ECO375 Tutorial 7
Wooldridge: Chapters 9, 10 and 16

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ECO375 Tutorial 6

Today's coverage:

- Chapter 16, #1 (on the board)
- Chapter 16, #4 (on the board)
- Chapter 9, #3 (in slides)
- Chapter 10, #2 (on the board)
- Chapter 10, #5 (on the board)

Chapter 9, #3

Let *math*10 denote the percentage of students at a Michigan high school receiving a passing score on a standardised math test. We are interested in estimating the effect of per student spending on math performance. A simple model is

$$math10 = \beta_0 + \beta_1 \log(expend) + \beta_2 \log(enroll) + \beta_3 poverty + u$$

where *poverty* is the percentage of students living below the poverty line.

i) The variable *lnchprg* is the percentage of students eligible for the federally funded school lunch programme. Why is this a sensible proxy variable for *poverty*?

Eligibility for the federally funded school lunch program is very tightly linked to being economically disadvantaged. Therefore, the percentage of students eligible for the lunch program is very similar to the percentage of students living in poverty.

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The table that follows contains OLS estimates, with and without *lnchprg* as an explanatory variable (standard errors in parentheses).

Independent Variables	(1)	(2)
log(*expend*)	11.13 (3.30)	7.75 (3.04)
log(*enroll*)	0.022 (0.615)	-1.26 (0.58)
lnchprg	–	-0.324 (0.036)
Intercept	-69.24 (26.72)	-23.14 (24.99)
Observations	428	428
R-squared	0.0297	0.1893

ii) Explain why the effect of expenditures on $math10$ is lower in column (2) than in column (1). Is the effect in column (2) still statistically greater than 0?

We can use our usual reasoning on omitting relevant variables from a regression equation. It is likely that $\log(expend)$ and *lnchprg* are negatively correlated; school districts with poorer children spend, on average, less on schools. We can also see that $\hat{\beta}_3 < 0$. Combining these two, it is clear that the estimate in column (1) is upward biased.

iii) Does it appear that pass rates are lower at larger schools, other factors being equal? Explain.

Once we control for *lnchprg*, the coefficient on log(*enroll*) becomes negative and has a t-statistic of about -2.17, which is significant at the 5% level against a two-sided alternative. The coefficient implies that a 1% increase in enrollment corresponds to a decrease of 0.0126 percentage points in *math*10.

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iv) Interpret the coefficient on *lnchprg* in column (2).

A one percentage point increase in *lnchprg* corresponds to a decrease of 0.324 percentage points in *math*10.

v) What do you make of the substantial increase in R^2 from column (1) to column (2)?

In column (1), we explain very little of the variation in pass rates on the standardised math test: less than 3%. In column (2), we explain almost 19%. Clearly a significant proportion of the variation in $math10$ is explained by variation in $lnchprg$. This is a common finding in studies of school performance; family income (or related factors, such as living in poverty) are much more important in explaining student performance than are spending per student or other school characteristics.