MCMC Diagnostics - IFLS data

Sarah Teichman

10/31/2019

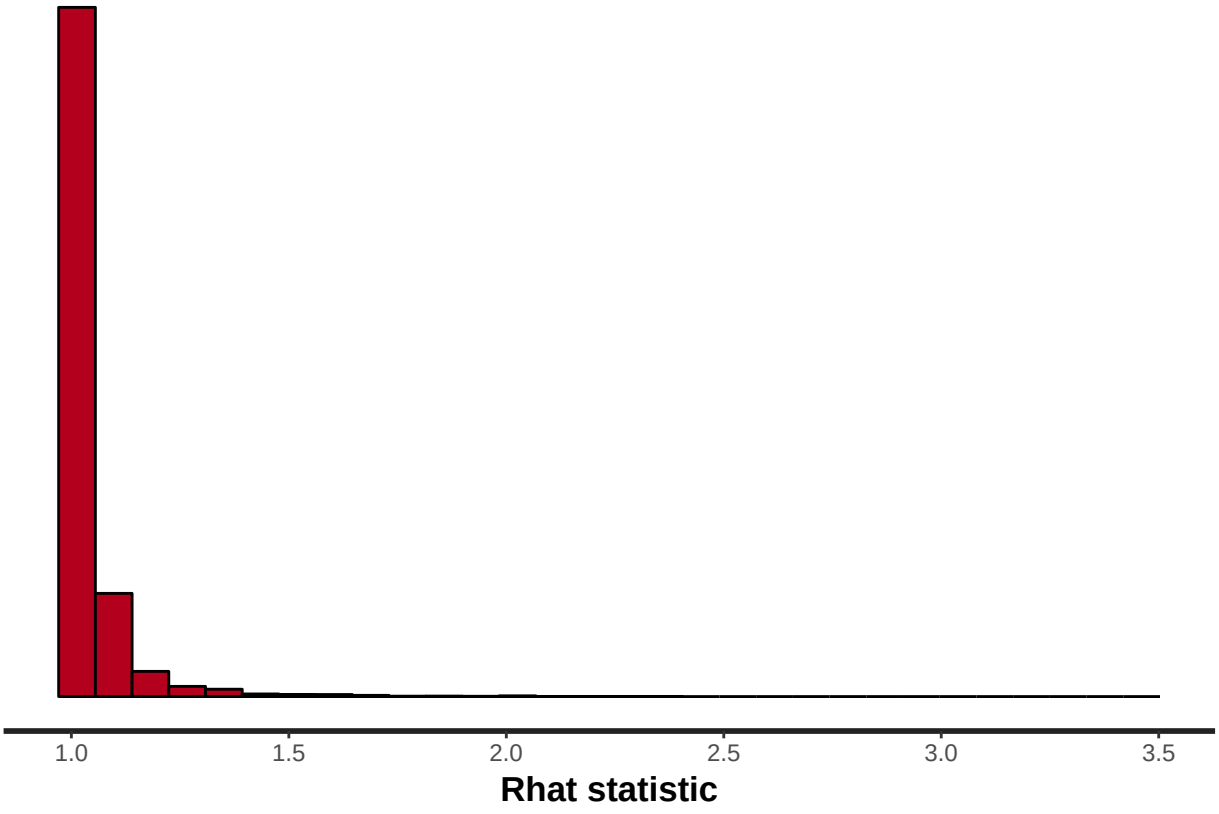
```
K <- 7
Ti <- 3
N <- 1973
```

General MCMC diagnostic plots

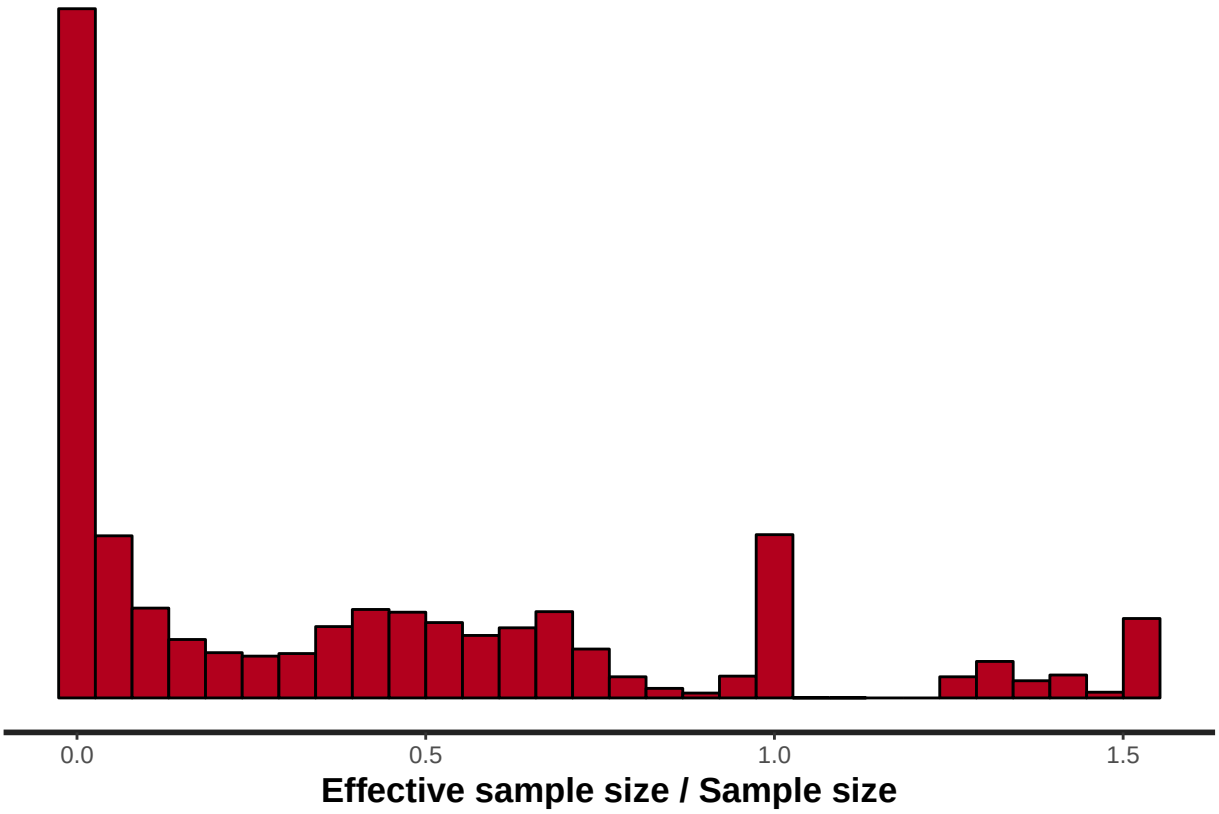
Overall model diagnostics from rstan package.

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

```
## Warning: Removed 1 rows containing non-finite values (stat_bin).
```

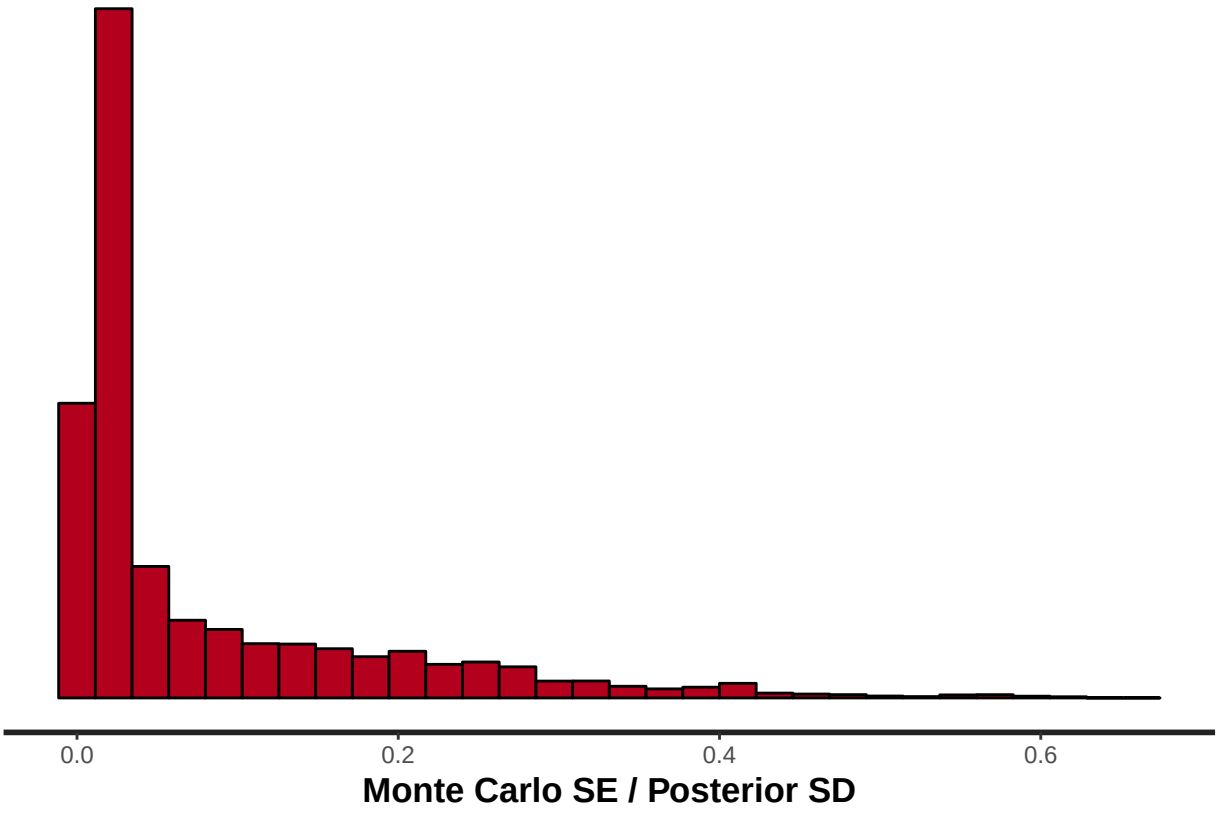



```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




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

```
## Warning: Removed 2 rows containing non-finite values (stat_bin).
```



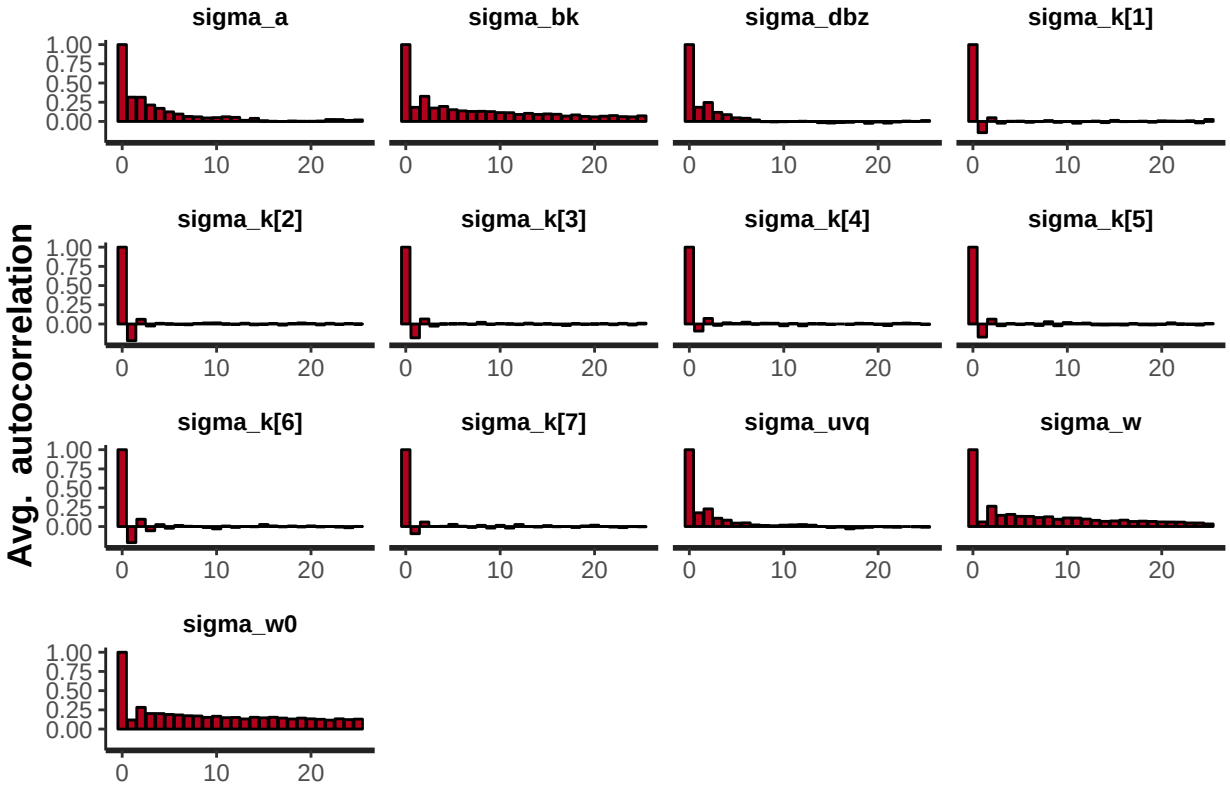
Individual Parameter Diagnostics

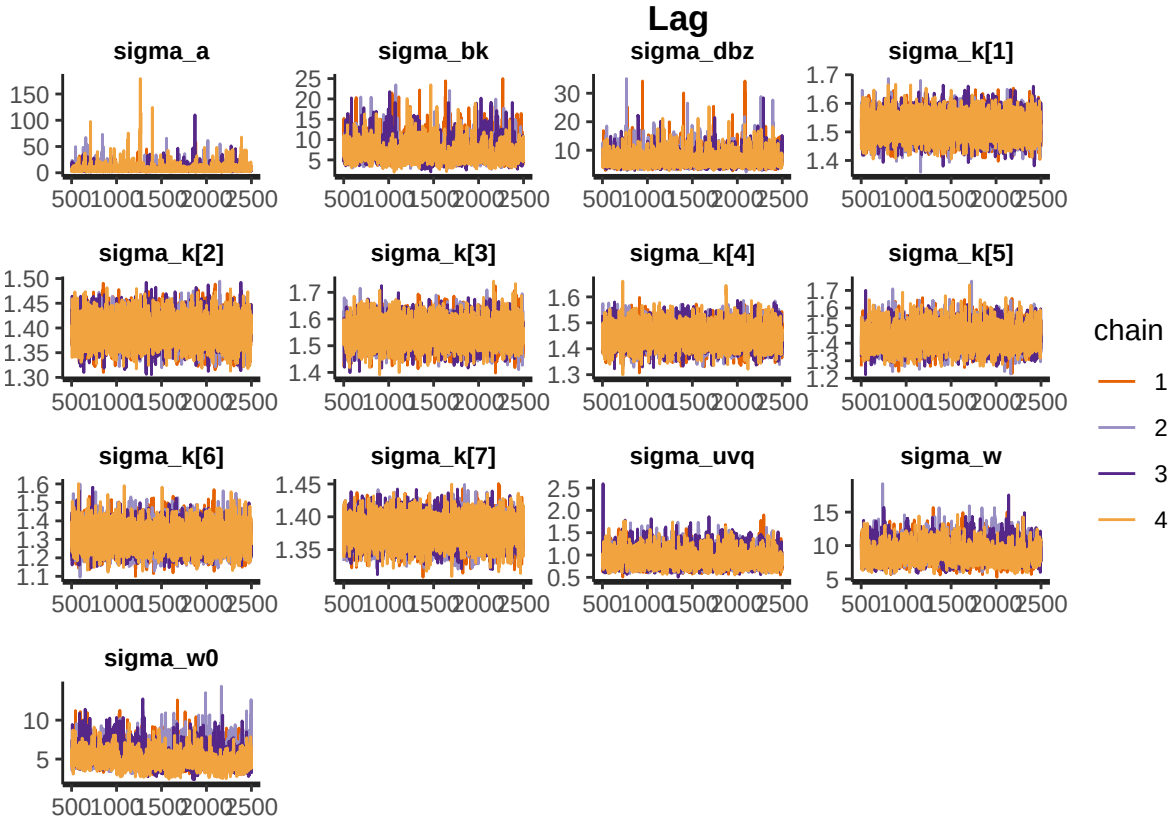
Individual parameter plots. Autocorrelation and trace plots for individual parameters, and histograms of posterior medians for group parameters.

