6104640252
Jirathorn C.

1. Which of the following can cause the usual OLS *t* statistics to be invalid (that is, not to have *t* distributions under H_0)?

i. Heteroskedasticity.

ii. A sample correlation coefficient of .95 between two independent variables that are in the model.

iii. Omitting an important explanatory variable.

ans : i and iii

iii omitting an important explanatory variables

If there are not enough explanatory variables (x), there will be some important x that are left in u. Then, $E(u|x_1, x_2) \neq 0$ which violate MLR 4 So, if we omit an important explanatory variable in the model, the $\hat{\beta}_i$ will be biased
suppose $i = 0, 1, 2$

i Heteroskedasticity

when omitting an important explanatory variable, $E(u|x_1, x_2) \neq 0$ and the covariance between u and each x will not be 0 anymore. There still some explanatory variables (x) left in the error term (u)

2. Consider an equation to explain salaries of CEOs in terms of annual firm sales, return on equity (*roe*, in percentage form), and return on the firm's stock (*ros*, in percentage form):

$$\log(salary) = \beta_0 + \beta_1 \log(sales) + \beta_2 roe + \beta_3 ros + u.$$

i. In terms of the model parameters, state the null hypothesis that, after controlling for *sales* and *roe*, *ros* has no effect on CEO salary. State the alternative that better stock market performance increases a CEO's salary.

positive impact

ii. Using the data in CEOSAL1, the following equation was obtained by OLS:

$$\widehat{\log(salary)} = \underset{(.32)}{4.32} + \underset{(.035)}{.280} \log(sales) + \underset{(.0041)}{.0174}\, roe + \underset{(.00054)}{.00024}\, ros$$

$$n = 209, R^2 = .283.$$

By what percentage is *salary* predicted to increase if *ros* increases by 50 points? Does *ros* have a practically large effect on *salary*?

i $H_0: \beta_3 = 0$ (ros has no impact on CEO salary)

$H_a: \beta_3 > 0$ (ros has positive impact on CEO salary)

ii $50(0.00024) = 0.012$ and $0.012 = 1.2\%$

So, ros does not have large effect on salary

iii. Test the null hypothesis that *ros* has no effect on *salary* against the alternative that *ros* has a positive effect. Carry out the test at the 10% significance level.

$n = 209$

$k = 3$

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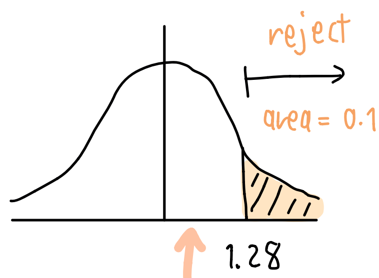
iv. Would you include *ros* in a final model explaining CEO compensation in terms of firm performance? Explain.

iii

$$d.f. = n-k-1$$

$$= 209 - 3 - 1 = 205 \rightarrow \text{use } z$$

$$z = \frac{\hat{\beta}_3 - \beta_3}{s.e.\hat{\beta}_3} = \frac{0.00024 - 0}{0.00054} = 0.444$$



Since the z-value does not fall in rejection region, we do not reject Ho. So, ros has no impact on CEO salary

iv

No, ros has no impact on CEOsal.

So, when adding it it will make the variance worse

(even it make R^2 increases)