Textbook Examples
Introductory Econometrics: A Modern Approach (1st and 2d eds.)
by Jeffrey Wooldridge.

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2d eds.)
Chapter 2 - The Simple Regression Model

Example 2.3: CEO Salary and Return on Equity

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CEOSAL1
```

```
summ salary roe
```

```
Variable |     Obs        Mean    Std. Dev.       Min        Max
---------+--------------------------------------------------------
  salary |     209     1281.12    1372.345       223      14822
     roe |     209    17.18421    8.518509        .5       56.3
```

```
reg salary roe
```

```
  Source |       SS       df       MS                  Number of obs =     209
---------+------------------------------               F(  1,   207) =    2.77
   Model |  5166419.04     1  5166419.04               Prob > F      =  0.0978
Residual |   386566563   207  1867471.32               R-squared     =  0.0132
---------+------------------------------               Adj R-squared =  0.0084
   Total |   391732982   208  1883331.64               Root MSE      =  1366.6

------------------------------------------------------------------------------
  salary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
     roe |   18.50119   11.12325      1.663   0.098      -3.428195    40.43057
   _cons |   963.1913   213.2403      4.517   0.000       542.7902    1383.592
------------------------------------------------------------------------------
```

Salary for ROE = 0

```
display _b[roe]*0+_b[_cons]
963.19134
```

Salary for ROE = 30

```
display _b[roe]*30+_b[_cons]
1518.2269
```

Example 2.4: Wage and Education

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1
```

```
summ wage
```

```
Variable |     Obs        Mean    Std. Dev.       Min        Max
---------+--------------------------------------------------------
    wage |     526    5.896103    3.693086        .53      24.98
```

```
reg wage educ
```

```
  Source |       SS       df       MS                  Number of obs =     526
---------+------------------------------               F(  1,   524) =  103.36
   Model |  1179.73204     1  1179.73204               Prob > F      =  0.0000
Residual |  5980.68225   524  11.4135158               R-squared     =  0.1648
---------+------------------------------               Adj R-squared =  0.1632
   Total |  7160.41429   525  13.6388844               Root MSE      =  3.3784
------------------------------------------------------------------------------
    wage |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    educ |   .5413593    .053248     10.167   0.000       .4367534    .6459651
   _cons |  -.9048516   .6849678     -1.321   0.187      -2.250472    .4407687
------------------------------------------------------------------------------
```

Wage for educ = 0

```
display _b[educ]*0+_b[_cons]
```

```
-.90485161
```

Wage for educ = 8

```
display _b[educ]*8+_b[_cons]
3.4260224
```

Return to 4 years education

```
display _b[educ]*4
2.165437
```

Example 2.5: Voting Outcomes and Campaign Expenditures

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/VOTE1
```

```
reg voteA shareA
```

```
  Source |       SS       df       MS                  Number of obs =     173
---------+------------------------------                F(  1,   171) = 1017.70
   Model |  41486.4749     1  41486.4749                Prob > F      =  0.0000
Residual |  6970.77363   171  40.7647581                R-squared     =  0.8561
---------+------------------------------                Adj R-squared =  0.8553
   Total |  48457.2486   172  281.728189                Root MSE      =  6.3847

------------------------------------------------------------------------------
   voteA |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  shareA |   .4638239   .0145393     31.901   0.000       .4351243    .4925234
   _cons |   26.81254   .8871887     30.222   0.000       25.06129    28.56379
------------------------------------------------------------------------------
```

Example 2.6: CEO Salary and Return on Equity

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CEOSAL1
```

```
summ salary roe
```

```
Variable |     Obs        Mean   Std. Dev.       Min        Max
---------+--------------------------------------------------------
  salary |     209     1281.12   1372.345        223      14822
     roe |     209    17.18421   8.518509         .5       56.3
```

```
reg salary roe
```

```
  Source |       SS       df       MS                  Number of obs =     209
---------+------------------------------                F(  1,   207) =    2.77
   Model |  5166419.04     1  5166419.04                Prob > F      =  0.0978
Residual |   386566563   207  1867471.32                R-squared     =  0.0132
---------+------------------------------                Adj R-squared =  0.0084
   Total |   391732982   208  1883331.64                Root MSE      =  1366.6

------------------------------------------------------------------------------
  salary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
     roe |   18.50119   11.12325      1.663   0.098      -3.428195    40.43057
   _cons |   963.1913   213.2403      4.517   0.000       542.7902    1383.592
------------------------------------------------------------------------------
```

Fitted Values and Residuals for the First 15 CEOs

```
predict salhat, xb
```

```
gen uhat=salary-salhat
```

```
list roe salary salhat uhat in 1/15
```

```
           roe     salary     salhat       uhat
  1.      14.1       1095   1224.058  -129.0581
```

```
  2.      10.9       1001   1164.854  -163.8542
  3.      23.5       1122   1397.969  -275.9692
  4.       5.9        578   1072.348  -494.3484
  5.      13.8       1368   1218.508   149.4923
  6.        20       1145   1333.215  -188.2151
  7.      16.4       1078   1266.611  -188.6108
  8.      16.3       1094   1264.761  -170.7606
  9.      10.5       1237   1157.454   79.54626
 10.      26.3        833   1449.773  -616.7726
 11.      25.9        567   1442.372  -875.3721
 12.      26.8        933   1459.023  -526.0231
 13.      14.8       1339   1237.009   101.9911
 14.      22.3        937   1375.768  -438.7678
 15.      56.3       2011   2004.808   6.191895
```

Example 2.7: Wage and Education

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1

summ wage educ

```
Variable |     Obs        Mean   Std. Dev.       Min        Max
---------+--------------------------------------------------------
    wage |     526    5.896103   3.693086        .53      24.98
    educ |     526    12.56274   2.769022          0         18
```

reg wage educ

```
  Source |       SS       df       MS                  Number of obs =     526
---------+------------------------------                F(  1,   524) =  103.36
   Model |  1179.73204     1  1179.73204                Prob > F      =  0.0000
Residual |  5980.68225   524  11.4135158                R-squared     =  0.1648
---------+------------------------------                Adj R-squared =  0.1632
   Total |  7160.41429   525  13.6388844                Root MSE      =  3.3784
------------------------------------------------------------------------------
    wage |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    educ |   .5413593    .053248     10.167   0.000       .4367534    .6459651
   _cons |  -.9048516   .6849678     -1.321   0.187      -2.250472    .4407687
------------------------------------------------------------------------------
```