```
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_k)
```

```
  get_single_plots(fit, other_1d)
  get_single_plots(fit, u)
  get_single_plots(fit, v)
  get_single_plots(fit, q)
  get_aggreg_plots(fit, "w")
  #get_aggreg_plots(fit, "z")
  get_aggreg_plots(fit, "p")
  get_aggreg_plots(fit, "eta", trim = T, trim_amount = .60)
  get_aggreg_plots(fit, "lambda", trim = T, trim_amount = .60)
  get_aggreg_plots(fit, "kappa", trim = T, trim_amount = .60)
}
plot_fit(fit)
```

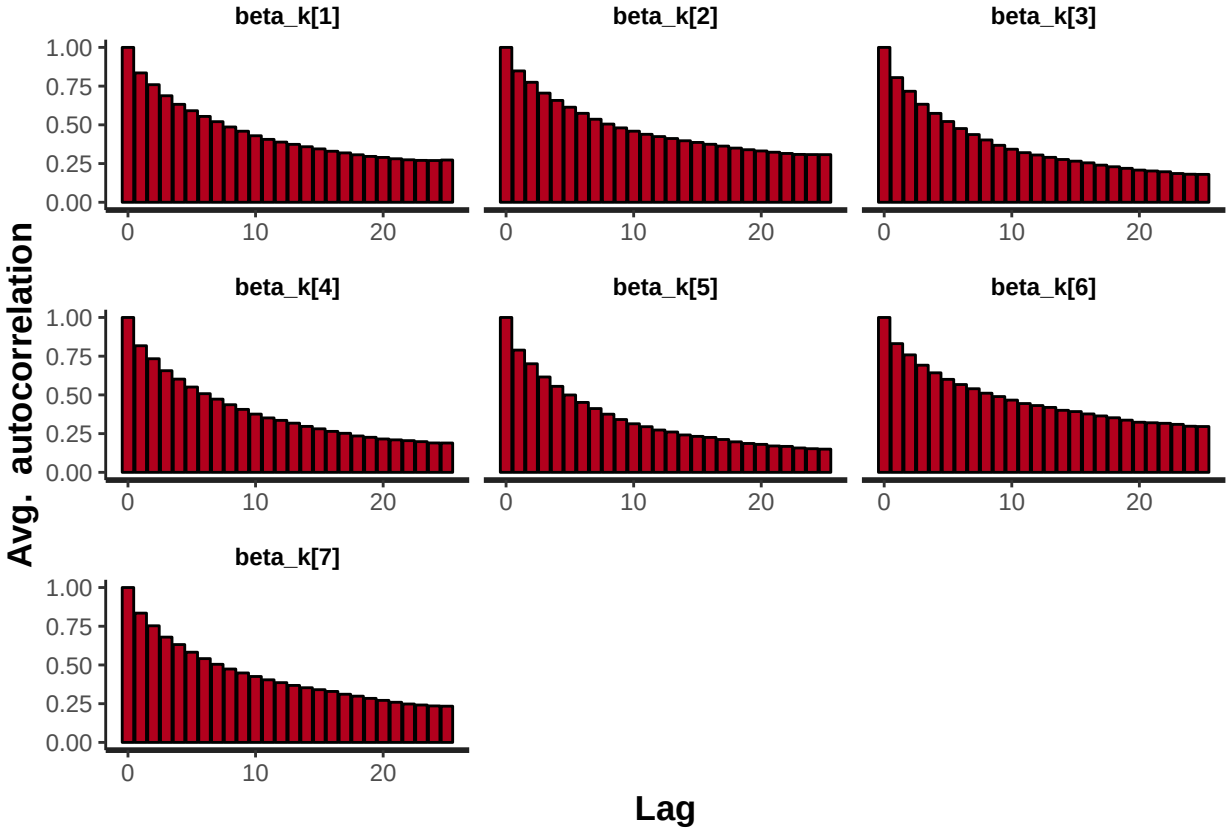
```
##                mean      se_mean         sd       25%       50%      75%
## sigma_a    7.1059997 0.2315404012 7.15444040 3.6111491 5.1245624 8.017194
## sigma_bk   7.0576198 0.1403217448 2.54720403 5.3334681 6.6019578 8.135260
## sigma_dbz  6.8480546 0.0480246190 2.70676069 5.0809236 6.2336153 7.912783
## sigma_k[1] 1.5189559 0.0004134966 0.04212929 1.4900342 1.5178913 1.546744
## sigma_k[2] 1.3957873 0.0002518795 0.02783747 1.3768692 1.3955960 1.413971
## sigma_k[3] 1.5496148 0.0004367546 0.04626439 1.5182505 1.5488596 1.580104
## sigma_k[4] 1.4511716 0.0004795314 0.04236637 1.4217993 1.4503601 1.479094
## sigma_k[5] 1.4374706 0.0006245016 0.06461332 1.3927710 1.4346959 1.479759
## sigma_k[6] 1.3107865 0.0006248792 0.06799750 1.2637721 1.3079311 1.354340
## sigma_k[7] 1.3780718 0.0002247561 0.02027967 1.3643090 1.3776444 1.391795
## sigma_uvq  0.9315053 0.0033867837 0.18702233 0.7976245 0.9036162 1.035540
## sigma_w    9.0262764 0.0578931755 1.44951830 8.0153345 8.8652833 9.864668
## sigma_w0   5.4085126 0.2662160390 1.33725264 4.4718106 5.2465843 6.147246
##                n_eff      Rhat
## sigma_a      954.7678 1.0134646
## sigma_bk     329.5168 1.0190154
## sigma_dbz   3176.6683 1.0001098
## sigma_k[1] 10380.6488 0.9997593
## sigma_k[2] 12214.4530 1.0001123
## sigma_k[3] 11220.6697 0.9999408
## sigma_k[4]  7805.6379 0.9999226
## sigma_k[5] 10704.7594 0.9999113
## sigma_k[6] 11841.1473 0.9999269
## sigma_k[7]  8141.3950 1.0000721
## sigma_uvq   3049.3832 1.0015204
## sigma_w      626.8919 1.0141502
## sigma_w0      25.2324 1.0790780
```

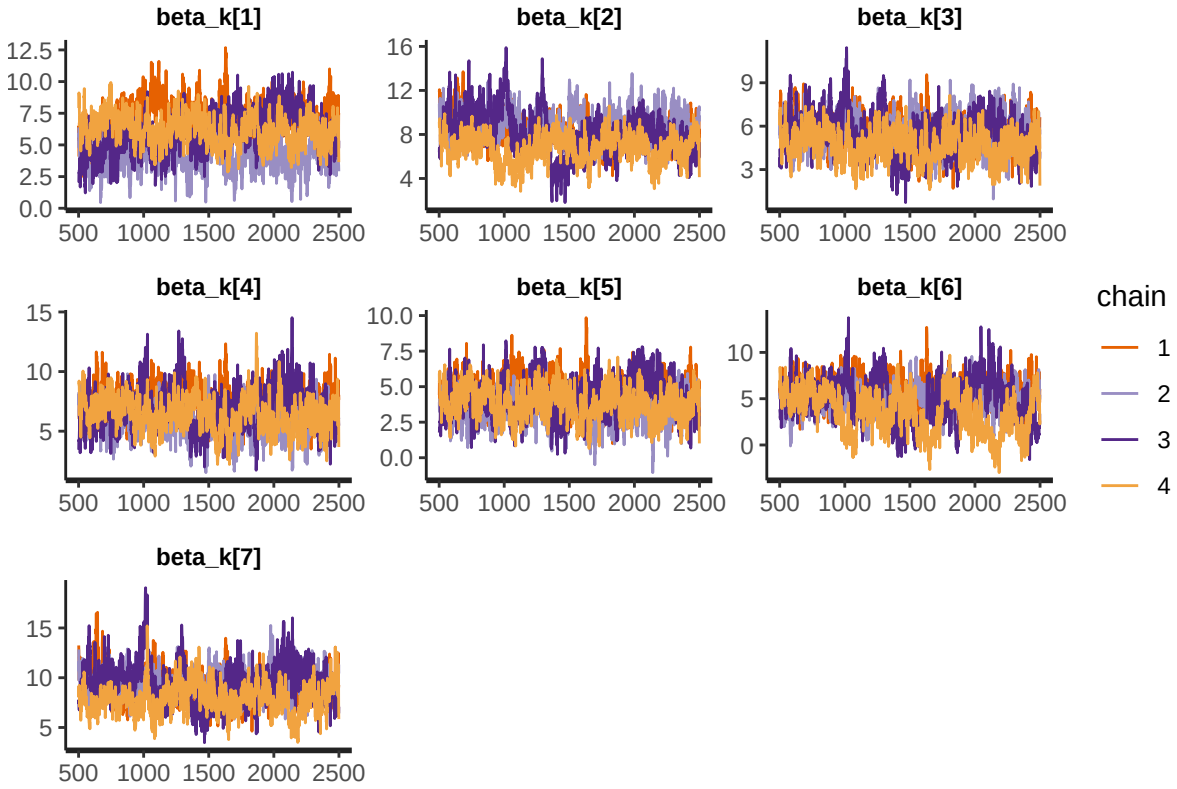




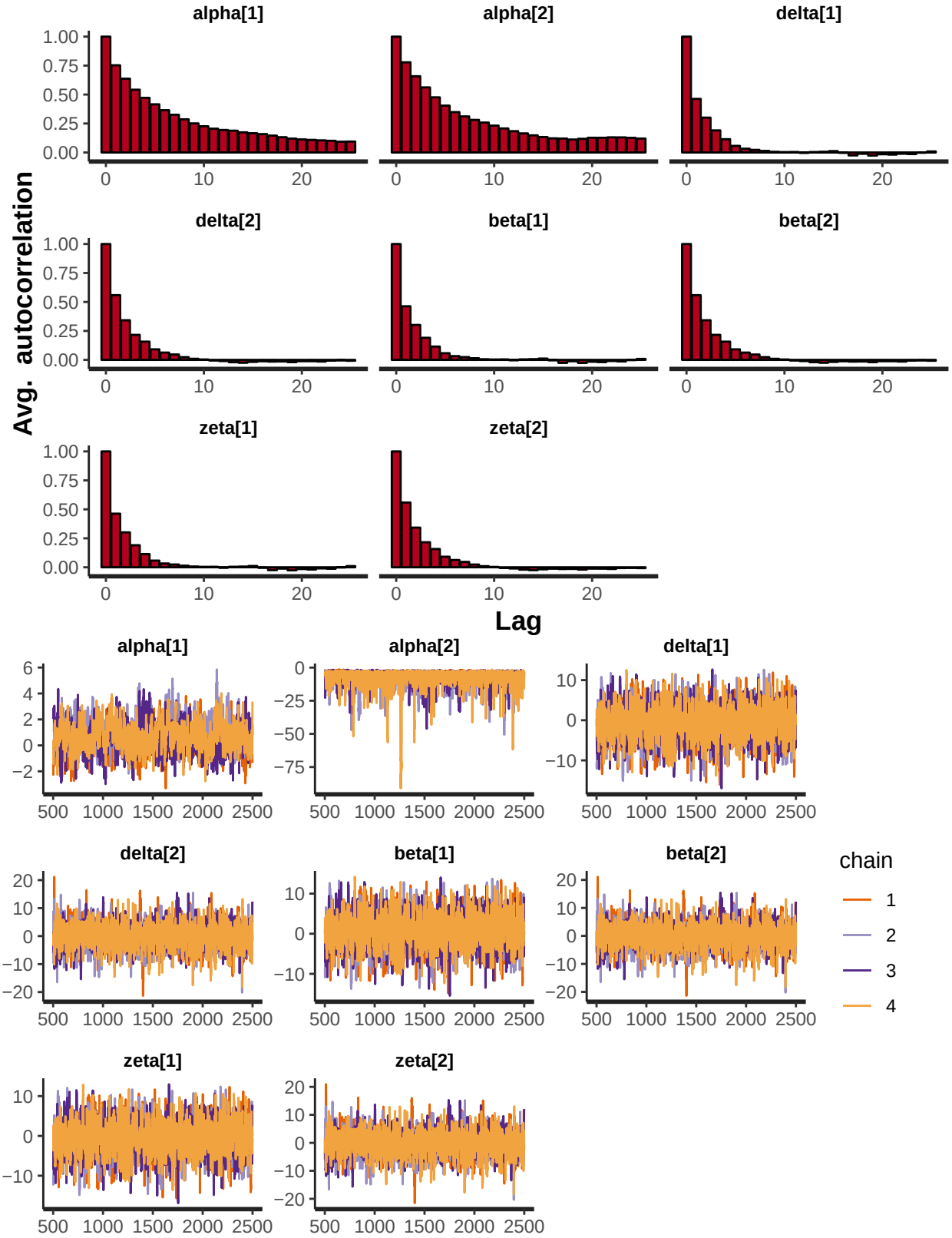

```
##                mean    se_mean        sd      25%      50%      75%     n_eff
## beta_k[1] 5.854255 0.8023952 1.783697 4.524350 5.899666 7.164210  4.941574
## beta_k[2] 7.967340 0.4942892 1.678261 6.904327 7.924361 9.001742 11.528076
```

