

# MCMC Diagnostics - IFLS data

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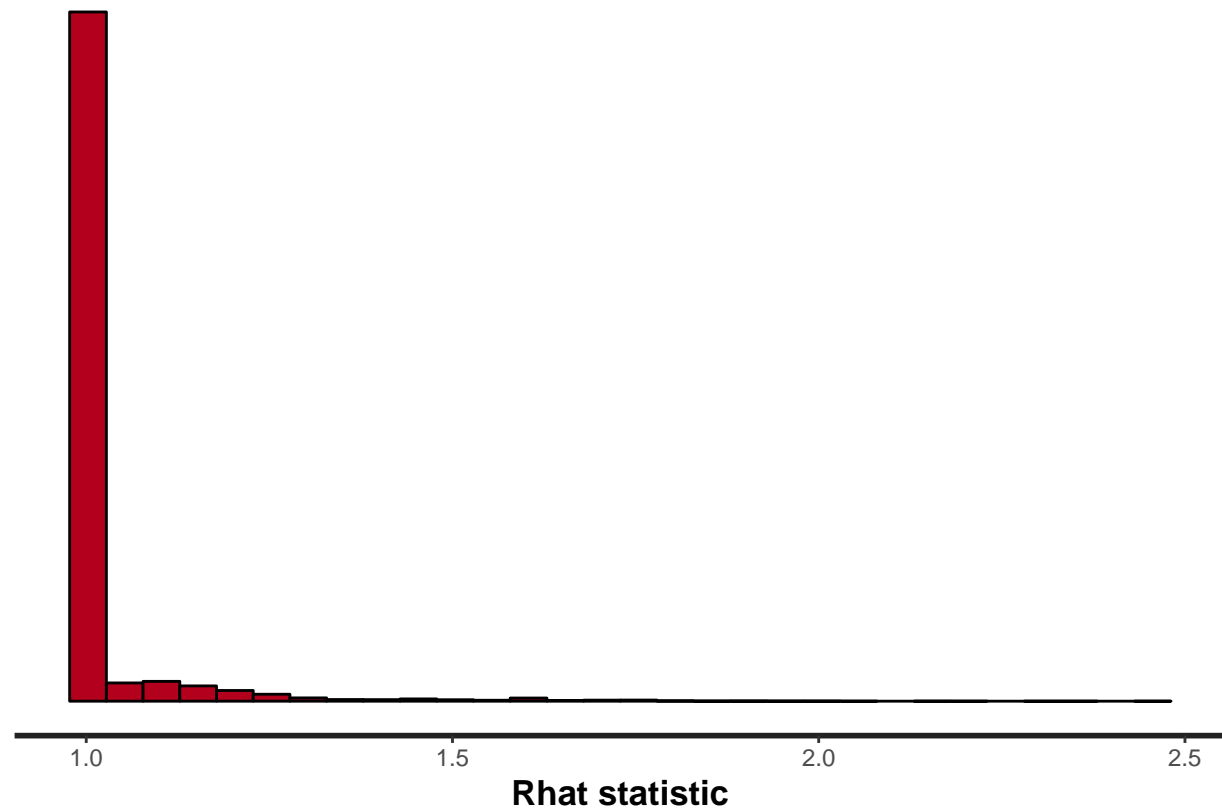
*05/01/2020*

