

Beta_p estimations vs rq() coefficients on mtcars

mtcars Dataset

The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973–74 models).

```
head(mtcars)
```

```
##           mpg cyl  disp  hp  drat    wt  qsec vs  am  gear  carb
## Mazda RX4      21.0   6  160  110 3.90 2.620 16.46 0   1    4    4
## Mazda RX4 Wag  21.0   6  160  110 3.90 2.875 17.02 0   1    4    4
## Datsun 710      22.8   4  108   93 3.85 2.320 18.61 1   1    4    1
## Hornet 4 Drive  21.4   6  258  110 3.08 3.215 19.44 1   0    3    1
## Hornet Sportabout 18.7   8  360  175 3.15 3.440 17.02 0   0    3    2
## Valiant        18.1   6  225  105 2.76 3.460 20.22 1   0    3    1
```

Model: $\text{mpg} \sim \text{cyl} + \text{drat} + \text{vs}$

Data types: mpg: Real data, Miles/(US) gallon
cyl: Integer/Count data, number of cylinders
drat: Real data, Rear axle ratio
vs: Binary data, Engine (0 = V-shaped, 1 = straight)

Quantreg

```
rqfit <- rq(mpg ~ cyl+drat+vs, data = mtcars, tau = quantiles)
summary(rqfit)
```

```
## Warning in rq.fit.br(x, y, tau = tau, ci = TRUE, ...): Solution may be nonunique
```

```
##
## Call: rq(formula = mpg ~ cyl + drat + vs, tau = quantiles, data = mtcars)
##
## tau: [1] 0.1
##
## Coefficients:
##           coefficients lower bd  upper bd
## (Intercept)  20.10375    13.58876   85.29796
## cyl         -2.54063    -4.71292   -1.36945
## drat          3.62500   -10.81283    4.40818
## vs          -1.85375    -3.00296    5.83125
```

```
##
## Call: rq(formula = mpg ~ cyl + drat + vs, tau = quantiles, data = mtcars)
##
## tau: [1] 0.5
##
## Coefficients:
##      coefficients lower bd upper bd
## (Intercept) 34.74953      9.74342 42.26316
## cyl        -2.66449     -3.01620 -1.14358
## drat         0.56075     -0.67615  4.67960
## vs          -1.76075     -3.03684  2.16945
##
## Call: rq(formula = mpg ~ cyl + drat + vs, tau = quantiles, data = mtcars)
##
## tau: [1] 0.9
##
## Coefficients:
##      coefficients lower bd upper bd
## (Intercept) -3.53871    -51.55192  89.33789
## cyl          0.23952     -7.75896   2.11267
## drat         6.45161     -2.65866  16.07341
## vs          8.65806    -13.09164   9.45551
```

Beta_p estimations vs rq() coefficients

The plot titles are formatted as (sampling method)(*quantile*)(error distribution)_(beta_p). The histograms are the beta_p estimations yielded by the paper's model. The red horizontal line reflects rq() beta coefficients. The absence of red lines in some plots reflects big difference in our beta_p estimations and the rq() results.

Notations:

GWS: Gibbs sampler of the asymmetric Laplace distribution (ALD) with Scale parameter

GWOS: Gibbs sampler of the asymmetric Laplace distribution (ALD) without Scale parameter