```
## beta_k[3] 5.330678 0.1738158 1.243876 4.514336 5.319651 6.130701 51.212404
## beta_k[4] 6.648439 0.3949195 1.594811 5.571940 6.637393 7.679000 16.308031
## beta_k[5] 4.005999 0.2895766 1.232319 3.212141 3.999903 4.778172 18.110052
## beta_k[6] 4.789474 0.5288671 2.130440 3.518369 5.049055 6.225617 16.227277
## beta_k[7] 8.908830 0.3415422 1.718943 7.782281 8.827774 9.915059 25.329942
##               Rhat
## beta_k[1] 1.452432
## beta_k[2] 1.181241
## beta_k[3] 1.070959
## beta_k[4] 1.125080
## beta_k[5] 1.107775
## beta_k[6] 1.155587
## beta_k[7] 1.090269
```



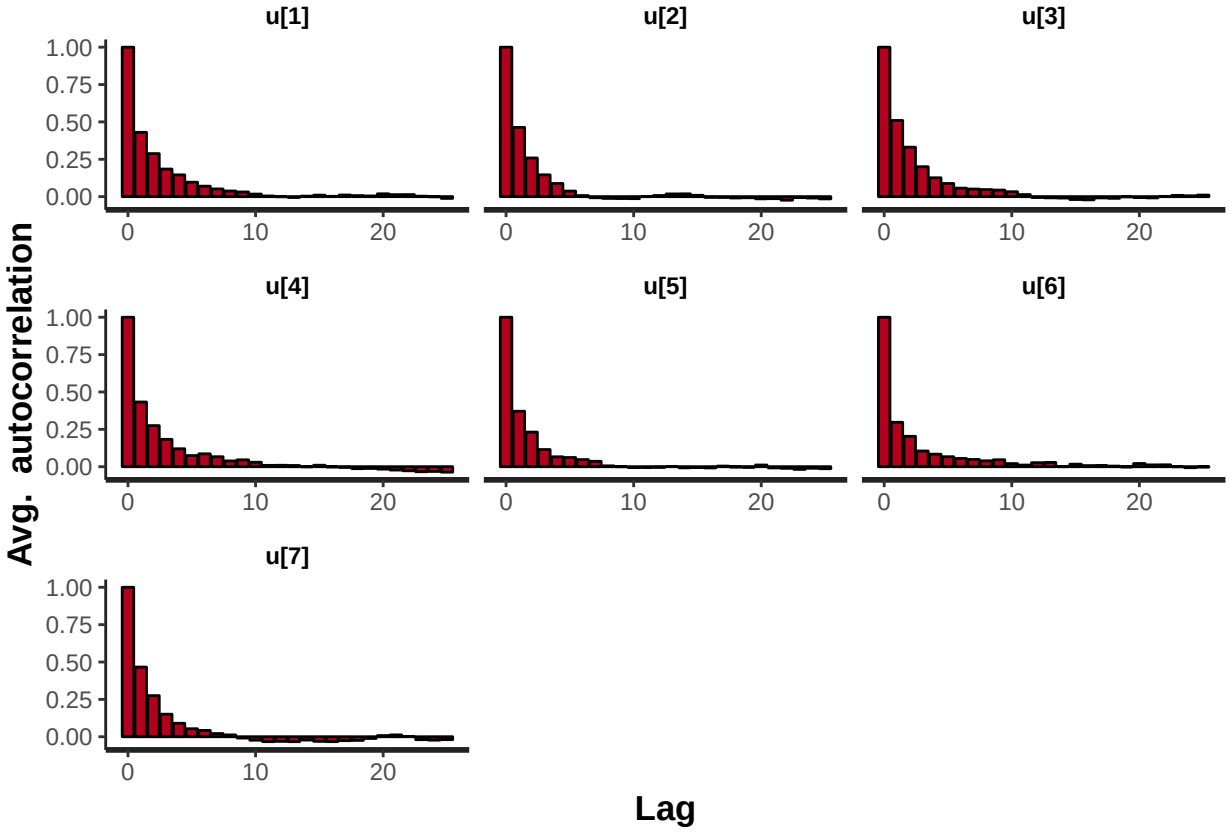


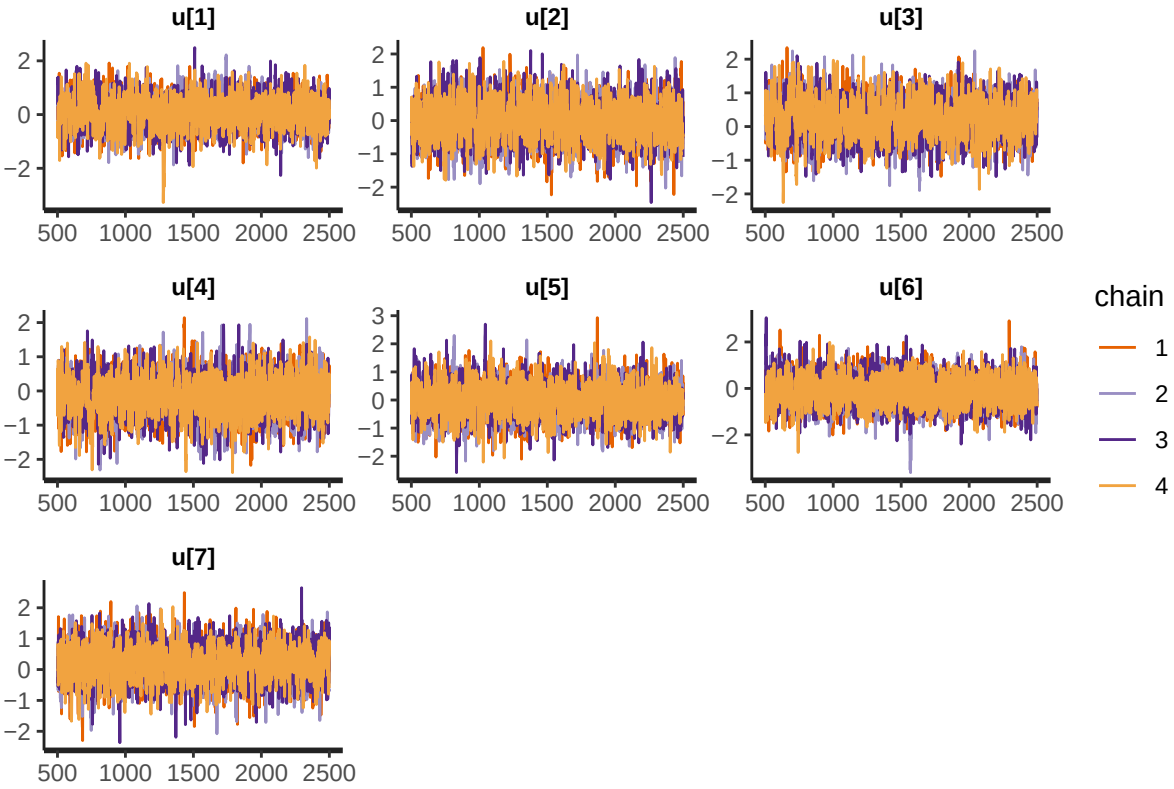

```
##                  mean    se_mean       sd        25%         50%        75%
## alpha[1]  0.61368109 0.07125088 1.110443 -0.1000786  0.56625786  1.279223
## alpha[2] -6.82601972 0.64988246 6.340788 -7.9256425 -4.85391110 -3.331653
## delta[1] -0.68063987 0.08381867 3.998801 -3.0931213 -0.59316993  1.789259
## delta[2] -0.03476382 0.09436677 4.191676 -2.5499974  0.04737784  2.555164
## beta[1]   0.79601530 0.08399765 4.000794 -1.6067362  0.87953202  3.270781
## beta[2]  -0.09964663 0.09435125 4.191307 -2.6241073 -0.02324319  2.480093
## zeta[1]  -0.55738470 0.08395134 4.000968 -2.9733289 -0.47467762  1.910604
## zeta[2]  -0.24335239 0.09434589 4.191239 -2.7708784 -0.17258154  2.333321
##              n_eff     Rhat
## alpha[1]  242.8914 1.033679
## alpha[2]   95.1956 1.038735
## delta[1] 2276.0306 1.000586
## delta[2] 1973.0461 1.000948
## beta[1]  2268.6009 1.000604
## beta[2]  1973.3474 1.000949
## zeta[1]  2271.3021 1.000620
## zeta[2]  1973.5079 1.000939
```



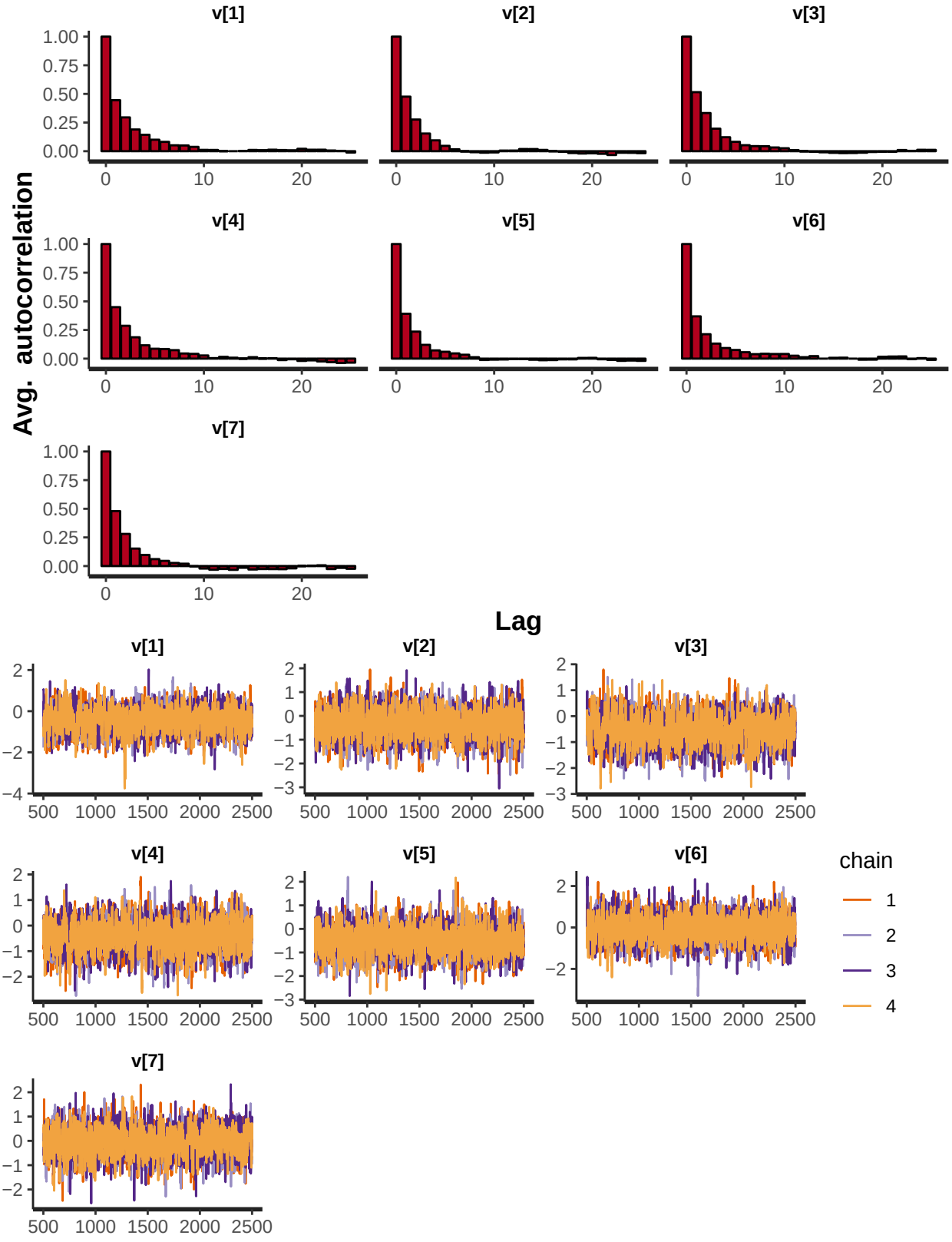

```
##              mean     se_mean        sd        25%         50%       75%
## u[1]  0.07104094 0.01250496 0.5721048 -0.2852566  0.07857652 0.4394199
## u[2]  0.01659972 0.01109775 0.5720139 -0.3517684  0.01861791 0.3961190
```

