Economics 471: Econometrics

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Problem Set #4 – Answers

1. (a) $H_0 : \beta_3 = 0$ vs. $H_1 : \beta_3 \neq 0$

   (b) All else equal, a larger population increases the demand for rental housing, which should increase rents. The demand for overall housing is higher when average income is higher.

   (c) $\ln\widehat{(rent)} = 0.043 + 0.066\ln(pop) + 0.507\ln(avginc) + 0.0056 * pctstu$ The coefficient on $\ln(pop)$ is an elasticity. A correct statement is that "a 10% increase in population increases $rent$ by $0.066(10) = 0.66\%$."

   (d) With degrees of freedom equal to $64 - 4 = 60$, the 1% critical value for a two-tailed test is 2.660. This is smaller than the test-statistic 3.29 and so we say that β_3 is statistically different from zero and the 1% level.

2. (a) A one percent increase in expenditures for Candidate A leads to a β_1 percentage increase in votes for Candidate A.

   (b) The null hypothesis is $H_0 : \beta_2 = -\beta_1$, which mean a z% increase in expenditure by A and a z% increase in expenditure by B leaves $voteA$ unchanged.

   (c) The OLS estimation equation is

   $$\widehat{voteA} = 45.08 + 6.083\ln(expendA) - 6.615\ln(expendB) + 0.152prtystrA$$

   The coefficient on $\ln(expendA)$ is significant as is the coefficient on $\ln(expendB)$.

   (d) Write $\theta = \beta_1 + \beta_2$ or $\beta_1 = \theta - \beta_2$, then

   $$
   \begin{aligned}
   voteA &= \alpha + (\theta - \beta_2)\ln(expendA) + \beta_2\ln(expendB) + \beta_3 prtystrA + u \\
   &= \alpha + \theta\ln(expendA) + \beta_2\left[\ln(expendB) - \ln(expendA)\right] + \beta_3 prtystrA + u
   \end{aligned}
   $$

   OLS estimation leads to a coefficient on $\ln(expendA)$ equal to -0.532 with a standard error of 0.533. The test statistic will be less than negative one and therefore we fail to reject the null.