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Econometrics
Homework 2
Suggested Answer

Daiji Kawaguchi
College of International Studies

I attached Stata output to this suggested answer. Please refer to that as you need.

Problem 1
Solve Problem 2.1 in page 61 of Wooldridge.
(i) The error term u may include the wealth level of the household of the mother. The mother of wealthier household is more likely to have higher educational background.
(ii) As discussed in the previous answer, the error term are likely to be correlated with error term. Thus the zero conditional mean assumption E(u|x)=0 is presumably violated. Thus we cannot obtain an unbiased estimator. This means that we cannot estimate the ceteris paribus effect of education on fertility.

Problem 2
Problem 2.12 in page 65 of Wooldridge.
(i) The result of estimation is:

$$sl\hat{e}ep = 3586.377 + -0.151 totwrk$$
$$N = 706, R^2 = 0.103$$

The intercept in this estimation means that when an individual do not work at all, he is predicted to sleep for 3586 minutes (about 60 hours) per week.

(ii) When totwrk increses by 2 hours (=120 minutes), sleep is estimated to fall by 18 (=0.15*120) minutes. I perceive this as a small effect.

Problem 3
Solve Problem 2.13 in page 65 of Wooldridge.

(i) The average monthly salary is about 958 dollar. The average IQ score is 101.282 and its standard deviation is 15.053.

(ii) In this question, you are asked to set up a model in which one-point increase in IQ changes wage by a constant dollar amount. The corresponding model is the following model:

$$wage = \beta_0 + \beta_1 IQ + u.$$

The result of OLS estimation is as following:

$$w\hat{a}ge = 116.992 + 8.303 IQ$$
$$N = 935, R^2 = 0.096$$

When IQ increases by 15 points, the wage is predicted to increase by 124.545 dollar. Because R^2 is 0.096, only 9.6 percent of the total variation of monthly wage is explained by the variation in IQ. The variation of IQ does not explain most of the variation in wage.

(iii) To sep up a model in which each one-point incerase in IQ has the same percentage effect on wage, you have to take natural log for the dependent variable. The resulting model is:

$$\log(wage) = \beta_0 + \beta_1 IQ + u.$$

The estimated result is following.

$$\log(\hat{wage}) = 5.887 + 0.009IQ$$
$$N = 935, R^2 = 0.099$$

When IQ increases by 15 points, the wage is predicted to increase by 13.5 (=15*0.009) percent.

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      log:  c:\stataproject\class\econometrics\hw2\hw2.log
 log type:  text
opened on:   6 Oct 2003, 12:42:20

. *Problem 2;
. use C:\stataproject\class\econometrics\hw2\sleep75.dta;

. reg sleep totwrk;

      Source |       SS       df       MS              Number of obs =     706
-------------+------------------------------           F(  1,   704) =   81.09
       Model |  14381717.2     1  14381717.2           Prob > F      =  0.0000
    Residual |   124858119   704  177355.282           R-squared     =  0.1033
-------------+------------------------------           Adj R-squared =  0.1020
       Total |   139239836   705  197503.313           Root MSE      =  421.14

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       sleep |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      totwrk |  -.1507458   .0167403    -9.00   0.000    -.1836126    -.117879
       _cons |   3586.377   38.91243    92.17   0.000     3509.979    3662.775
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. *Problem 3;
. clear;

. use c:\stataproject\class\econometrics\hw2\wage2.dta;

. *(i);
. sum wage IQ;

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+-----------------------------------------------------
        wage |       935    957.9455    404.3608        115       3078
          IQ |       935    101.2824    15.05264         50        145

. *(ii);
. reg wage IQ;

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  1,   933) =   98.55
       Model |  14589782.6     1  14589782.6           Prob > F      =  0.0000
    Residual |   138126386   933  148045.429           R-squared     =  0.0955
-------------+------------------------------           Adj R-squared =  0.0946
       Total |   152716168   934  163507.675           Root MSE      =  384.77

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        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          IQ |   8.303064   .8363951     9.93   0.000     6.661631    9.944498
       _cons |   116.9916   85.64153     1.37   0.172    -51.08078    285.0639
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. *(iii);
. reg lwage IQ;

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  1,   933) =  102.62
       Model |  16.4150939     1  16.4150939           Prob > F      =  0.0000
    Residual |  149.241189   933  .159958402           R-squared     =  0.0991
-------------+------------------------------           Adj R-squared =  0.0981
       Total |  165.656283   934  .177362188           Root MSE      =  .39995

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       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          IQ |   .0088072   .0008694    10.13   0.000      .007101    .0105134
       _cons |   5.886994   .0890206    66.13   0.000     5.712291    6.061698
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