```
## u[3]  0.22801092 0.01286371 0.5668547 -0.1367517  0.22944035 0.5924595
## u[4] -0.15793167 0.01252712 0.5747720 -0.5244542 -0.15195303 0.2161991
## u[5] -0.01377106 0.01090792 0.5765620 -0.3901241 -0.01277652 0.3510938
## u[6] -0.11340437 0.01245067 0.6144256 -0.5135796 -0.11638534 0.2820824
## u[7]  0.19573968 0.01131604 0.5670847 -0.1614348  0.20035718 0.5725580
##         n_eff      Rhat
## u[1] 2093.084 1.0000929
## u[2] 2656.707 1.0008701
## u[3] 1941.829 1.0007514
## u[4] 2105.178 0.9995951
## u[5] 2793.882 1.0007542
## u[6] 2435.303 1.0017705
## u[7] 2511.348 1.0023182
```



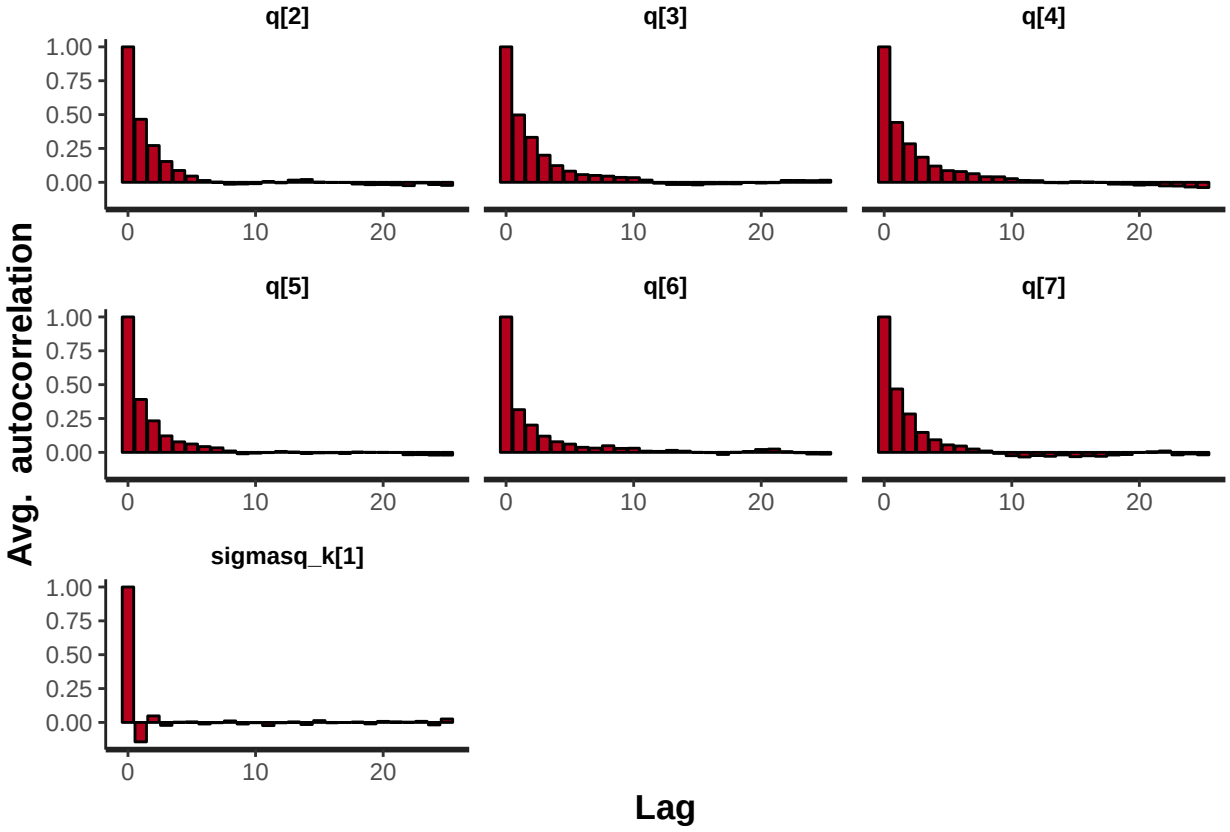


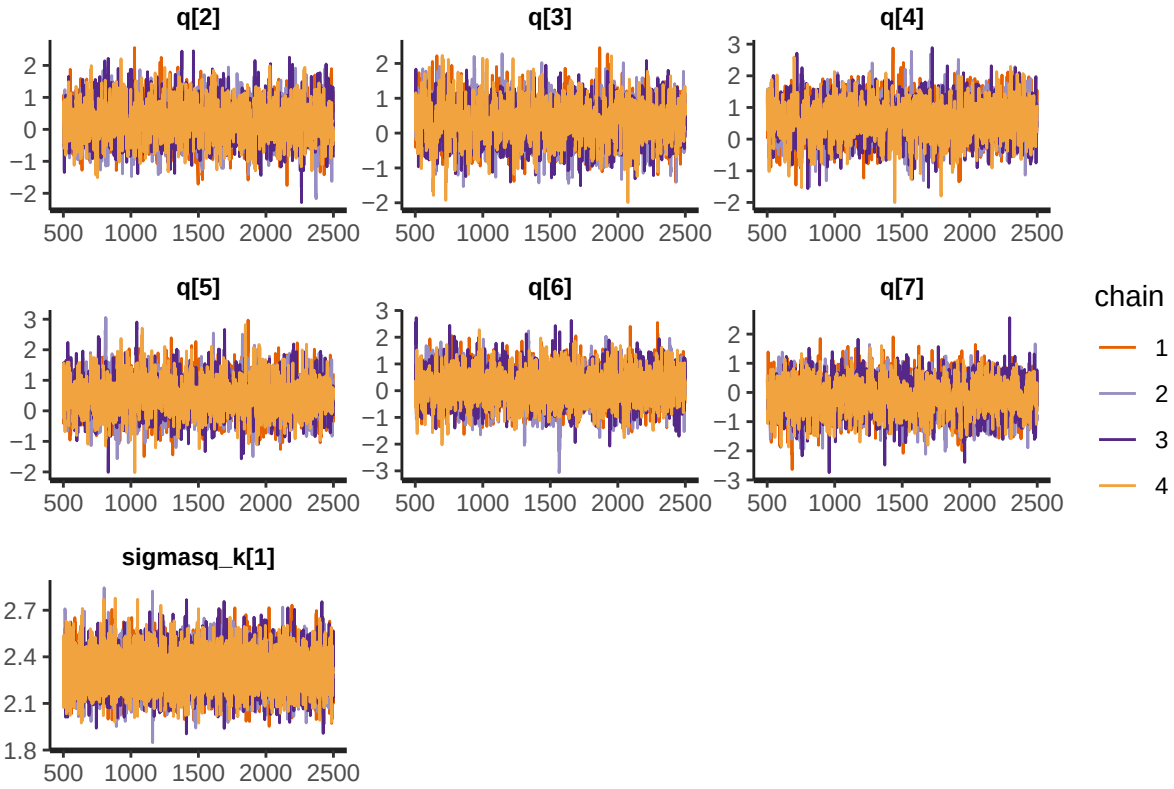

```
##              mean    se_mean        sd        25%         50%         75%
## v[1] -0.46730085 0.01269695 0.5649109 -0.8256916 -0.45830554 -0.09648300
## v[2] -0.34163958 0.01129716 0.5692197 -0.7010699 -0.33229049  0.02720905
## v[3] -0.53867903 0.01262863 0.5617665 -0.8940059 -0.53692310 -0.17358728
## v[4] -0.43071177 0.01259027 0.5696427 -0.7968406 -0.41819284 -0.05864467
## v[5] -0.48328110 0.01079683 0.5649766 -0.8599085 -0.47459274 -0.12240863
## v[6] -0.06951976 0.01232508 0.5861778 -0.4486916 -0.06294986  0.30821787
## v[7] -0.06034446 0.01138140 0.5605638 -0.4117314 -0.05296867  0.30321253
##         n_eff      Rhat
## v[1] 1979.525 1.0002576
## v[2] 2538.757 1.0006967
## v[3] 1978.789 1.0006621
## v[4] 2047.080 0.9995528
## v[5] 2738.221 1.0004573
## v[6] 2261.932 1.0018306
## v[7] 2425.820 1.0023728
```



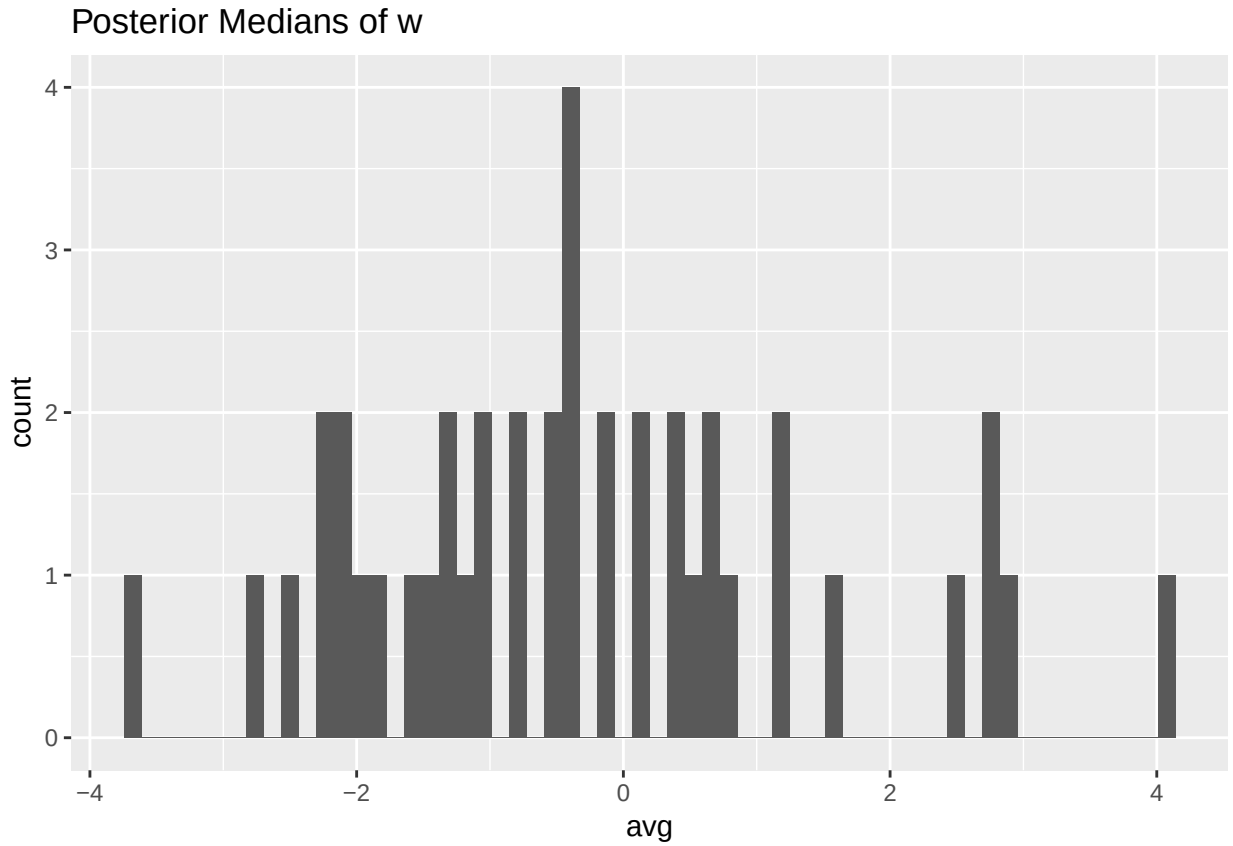

```
##                  mean      se_mean        sd          25%        50%
## q[2]        0.2712652 0.011304547 0.5742205 -0.09789836  0.2735468
## q[3]        0.3146267 0.012763528 0.5667767 -0.04771602  0.3101437
```

```
## q[4]          0.5826678 0.012564383 0.5746874  0.21085553  0.5766185
## q[5]          0.4947330 0.010919683 0.5704531  0.11676178  0.4827995
## q[6]          0.1445793 0.012048685 0.6060831 -0.24982114  0.1403469
## q[7]         -0.1657940 0.011282952 0.5638443 -0.52074999 -0.1711626
## sigmasq_k[1]  2.3090016 0.001264686 0.1282364  2.22020206  2.3039939
##                     75%     n_eff      Rhat
## q[2]          0.6440110  2580.186 1.0007263
## q[3]          0.6854288  1971.889 1.0009034
## q[4]          0.9599293  2092.093 0.9996312
## q[5]          0.8536190  2729.102 1.0004184
## q[6]          0.5357614  2530.376 1.0017367
## q[7]          0.2093297  2497.312 1.0021027
## sigmasq_k[1] 2.3924182 10281.516 0.9997581
```

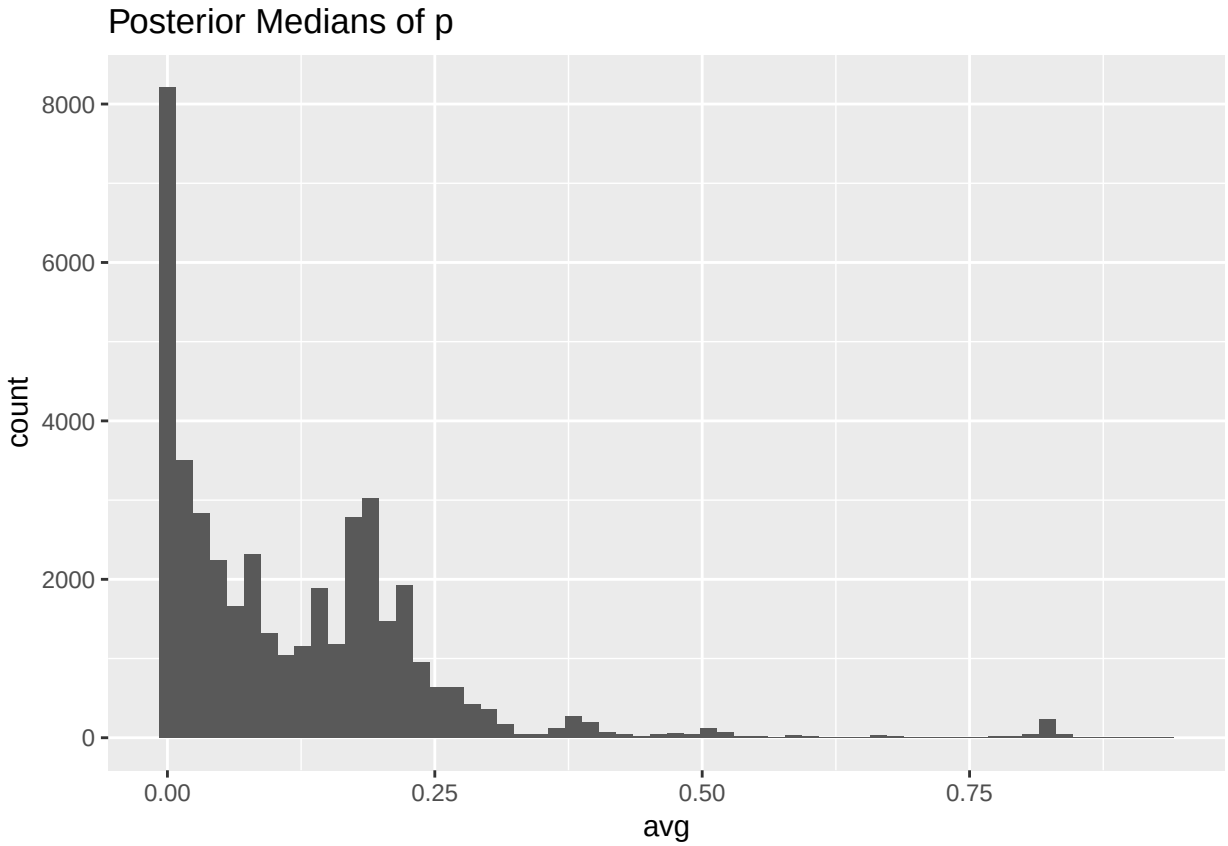




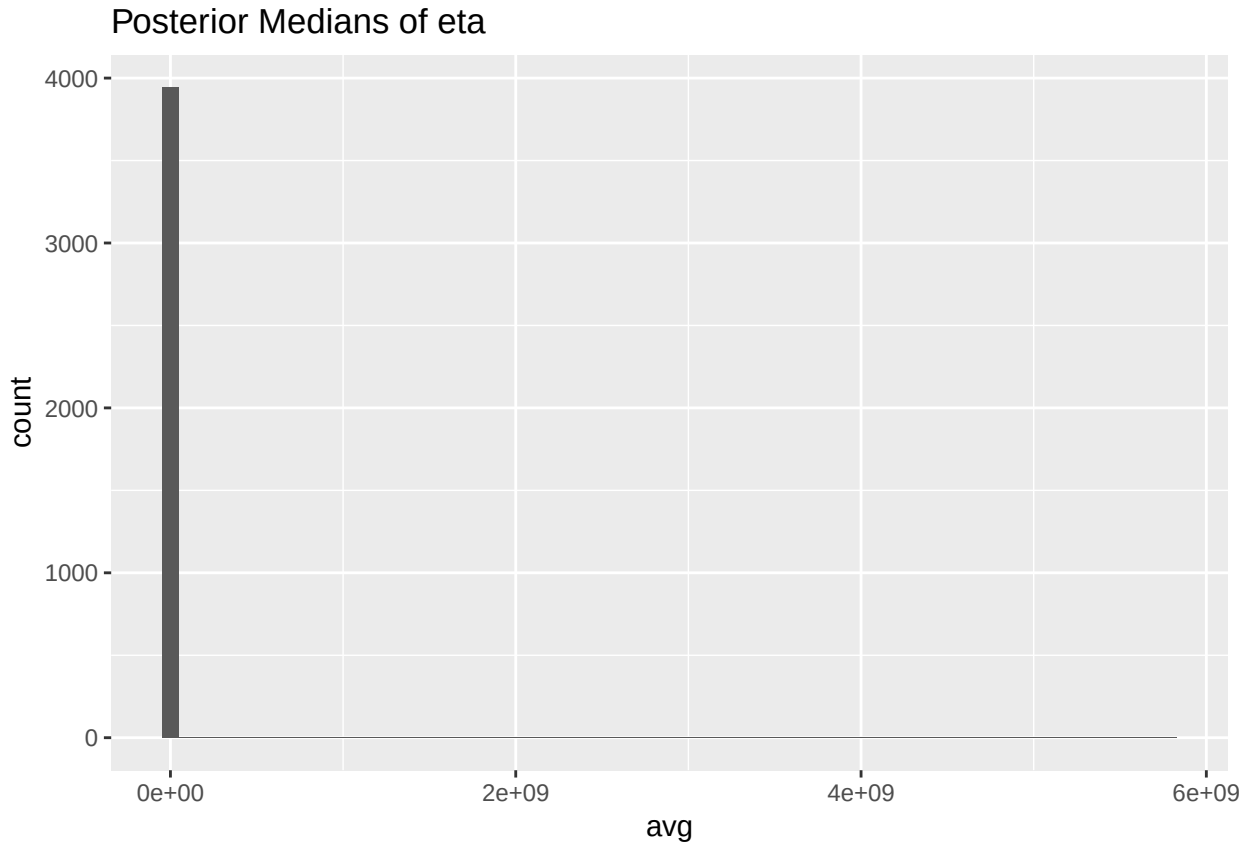