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

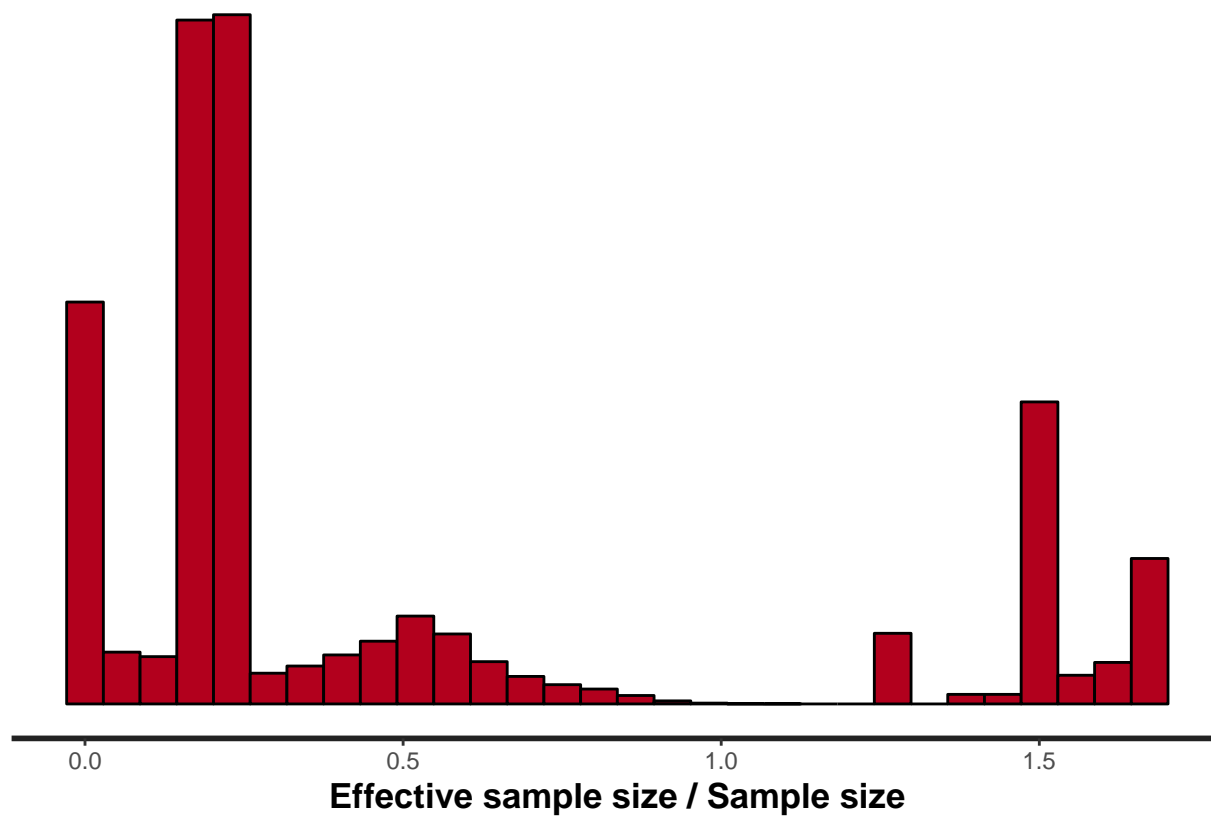
## General MCMC diagnostic plots

Overall model diagnostics from rstan package.

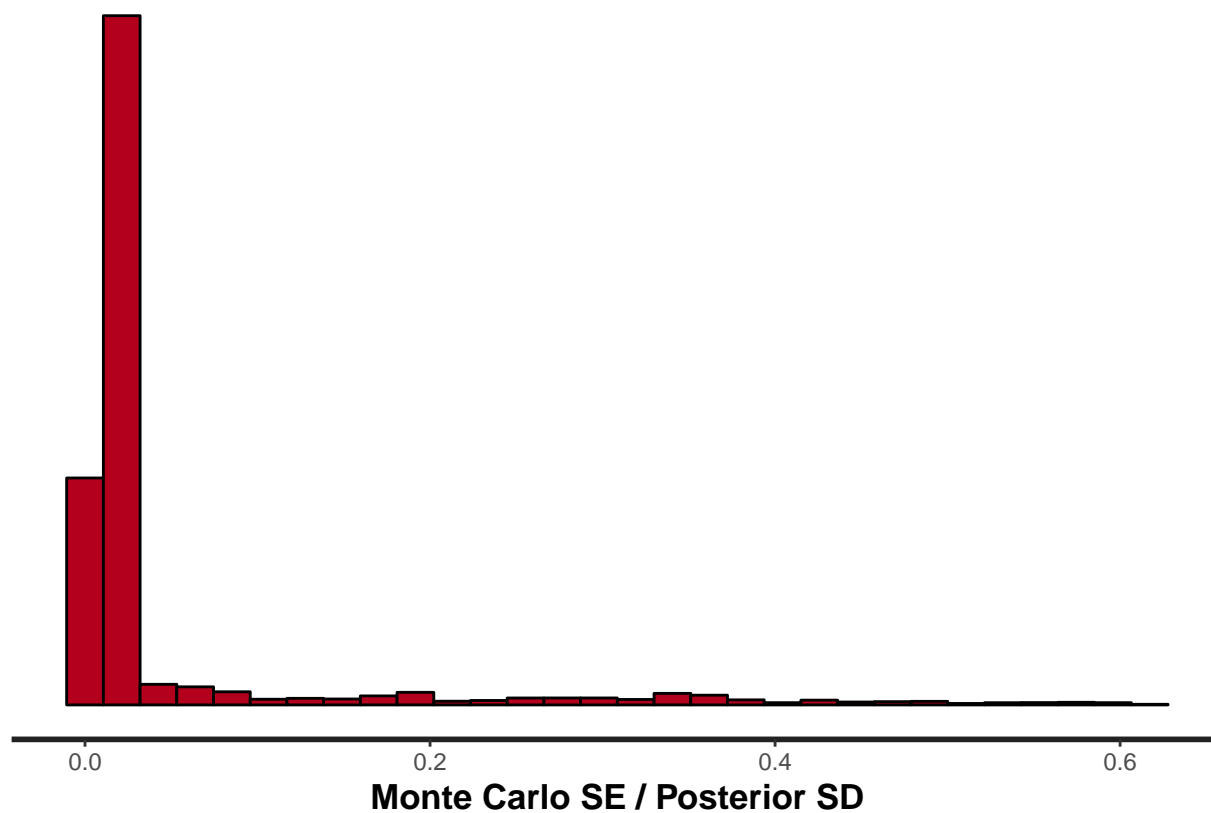
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```



