Answer key: Exam II   Fall 2003

① $\ln \hat{w} = 7.21 + .094S + .023N - .000325N^2$

$(.113)\quad (.005)\quad (.009)\quad (.000187)\qquad R^2 = .337$

$n = 44$

(i) $H_0: \beta_1 = 0$ +1 $\qquad t_{\beta_1} = \frac{.094}{.005} = 18.8$ +1

$H_1: \beta_1 > 0$ +1

$\boxed{C_\alpha = 1.684}$ → −2 if missing

df=40 $\qquad$ reject null, schooling is statistically significant +1

(ii) $H_0: \beta_1 = \beta_2 = \beta_3 = 0$ +1 $\qquad$ F-test

H_1: Not H_0 +1

$F = \frac{R^2/q}{(1-R^2)/n-k-1} = \frac{.337/3}{(1-.337)/40}$ +2 +2 $= \frac{.112}{.663/40}$

$F = \frac{4.48}{.663} = 6.757$ +1

$F(3,40) = 2.8387$ ⟷ reject null, schooling & experience are jointly significant +1

(iii) $H_0: \beta_2 = \beta_3 = 0$ +1 $\qquad$ I would run a regression

H_1: Not H_0 +1 $\qquad \ln w = \gamma_0 + \gamma_1 S + u$ +2

and find either R^2 or RSS and perform

use $F(2,40) = 3.2317$ +1 $\qquad$ and F test. There would be +1 2 restrictions

if $F > F(2,40)$ +1 reject $\qquad$ and 40 +1 denominator degrees of freedom

(iv) $\frac{\partial \ln \hat{w}}{\partial S} = .094$ +4 ⟹ 9.4% increase in wage for additional year of schooling

$\frac{\partial \ln \hat{w}}{\partial N} = .023 - .00065N$ +4 $\qquad$ %Δ in wage depends +2 linearly on N

need actual value of N to say more

(v) $\widehat{\ln w} = E(\widehat{\ln w}) = 8.8475$ +2 +2

s.e. $(E(\widehat{\ln w})) = .436$ +2

s.e. $(\widehat{\ln w}^{o}) = \sqrt{(.436)^2 + \frac{80}{40}} = \sqrt{(.436)^2 + 2} = \sqrt{2.190} = 1.480$

+4

s.e. $(\widehat{\ln w}^{o}) >$ s.e. $E(\widehat{\ln w})$ because more uncertainty w/ true wage

(2)

(i) +3 1% ↑ in car price causes 1.75% ↓ new car sales makes sense!

+3 1% ↑ in per capita income cause 4.75% ↑ new car-sales makes sense!

+3 1% pt change in interest rate causes .29% ↓ new car-sales makes sense!

(ii) +4 mean % ↑ of 9.2 in Spring over winter

+4 mean % ↓ of 5.1 in Summer over winter

+4 mean % ↓ of 4.9 in fall over winter

} ceterus paribus

winter is reference group

(iii) +4 $E[\ln Y|_{spring} - \ln Y|_{winter}]$ ceterus paribus

(iv) $\bar{R}^2 = 1 - \frac{(1-R^2)(n-1)}{n-k-1}$

Model A:

$\bar{R}^2 = 1 - \frac{(1-.748)(33)}{30} = 1 - \frac{(.252)(33)}{30}$

$n = 34$

$\bar{R}^2 = 1 - \frac{8.316}{30} = 1 - .2772 = .722$

$\bar{R}^2_A = .722$ +3

(iv) cont Model B: $\bar{R}^2 = 1 - \frac{(1-.834)(33)}{27} = \frac{1-(.166)(33)}{27} = \frac{1-5.498}{27}$

$\bar{R}^2 = 1 - \frac{5.478}{27} = 1 - .203 = .797$

$\bar{R}^2_B = .797$ +3

Model C: $\bar{R}^2 = 1 - \frac{(1-.818)(33)}{29} = \frac{1-(.182) \cdot 33}{29} = \frac{1-6.006}{29}$

$\bar{R}^2_C = 1 - .207 = .793$ +3

(v) Choose model B has highest $\bar{R}^2$ w/ most parameters +4

(vi) $H_0: \beta_{Sp} = \beta_S = \beta_F = 0$ +1
H_1: Not H_0 +1

$F = \frac{(R^2_{UR} - R^2_R)/q}{(1 - R^2_{UR})/n-k-1} = \frac{(.834 - .748)/3^{+2}}{(1-.834)/34-7^{+2}} = \frac{.086/3}{.166/27} = \frac{.029}{.006}$

$F = 4.83^{+1}$ $F(3,27) = 3.354!$

$F > F(3,27)^{+1}$ so reject H_0 seasons make a difference on new car sales

(vii) Model D: $\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 X_3 + \beta_4 D_{Sp} + \beta_5 D_S + \beta_6 D_F$
+2 $+ \beta_7 D_{Sp} \ln X_1 + \beta_8 D_S \ln X_1 + \beta_9 D_F \ln X_1$

$H_0: \beta_7 = \beta_8 = \beta_9 = 0$ +2 get R^2 from Model D
H_1: Not H_0 +2

$F = \frac{R^2_D - R^2_B}{1 - R^2_D} \cdot \frac{24}{3}^{+2}$ +1 +2 compare w/ $F(3,24)$ +1