```r
library(rstan)

## Loading required package:  Rcpp
## Loading required package:  ggplot2
## rstan (Version 2.8.0, packaged:  2015-09-19 14:48:38 UTC, GitRev:
05c3d0058b6a)
## For execution on a local, multicore CPU with excess RAM we recommend
calling
## rstan_options(auto_write = TRUE)
## options(mc.cores = parallel::detectCores())

rstan_options(auto_write = TRUE)
options(mc.cores = parallel::detectCores())

#library(ShinyStan)  #not available on cran for R3.2.2
library(shinystan)   #downloaded from cran

## Loading required package:  shiny
##
## This is shinystan version 2.0.1

pgm_name="precip_gamma"

read_site<-function(sname="amherst"){
  tempdf<-read.csv(paste(sname,"PRECIP.csv",sep=''))
  tempdf$site<-as.factor(rep(sname,nrow(tempdf)))
  names(tempdf)<-c("n","year","month","day","rain_mm","X01","site")
  return(tempdf)
}
rainfall=read.csv("amherstPRECIP.csv")
rainfall$site<-as.factor(rep("amherst",nrow(rainfall)))
names(rainfall)<-c("n","year","month","day","rain_mm","X01","site")

rainfall<-rbind(rainfall,read_site(sname="bedford"))
rainfall<-rbind(rainfall,read_site(sname="bluehill"))
rainfall<-rbind(rainfall,read_site(sname="gb"))
rainfall<-rbind(rainfall,read_site(sname="lawrence"))
rainfall<-rbind(rainfall,read_site(sname="nb"))
rainfall<-rbind(rainfall,read_site(sname="pk"))
rainfall<-rbind(rainfall,read_site(sname="ptown"))
rainfall<-rbind(rainfall,read_site(sname="reading"))
rainfall<-rbind(rainfall,read_site(sname="taunton"))
rainfall<-rbind(rainfall,read_site(sname="walpole"))
rainfall<-rbind(rainfall,read_site(sname="wm"))

str(rainfall)
```

```
## 'data.frame': 349544 obs. of  7 variables:
##  $ n     : int  2 3 4 5 6 7 8 9 10 11 ...
##  $ year  : int  1893 1893 1893 1893 1893 1893 1893 1893 1893 1893 ...
##  $ month : int  1 1 1 1 1 1 1 1 1 1 ...
##  $ day   : int  2 3 4 5 6 7 8 9 10 11 ...
##  $ rain_mm: num  215 0 0 0 4 0 0 NaN 6 NaN ...
##  $ X01   : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ site  : Factor w/ 12 levels "amherst","bedford",..: 1 1 1 1 1 1 1 1 1 1 ...

rainfall2<-subset(rainfall,!is.na(rain_mm) & year>=1990 & year <= 1992 & rain_mm>0)

