MCMC Diagnostics - Extension to results from 4/28

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04/30/2020

```
K <- 7
Ti <- 3
N <- 1973
fit <- fit_ifls
```

Individual Parameter Diagnostics

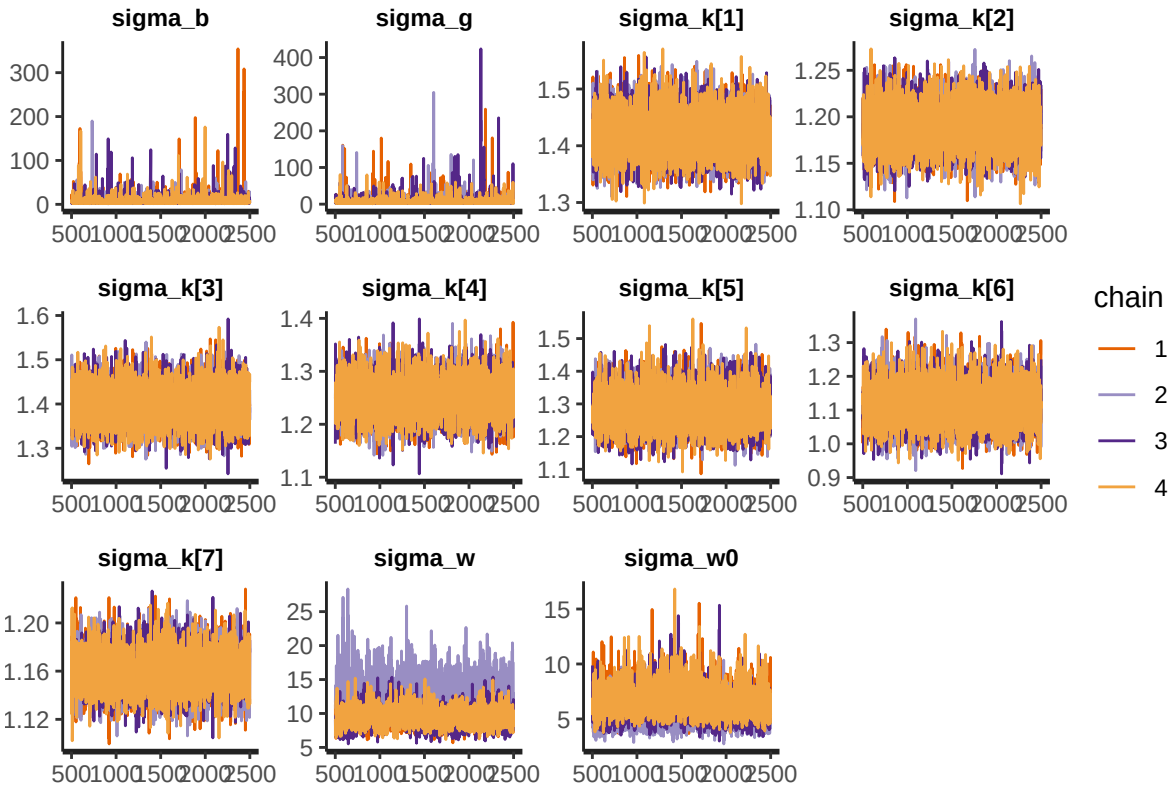
Reduce posterior to only runs where the absolute value of β is greater than 30.

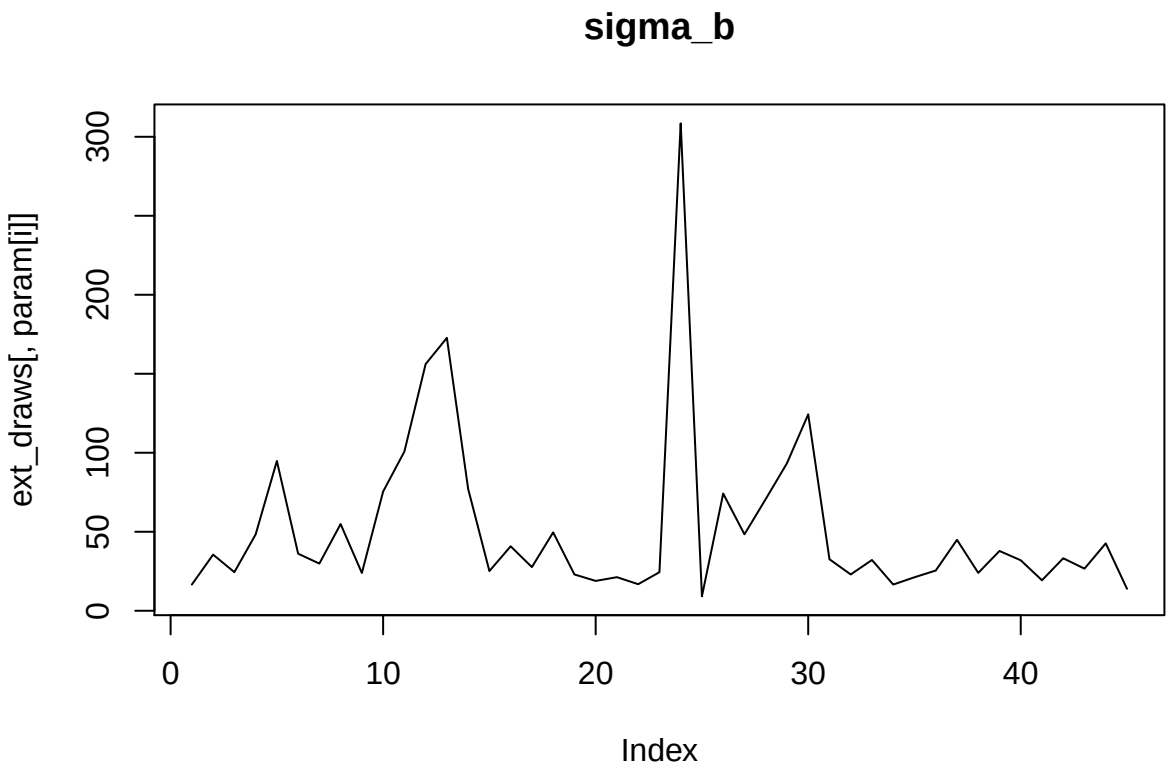
Individual parameter plots. Autocorrelation and trace plots for individual parameters, and histograms of posterior medians for group parameters.

```
get_single_plots <- function(fit, param) {
  print(fit_summ[param,c(1,2,3,5,6,7,9,10)])
  print(rstan::traceplot(fit, pars = param))
  len <- length(param)
  for (i in 1:len) {
    title = param[i]
    print(plot(ext_draws[,param[i]], type = "l", main = title))
  }
}
get_aggreg_plots <- function(fit, param, trim = F, trim_amount) {
  ind <- grep(paste0("^",param), rownames(as.data.frame(summary(fit)$summary)))
  medians <- data.frame(avg = as.data.frame(summary(fit)$summary)$`50%`[ind])
  print(paste0("Summary statistics for posterior medians of ",param))
  print(summary(medians))
  title <- paste0("Posterior Medians of ",param)
  print(ggplot(medians, aes(x = avg)) + geom_histogram(bins = 60) + ggtitle(title))
  get_median <- function(x) {return(median(x))}
  ext_medians <- data.frame(med = apply(ext_draws[,ind], 2, get_median))
  title <- paste0("Extreme Posterior Medians of ",param)
  print(ggplot(ext_medians, aes(x = med)) + geom_histogram(bins = 60) + ggtitle(title))
}
plot_fit <- function(fit) {
  get_single_plots(fit, sigma_params)
  get_single_plots(fit, beta)
  get_single_plots(fit, gamma)
  get_aggreg_plots(fit, "w")
  get_aggreg_plots(fit, "z")
  get_aggreg_plots(fit, "p")
}
plot_fit(fit)
```