Wage for educ = 12.56

display _b[educ]*12.56+_b[_cons]

```
5.8824
```

Example 2.8: CEO Salary and Return on Equity

use http://fmwww.bc.edu/ec-p/data/wooldridge/CEOSAL1

reg salary roe

```
  Source |       SS       df       MS                  Number of obs =     209
---------+------------------------------                F(  1,   207) =    2.77
   Model |  5166419.04     1  5166419.04                Prob > F      =  0.0978
Residual |   386566563   207  1867471.32                R-squared     =  0.0132
---------+------------------------------                Adj R-squared =  0.0084
   Total |   391732982   208  1883331.64                Root MSE      =  1366.6

------------------------------------------------------------------------------
  salary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
     roe |   18.50119   11.12325      1.663   0.098      -3.428195    40.43057
   _cons |   963.1913   213.2403      4.517   0.000       542.7902    1383.592
------------------------------------------------------------------------------
```

Example 2.9: Voting Outcomes and Campaign Expenditures

use http://fmwww.bc.edu/ec-p/data/wooldridge/VOTE1

reg voteA shareA

```
  Source |       SS       df       MS                  Number of obs =     173
---------+------------------------------                F(  1,   171) = 1017.70
   Model |  41486.4749     1  41486.4749                Prob > F      =  0.0000
Residual |  6970.77363   171  40.7647581                R-squared     =  0.8561
---------+------------------------------                Adj R-squared =  0.8553
   Total |  48457.2486   172  281.728189                Root MSE      =  6.3847

------------------------------------------------------------------------------
   voteA |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  shareA |   .4638239   .0145393     31.901   0.000       .4351243    .4925234
   _cons |   26.81254   .8871887     30.222   0.000       25.06129    28.56379
------------------------------------------------------------------------------
```

Example 2.10: A Log Wage Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1

reg lwage educ

```
  Source |       SS       df       MS                  Number of obs =     526
---------+------------------------------                F(  1,   524) =  119.58
   Model |  27.5606296     1  27.5606296                Prob > F      =  0.0000
Residual |  120.769132   524  .230475443                R-squared     =  0.1858
---------+------------------------------                Adj R-squared =  0.1843
   Total |  148.329762   525   .28253288                Root MSE      =  .48008

------------------------------------------------------------------------------
   lwage |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    educ |   .0827444   .0075667     10.935   0.000       .0678796    .0976092
   _cons |   .5837726   .0973358      5.998   0.000       .3925562     .774989
------------------------------------------------------------------------------
```

Example 2.11: CEO Salary and Firm Sales

use http://fmwww.bc.edu/ec-p/data/wooldridge/CEOSAL1

reg lsalary lsales

```
  Source |       SS       df       MS                  Number of obs =     209
---------+------------------------------                F(  1,   207) =   55.30
   Model |  14.0661711     1  14.0661711                Prob > F      =  0.0000
Residual |  52.6559988   207  .254376806                R-squared     =  0.2108
---------+------------------------------                Adj R-squared =  0.2070
   Total |  66.7221699   208  .320779663                Root MSE      =  .50436

------------------------------------------------------------------------------
 lsalary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  lsales |   .2566717   .0345167      7.436   0.000       .1886225     .324721
   _cons |   4.821996   .2883397     16.723   0.000       4.253537    5.390455
------------------------------------------------------------------------------
```

Example 2.12: Student Math Performance and the School Lunch Program

use http://fmwww.bc.edu/ec-p/data/wooldridge/MEAP93

reg math10 lnchprg

```
  Source |       SS       df       MS                  Number of obs =     408
```

```
---------+------------------------------              F(  1,   406) =   83.77
   Model |  7665.26597     1  7665.26597              Prob > F      =  0.0000
Residual |  37151.9145   406  91.5071786              R-squared     =  0.1710
---------+------------------------------              Adj R-squared =  0.1690
   Total |  44817.1805   407  110.115923              Root MSE      =  9.5659

------------------------------------------------------------------------------
  math10 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
 lnchprg |  -.3188643   .0348393     -9.152   0.000      -.3873523   -.2503763
   _cons |   32.14271   .9975824     32.221   0.000       30.18164    34.10378
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 13 Sep 2002)

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2d eds.)
Chapter 3 - Multiple Regression Analysis: Estimation

Example 3.1: Determinants of College GPA

use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA1

summ ACT

```
Variable |     Obs        Mean    Std. Dev.       Min        Max
---------+--------------------------------------------------------
     ACT |     141    24.15603    2.844252         16         33
```

reg colGPA hsGPA ACT

```
  Source |       SS       df       MS              Number of obs =     141
---------+------------------------------           F(  2,   138) =   14.78
   Model |  3.42365506     2  1.71182753            Prob > F      =  0.0000
Residual |  15.9824444   138  .115814814            R-squared     =  0.1764
---------+------------------------------           Adj R-squared =  0.1645
   Total |  19.4060994   140  .138614996            Root MSE      =  .34032

------------------------------------------------------------------------------
  colGPA |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
   hsGPA |   .4534559   .0958129      4.733   0.000       .2640047    .6429071
     ACT |    .009426   .0107772      0.875   0.383      -.0118838    .0307358
   _cons |   1.286328   .3408221      3.774   0.000        .612419    1.960237
------------------------------------------------------------------------------
```

reg colGPA ACT

```
  Source |       SS       df       MS              Number of obs =     141
---------+------------------------------           F(  1,   139) =    6.21
   Model |  .829558811     1  .829558811            Prob > F      =  0.0139
Residual |  18.5765406   139  .133644177            R-squared     =  0.0427
---------+------------------------------           Adj R-squared =  0.0359
   Total |  19.4060994   140  .138614996            Root MSE      =  .36557

------------------------------------------------------------------------------
  colGPA |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
     ACT |    .027064   .0108628      2.491   0.014       .0055862    .0485417
   _cons |   2.402979   .2642027      9.095   0.000       1.880604    2.925355
------------------------------------------------------------------------------
```

Example 3.2: Hourly Wage Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1

reg lwage educ exper tenure

```
  Source |       SS       df       MS              Number of obs =     526
---------+------------------------------           F(  3,   522) =   80.39
   Model |  46.8741805     3  15.6247268            Prob > F      =  0.0000
Residual |  101.455581   522  .194359351            R-squared     =  0.3160
---------+------------------------------           Adj R-squared =  0.3121
   Total |  148.329762   525   .28253288            Root MSE      =  .44086

------------------------------------------------------------------------------
   lwage |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    educ |    .092029   .0073299     12.555   0.000       .0776292    .1064288
   exper |   .0041211   .0017233      2.391   0.017       .0007357    .0075065
  tenure |   .0220672   .0030936      7.133   0.000       .0159897    .0281448
   _cons |   .2843595   .1041904      2.729   0.007       .0796755    .4890435
```

```
------------------------------------------------------------------------------
```

Example 3.3: Participation in 401(K) Pension Plan

use http://fmwww.bc.edu/ec-p/data/wooldridge/401K

summ prate mrate age

