# MCMC Diagnostics - IFLS data

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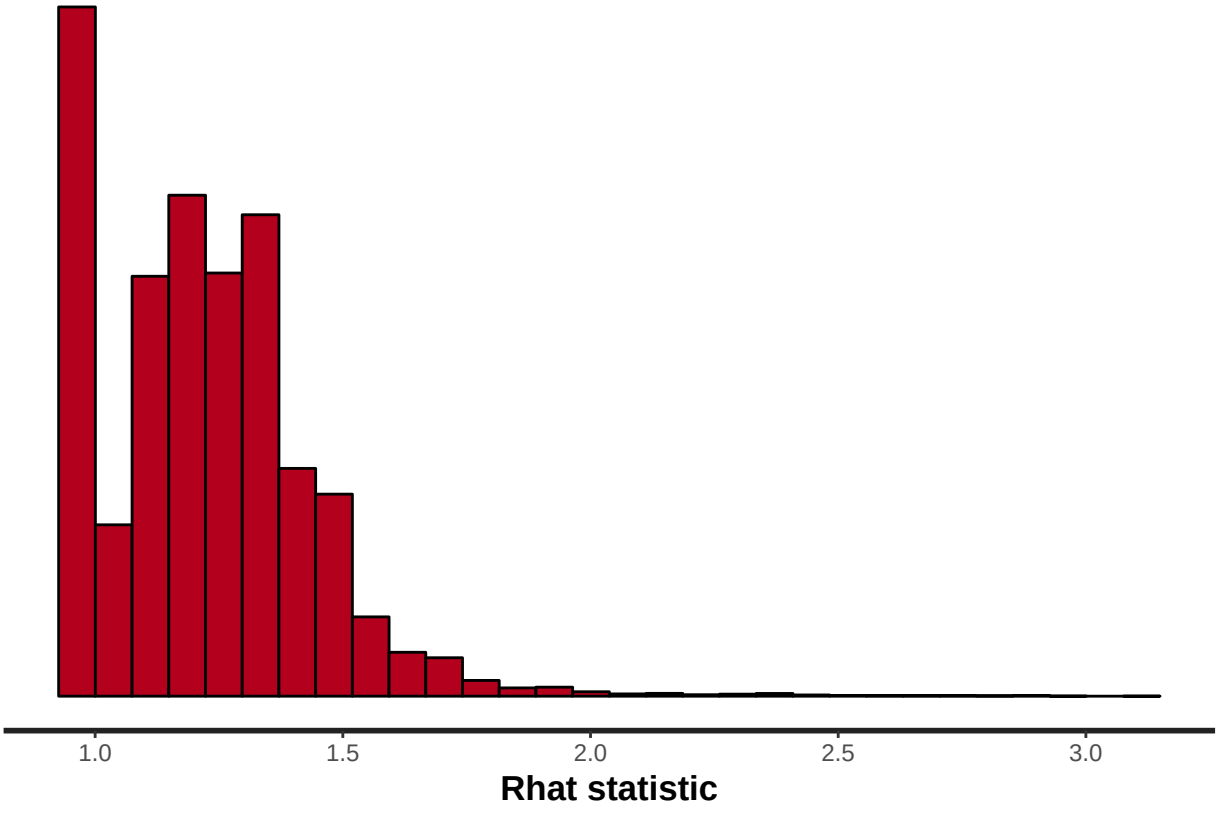
*05/13/2020*

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

### General MCMC diagnostic plots

Overall model diagnostics from rstan package.

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
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```

