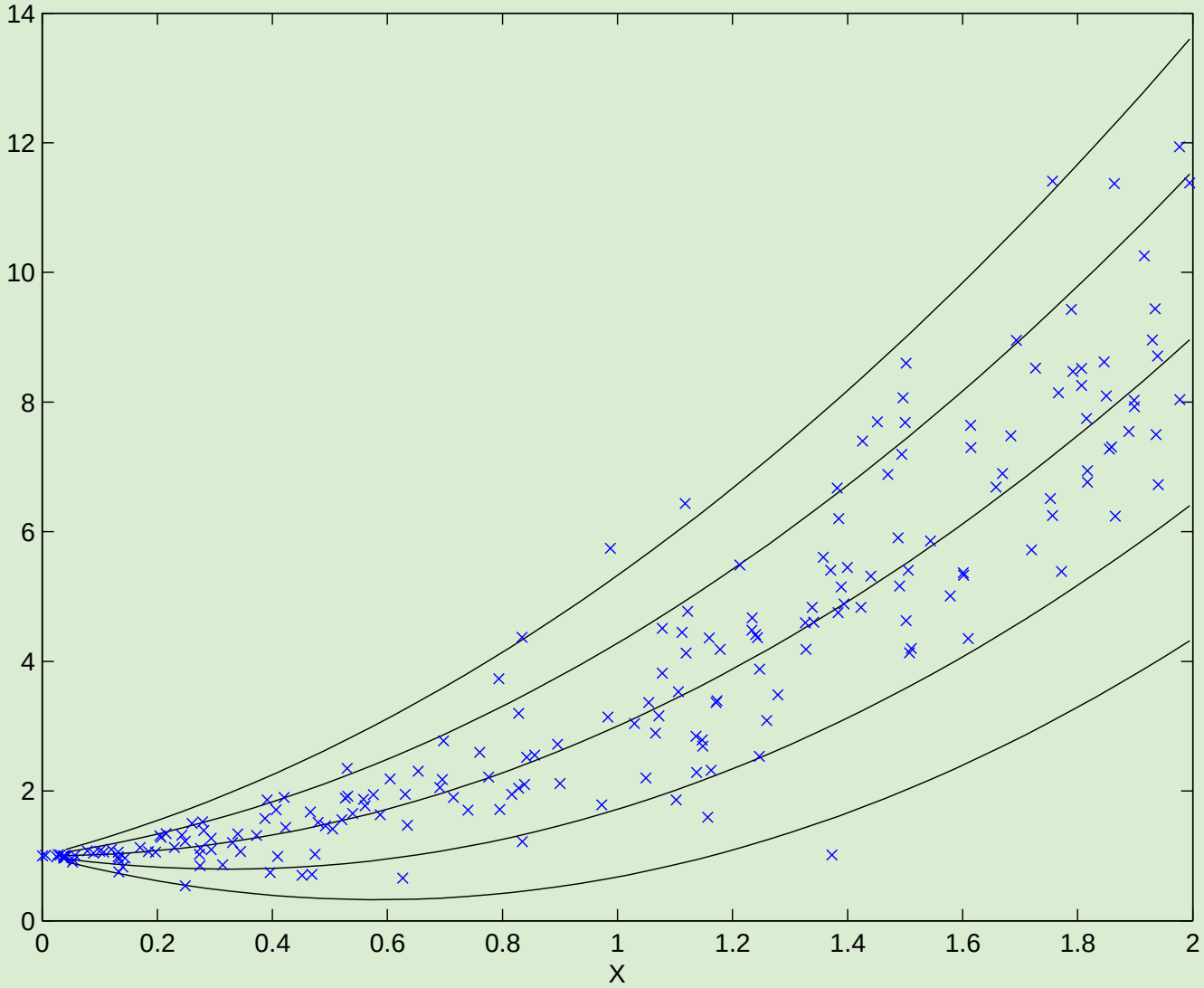
The Parabolic regression example

OpenBUGS

Parabolic Regression Initial Data and Percentiles

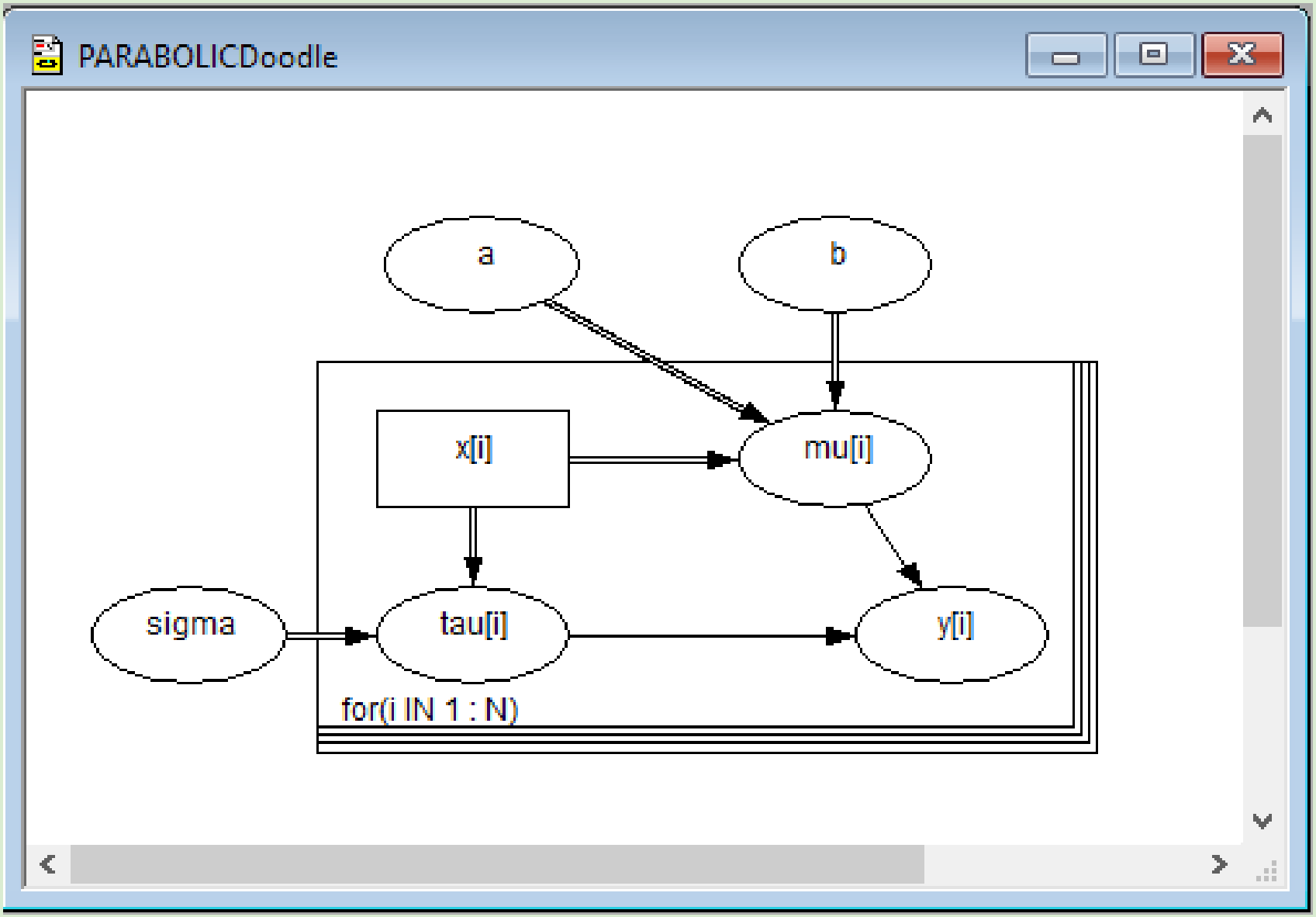


This is the **Parabolic Regression** initial data with the corresponding percentiles. **It shows a non-linear trend and heterocedasticity**.

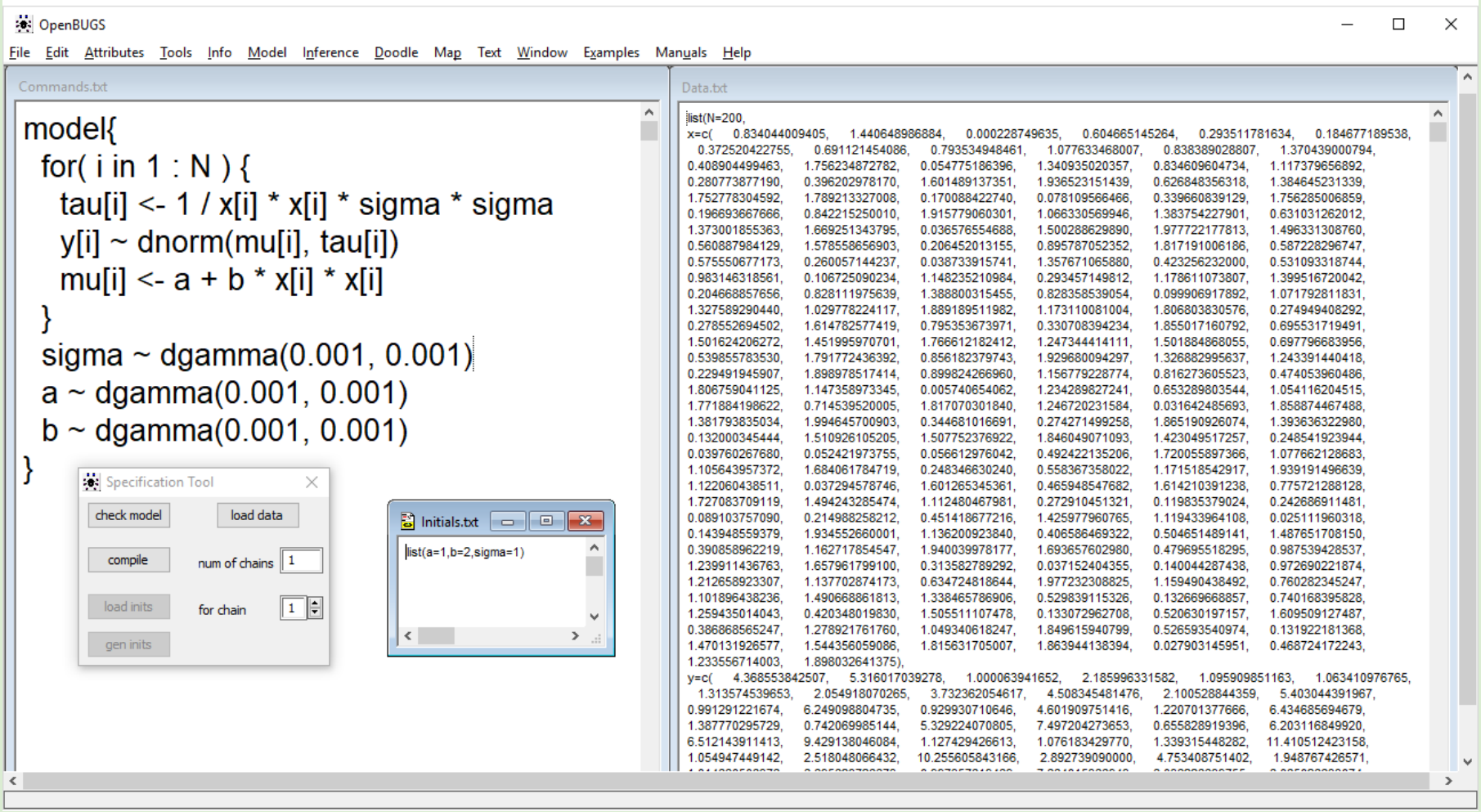
The Parabolic Regression Example Commands

```
# Parabolic Regression Example
model {
    for (i in 1:N){
        tau[i]<-1/(x[i]*x[i]*sigma*sigma)

# Data
        y[i]~dnorm(mu[i],tau[i])
        mu[i]<-a+b*x[i]*x[i]
    }

# Priors
    sigma~dgamma(0.001,0.001)
    a~dgamma(0.001,0.001)
    b~dgamma(0.001,0.001)
}
```