```
    Variable |     Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       prate |    1534    87.36291    16.71654          3        100
       mrate |    1534    .7315124    .7795393        .01       4.91
         age |    1534    13.18123    9.171114          4         51
```

reg prate mrate age

```
      Source |       SS       df       MS              Number of obs =    1534
-------------+------------------------------           F(  2,  1531) =   77.79
       Model |  39517.1118     2  19758.5559           Prob > F      =  0.0000
    Residual |  388868.428  1531   253.99636           R-squared     =  0.0922
-------------+------------------------------           Adj R-squared =  0.0911
       Total |  428385.539  1533  279.442622           Root MSE      =  15.937

------------------------------------------------------------------------------
       prate |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       mrate |   5.521289   .5258844    10.50   0.000     4.489759    6.552819
         age |   .2431466   .0446999     5.44   0.000     .1554671     .330826
       _cons |   80.11905   .7790208   102.85   0.000     78.59099    81.64711
------------------------------------------------------------------------------
```

reg prate mrate

```
      Source |       SS       df       MS              Number of obs =    1534
-------------+------------------------------           F(  1,  1532) =  123.68
       Model |  32001.7271     1  32001.7271           Prob > F      =  0.0000
    Residual |  396383.812  1532   258.73617           R-squared     =  0.0747
-------------+------------------------------           Adj R-squared =  0.0741
       Total |  428385.539  1533  279.442622           Root MSE      =  16.085

------------------------------------------------------------------------------
       prate |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       mrate |   5.861079   .5270107    11.12   0.000      4.82734    6.894818
       _cons |   83.07546   .5632844   147.48   0.000     81.97057    84.18035
------------------------------------------------------------------------------
```

Example 3.4: Determinants of College GPA

use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA1

reg colGPA hsGPA ACT

```
  Source |       SS       df       MS              Number of obs =     141
---------+------------------------------           F(  2,   138) =   14.78
   Model |  3.42365506     2  1.71182753           Prob > F      =  0.0000
Residual |  15.9824444   138  .115814814           R-squared     =  0.1764
---------+------------------------------           Adj R-squared =  0.1645
   Total |  19.4060994   140  .138614996           Root MSE      =  .34032

------------------------------------------------------------------------------
  colGPA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------+--------------------------------------------------------------------
   hsGPA |   .4534559   .0958129     4.733   0.000      .2640047    .6429071
     ACT |    .009426   .0107772     0.875   0.383     -.0118838    .0307358
   _cons |   1.286328   .3408221     3.774   0.000       .612419    1.960237
```

```
-------------------------------------------------------------------------------
```

Example 3.5: Explaining Arrest Records

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME1
```

```
sum narr86 pcnv avgsen ptime86 qemp86
```

```
Variable |     Obs        Mean    Std. Dev.       Min        Max
---------+--------------------------------------------------------
  narr86 |    2725    .4044037    .8590768          0         12
    pcnv |    2725    .3577872     .395192          0          1
  avgsen |    2725    .6322936    3.508031          0       59.2
 ptime86 |    2725     .387156    1.950051          0         12
  qemp86 |    2725    2.309028    1.610428          0          4
```

```
reg narr86 pcnv ptime86 qemp86
```

```
  Source |       SS       df       MS                  Number of obs =    2725
---------+------------------------------                F(  3,  2721) =   39.10
   Model |  83.0741941     3   27.691398                Prob > F      =  0.0000
Residual |  1927.27296  2721  .708295833                R-squared     =  0.0413
---------+------------------------------                Adj R-squared =  0.0403
   Total |  2010.34716  2724  .738012906                Root MSE      =   .8416

------------------------------------------------------------------------------
  narr86 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    pcnv |  -.1499274   .0408653     -3.669   0.000      -.2300576   -.0697973
 ptime86 |  -.0344199    .008591     -4.007   0.000      -.0512655   -.0175744
  qemp86 |   -.104113   .0103877    -10.023   0.000      -.1244816   -.0837445
   _cons |   .7117715   .0330066     21.565   0.000       .647051    .776492
------------------------------------------------------------------------------
```

Change in the predicted number of arrests when proportion of convictions increases by .5 for 1 man

```
display _b[pcnv]*.5
-.075
```

Change in the predicted number of arrests when proportion of convictions increases by .5 for 100 men

```
display 100*_b[pcnv]*.5
-7.5
```

Change in the predicted number of arrests when prison term increases by 12

```
display _b[ptime86]*12
-.408
```

Change in the predicted number of arrests when legal employment increases by a quarter for 100 men

```
display _b[qemp86]*100
-10.4
```

```
reg narr86 pcnv avgsen ptime86 qemp86
```

```
  Source |       SS       df       MS                  Number of obs =    2725
---------+------------------------------                F(  4,  2720) =   29.96
   Model |  84.8242895     4  21.2060724                Prob > F      =  0.0000
Residual |  1925.52287  2720  .707912819                R-squared     =  0.0422
---------+------------------------------                Adj R-squared =  0.0408
   Total |  2010.34716  2724  .738012906                Root MSE      =  .84138

------------------------------------------------------------------------------
  narr86 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    pcnv |  -.1508319   .0408583     -3.692   0.000      -.2309484   -.0707154
  avgsen |   .0074431   .0047338      1.572   0.116      -.0018392    .0167254
```

```
 ptime86 |  -.0373908   .0087941     -4.252   0.000      -.0546345   -.0201471
  qemp86 |   -.103341   .0103965     -9.940   0.000      -.1237268   -.0829552
   _cons |   .7067565   .0331515     21.319   0.000       .6417519    .771761
------------------------------------------------------------------------------
```

Example 3.6: Hourly Wage Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1

reg lwage educ

```
  Source |       SS       df       MS                  Number of obs =     526
---------+------------------------------                F(  1,   524) =  119.58
   Model |  27.5606296     1  27.5606296                Prob > F      =  0.0000
Residual |  120.769132   524  .230475443                R-squared     =  0.1858
---------+------------------------------                Adj R-squared =  0.1843
   Total |  148.329762   525   .28253288                Root MSE      =  .48008

------------------------------------------------------------------------------
   lwage |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    educ |   .0827444   .0075667     10.935   0.000       .0678796    .0976092
   _cons |   .5837726   .0973358      5.998   0.000       .3925562     .774989
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 13 Sep 2002)

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2d eds.)
Chapter 4 - Multiple Regression Analysis: Inference

Example 4.1: Hourly Wage Equation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1
```

```
reg lwage educ exper tenure
```

```
  Source |       SS       df       MS              Number of obs =     526
---------+------------------------------           F(  3,   522) =   80.39
   Model |  46.8741805     3  15.6247268           Prob > F      =  0.0000
Residual |  101.455581   522  .194359351           R-squared     =  0.3160
---------+------------------------------           Adj R-squared =  0.3121
   Total |  148.329762   525   .28253288           Root MSE      =  .44086

------------------------------------------------------------------------------
   lwage |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    educ |    .092029   .0073299     12.555   0.000       .0776292    .1064288
   exper |   .0041211   .0017233      2.391   0.017       .0007357    .0075065
  tenure |   .0220672   .0030936      7.133   0.000       .0159897    .0281448
   _cons |   .2843595   .1041904      2.729   0.007       .0796755    .4890435
------------------------------------------------------------------------------
```