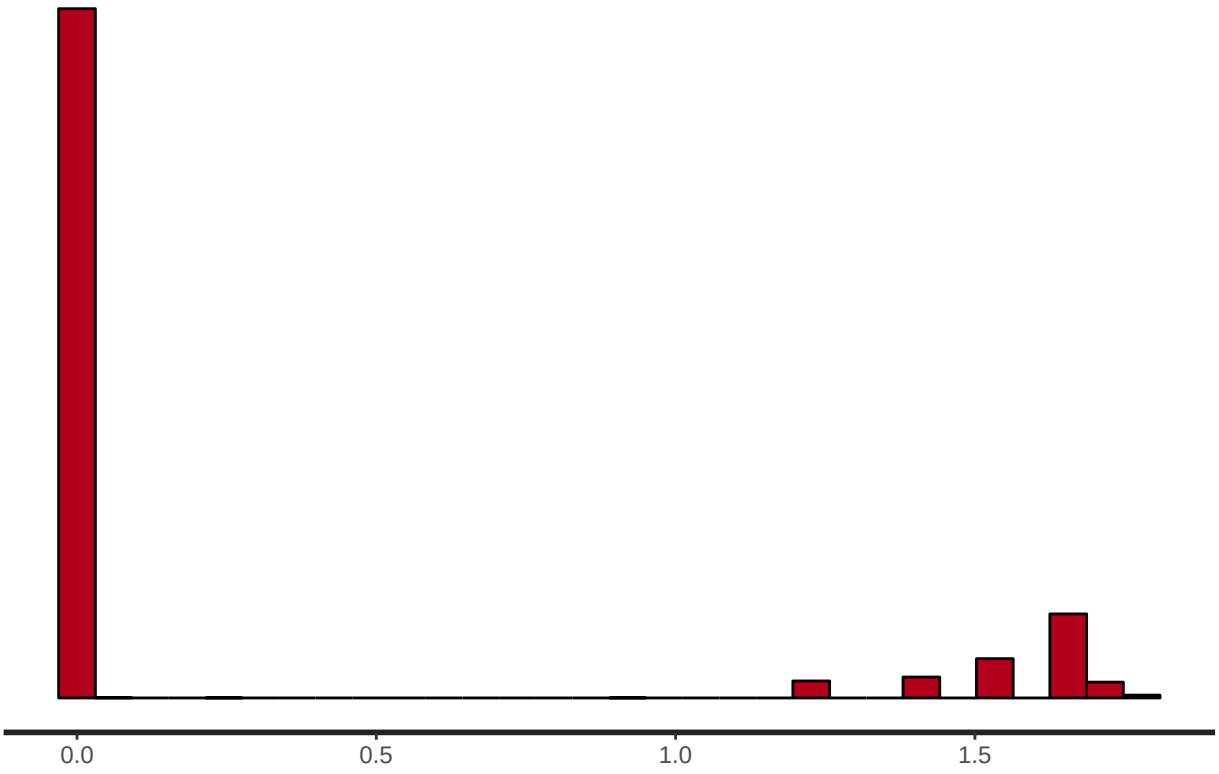


```
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```
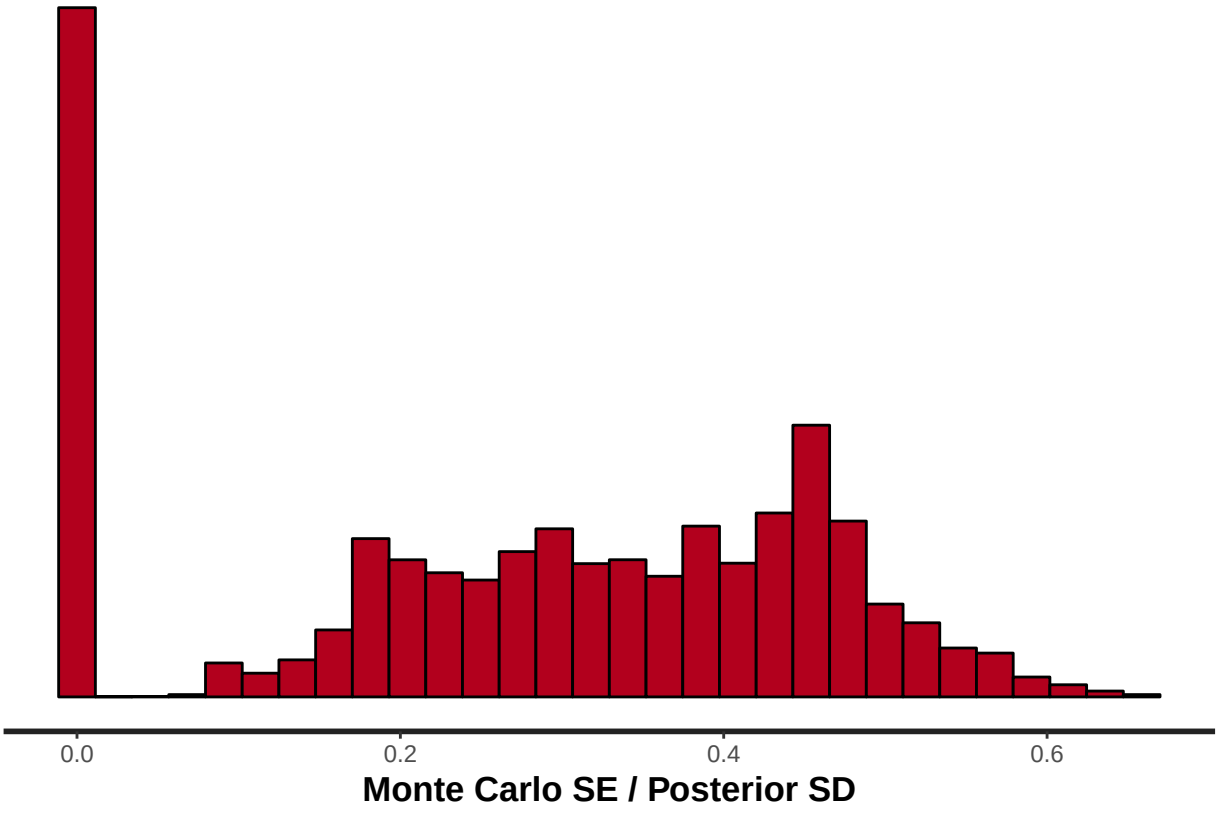
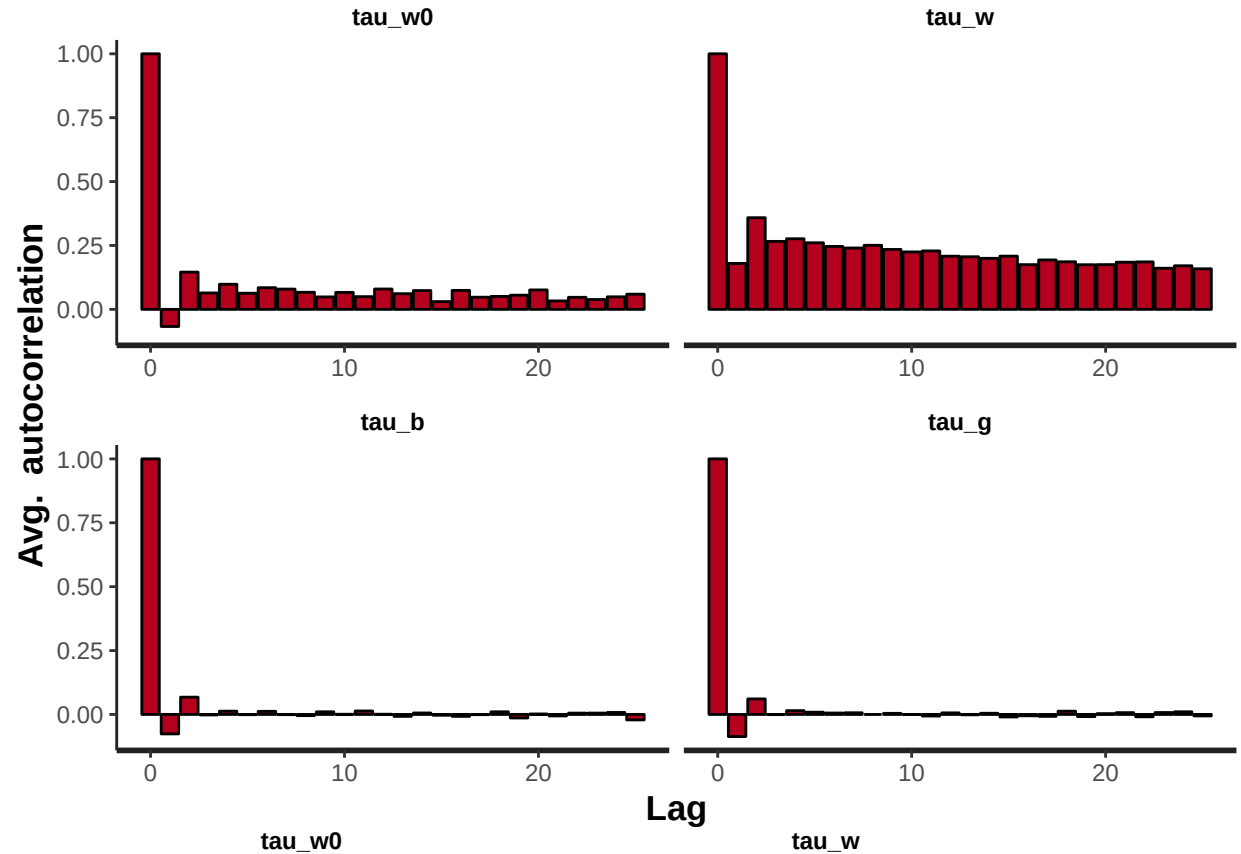



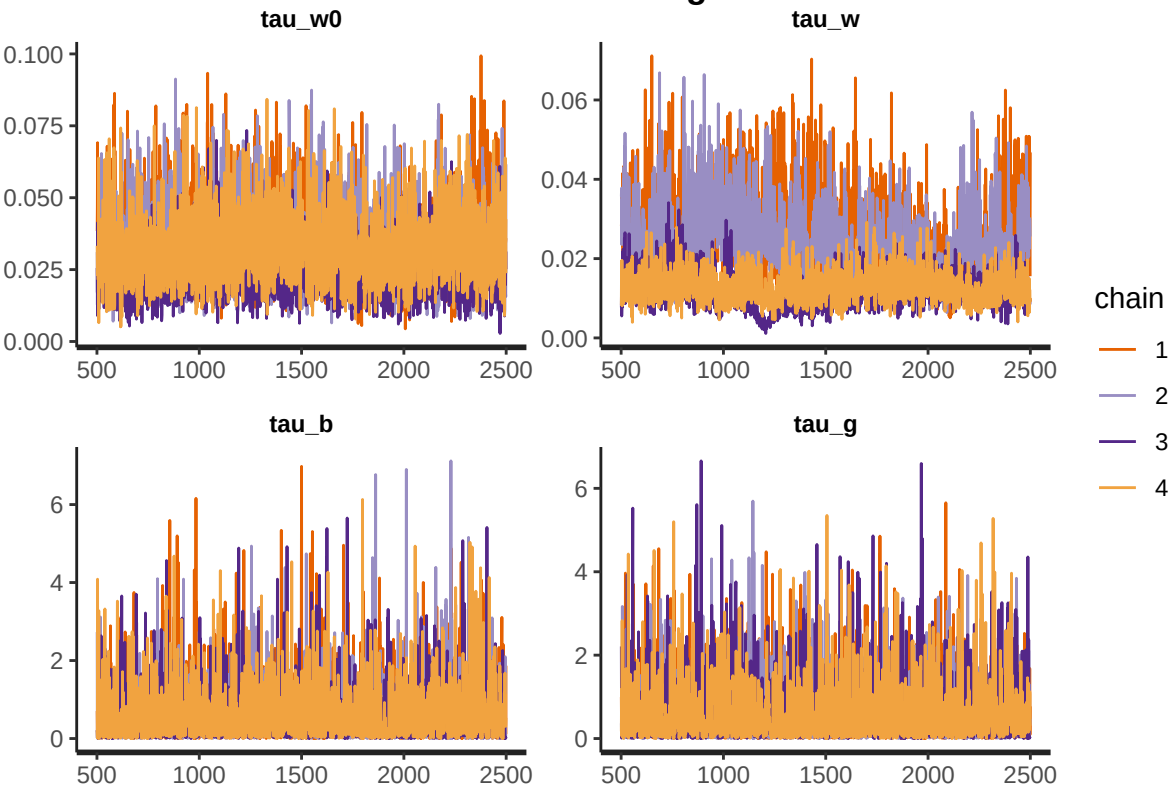
### Individual Parameter Diagnostics

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(stan_ac(fit, pars = param))
  print(rstan::traceplot(fit, pars = param))
}
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)$`50%`[ind])
  print(paste0("Summary statistics for posterior medians of ",param))
  print(summary(medians))
  title <- paste0("Posterior Medians of ",param)
  print(ggplot(medians, aes(x = avg)) + geom_histogram(bins = 60) + ggtitle(title))
  if (trim == T) {
    lim <- quantile(abs(medians$avg), probs = trim_amount)
    meds_trim <- medians %>% filter(abs(medians$avg) < lim)
    print(ggplot(meds_trim, aes(x = avg)) + geom_histogram(bins = 60) +
            ggtitle(paste0(title, " Without Extreme ",100*(1-trim_amount),"%")))
  }
}
plot_fit <- function(fit) {
  get_single_plots(fit, tau_params)
  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)
```