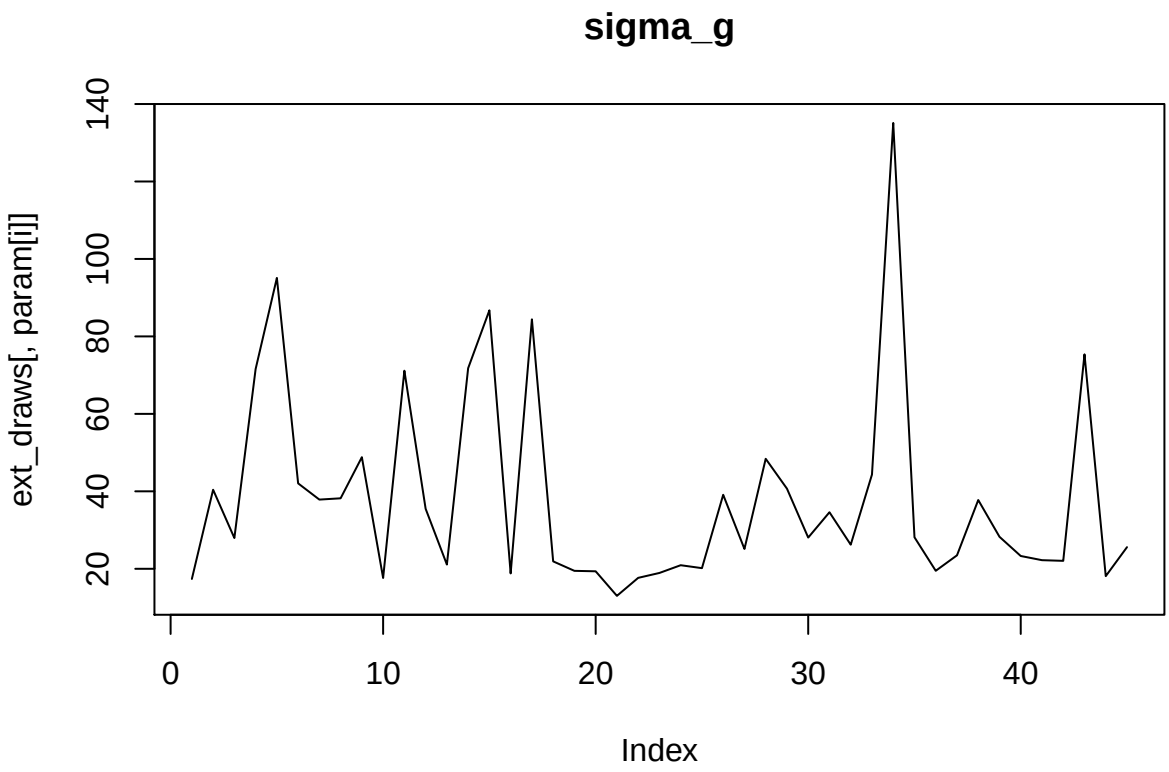
```
##                mean      se_mean          sd      25%      50%       75%
## sigma_b     8.314664 0.2918638496 12.81391537 3.545753 5.264778  8.688576
## sigma_g     8.357811 0.2906642964 13.28265065 3.568838 5.234731  8.536570
```

```
## sigma_k[1]  1.422215 0.0003398700  0.03794483 1.395131 1.421367  1.448125
## sigma_k[2]  1.189243 0.0002134336  0.02320545 1.173678 1.189065  1.204595
## sigma_k[3]  1.398187 0.0003944494  0.04203025 1.369180 1.397122  1.425761
## sigma_k[4]  1.250496 0.0003116472  0.03609410 1.225386 1.249602  1.274763
## sigma_k[5]  1.285736 0.0005065962  0.05768392 1.246474 1.283710  1.322412
## sigma_k[6]  1.113591 0.0005490045  0.05870945 1.072902 1.111252  1.150320
## sigma_k[7]  1.160930 0.0001376492  0.01674052 1.149855 1.160902  1.171844
## sigma_w    10.433608 1.4439786089  2.60067841 8.586274 9.765307 11.620508
## sigma_w0    6.093449 0.4363687010  1.42587796 5.099852 5.894089  6.884969
##                   n_eff      Rhat
## sigma_b     1927.538628 1.0026289
## sigma_g     2088.267469 1.0018472
## sigma_k[1] 12464.634787 0.9999229
## sigma_k[2] 11821.003498 0.9997961
## sigma_k[3] 11353.801207 0.9998636
## sigma_k[4] 13413.622737 0.9999199
## sigma_k[5] 12965.392338 0.9998369
## sigma_k[6] 11435.736398 1.0002203
## sigma_k[7] 14790.743961 0.9996603
## sigma_w        3.243783 1.5827018
## sigma_w0      10.677204 1.1183971
```