The Parabolic Regression Doodle Model

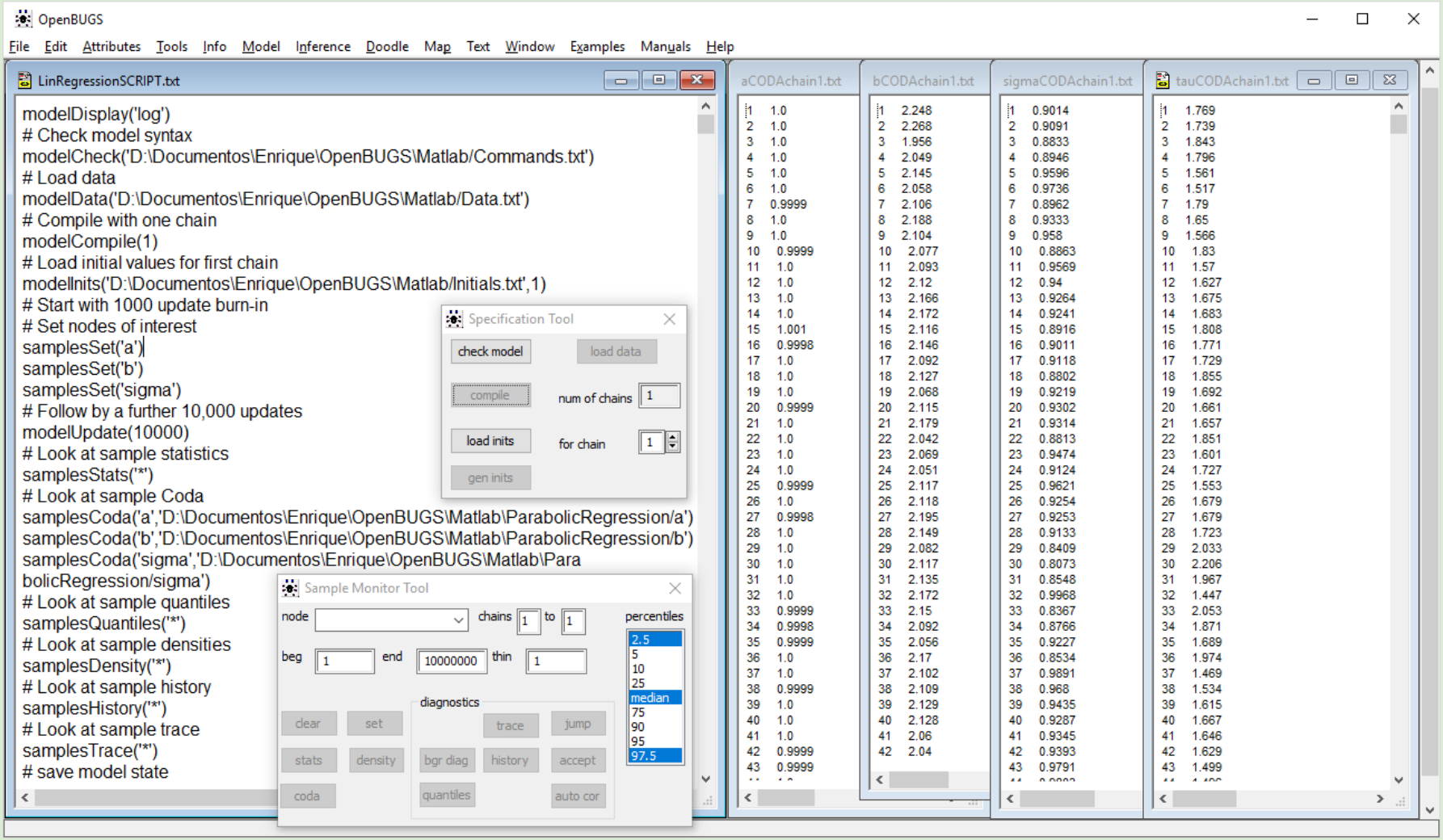


The parabolic Regression Commands, Data and Initials



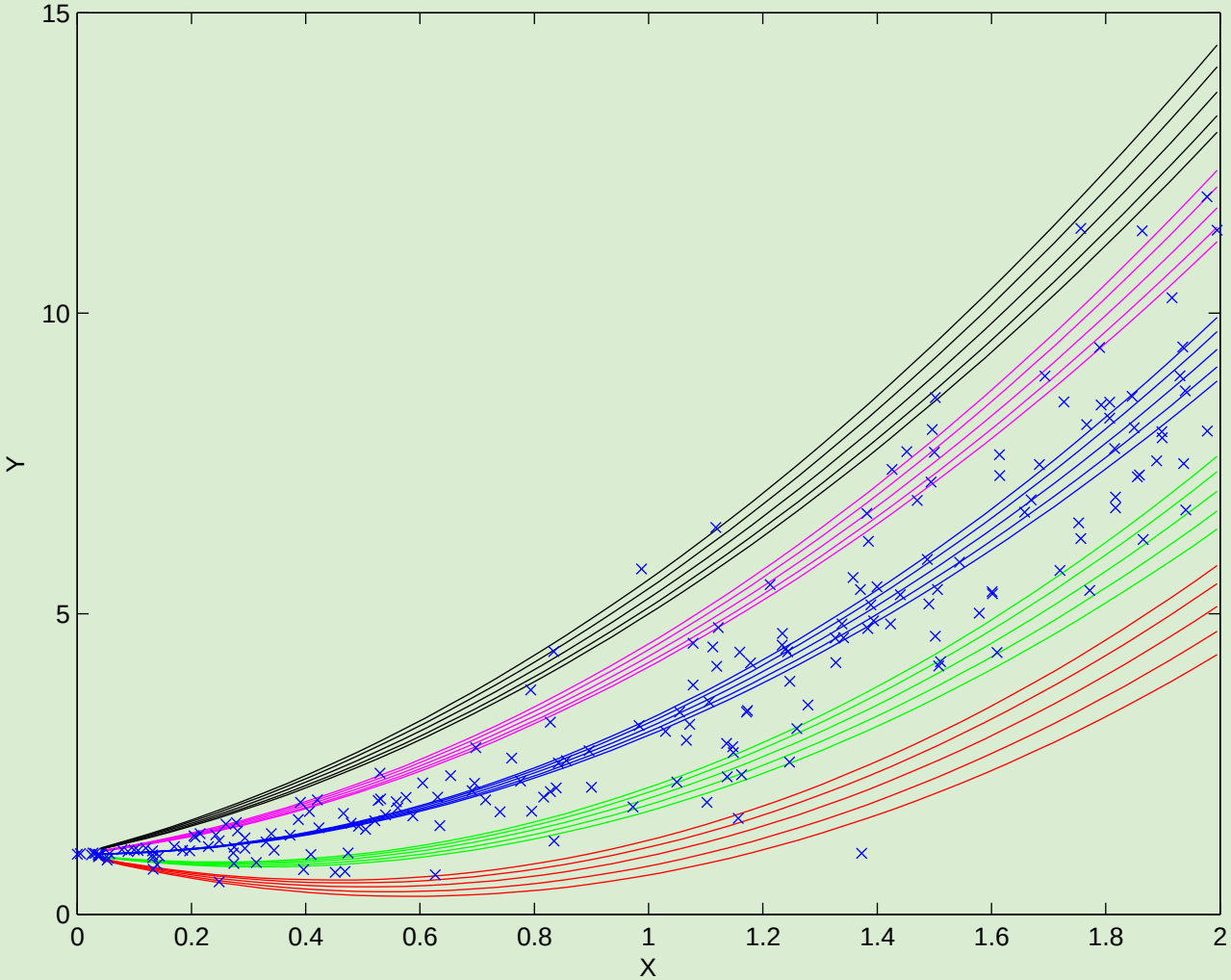
This is the **Parabolic Regression** window with the corresponding commands, data and initials.

The Parabolic Regression Script and CODA Files



