EEP 118 / IAS 118 Elisabeth Sadoulet and Becca Taylor
University of California at Berkeley Fall 2014

Introductory Applied Econometrics
Midterm examination

1. (5 points) **For each of the following estimated equations** of weekly wage (in $) on education (in years):

(a) $\widehat{wage} = 300 + 8\, education$

(b) $\widehat{wage} = 150 + 100 \log(education)$

(c) $\widehat{\log(wage)} = 5 + .08\ education$

(d) $\widehat{\log(wage)} = 3 + 1.2 \log(education)$

Interpret in a sentence the relationship between education and wage. What is the estimated effect of an increase in education from 10 to 11 years on the wage (in $ value or in %)?

2. (5 points) Using the Kenyan Demographic and Health Survey 2003, we found the following mean and standard deviation for the education of women raised rural and in urban areas respectively:

Variable		Obs	Mean	Std. Dev.	Min	Max
Raised in rural areas	education	727	6.690509	4.152626	0	20
Raised in urban areas	education	236	8.411017	4.608563	0	20

Do the data given in the previous question provide statistical evidence at the 1% significance level that the average education of the women raised in urban areas is higher than the average education of the women raised in rural areas? (To answer this question, call *D* the difference in mean education of the two groups; suggest an estimator $\hat{D}$ for *D* and for the standard error of $\hat{D}$; and then use the 5 steps for hypothesis testing that we followed in class.)

3. (5 points) Using data form a large number of Mexican communities, we estimated the following two models:
deforestation = 9.48 + 25.9 boundary
deforestation = −66.63 + 20.1 boundary + 12.9 log(totalpop)

where deforestation is area deforested over 10 years (in ha), boundary is a dummy variable indicating the ejido has boundary problem and totalpop is the total population of the community.
How does the introduction of the log(totalpop) affect the estimated parameter on boundary? What can you infer about the correlation between boundary and log(totalpop)?

4. (15 points) In order to estimate the following model of emission by power plants:

$$\log(CO2) = \beta_0 + \beta_1 \log(Q) + \beta_2 OLD + u$$

You collect information from 110 firms on carbon dioxide emission (CO2), their level of production (Q), and a dummy variable that is equal to 1 for firms whose generator is older than 15 years (OLD) and zero otherwise. The estimated equation is the following:

$$\widehat{\log(CO2)} = 2.54 + 0.924 \log(Q) + 0.210 OLD \qquad R^2 = 0.253$$
$$(0.52)\ \ (0.042) \qquad (0.097)$$

(standard errors in parentheses)

a. What is the economic interpretation of the true parameters β_1 and β_2?

b. Construct a 95% confidence interval for β_1. Give an interpretation.

c. Test the hypothesis $\beta_1 = 1$ against $\beta_1 \neq 1$ at the 5% significance level. What is the ***economic*** interpretation of your result?

5. (20 points) Using data from the 2006 Indian DHS survey of 976 women—which includes a measure of autonomy of the women surveyed (a scale from 0-10, 10 being the most autonomous), the age when married (*marr_rage)*, current age (*curr_age)*, a dummy for husband's education greater than primary school (*husb_educ)*, and a dummy for an urban location—we estimate the following model:

$$(1) \qquad autonomy = \beta_0 + \beta_1 mrage + \beta_2 crage + \beta_3 husbedu + \beta_4 urban + u$$

a. Using the Stata output from model 1 below, what is the p-value for the test that husband's education has no effect on the autonomy of the women? Interpret your results.
b. Calculate and interpret the R-squared for this estimation.
c. We now re-estimate the model without the two age variables (model 2 below). Comparing the two estimated models, test that both marriage age and current age do not have an effect on women's autonomy (i.e. do a joint test of significance on the two parameters).
d. Fully interpret the result on the role of husband education on the women's autonomy from the estimation of model 2. (Hint: use the value of the intercept to help you interpret the size of the effect)

Model 1 `. reg autonomy marr_age curr_age husb_educ urban`

```
      Source |       SS       df       MS              Number of obs =     976
-------------+------------------------------           F(  4,   971) =   14.58
       Model |  949.690268     4  237.422567            Prob > F      =  0.0000
    Residual |  15809.3097   971  16.2814724            R-squared     =
-------------+------------------------------           Adj R-squared =  0.0528
       Total |       16759   975  17.1887179            Root MSE      =   4.035

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    autonomy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    marr_age |   .0329975   .0400423     0.82   0.410     -.045582    .1115769
    curr_age |   .1129321   .0265058     4.26   0.000
    husb_educ|   .5356327   .2834984     1.89              -.0207074    1.091973
       urban |   1.192164   .2735485     4.36   0.000     .6553492    1.728978
       _cons |   .3844601   .7484315     0.51   0.608    -1.084269     1.85319
------------------------------------------------------------------------------
```

Model 2 `. reg autonomy husb_educ urban`

```
      Source |       SS       df       MS              Number of obs =     976
-------------+------------------------------           F(  2,   975) =   14.54
       Model |  486.726699     2  243.363349            Prob > F      =  0.0000
    Residual |   16317.306   975  16.7356985            R-squared     =  0.0290
-------------+------------------------------           Adj R-squared =  0.0270
       Total |  16804.0327   977  17.1996241            Root MSE      =  4.0909

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    autonomy |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    husb_educ |   .5590007   .2734715     2.04   0.041     .0223403    1.095661
       urban |   1.250604   .2747828     4.55   0.000     .7113701    1.789838
       _cons |   3.928316   .2236928    17.56   0.000     3.489341    4.367291
------------------------------------------------------------------------------
```