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```



## 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))
}

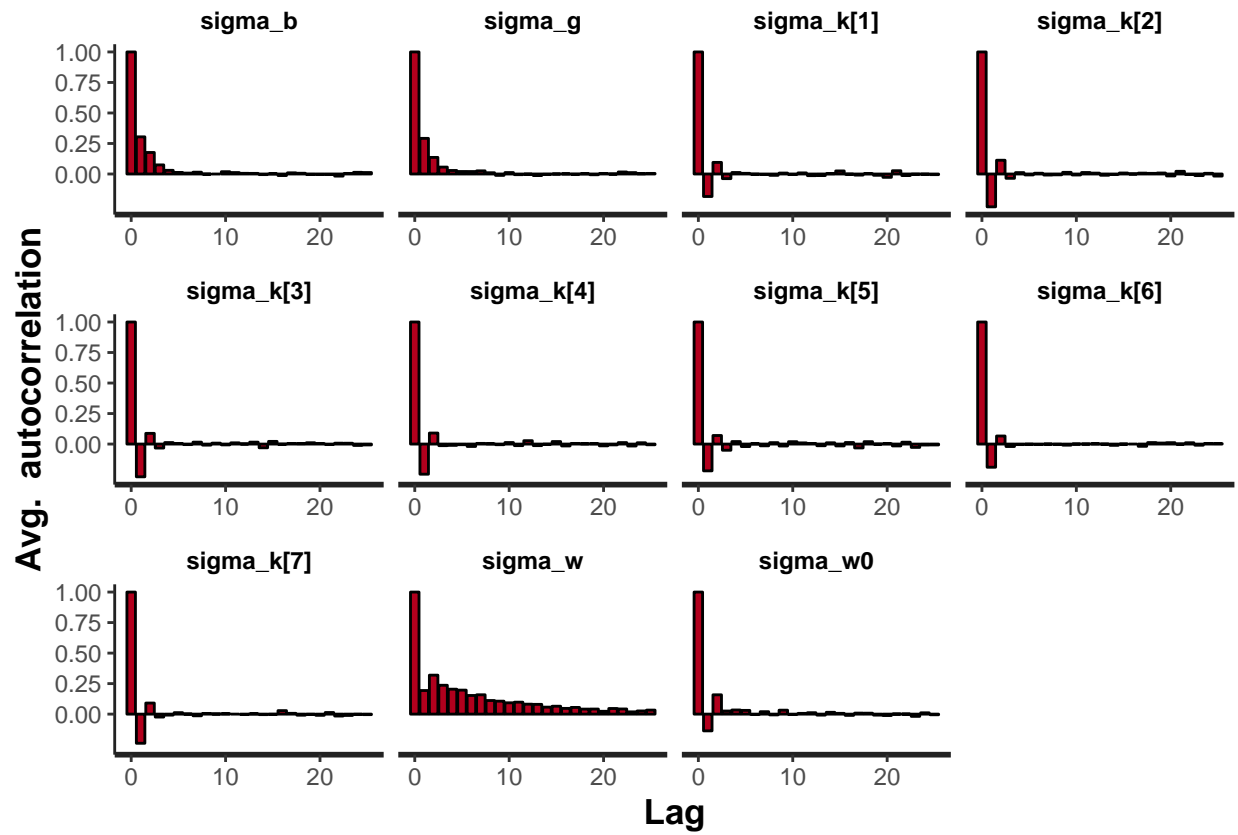
get_aggreg_plots <- function(fit, param, trim = F, trim_amount) {
  ind <- grep(paste0("^",param), rownames(as.data.frame(summary(fit)$summary)))
  medians <- data.frame(avg = as.data.frame(summary(fit)$summary)$`50%`[ind])
  print(paste0("Summary statistics for posterior medians of ",param))
  print(summary(medians))
  title <- paste0("Posterior Medians of ",param)
  print(ggplot(medians, aes(x = avg)) + geom_histogram(bins = 60) + ggtitle(title))
  if (trim == T) {
    lim <- quantile(abs(medians$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),"%")))
  }
}