Inclease in log(wage) if experience increases by 3 years

```
display _b[exper]*3
.0123
```

Example 4.2: Student Performance and School Size

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/MEAP93
```

```
reg math10 totcomp staff enroll
```

```
  Source |       SS       df       MS              Number of obs =     408
---------+------------------------------           F(  3,   404) =    7.70
   Model |  2422.93434     3  807.644779           Prob > F      =  0.0001
Residual |  42394.2462   404  104.936253           R-squared     =  0.0541
---------+------------------------------           Adj R-squared =  0.0470
   Total |  44817.1805   407  110.115923           Root MSE      =  10.244

------------------------------------------------------------------------------
  math10 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
 totcomp |   .0004586   .0001004      4.570   0.000       .0002613    .0006559
   staff |   .0479199    .039814      1.204   0.229      -.0303487    .1261884
  enroll |  -.0001976   .0002152     -0.918   0.359      -.0006207    .0002255
   _cons |   2.274021   6.113794      0.372   0.710        -9.7448    14.29284
------------------------------------------------------------------------------
```

```
reg math10 ltotcomp lstaff lenroll
```

```
  Source |       SS       df       MS              Number of obs =     408
---------+------------------------------           F(  3,   404) =    9.42
   Model |  2930.03231     3  976.677437           Prob > F      =  0.0000
Residual |  41887.1482   404   103.68106           R-squared     =  0.0654
---------+------------------------------           Adj R-squared =  0.0584
   Total |  44817.1805   407  110.115923           Root MSE      =  10.182

------------------------------------------------------------------------------
  math10 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
ltotcomp |   21.15498   4.055549      5.216   0.000       13.18237     29.1276
  lstaff |   3.979981   4.189659      0.950   0.343      -4.256274    12.21624
```

```
 lenroll |  -1.268042   .6932037     -1.829   0.068      -2.630778     .094695
   _cons |  -207.6645   48.70311     -4.264   0.000      -303.4077   -111.9213
------------------------------------------------------------------------------
```

Change in math10 if enrollment increases by 1 percent

```
display _b[lenrol]/100
-.013
```

Example 4.3: Determinants of College GPA

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA1
```

```
reg colGPA hsGPA ACT skipped
```

```
  Source |       SS       df       MS                  Number of obs =     141
---------+------------------------------                F(  3,   137) =   13.92
   Model |  4.53313314     3  1.51104438                Prob > F      =  0.0000
Residual |  14.8729663   137  .108561798                R-squared     =  0.2336
---------+------------------------------                Adj R-squared =  0.2168
   Total |  19.4060994   140  .138614996                Root MSE      =  .32949

------------------------------------------------------------------------------
  colGPA |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
   hsGPA |   .4118162   .0936742      4.396   0.000       .2265819    .5970505
     ACT |   .0147202   .0105649      1.393   0.166      -.0061711    .0356115
 skipped |  -.0831131   .0259985     -3.197   0.002      -.1345234   -.0317028
   _cons |   1.389554   .3315535      4.191   0.000       .7339295    2.045178
------------------------------------------------------------------------------
```

Example 4.4: Campus Crime and Enrollment

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/campus
```

```
reg lcrime lenroll
```

```
      Source |       SS       df       MS              Number of obs =      97
-------------+------------------------------           F(  1,    95) =  133.79
       Model |  107.083654     1  107.083654           Prob > F      =  0.0000
    Residual |  76.0358244    95  .800377098           R-squared     =  0.5848
-------------+------------------------------           Adj R-squared =  0.5804
       Total |  183.119479    96  1.90749457           Root MSE      =  .89464

------------------------------------------------------------------------------
      lcrime |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lenroll |    1.26976    .109776    11.57   0.000     1.051827    1.487693
       _cons |   -6.63137    1.03354    -6.42   0.000    -8.683206   -4.579533
------------------------------------------------------------------------------
```

T-statistics for testing the coefficient on lenrol equal to 1

```
scalar tvalue=(_b[lenrol]-1)/_se[lenrol]
```

```
scalar pvalue=ttail(120,tvalue)
```

```
display "T-value: " tvalue ", P=value: " pvalue
```

```
T-statistics: 2.45737, P=value: .00771259
```

```
test lenroll=1
```

```
 ( 1)  lenroll = 1.0

       F(  1,    95) =    6.04
            Prob > F =    0.0158
```

Example 4.5: Housing Prices and Air Pollution

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/HPRICE2

gen ldist=log(dist)

reg lprice lnox ldist rooms stratio
```

```
  Source |       SS       df       MS                  Number of obs =     506
---------+------------------------------                F(  4,   501) =  175.86
   Model |  49.3987735     4  12.3496934                Prob > F      =  0.0000
Residual |  35.1834974   501  .070226542                R-squared     =  0.5840
---------+------------------------------                Adj R-squared =  0.5807
   Total |  84.5822709   505  .167489645                Root MSE      =    .265

------------------------------------------------------------------------------
  lprice |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    lnox |    -.95354   .1167418     -8.168   0.000      -1.182904   -.7241762
   ldist |  -.1343401   .0431032     -3.117   0.002      -.2190255   -.0496548
   rooms |   .2545271   .0185303     13.736   0.000       .2181203    .2909338
 stratio |  -.0524512   .0058971     -8.894   0.000      -.0640373   -.0408651
   _cons |   11.08387   .3181115     34.843   0.000       10.45887    11.70886
------------------------------------------------------------------------------
```

Example 4.6: Participation Rates in 401K Plans

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/401K

reg prate mrate age totemp
```

```
  Source |       SS       df       MS                  Number of obs =    1534
---------+------------------------------                F(  3,  1530) =   56.41
   Model |  42666.5732     3  14222.1911                Prob > F      =  0.0000
Residual |  385718.966  1530  252.103899                R-squared     =  0.0996
---------+------------------------------                Adj R-squared =  0.0978
   Total |  428385.539  1533  279.442622                Root MSE      =  15.878

------------------------------------------------------------------------------
   prate |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
   mrate |   5.441433   .5244086     10.376   0.000       4.412797    6.470068
     age |   .2694073   .0451486      5.967   0.000       .1808477    .3579669
  totemp |  -.0001298   .0000367     -3.535   0.000      -.0002018   -.0000578
   _cons |   80.29429   .7776952    103.246   0.000       78.76882    81.81975
------------------------------------------------------------------------------
```

Change in participation rate if total employment increases by 10,000

