Ti Sakorunrasee

6104640654

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.

i : Yes, violating the assumption of homoskedasticity

ii : No, It requires the coefficient not to be 1

iii : Yes, violating the 4th assumption $E(u|x) = 0$ if the omitted variable is correlated with the independent variables in the model

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.

   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*?

   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.

i $H_0 : \beta_3 = 0$

$H_a : \beta_3 \neq 0$

ii the proportionate effect on $\widehat{salary}$

$= 0.00024(50) = 0.12 = 1.2\%$

Thus, a 50 point ceteris paribus increase in ros is predicted to increase salary by 1.2%.

iii $H_0 : \beta_3 = 0$

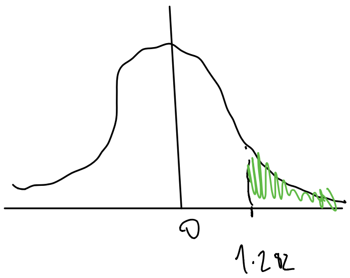
$H_a : \beta_3 > 0$

Significant level $10\% = 0.1$; d.f. $= 209 - 3 - 1 = 205$

d.f. $> 30 \rightarrow$ Z score

$t_{crit} = 1.282$

$t_{cal} = \dfrac{\hat{\beta}_3 - 0}{s.e.(\hat{\beta}_3)} = \dfrac{0.0024}{0.0054} = 0.44$



$0.44 < 1.282$

so, we do not reject H_0 at $\alpha = 0.1$

C1. The following model can be used to study whether campaign expenditures affect election outcomes:

$$voteA = \beta_0 + \beta_1 \log(expendA) + \beta_2 \log(expendB) + \beta_3 prtystrA + u,$$

where *voteA* is the percentage of the vote received by Candidate A, *expendA* and *expendB* are campaign expenditures by Candidates A and B, and *prtystrA* is a measure of party strength for Candidate A (the percentage of the most recent presidential vote that went to A's party).

i. What is the interpretation of β_1 ?

ii. In terms of the parameters, state the null hypothesis that a 1% increase in A's expenditures is offset by a 1% increase in B's expenditures.

iii. Estimate the given model using the data in VOTE1 and report the results in usual form. Do A's expenditures affect the outcome? What about B's expenditures? Can you use these results to test the hypothesis in part (ii)?

iv. Estimate a model that directly gives the *t* statistic for testing the hypothesis in part (ii). What do you conclude? (Use a two-sided alternative.)

```
. reg voteA lexpendA lexpendB prtystrA

      Source |       SS           df       MS      Number of obs   =       173
-------------+----------------------------------   F(3, 169)       =    215.23
       Model |  38405.1096         3  12801.7032   Prob > F        =    0.0000
    Residual |  10052.1389       169   59.480112   R-squared       =    0.7926
-------------+----------------------------------   Adj R-squared   =    0.7889
       Total |  48457.2486       172  281.728189   Root MSE        =    7.7123

------------------------------------------------------------------------------
       voteA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    lexpendA |   6.083316     .38215    15.92   0.000     5.328914    6.837719
    lexpendB |  -6.615417   .3788203   -17.46   0.000    -7.363246   -5.867588
    prtystrA |   .1519574   .0620181     2.45   0.015     .0295274    .2743873
       _cons |   45.07893   3.926305    11.48   0.000     37.32801    52.82985
------------------------------------------------------------------------------
```

(i) $\Delta voteA = \beta_1 \Delta \log(ExpendA)$

$= (\beta_1/100)[100 \times \Delta \log(ExpendA)]$

$\approx (\beta_1/100)[\% \Delta \log(ExpendA)]$

so, $\beta_1/100$ is ceteris paribus percentage point change of vote received when campaign expenditure by candidate A increases by 1 %.

(ii) $H_0 : \beta_2 = -\beta_1$

$H_1 : \beta_2 \neq -\beta_1$

(iii) regression model in usual form

$$\text{vote}A = \underset{(11.41)}{45.1} + \underset{(15.42)}{6.08}\log(\text{Expend}A) - \underset{(-17.46)}{6.62}\log(\text{Expend}B) + \underset{(2.45)}{0.152}(\text{Prtystr}A)$$

