

Inspecting Convergence of a Model

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1 Introduction

A Markov Chain Monte Carlo posterior simulation should be visually inspected to assess convergence.

```
# load CNPBayes
suppressMessages(library(CNPBayes))

# load packages for manipulating and visualizing data
suppressMessages(library(dplyr))
suppressMessages(library(tidyr))
suppressMessages(library(ggplot2))
```

2 Workflow

```
set.seed(1)

N <- 7524
n <- 81
lrr <- replicate(N, mean(rnorm(n)))

mp <- McmcParams(iter=1000, burnin=5000, thin=1, nStarts=1)

model <- MarginalModel(data=lrr, mcmc.params=mp)
m.list <- posteriorSimulation(model, k=1:4)
m.lik <- marginalLikelihood(m.list)
## Warning in FUN(X[[i]], ...): The model for k=2 may be overfit. This can
## lead to an incorrect marginal likelihood
## Warning in FUN(X[[i]], ...): The model for k=3 may be overfit. This can
## lead to an incorrect marginal likelihood
## Warning in FUN(X[[i]], ...): The model for k=4 may be overfit. This can
## lead to an incorrect marginal likelihood
m.lik
##      SB1      SB2      SB3      SB4
## 5824.198      NA      NA      NA
```

```
data1 <- as.data.frame(theta(chains(m.list[[1]]))) %>%
  mutate(iter=1:1000) %>%
  gather(component, theta, V1) %>%
  mutate(model=1)

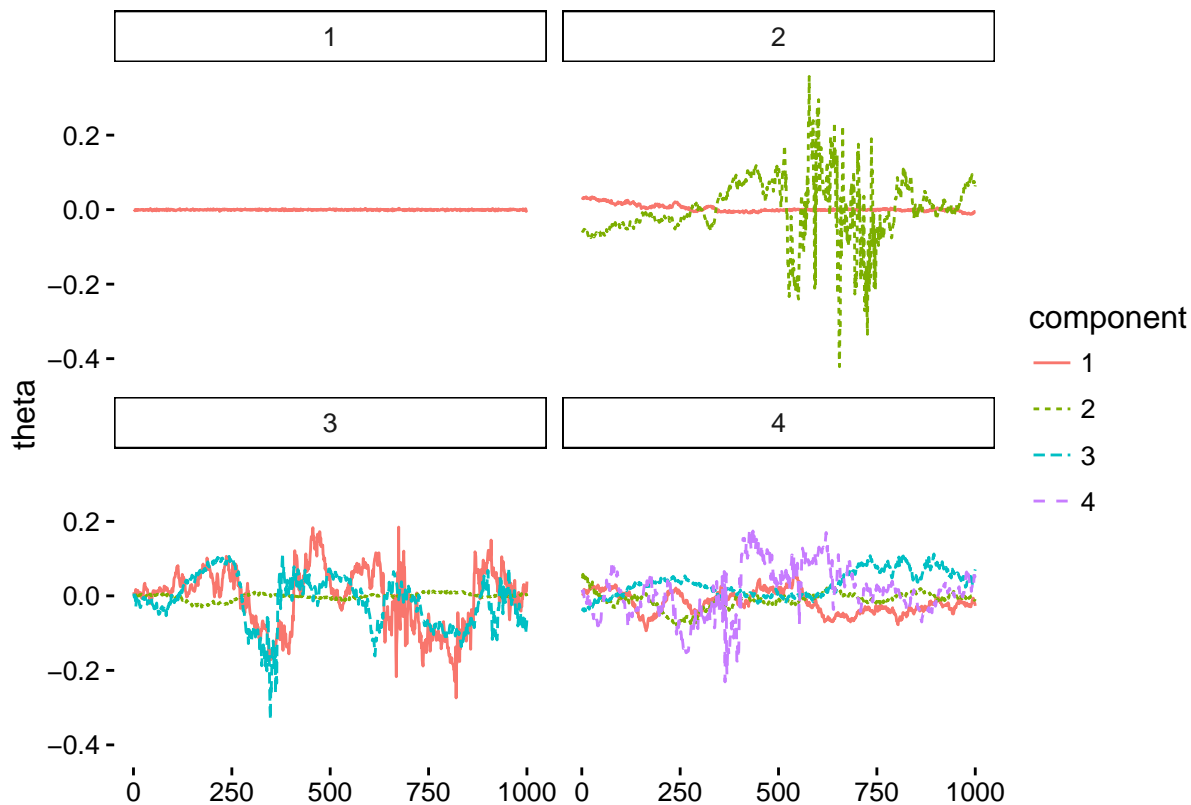