```
 display _b[totemp]*10000
-1.2978125
```

Example 4.7: Effect of Job Training Grants on Firm Scrap Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/JTRAIN

summ hrsemp sales employ
```

```
Variable |     Obs        Mean   Std. Dev.       Min        Max
---------+--------------------------------------------------------
  hrsemp |     390    14.96754   25.71064          0   163.9167
   sales |     373     6116327    7912603     110000   5.40e+07
  employ |     440    59.31591   74.12378          4        525
```

```
reg lscrap hrsemp lsales lemploy
```

```
  Source |       SS       df       MS                  Number of obs =     135
```

```
---------+------------------------------              F(  3,   131) =    4.66
   Model |  27.3075334     3  9.10251115              Prob > F      =  0.0040
Residual |  256.148694   131  1.95533354              R-squared     =  0.0963
---------+------------------------------              Adj R-squared =  0.0756
   Total |  283.456227   134  2.11534498              Root MSE      =  1.3983

------------------------------------------------------------------------------
  lscrap |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  hrsemp |  -.0031172   .0045738     -0.682   0.497      -.0121651    .0059308
  lsales |  -.7265661   .2169671     -3.349   0.001      -1.155779   -.2973534
 lemploy |   .7457646   .2090992      3.567   0.001       .3321164    1.159413
   _cons |   8.800996   2.716819      3.239   0.002        3.42648    14.17551
------------------------------------------------------------------------------
```

Change in Firm Scrap Rates if training per employee increases by 1 hour

```
display _b[hrsemp]*1
-.00311716
```

Change in Firm Scrap Rates if training per employee increases by 5 hour

```
display _b[hrsemp]*5
-.01558579
```

Note: the textbook example is based on an undocumented subset of this dataset.

Example 4.8: Hedonic Price Model for Houses

```
Dataset is not available
```

Example 4.9: Parents Education in a Birth Weight Equation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/BWGHT
```

```
reg bwght cigs parity faminc motheduc fatheduc
```

```
  Source |       SS       df       MS              Number of obs =    1191
---------+------------------------------           F(  5,  1185) =    9.55
   Model |  18705.5567     5  3741.11135            Prob > F      =  0.0000
Residual |  464041.135  1185  391.595895            R-squared     =  0.0387
---------+------------------------------           Adj R-squared =  0.0347
   Total |  482746.692  1190  405.669489            Root MSE      =  19.789

------------------------------------------------------------------------------
   bwght |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    cigs |  -.5959362   .1103479     -5.401   0.000      -.8124352   -.3794373
  parity |   1.787603   .6594055      2.711   0.007       .493871    3.081336
  faminc |   .0560414   .0365616      1.533   0.126      -.0156913    .1277742
motheduc |  -.3704503   .3198551     -1.158   0.247      -.9979957    .2570951
fatheduc |   .4723944   .2826433      1.671   0.095      -.0821426    1.026931
   _cons |   114.5243   3.728453     30.716   0.000       107.2092    121.8394
------------------------------------------------------------------------------
```

Test for joint significance of motheduc and fatheduc

```
test motheduc fatheduc
```

```
 ( 1)  motheduc = 0.0
 ( 2)  fatheduc = 0.0

       F(  2,  1185) =    1.44
            Prob > F =    0.2380
```

```
reg bwght cigs parity faminc if e(sample)
```

```
      Source |       SS       df       MS              Number of obs =    1191
```

```
-------------+------------------------------           F(  3,  1187) =   14.95
       Model |  17579.8997     3  5859.96658           Prob > F      =  0.0000
    Residual |  465166.792  1187  391.884408           R-squared     =  0.0364
-------------+------------------------------           Adj R-squared =  0.0340
       Total |  482746.692  1190  405.669489           Root MSE      =  19.796

------------------------------------------------------------------------------
       bwght |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        cigs |  -.5978519   .1087701    -5.50   0.000    -.8112549   -.3844489
      parity |   1.832274   .6575402     2.79   0.005     .5422035    3.122345
      faminc |   .0670618   .0323938     2.07   0.039     .0035063    .1306173
       _cons |   115.4699   1.655898    69.73   0.000     112.2211    118.7187
------------------------------------------------------------------------------
```

Example 4.10: Salary-Pension Tradeoff for Teachers

use http://fmwww.bc.edu/ec-p/data/wooldridge/MEAP93

reg lsalary bensal lenrol lstaff droprate gradrate

```
  Source |       SS       df       MS                  Number of obs =     408
---------+------------------------------                 F(  5,   402) =   45.43
   Model |  3.49912092     5  .699824185                 Prob > F      =  0.0000
Residual |  6.19292056   402  .015405275                 R-squared     =  0.3610
---------+------------------------------                 Adj R-squared =  0.3531
   Total |  9.69204149   407   .02381337                 Root MSE      =  .12412

------------------------------------------------------------------------------
 lsalary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  bensal |  -.5893175   .1648739     -3.574   0.000      -.9134402   -.2651948
 lenroll |   .0881206    .007324     12.032   0.000       .0737224    .1025187
  lstaff |  -.2182771   .0499504     -4.370   0.000      -.3164737   -.1200806
droprate |  -.0002826   .0016145     -0.175   0.861      -.0034565    .0028913
gradrate |   .0009674   .0006625      1.460   0.145      -.0003351    .0022699
   _cons |   10.73846   .2582652     41.579   0.000       10.23074    11.24618
------------------------------------------------------------------------------
```

reg lsalary bensal lenrol lstaff

```
  Source |       SS       df       MS                  Number of obs =     408
---------+------------------------------                 F(  3,   404) =   73.39
   Model |  3.41865698     3  1.13955233                 Prob > F      =  0.0000
Residual |  6.27338451   404  .015528179                 R-squared     =  0.3527
---------+------------------------------                 Adj R-squared =  0.3479
   Total |  9.69204149   407   .02381337                 Root MSE      =  .12461

------------------------------------------------------------------------------
 lsalary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
  bensal |  -.6047698   .1653685     -3.657   0.000      -.9298599   -.2796797
 lenroll |   .0873968   .0073462     11.897   0.000       .0729552    .1018385
  lstaff |  -.2220324   .0500774     -4.434   0.000      -.3204773   -.1235875
   _cons |   10.84383   .2516434     43.092   0.000       10.34914    11.33853
------------------------------------------------------------------------------
```

reg lsalary bensal