table(rainfall2$rain_mm)

##
##   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18
## 302 290 228 152 170 119  88 107  69 121  58  78  72  71  82  45  56  67
##  19  20  21  22  23  24  25  26  27  28  29  30  31  32  33  34  35  36
##  45  63  37  46  38  44  56  29  35  57  33  53  30  45  37  33  39  29
##  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54
##  24  26  18  39  18  41  21  18  31  29  18  28  11  30  10  22  31  22
##  55  56  57  58  59  60  61  62  63  64  65  66  67  68  69  70  71  72
##  26  18  18  22  16  21  16  20  22  16  19  14  12  21   3  26   5  13
##  73  74  75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90
##  13  10  21   4  11  16   9  16   7  14  14   7   7  11  10   7   7   5
##  91  92  93  94  95  96  97  98 100 101 102 103 104 105 106 107 108 109
##  10   8   4   9   6   8   6   9  13   7   7  10   9   9   7   9   7   5
## 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
##  16   4   9   3   7   7   4   6   7   3   7   3   1   2   2   4   2   4
## 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145
##   2   1   3   6   3   4   3   4   4   2   5   1  11   6   4   6   4   4
## 146 147 148 149 150 151 153 154 155 156 157 158 159 160 162 163 164 165
##   2   3   3   2   2   2   4   2   4   6   3   1   4   3   2   2   1   3
## 167 168 169 170 171 173 174 175 176 177 179 180 181 182 184 185 187 188
##   1   3   1   1   1   4   2   4   1   3   1   3   1   1   3   4   1   2
## 190 192 194 195 196 197 198 200 203 204 205 206 210 211 212 215 216 218
##   1   1   1   4   1   2   1   2   1   1   1   2   1   2   3   2   1   2
## 222 223 224 225 227 228 229 231 234 235 236 241 243 244 247 249 251 253
##   1   2   1   1   1   3   1   1   1   2   1   1   1   1   2   1   1   1
## 255 257 258 260 266 267 269 270 275 289 305 312 313 314 318 329 334 336
##   1   2   1   1   1   1   2   2   1   1   1   2   1   1   2   1   1   1
## 340 343 365 367 372 374 377 383 387 394 400 455 467 477 509 547 605 639
##   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   2   1   1
## 728
##   1

hist(rainfall2$rain_mm)
