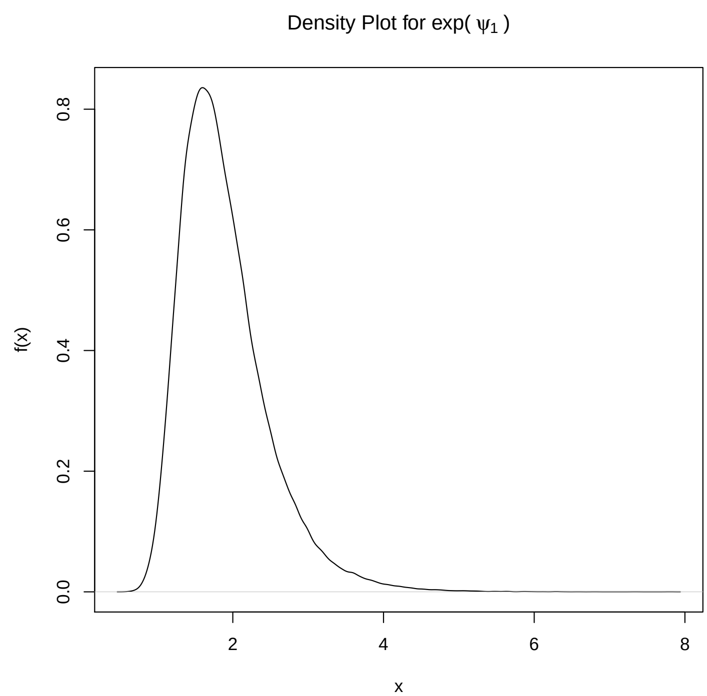


Figure 1: Density plot for odds ratio

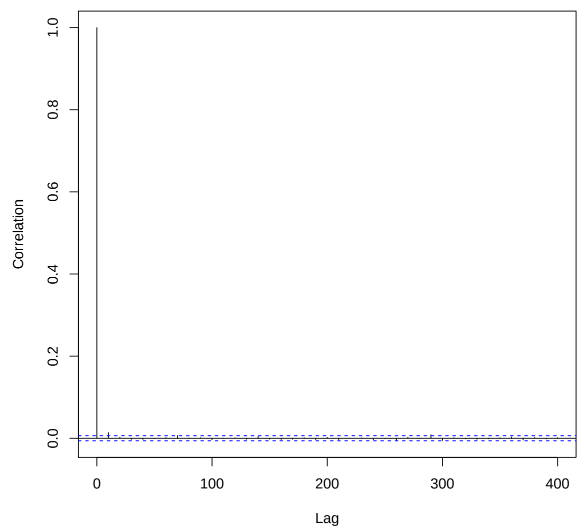
Homework 5

1. We use *JAGS* to run a Gibbs Samper to estimate the joint density of (μ, σ) and $(\psi_j)_{j=1}^{12}$. We use a thin of 2, a burn-in of 100000 and collect 1 million samples.

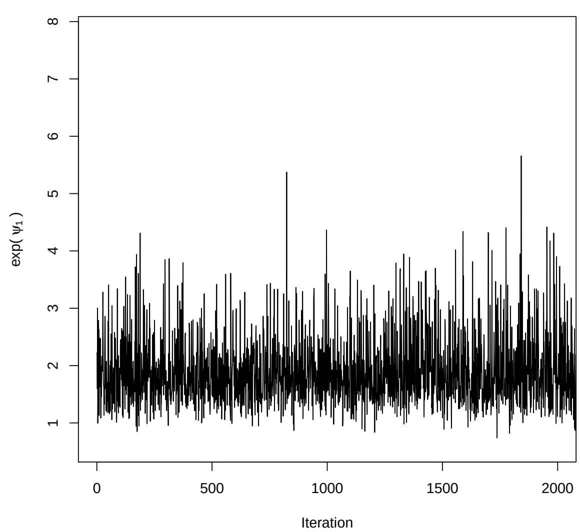
The probability that the odds ratio is greater than 1 can be estimated using:

$$\hat{P}(e^{\psi_1} > 1) = \frac{1}{n}\sum_{i=1}^{n} I[e^{\psi_1^{(i)}} > 1] = 0.98796$$

Figure 1 shows a plot for the posterior density of the odds ratio using a kernel density estimator, while Figure 2a displays the autocorrelation and Figure 2b shows the trace for e^{ψ_1}.



(a)



(b)

Figure 2: Trace and Autocorrelation plots for the odds ratio

Appendix 1: model.txt

```
model {
for (i in 1:N) {
psihat[i]~dnorm(psi[i],1/(sigma[i])^2)
psi[i]~dnorm(mu,1/tau^2)
}
mu~dnorm(0,1/(1000*tau^2))
tau<-1/sqrt(gam)
gam ~ dgamma(0.1,0.1)
}
```

Appendix 2: script.txt

```
model clear
data clear
model in "model.txt"
data in "data.txt"
compile
inits in "initial_1.txt"
initialize
update 100000
monitor mu, thin(10)
monitor psi, thin(10)
monitor gam, thin(10)
update 1000000
coda *
```

Appendix 3: R code

```
library(coda)
res = read.coda("CODAchain1.txt", "CODAindex.txt")
psi1 = exp(res[,2])


pdf("psi1trace.pdf")
plot(as.numeric(psi1),  type= 'l',xlim = c(0,2000),
xlab = "Iteration",
ylab = expression("exp(" ~ psi[1]~")")) ##trace plot
```

```
dev.off()

pdf("psi1acf.pdf")
acf(psi1, lag.max = 40, xlab = "Lag",
ylab = "Correlation", main="")
## autocorrelation plot
dev.off()

pdf("psi1density.pdf")
plot(density(psi1),xlab = "x",ylab = "f(x)",
main = expression("Density Plot for exp(" ~ psi[1]~")"))
dev.off()
prob = (1/length(psi1))*sum(psi1>1)
prob
```