This is the **Parabolic Regression** window with the corresponding script and CODA files.

The Parabolic Regression final model and percentile percentiles



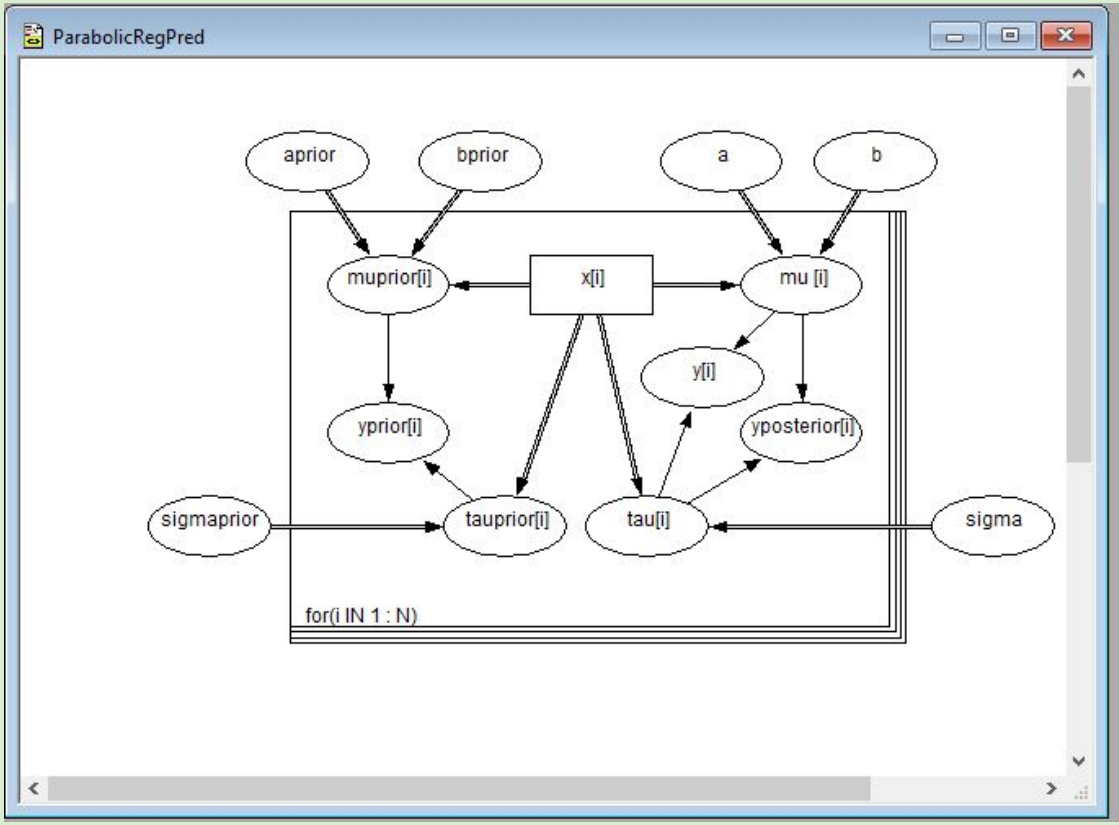
This is the **Parabolic Regression** resulting model with the percentile percentiles.

