Lab3 Report

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13 May 2017

Rainfall

a) Normal model

A Gibbs sampler is implemented that simulates from the joint posterior and after 2500 iterations the mean and variance converges. The result can be shown in Figure 1 and Figure 2.

$$\mu|\sigma^2, x \sim N(\mu_n, \tau_n^2)$$

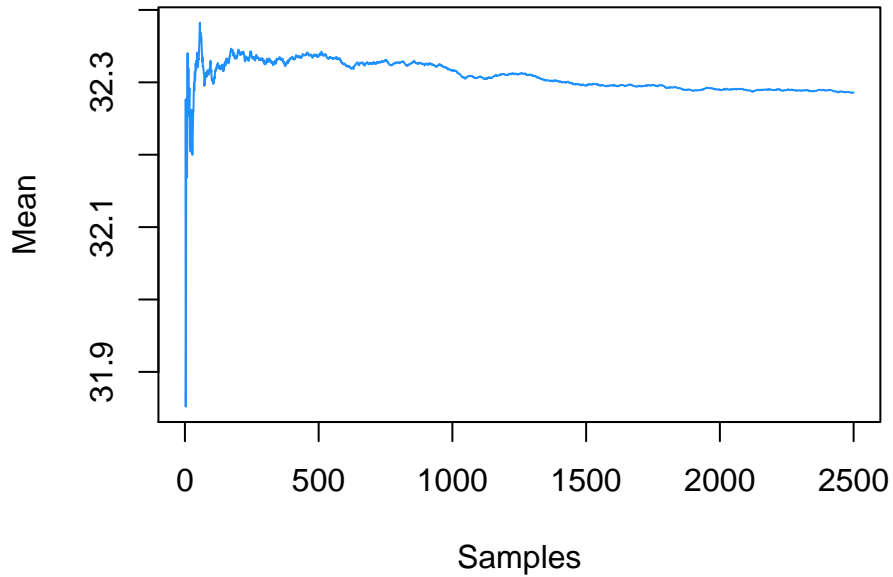$$\sigma^2|\mu, x \sim Inv - \chi^2 \left(v_n, \frac{v_0\sigma_0^2 + \sum_{i=1}^{n}(x_i - \mu)^2}{n + v_0} \right)$$

Figure 1: Convergence of the Mean

b) Mixture normal model

We use the provided code and modified it to suite our model. We updated the μ hyperparameters to:

$\mu_1 =$ mode of the density
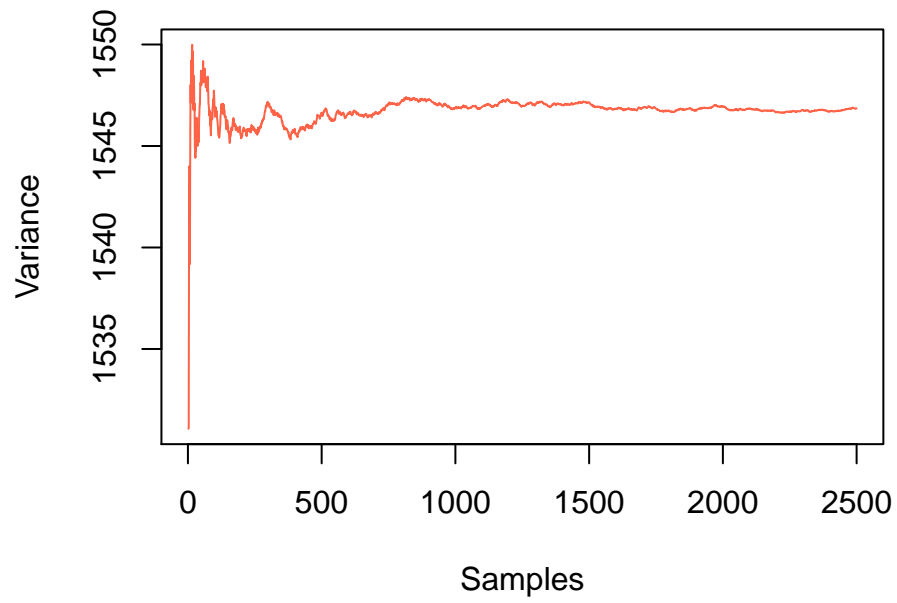
$\mu_2 =$ mean of the data

Figure 2: Convergence of the Variance

The convergence of the mean and variance can be shown in Figure 3 and Figure 4.

c)

