Exercise Session 5

Problem 1

Suppose that you have a sample of n individuals who apart from their mother tongue (Czech) can speak English, German, or are trilingual (i.e., all individuals in your sample speak in addition to their mother tongue at least one foreign language). You estimate the following model:

$$wage = \beta_0 + \beta_1 educ + \beta_2 IQ + \beta_3 exper + \beta_4 DM + \beta_5 Germ + \beta_6 Engl + \varepsilon \ ,$$

where

$educ$ . . . years of education
IQ . . . IQ level
$exper$ . . . years of on-the-job experience
DM . . . dummy, equal to one for males and zero for females
$Germ$ . . . dummy, equal to one for German speakers and zero otherwise
$Engl$ . . . dummy, equal to one for English speakers and zero otherwise

(a) Explain why a dummy equal to one for trilingual people and zero otherwise is not included in the model.

(b) Explain how you would test for discrimination against females (in the sense that *ceteris paribus* females earn less than males). Be specific: state the hypothesis, give the test statistic and its distribution.

(c) Explain how you would measure the payoff (in terms of wage) to someone of becoming trilingual given that he can already speak (i) English, (ii) German.

(d) Explain how you would test if the influence of on-the-job experience is greater for males than for females. Be specific: specify the model, state the hypothesis, give the test statistic and its distribution.

Problem 2

Are rent rates influenced by the student population in a college town? Let *rent* be the average monthly rent paid on rental units in a college town in the United States. Let *pop* denote the total city population, *avginc* the average city income, and *pctstu* the student population as a percentage of the total population. One model to test for a relationship is

$$\log(rent) = \beta_0 + \beta_1 \log(pop) + \beta_2 \log(avginc) + \beta_3 pctstu + u$$

(i) State the null hypothesis that size of the student body relative to the population has no ceteris paribus effect on monthly rents. State the alternative that there is an effect.

(ii) What signs do you expect for β_1 and β_2?

(iii) The equation estimated using 1990 data from RENTAL.RAW for 64 college towns is

(0.844) (0 .039) (.081) (.0017)

$$\widehat{\log(rent)} = 0.43 + 0.066\log(pop) + 0.507\log(avginc) + 0.0056pctstu + u$$

$n = 64, R^2 = .458$

What is wrong with the statement: "A 10% increase in population is associated with about a 6.6% increase in rent"? Interpret the coefficient on pctstu.
(iv) Test the hypothesis stated in part (i) at the 1% level.

Problem 3

When estimating wage equations, we expect that young, inexperienced workers will have relatively low wages and that with additional experience their wages will rise, but then begin to decline after middle age, as the worker nears retirement. This lifecycle pattern of wages can be captured by introducing experience and experience squared to explain the level of wages. If we also include years of education, we have the equation:

$$Wage = \beta_0 + \beta_1 * Educ + \beta_2 * Exper + \beta_3 Exper^2 + u$$

a) What is the marginal effect of experience on wages?
b) What sign do you expect for each of the coefficients? Why?
c) Estimate the model using data *cps_small.gdt*. Do the estimated coefficients have expecting signs?
d) Test the hypothesis that education has no effect on wages. What do you conclude?
e) Test the hypothesis that education and experience have no effect on wages. What do you conclude?
f) Include the dummy variable *black* in the regression. Interpret the coefficient and comment on its significance.
g) Include the interaction term of *black* and *educ*. Interpret the coefficient and comment on its significance.
h) Transform dependent variable in logarithmic form and estimate the equation. Interpret the coefficients.

Problem 4

Given the following regression model:

$Inflation_i = \beta_0 + \beta_1 InterestRate_i + u_i$

Where both variables are measured in percentage points, a sample of 100 countries is used in order to estimate the above model and the following information is given:

$Var(Inflation_i)$ = 100; $Var(InterestRate_i)$ = 50; $Cov(Inflationi ,InterestRate_i)$ = −25; SSR = 49

i) Find the OLS estimation of the effect of interest rates on inflation and the estimated standard error.

ii) Interpret your estimation results.

iii) Calculate a one-tailed t-test in order to validate the significance of the estimated slope coefficient at 1% significance level.

iv) What could you say about the explanatory power of the above model?