The Parabolic Regression Example with predictive distributions

The Parabolic Regression Model Commands With Predictive Distributions

```
model {
  for (i in 1:N){
    tau[i]<-1/(x[i]*x[i]*sigma*sigma)
    tauprior[i]<-1/(x[i]*x[i]*sigmaprior*sigmaprior)
    y[i]~dnorm(mu[i],tau[i])
    yprior[i]~dnorm(muprior[i],tauprior[i])
    ypredictive[i]~dnorm(mu[i],tau[i])
    mu[i]<-a+b*x[i]*x[i]
    muprior[i]<-aprior+bprior*x[i]*x[i]
  }
  a~dunif(0.5,2)
  b~dunif(1,3)
  sigma~dunif(0.5,2)
  aprior~dunif(0.5,2)
  bprior~dunif(1,3)
  sigmaprior~dunif(0.5,2)
}
```

The Parabolic Regression model commands with predictive distributions

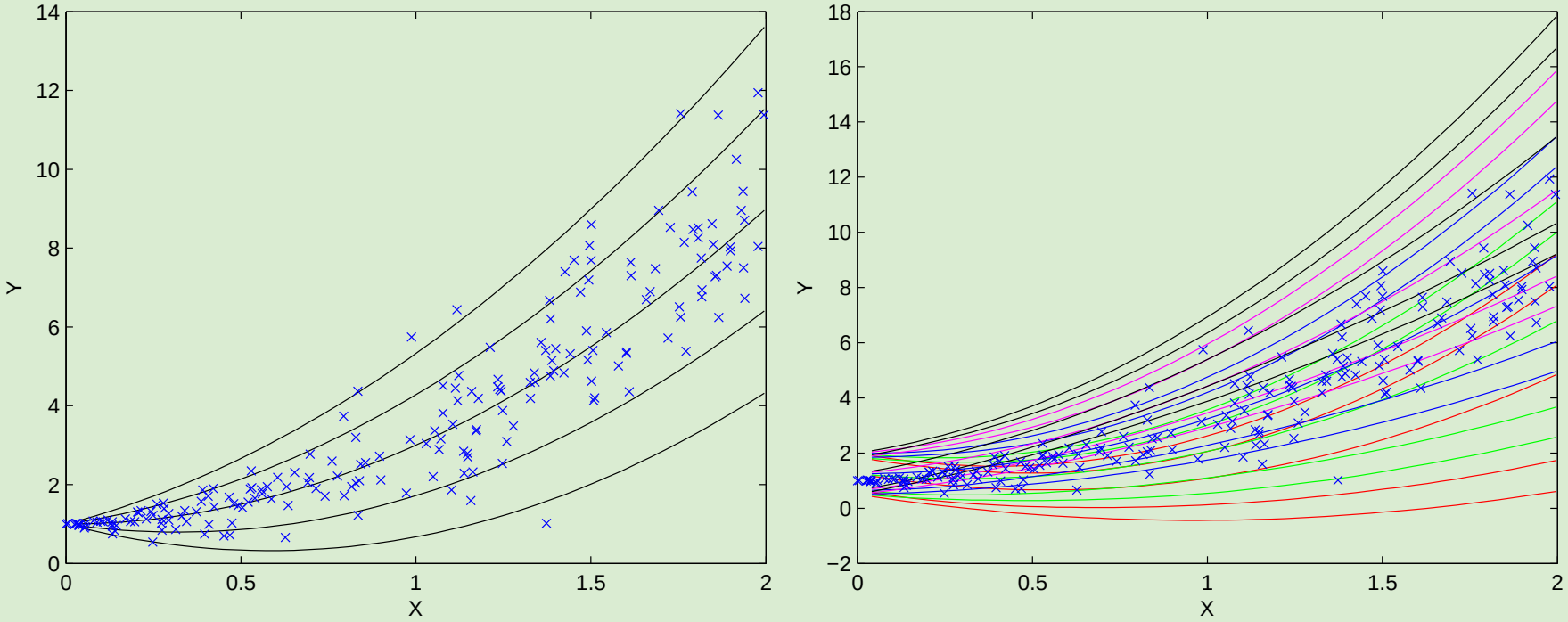


Commands.txt

```
model {
for (i in 1:N){
tau[i]<-1/(x[i]*x[i]*sigma*sigma)
tauprior[i]<-1/(x[i]*x[i]*sigmaprior*sigmaprior)
y[i]~dnorm(mu[i],tau[i])
yprior[i]~dnorm(muprior[i],tauprior[i])
ypredictive[i]~dnorm(mu[i],tau[i])
mu[i]<-a+b*x[i]*x[i]
muprior[i]<-aprior+bprior*x[i]*x[i]
}
a~dunif(0.9,1.1)
b~dunif(1.8,2.2)
sigma~dunif(0.9,1.1)
aprior~dunif(0.9,1.1)
bprior~dunif(1.8,2.2)
sigmaprior~dunif(0.9,1.1)
}
```