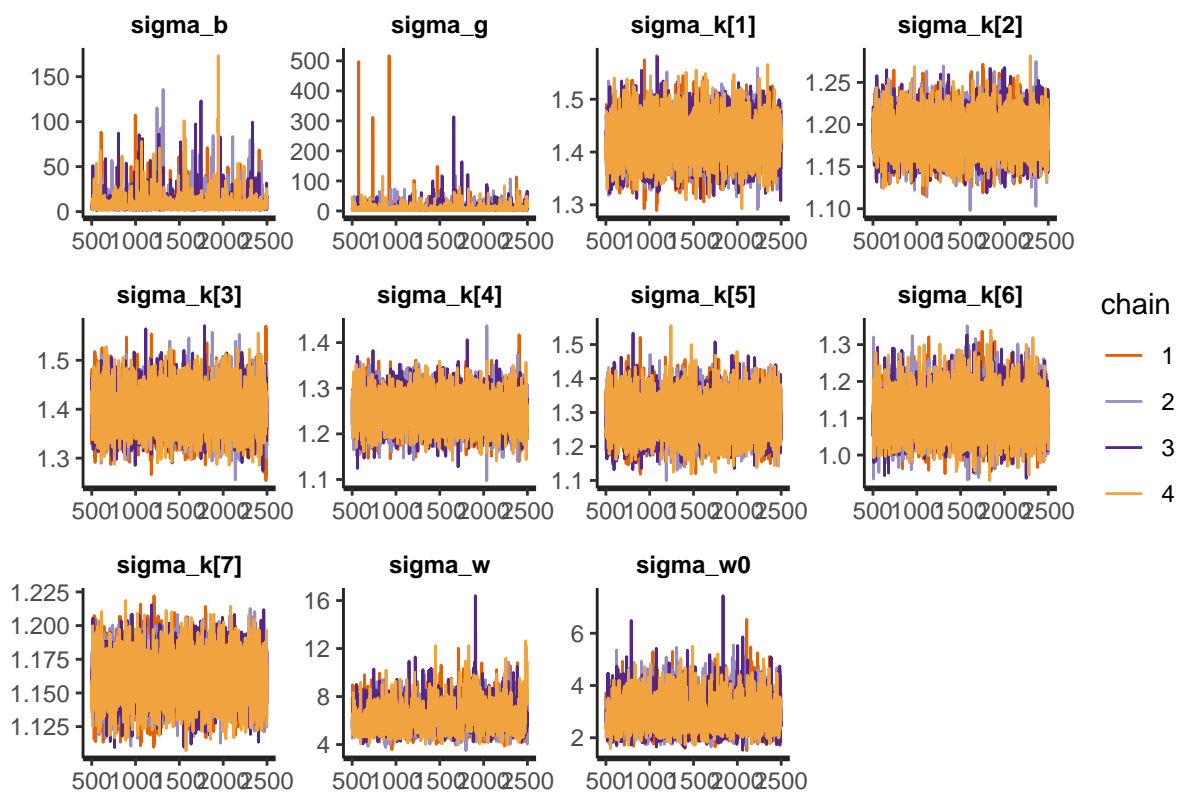
plot_fit <- function(fit) {
  get_single_plots(fit, sigma_params)
  get_single_plots(fit, beta)
  get_single_plots(fit, gamma)
  get_aggreg_plots(fit, "w")
  get_aggreg_plots(fit, "z")
  get_aggreg_plots(fit, "p")
}

