

## Homework 7 for STA 250 – Fall 2017

Due at the beginning of class on November 1, 2017

(Note: The book uses  $\gamma$  in place of  $1 - \alpha$ . You may use either notation.)

1. D&S (4th Ed.) Exercise 8.3.7 (page 479) For this problem, replace “ $\geq 0.95$ ” with “ $\geq 0.98$ ”, and replace “ $\geq 0.8$ ” with “ $\geq 0.75$ ”.
2. D&S (4th Ed.) Exercise 8.8.6 (page 527)
3. D&S (4th Ed.) Exercise 8.5.4 (page 494)
4. D&S (4th Ed.) Exercise 8.5.6 (page 494)
5. (This continues from Problem 6 in HW6.) Suppose the data are  $n$  i.i.d. observations  $X_1, X_2, \dots, X_n$ , from a  $\text{Gamma}(\alpha, \beta)$  distribution with known  $\alpha$  and unknown  $\beta$ . Now suppose  $n = 40$ ,  $\alpha = 5$ .

- (a) Find an approximate 90% confidence interval for  $\beta$ .
- (b) Suppose instead we took a Bayesian approach to inference and adopt the following prior on  $\beta$

$$\xi(\beta) = 10e^{-10\beta} \quad \text{for } \beta > 0.$$

Find the central 90% credible interval for  $\beta$ .

- (c) Find a 90% confidence interval and a 90% credible interval for  $\theta = \beta^2$ .
6. Suppose the data are  $n$  i.i.d. observations  $X_1, X_2, \dots, X_n$ , from a  $\text{geometric}(p)$  distribution where  $p$  is unknown.
    - (a) What is the Fisher’s information for  $p$  from a single observation.
    - (b) Construct an approximate 95% confidence interval for  $p/(1 - p)$ .
    - (c) If we take a Bayesian approach and adopt a  $\text{Beta}(5, 8)$  prior on  $p$ , find the 95% central credible interval for  $p/(1 - p)$ .
    - (d) If the sample size  $n = 50$  and the observed sample average is 12.5, what are the 95% confidence interval and credible interval you found for  $p/(1 - p)$ ? Explain their meaning using one sentence for each.)