```
  Source |       SS       df       MS                  Number of obs =     408
---------+------------------------------                 F(  1,   406) =   17.05
   Model |  .390608607     1  .390608607                 Prob > F      =  0.0000
Residual |  9.30143288   406  .022909933                 R-squared     =  0.0403
---------+------------------------------                 Adj R-squared =  0.0379
   Total |  9.69204149   407   .02381337                 Root MSE      =  .15136
```

lsalary	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
bensal	-.8253933	.199895	-4.129	0.000	-1.218352	-.4324349
_cons	10.52318	.0415602	253.203	0.000	10.44148	10.60488

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2d eds.)
Chapter 5 - Multiple Regression Analysis: OLS Asymptotics

Example 5.2: Standard Errors in a Birth Weight Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/BWGHT

Regression with 694 observations

reg lbwght cigs lfaminc in 1/694

```
  Source |       SS       df       MS                  Number of obs =     694
---------+------------------------------               F(  2,   691) =   10.52
   Model |  .809213892     2  .404606946               Prob > F      =  0.0000
Residual |  26.5787089   691  .038464123               R-squared     =  0.0295
---------+------------------------------               Adj R-squared =  0.0267
   Total |  27.3879228   693  .039520812               Root MSE      =  .19612

------------------------------------------------------------------------------
  lbwght |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    cigs |  -.0046368   .0013319     -3.481   0.001      -.0072519   -.0020216
 lfaminc |   .0194044   .0081884      2.370   0.018       .0033274    .0354815
   _cons |   4.705583    .027053    173.939   0.000       4.652467    4.758699
------------------------------------------------------------------------------
```

Regression with 1388 observations

reg lbwght cigs lfaminc

```
  Source |       SS       df       MS                  Number of obs =    1388
---------+------------------------------               F(  2,  1385) =   18.31
   Model |  1.29879046     2   .64939523               Prob > F      =  0.0000
Residual |  49.1215342  1385  .035466812               R-squared     =  0.0258
---------+------------------------------               Adj R-squared =  0.0244
   Total |  50.4203246  1387  .036352073               Root MSE      =  .18833

------------------------------------------------------------------------------
  lbwght |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    cigs |  -.0040816   .0008582     -4.756   0.000      -.0057651    -.002398
 lfaminc |   .0162657   .0055833      2.913   0.004        .005313    .0272183
   _cons |   4.718594   .0182445    258.631   0.000       4.682804    4.754383
------------------------------------------------------------------------------
```

Example 5.3: Economic Model of Crime

use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME1

reg narr86 pcnv ptime86 qemp86

```
  Source |       SS       df       MS                  Number of obs =    2725
---------+------------------------------               F(  3,  2721) =   39.10
   Model |  83.0741941     3   27.691398               Prob > F      =  0.0000
Residual |  1927.27296  2721  .708295833               R-squared     =  0.0413
---------+------------------------------               Adj R-squared =  0.0403
   Total |  2010.34716  2724  .738012906               Root MSE      =   .8416

------------------------------------------------------------------------------
  narr86 |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    pcnv |  -.1499274   .0408653     -3.669   0.000      -.2300576   -.0697973
 ptime86 |  -.0344199    .008591     -4.007   0.000      -.0512655   -.0175744
  qemp86 |   -.104113   .0103877    -10.023   0.000      -.1244816   -.0837445
   _cons |   .7117715   .0330066     21.565   0.000        .647051     .776492
------------------------------------------------------------------------------
```

predict ubar, resid

reg ubar pcnv ptime86 qemp86 avgsen tottime

```
  Source |       SS       df       MS                  Number of obs =    2725
---------+------------------------------                F(  5,  2719) =    0.81
   Model |  2.87904835     5  .575809669                Prob > F      =  0.5398
Residual |  1924.39392  2719  .707757969                R-squared     =  0.0015
---------+------------------------------                Adj R-squared = -0.0003
   Total |  1927.27297  2724  .707515773                Root MSE      =  .84128

------------------------------------------------------------------------------
    ubar |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
    pcnv |  -.0012971    .040855     -0.032   0.975      -.0814072    .0788129
 ptime86 |  -.0048386   .0089166     -0.543   0.587      -.0223226    .0126454
  qemp86 |   .0010221   .0103972      0.098   0.922      -.0193652    .0214093
  avgsen |  -.0070487   .0124122     -0.568   0.570       -.031387    .0172897
 tottime |   .0120953   .0095768      1.263   0.207      -.0066833     .030874
   _cons |  -.0057108   .0331524     -0.172   0.863      -.0707173    .0592956
------------------------------------------------------------------------------
```

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 6 - Multiple Regression Analysis: Further Issues

Example 6.1: Effect of Pollution on Housing Prices

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/HPRICE2
```

```
reg price nox crime rooms dist stratio, beta
```

```
  Source |       SS       df       MS                  Number of obs =     506
---------+------------------------------                F(  5,   500) =  174.47
   Model |  2.7223e+10     5  5.4445e+09                Prob > F      =  0.0000
Residual |  1.5603e+10   500  31205611.6                R-squared     =  0.6357
---------+------------------------------                Adj R-squared =  0.6320
   Total |  4.2826e+10   505  84803032.0                Root MSE      =  5586.2

------------------------------------------------------------------------------
   price |      Coef.   Std. Err.       t     P>|t|                     Beta
---------+--------------------------------------------------------------------
     nox |  -2706.433   354.0869     -7.643   0.000                  -.340446
   crime |   -153.601   32.92883     -4.665   0.000                 -.1432828
   rooms |   6735.498   393.6037     17.112   0.000                  .5138878
    dist |  -1026.806   188.1079     -5.459   0.000                 -.2348385
 stratio |  -1149.204   127.4287     -9.018   0.000                 -.2702799
   _cons |   20871.13   5054.599      4.129   0.000                         .
------------------------------------------------------------------------------
```

Example 6.2: Effect of Pollution on Housing Prices

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PRICE2
```

```
gen rooms2=rooms*rooms
```

```
gen ldist=log(dist)
```

```
reg lprice lnox ldist rooms rooms2 stratio
```

```
  Source |       SS       df       MS                  Number of obs =     506
---------+------------------------------                F(  5,   500) =  151.77
   Model |    50.98725     5    10.19745                Prob > F      =  0.0000
Residual |   33.595021   500  .067190042                R-squared     =  0.6028
---------+------------------------------                Adj R-squared =  0.5988
   Total |  84.5822709   505  .167489645                Root MSE      =  .25921

------------------------------------------------------------------------------
  lprice |      Coef.   Std. Err.       t     P>|t|     [95% Conf. Interval]
---------+--------------------------------------------------------------------
    lnox |  -.9016832    .114687     -7.862   0.000    -1.127011   -.6763553
   ldist |  -.0867821   .0432808     -2.005   0.045    -.1718166   -.0017475
   rooms |  -.5451122   .1654542     -3.295   0.001    -.8701834    -.220041
  rooms2 |   .0622611    .012805      4.862   0.000     .0371029    .0874194
 stratio |  -.0475903   .0058542     -8.129   0.000    -.0590921   -.0360884
   _cons |   13.38548   .5664734     23.629   0.000     12.27252    14.49844
------------------------------------------------------------------------------
```

Turnaround value of rooms

