Xuange Liang
xl3493

Homework 7

1. Poisson Regression Model

$$\log\big(E(daysabs)\big) = \beta_0 + \beta_1 \times school + \beta_2 \times male + \beta_3 \times math + \beta_4 \times langart$$

Where school = 1 representing school A, school = 2 representing school B; male = 1 representing male, male = 0 representing female.

$$Dispersion\ Ratio = \frac{Residual\ Deviance}{Degrees\ of\ freedom} = \frac{2010.23}{311} = 6.4638$$

Because the dispersion ratio is far greater than 1, we conclude that overdispersion is a potential problem for this poison model.

2. Refinement with scale parameter

$$Rate\ Ratio = e^{-0.4330602} = 0.6485$$

$$SE = 0.0482091 \times \sqrt{6.4638} = 0.123$$

$$95\%\ CI = (e^{-0.433-1.96\times0.123}, e^{-0.433+1.96\times0.123}) = (0.5096, 0.8254)$$

Therefore, the estimated absence rate ratio between male and female students is 0.6485 (95% CI: 0.4963 - 0.8474), holding school, math score, and language arts score constant.

3. Negative Binomial Regression

H_0: The Poisson model is adequate.
H_1: The Poisson model is not adequate.

$$Log\ likelihood\ (Poisson) = -1435.811$$

$$Log\ likelihood\ (Negative\ Binomial) = -867.15$$

$$LR = 2 \times (-867.15 + 1435.811) = 1137.321$$

$$P\ value\ (\chi_1^2 > 1137.32) < 0.05$$

Therefore, we reject the null hypothesis and Negative Binomial Model is preferred.

4. Estimate RR with model in 3

$$\beta_{male} = -0.3958$$

$$RR = e^{-3.958} \approx 0.673$$

Xuange Liang
xl3493

$$95\%\ CI = (e^{-0.3958-1.96\times0.134}, e^{-0.3958+1.96\times0.134}) = (0.518, 0.875)$$

This is slightly different from the result in question 2 $(0.5096, 0.8254)$. However, this does not change our conclusion that male's absence rate is significantly lower than female student (95% confidence).