Exam #2 Answer Key

Economics 435

Spring 2002

1 School spending

a) No. A finding of a statistically insignificant coefficient does not in any way imply that there is no relationship.

b) One reason is that richer provinces or school districts have more money to spend. As a result, parents that have more assistance to offer their kids are more likely to live in a high-spending district. Alternatively, schools with more special needs students may spend more per pupil.

2 Data mining

a) 2.5 percent.

b) Each variable will generate a publication with probability 0.05. So in 40 trials, the expected number of publications is 0.05*40 = 2.

c) The probability that he doesn't publish any articles is $0.95^{40} = 0.13$, or 13%.

3 Private school

a) Students who have particularly high potential, or ambitious parents, will go to private school to prepare for university.

b) One condition is exogeneity: $corr(Cath, u) = 0$. The other is relevance: in an OLS regression of $priv$ on $Cath$ and x, the coefficient on $Cath$ must be nonzero.

c) Relevance can be tested, by simply estimating the OLS regression and testing for significance of the coefficient on $Cath$.

4 A variation on the Hausman test

a) The two hypotheses are:

$$H_0: \quad \lambda_1 - \lambda_2 = 0$$
$$H_1: \quad \lambda_1 - \lambda_2 \neq 0$$

b) The test statistic is:

$$t = \frac{\hat{\lambda}_1 - \hat{\lambda}_2}{\sqrt{\sigma_1^2 + \sigma_2^2 - 2\sigma_{12}}}$$

5 Employer-provided health insurance and "job lock"

a) A number of answers are acceptable here; mine is that the provision of health insurance by an employer is likely to be correlated with other features of the job (like pay), which make workers want to stay in their jobs.

b) First we notice that:

$$\begin{aligned}
\text{plim } \bar{y}_{00} &= \beta_0 \\
\text{plim } \bar{y}_{01} &= \beta_0 + \beta_2 \\
\text{plim } \bar{y}_{10} &= \beta_0 + \beta_1 \\
\text{plim } \bar{y}_{11} &= \beta_0 + \beta_1 + \beta_2 + \beta_3
\end{aligned}$$

This suggests the following estimates:

$$\begin{aligned}
\hat{\beta}_0 &= \bar{y}_{00} \\
\hat{\beta}_1 &= \bar{y}_{10} - \bar{y}_{00} \\
\hat{\beta}_2 &= \bar{y}_{01} - \bar{y}_{00} \\
\hat{\beta}_3 &= \bar{y}_{11} - \bar{y}_{01} - \bar{y}_{10} + \bar{y}_{00}
\end{aligned}$$

c) The variance is:

$$\begin{aligned}
var(\hat{\beta}_3) &= var(\bar{y}_{11}) + var(\bar{y}_{01}) + var(\bar{y}_{10}) + var(\bar{y}_{00}) \\
&= \frac{\bar{y}_{11}(1 - \bar{y}_{11})}{n_{11}} + \frac{\bar{y}_{01}(1 - \bar{y}_{01})}{n_{01}} + \frac{\bar{y}_{10}(1 - \bar{y}_{10})}{n_{10}} + \frac{\bar{y}_{00}(1 - \bar{y}_{00})}{n_{00}}
\end{aligned}$$

d) The test statistic is:

$$t = \frac{\bar{y}_{11} - \bar{y}_{01} - \bar{y}_{10} + \bar{y}_{00}}{\sqrt{\frac{\bar{y}_{11}(1-\bar{y}_{11})}{n_{11}} + \frac{\bar{y}_{01}(1-\bar{y}_{01})}{n_{01}} + \frac{\bar{y}_{10}(1-\bar{y}_{10})}{n_{10}} + \frac{\bar{y}_{00}(1-\bar{y}_{00})}{n_{00}}}}$$