The density from the original data together with the densities from a and b are shown in Figure 5. It is clear that the mixture model fits the data much more accurately.
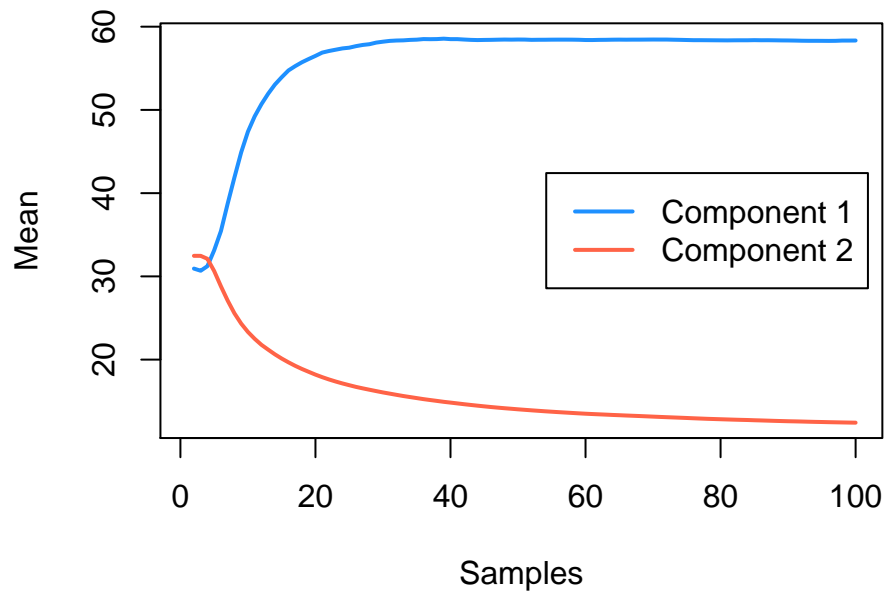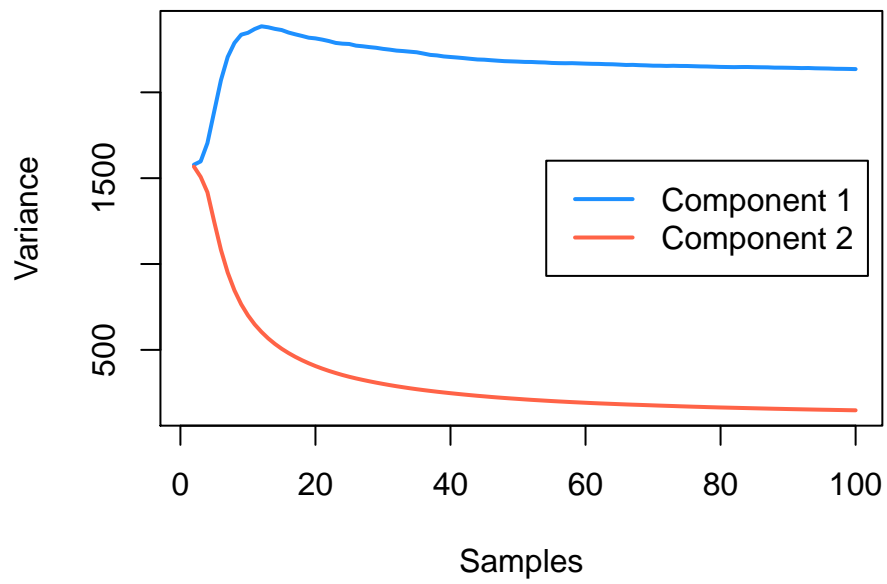
Figure 3: Convergence of the Mean

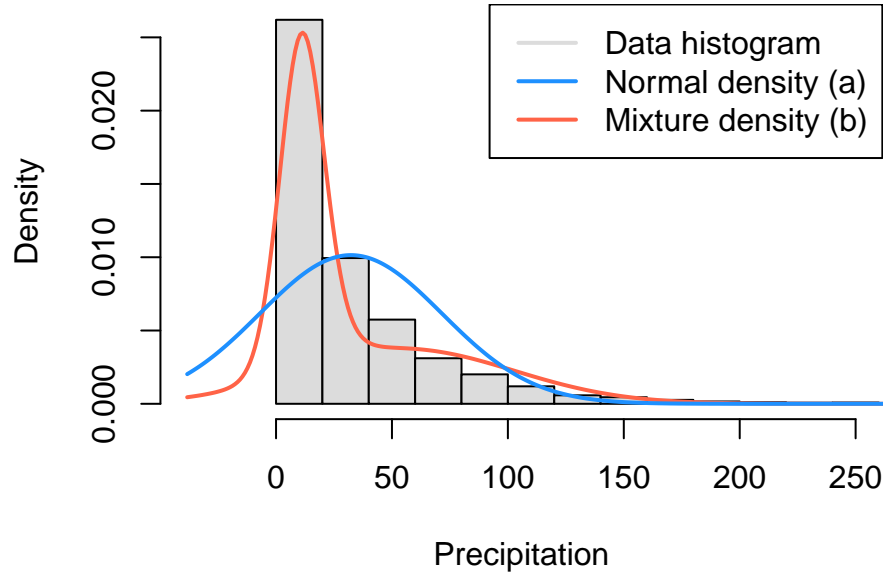Figure 4: Convergence of the Variance

Figure 5: Mixture of normals

2 Probit regression

The Gibbs sampler for the probit regression model is implemented. With 10 000 iterations in the sampling the mean of the β values are calculated. To see how good these values fit the original data the confusion matrix is produced.

