

Homework 2

Please submit your assignment *on paper*. Make sure your answers are completely justified and clear enough to read! Any computer code and output should be included.

1. Of the 70 respondents to the survey after the first lecture, 6 reported having played the card game Euchre. Assume the survey was a random sample from a large population of “people like us.” Suppose we are interested in the proportion π of “people like us” who have played Euchre. Answer parts (a), (b), (c), and (d) under *each* of the following priors on π :

(I) a uniform (“flat”) prior

(II) a (very informative) beta prior with parameters $\alpha = 100$ and $\beta = 100$ (see Cowles Table A.2)

- (a) [4 pts] Find a (full) formula for the posterior density function for π . Also, *accurately graph* the posterior density function.
 - (b) [4 pts] Compute the posterior mean and posterior *standard deviation* of π .
 - (c) [2 pts] Compute a 95% equal-tailed credible interval for π .
 - (d) [2 pts] Compute the posterior probabilities of $H_0 : \pi \geq 0.2$ and $H_1 : \pi < 0.2$
2. [3 pts] Cowles, Problem 5.3 [Note: “(5.2)” refers to equation (5.2) on p. 74. The equation that precedes it (the transformation-of-variables formula) should have g^{-1} in place of g .]

3. GRADUATE SECTION ONLY

Refer to Problem 1. The card game Euchre usually requires 4 players. Suppose 20 random “people like us” attend a party.

- (a) [2 pts] By using the usual frequentist estimate $\hat{\pi}$ in place of π , compute the (approximate) probability that *at least* 4 of them have played Euchre.
- (b) [3 pts] Based on the posterior you computed from the uniform (“flat”) prior in Problem 1, compute the *posterior predictive* probability that *at least* 4 of them have played Euchre.

Show your work and the final numerical answers, correct to at least three significant digits.