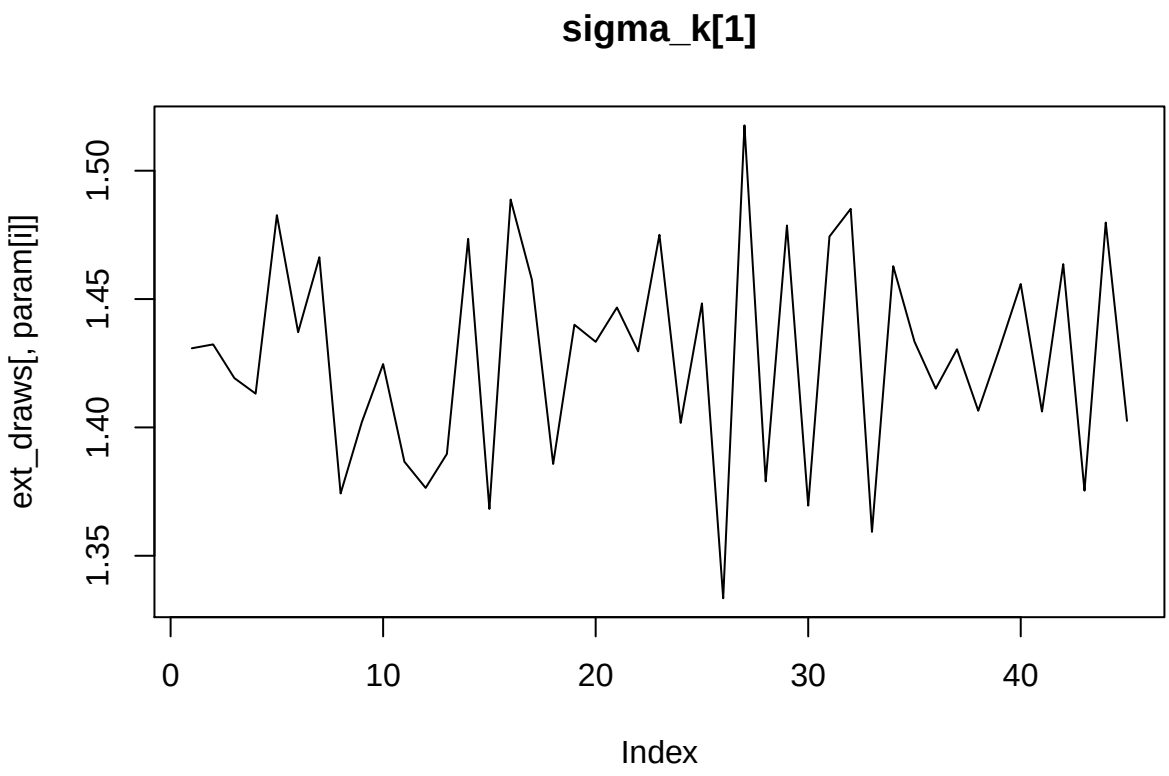



sigma_b
ext_draws[, param[i]]
0
50
100
200
300
0
10
20
30
40
Index

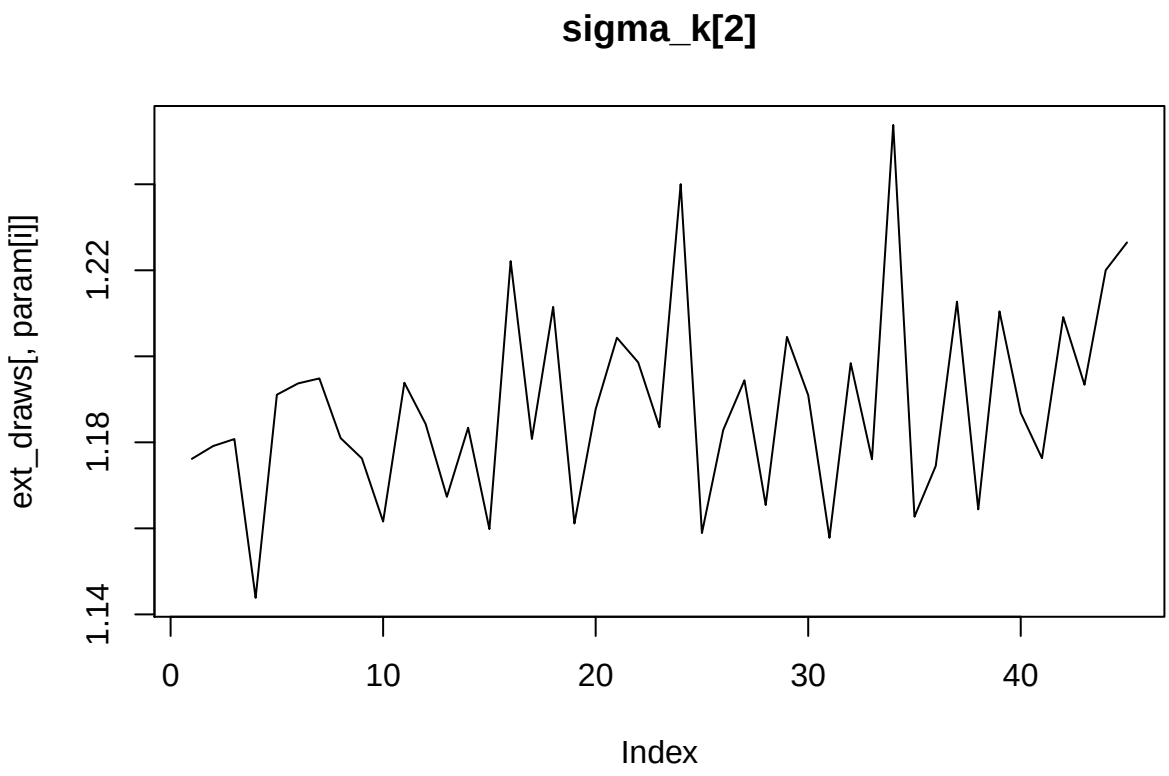
```
## NULL
```


sigma_g
ext_draws[, param[i]]
20
40
60
80
100
140
0
10
20
30
40
Index

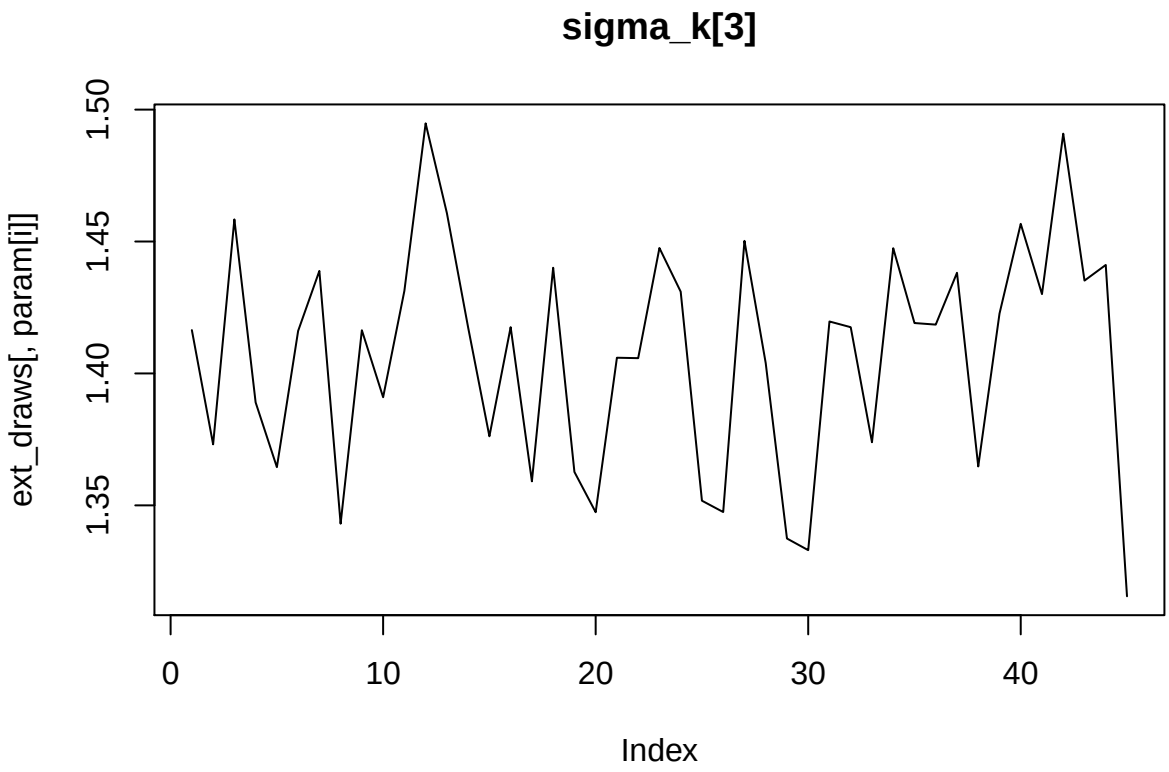
```
## NULL
```


sigma_k[1]
ext_draws[, param[i]]
1.35
1.40
1.45
1.50
0
10
20
30
40
Index

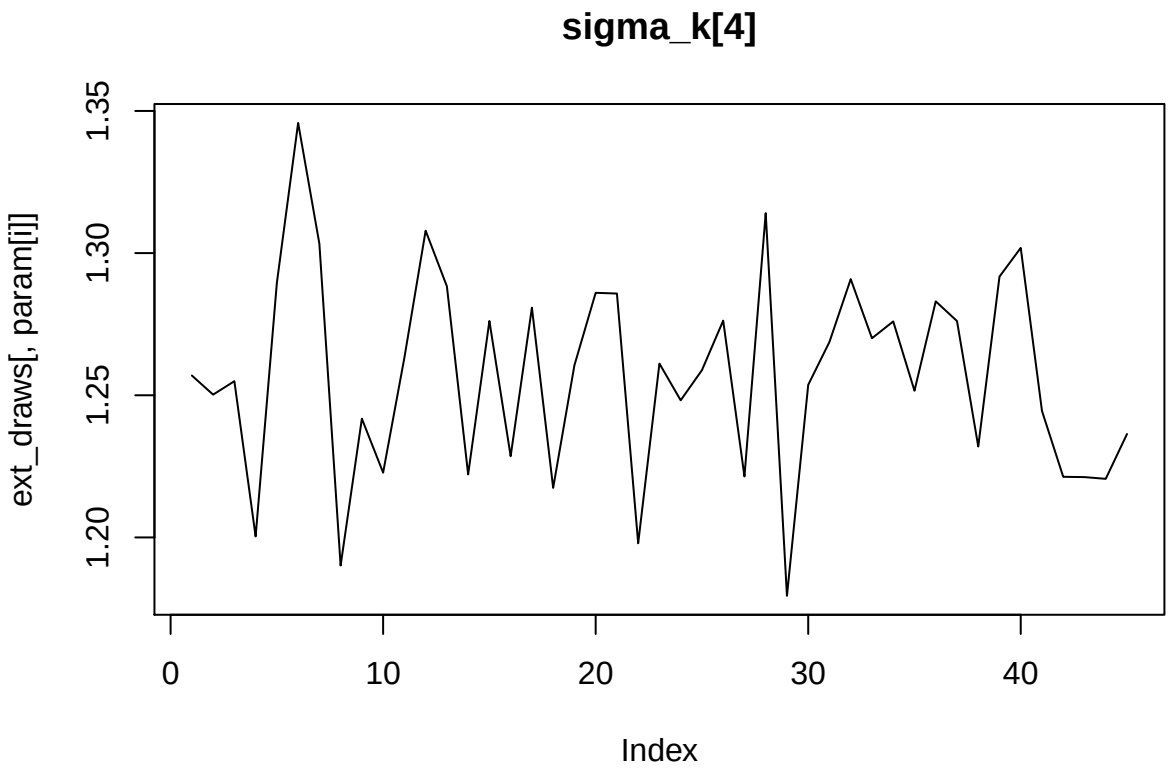
```
## NULL
```


sigma_k[2]