```
display -1*_b[rooms]/(2*_b[rooms2])
4.3776278
```

Change in price if rooms increases from 5 to 6

```
display 100*(_b[rooms]+2*_b[rooms2]*5)
7.7499207
```

Change in price if rooms increases from 6 to 7

```
display 100*(_b[rooms]+2*_b[rooms2]*6)
```

```
20.202149
```

Example 6.3: Effect of Attendance on Final Exam Performance

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/ATTEND

summ priGPA
Variable |     Obs        Mean    Std. Dev.       Min        Max
---------+--------------------------------------------------------
  priGPA |     680    2.586775    .5447141       .857       3.93

gen priGPA2=priGPA*priGPA

gen ACT2=ACT*ACT

gen priatn=priGPA*atndrte

reg stndfnl atndrte priGPA ACT priGPA2 ACT2 priatn

  Source |       SS       df       MS                  Number of obs =     680
---------+------------------------------               F(  6,   673) =   33.25
   Model |  152.001001     6  25.3335002               Prob > F      =  0.0000
Residual |   512.76244   673  .761905557               R-squared     =  0.2287
---------+------------------------------               Adj R-squared =  0.2218
   Total |  664.763441   679   .97903305               Root MSE      =  .87287

------------------------------------------------------------------------------
 stndfnl |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
 atndrte |  -.0067129   .0102321     -0.656   0.512      -.0268035    .0133777
  priGPA |   -1.62854   .4810025     -3.386   0.001      -2.572986   -.6840938
     ACT |  -.1280394    .098492     -1.300   0.194      -.3214279    .0653492
 priGPA2 |   .2959046   .1010495      2.928   0.004       .0974945    .4943147
    ACT2 |   .0045334   .0021764      2.083   0.038          .00026    .0088068
  priatn |   .0055859   .0043174      1.294   0.196      -.0028913    .0140631
   _cons |   2.050293   1.360319      1.507   0.132      -.6206864    4.721272
------------------------------------------------------------------------------
```

Partial effect of atndrte on stndfnl

```
display _b[atndrte]+_b[priatn]*2.59
.00775457
```

Example 6.4: CEO Compensation and Firm Performance

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CEOSAL

reg salary sales roe

  Source |       SS       df       MS                  Number of obs =     209
---------+------------------------------               F(  2,   206) =    3.09
   Model |  11427511.8     2  5713755.89               Prob > F      =  0.0474
Residual |   380305470   206  1846143.06               R-squared     =  0.0292
---------+------------------------------               Adj R-squared =  0.0197
   Total |   391732982   208  1883331.64               Root MSE      =  1358.7

------------------------------------------------------------------------------
  salary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
---------+--------------------------------------------------------------------
   sales |   .0163416   .0088736      1.842   0.067      -.0011532    .0338363
     roe |   19.63097   11.07655      1.772   0.078       -2.20697    41.46891
   _cons |   830.6313   223.9049      3.710   0.000       389.1924     1272.07
------------------------------------------------------------------------------

reg lsalary lsales roe

  Source |       SS       df       MS                  Number of obs =     209
---------+------------------------------               F(  2,   206) =   40.45
```

```
      Model |  18.8149023     2  9.40745113           Prob > F      =  0.0000
   Residual |  47.9072676   206  .232559552           R-squared     =  0.2820
-------------+------------------------------           Adj R-squared =  0.2750
      Total |  66.7221699   208  .320779663           Root MSE      =  .48224

------------------------------------------------------------------------------
     lsalary |      Coef.   Std. Err.       t     P>|t|       [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lsales |   .2750875    .033254      8.272   0.000       .2095258    .3406492
         roe |   .0178723   .0039551      4.519   0.000       .0100746    .0256699
       _cons |   4.362167   .2938776     14.843   0.000       3.782774    4.941561
------------------------------------------------------------------------------
```

Example 6.5: Confidence Interval for Predicted College GPA (Approach in Book)

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA2

gen hsize2=hsize*hsize

reg colgpa sat hsperc hsize hsize2
```

```
      Source |       SS       df       MS              Number of obs =    4137
-------------+------------------------------           F(  4,  4132) =  398.02
       Model |  499.030504     4  124.757626           Prob > F      =  0.0000
    Residual |  1295.16517  4132  .313447524           R-squared     =  0.2781
-------------+------------------------------           Adj R-squared =  0.2774
       Total |  1794.19567  4136  .433799728           Root MSE      =  .55986

------------------------------------------------------------------------------
      colgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         sat |   .0014925   .0000652    22.89   0.000     .0013646    .0016204
      hsperc |  -.0138558    .000561   -24.70   0.000    -.0149557   -.0127559
       hsize |  -.0608815   .0165012    -3.69   0.000    -.0932327   -.0285302
      hsize2 |   .0054603   .0022698     2.41   0.016     .0010102    .0099104
       _cons |   1.492652   .0753414    19.81   0.000     1.344942    1.640362
------------------------------------------------------------------------------
```

Predicted college GPA

```
display _b[_cons]+_b[sat]*1200+_b[hsperc]*30+_b[hsize]*5+_b[hsize2]*25
2.7000755

gen sat0=sat-1200

gen hsperc0=hsperc-30

gen hsize0=hsize-5

gen hsize20=hsize2-25

reg colgpa sat0 hsperc0 hsize0 hsize20
```

```
      Source |       SS       df       MS              Number of obs =    4137
-------------+------------------------------           F(  4,  4132) =  398.02
       Model |  499.030503     4  124.757626           Prob > F      =  0.0000
    Residual |  1295.16517  4132  .313447524           R-squared     =  0.2781
-------------+------------------------------           Adj R-squared =  0.2774
       Total |  1794.19567  4136  .433799728           Root MSE      =  .55986

------------------------------------------------------------------------------
      colgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        sat0 |   .0014925   .0000652    22.89   0.000     .0013646    .0016204
     hsperc0 |  -.0138558    .000561   -24.70   0.000    -.0149557   -.0127559
      hsize0 |  -.0608815   .0165012    -3.69   0.000    -.0932327   -.0285302
     hsize20 |   .0054603   .0022698     2.41   0.016     .0010102    .0099104
       _cons |   2.700075   .0198778   135.83   0.000     2.661104    2.739047
------------------------------------------------------------------------------
```

Example 6.5: Confidence Interval for Predicted College GPA (Another Approach)

