

Estimating the parameters of a beta distribution

When to use this

Use this program when your data consists of N observations (y_1, y_2, \dots, y_N) from a beta distribution and you want to estimate the shape and scale parameters.

The likelihood for this model is a beta density,

$$f(y|\alpha, \beta) = \prod_{i=1}^N \frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)} y_i^{\alpha-1} (1 - y_i)^{\beta-1} \quad \alpha, \beta > 0$$

The priors for α and β

The default model file `beta.stan` is set up with half-normal priors for α and β , coded as `normal(0,50)` with a nonnegativity constraint.

These priors allow for values of both α and β up to 100 to have some probability mass.

The default Stan model file

The name of the model file in the example code is `beta.stan`

```
//Estimate the parameters of a beta distribution
data {
  int N;                                //sample size
  real<lower=0,upper=1> y[N];           //y consists of N real values between zero and one
}
parameters {
  real<lower=0> alpha;                  //shape constrained to be nonnegative
  real<lower=0> beta;                   //scale constrained to be nonnegative
}
model {
  alpha ~ normal(0,50);                 //half-normal prior for shape
  beta ~ normal(0,50);                  //half-normal prior for scale

  y ~ beta(alpha,beta);                 //beta likelihood given parameters alpha,beta
}
```