```
## [1] "Summary statistics for posterior medians of w"
##        avg
##  Min.   :-3.6243
##  1st Qu.:-1.4376
##  Median :-0.4099
##  Mean   :-0.2903
##  3rd Qu.: 0.5902
##  Max.   : 4.1311
```

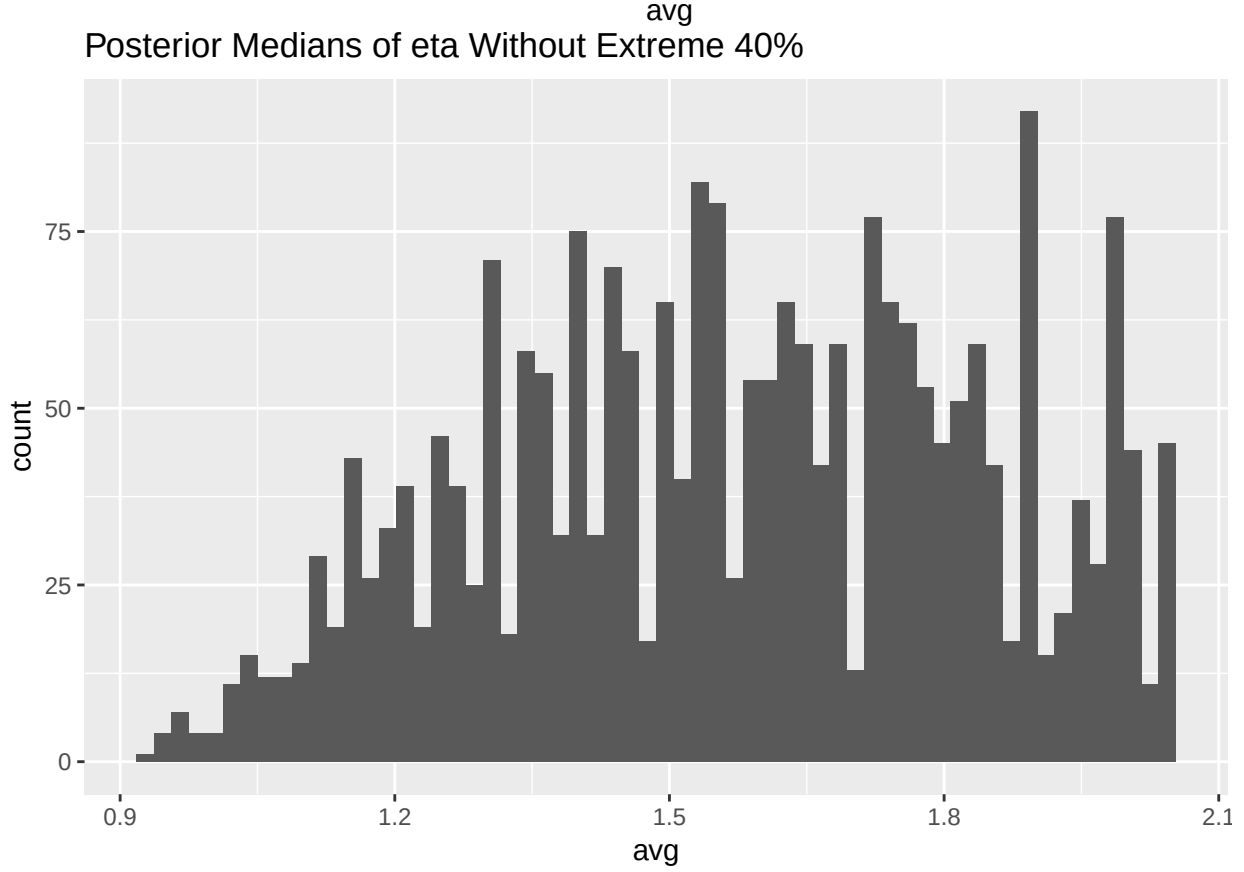



```
## [1] "Summary statistics for posterior medians of p"
##       avg
##  Min.   :0.0000001
##  1st Qu.:0.0139860
##  Median :0.0866686
##  Mean   :0.1187970
##  3rd Qu.:0.1868621
##  Max.   :0.9335687
```

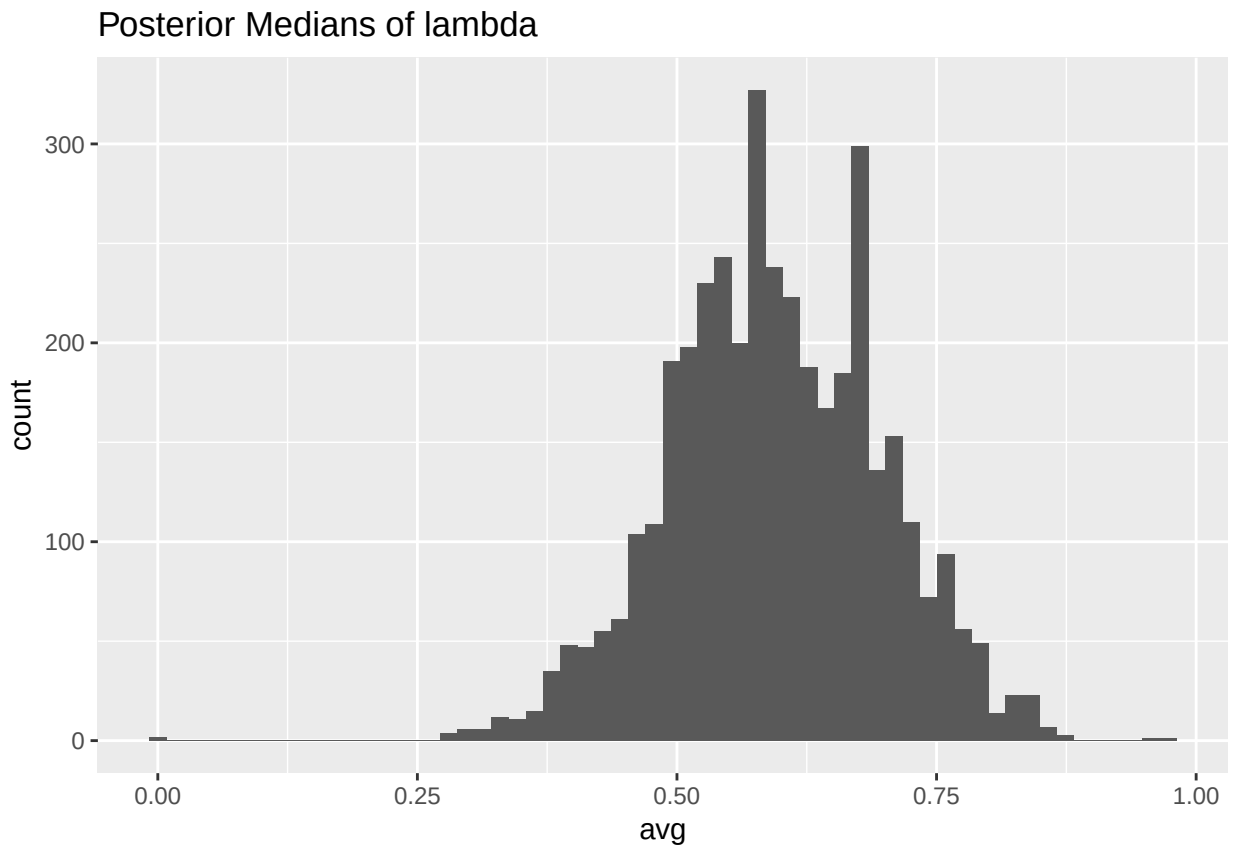


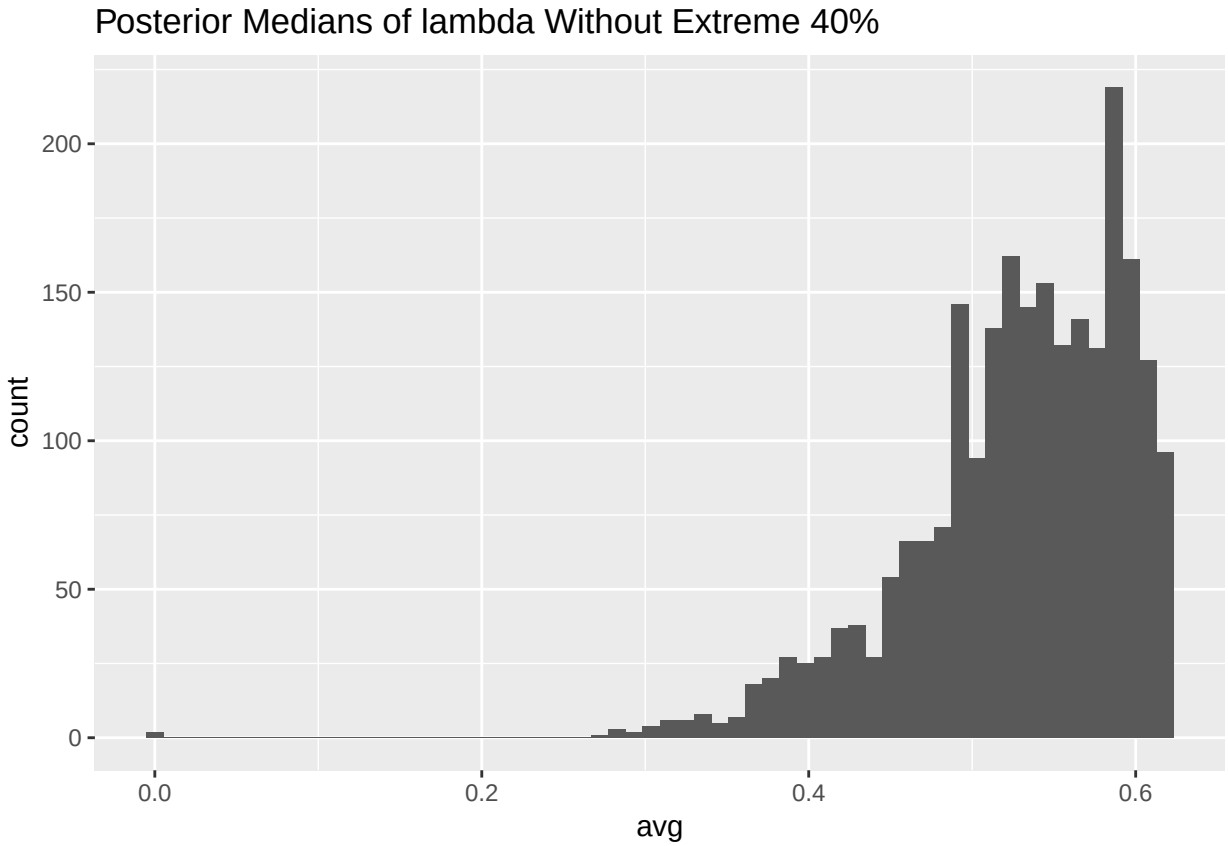