data2 <- as.data.frame(theta(chains(m.list[[2]]))) %>%
  mutate(iter=1:1000) %>%
  gather(component, theta, V1:V2) %>%
  mutate(model=2)

data3 <- as.data.frame(theta(chains(m.list[[3]]))) %>%
  mutate(iter=1:1000) %>%
  gather(component, theta, V1:V3) %>%
  mutate(model=3)

data4 <- as.data.frame(theta(chains(m.list[[4]]))) %>%
  mutate(iter=1:1000) %>%
  gather(component, theta, V1:V4) %>%
  mutate(model=4)

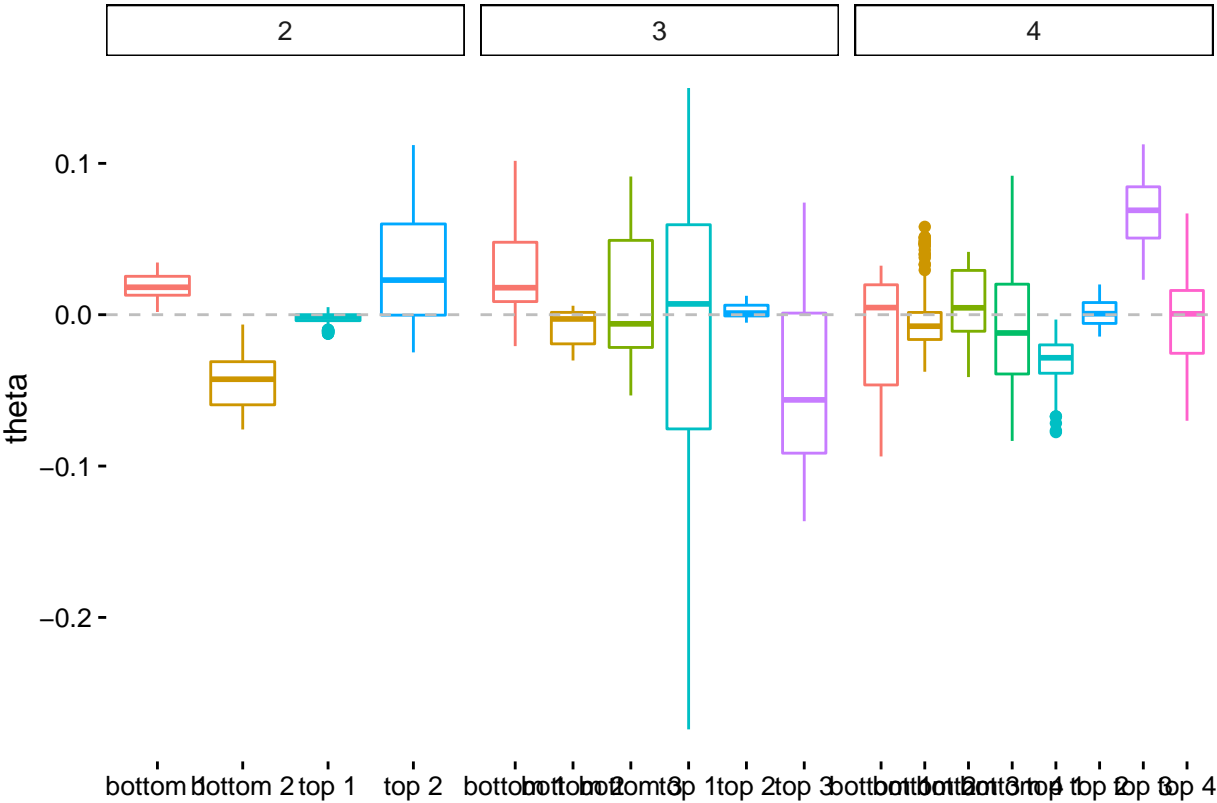
data <- bind_rows(data1, data2, data3, data4) %>%
  mutate(component=gsub("V", "", component))

ggplot(data, aes(x=iter, y=theta)) +
  geom_line(aes(colour=component, linetype=component)) +
  facet_wrap(~model, nrow=2, ncol=2) +
  theme_classic() +
  xlab("")
```



```
data_2.4 <- data %>%
  filter(model > 1, (iter <= 200 | iter >= 800)) %>%
  mutate(iter.cat=cut(iter, c(0, 200, 799, 1000),
                        c("bottom", "middle", "top"))) %>%
  group_by(component, iter.cat, model) %>%
  mutate(cat.model.median=median(theta)) %>%
  ungroup() %>%
  mutate(box.cat=paste(iter.cat, component))

ggplot(data_2.4, aes(x=box.cat, y=theta)) +
  geom_boxplot(aes(colour=box.cat)) +
  geom_hline(yintercept=0.0, linetype="dashed", colour="gray") +
  facet_wrap(~model, scales="free_x") +
  guides(colour=FALSE) +
  theme_classic() +
  xlab("")
```



References