MSc in Environmental Economics:
Answer Keys to Examination in Environmental Econometrics (GR03)

May 2008

Section 1 (Compulsory) [40 points]

Question 1

1 18.8% more. The value of t statistic is $0.188/0.008 = 23.5 > 1.96 = t_{\alpha/2}$. Thus, it is statistically significant.

2 Omitted variable bias. Positive correlation will lead to an upward bias.

3 R^2 measures the part of the variance in the dependent variable explained by the model. Here 45.1%. Remaining part of variance cannot be explained by existing explanatory variables.

4 17.7% more. 7% more. The values of t statistic are $0.177/0.009 = 19.67$ and $0.070/0.019 = 3.68$. Thus, they are statistically significant.

5 8.7% more.

Question 2

1

$$\begin{aligned}
\Pr(H) &= \frac{\exp(\beta_{H0} + \beta_{H1} Age + \beta_{H2} Gender + \beta_{H3} \log income)}{1 + \sum_{k=H,A} \exp(\beta_{k0} + \beta_{k1} Age + \beta_{k2} Gender + \beta_{k3} \log income)} \\
\Pr(A) &= \frac{\exp(\beta_{A0} + \beta_{A1} Age + \beta_{A2} Gender + \beta_{A3} \log income)}{1 + \sum_{k=H,A} \exp(\beta_{k0} + \beta_{k1} Age + \beta_{k2} Gender + \beta_{k3} \log income)}
\end{aligned}$$

2

$$\log\left(\frac{\Pr(H)}{\Pr(F)}\right) = \beta_{H0} + \beta_{H1} Age + \beta_{H2} Gender + \beta_{H3} \log income$$

No, it is an implication of IIA.

3 If there is 1% increase of income, there would be 1.358% increase of the odds-ratio between H and F. $\Delta \log(\Pr(H)/\Pr(F)) = 1.358 \times 0.5 = 0.679$.

4 In the ordered probit model, choice variables are ordered, whereas not in the multinomial logit model. So a colleague's suggestion does not make much sense in this example.

Section 2 [60 points]
Question 1 (Autocorrelation)

1 $Cov(u_t, u_{t-j}) \neq 0$ for some j. Unbiased but not BLUE any longer. need to correct the usual standard error.

2 See lecture notes.

3 $u_t = \mu + v_t + \lambda v_{t-1}$, where v_s iid mean zero and a variance σ^2.

4 $Cov(u_t, u_t) = \left(1 + \lambda^2\right)\sigma^2; Cov(u_t, u_{t-1}) = \lambda\sigma^2; Cov(u_t, u_{t-2}) = 0.$

Question 2 (Measurement Error)

1 No. $Cov(X, u + e) = 0$.

2 Yes. $Cov\left(\widetilde{X}, u - \beta_1 v\right) \neq 0$.

3 Z is an IV such that $Cov(Z, X) \neq 0$ and $Cov(Z, u) = 0$.

4

$$\widehat{\beta}_1^{IV} = \frac{\sum \left(Z_i - \overline{Z}\right)\left(Y_i - \overline{Y}\right)}{\sum \left(Z_i - \overline{Z}\right)\left(X_i - \overline{X}\right)}$$

Question 3 (Simultaneous Equations Model)

1 See lecture notes.

2 No. The parameters in the first equation of the second system can be identified.

3 Hauseman's exogeneity test (see lecture notes).

Question 4

1 If there is 1% increase of nitrogen oxide, there would be 0.954% decrease of housing price. $-0.954/0.117 = 8.15 > 1.96$ (yes). $(-0.954 + 1)/0.117 = 0.39 < 1.96$ (No).

2 If there is one unit increase of room, there would 25.5% increase of housing price. If there is one unit increase of stratio, there is 5.2% decrease of housing price. If there is 1% increase of Dist, there would be 0.134% decrease of housing price.

3

$$F = \frac{(0.581 - 0.402)/3}{(1 - 0.581)/(352 - 4 - 1)} = 49.41 > 2.60 = F_{\alpha}(3, 347)$$

Cannot accept the null.

4 Either large sample or small sample with normally distributed errors. Heteroskedasticity.