Chapter 04 Practice Problems

Reginald Edwards

6/01/2020

Solutions

Setup code for problems:

```
p_grid <- seq(from=0, to=1, length.out=1000)
prior <- rep(1, 1000)
likelihood <- dbinom(6, size=9, prob=p_grid)
posterior <- likelihood*prior
posterior <- posterior/sum(posterior)
set.seed(100)
samples <- sample(p_grid, prob=posterior, size=1e4, replace=TRUE)
```

Problem 4E1

The likelihood is $y_i \ Normal(\mu, \sigma)$

Problem 4E2

Problem 4E3

$$Pr(\mu, \sigma|y) = \frac{\Pi_i N(0,10) Exp(1) N(y_i|\mu,\sigma)}{\int\int \Pi_i N(0,10) Exp(1) N(y_i|\mu,\sigma) d\mu d\sigma}$$

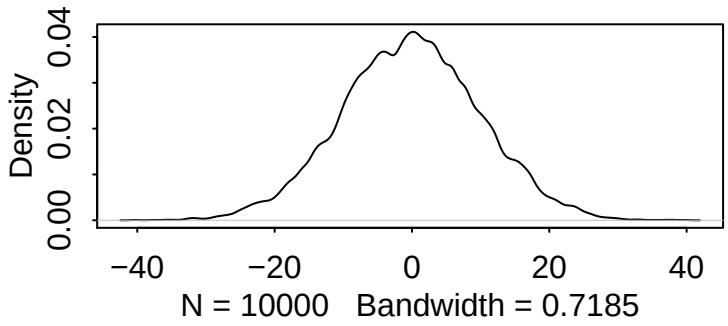
Problem 4E4

The second line, $\mu_i = \alpha + \beta x_i$, is the linear model.

Problem 4E5

Problem 4M1

```
n <- 1e4
sample_mu <- rnorm(n, 0, 10)
sample_sigma <- rexp(n, 1)
prior_h <- rnorm(n, sample_mu, sample_sigma)
rethinking::dens(prior_h)
```



Problem 4M2

```
flist <- alist(y ~ rnorm(mu, sigma),
               mu ~ dnorm(0, 10),
               sigma ~ dexp(1))
```

Problem 4M3

$$
\begin{aligned}
y_i &\sim N(\mu, \sigma) \\
\mu &= \alpha + \beta x_i \\
\alpha &\sim N(0, 10) \\
\beta &\sim Uni[0, 1] \\
\sigma &\sim Exp(1)
\end{aligned}
$$