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HOMEWORK 3 paper, pencil

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.

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.

$H_0 : \beta_2 = 0$
$H_a : \beta_2 \neq 0$

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

$$\widehat{\log(salary)} = \underset{(.32)}{4.32} + \underset{(.035)}{.280} \log(sales) + \underset{(.0041)}{.0174}\, roe + \underset{(.00054)}{.00024}\, ros$$
$$n = 209, R^2 = .283.$$

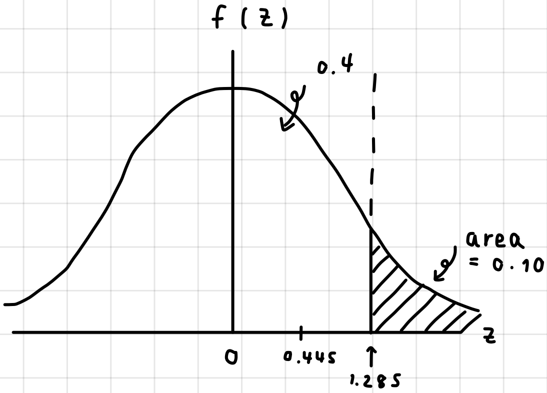
By what percentage is *salary* predicted to increase if *ros* increases by 50 points? Does *ros* have a practically large effect on *salary*?

If ros increases by 50 points, it increases the salary only ≈ 16 %. So, 50 points increase in ros doesn't have a 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.

$\alpha = 10\% = 0.10$

$H_0 : \beta_3 \leq 0$
$H_a : \beta_3 > 0$



$d.f = n - k - 1$

$= 209 - 3 - 1 > 30$ → use z-score

let's test with 10% significant level

$$z = \frac{\hat{\beta}_3 - \beta_3}{s.e.\ \hat{\beta}_3} = \frac{0.00024 - 0}{0.00054} = 0.445$$

$0.445 < 1.285$

Because 0.445 doesn't fall in the rejection region, we reject Ha. So, ros has negative impact.

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

β is significant ?

Computer

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?

$n = 2017$

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?

interpret equation $\beta_1 = 0.7993167$

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. regress nettfa inc age if fsize == 1
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Source	SS	df	MS
Model	544916.989	2	272458.495
Residual	4021048.06	2,014	1996.54819
Total	4565965.05	2,016	2264.86361

Number of obs	=	2,017
F(2, 2014)	=	136.46
Prob > F	=	0.0000
R-squared	=	0.1193
Adj R-squared	=	0.1185
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. $\beta_0 = -43.03981$

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? ทำแยก (moodle)

สลับ x กับ y

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?

$inc = \beta_0 + \beta_1 nettfa + u$: compare coefficient

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. regress inc nettfa if fsize == 1
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Source	SS	df	MS			
				Number of obs	=	2,017
				F(1, 2015)	=	181.60
Model	46335.1731	1	46335.1731	Prob > F	=	0.0000
Residual	514127.962	2,015	255.150354	R-squared	=	0.0827
				Adj R-squared	=	0.0822
Total	560463.135	2,016	278.007508	Root MSE	=	15.973

inc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
nettfa	.100737	.0074754	13.48	0.000	.0860768	.1153973
_cons	28.07666	.3699027	75.90	0.000	27.35123	28.80209

$\left.\begin{array}{l}\beta_0 = 28.07666 \\ \beta_1 = 0.100737\end{array}\right\}$ comparing to the normal equation, the intercept is positive and increases but the slope decreases from the initial ones. However, the number of observation is still the same

ไม่ต้องใช้

C6. Use the data in WAGE2 for this exercise.

i. Consider the standard wage equation

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

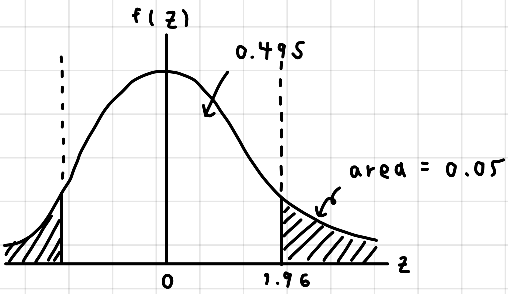
Print Preview

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. $H_0: \beta_2 = \beta_3$, $\beta_2 - \beta_3 = 0$

$H_a: \beta_2 \neq \beta_3$, $\beta_2 - \beta_3 \neq 0$

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?

2-tailed test



$$z = \frac{(\hat{\beta}_2 - \hat{\beta}_3) - 0}{s.e.(\hat{\beta}_2 - \hat{\beta}_3)}$$

let $\theta = \hat{\beta}_2 - \hat{\beta}_3$

then $H_0 : \theta = 0$

$H_a : \theta \neq 0$

$$z = \frac{\hat{\theta}_2 - 1}{s.e.(\hat{\theta}_2)}$$

Now, $\hat{\beta}_1 = \hat{\theta}_2 + \hat{\beta}_3$

$\beta_1 = \theta_2 + \beta_3$

substitute in the main regression

$$y = \beta_0 + \beta_1 educ + (\theta_2 + \beta_3) exper + \beta_3 tenure + u$$

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 ?

slope or the measure of expenditure A corresponding with vote A.

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.

slope = 1% = 0.01

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)? อธิบาย variable นี้ใน equation

as A and B have different value and sign. Therefore, it generates different outcomes.