```
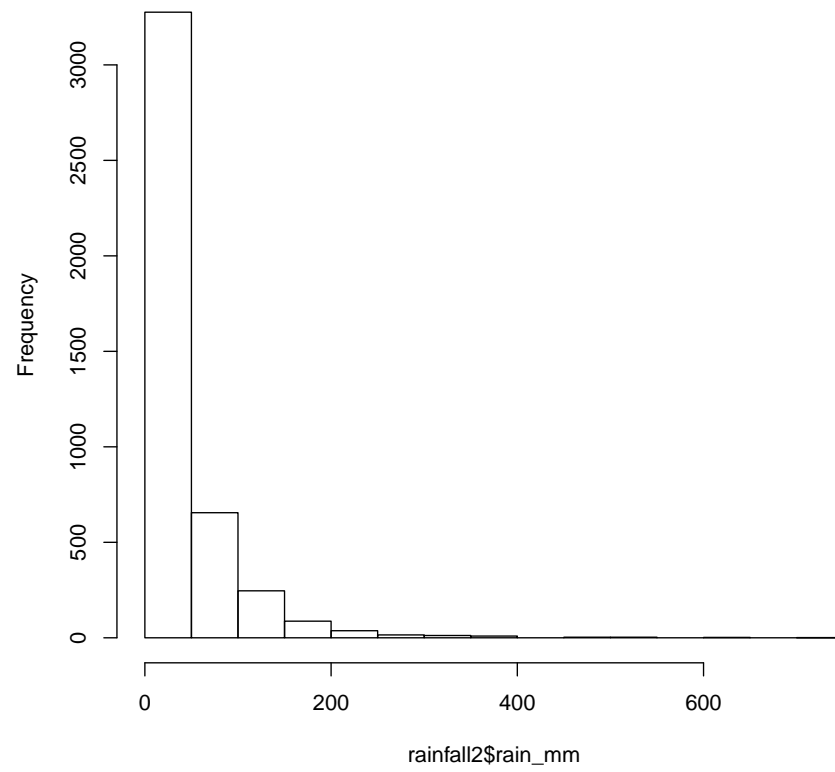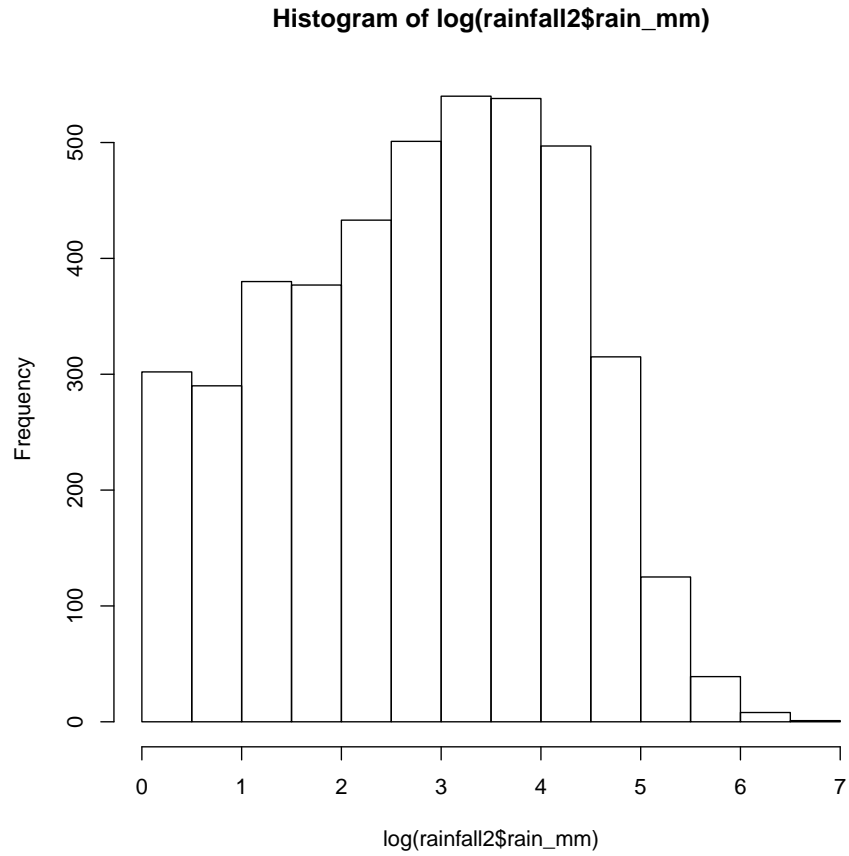
Histogram of rainfall2$rain_mm


```
hist(log(rainfall2$rain_mm))
```

3

Histogram of log(rainfall2$rain_mm)

log(rainfall2$rain_mm)

```
Nobs<-length(table(rainfall2$rain_mm))

y<-log(rainfall2$rain_mm)    #rainfall mm
Nobs<-length(y)              #number of obs

Nobs

## [1] 4346

stanfit<-stan("precip_gamma.stan",iter=6000)

fname=paste("Rdata/",pgm_name,"_rainfall_gamma_",format(Sys.time(),'%m%d%Y%H%M%S'),".Rdata",
save(stanfit,file=fname)

launch_shinystan(stanfit)

##
```

```
## Loading...
## Note:  for large models ShinyStan may take a few moments to launch.
##
## Listening on http://127.0.0.1:6356
```

```
quantile(y,c(.025,.25,.50,.75,.975))
```

```
##      2.5%       25%       50%       75%     97.5%
## 0.000000 1.609438 2.890372 3.912023 5.192957
```

```
print(stanfit)
```

```
## Inference for Stan model: precip_gamma.
## 4 chains, each with iter=6000; warmup=3000; thin=1;
## post-warmup draws per chain=3000, total post-warmup draws=12000.
##
##           mean se_mean   sd     2.5%       25%       50%       75%     97.5%
## alpha     4.26    0.00 0.09     4.09      4.20      4.26      4.32      4.43
## beta      1.54    0.00 0.03     1.48      1.52      1.54      1.56      1.61
## y_rep     2.77    0.01 1.34     0.81      1.78      2.57      3.51      5.95
## lp__  -7075.04    0.02 1.02 -7077.80 -7075.41 -7074.71 -7074.32 -7074.06
##         n_eff Rhat
## alpha    1751    1
## beta     1707    1
## y_rep   12000    1
## lp__     2662    1
##
## Samples were drawn using NUTS(diag_e) at Sun Dec 27 13:35:35 2015.
## For each parameter, n_eff is a crude measure of effective sample size,
## and Rhat is the potential scale reduction factor on split chains (at
## convergence, Rhat=1).
```