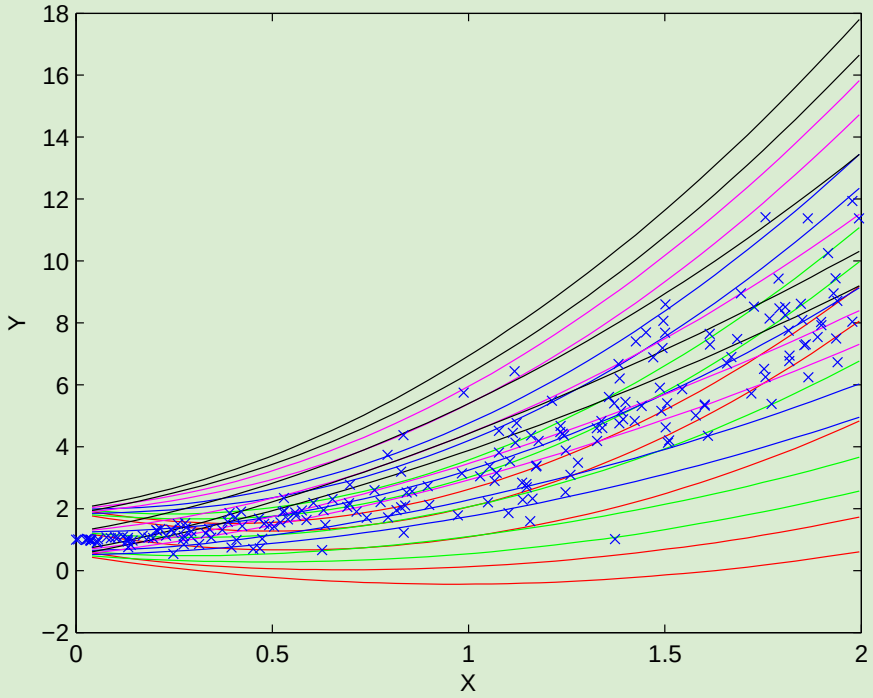
The Doodle and the Commands model

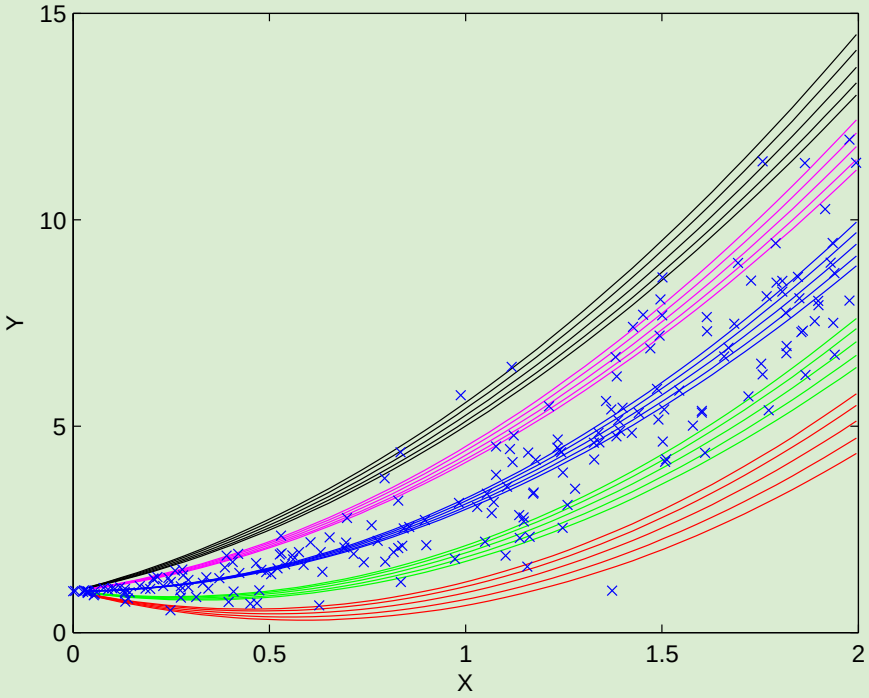
The Exact Model and Predictive Prior Model



The prior predictive model, on the right, does not fit well the sample data, because it ignores it.

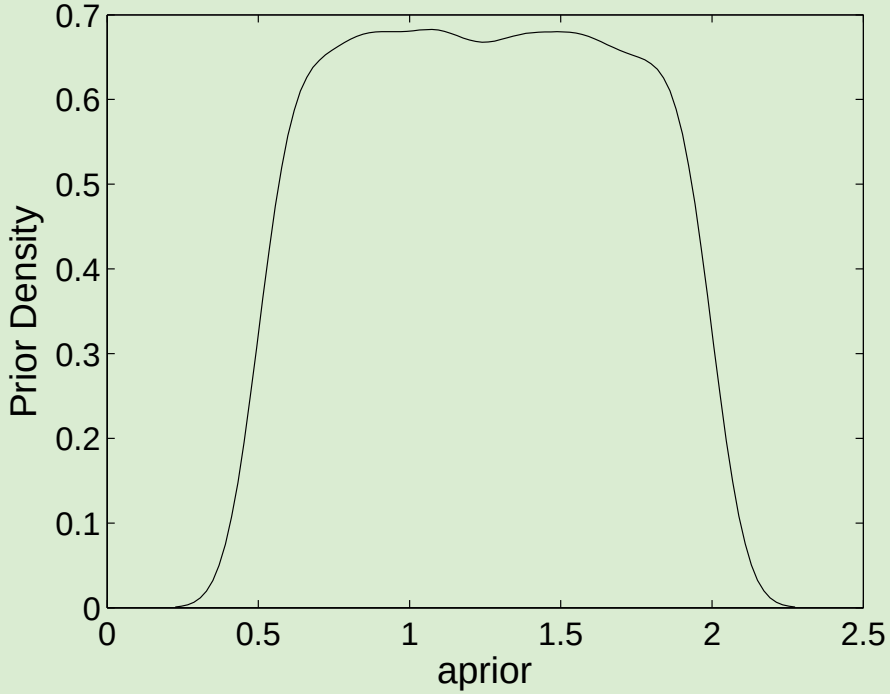
Prior and Posterior Predictive Models With Data