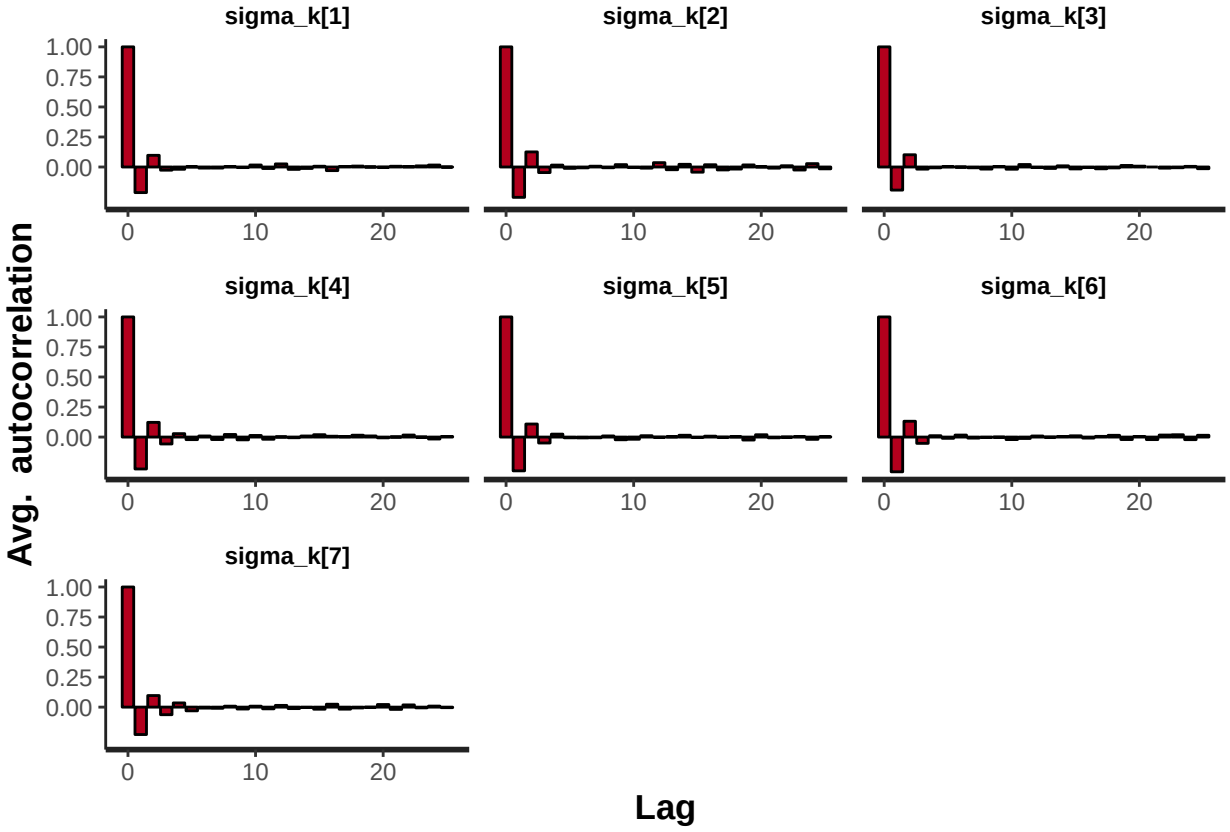
```
##              mean     se_mean         sd        25%        50%        75%
## tau_w0 0.03126809 0.003103282 0.01314374 0.02162224 0.02926061 0.03864162
## tau_w  0.01897606 0.005052775 0.01007684 0.01143309 0.01623969 0.02466470
## tau_b  0.58888683 0.008553655 0.72823705 0.11690414 0.32581650 0.79433980
## tau_g  0.57078971 0.008049657 0.69983043 0.12201741 0.32550334 0.75130097
##              n_eff     Rhat
## tau_w0   17.938885 1.077371
## tau_w     3.977302 1.455726
## tau_b  7248.398244 1.000898
## tau_g  7558.417165 1.000682
```