plot_fit(fit)
```

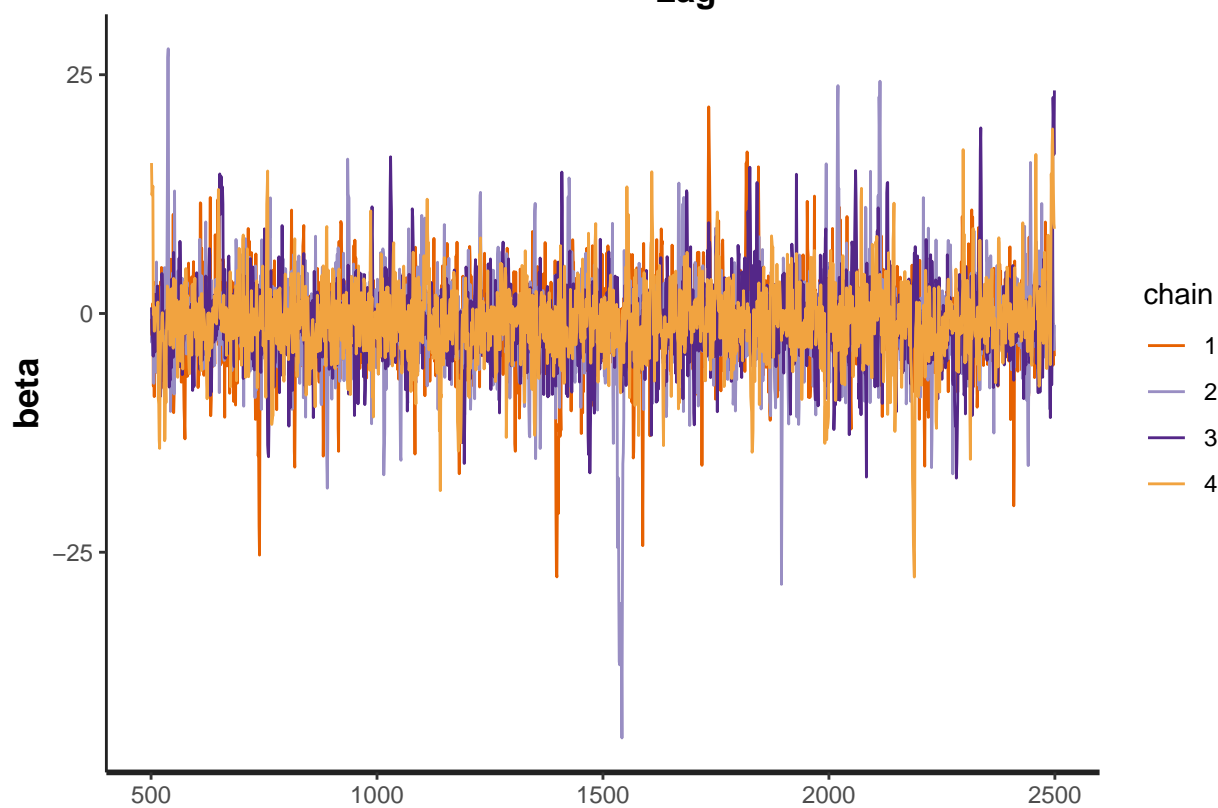
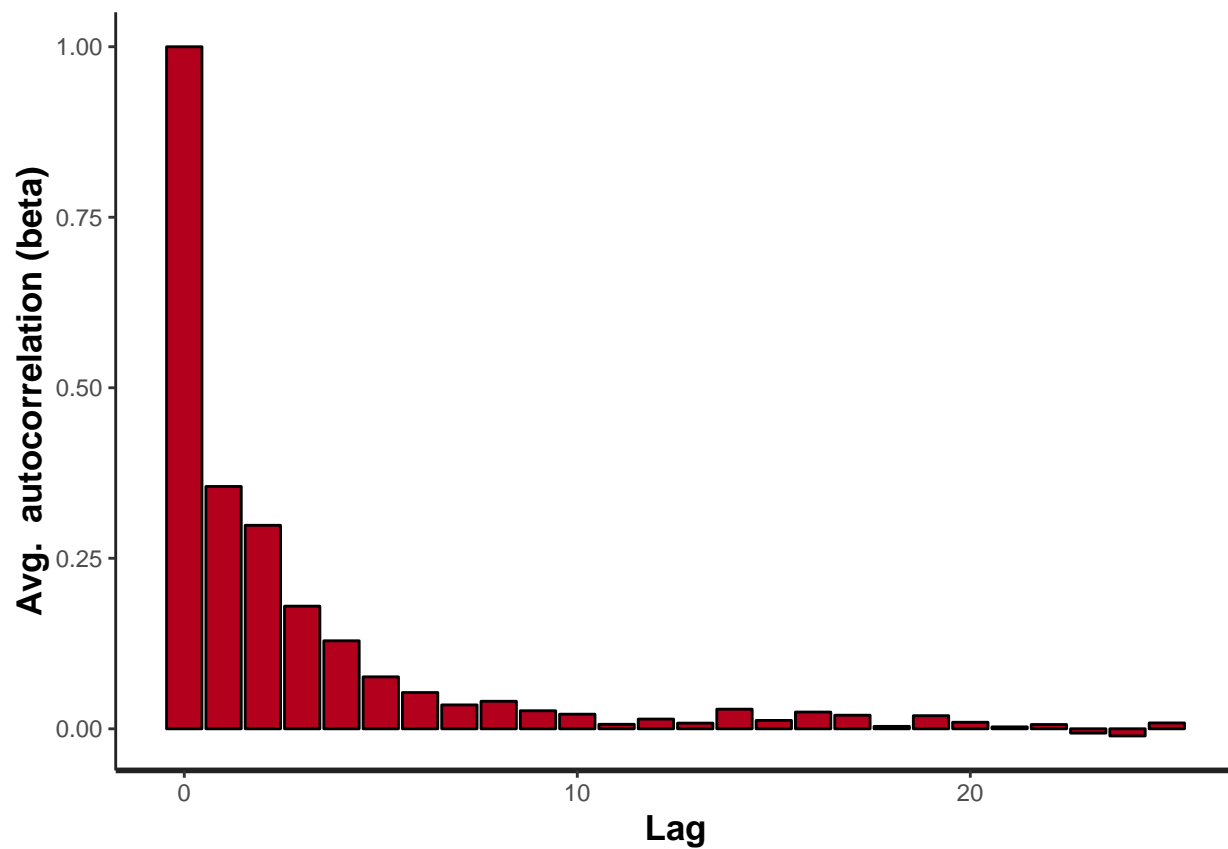
```
##           mean      se_mean      sd      25%      50%      75%
## sigma_b    7.725767  0.1536783997  9.11742174  3.525692  5.180551  8.464544
## sigma_g    8.012835  0.2109061879 13.44314112  3.536315  5.163070  8.579640
## sigma_k[1]  1.422503  0.0003807684  0.03867751  1.396445  1.421595  1.447654
## sigma_k[2]  1.189320  0.0002036614  0.02341475  1.173124  1.188954  1.204722
## sigma_k[3]  1.398963  0.0003666193  0.04145618  1.369642  1.397502  1.426959
## sigma_k[4]  1.250076  0.0003290111  0.03625542  1.224737  1.249279  1.274256
## sigma_k[5]  1.286184  0.0004877987  0.05644599  1.247522  1.284452  1.321776
## sigma_k[6]  1.112026  0.0005461257  0.05824035  1.071589  1.109238  1.149680
## sigma_k[7]  1.160990  0.0001532598  0.01684304  1.149341  1.160809  1.172300
## sigma_w    6.256371  0.0387701051  1.10506128  5.488916  6.080410  6.846063
## sigma_w0    2.839498  0.0075702558  0.58562832  2.428092  2.742596  3.153187
##           n_eff      Rhat
## sigma_b    3519.8036  0.9999874
## sigma_g    4062.7759  1.0012699
## sigma_k[1] 10317.9951  0.9998861
## sigma_k[2] 13217.8694  0.9996862
## sigma_k[3] 12786.3872  1.0001709
## sigma_k[4] 12142.9618  0.9998512
## sigma_k[5] 13390.1340  0.9996666
```