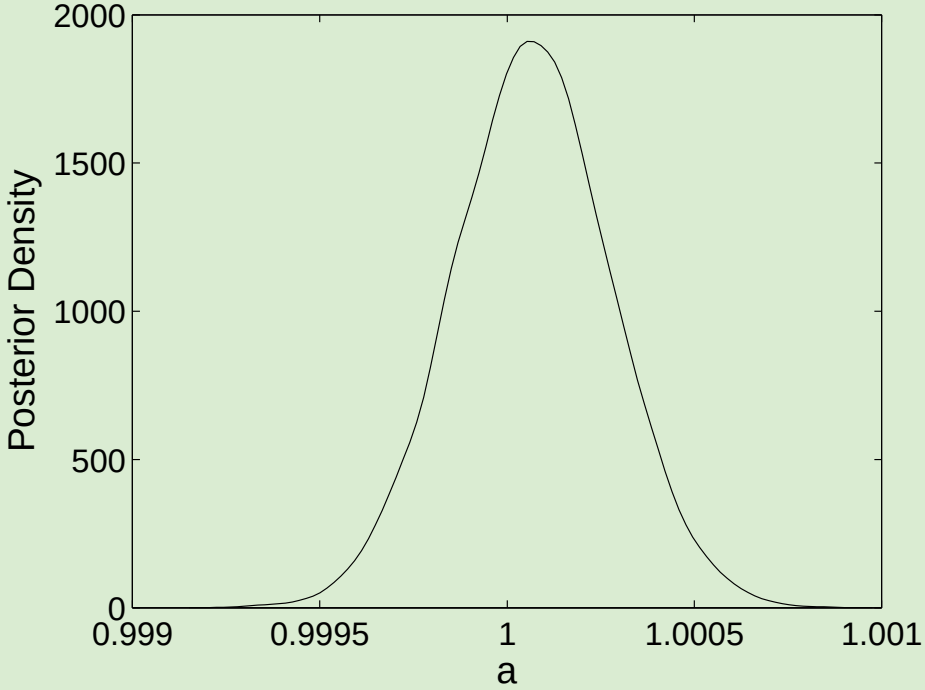




The posterior predictive model, on the right, incorporates the sample data and then, it fits the data much better than the prior predictive model.

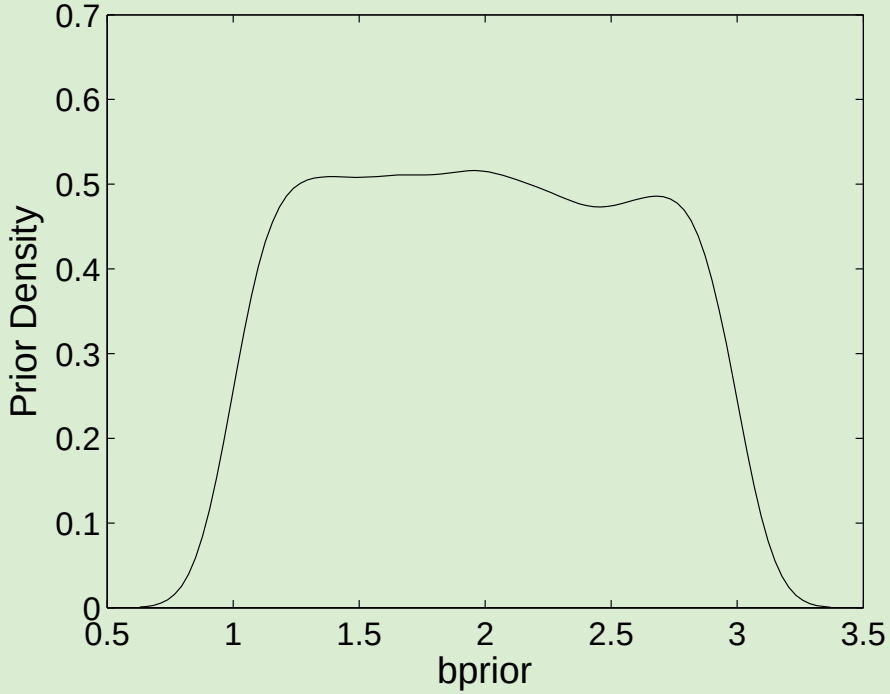
Prior and Posterior Densities Of The a Parameter