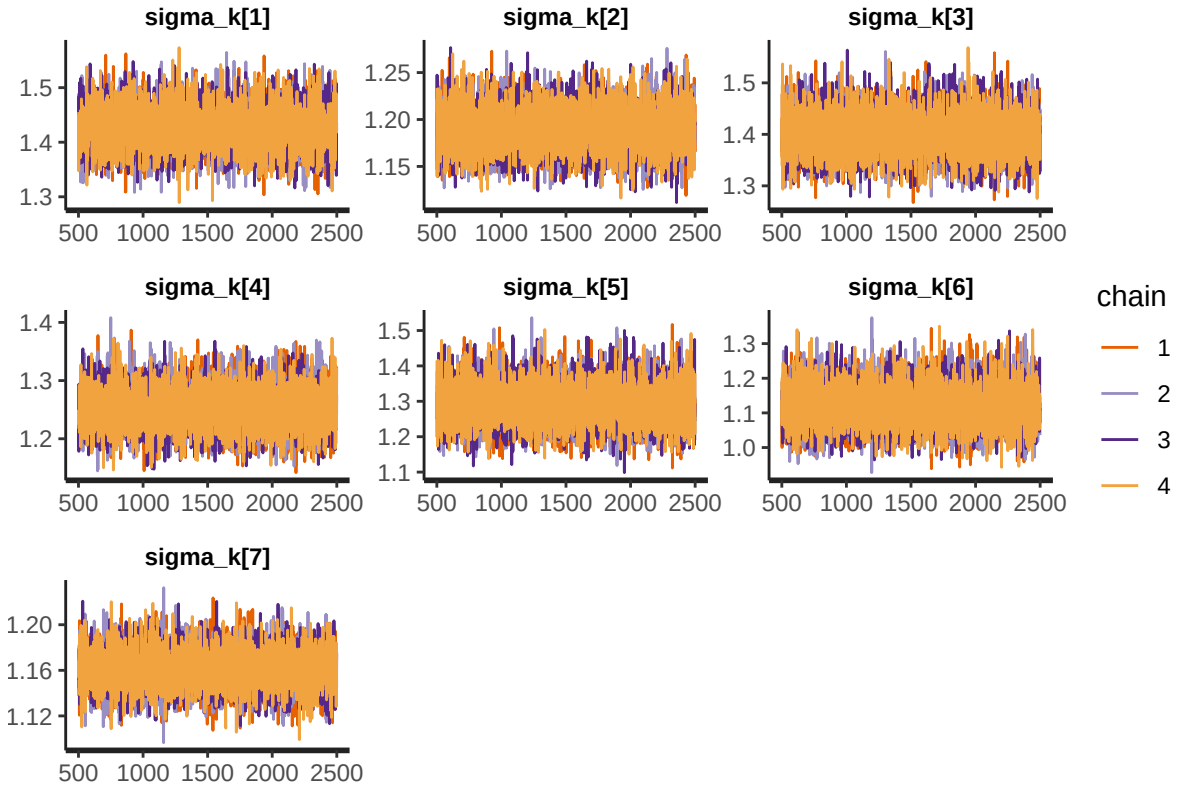


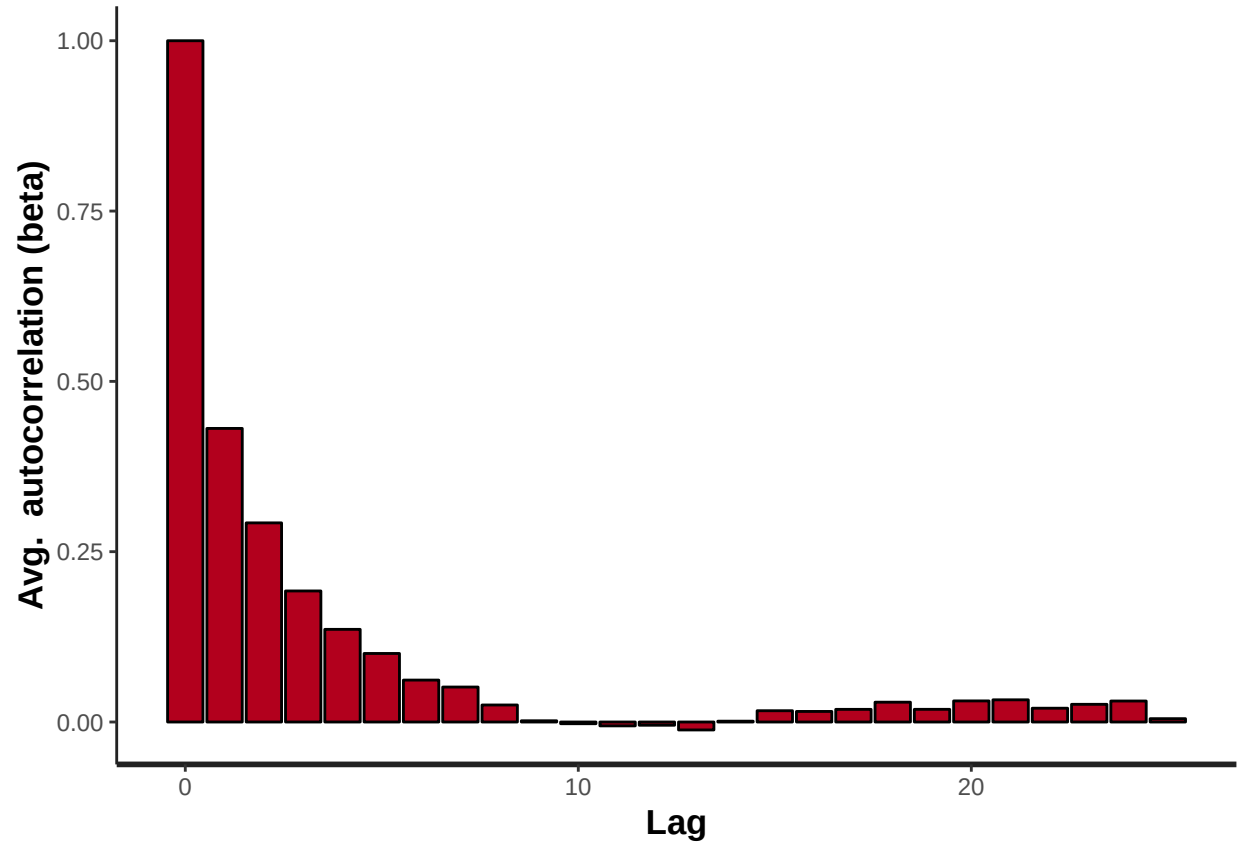

```
##                mean      se_mean          sd      25%      50%      75%
## sigma_k[1] 1.425220 0.0003696457 0.03920133 1.398527 1.424341 1.451280
## sigma_k[2] 1.190480 0.0002122580 0.02331626 1.174709 1.190292 1.206134
```

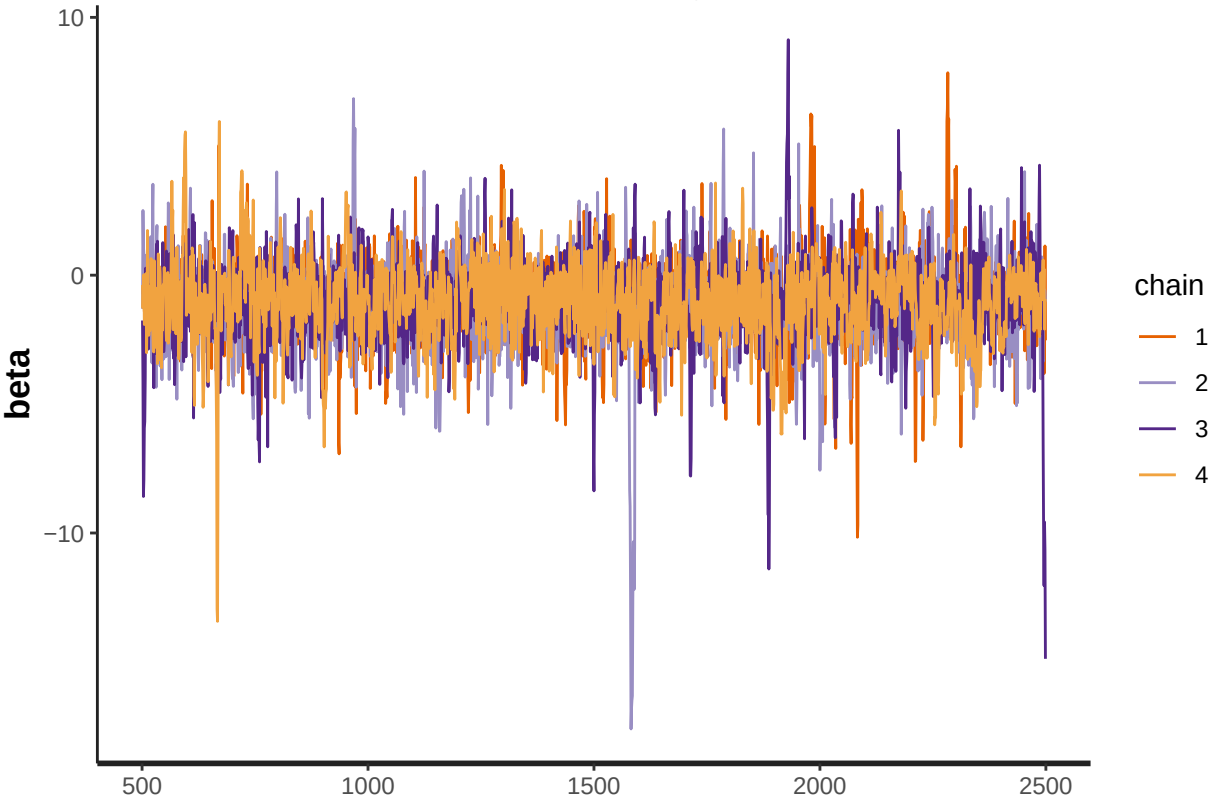
```
## sigma_k[3] 1.401965 0.0004175460 0.04175694 1.373423 1.401166 1.429430
## sigma_k[4] 1.252979 0.0003135104 0.03645755 1.227608 1.252261 1.277537
## sigma_k[5] 1.291986 0.0005019027 0.05854740 1.251324 1.289385 1.329926
## sigma_k[6] 1.120849 0.0005006396 0.05972225 1.080124 1.118320 1.159554
## sigma_k[7] 1.161573 0.0001511958 0.01741598 1.149648 1.161306 1.173482
##               n_eff      Rhat
## sigma_k[1] 11246.83 0.9997565
## sigma_k[2] 12066.73 0.9997150
## sigma_k[3] 10001.12 0.9995864
## sigma_k[4] 13522.94 0.9996993
## sigma_k[5] 13607.43 0.9996227
## sigma_k[6] 14230.56 0.9996338
## sigma_k[7] 13268.35 0.9998650
```





