

fitting2

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```
require(rstan)
require(MASS)
require(loo)
load("fitting2.RData")
```

Model 4, letting alpha_R40 be real

```
R40dmg_mod <- stan_model("only_alphaR40_real.stan")
init_R40dmg <- function() {
  list(mu = c(35,8), sigma = c(10,1), rho = .5, alpha_R40 = 1)
}

R40dmg_fit <- sampling(object = R40dmg_mod,
                        data = list(N_R20 = nrow(R20_data), N_R40 = nrow(R40_data), N_R60 = nrow(R60_data),
                                    N_T20 = nrow(T20_data), N_T40 = nrow(T40_data), N_T60 = nrow(T60_data),
                                    N_x = length(T100_data), N_y = length(R100_data),
                                    X_R20 = R20_data, X_R40 = R40_data, X_R60 = R60_data,
                                    X_T20 = T20_data, X_T40 = T40_data, X_T60 = T60_data,
                                    t_x = R100_data, t_y = T100_data,
                                    l_R20=R_pf[1], l_R40=R_pf[2], l_R60=R_pf[3],
                                    l_T20=T_pf[1], l_T40=T_pf[2], l_T60=T_pf[3]),
                        control = list(adapt_delta = 0.8), init = init_R40dmg)

print(R40dmg_fit, pars = c('mu', 'sigma', 'rho', 'alpha_R40'))

## Inference for Stan model: only_alphaR40_real.
## 4 chains, each with iter=2000; warmup=1000; thin=1;
## post-warmup draws per chain=1000, total post-warmup draws=4000.
##
##           mean se_mean    sd  2.5%   25%   50%   75% 97.5% n_eff Rhat
## mu[1]     44.75    0.01 0.53 43.72 44.40 44.76 45.11 45.80  4647    1
## mu[2]      5.49    0.00 0.05  5.40  5.46  5.49  5.52  5.58  4988    1
## sigma[1]   12.74    0.01 0.42 11.94 12.44 12.72 13.02 13.58  5259    1
## sigma[2]    1.06    0.00 0.04  0.99  1.03  1.05  1.08  1.13  4753    1
## rho        0.72    0.00 0.05  0.60  0.69  0.72  0.75  0.81  4195    1
## alpha_R40  1.17    0.01 0.85 -0.42  0.58  1.16  1.73  2.92  4256    1
##
```

```

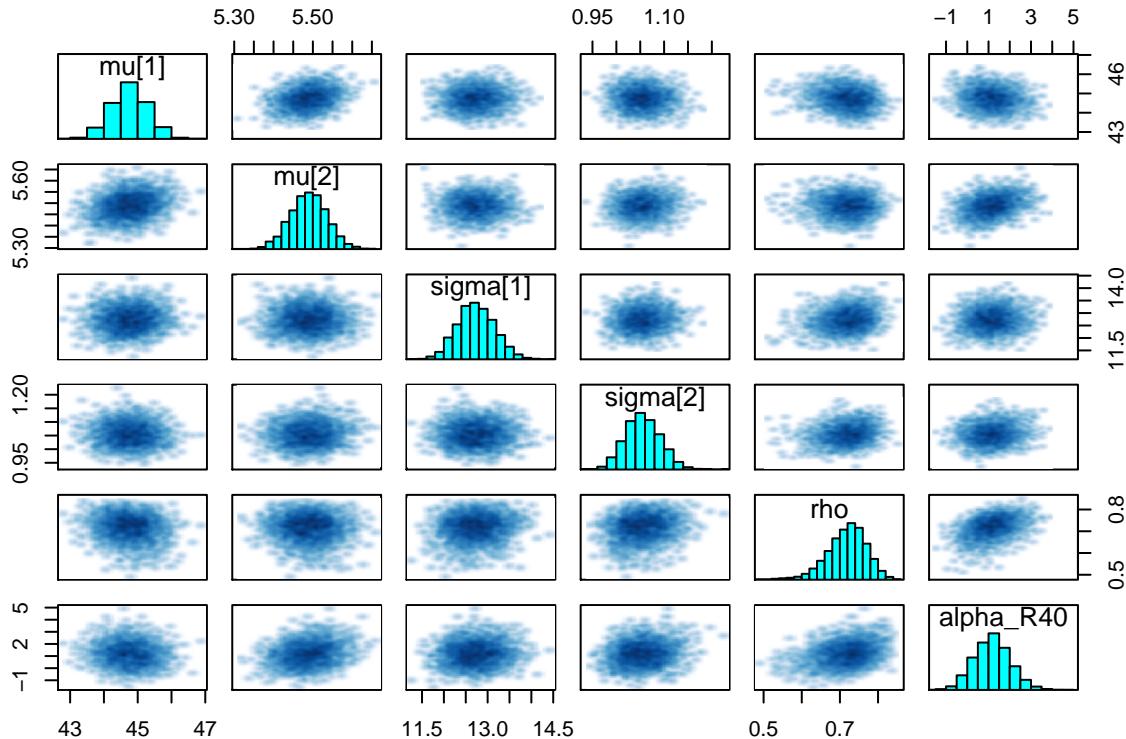
## Samples were drawn using NUTS(diag_e) at Tue Mar 30 12:32:27 2021.
## For each parameter, n_eff is a crude measure of effective sample size,
## and Rhat is the potential scale reduction factor on split chains (at
## convergence, Rhat=1).

```