stdN: Standard Normal Prior

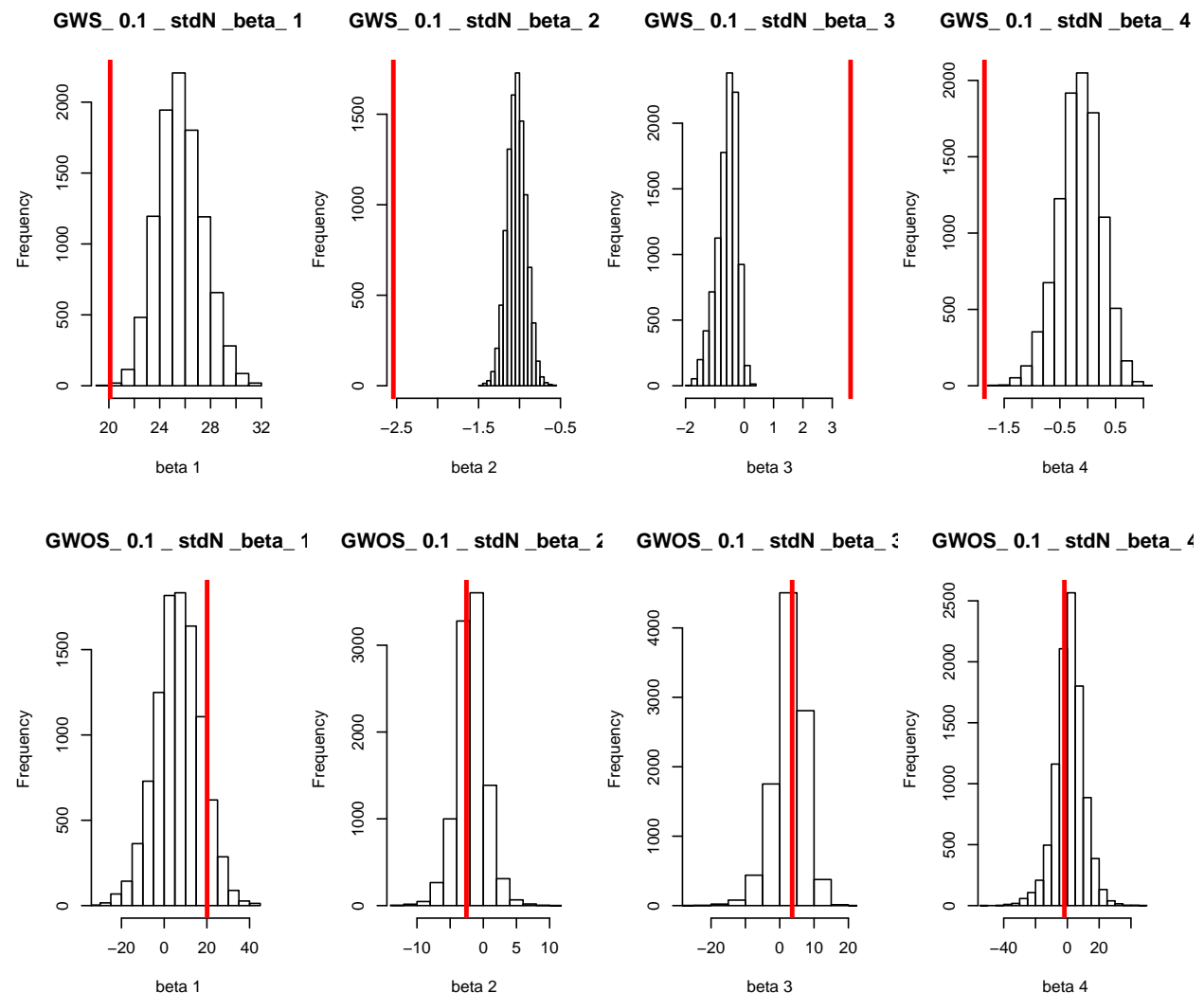
beta_1: Intercept

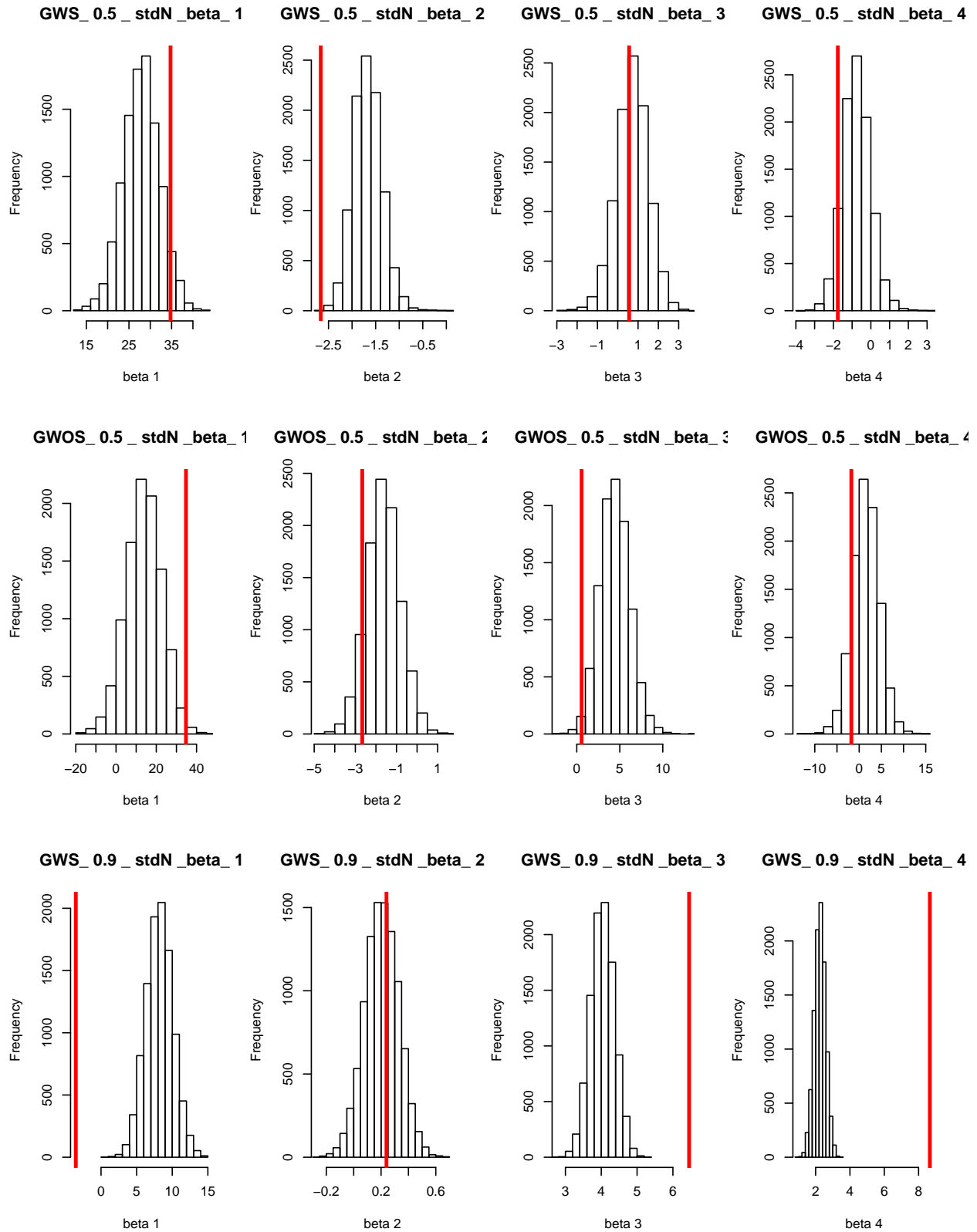
beta_2: Regression coefficient associated with cyl

beta_3: Regression coefficient associated with drat

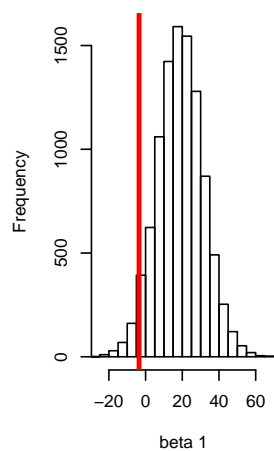
beta_4: Regression coefficient associated with vs