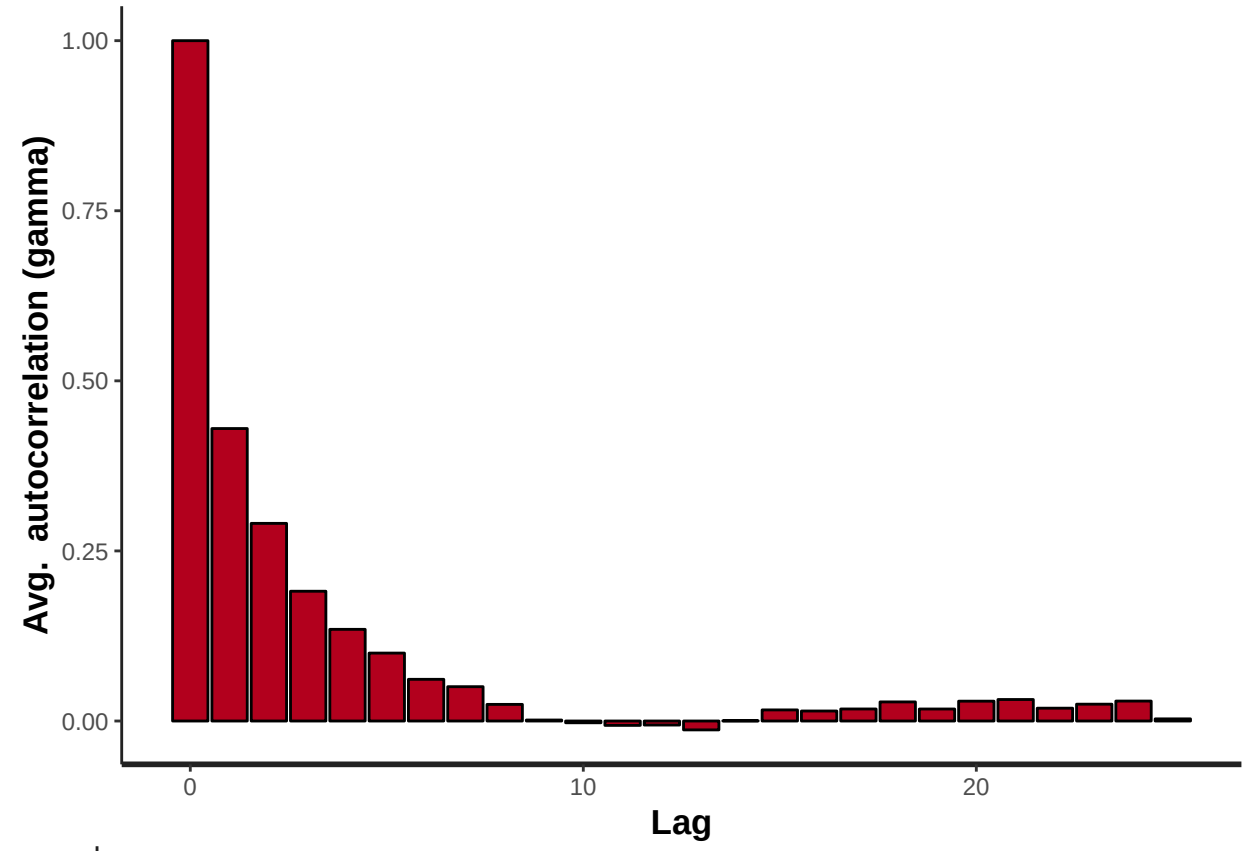

```
##            mean    se_mean       sd       25%        50%        75%    n_eff
## beta -1.046033 0.0361642 1.669463 -1.920475 -0.9935883 -0.1030336 2131.061
##          Rhat
## beta 1.002505
```