```

pairs(R40dmg_fit,pars = c('mu','sigma','rho','alpha_R40'))

```



Model 5, letting all alpha's be real

```

dmg_mod <- stan_model("damage_real.stan")

init_dmg <- function() {
  list(mu = c(35,8), sigma = c(10,1), rho = .5, alpha_R20 = 1,
       alpha_R40 = 1, alpha_R60 = 1, alpha_T20 = 1, alpha_T40 = 1, alpha_R60 = 1 )
}

dmg_fit <- sampling(object = dmg_mod,
                      data = list(N_R20 = nrow(R20_data), N_R40 = nrow(R40_data), N_R60 = nrow(R60_data),
                                  N_T20 = nrow(T20_data), N_T40 = nrow(T40_data), N_T60 = nrow(T60_data),
                                  N_x = length(T100_data), N_y = length(R100_data),
                                  X_R20 = R20_data, X_R40 = R40_data, X_R60 = R60_data,
                                  X_T20 = T20_data, X_T40 = T40_data, X_T60 = T60_data,
                                  t_x = R100_data, t_y = T100_data,

```

```

    l_R20=R_pf[1],l_R40=R_pf[2],l_R60=R_pf[3],
    l_T20=T_pf[1],l_T40=T_pf[2],l_T60=T_pf[3]),
control = list(adapt_delta = 0.8),init = init_dmg)

```

```

print(dmg_fit,pars = c('mu','sigma','rho','alpha_R20','alpha_R40',
                      'alpha_R60','alpha_T20','alpha_T40','alpha_T60'))

```

```

## Inference for Stan model: damage_real.
## 4 chains, each with iter=2000; warmup=1000; thin=1;
## post-warmup draws per chain=1000, total post-warmup draws=4000.
##
##          mean   se_mean     sd   2.5%   25%   50%   75% 97.5% n_eff
## mu[1]      44.70    0.02   0.66  43.38  44.26  44.69  45.16 45.98  976
## mu[2]       5.49    0.00   0.06   5.38   5.46   5.49   5.53  5.60  627
## sigma[1]    12.64    0.02   0.45  11.81  12.33  12.63  12.95 13.55  841
## sigma[2]     1.05    0.00   0.04   0.98   1.03   1.05   1.08  1.13  819
## rho         0.64    0.01   0.12   0.36   0.56   0.66   0.73  0.83  357
## alpha_R20   -0.10    0.03   0.78  -1.69  -0.63  -0.10   0.41  1.48  586
## alpha_R40    0.83    0.04   1.03  -1.25   0.15   0.85   1.53  2.79  545
## alpha_R60   -0.33    0.06   1.34  -2.86  -1.24  -0.34   0.59  2.27  568
## alpha_T20    19.33   2.38  67.15 -98.05 -29.60  12.95  62.56 163.27 797
## alpha_T40   -16.95   3.98 101.86 -202.67 -86.85 -21.10  51.01 186.70 654
## alpha_T60   -131.51   4.34 99.16 -277.27 -210.03 -143.58 -67.07  88.23 521
##          Rhat
## mu[1]      1.00
## mu[2]      1.00
## sigma[1]   1.00
## sigma[2]   1.00
## rho        1.01
## alpha_R20  1.00
## alpha_R40  1.01
## alpha_R60  1.01
## alpha_T20  1.00
## alpha_T40  1.00
## alpha_T60  1.01
##
## Samples were drawn using NUTS(diag_e) at Tue Mar 30 12:37:52 2021.
## 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).

```

```

pairs(dmg_fit,pars = c('rho','alpha_R20','alpha_R40',
                      'alpha_R60','alpha_T20','alpha_T40','alpha_T60'))

```