Histograms

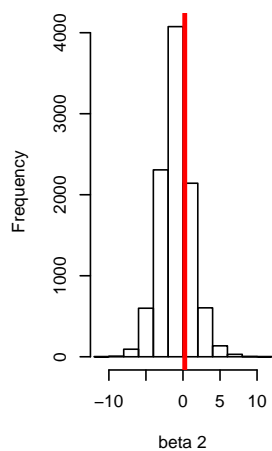




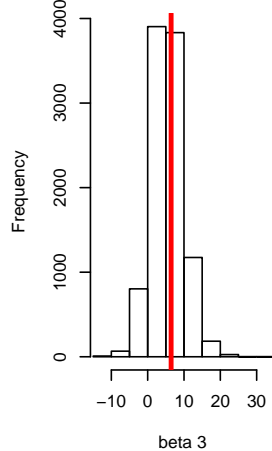
GWOS_0.9_stdN_beta_1



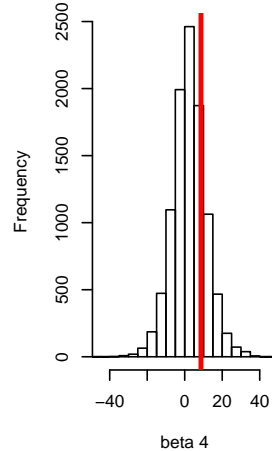
GWOS_0.9_stdN_beta_2



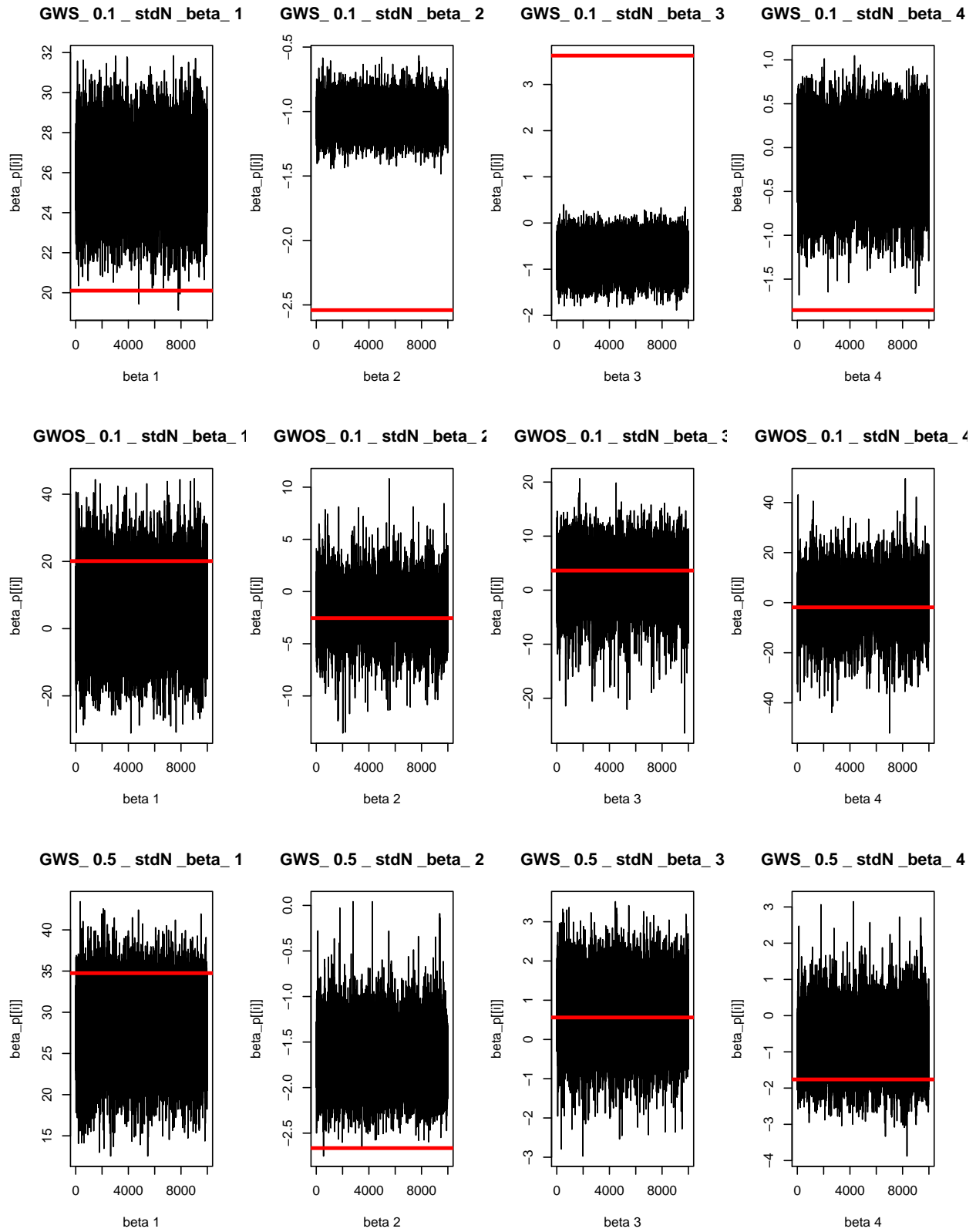
GWOS_0.9_stdN_beta_3



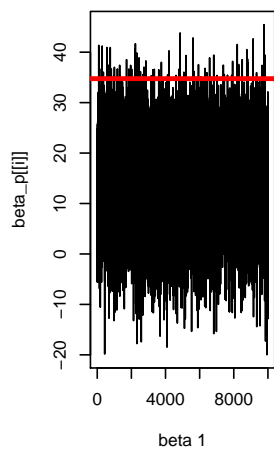
GWOS_0.9_stdN_beta_4



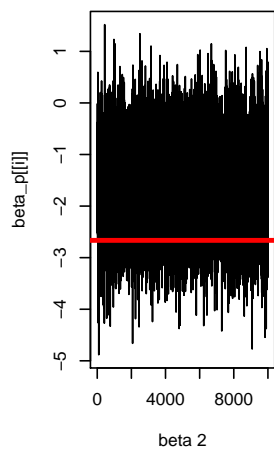
Traceplots



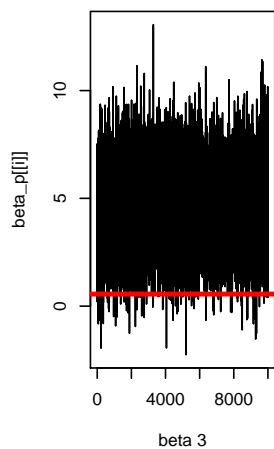
GWOS_0.5_stdN_beta_1



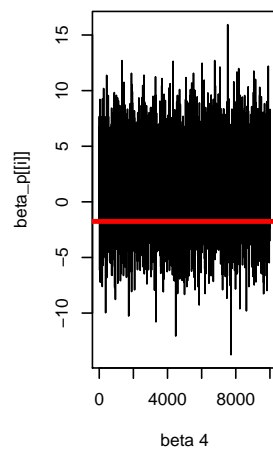
GWOS_0.5_stdN_beta_2



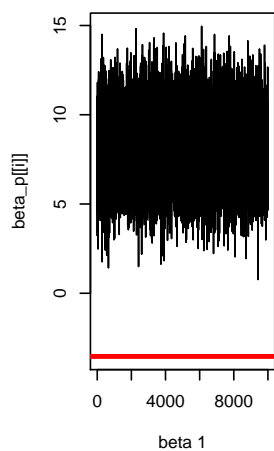