ext_draws[, param[i]]
1.14
1.18
1.22
0
10
20
30
40
Index

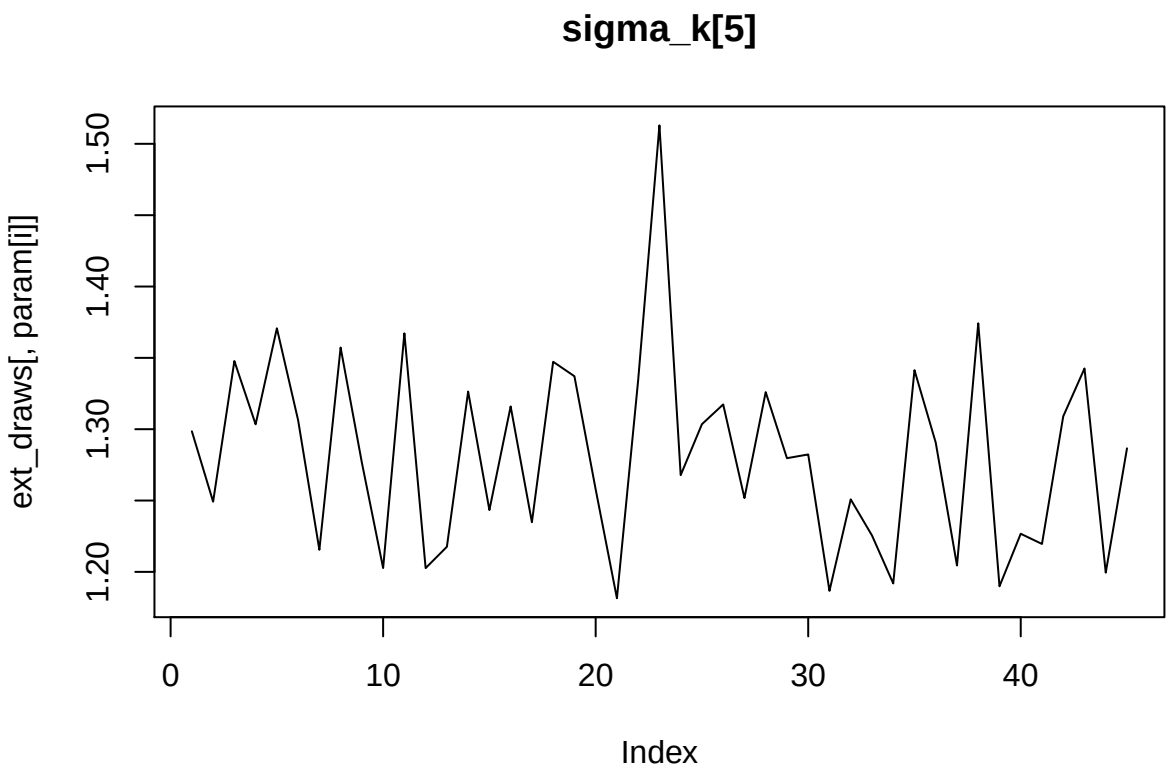
```
## NULL
```


sigma_k[3]
ext_draws[, param[i]]
1.35
1.40
1.45
1.50
0
10
20
30
40
Index

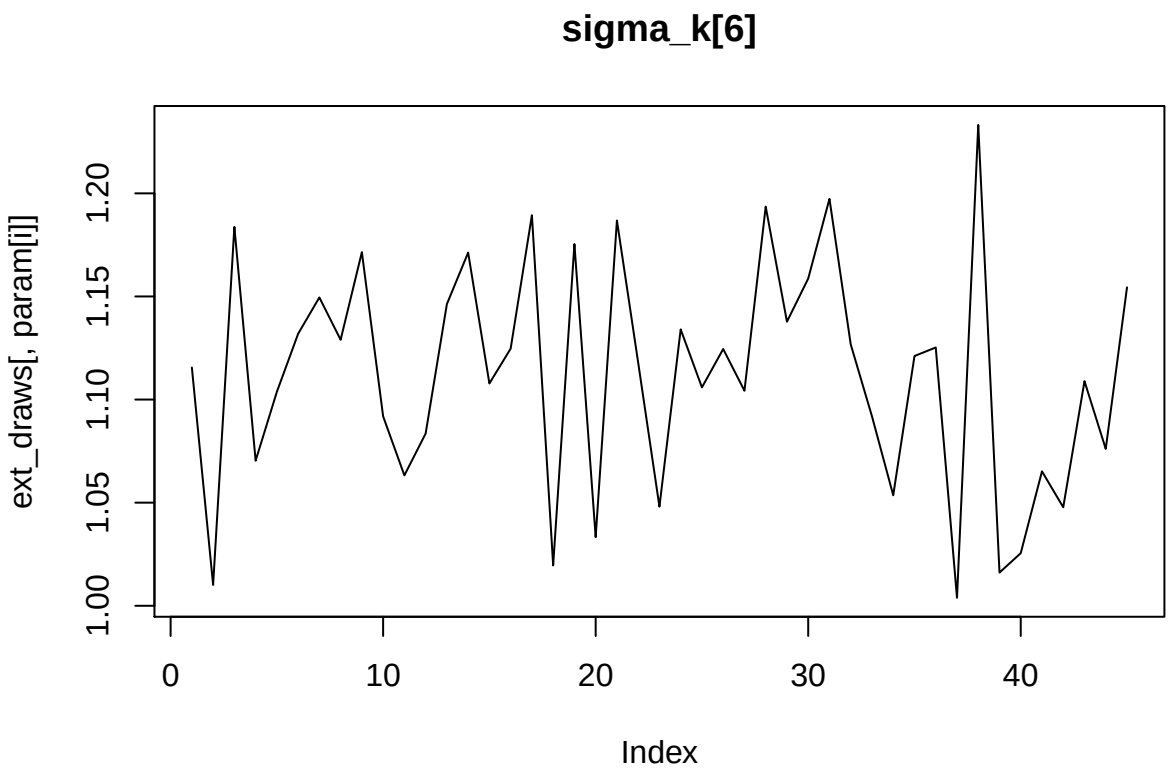
```
## NULL
```


sigma_k[4]
ext_draws[, param[i]]
1.20
1.25
1.30
1.35
0
10
20
30
40
Index

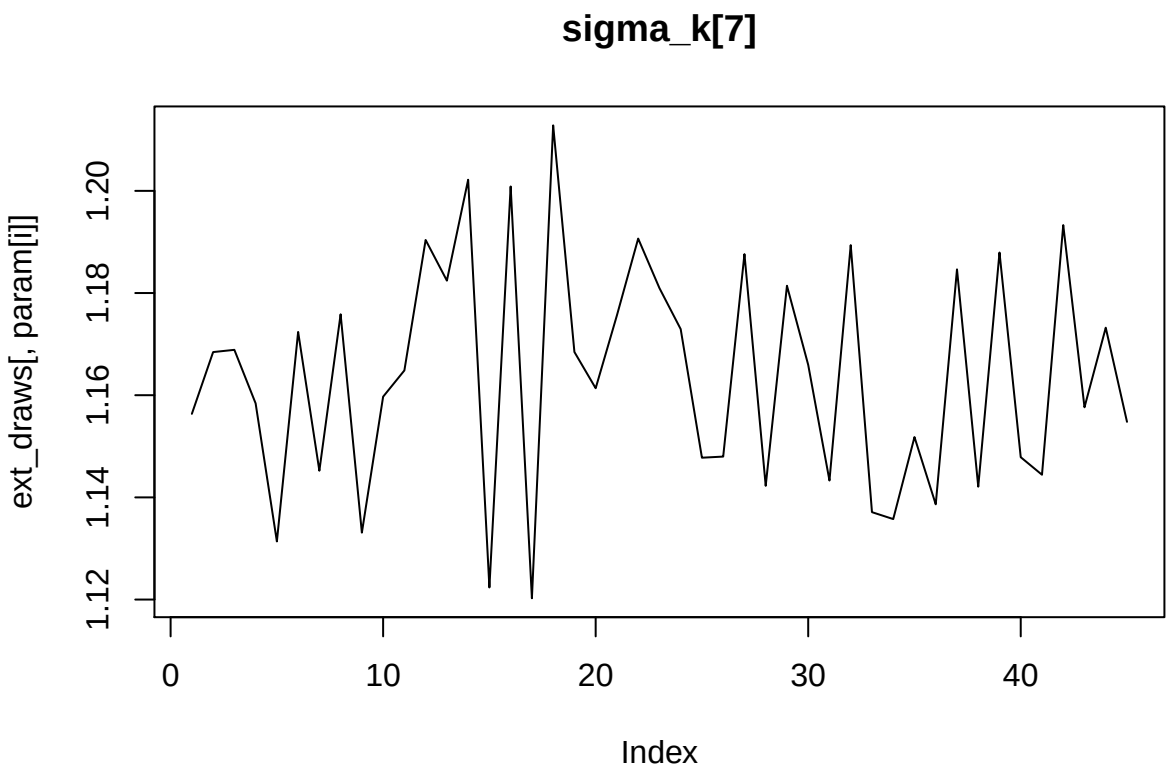
```
## NULL
```


sigma_k[5]
ext_draws[, param[i]]
1.20
1.30
1.40
1.50
0
10
20
30
40
Index

