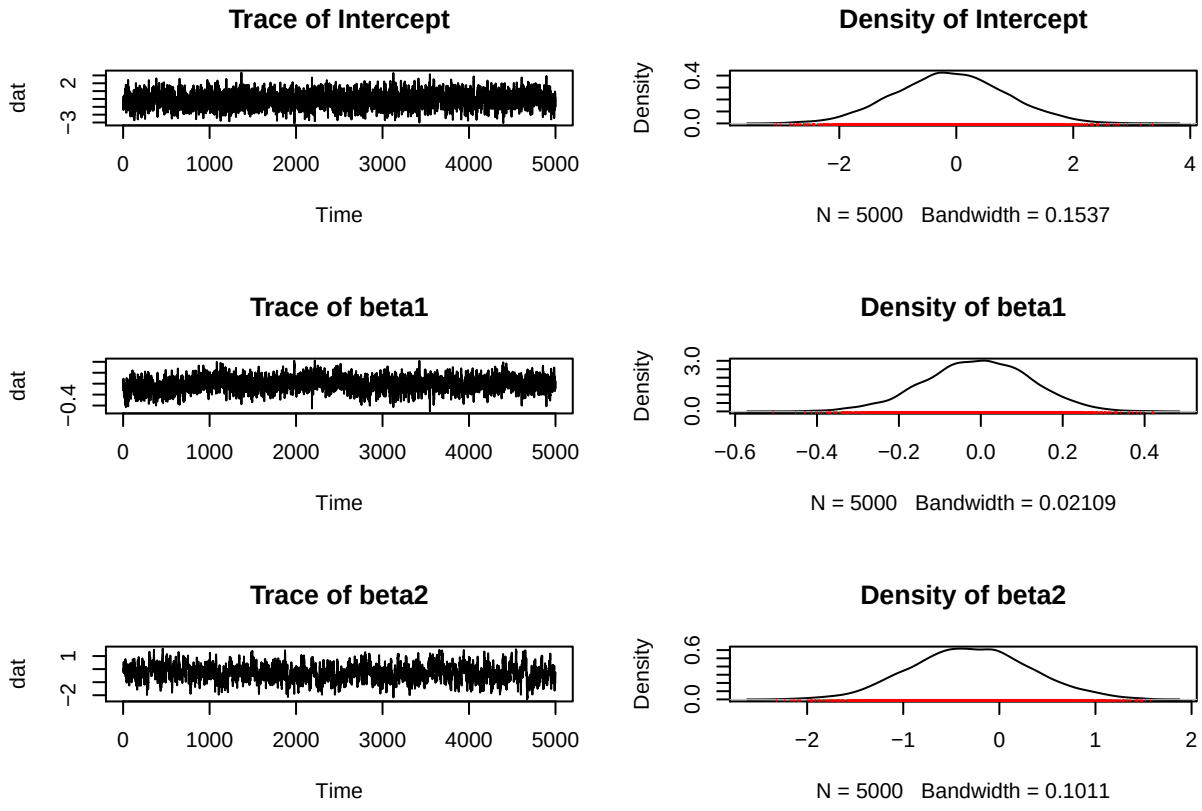
```
##
## 2. Quantiles for each variable,
##              2.5%    25%    50%    75%  97.5%
## Intercept -1.911 -0.735 -0.109  0.532  1.752
## beta1     -0.270 -0.093 -0.006  0.081  0.237
## beta2     -1.481 -0.720 -0.300  0.115  0.932
## beta3     -0.369 -0.296 -0.248 -0.193 -0.077
## Varphi2    0.458  0.715  0.917  1.221  2.132
##
## MultiESS value = 351.2343 675.0183
##
## 3. Model Selection Criterion
## Log likelihood = -77.13456
## AIC = 164.2691
## BIC = 180.6087
```

