ECON-C4100 - Econometrics I

Lectures 12: Recap

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Topics

- OLS assumptions

- Interpretation of regression results.

- Multiple regression.

- IV & reduced form regression.

OLS assumptions

1. Strict exogeneity: $\mathbb{E}(u|\boldsymbol{X}) = 0$.

2. $(\boldsymbol{X_i}, Y)$, $i = 1, ..., n$ are independent and identically distributed across observations.

3. $\boldsymbol{X_i}$ and Y_i (u_i) have finite *fourth* moments.

4. No **perfect multicollinearity** ($\boldsymbol{X}$ has **full column rank**).

5. Auxiliary: u_i is homoskedastic.

- Important to understand the **substance** of these assumptions.

Multiple regression

- Comparison of assumptions uni- vs. multivariate OLS.

- Why add additional variables? .

- Interpretation of individual coefficients.

- Testing of (sub)sets of coefficients.

- Transformation of variables.

Interpretation of regression results

- Economic significance of (key) coefficients.

- Statistical significance of (key) coefficients.

- Statistical significance of (vectors of) control variables.

- Statistical performance of the regression as a whole (R^2, F-test, choice of standard errors, ...).

Example: Effect of age on income depends on gender

$$Income = f(Age, G, u) = \beta_0 + \beta_{Age} \times Age + \beta_G \times G + u$$
$$Income = f(Age, G, u) = \beta_0 + \beta_{Age} \times Age + \beta_g \times G$$
$$+ \beta_{AgeG} \times Age \times G + u$$

- What is now the expected income | gender?

- What is now the expected income | age?

- Make sure you understand how to calculate conditional expectations such as those above.

Effect of coworker invention on wage

Table: Wage returns to invention

	white-collar (1)	blue-collar (2)
post	0.0996***	0.0448***
post × senior	0.00232	-0.00734
post × educ	0.0432***	0.0713***
post × DTHCF	-0.00602***	-0.00479***
Observations	1,885,513	1,396,204
R-squared	0.280	0.221
Number of individuals	159,429	132,787

IV

- Root cause for need of IV: (suspected) breakdown of $\mathbb{E}[u|\boldsymbol{X}] = 0$.

- The key properties of an instrumental variable.

- The algebra of IV.

- Think back to what an experiment allows the researcher to do.

Reduced form

Equilibrium quantity

$$Q_i = \frac{a}{2} - \frac{b}{2}(c_0 + c_1 z_i + \eta_i) + \frac{1}{2}\epsilon_i$$

$$Q_i = \underbrace{\frac{a}{2} - \frac{b}{2}c_0}_{\mu_0} + \underbrace{\frac{b}{2}c_1}_{\mu_1} z_i + \underbrace{\frac{b}{2}\eta_i + \frac{1}{2}\epsilon_i}_{w_i}$$

$$Q_i = \mu_0 + \mu_1 z_i + w_i$$