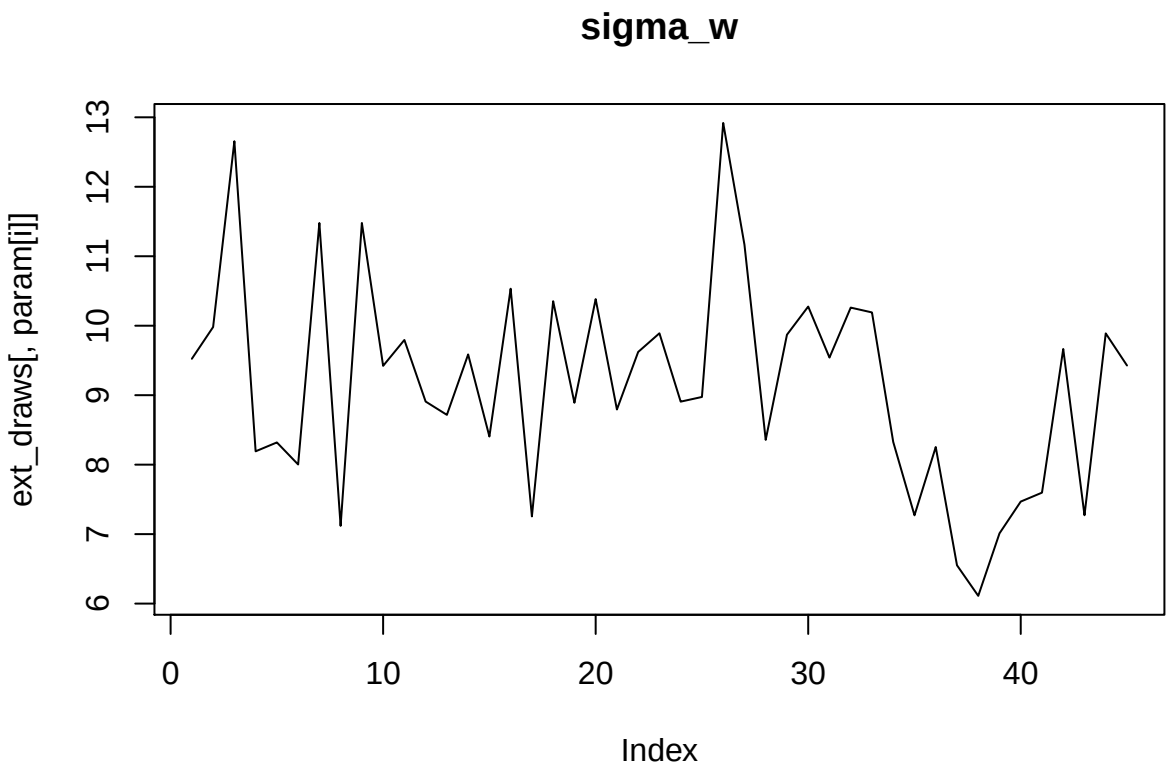
```
## NULL
```


sigma_k[6]
ext_draws[, param[i]]
1.00
1.05
1.10
1.15
1.20
0
10
20
30
40
Index

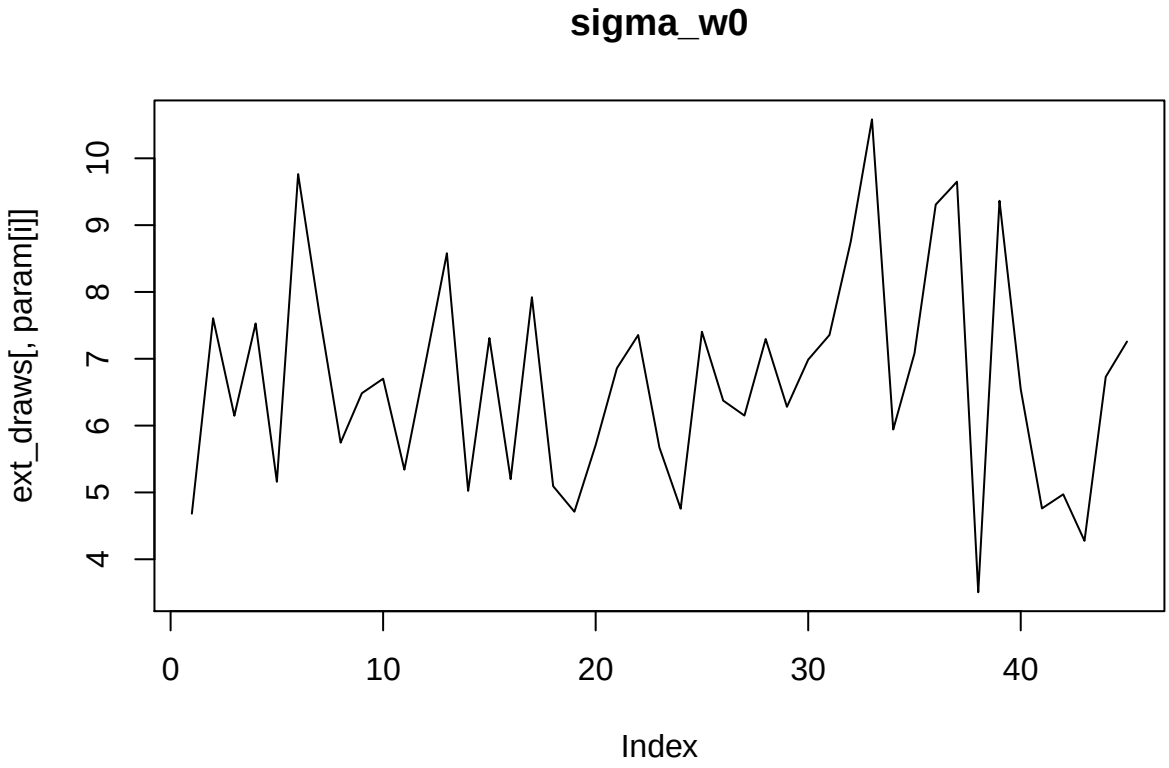
```
## NULL
```


sigma_k[7]
ext_draws[, param[i]]
1.12
1.14
1.16
1.18
1.20
0
10
20
30
40
Index

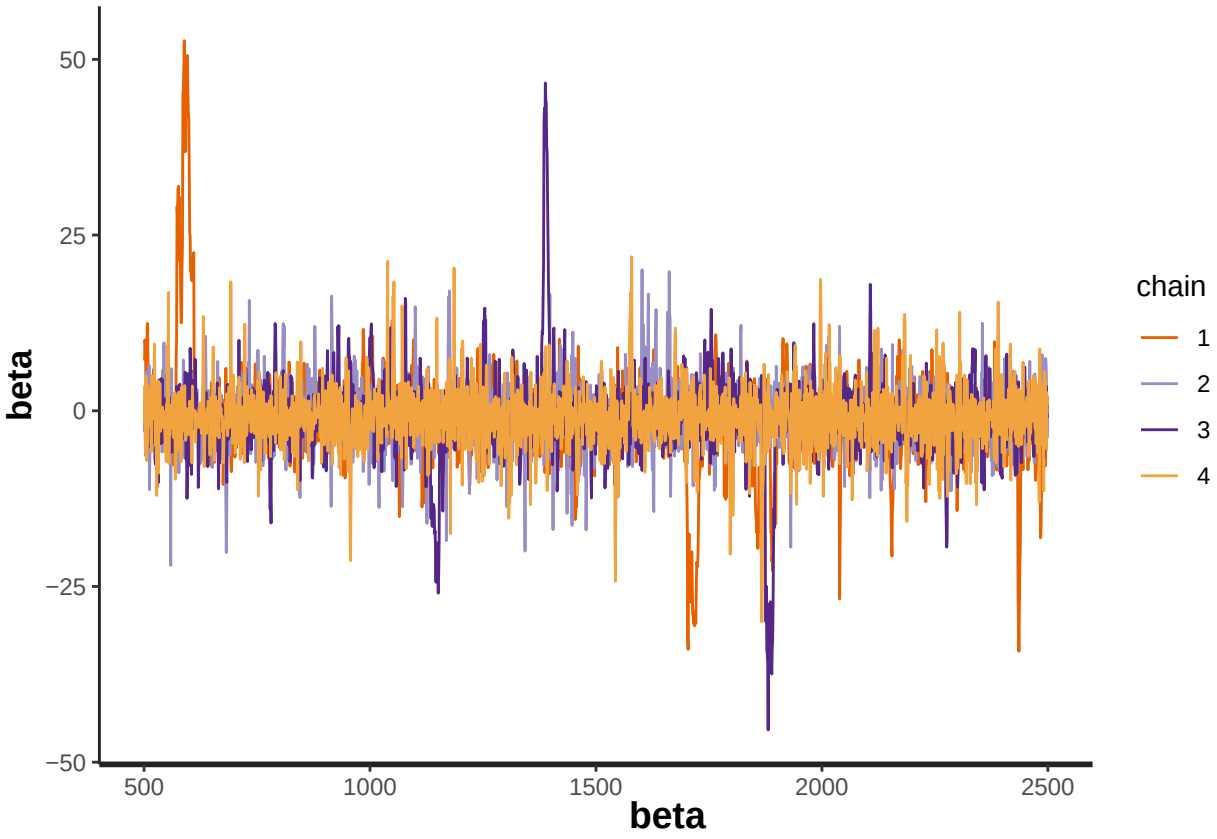
```
## NULL
```

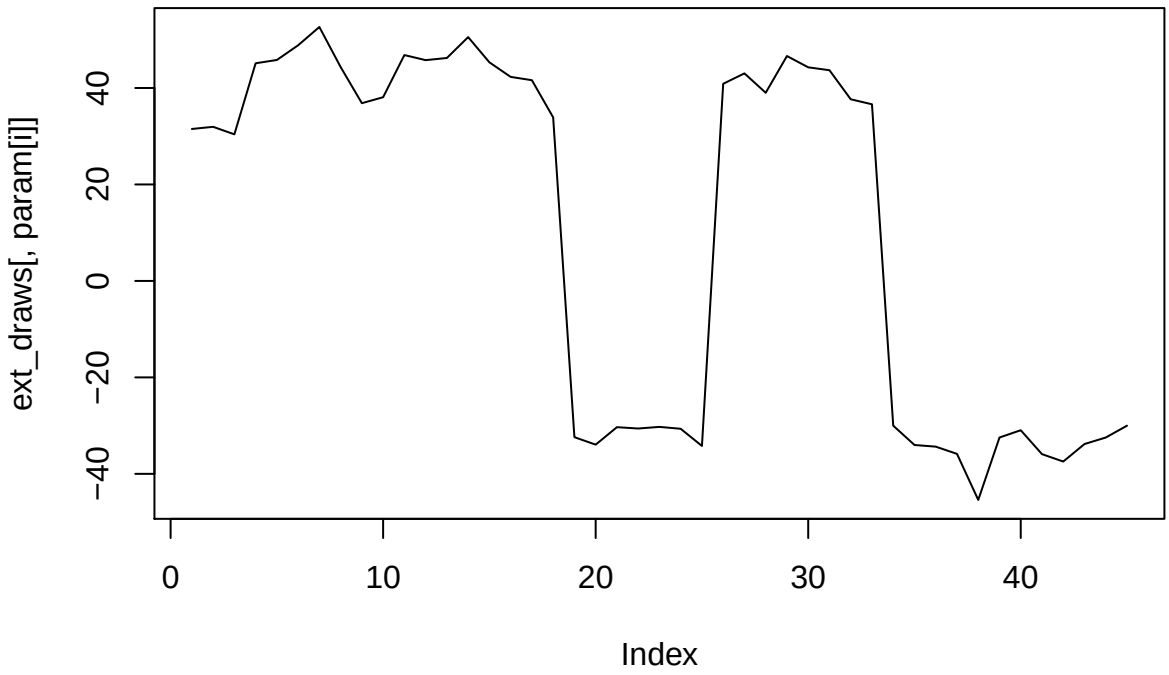

sigma_w
ext_draws[, param[i]]
6
7
8
9
10
11
12
13
0
10
20
30
40
Index

```
## NULL
```