```
## sigma_k[6] 11372.6747 0.9998745
## sigma_k[7] 12077.7142 0.9996636
## sigma_w      812.4166 1.0101648
## sigma_w0     5984.4332 1.0006040
```



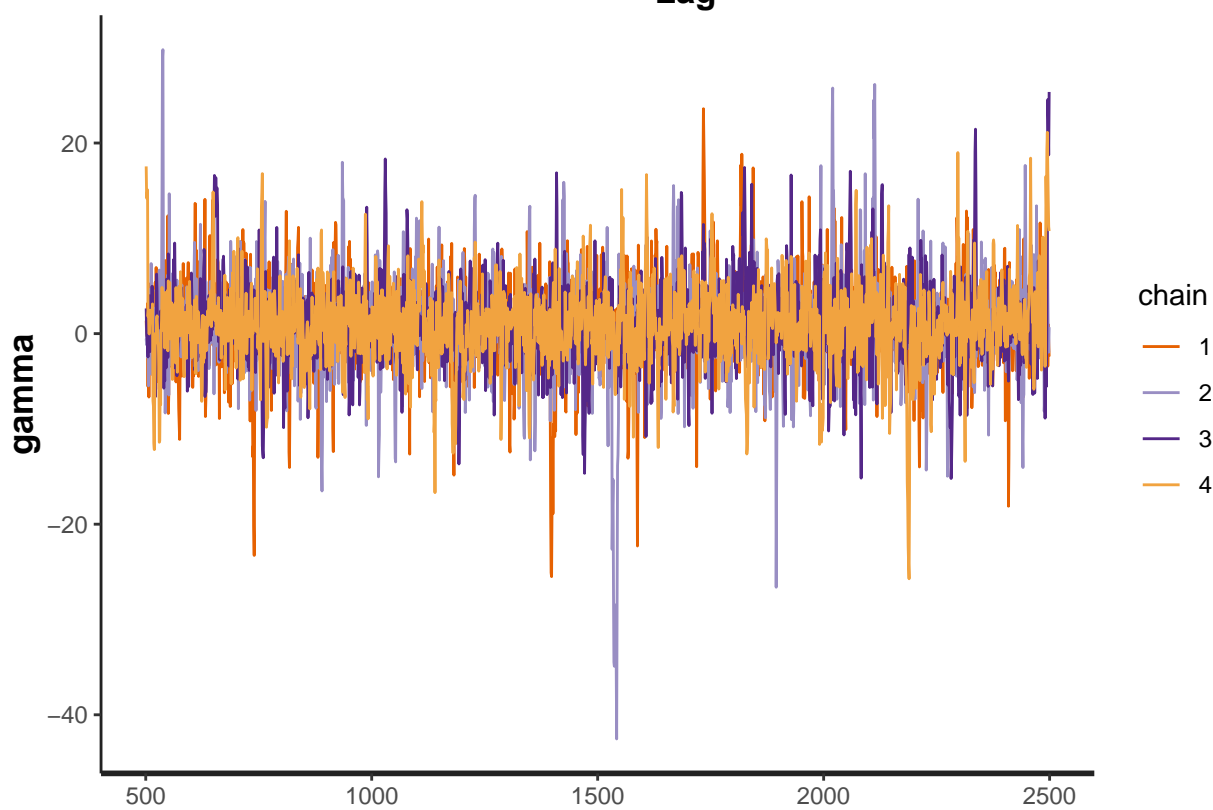
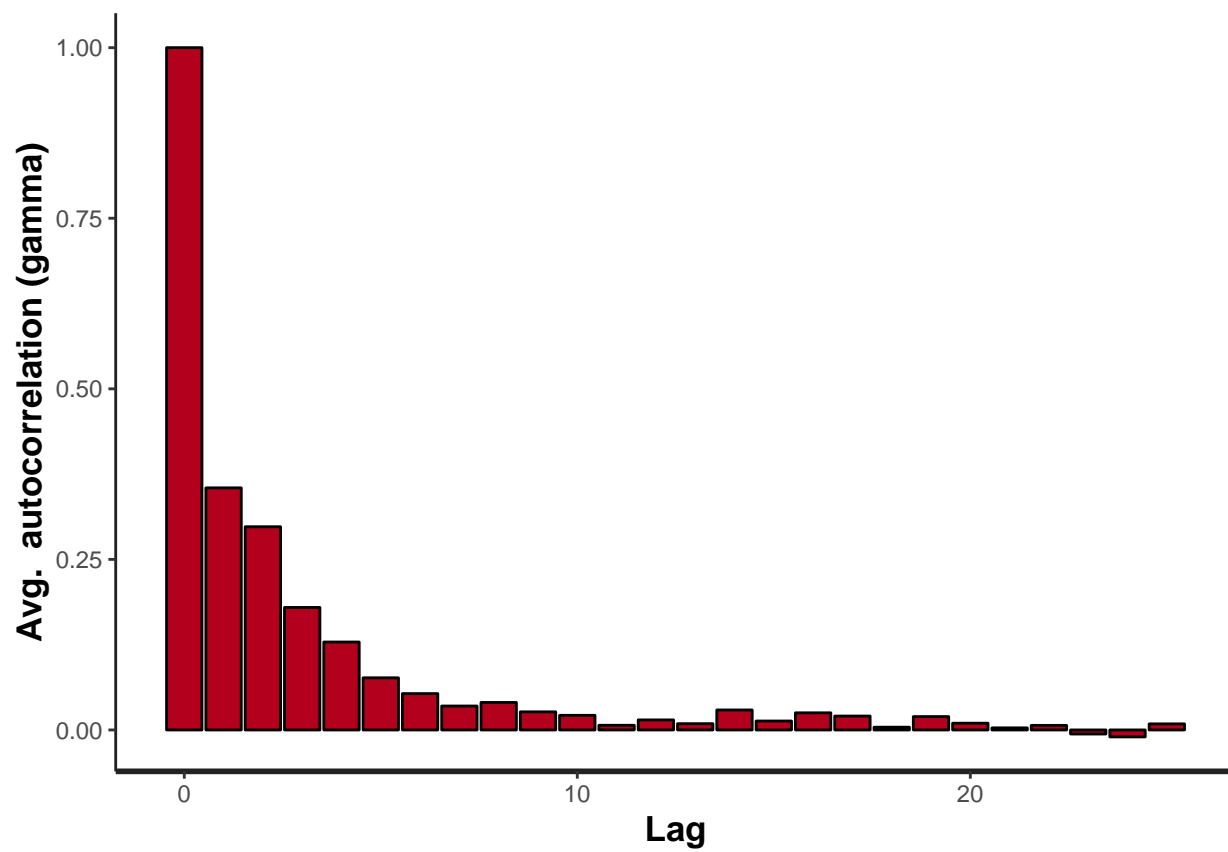


