

Econometrics
Homework 4
Suggested Answer
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Answer following questions. You are encouraged to work together in a study group, but *you have to compose your own answer individually*. Please download the necessary dataset from my webpage.

Problem 1

Solve Problem 5.1 in page 180 of Wooldridge.

$$\text{plim}\hat{\beta}_0 = \text{plim}\bar{y} - \text{plim}\hat{\beta}_1\text{plim}\bar{x}_1 = E y - \beta_1 E x_1 = \beta_0.$$

Problem 2

Solve Problem 5.2 in page 180 of Wooldridge.

We expect that those with higher risk tolerance increases the proportion of a pension invested in stock market. Thus expected sign of β_2 is positive. When $\beta_2 \text{risktol}$ is left in the error term, this part is positively correlated with *funds*, thus we expect positive asymptotic bias in $\hat{\beta}_1$.

Problem 3

Solve Problem 5.5 in page 180 of Wooldridge.

[Hint] Use “predict” command in Stata to obtain residuals. To draw a histogram, you may use Stata’s graphic function. Choose [Graphics]-[Histogram] from the menu bar.

See the attached Stata output.

Problem 4

Solve Problem 6.4 in page 212 of Wooldridge.

(i) By taking the partial derivative of the estimation function with respect to *educ*, we obtain,

$$\frac{\partial \log(\text{wage})}{\partial \text{educ}} = \beta_1 + \beta_2 \text{educ}.$$

(ii) The return for an additional year of education is about 0.078 percentage point higher if the total years of education of both parents increase by one year. For example, if both parents are college graduate, the return to education is $0.047 + 0.00078 * 32 = 0.07196$, while it is $0.047 + 0.00078 * 24 = 0.06572$ if both parents are high school graduates.

(iii) After the inclusion of *pareduc* as an additional explanatory variable, the interaction term becomes negative. T-statistics for this estimated coefficient is $0.0016 / 0.0012 = 1.333$. Thus we do not reject the null hypothesis that the coefficient is zero.

Problem 5

Solve Problem 6.16 in page 216 of Wooldridge.

(i) See the attached Stata output.

(ii) The turn-around point is 15.34 years.

(iii) College years negatively affect wage probably because better players do not play in college but start to play in NBA right after graduating from high school. Thus the coefficient is negative not

due to causality but because of Endogeneity of years played in colleges.

(iv) See the attached Stata output for the results. It is not needed to include age squared as indicated by the insignificant coefficient for age squared.

(v) See the attached Stata output for the result of F test. We do not reject the null that age and educ (in fact, col) are jointly not significant.

