MATH 598/782 - PROJECT 2

Please submit your project by 6.00 pm (EDT) on Monday 5th October by uploading a single pdf to myCourses.

You may use any computing language to perform the analyses. Please show your code in your solutions, or upload it as a separate file.

This problem relates to the analysis of the data in the file

www.math.mcgill.ca/dstephens/598-Bayes-2020/Projects/Project2.csv

which are measurements made on $n = 251$ men using a simple linear regression model

$$Y_i = \beta_0 + \beta_1 x_i + \epsilon_i \qquad i = 1, \ldots, n$$

where

- Y_i is weight (in kg);
- x_i is percent bodyfat;
- $\epsilon_i \sim Normal(0, \sigma^2)$ are independent residual errors.

Let $\beta = (\beta_0, \beta_1)^\top$.

(a) Compute the Bayesian posterior distribution $\pi_n(\beta, \sigma^2)$ and display its marginals for these data assuming

   (i) a (proper) conjugate prior, with hyperparameters $\mathbf{m}_0, \mathbf{M}_0, a_0, b_0$ chosen in a subjective fashion of your choosing.   4 MARKS

   (ii) a g-prior, with λ taking a specified value chosen by you, and an Inverse Gamma prior on σ^2 having hyperparameters $a_0 = b_0 = 1$.   3 MARKS

(b) Examine how the posterior distribution for σ^2 changes in (a) part (ii) as λ changes over a ranges of values of your choosing.   3 MARKS