

Teacher Salary and Benefits Tradeoff

This homework is intended to provide a review of some of the basic procedures in linear regression. Download the Excel dataset “HW1 Data.xlsx” from the class website. The “Variable Descriptions” tab provides descriptions for the variables on the “MEAP93” data tab.

For a sample of 408 public school teachers, the key question at issue is whether there is a one-to-one tradeoff between salary and benefits. For a regression equation of the form:

$$\log(\text{salary}) = \beta_0 + \beta_1 \left(\frac{b}{s} \right) + \text{other factors}$$

Where b/s is the benefits to salary ratio. If there is a one-to-one salary-benefits tradeoff, we would expect $\beta_1 = -1$.

1. Using the HW1 Data, estimate the simple bivariate model with $\log(\text{salary})$ as the dependent variable and “bensal” (the benefits/salary ratio) as the explanatory variable.
 - a. Report the regression coefficients, t-statistics, R^2 , and regression F-Statistic.
 - b. Provide a test of the hypothesis $H_0: \beta_1 = -1$. Show your test statistic and state your conclusion.
2. Estimate a second regression equation adding “lenroll” (the log of enrollment) and “lstaff” (the log of staff) as additional explanatory variables.
 - a. Report the regression coefficients, t-statistics, R^2 , and regression F-Statistic.
 - b. Are the two additional variables individually significant?
 - c. Provide a scatter plot of the residuals by observation number. Does there appear to be any type of pattern or issue with heteroskedasticity?
 - d. How does the R^2 value compare to the bivariate model in (1) and what does this suggest about the importance of the enrollment and staff variables as explanatory factors?
 - e. Provide a test of the hypothesis $H_0: \beta_1 = -1$. Show your test statistic and state your conclusion. How does your conclusion change compared to the bivariate model?
3. Estimate a third regression adding “droprate” and “gradrate” as explanatory variables.
 - a. Report the regression coefficients, t-statistics, R^2 , and regression F-Statistic.
 - b. Are the two additional variables individually significant?
 - c. Provide a test of the joint hypothesis $H_0: \beta_4 = \beta_5 = 0$ (that the coefficients on droprate and gradrate are jointly equal to zero). Show your test statistic and state your conclusion.

Organize your answers in a Word or similar document to upload into Canvas by midnight Friday, February 2nd.