Question

Let π denote the proportion of works in major U.S. art museums that are done by white men. Randomly selecting 100 work from the collection of 18 major US art museums from a study conducted by Topaz et. al (2019) showed that of the 100 art works 76 were done by white men.

1 Review of Frequentist Inference

Using the frequentist approach test hypothesis that the proportion of art works represented at U.S. museum that are done by white male artists is greater than 0.7.

2 Posterior Hypothesis Testing

Assuming that you start with a prior for Beta as $\pi \sim \text{Beta}(4,4)$. Calculate the posterior. We will use this posterior distribution to test the same hypothesis that we have tested using the frequentist approach.

2.1 Bayes' Factor

In a hypothesis test of two competing hypotheses, H_a vs H_0 , the Bayes' Factor is an odds ratio for H_a :

Bayes' Factor =
$$\frac{\text{Posterior odds}}{\text{Prior odds}} = \frac{P(H_a|X)/P(H_0|X)}{P(H_a)/P(H_0)}$$

As a ratio, it's meaningful to compare the Bayes' Factor (BF) to 1. To this end, consider three possible scenarios:

- 1. BF = 1: The plausibility of H_a didn't change in light of the observed data.
- 2. BF > 1: The plausibility of H_a increased in light of the observed data. Thus the greater the Bayes' Factor, the more convincing the evidence for H_a .
- 3. BF < 1: The plausibility of H_a decreased in light of the observed data.

2.2 Posterior Credible Intervals

3 Posterior prediction