```
## [1] "Summary statistics for posterior medians of eta"
##       avg
##  Min.   :1.000e+00
##  1st Qu.:2.000e+00
##  Median :2.000e+00
##  Mean   :2.510e+06
##  3rd Qu.:2.000e+00
##  Max.   :5.783e+09
```


Posterior Medians of eta
4000
3000
2000
1000
0
count
0e+00
2e+09
4e+09
6e+09
avg

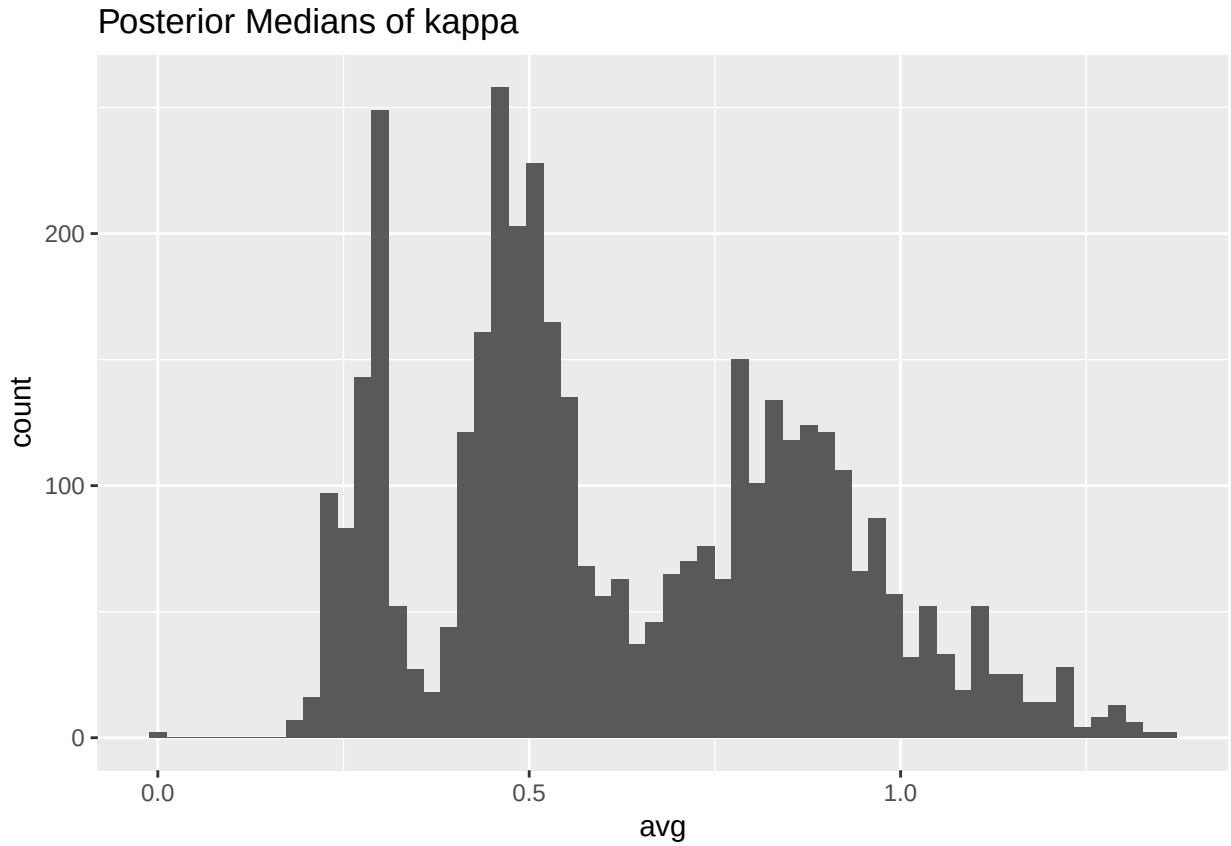

Posterior Medians of eta Without Extreme 40%
75
50
25
0
count
0.9
1.2
1.5
1.8
2.1
avg

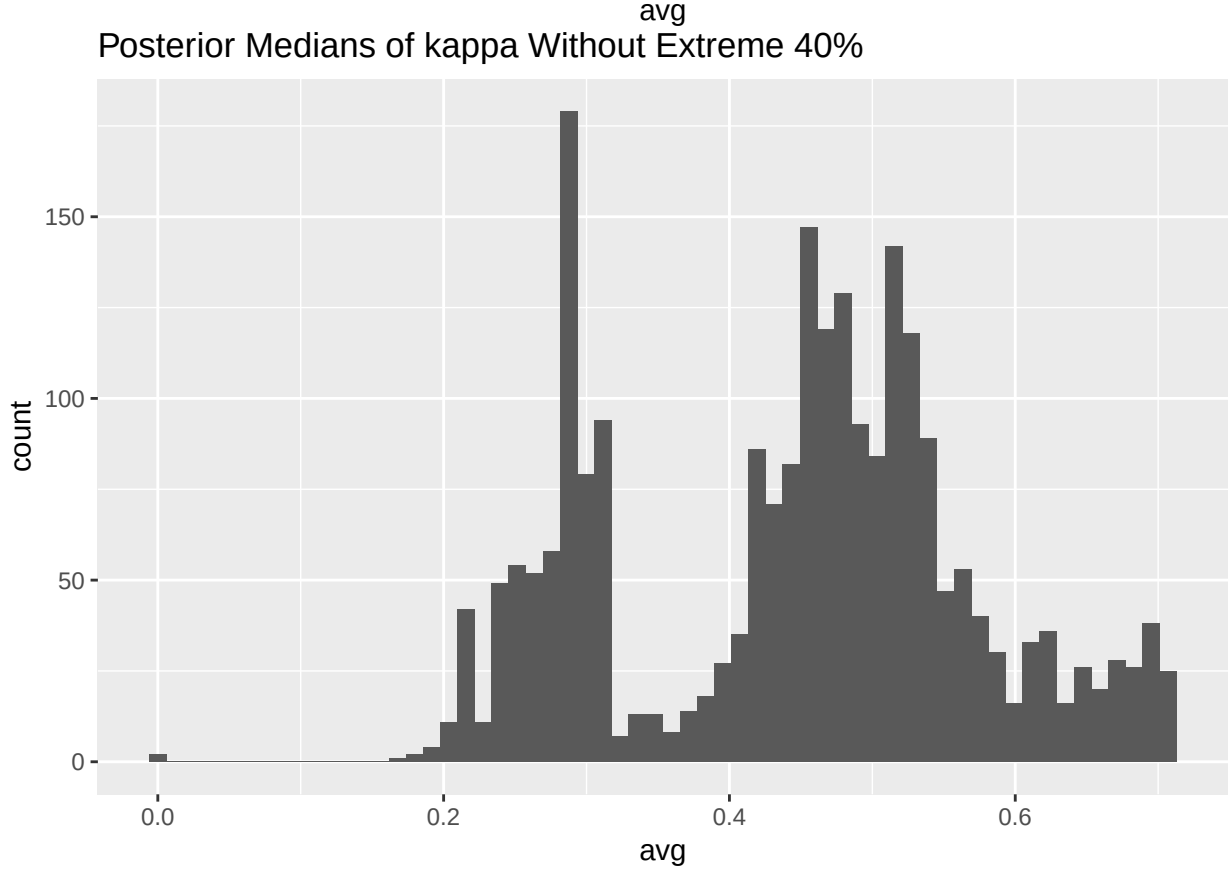
```
## [1] "Summary statistics for posterior medians of lambda"
##       avg          
##  Min.   :0.0000002  
##  1st Qu.:0.5227589  
##  Median :0.5915250  
##  Mean   :0.5948754  
##  3rd Qu.:0.6721302  
##  Max.   :0.9730825
```






```
## [1] "Summary statistics for posterior medians of kappa"
##       avg
##  Min.   :0.0000049
##  1st Qu.:0.4469663
##  Median :0.5541139
##  Mean   :0.6310875
##  3rd Qu.:0.8448611
##  Max.   :1.3602376
```


Posterior Medians of kappa
count
200
100
0
0.0
0.5
1.0
avg


Posterior Medians of kappa Without Extreme 40%
count
150
100
50
0
0.0
0.2
0.4
0.6
avg

Identifying Parameters with Large Rhats

```
summary(fit_summ$Rhat)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
##  0.9995  1.0001  1.0077  1.0378  1.0352  3.4474       1
```

```
big_Rhat <- fit_summ$Rhat > 1.5
big_Rhat_dat <- fit_summ[big_Rhat,c(1,2,10)]
big_Rhat_dat
```

```
##                    mean    se_mean     Rhat
## w[1,1,1]    -0.273101925 2.74782720 3.447403
## w[1,2,1]    -1.012193156 3.27288880 2.288526
## w[1,2,2]     0.220571395 3.46901051 2.311579
## w[1,3,1]     1.907751563 3.97945765 2.195475
## w[2,1,1]    -1.034623478 0.91511900 1.627530
## w[2,1,2]     1.404140381 2.15988589 1.967699
## w[2,2,2]    -1.618156783 2.90000729 2.275544
## w[2,3,1]    -0.609416525 2.77513842 1.966156
## w[2,3,2]    -0.004250049 1.72710765 1.523711
## w[3,1,1]    -0.738774473 0.77626594 1.537669
## w[3,1,2]     1.435377496 1.36954514 1.685851
## w[3,2,2]    -1.262786466 2.03401228 1.854412
## w[3,3,1]    -0.198564572 1.93088685 1.741482
## w[4,1,1]     0.021364997 4.69738306 2.949484
## w[4,1,2]     4.093621462 1.25418397 1.622499
## w[4,2,1]    -0.226369737 2.28824532 2.187947
## w[4,2,2]    -2.123402732 1.23035715 1.679478
## w[4,3,1]     0.290375099 1.89573228 1.648740
## w[5,1,1]     0.063298071 1.44874133 1.753512
## w[5,1,2]     1.945821629 1.74140912 1.807253
## w[5,2,1]     0.426838624 1.75819293 1.870954
## w[5,3,1]    -0.083131649 1.91089151 1.697384
## w[6,1,1]     0.144662543 6.25698710 2.486026
## w[6,1,2]    -1.702854213 3.27123534 1.665238
## w[6,2,1]     1.941060846 4.43011955 1.804154
## w[6,2,2]     0.381151876 5.59441856 2.049267
## w[6,3,1]    -0.165702059 1.36255065 1.593458
## w[7,1,1]    -1.530640344 1.44144486 1.588670
## w[7,1,2]     0.626116169 2.28238185 2.097336
## w[7,2,1]     0.644498927 3.14780797 1.909877
## w[7,2,2]     0.484036718 4.09704400 2.388525
## w[7,3,1]    -0.565847157 3.22365567 2.162470
## w[7,3,2]    -0.046573998 2.01794607 1.583872
## z[1,2]       1.065134396 2.07277329 1.555122
## z[5,1]       0.388236239 2.91532203 1.931605
## z[6,2]       1.308747454 2.02171853 1.534764
## z[11,1]     -0.683887311 3.03762390 1.638523
## z[11,2]      0.404031931 2.93043224 1.642429
## z[12,1]      0.138381471 2.69355155 1.734258
## z[14,1]      0.540251279 2.61186517 1.647120
```

```
## z[17,1]      0.103505853 2.46313551 1.867745
## z[19,1]      0.544156184 2.64659956 1.673045
## z[20,1]      0.492443933 2.63705440 1.683987
## z[22,1]      0.483478232 2.58746361 1.631730
## z[39,1]      0.293639859 3.12810782 1.565138
## z[40,1]      0.235099371 4.05356163 2.035870
## z[46,1]      1.557189587 3.09066750 1.928644
## z[46,2]     -1.734030652 2.67248483 1.623464
## z[50,1]      0.490386799 2.64309093 1.633766
## z[52,1]      0.536392551 2.64026912 1.680176
## z[56,1]      0.592810334 2.14787531 1.616089
## z[66,1]      0.209758487 4.06984961 2.064852
## z[86,1]      0.339559654 3.80016618 1.901603
## z[94,1]      0.535588138 4.00014730 1.953996
## z[95,1]      0.393719308 3.36159007 1.732668
## z[121,1]     0.291394996 3.89030360 1.901220
## z[127,1]     0.276890010 3.31169564 1.639473
## z[130,1]     0.171286514 4.09545998 2.077929
## z[142,1]     0.277242681 3.26545599 1.606177
## z[143,1]     0.456303628 4.03390610 2.060976
## z[144,1]     0.318612237 3.54989168 1.825044
## z[146,2]     0.765931699 2.85411305 1.586256
## z[149,1]     0.397538309 2.80135365 1.654026
## z[150,1]     0.313413011 3.26741102 1.625868
## z[153,1]    -0.380798178 2.16313241 1.548570
## z[164,1]     0.206211337 3.62333765 1.750770
## z[174,1]     0.249960849 3.36065494 1.664949
## z[187,2]     0.397866769 2.39360075 1.527302
## z[188,1]     1.160338956 2.84496333 1.695176
## z[190,1]    -0.672871535 3.14560297 1.724695
## z[190,2]     0.282195906 3.04122614 1.705071
## z[195,1]    -0.669928578 3.22494456 1.743851
## z[195,2]     0.247060920 3.07335029 1.699453
## z[199,1]     1.168392933 2.76079117 1.644148
## z[199,2]     0.609682400 2.98355661 1.624071
## z[203,1]     0.157964158 3.01534838 2.024471
## z[221,1]     0.195153091 4.07227051 2.065317
## z[227,1]     0.573961530 2.17294717 1.584666
## z[234,1]     0.285470039 3.62860740 1.847024
## z[237,2]     0.800619886 2.83154086 1.581985
## z[238,2]     0.356061996 2.41749876 1.530297
## z[251,1]     0.303893882 3.37153919 1.661623
## z[266,1]     0.611628313 2.63788225 1.658572
## z[269,1]     0.478208839 2.65141315 1.708127
## z[270,1]     0.506537210 2.60632615 1.660022
## z[274,1]     0.279540938 3.27352580 1.624430
## z[277,2]     1.303642597 2.05096151 1.579032
## z[280,1]     0.313525537 4.32030853 1.878549
## z[280,2]    -1.926440699 2.72029119 1.527964
## z[284,1]     0.380429230 3.84746005 1.884819
## z[289,1]     0.228715803 4.07328167 2.032358
## z[300,2]    -0.221211348 2.84788663 1.524994
## z[303,1]     0.312391388 3.85022060 1.882647
## z[305,1]     0.286704770 3.84819305 1.884218
```