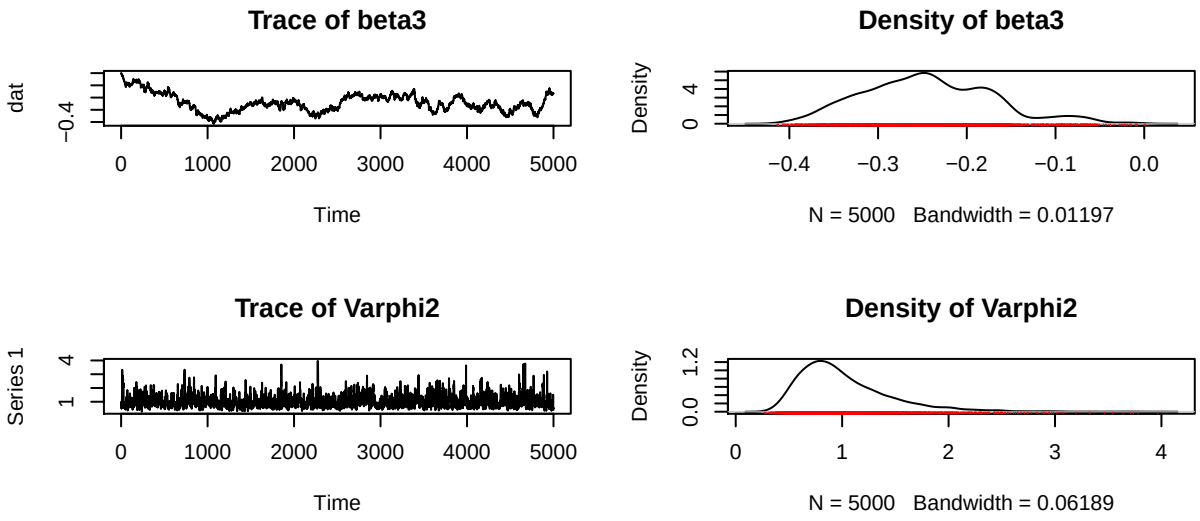
```
time_b = Sys.time()
paste0("Time elapsed = ",round(time_b-time_a,2)," sec")
```

```
## [1] "Time elapsed = 1.63 sec"
```

Plotting the output

```
plot(out2)  #rugplot allows for coda type points concentration
```



