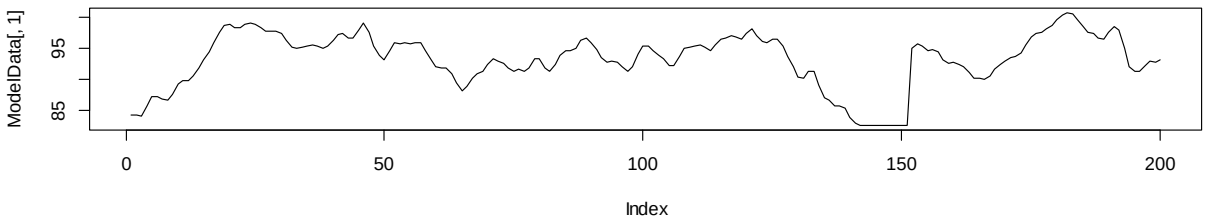
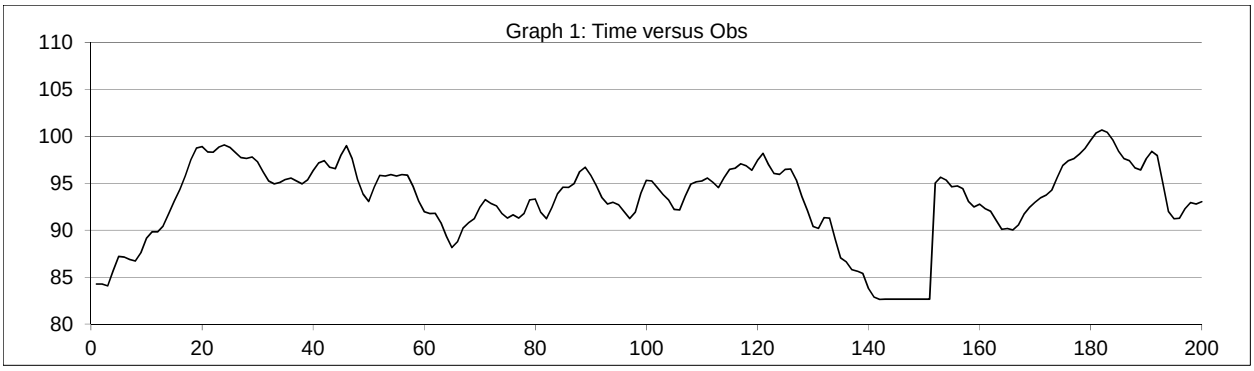
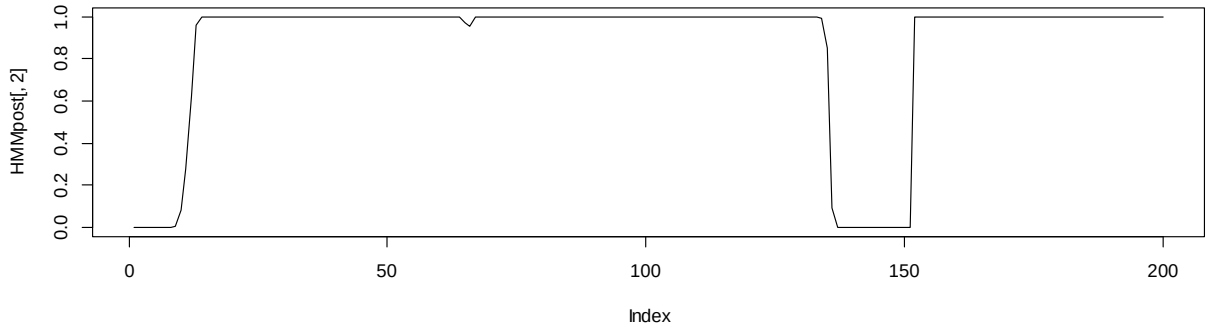
Univariate Series fitting of HMM