(iv) rewrite hypothesis $\theta_1 = \beta_1 + \beta_2 \Rightarrow H_0: \theta_1 = 0 \quad H_a: \theta_1 \neq 0$

rearrange equation $\widehat{\text{vote}A} = \beta_0 + \theta \log(\text{Expend}A) + \beta_2[\text{Expend}B - \log(\text{Expend}A)]$

when estimate equation we have $\hat{\beta}_1 \approx -.532$

$se(\hat{\theta}_1) \approx .533$

then $t_{cal} = \dfrac{-.532 - 0}{.533} \approx -1$

so, we do not reject H_0

C6. Use the data in WAGE2 for this exercise.

i. Consider the standard wage equation

$$\log(wage) = \beta_0 + \beta_1 educ + \beta_2 exper + \beta_3 tenure + u.$$

State the null hypothesis that another year of general workforce experience has the same effect on $\log(wage)$ as another year of tenure with the current employer.

ii. Test the null hypothesis in part (i) against a two-sided alternative, at the 5% significance level, by constructing a 95% confidence interval. What do you conclude?

```
. reg voteA lexpendA lexpendB prtystrA

      Source |       SS           df       MS      Number of obs   =       173
-------------+----------------------------------   F(3, 169)       =    215.23
       Model |  38405.1096         3  12801.7032   Prob > F        =    0.0000
    Residual |  10052.1389       169   59.480112   R-squared       =    0.7926
-------------+----------------------------------   Adj R-squared   =    0.7889
       Total |  48457.2486       172  281.728189   Root MSE        =    7.7123

------------------------------------------------------------------------------
       voteA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    lexpendA |   6.083316     .38215    15.92   0.000     5.328914    6.837719
    lexpendB |  -6.615417   .3788203   -17.46   0.000    -7.363246   -5.867588
    prtystrA |   .1519574   .0620181     2.45   0.015     .0295274    .2743873
       _cons |   45.07893   3.926305    11.48   0.000     37.32801    52.82985
------------------------------------------------------------------------------
```

(i) $H_0 : \beta_2 = \beta_3$

(ii) α is insignificant at 95% of confidence interval, Thus, we do not reject H_0. We conclude that the one additional year of general workforce experience has the same effect on log(wage) as another year.

C8. The data set 401KSUBS contains information on net financial wealth (*nettfa*), age of the survey respondent (*age*), annual family income (*inc*), family size (*fsize*), and participation in certain pension plans for people in the United States. The wealth and income variables are both recorded in thousands of dollars. For this question, use only the data for single-person households (so $fsize = 1$).

i. How many single-person households are there in the data set?

ii. Use OLS to estimate the model

$$nettfa = \beta_0 + \beta_1 inc + \beta_2 age + u,$$

and report the results using the usual format. Be sure to use only the single-person households in the sample. Interpret the slope coefficients. Are there any surprises in the slope estimates?

```
. reg nettfa inc age if fsize ==1

      Source |       SS           df       MS      Number of obs   =     2,017
-------------+----------------------------------   F(2, 2014)      =    136.46
       Model |  544916.989         2  272458.495   Prob > F        =    0.0000
    Residual |  4021048.06     2,014  1996.54819   R-squared       =    0.1193
-------------+----------------------------------   Adj R-squared   =    0.1185
       Total |  4565965.05     2,016  2264.86361   Root MSE        =    44.683

------------------------------------------------------------------------------
      nettfa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |   .7993167   .0597307    13.38   0.000     .6821762    .9164572
         age |   .8426563   .0920169     9.16   0.000     .6621982    1.023115
       _cons |  -43.03981   4.080393   -10.55   0.000    -51.04204   -35.03758
------------------------------------------------------------------------------
```

iii. Does the intercept from the regression in part (ii) have an interesting meaning? Explain.

iv. Find the *p*-value for the test $H_0: \beta_2 = 1$ against $H_1: \beta_2 < 1$. Do you reject H_0 at the 1% significance level?

v. If you do a simple regression of *nettfa* on *inc*, is the estimated coefficient on *inc* much different from the estimate in part (ii)? Why or why not?

(i) 2017 observations

(ii) β_1 can be interpret as a \$1,000 increase in income corresponds to a \$799 increase in net financial wealth.

(iii) $\hat{\beta}_0 = -43.04$

this is an individual's net financial wealth when their income is \$0 and there age is 0.

(iv) $t\text{-statistic} = \dfrac{0.843 - 1}{0.092} \approx -1.71$ $\quad$ p-value $= P(T < -1.71) \approx 0.044$

Against the one-sided alternative $H_1: \beta_2 < 1$

So, we reject H_0 at $\alpha = 0.05$ but not at $\alpha = 0.01$