```
## z[313,1]     0.297713715 4.33653274 1.973441
## z[313,2]    -1.780275067 3.17544711 1.643141
## z[317,1]     0.352060945 4.26814896 1.839203
## z[317,2]    -1.863481770 2.70154493 1.533957
## z[319,1]     0.313829115 3.25636539 1.639302
## z[320,1]     0.306477524 3.29998653 1.638067
## z[329,2]     0.776534543 2.85190142 1.587143
## z[332,1]     0.293596625 4.23990172 1.842092
## z[332,2]    -1.779915107 2.68456505 1.511621
## z[335,1]     0.653395358 4.94268622 2.181436
## z[335,2]    -2.136389947 3.60029773 1.743556
## z[345,1]     0.142785730 3.09935026 1.600833
## z[349,1]     0.210997739 4.13889805 1.991248
## z[351,1]     0.194086849 4.10727604 2.036027
## z[358,1]     0.266295225 3.21316072 1.596511
## z[359,1]     0.221426715 4.09621318 2.072268
## z[360,1]     0.236914517 3.32635101 1.663391
## z[362,1]     0.388615838 2.76699976 1.622788
## z[364,1]     0.318218780 3.40391801 1.733798
## z[365,1]     0.276127519 4.36049365 1.896149
## z[365,2]    -1.895531985 2.77093546 1.538803
## z[368,1]     0.303377050 4.29468260 1.855272
## z[368,2]    -1.799283544 2.73504433 1.530600
## z[371,1]     0.307877394 4.30919637 1.869080
## z[371,2]    -1.833940811 2.77835323 1.538767
## z[375,1]     0.650798482 4.93219393 2.175585
## z[375,2]    -2.087722265 3.62705078 1.745686
## z[386,1]     0.277854004 4.10919382 1.980491
## z[389,1]     0.234958273 3.14912960 1.578218
## z[395,1]     0.549771935 4.96197363 2.043845
## z[395,2]    -2.155057070 3.04562299 1.604359
## z[397,1]     0.221060793 4.07109125 2.053525
## z[399,1]     0.136896528 4.18369216 2.192591
## z[404,1]     0.367751719 3.81159165 1.869423
## z[407,2]     0.330092314 2.42791126 1.524128
## z[410,1]     0.473539272 3.49222723 1.787527
## z[412,1]     0.528038385 2.67750821 1.700783
## z[416,1]     0.552931871 2.57893775 1.612827
## z[420,1]     1.007695416 3.30313764 1.716161
## z[420,2]    -0.326664825 3.60632178 1.739442
## z[431,1]     0.422170468 2.78825956 1.639469
## z[434,1]     0.211840141 4.06879851 2.047671
## z[436,1]     0.241902679 4.03351085 2.022379
## z[437,1]     0.320575928 3.28647217 1.619397
## z[455,1]     0.169319259 4.31372219 2.380379
## z[461,1]    -0.003404036 3.57442811 1.813059
## z[462,1]     0.276825166 4.23270060 2.315598
## z[466,2]     0.914784985 3.13403671 1.880691
## z[474,1]     0.310259746 3.41662719 1.737841
## z[477,1]     0.311930799 3.90847268 1.921232
## z[488,1]     0.126955997 3.56236853 1.769921
## z[488,2]    -0.986811996 3.01840826 1.590997
## z[517,2]     0.114577165 2.47734715 1.665220
## z[519,2]     0.814629417 2.83219703 1.570004
```

```
## z[526,1]     0.288348234 3.33824668 1.642070
## z[527,1]     0.183364915 3.94343474 1.984456
## z[531,1]     0.293598376 3.22704459 1.620323
## z[540,1]    -0.673176680 3.05716346 1.643006
## z[540,2]     0.417607900 2.95428000 1.628725
## z[544,1]     0.920741916 3.25408354 1.723843
## z[544,2]    -0.244172501 3.42224201 1.702394
## z[548,1]     0.389450665 2.74981180 1.636221
## z[550,1]     0.226359622 2.96130712 1.666977
## z[553,1]    -0.444293079 2.14612051 1.567359
## z[569,2]     0.826635534 2.90148638 1.600931
## z[581,2]     0.778168481 3.26752842 1.721631
## z[583,1]     0.537607191 2.58658277 1.647149
## z[592,1]     0.220261981 4.10466340 2.058892
## z[616,1]     0.559294783 2.63299737 1.669565
## z[635,1]     0.504891591 2.62365322 1.679068
## z[645,1]     0.542016399 3.97574830 1.905820
## z[652,1]     0.532411668 2.56478964 1.634407
## z[686,1]     0.569843884 2.66566439 1.680014
## z[710,2]     0.776180100 3.22528417 1.718284
## z[726,1]     0.404189013 2.93245948 1.921960
## z[733,1]     0.604619383 2.61262654 1.635068
## z[745,1]     0.306748453 4.29741199 1.852179
## z[745,2]    -1.913589463 2.75873481 1.520797
## z[772,1]     0.640741255 2.22792984 1.574798
## z[772,2]    -1.155508293 2.25304199 1.578046
## z[775,1]     0.279951389 3.28222084 1.657510
## z[780,1]     0.504864211 2.38648109 1.640106
## z[780,2]     0.031433708 2.52011199 1.689912
## z[785,1]     0.356290368 3.34575802 1.657323
## z[786,1]     0.271640904 3.18139628 1.587610
## z[812,1]     0.407569433 3.37891948 1.645274
## z[820,1]     0.244683656 4.07123382 2.052528
## z[824,1]     0.342438149 3.34924537 1.660425
## z[825,1]     0.176736667 4.09190678 2.055480
## z[830,1]     0.246881136 3.29442182 1.629051
## z[831,1]     0.540659859 3.98646557 1.919639
## z[839,1]     0.242441386 4.22643547 2.343336
## z[840,1]     0.600745335 2.63689351 1.838224
## z[840,2]    -0.301035881 2.34927845 1.581478
## z[866,1]    -0.525361686 2.33393060 1.639153
## z[867,2]     0.895895623 3.18517120 1.660307
## z[880,1]     0.282209743 3.23454901 1.596828
## z[881,1]     1.404276319 2.66430294 1.545834
## z[883,1]     0.101074549 4.21174898 2.194971
## z[900,1]     0.221328627 4.09783347 2.095841
## z[909,1]     1.575739383 3.10715937 1.923140
## z[909,2]    -1.757374708 2.62218753 1.621359
## z[915,2]    -0.817494720 2.33609187 1.763391
## z[918,1]     1.400188870 2.67785142 1.524124
## z[919,2]     1.073489497 2.08591484 1.537695
## z[921,1]    -0.522032248 2.10604815 1.550258
## z[921,2]    -0.614913892 1.63756354 1.515806
## z[929,1]     1.039740869 2.67042257 1.638070
```

```
## z[929,2]     0.673765239 2.86605477 1.587746
## z[933,2]     0.725336974 3.26537581 1.731397
## z[936,2]     0.857050697 2.37192346 1.547219
## z[938,2]     1.067510856 2.06425794 1.556319
## z[939,2]     0.758384129 3.26575562 1.709096
## z[941,1]    -0.622811663 3.47080101 1.849560
## z[944,2]     0.814481627 2.82230513 1.562650
## z[945,1]     0.202116985 2.68945545 1.724108
## z[948,2]     0.960112299 3.14219115 1.908436
## z[955,2]     0.809573987 2.85662780 1.580900
## z[961,1]     0.226071496 4.12025113 2.049459
## z[962,1]     0.592108016 2.56195718 1.638839
## z[963,1]     0.472260939 2.62150023 1.665675
## z[965,2]     1.050793683 2.05098639 1.529175
## z[976,1]     0.301240022 3.54103268 1.794410
## z[988,2]     1.009157131 3.05897144 1.803245
## z[999,2]     0.510195627 2.42532315 1.543517
## z[1008,1]    0.276765189 3.63998291 1.742334
## z[1010,1]    0.477817021 2.62253628 1.640424
## z[1013,1]    0.343618818 2.58481061 1.694515
## z[1014,1]    0.567159331 2.61465195 1.642154
## z[1015,1]    0.520478084 2.64324015 1.663278
## z[1023,1]    0.561365454 2.57007897 1.630270
## z[1024,1]    0.171605191 3.45293378 1.838919
## z[1028,1]    0.459097608 2.64612461 1.662248
## z[1032,1]    0.500168141 2.59137771 1.653088
## z[1037,1]    0.290821655 3.30987908 1.636035
## z[1039,1]    0.559885055 2.57830625 1.604355
## z[1040,1]    0.543883304 2.61539826 1.664107
## z[1045,1]    0.245685068 4.31983298 1.887649
## z[1045,2]   -1.833468398 2.75025586 1.553392
## z[1048,1]    0.348422491 4.32509375 1.871895
## z[1048,2]   -1.826373774 2.73622524 1.522961
## z[1049,1]    0.592992441 4.95001031 2.037976
## z[1049,2]   -2.094700260 3.11328146 1.617646
## z[1051,1]    0.325037737 3.33514899 1.644365
## z[1057,1]    0.236775412 4.10777745 2.062499
## z[1058,1]    0.275851331 3.30595026 1.633050
## z[1059,1]    0.326046208 3.31453632 1.649835
## z[1069,1]    0.290394480 3.28041923 1.620737
## z[1070,1]    0.368944405 3.42242528 1.743357
## z[1071,1]    0.203013666 4.05420146 2.029078
## z[1073,1]    0.332994120 3.34834521 1.653550
## z[1075,1]    0.338104815 4.26365283 1.853943
## z[1075,2]   -1.905460418 2.73824161 1.515949
## z[1081,1]    0.334092512 3.37352437 1.658273
## z[1082,1]    0.263946787 3.33197932 1.648249
## z[1090,1]    0.077908036 4.27826400 1.860766
## z[1090,2]   -1.726498835 2.78222886 1.543108
## z[1091,1]    0.166460928 3.15208828 1.622671
## z[1095,2]    1.330664655 2.02706573 1.567468
## z[1103,1]    0.670191796 5.04209793 2.338756
## z[1103,2]   -2.935621328 2.29154446 1.742738
## z[1113,1]    1.443633696 3.92088287 1.875262
```

```
## z[1113,2]    1.249237124 3.81972110 1.802248
## z[1118,1]    0.322657322 2.74151103 1.644860
## z[1130,1]    0.325860670 3.37158482 1.730701
## z[1134,1]    0.368005437 2.75138237 1.642305
## z[1136,1]    0.257534380 3.26806343 1.622245
## z[1140,1]    0.279246571 3.28747837 1.648345
## z[1144,1]    0.348997283 2.58737384 1.709104
## z[1166,1]    0.320836334 4.48714205 2.070829
## z[1166,2]   -2.440133985 1.98105024 1.563625
## z[1172,1]    0.554536849 4.97162793 2.030441
## z[1172,2]   -2.095995046 3.10210448 1.616672
## z[1174,1]    0.328829820 3.32975475 1.633810
## z[1186,1]    0.258496233 3.30526908 1.641892
## z[1188,1]    1.491798799 3.21508281 1.859232
## z[1200,1]    0.587455119 4.91939918 1.998262
## z[1200,2]   -2.142639919 3.10666840 1.610890
## z[1201,1]    0.295567361 4.09940387 1.992254
## z[1220,1]    0.311531623 3.32191706 1.620700
## z[1229,1]    0.633561720 4.97214906 2.043085
## z[1229,2]   -2.059816052 3.13709927 1.622451
## z[1231,1]    0.323738198 3.38067361 1.643409
## z[1237,1]    0.197107211 4.08717719 2.058391
## z[1241,1]    0.277297459 3.27599908 1.639110
## z[1247,1]    0.270608677 3.30268085 1.641548
## z[1248,1]    0.256661336 3.33415173 1.632080
## z[1249,1]    0.218842714 4.06938293 2.014629
## z[1251,1]    0.355109979 3.40919501 1.747133
## z[1254,1]    0.173875966 4.27285855 1.855738
## z[1254,2]   -1.696713781 2.75261671 1.545202
## z[1258,1]    0.295038219 3.33061689 1.629961
## z[1268,1]    0.224761415 4.05546044 2.035542
## z[1270,1]   -0.598309620 2.98834704 1.626410
## z[1270,2]    0.471666629 2.94288182 1.623473
## z[1271,1]    0.185789254 4.07591055 2.032038
## z[1274,1]    0.316327810 3.86877208 1.910447
## z[1275,1]    0.473571071 2.66972907 1.716764
## z[1280,1]    0.236258336 3.65467792 1.780186
## z[1286,1]    0.542556951 2.60806210 1.637007
## z[1291,1]    0.522402919 4.90110715 2.002047
## z[1291,2]   -2.213186236 3.04355045 1.623046
## z[1293,1]    0.227472627 4.08554474 2.072517
## z[1297,2]    0.495882105 2.43478892 1.559759
## z[1298,1]    0.215710154 4.04719389 2.020385
## z[1300,1]    0.200292005 4.09072453 2.039775
## z[1304,1]    0.183142819 4.08187865 2.044077
## z[1306,1]    0.533856375 2.65530906 1.687749
## z[1308,1]    0.380488709 4.25988980 1.813381
## z[1308,2]   -1.825348060 2.68850685 1.515080
## z[1309,1]    0.176271360 4.09765734 2.069504
## z[1310,1]    0.218872383 4.05741443 2.049306
## z[1314,1]    0.676782698 2.17430768 1.538185
## z[1314,2]   -1.109939191 2.33295913 1.610207
## z[1327,1]    0.073579651 3.92357109 1.999064
## z[1328,1]    0.168773963 4.04612418 2.022327
```

```
## z[1329,1]    0.189495238 4.08512427 2.032854
## z[1333,1]    0.221419159 4.10251662 2.057333
## z[1335,1]    0.209551170 4.12298914 2.054135
## z[1336,1]    0.324973727 2.91170581 1.924871
## z[1337,1]    0.253967948 4.07770240 2.056564
## z[1338,1]    0.221643891 4.08938231 2.056222
## z[1339,1]    0.128122954 3.93820354 2.025073
## z[1346,1]    0.556537087 2.63630609 1.658364
## z[1347,1]    0.518892816 2.92012112 1.707824
## z[1348,1]    0.498055748 2.63493597 1.647508
## z[1350,1]    0.676080254 2.21033973 1.570110
## z[1350,2]   -1.100262398 2.28026024 1.582389
## z[1351,1]    0.560950005 2.61486016 1.650976
## z[1353,2]    0.405757579 3.17901795 1.581686
## z[1354,1]    0.566630732 2.61242445 1.646124
## z[1360,1]    0.223799938 4.05342484 2.064424
## z[1363,2]    0.382099007 2.37752610 1.520878
## z[1367,1]    0.242944656 4.03236168 2.041890
## z[1370,1]    0.503061054 2.59143010 1.614600
## z[1372,1]   -0.243748882 2.63646017 1.520587
## z[1373,1]    0.527586941 2.65673108 1.657181
## z[1380,1]    0.533945761 2.64332062 1.675408
## z[1381,1]    0.563041807 2.66180044 1.689634
## z[1384,1]    0.250009423 2.68858953 1.886998
## z[1386,1]    0.214119562 4.04672282 2.064248
## z[1388,1]    0.055802153 2.46703972 1.865015
## z[1389,1]    0.310889568 2.61589060 1.622549
## z[1390,1]    0.297042818 3.29330974 1.644045
## z[1393,1]   -0.565966162 2.08036941 1.526475
## z[1393,2]   -0.610644031 1.59768557 1.508601
## z[1395,1]    0.632631904 2.56490275 1.605934
## z[1397,1]    0.529662271 2.62795573 1.654380
## z[1400,1]    0.528986853 2.63337199 1.681617
## z[1402,1]    0.255439145 3.15361873 1.593509
## z[1403,2]    1.314608204 2.02103739 1.552507
## z[1404,1]    0.351091450 3.11185168 1.557385
## z[1406,1]    0.513856443 2.64529211 1.639505
## z[1407,1]    1.393091044 2.61998060 1.528897
## z[1414,1]    0.251684795 4.12884534 2.022296
## z[1418,1]    0.357943169 4.28322190 1.863838
## z[1418,2]   -1.879528634 2.77146419 1.524321
## z[1420,1]    0.484369656 4.07968858 2.080406
## z[1430,1]    0.351555348 4.27393439 1.858159
## z[1430,2]   -1.835757291 2.71983202 1.513542
## z[1433,1]    0.545825827 4.92506499 2.010261
## z[1433,2]   -2.188036355 3.09632977 1.605976
## z[1439,1]    0.338725605 3.42566855 1.669305
## z[1444,1]    0.273097154 3.40332770 1.757468
## z[1466,2]    0.528135134 2.46435899 1.563588
## z[1468,1]    0.221713671 4.09123255 2.041663
## z[1479,1]    0.588775670 2.62204307 1.673630
## z[1483,1]    0.618608334 2.17116014 1.539614
## z[1483,2]   -1.095095896 2.32213681 1.610381
## z[1484,1]    0.356525369 2.93576386 1.932463
```