GWOS_0.5_stdN_beta_3



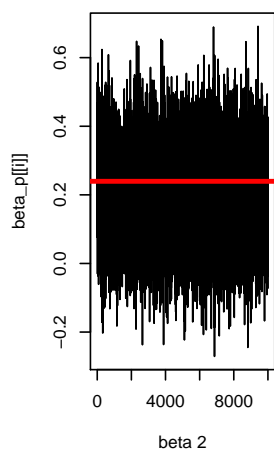
GWOS_0.5_stdN_beta_4



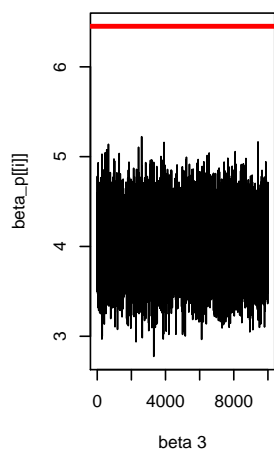
GWS_0.9_stdN_beta_1



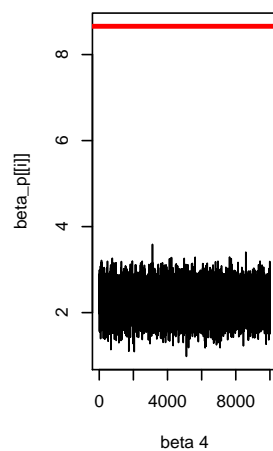
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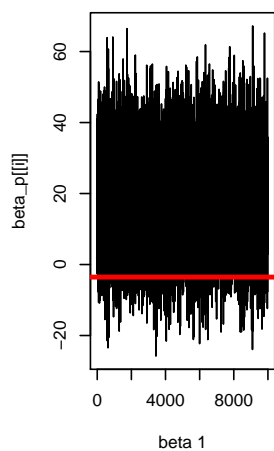
GWS_0.9_stdN_beta_3



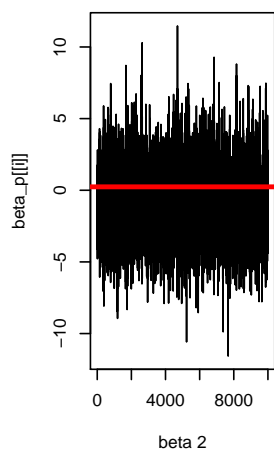
GWS_0.9_stdN_beta_4



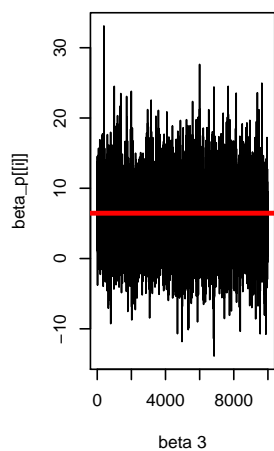
GWOS_0.9_stdN_beta_1



GWOS_0.9_stdN_beta_2



GWOS_0.9_stdN_beta_3



GWOS_0.9_stdN_beta_4