```
##           mean    se_mean      sd    25%    50%    75%    n_eff
## beta -0.9818173 0.09930403 4.558893 -3.262935 -0.9573548 1.3053 2107.584
##           Rhat
## beta 1.000715
```

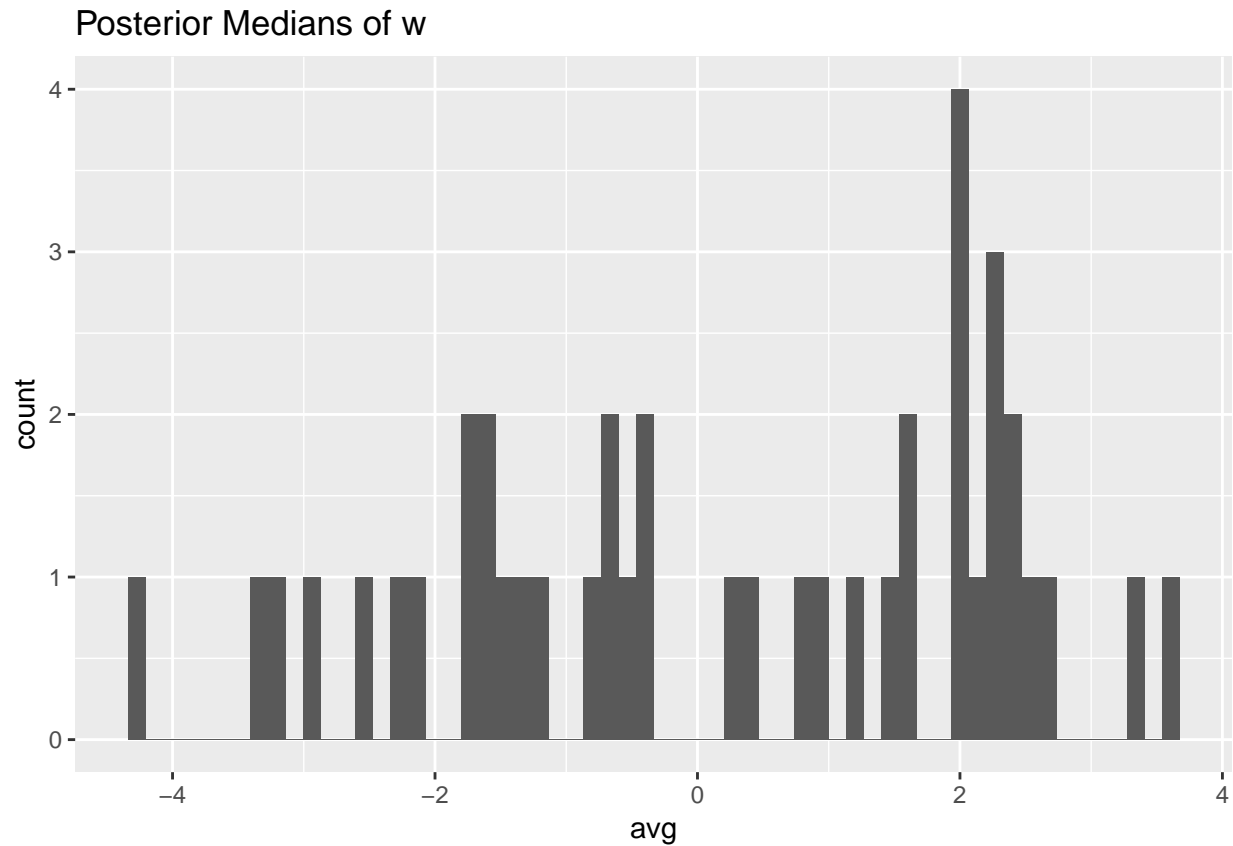


##	mean	se_mean	sd	25%	50%	75%	n_eff
## gamma	0.9569982	0.09942947	4.557911	-1.319399	0.9777151	3.240742	2101.364

