HW 4

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1. Heteroskedarticity is needed in order to do OLS estimation for MLR. Without this assumption, the $\beta_0, \beta_1 \ldots$ etc won't be efficient $var(u|X \ldots X_k) = 6^2$. Moreover, the explanatory variables are also needed as well since it can caused the OLS to be biased when some variables will be counted as error terms. If our OLS has sample correlation coefficient of 0.95 between 2 independent variables, it is fine since it doesn't violate any MLR assumption.

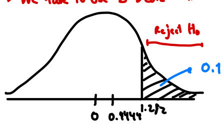
2. (i) Null hypothesis that ros has no effect on CEO salary.
   ↳ $H_0: \beta_3 = 0$
   The alternative that better stock market performance increases a CEO's salary.
   ↳ $H_a: \beta_3 > 0$

(ii) If ros increases by 50 points, salary will be predicted to increase by $(0.00024)(50) = 0.012$. Then, we multiply it by 100 in order to answer in percentage form which 1.2%. ∴ ros does not have a practically large effect on salary.

(iii) $H_0: \beta_3 = 0$
$H_a: \beta_3 > 0$

$\alpha = 0.1$, $n = 209$, $d.f. = n-k-1 = 209-3-1 = 205$ → We have to use z-score since d.f. > 30.

$$z = \frac{\hat{\beta}_3 - \beta_3}{s.e.\,\hat{\beta}_3} = \frac{0.00024 - 0}{0.00054} = 0.4444$$



As you can see that the z-value does not fall into the rejection region so it does not reject H_0 at 0.1 level of significance or you can say that ros does not effect salary.

(iv) No, we won't include ros in a final model because it has no effect on salary at 0.1 level of significance.

C1.

(i) A percentage increase in campaign expenditure by Candidate A.

(ii) H_0: expenditure A = − expenditure B

(iii) Vote A = 45.08 + 6.083 log(exp. A) − 6.615 log(exp. B) + 0.152 prtystr A

0.382 0.379 0.152

t test A = 6.083/0.382 = 15.924
t cri A (169, 0.05) = 1.654
t test B = −6.615/0.379 = −17.454
t cri B (169, 0.05) = 1.654

- Both A and B are rejected
  Both A and B exp. have effect on the outcome
- We can't use these results to test the hypothesis in part (ii).

(iv) gen log lexp.A | exp.B = lexp.A − lexp.B
vote A = 42.7 + 6.342 log(exp.A / exp.B) + 0.146 prtystr A + u

0.291 0.062

t test = 6.342/0.291 = 23.4
t cri (170, 0.05) = 1.654
reject H_0, a 1% increase in exp.A is not offset by a 1% increase in exp.B

C6. (i) $H_0: \beta_2 = \beta_3$

(ii) Let $\theta_2 = \beta_2 - \beta_3$. Then, we can estimate the equation

$$\log(wage) = \beta_0 + \beta_1 educ + \theta_2 exper + \beta_3 (exp + tenure) + u$$

to obtain the 95% confidence interval for θ_2 which is approximately $0.0020 \pm 1.96(0.0049) \approx -0.0092$ to 0.112. Since there's zero in this confidence interval, θ_2 is not statistically different from zero at the 5% level of significance, and we fail to reject $H_0: \beta_2 = \beta_3$ at 5% level of significance

C8. (i) There're 2,017 single people in the sample of 9,275.

(ii) The coefficient inc indicates that one more dollar in income is reflected in about 80 more cents in predicted nettfa; no surprise there. The coefficient on age means that, holding income fixed, if a person gets another year older, their nettfa is predicted to increase by about \$843.

(iii) The intercept is not very interesting as it gives the predicted nettfa for inc = 0 and age = 0. Clearly, there's no one with even close to these values in the relevant population.

(iv) The t-statistic is $(0.843-1)/0.92 \approx -1.71$. Against the one-sided alternative $H_1: \beta_2 < 1$, the p-value is about 0.044. Therefore, we can reject $H_0: \beta_2 = 1$ at the 5% level of significance (against the one-sided alternative).

(v) The slope coefficient on inc in the simple regression is about 0.821, which is not very different from the 0.799 obtained in part (ii). As it turns out, the correlation between inc and age in the sample of single people is only about 0.039, which helps explain why the simple & multiple regression estimates are not very different.