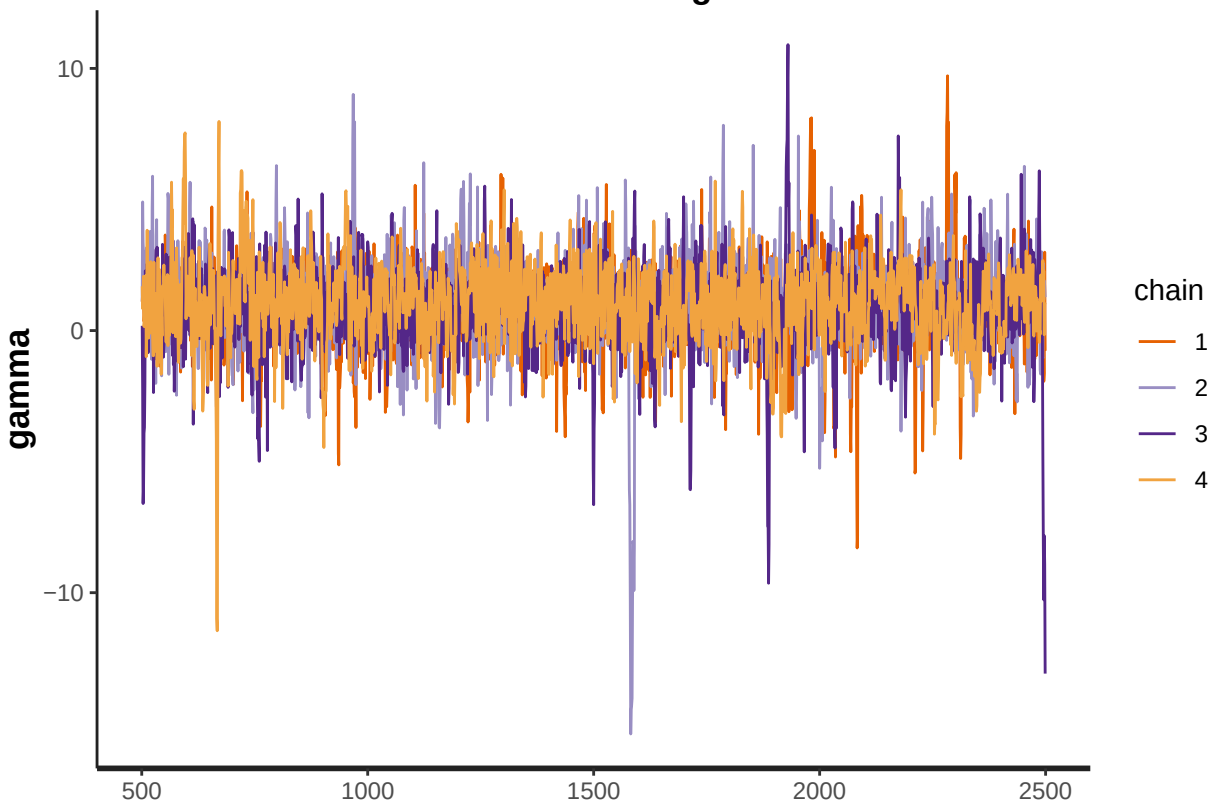


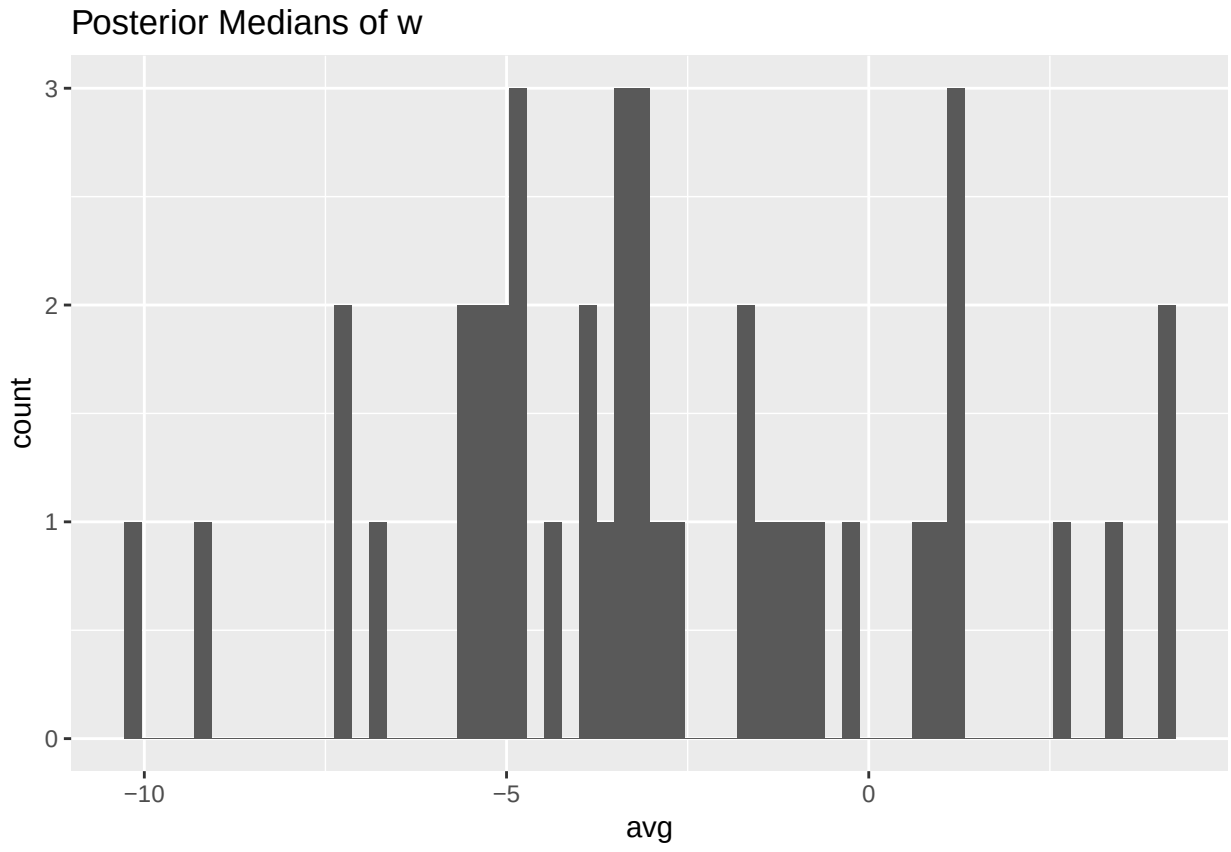

```
##              mean     se_mean       sd      25%      50%      75%    n_eff
## gamma 0.9553174 0.03624369 1.669732 0.101913 0.985702 1.894945 2122.407
```

```
##           Rhat
## gamma 1.003399
```