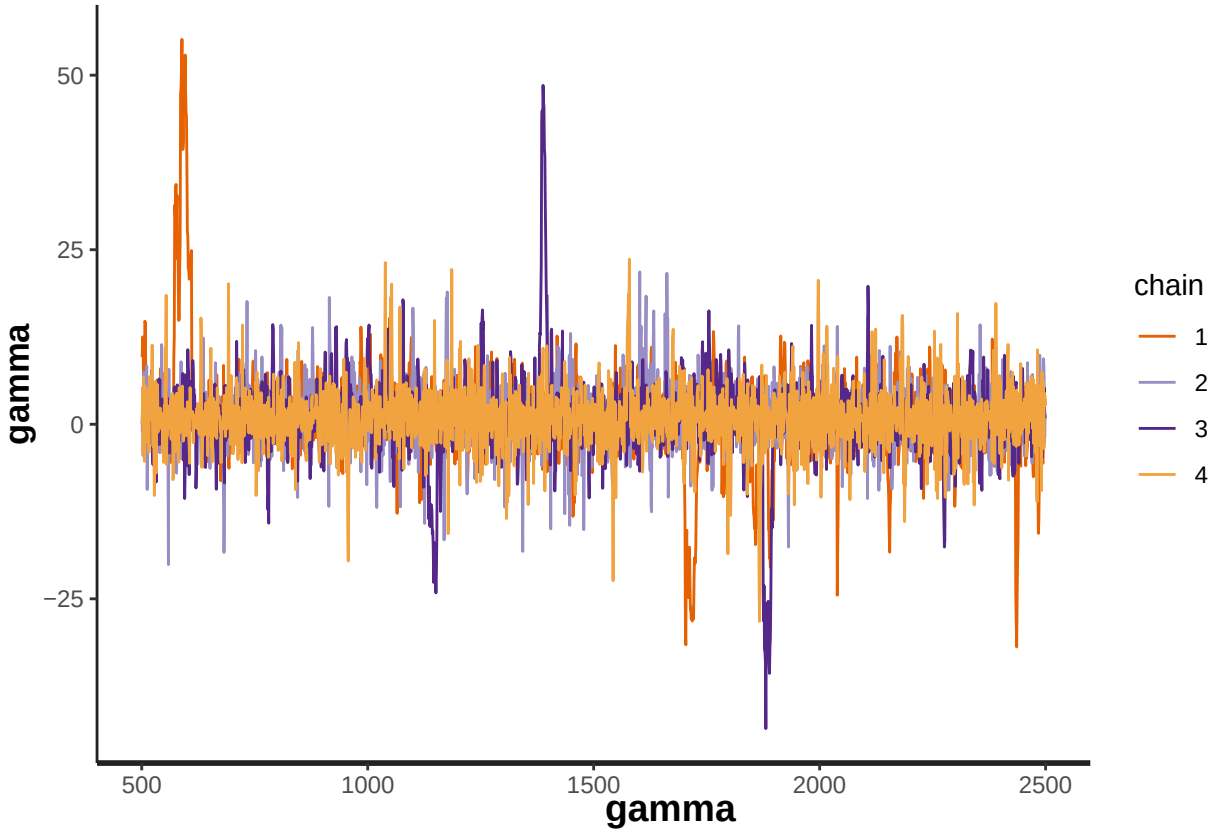

```
## NULL
##            mean   se_mean       sd       25%        50%     75%    n_eff
## beta -0.9594464 0.2250137 5.621688 -3.297915 -0.9017284 1.34763 624.1884
##          Rhat
## beta 1.009121
```

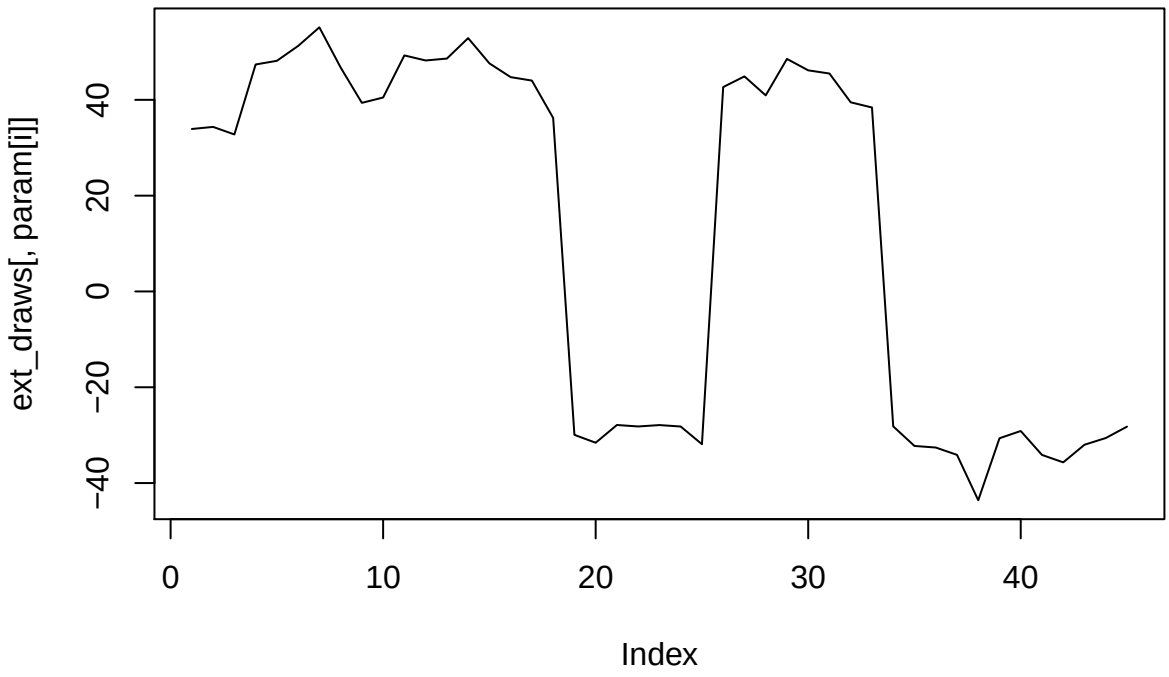





```
## NULL
##            mean    se_mean       sd       25%      50%      75%    n_eff
## gamma 1.000092 0.2243963 5.621332 -1.332968 1.030715 3.295308 627.5484
##           Rhat
```