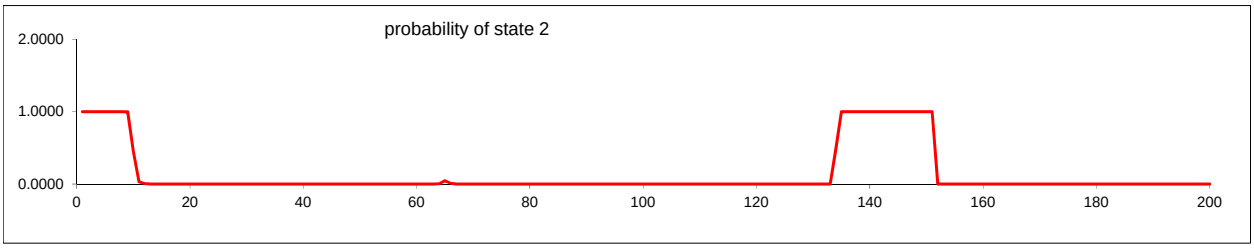
```
> hmmData<-read.table("C:/Users/bill/Desktop/HMMdata.txt",header=TRUE)
> y<-hmmData[2]
> library(depmixS4)
Loading required package: nnet
Loading required package: MASS
Loading required package: Rsolnp
> set.seed(1)
> ModelData<-data.frame(y)
> colnames(ModelData)<-"y"
> HMM<-depmix(y~1,data=ModelData,nstates=2,family=gaussian())
> HMMfit<-fit(HMM,verbose = FALSE)
converged at iteration 40 with logLik: -487.9615
> print(HMMfit)
Convergence info: Log likelihood converged to within tol. (relative change)
'log Lik.' -487.9615 (df=7)
AIC:  989.9229
BIC:  1013.011
> summary(HMMfit)
Initial state probabilties model
pr1 pr2
  0   1

Transition matrix
       toS1  toS2
fromS1 0.994 0.006
fromS2 0.074 0.926

Response parameters
Resp 1 : gaussian
    Re1.(Intercept) Re1.sd
St1          94.548  2.730
St2          84.705  2.033
> HMMpost<-posterior(HMMfit)
> head(HMMpost)
  state          S1        S2
1     2 0.000000e+00 1.0000000
2     2 5.104915e-05 0.9999490
3     2 3.926793e-05 0.9999607
4     2 3.301796e-04 0.9996698
5     2 3.429852e-03 0.9965701
6     2 2.999896e-03 0.9970001
> plot(ModelData[,1],type="l")
```






```
> plot(HMMpost[,2],type="l")
```





Fitting a Multivariate Normal HMM

```
> hmmData<-read.table("C:/Users/bill/Desktop/MHMM.txt",header=TRUE)
> x<-hmmData[2]
> y<-hmmData[3]
> library(depmixS4)
Loading required package: nnet
Loading required package: MASS
Loading required package: Rsolnp
> ModelData<-data.frame(x,y)
> z<-data.matrix(ModelData)

> rModels<-list()
> rModels[[1]]<-list(MVNresponse(z~1))
> rModels[[2]]<-list(MVNresponse(z~1))
> trstart=c(0.9,0.1,0.1,0.9)
> transition<-list()
> transition[[1]]<-transInit(~1,nstates=2,data=data.frame(1),pstart=c(trstart[1:2]))
> transition[[2]]<-transInit(~1,nstates=2,data=data.frame(1),pstart=c(trstart[3:4]))
> instart=runif(2)
> inMod<-transInit(~1,ns=2,ps=instart,data=data.frame(1))
> mod<- makeDepmix(response=rModels,transition=transition,prior=inMod)

> fm<-fit(mod,emc=em.control(random=FALSE))
iteration 0 logLik: -1033.003
iteration 5 logLik: -814.8728
converged at iteration 9 with logLik: -814.8716
```

> summary(fm)

Initial state probabilties model

	St1	St2
(Intercept)	0	10.165

Transition matrix

	toS1	toS2
fromS1	0.981	0.019
fromS2	0.037	0.963

Transition probabilities

	1	2
1	0.96	0.04
2	0.03	0.97

Response parameters

	Re1.coefficients1	Re1.coefficients2	Re1.Sigma1	Re1.Sigma2	Re1.Sigma3
St1	8.082	10.070	3.715	-2.944	4.512
St2	9.982	4.664	15.147	6.805	3.854

Estimated mean vector, Covariance, Correlation matrix

State 1

$$\mu_1 = \begin{bmatrix} 8.082 \\ 10.070 \end{bmatrix}, \Sigma_1 = \begin{bmatrix} 3.715 & -2.944 \\ -2.944 & 4.512 \end{bmatrix}, P_1 = \begin{bmatrix} 1 & -0.71892 \\ -0.71892 & 1 \end{bmatrix}$$

σ_1 =1.927434 ρ =-0.71892 σ_2 =2.124618

State 2

$$\mu_2 = \begin{bmatrix} 9.982 \\ 4.664 \end{bmatrix}, \Sigma_2 = \begin{bmatrix} 15.147 & 6.805 \\ 6.805 & 3.854 \end{bmatrix}, P_2 = \begin{bmatrix} 1 & 0.890423 \\ 0.890423 & 1 \end{bmatrix}$$

σ_1 =3.891915 ρ = 0.890423 σ_2 =1.96367

Parameters

State	μ_1	σ_1	μ_2	σ_2	ρ
1	10	4	5	2	0.9
2	8	2	10	2	-0.7

> fmpost<-posterior(fm)

> plot(fmpost[,2],type="l")