	0	1
0	65	35
1	32	68

Which have the misclassification rate 33.5 %.

By using optim to optimize β the following confusion matrix is produced.

	0	1
0	66	27
1	31	76

Which have the misclassification rate 29 %.

By plotting the histogram for each parameter together with the normal model that optim produce the following plot is derived. The histograms for the parameters resembles normal approximations pretty good. The result from the Gibbs sampling and optim are however different.

Some parameters have similar mean, for example HusbandInc and NBigChild but others are way off. The variance for Age and NSmallCHild are quite similar to the histograms.
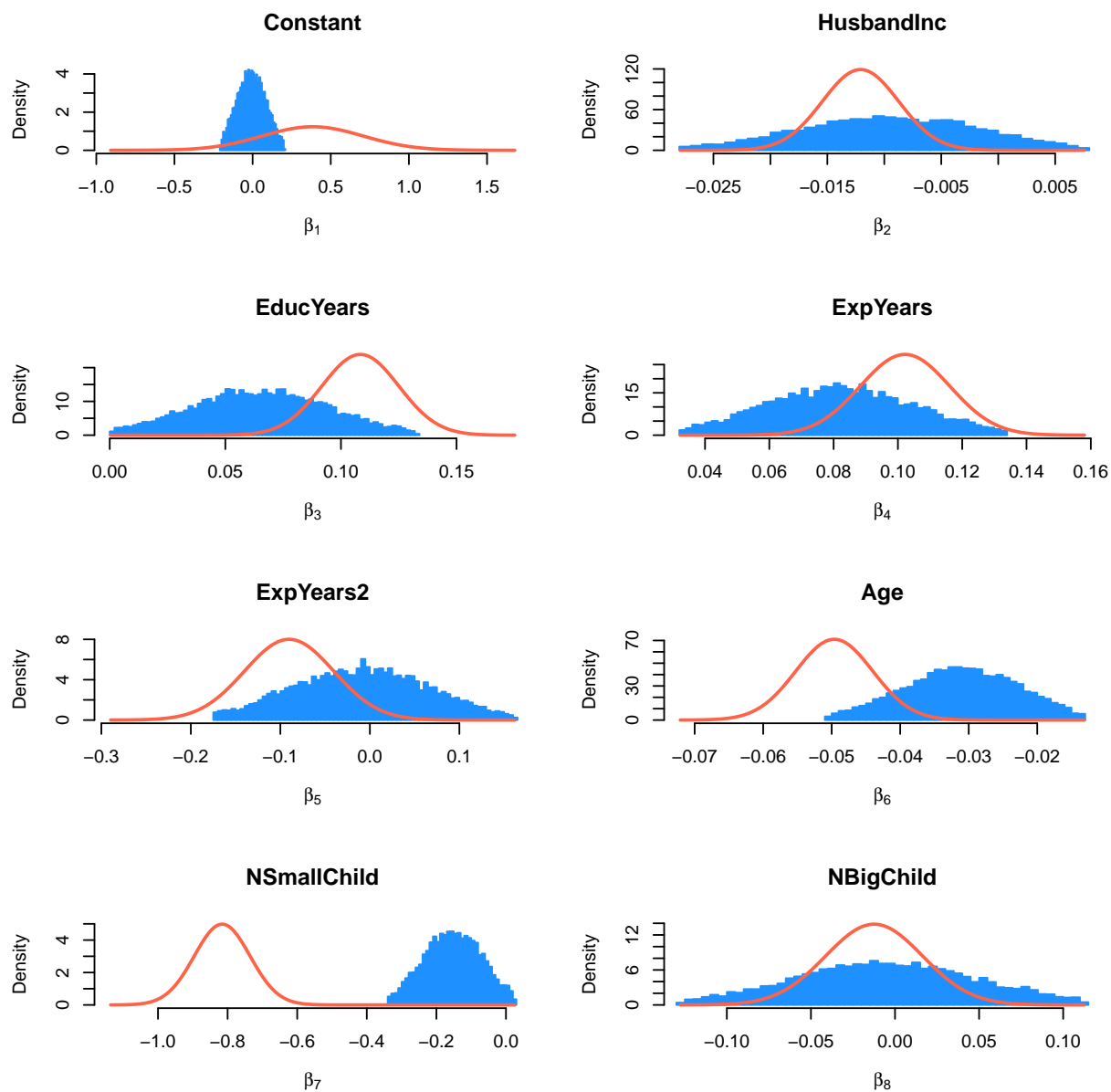
Figure 6: Histogram and density plots for β

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Appendix A - Code for assignment 1

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potatis = okej
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Appendix B - Code for assignment 2

```
a = c(1,3,3,7)
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