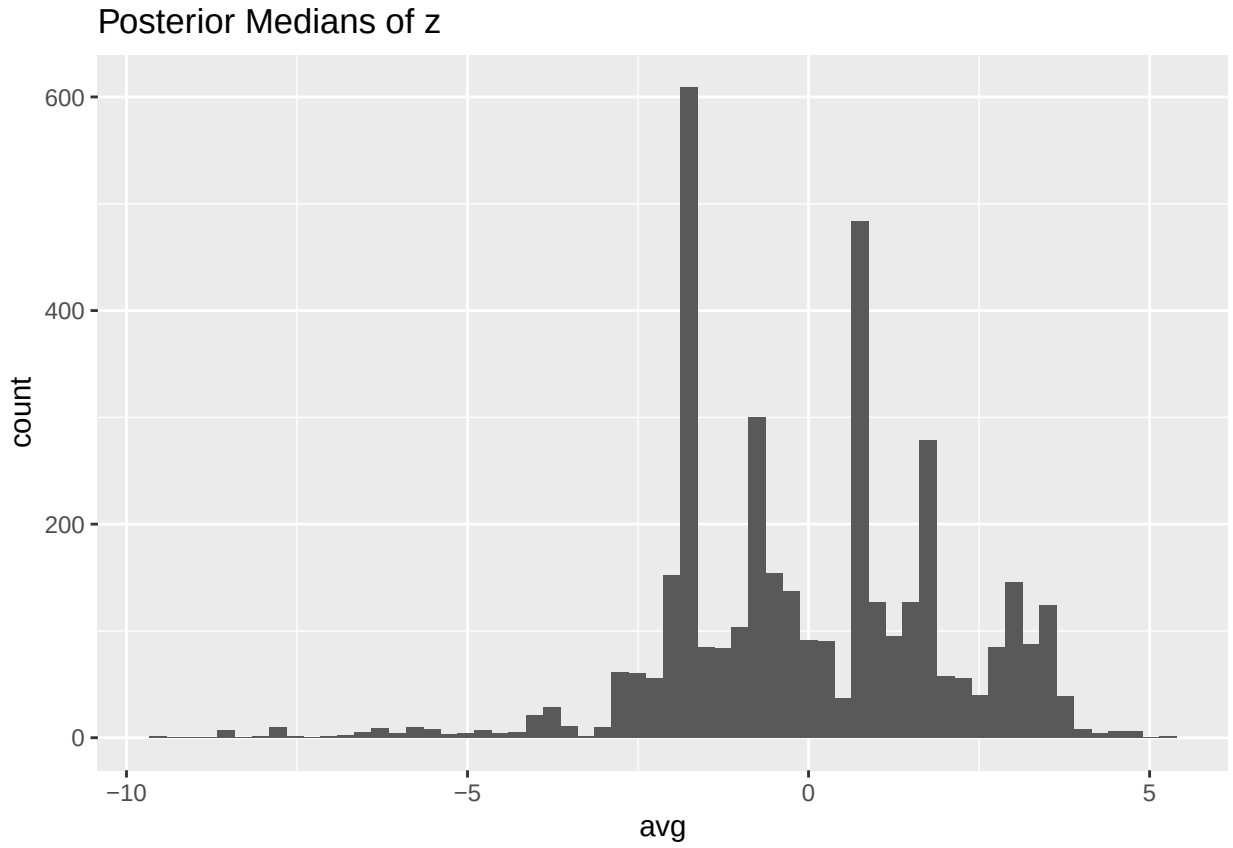


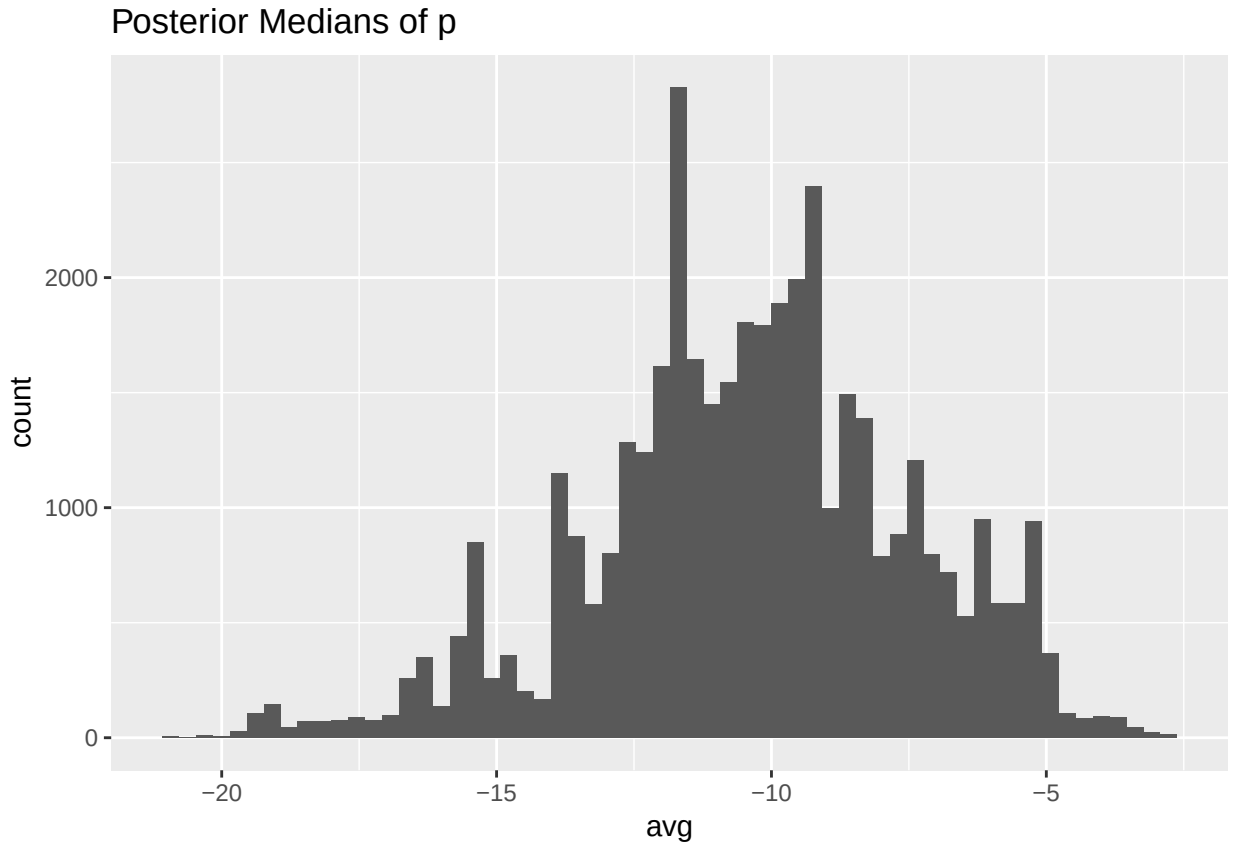
```
## [1] "Summary statistics for posterior medians of w"
##       avg          
##  Min.   :-10.0747  
##  1st Qu.: -5.0314  
##  Median : -3.2649  
##  Mean   : -2.7584  
##  3rd Qu.: -0.7155  
##  Max.   :  4.2014
```




```
## [1] "Summary statistics for posterior medians of z"
##       avg          
##  Min.   :-9.61061  
##  1st Qu.:-1.70113  
##  Median :-0.01650  
##  Mean   : 0.02278  
##  3rd Qu.: 1.49192  
##  Max.   : 5.20267
```




```
## [1] "Summary statistics for posterior medians of p"
##       avg
##  Min.   :-20.928
##  1st Qu.:-12.034
##  Median :-10.302
##  Mean   :-10.383
##  3rd Qu.: -8.488
##  Max.   : -2.766
```


Posterior Medians of p
count
2000
1000
0
−20
−15
−10
−5
avg