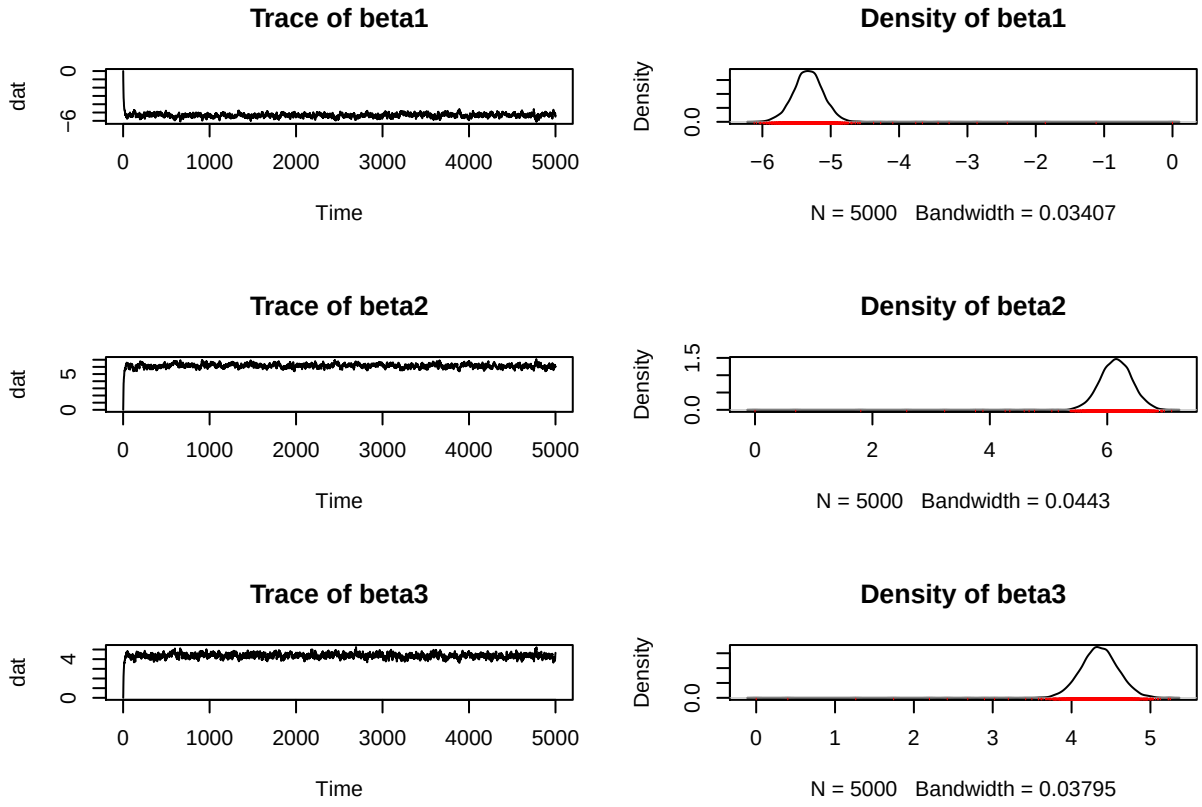


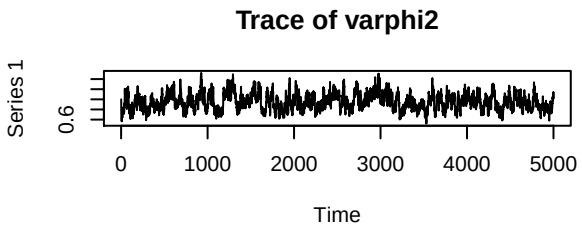

```
### load an exisiting run and try summary/plot on it
run25 <- readRDS("~/Desktop/gsoc_qbld/Testing/run25.rds")
run25[[1]] = t(run25[[1]])

### make a qbld object out of existing object
out3 <- make.qbld(run25,p=0.25,nsim=5000,burn=0,
        varnames.fixed = c("beta1","beta2","beta3","varphi2")
        ,which="blocked")

summary(out3) ##AIC,BIC,loglike missing as cannot be calculated
```

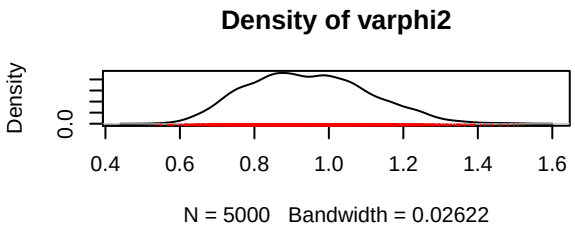
```
##
## Quantile used = 0.25
##
## No. of Iterations = 5000 samples
## Type of Sampler = blocked
## Burn-in Used? = FALSE
##
## 1. Statistics for each variable,
##          Mean   SD    ESS GR Diagnostic  MCSE
## beta1   -5.32 0.25 291.05         1.002 0.015
## beta2    6.15 0.31 231.76         1.002 0.020
## beta3    4.35 0.26 307.26         1.001 0.015
## varphi2  0.95 0.16 149.84         1.004 0.013
##
```

```
##
## 2. Quantiles for each variable,
##           2.5%    25%    50%    75%  97.5%
## beta1   -5.763 -5.467 -5.329 -5.188 -4.901
## beta2    5.613  5.970  6.153  6.333  6.672
## beta3    3.889  4.198  4.352  4.508  4.816
## varphi2  0.667  0.827  0.937  1.056  1.266
##
## MultiESS value = 500.9752 149.8425
```

```
plot(out3)
```




Trace of varphi2
Series 1
0.6
0
1000
2000
3000
4000
5000
Time


Density of varphi2
Density
0.0
0.4
0.6
0.8
1.0
1.2
1.4
1.6
N = 5000 Bandwidth = 0.02622