

In-Class Exercise - Multiple Linear Regression

Consider a dataset on earnings in the United States. We are interested in the returns to education - how much an extra year of schooling “buys” you in terms of weekly wages (...as of 1980). You’re also worried about whether one’s education suffers from omitted variable bias.

1. You estimate two equations:

$$\widehat{wage} = 146.95 + 60.21educ$$

$$\widehat{educ} = 5.84 + 0.075IQ$$

Based on these results, is 60.21 an overestimate or underestimate of the returns to education? How do you know?

2. You estimate another equation: $\widehat{wage} = -128.89 + 42.06educ + 5.14IQ$

What is the interpretation of the coefficient on *educ*? What is the interpretation of the constant?

3. Now, you control for experience and age and estimate the following population regression model:

$$wage_i = \beta_0 + \beta_1educ_i + \beta_2IQ_i + \beta_3exper_i + \beta_4age_i + \beta_5age_i^2 + u_i$$

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. reg wage educ IQ exper age age_sq, robust
Linear regression               Number of obs   =          935
                               F(5, 929)         =          35.68
                               Prob > F             =          0.0000
                               R-squared            =          0.1704
                               Root MSE         =          369.29
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	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
wage						
educ	51.65693	7.507317	6.88	0.000	36.92366	66.3902
IQ	5.280274	.8996509	5.87	0.000	3.51469	7.045858
exper	11.14023	3.871415	2.88	0.004	3.542496	18.73796
age	63.78875	98.27005	0.65	0.516	-129.0683	256.6458
age_sq	-.745563	1.478397	-0.50	0.614	-3.646948	2.155822
_cons	-1688.496	1615.041	-1.05	0.296	-4858.048	1481.057

A one-year increase in age is associated with what change in wages? (mind the squared term)

4. Finally, because you are worried about omitted variable bias, you include father's and mother's education.

(a) Why might parent's education might directly affect wages?

(b) Which other independent variables do you think parent's education might affect? Explain.

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. reg wage educ IQ exper age age_sq feduc meduc, robust
Linear regression                Number of obs   =       722
                                F(7, 714)         =       21.49
                                Prob > F             =       0.0000
                                R-squared            =       0.1818
                                Root MSE         =       370.94
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wage	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
educ	40.62398	8.610596	4.72	0.000	23.71886	57.52909
IQ	4.730038	1.020807	4.63	0.000	2.725896	6.734179
exper	13.12448	4.84228	2.71	0.007	3.617671	22.63129
age	76.02757	116.5825	0.65	0.515	-152.858	304.9131
age_sq	-.9288294	1.756502	-0.53	0.597	-4.377356	2.519697
feduc	12.41051	5.080028	2.44	0.015	2.436935	22.38409
meduc	6.947846	5.25549	1.32	0.187	-3.370215	17.26591
_cons	-1899.173	1910.946	-0.99	0.321	-5650.918	1852.572

(c) How did controlling for parent's education affect the returns to education? The returns to IQ?