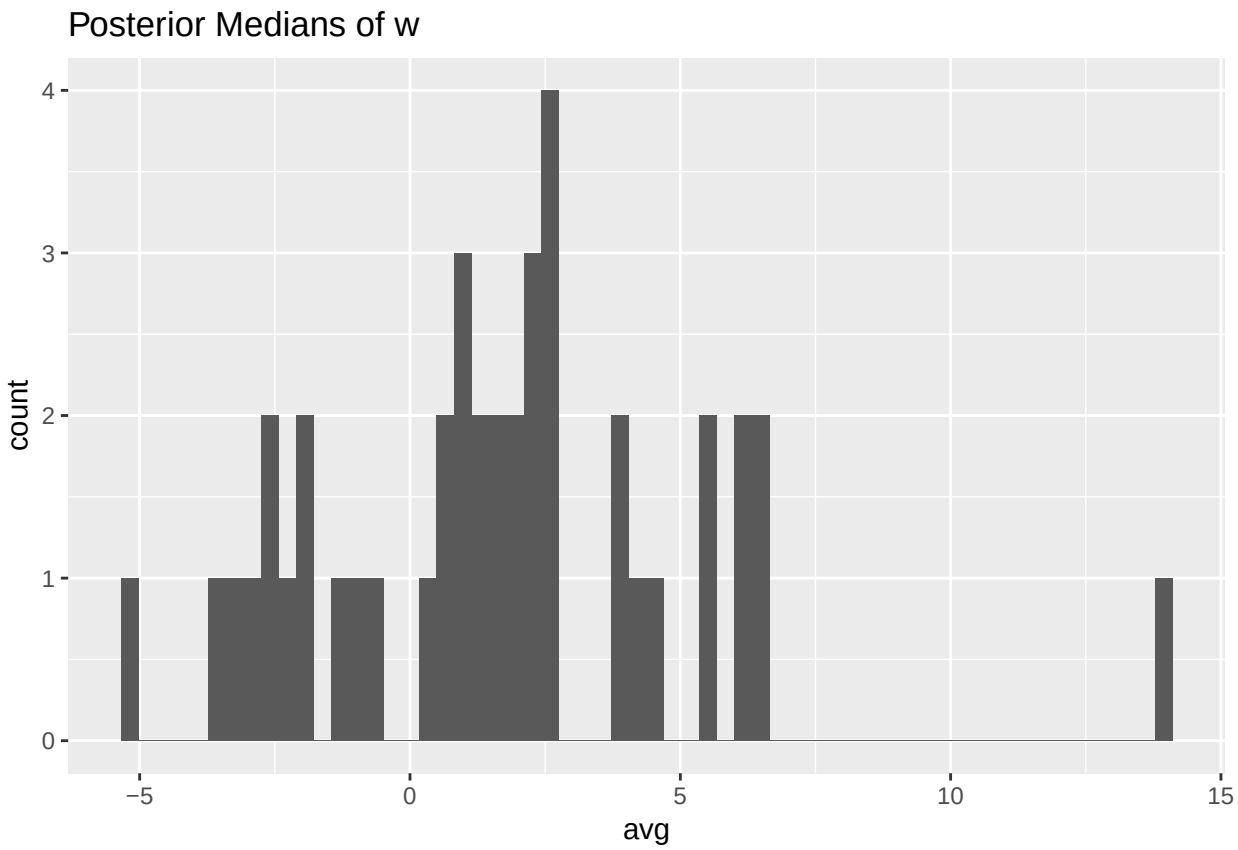
```
## gamma 1.008929
```

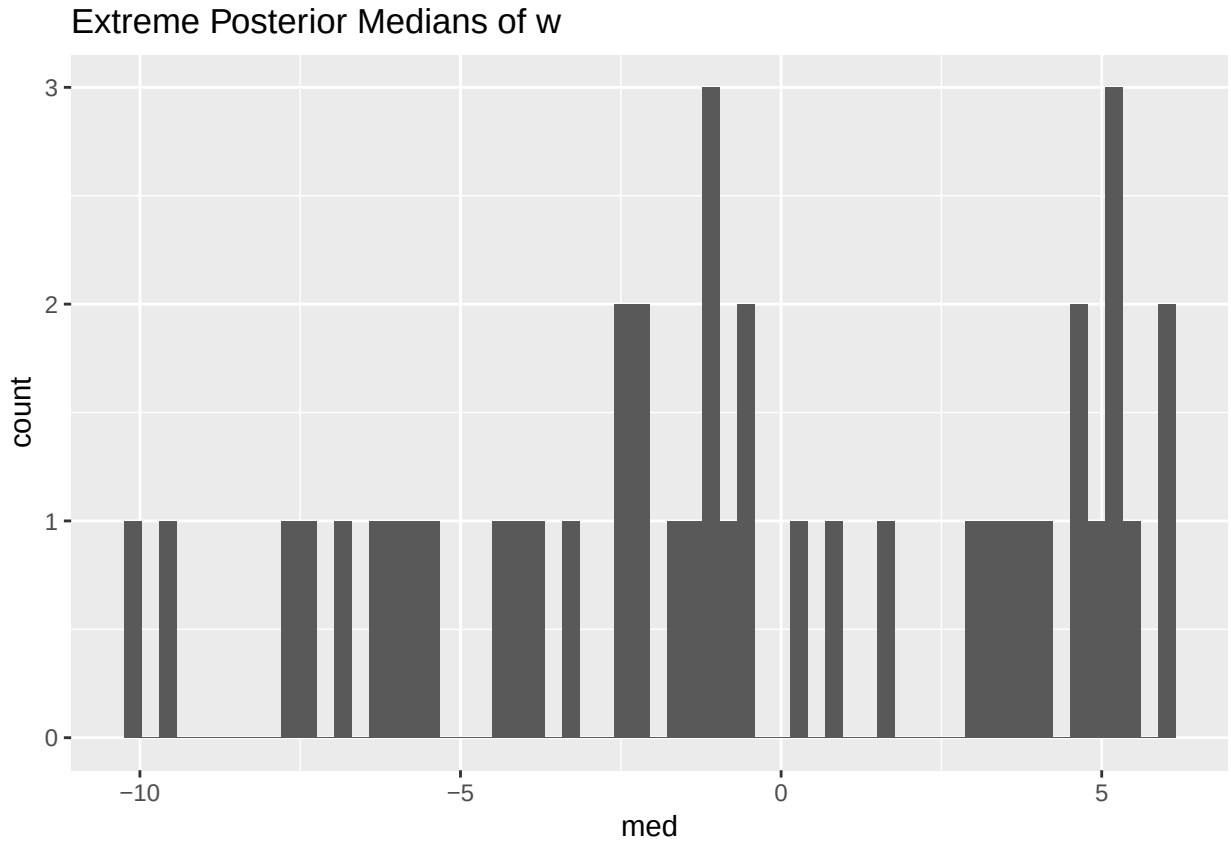




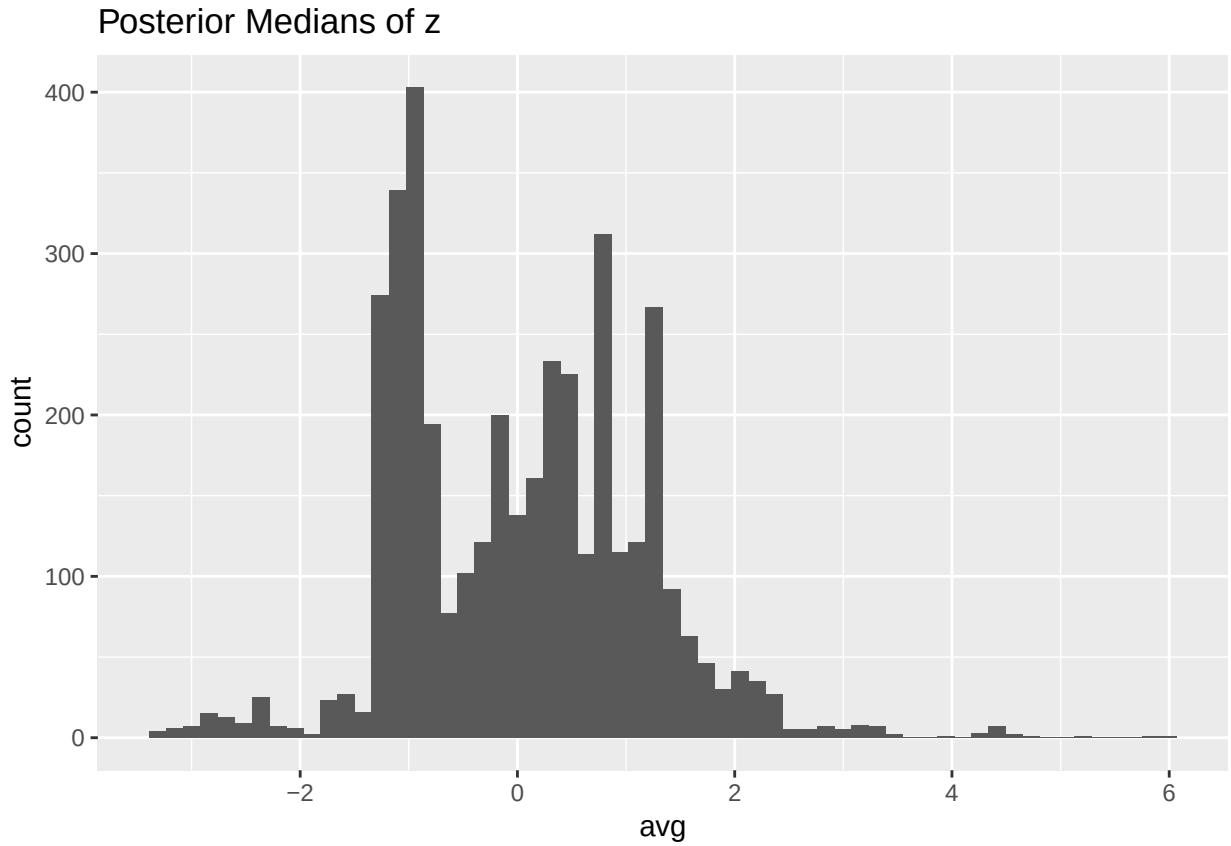

```
## NULL
## [1] "Summary statistics for posterior medians of w"
```

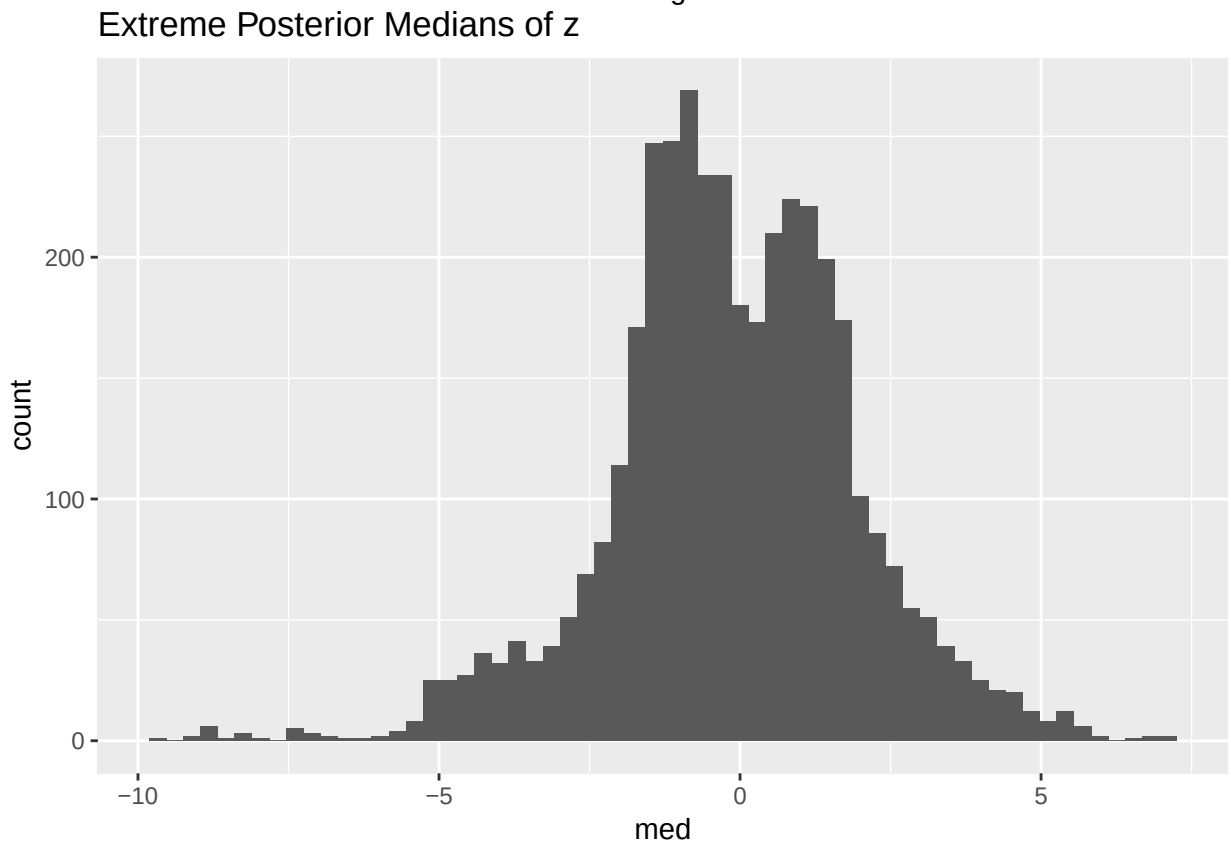
```
##       avg          
##  Min.   :-5.199  
##  1st Qu.:-0.977  
##  Median : 1.765  
##  Mean   : 1.648  
##  3rd Qu.: 3.582  
##  Max.   :13.930
```