```
## z[1485,1]    0.051489844 2.48649266 1.916884
## z[1488,1]    1.475919489 3.21252490 1.847217
## z[1493,1]    0.574213716 2.61025243 1.649463
## z[1494,1]    0.487055684 2.65284181 1.701143
## z[1495,1]    0.544204713 2.60150570 1.644163
## z[1499,2]    1.073012219 2.41709479 1.604310
## z[1501,1]    0.555694448 2.59049068 1.634883
## z[1502,1]    0.468198483 2.61677926 1.651838
## z[1506,2]    0.791733915 3.22472393 1.705025
## z[1512,1]    0.370209615 2.73208771 1.615369
## z[1513,1]    0.244476397 4.08951162 2.058565
## z[1516,1]    0.437693776 2.62292109 1.652452
## z[1518,1]    0.541428266 2.59840472 1.644819
## z[1526,1]    0.284679328 3.36462420 1.662406
## z[1541,1]    0.306866771 3.85030875 1.894386
## z[1561,1]    1.153583756 3.25655667 2.047345
## z[1562,1]    0.226685224 4.07089973 2.045698
## z[1564,1]    0.184145561 3.94535701 1.975635
## z[1567,1]    0.171391558 3.90600776 1.955829
## z[1568,1]    0.237789140 4.28333740 2.341631
## z[1570,1]    0.154124035 3.94576213 1.993918
## z[1573,1]    0.228137492 4.05046041 2.051178
## z[1579,1]   -0.657726241 3.24674902 1.733611
## z[1579,2]    0.262269130 3.05799037 1.693618
## z[1581,1]    0.396322782 3.85787858 1.889648
## z[1598,1]    0.258553350 4.05455073 2.012763
## z[1603,1]    0.333833729 4.28825942 1.859203
## z[1603,2]   -1.890015076 2.75668065 1.526219
## z[1610,1]    0.277353966 3.32021187 1.646988
## z[1613,1]    0.327765025 3.21401976 1.593340
## z[1616,1]   -0.421932921 2.15218590 1.579814
## z[1620,1]    0.249983815 3.28719375 1.641136
## z[1621,1]    0.371949142 3.41412678 1.741900
## z[1622,1]    0.231893748 4.08889685 2.073439
## z[1634,1]    0.241120617 3.31747469 1.638980
## z[1635,1]   -0.039606524 2.97025012 1.578822
## z[1643,1]   -0.336915971 2.14322793 1.503779
## z[1645,1]    0.424728424 2.81616860 1.648153
## z[1653,1]    0.289221382 3.33975793 1.648317
## z[1654,1]   -0.028878274 2.98880345 1.617782
## z[1673,1]    0.710110265 2.22857631 1.552498
## z[1698,1]    0.233655497 4.26939314 2.306039
## z[1700,1]    0.303279828 3.26381104 1.623769
## z[1701,1]    0.282466444 3.35571366 1.650142
## z[1702,1]    0.326891957 3.25675436 1.611156
## z[1703,1]    0.141796575 4.18192014 2.173817
## z[1707,1]    0.309071070 3.36371873 1.648879
## z[1717,1]    0.296479388 3.35236385 1.646516
## z[1721,1]    0.507891008 2.65020398 1.693024
## z[1725,2]    0.383140184 2.39487181 1.533269
## z[1726,1]    0.199985252 2.97005921 2.035165
## z[1730,1]    0.159817359 4.03182008 2.005796
## z[1733,1]    0.419613187 2.25696439 1.700222
## z[1733,2]   -0.960308393 2.04012265 1.557187
```

```
## z[1735,1]    0.616106591 2.19054734 1.578852
## z[1735,2]   -1.103434252 2.27393779 1.602767
## z[1745,1]    0.518858237 2.66771970 1.670751
## z[1755,1]    0.209381070 4.08253288 2.035356
## z[1756,1]   -0.397634830 2.22252719 1.503843
## z[1759,1]    1.071642791 3.29922807 1.730159
## z[1759,2]   -0.250761446 3.78263367 1.826870
## z[1767,1]    0.535834908 2.60915154 1.648367
## z[1782,1]    0.523835644 4.97112822 2.051314
## z[1782,2]   -2.107891592 3.08822860 1.632554
## z[1787,1]    0.501578639 2.56781383 1.634556
## z[1788,1]    0.497701327 2.61429159 1.684015
## z[1790,1]    0.740211428 2.19280774 1.551243
## z[1791,1]    0.547561746 2.60545111 1.656847
## z[1801,1]    0.509849024 2.60053130 1.636812
## z[1808,1]    0.496256464 2.64276452 1.668021
## z[1809,1]    0.528309581 2.63492074 1.656646
## z[1830,1]    0.522815547 2.63236113 1.641572
## z[1865,1]    1.558157797 3.08358274 1.923427
## z[1865,2]   -1.733976471 2.61913900 1.621073
## z[1870,1]    0.711265486 2.21539174 1.529672
## z[1884,1]    0.700438259 2.21334411 1.572782
## z[1889,1]    0.308370087 3.35822355 1.665816
## z[1891,1]    0.573768090 2.59359180 1.622337
## z[1892,1]    0.325083637 3.35516362 1.652130
## z[1902,1]    0.243941437 2.91985651 1.639610
## z[1903,1]    0.247501077 4.27248801 2.321074
## z[1915,1]    0.215108132 3.25733625 1.622104
## z[1916,1]    0.555478660 4.92314719 2.004015
## z[1916,2]   -2.163660050 3.04777029 1.596998
## z[1917,1]    0.308372217 3.83278697 1.896149
## z[1920,1]   -0.657532511 2.98642433 1.619003
## z[1920,2]    0.425496088 2.91112725 1.625896
## z[1939,1]    0.216496309 4.09391209 2.040072
## z[1947,2]    0.778024050 3.24470693 1.712743
## z[1950,1]    0.063398884 4.35708551 2.316370
## z[1957,1]    0.538880355 4.95300595 2.043245
## z[1957,2]   -2.139493518 3.01859818 1.625195
## p[6,1,1]     0.122803951 0.04404128 1.621944
## p[42,2,7]    0.101250894 0.05960127 1.641370
## p[46,2,4]    0.185486775 0.13710360 1.566055
## p[46,3,6]    0.075104651 0.04243897 1.537732
## p[56,1,7]    0.244162639 0.16421378 1.840971
## p[86,1,1]    0.114469703 0.05314672 1.570643
## p[92,2,7]    0.185733252 0.13061242 1.677536
## p[94,1,1]    0.116691686 0.05306235 1.505673
## p[115,1,1]   0.140070110 0.04540904 1.541519
## p[121,1,1]   0.114855965 0.05371817 1.548860
## p[123,2,7]   0.198554835 0.13418442 1.702966
## p[135,2,7]   0.103428041 0.06033194 1.604306
## p[144,1,1]   0.117194041 0.05157932 1.533222
## p[149,1,1]   0.116922620 0.05637648 1.551768
## p[150,1,1]   0.114439914 0.05388953 1.503784
## p[164,1,1]   0.110833280 0.05557742 1.556824
```

```
## p[168,2,7]   0.234803333 0.13869717 1.525863
## p[175,2,7]   0.256508086 0.13448076 1.504342
## p[187,1,7]   0.221872142 0.13164005 1.604788
## p[199,1,7]   0.195593017 0.09772077 1.683512
## p[199,2,3]   0.083607883 0.05001633 1.627929
## p[227,1,7]   0.243095757 0.16580448 1.879837
## p[234,1,1]   0.110736640 0.05999209 1.560126
## p[238,1,7]   0.223455469 0.13463427 1.611578
## p[251,1,1]   0.115201571 0.05465423 1.506387
## p[275,2,7]   0.104925397 0.06093628 1.585962
## p[277,1,1]   0.120179285 0.04552376 1.617993
## p[284,1,1]   0.113911859 0.05310712 1.565853
## p[287,2,7]   0.102066801 0.05548589 1.586202
## p[296,2,7]   0.184002647 0.12807082 1.666252
## p[303,1,1]   0.112947062 0.05274701 1.547328
## p[305,1,1]   0.113961284 0.05263175 1.504894
## p[312,1,1]   0.143002244 0.04583486 1.504346
## p[313,2,2]   0.113526660 0.06291826 1.529537
## p[349,1,1]   0.110746234 0.05392147 1.593270
## p[358,1,1]   0.117088045 0.05224527 1.517162
## p[386,1,1]   0.110020791 0.05431620 1.556055
## p[404,1,1]   0.113897505 0.05186971 1.546326
## p[407,1,7]   0.218278280 0.13263573 1.605365
## p[431,1,1]   0.116945830 0.05582975 1.546427
## p[452,1,1]   0.139030970 0.04392266 1.533924
## p[461,1,1]   0.112895351 0.05314097 1.542558
## p[477,1,1]   0.113908757 0.05340859 1.552256
## p[517,1,7]   0.236983479 0.14244660 1.731572
## p[526,1,1]   0.113419799 0.05409704 1.518860
## p[619,1,7]   0.266838585 0.13217730 1.594561
## p[645,1,1]   0.117115482 0.05197959 1.511554
## p[657,1,1]   0.145127819 0.04390041 1.521140
## p[731,2,7]   0.101544028 0.05928646 1.659658
## p[812,1,1]   0.114456052 0.05285512 1.505977
## p[830,1,1]   0.113837775 0.05334663 1.524202
## p[866,1,1]   0.102424065 0.04925841 1.804289
## p[904,2,7]   0.101803159 0.05953863 1.632481
## p[909,2,4]   0.186407176 0.13543388 1.532734
## p[909,3,6]   0.075263528 0.04266075 1.589655
## p[929,1,7]   0.190021657 0.09622552 1.669222
## p[929,2,3]   0.081620509 0.04976376 1.631456
## p[976,1,1]   0.118761944 0.05171292 1.554028
## p[979,2,7]   0.183830727 0.12891938 1.662385
## p[984,2,7]   0.184133087 0.12890051 1.663360
## p[999,1,7]   0.203465102 0.12218909 1.566770
## p[1008,1,1]  0.109095743 0.05341047 1.531272
## p[1024,1,1]  0.118365883 0.05312922 1.589635
## p[1066,2,7]  0.231848791 0.13848511 1.541786
## p[1069,1,1]  0.114578893 0.05408115 1.507975
## p[1082,1,1]  0.114933416 0.05421746 1.503177
## p[1095,1,1]  0.122294684 0.04538609 1.641326
## p[1103,3,1]  0.309023219 0.19656549 1.546617
## p[1113,1,7]  0.175000771 0.09535200 1.510408
## p[1118,1,1]  0.117111015 0.05823640 1.534215
```

```
## p[1134,1,1]  0.116984705 0.05638194 1.503433
## p[1140,1,1]  0.114214914 0.05351877 1.518110
## p[1156,2,7]  0.172007144 0.12367209 1.635574
## p[1164,2,7]  0.183580838 0.13107055 1.682152
## p[1170,2,7]  0.235326894 0.13695538 1.527697
## p[1174,1,1]  0.114972738 0.05354502 1.505552
## p[1201,1,1]  0.109502775 0.05374899 1.567074
## p[1215,2,7]  0.103508844 0.05892378 1.594991
## p[1220,1,1]  0.113658727 0.05334674 1.506682
## p[1247,1,1]  0.113177855 0.05233588 1.512491
## p[1256,2,7]  0.234632331 0.13576355 1.514386
## p[1263,1,7]  0.265378375 0.12784779 1.562245
## p[1274,1,1]  0.114619529 0.05381198 1.552757
## p[1279,1,7]  0.276072096 0.14970725 1.540663
## p[1280,1,1]  0.110661501 0.05591161 1.543970
## p[1290,1,7]  0.222145727 0.12999338 1.591897
## p[1297,1,7]  0.202238743 0.11893526 1.546523
## p[1317,2,7]  0.184750626 0.12914680 1.651197
## p[1347,1,1]  0.118292370 0.05593710 1.527618
## p[1363,1,7]  0.220045073 0.13279863 1.608620
## p[1385,1,1]  0.120446937 0.04922156 1.565389
## p[1389,1,1]  0.119735858 0.05612213 1.549635
## p[1403,1,1]  0.122060802 0.04631407 1.608116
## p[1466,1,7]  0.204376792 0.12182463 1.555499
## p[1475,2,7]  0.185138353 0.13115078 1.684568
## p[1512,1,1]  0.117428666 0.05644301 1.507803
## p[1523,2,7]  0.236932770 0.13400780 1.507012
## p[1526,1,1]  0.114270305 0.05470752 1.517535
## p[1537,1,7]  0.266448392 0.12784806 1.561776
## p[1541,1,1]  0.113833640 0.05335633 1.536834
## p[1581,1,1]  0.113908574 0.05188278 1.549377
## p[1590,1,1]  0.141096910 0.04537772 1.508085
## p[1593,2,7]  0.105337974 0.05820634 1.569841
## p[1620,1,1]  0.115247586 0.05352608 1.509453
## p[1635,1,1]  0.113799053 0.05310861 1.556721
## p[1645,1,1]  0.116938311 0.05554816 1.553876
## p[1654,1,1]  0.113119680 0.05347668 1.542237
## p[1672,2,7]  0.103943072 0.05833671 1.563916
## p[1700,1,1]  0.115949308 0.05321593 1.509706
## p[1702,1,1]  0.116016450 0.05282206 1.501454
## p[1725,1,7]  0.219734180 0.13015346 1.591830
## p[1731,2,7]  0.103272695 0.06112924 1.590521
## p[1829,2,7]  0.101865209 0.05809940 1.579860
## p[1865,2,4]  0.185848181 0.13569682 1.546485
## p[1865,3,6]  0.075966008 0.04251983 1.554009
## p[1885,2,7]  0.258893644 0.13611283 1.508615
## p[1892,1,1]  0.115475035 0.05440755 1.502168
## p[1917,1,1]  0.114446862 0.05310549 1.519461
## p[1928,2,7]  0.111411470 0.05886426 1.536038
## p[1953,2,7]  0.106171597 0.06234538 1.638268
## p[1962,2,7]  0.101586853 0.05942146 1.604677
## NA                   NA         NA       NA
```