Problem 5.5

```
log: C:\ttx\class\econometrics\2004\homeworks\hw4ans.log
log type: text
opened on: 17 Nov 2004, 09:24:44

. use "C:\stataproject\class\econometrics\wooldridge\stata\WAGE1.DTA", clear

. reg wage educ exper tenure

-----+-----
Source |      SS      df      MS                Number of obs =      526
-----+-----
Model | 2194.1116    3 731.370532          F( 3, 522) = 76.87
Residual | 4966.30269  522  9.51398984          Prob > F      = 0.0000
-----+-----
Total | 7160.41429  525 13.6388844          R-squared     = 0.3064
                                           Adj R-squared = 0.3024
                                           Root MSE     = 3.0845

-----+-----
wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
educ |   .5989651   .0512835    11.68  0.000   .4982176   .6997126
exper |   .0223395   .0120568     1.85  0.064  -.0013464   .0460254
tenure |   .1692687   .0216446     7.82  0.000   .1267474   .2117899
_cons |  -2.872735   .7289643    -3.94  0.000  -4.304799  -1.440671

. predict uhat, residual

. histogram uhat
(bin=22, start=-7.6067705, width=1.011835)

. reg lwage educ exper tenure

-----+-----
Source |      SS      df      MS                Number of obs =      526
-----+-----
Model | 46.8741776    3 15.6247259          F( 3, 522) = 80.39
Residual | 101.455574  522  .194359337          Prob > F      = 0.0000
-----+-----
Total | 148.329751  525  .28253286          R-squared     = 0.3160
                                           Adj R-squared = 0.3121
                                           Root MSE     = .44086

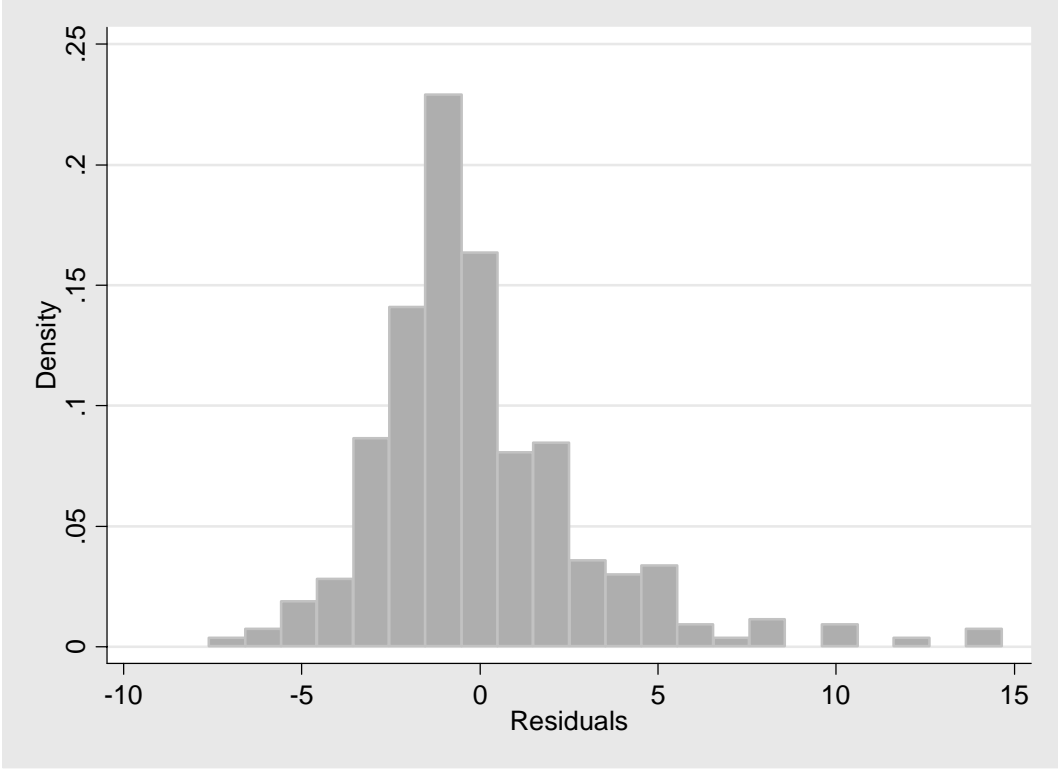
-----+-----
lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
educ |   .092029   .0073299    12.56  0.000   .0776292   .1064288
exper |   .0041211   .0017233     2.39  0.017   .0007357   .0075065
tenure |   .0220672   .0030936     7.13  0.000   .0159897   .0281448
_cons |   .2843595   .1041904     2.73  0.007   .0796756   .4890435

. predict luhat, residual

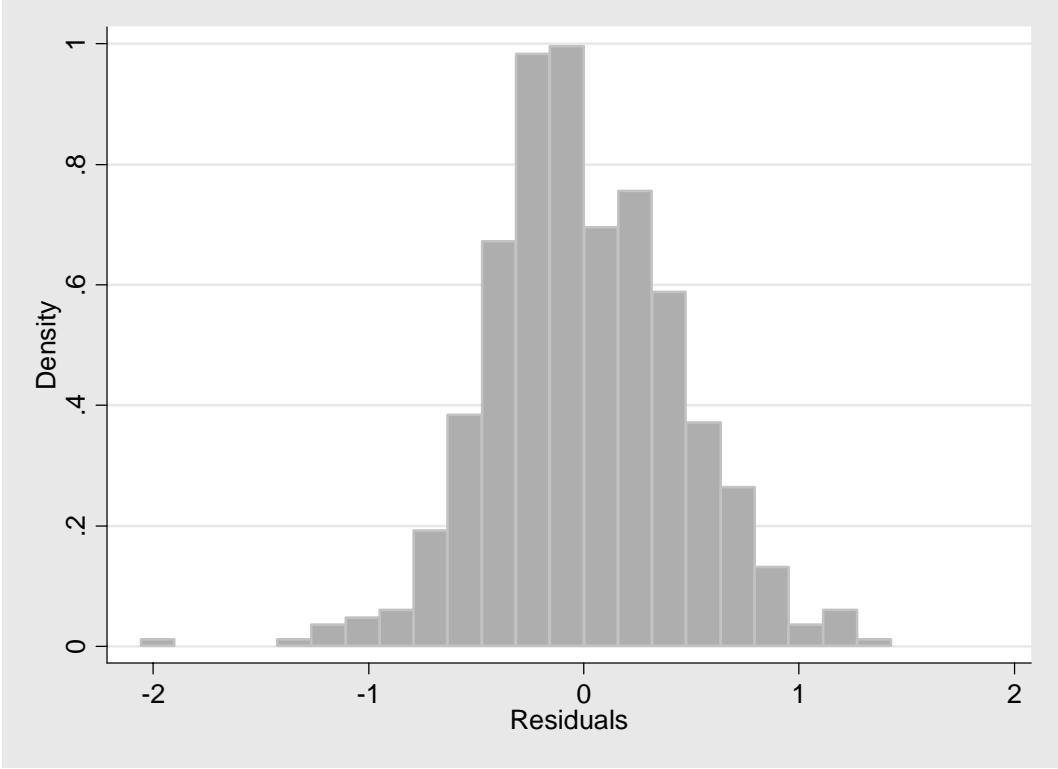
. histogram luhat
(bin=22, start=-2.0580163, width=.15845945)

. log close
log: C:\ttx\class\econometrics\2004\homeworks\hw4ans.log
log type: text
closed on: 17 Nov 2004, 09:28:08
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Histogram of residuals from wage regression



Histogram of residuals from log(wage) regression