```
##           Rhat
## gamma 1.000771
```

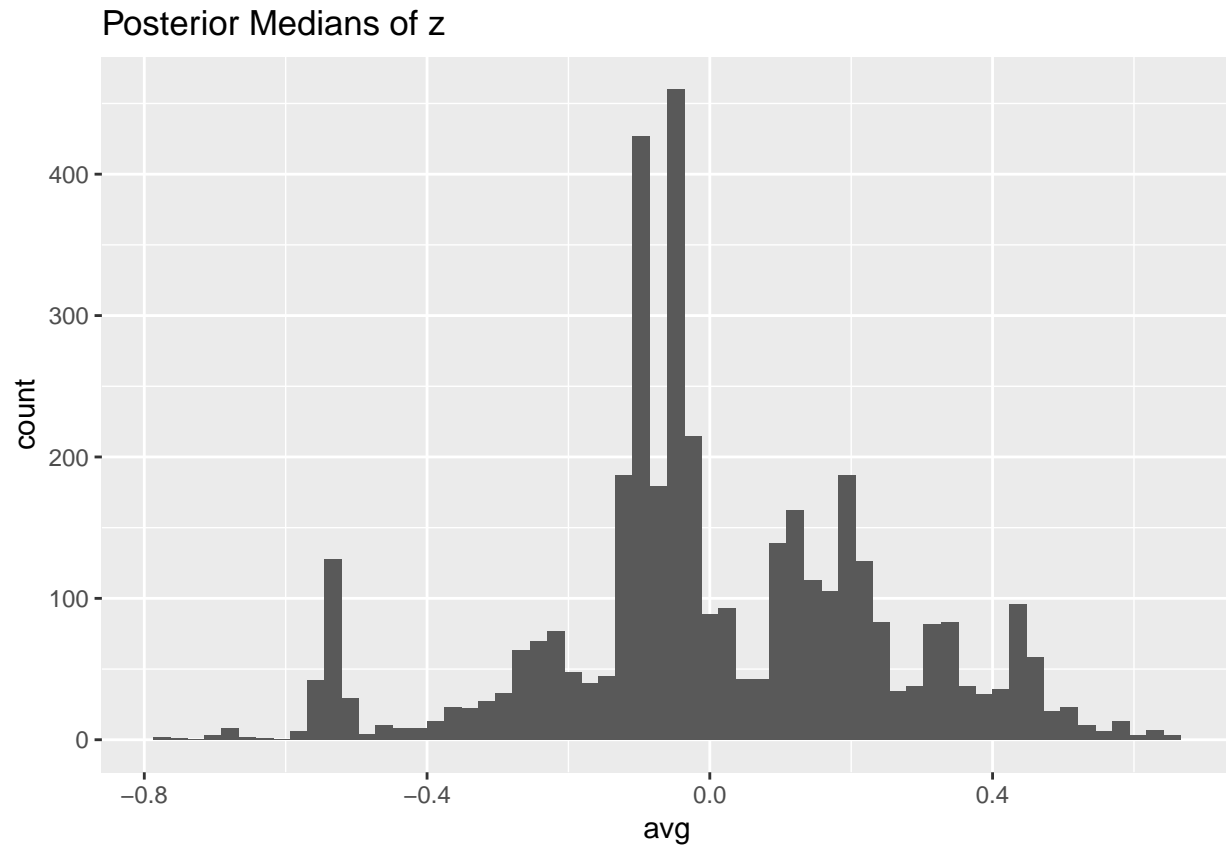


```
## [1] "Summary statistics for posterior medians of w"
##      avg
##  Min.   :-4.2913
## 1st Qu. :-1.5279
##  Median : 0.3532
##   Mean  : 0.1837
## 3rd Qu. : 2.0598
##   Max.   : 3.5896
```



```
## [1] "Summary statistics for posterior medians of z"
##      avg
##  Min.   :-0.771837
## 1st Qu. :-0.104325
##  Median :-0.035956
##   Mean  : 0.009374
## 3rd Qu. : 0.180525
##   Max.   : 0.657484
```





```
## [1] "Summary statistics for posterior medians of p"
##      avg
##  Min.   :-10.0032
## 1st Qu.: -7.0768
## Median : -5.9895
## Mean   : -5.5026
## 3rd Qu.: -3.7278
## Max.   : -0.9835
```

