Session 3 - AAE636 - Fall 2019

Group Exercise

Exploring the relationship between wage and education

Relationship between wages and education.

1. What are the sample means and standard deviations of wages and of education?
2. Plot wages against education(education as x and wages as y). Is the correlation between wages and education positive or negative? Does the correlation appear to be strong or weak? Explain.
3. What is the covariance between wages and education? What is the correlation between wages and education?
4. We are interested in estimating the regression model

$$Wage = \beta_0 + \beta_1 Educ + u$$

   Calculate BY HAND(Step by step) the OLS regression coefficients for the intercept and slope terms in a regression of wage on education. (i.e., compute these values using the formulas and the above results, not using the output of the `regress` command in Stata (`lm` command in *R*))
5. What does the estimated coefficient, $\hat{\beta}_1$, tell you about the relationship between wages and education? Is it causal? how can you explain the coefficient?
6. Calculate the residuals, and plot the residuals against education, what can you learn from the graph.
7. Calculate the SST, SSE and SSR, and which one or none of these is the OLS estimator for σ^2?
8. BY HAND(Step by step), compute the estimates of the variances of $\hat{\beta}_0$ and $\hat{\beta}_1$ by inserting the estimate $\hat{\sigma}^2$. into the appropriate formulas.
9. BY HAND(Step by step)(Step by step), create a 95% confidence interval for the slope parameter $\hat{\beta}_1$.
10. Calculate t-statistics, p-value for education and decide whether we accept the Null hypothesis at the significance level of 95%: $\hat{\beta}_1$ is zero.
11. Calculate F-statistics for the regression equation.
12. Calculate the R^2 and the adjusted R^2, and explain the value.