Problem 6.16

log: C:\t\class\econometrics\2004\homeworks\hw4ans2.log
 log type: text
 opened on: 17 Nov 2004, 13:24:28

. use "C:\stataproject\class\econometrics\wooldridge\stata\mbasal.dta", clear

(i)

. reg points exper expersq age coll

Source	SS	df	MS	Number of obs = 269		
Model	1317.59877	4	329.399693	F(4, 264) =	10.85	
Residual	8013.59211	264	30.3545156	Prob > F =	0.0000	
				R-squared =	0.1412	
				Adj R-squared =	0.1282	
Total	9331.19088	268	34.8178764	Root MSE =	5.5095	

points	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
exper	2.363631	.4054974	5.83	0.000	1.56521	3.162051
expersq	-.0770269	.0234833	-3.28	0.001	-.1232652	-.0307885
age	-1.073958	.2950722	-3.64	0.000	-1.654953	-.4929638
coll	-1.286255	.4505921	-2.85	0.005	-2.173466	-.399043
_cons	35.21831	6.986731	5.04	0.000	21.4615	48.97512

(ii)

. di - _b[exper]/(2*_b[expersq])
 15.342896

(iv)

. reg points exper expersq age agesq coll

Source	SS	df	MS	Number of obs = 269		
Model	1353.54692	5	270.709385	F(5, 263) =	8.92	
Residual	7977.64396	263	30.333247	Prob > F =	0.0000	
				R-squared =	0.1451	
				Adj R-squared =	0.1288	
Total	9331.19088	268	34.8178764	Root MSE =	5.5076	

points	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
exper	2.863828	.6127241	4.67	0.000	1.657359	4.070297
expersq	-.1280723	.0524378	-2.44	0.015	-.2313237	-.0248209
age	-3.983695	2.689078	-1.48	0.140	-9.278557	1.311168
agesq	.0535514	.0491917	1.09	0.277	-.0433083	.1504112
coll	-1.312604	.4510841	-2.91	0.004	-2.200799	-.424408
_cons	73.59034	35.93341	2.05	0.042	2.836555	144.3441

(v)

. reg lwage points exper expersq age coll

Source	SS	df	MS	Number of obs = 269		
Model	101.561351	5	20.3122701	F(5, 263) =	50.10	
Residual	106.627377	263	.405427287	Prob > F =	0.0000	
				R-squared =	0.4878	
				Adj R-squared =	0.4781	
Total	208.188727	268	.776823609	Root MSE =	.63673	

lwage	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
points	.0777297	.0071128	10.93	0.000	.0637243	.091735
exper	.2178447	.0497877	4.38	0.000	.1198115	.315878
expersq	-.0070821	.0027687	-2.56	0.011	-.0125338	-.0016305
age	-.0481375	.0349466	-1.38	0.170	-.1169481	.0206732
coll	-.0402709	.0528725	-0.76	0.447	-.1443781	.0638364
_cons	6.779038	.8454209	8.02	0.000	5.114384	8.443693

(vi)

. test age coll

(1) age = 0
 (2) coll = 0

F(2, 263) = 1.19
 Prob > F = 0.3061