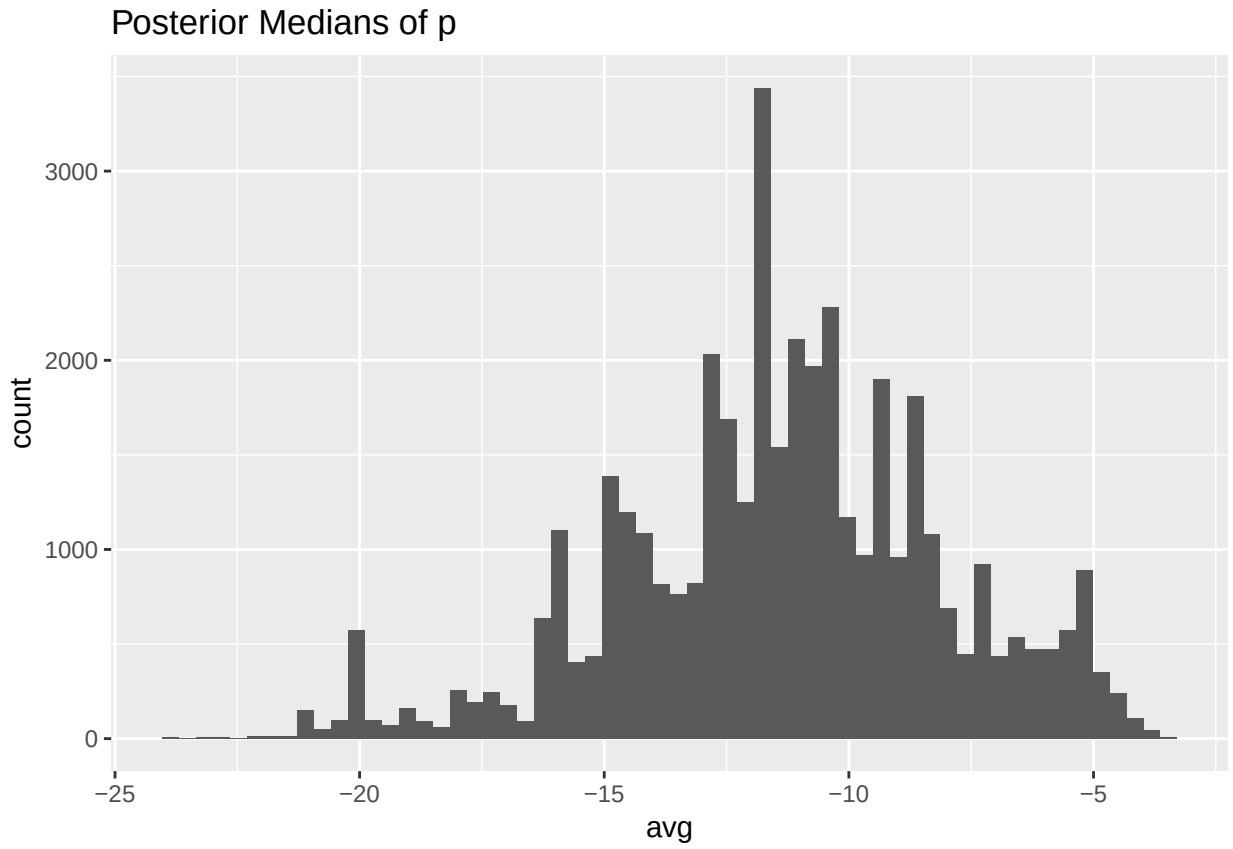


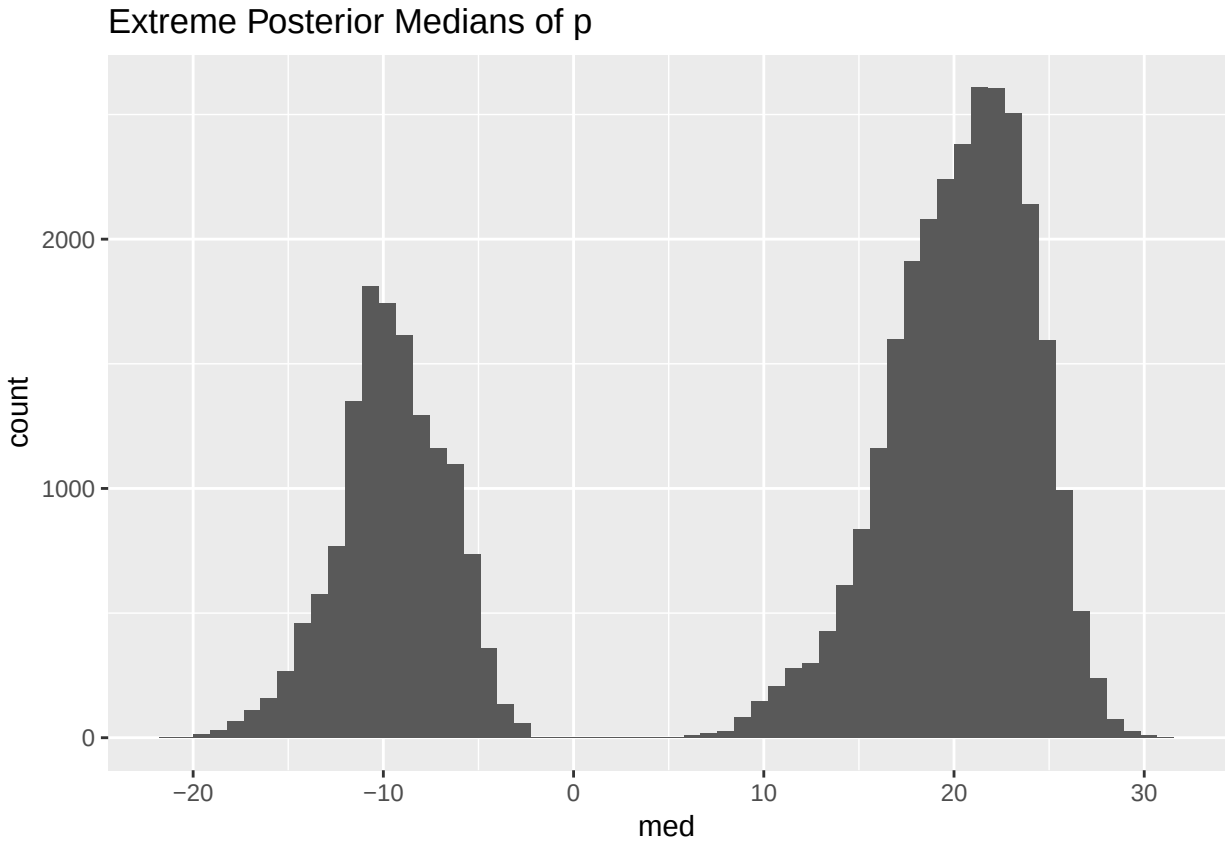

```
## [1] "Summary statistics for posterior medians of z"
##       avg
##  Min.   :-3.35862
##  1st Qu.:-0.91178
##  Median : 0.04142
##  Mean   : 0.03025
##  3rd Qu.: 0.79647
##  Max.   : 5.94238
```


Posterior Medians of z
count
400
300
200
100
0
−2
0
2
4
6
avg


Extreme Posterior Medians of z
count
200
100
0
−10
−5
0
5
med

```
## [1] "Summary statistics for posterior medians of p"
##       avg          
##  Min.   :-23.920  
##  1st Qu.:-13.227  
##  Median :-11.304  
##  Mean   :-11.375  
##  3rd Qu.: -9.213  
##  Max.   : -3.513
```




Extreme Posterior Medians of p
count
2000
1000
0
−20
−10
0
10
20
30
med