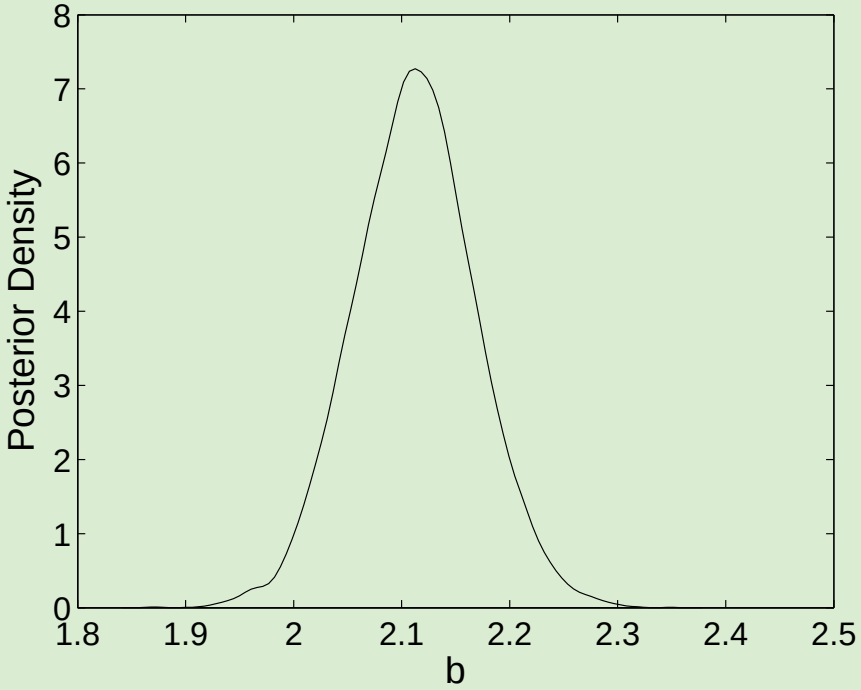




The a prior is the uniform distribution (approximately) and the posterior incorporates the sample information. We answer when asked about the a parameter by providing the posterior density of a

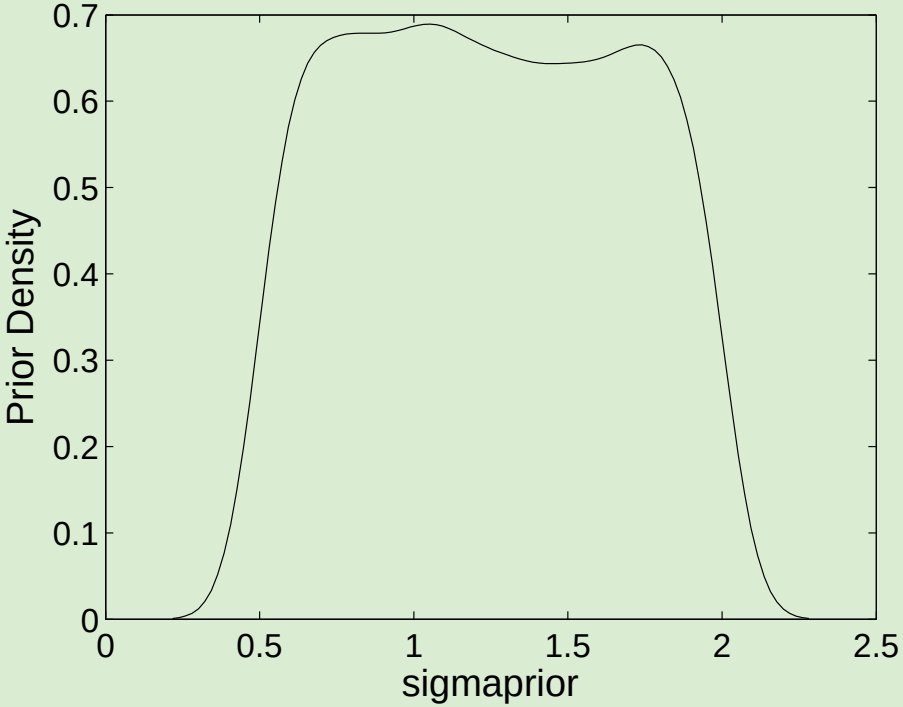
Prior and Posterior Densities Of The b Parameter

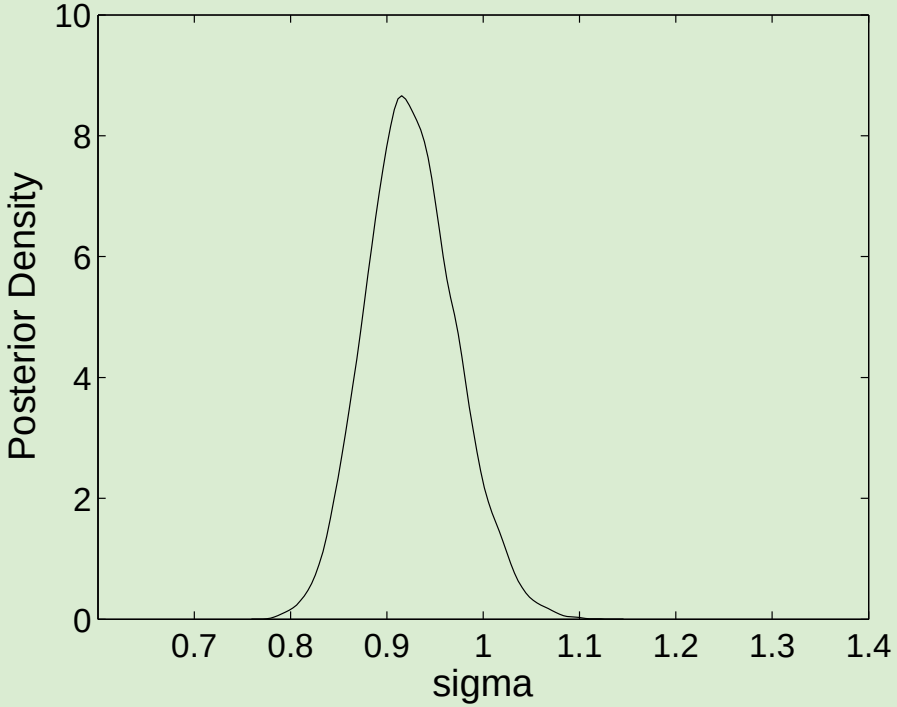




The b prior is the uniform distribution (approximately) and the posterior incorporates the sample information. We answer when asked about the b parameter by providing the posterior density of b.

Prior and Posterior Densities Of The Sigma Parameter





The sigma prior is the uniform distribution (approximately) and the posterior incorporates the sample information. We answer when asked about the sigma parameter by providing the posterior density of sigma.