

P8110: Applied Regression II

Homework #6 [20 points]

The “cars.csv” data give the result of a study of motor vehicle safety. In this study, 300 motor vehicle drivers were asked to rate importance of air conditioning and power steering in cars. The columns of variables from left to right are:

sex = 1 - Women, 2 - Men
age = 1 - (18-23 years), 2 - (24-40 years), 3 - (> 40 years)
response = 1 - No or little importance, 2 - Important, 3 - Very important
count = Frequency of each response category

1. Fit an ordinal logistic regression model (1) to the data to assess the response to importance of air conditioning and power steering in cars for men and women in the three different age categories.
 - Write down the model. [2 points]
 - Test the proportional odds assumption. Show hypotheses, test statistic, degrees of freedom, p-value, and conclusion. [2 point]
 - Estimate the odds ratio and 95% CI of a lower rating (i.e. rating less important) regarding air conditioning and power steering in cars between men and women. Do women care less or more about the features of air conditioning and power steering in cars? Justify your conclusion. [4 points]
 - Estimate the probability of rating “Very important” regarding the features of air conditioning and power steering in cars for women aged 18-23. [Hint: $\Pr(Y = 3) = 1 - \Pr(Y \leq 2)$] [3 points]
2. Fit a multinomial logistic regression model (2) to the data using the “no or little importance” as the reference category.
 - Write down the model. [2 points]
 - Estimate the odds ratio and 95% CI of rating “very important” versus “no or little importance” between men and women. [2 points]
 - Estimate the probability of rating “Very important” regarding the features of air conditioning and power steering in cars for women aged 18-23. [3 points]
3. Which model would you choose? Why? [2 points]