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA2

gen hsize2=hsize*hsize

reg colgpa sat hsperc hsize hsize2
```

```
      Source |       SS       df       MS              Number of obs =    4137
-------------+------------------------------           F(  4,  4132) =  398.02
       Model |  499.030504     4  124.757626            Prob > F      =  0.0000
    Residual |  1295.16517  4132  .313447524            R-squared     =  0.2781
-------------+------------------------------           Adj R-squared =  0.2774
       Total |  1794.19567  4136  .433799728            Root MSE      =  .55986

------------------------------------------------------------------------------
      colgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         sat |   .0014925   .0000652    22.89   0.000     .0013646    .0016204
      hsperc |  -.0138558    .000561   -24.70   0.000    -.0149557   -.0127559
       hsize |  -.0608815   .0165012    -3.69   0.000    -.0932327   -.0285302
      hsize2 |   .0054603   .0022698     2.41   0.016     .0010102    .0099104
       _cons |   1.492652   .0753414    19.81   0.000     1.344942    1.640362
------------------------------------------------------------------------------
```

```
set obs 4138

replace sat=1200 in 4138/4138

replace hsperc=30 in 4138/4138

replace hsize=5 in 4138/4138

replace hsize2=25 in 4138/4138

regress
```

```
      Source |       SS       df       MS              Number of obs =    4137
-------------+------------------------------           F(  4,  4132) =  398.02
       Model |  499.030504     4  124.757626            Prob > F      =  0.0000
    Residual |  1295.16517  4132  .313447524            R-squared     =  0.2781
-------------+------------------------------           Adj R-squared =  0.2774
       Total |  1794.19567  4136  .433799728            Root MSE      =  .55986

------------------------------------------------------------------------------
      colgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         sat |   .0014925   .0000652    22.89   0.000     .0013646    .0016204
      hsperc |  -.0138558    .000561   -24.70   0.000    -.0149557   -.0127559
       hsize |  -.0608815   .0165012    -3.69   0.000    -.0932327   -.0285302
      hsize2 |   .0054603   .0022698     2.41   0.016     .0010102    .0099104
       _cons |   1.492652   .0753414    19.81   0.000     1.344942    1.640362
------------------------------------------------------------------------------
```

```
predict colgpahat in 4138/4138,stdp

predict colgpahatt in 4138/4138,xb

gen lb =  colgpahatt-1.96* colgpahat in 4138/4138

gen ub =  colgpahatt+1.96* colgpahat in 4138/4138

list  colgpahat lb colgpahatt ub in 4138/4138
```

```
      colgpahat         lb  colgpahatt        ub
4138.  .0198778   2.661115   2.700075   2.739036
```

Example 6.6: Confidence Interval for Future College GPA

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA2

gen hsize2=hsize*hsize

reg colgpa sat hsperc hsize hsize2
```

```
      Source |       SS       df       MS              Number of obs =    4137
-------------+------------------------------           F(  4,  4132) =  398.02
       Model |  499.030504     4  124.757626            Prob > F      =  0.0000
    Residual |  1295.16517  4132  .313447524            R-squared     =  0.2781
-------------+------------------------------           Adj R-squared =  0.2774
       Total |  1794.19567  4136  .433799728            Root MSE      =  .55986

------------------------------------------------------------------------------
      colgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         sat |   .0014925   .0000652    22.89   0.000     .0013646    .0016204
      hsperc |  -.0138558    .000561   -24.70   0.000    -.0149557   -.0127559
       hsize |  -.0608815   .0165012    -3.69   0.000    -.0932327   -.0285302
      hsize2 |   .0054603   .0022698     2.41   0.016     .0010102    .0099104
       _cons |   1.492652   .0753414    19.81   0.000     1.344942    1.640362
------------------------------------------------------------------------------
```

```
set obs 4138

replace sat=1200 in 4138/4138

replace hsperc=30 in 4138/4138

replace hsize=5 in 4138/4138

replace hsize2=25 in 4138/4138

regress
```

```
      Source |       SS       df       MS              Number of obs =    4137
-------------+------------------------------           F(  4,  4132) =  398.02
       Model |  499.030504     4  124.757626            Prob > F      =  0.0000
    Residual |  1295.16517  4132  .313447524            R-squared     =  0.2781
-------------+------------------------------           Adj R-squared =  0.2774
       Total |  1794.19567  4136  .433799728            Root MSE      =  .55986

------------------------------------------------------------------------------
      colgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         sat |   .0014925   .0000652    22.89   0.000     .0013646    .0016204
      hsperc |  -.0138558    .000561   -24.70   0.000    -.0149557   -.0127559
       hsize |  -.0608815   .0165012    -3.69   0.000    -.0932327   -.0285302
      hsize2 |   .0054603   .0022698     2.41   0.016     .0010102    .0099104
       _cons |   1.492652   .0753414    19.81   0.000     1.344942    1.640362
------------------------------------------------------------------------------
```

```
predict cc in 4138/4138,stdf

predict colgpahatt in 4138/4138,xb

gen lb1 =  colgpahatt-1.96* cc in 4138/4138

gen ub1 =  colgpahatt+1.96* cc in 4138/4138

list  cc lb1 colgpahatt ub1 in 4138/4138
```

```
             cc        lb1  colgpahatt        ub1
4138.  .5602166   1.602051   2.700075     3.7981
```

Example 6.7: Predicting CEO Salaries

use http://fmwww.bc.edu/ec-p/data/wooldridge/CEOSAL2

reg lsalary lsales lmktval ceoten

```
      Source |       SS       df       MS              Number of obs =     177
-------------+------------------------------           F(  3,   173) =   26.91
       Model |  20.5672427     3  6.85574758           Prob > F      =  0.0000
    Residual |  44.0789788   173  .254791785           R-squared     =  0.3182
-------------+------------------------------           Adj R-squared =  0.3063
       Total |  64.6462215   176  .367308077           Root MSE      =  .50477

------------------------------------------------------------------------------
     lsalary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lsales |   .1628544   .0392421     4.15   0.000     .0853995    .2403094
     lmktval |    .109243   .0495947     2.20   0.029     .0113545    .2071315
      ceoten |   .0117054   .0053261     2.20   0.029      .001193    .0222178
       _cons |   4.503795   .2572344    17.51   0.000     3.996073    5.011517
------------------------------------------------------------------------------
```

predict lsal, xb

gen mhat=exp(lsal)

Predicted salary

display _b[_cons]+_b[lsales]*log(5000)+_b[lmktval]*log(10000)+_b[ceoten]*10
7.014077

reg salary mhat, noconstant

```
      Source |       SS       df       MS              Number of obs =     177
-------------+------------------------------           F(  1,   176) =  562.39
       Model |   147352712     1   147352712           Prob > F      =  0.0000
    Residual |  46113900.4   176  262010.798           R-squared     =  0.7616
-------------+------------------------------           Adj R-squared =  0.7603
       Total |   193466612   177  1093031.71           Root MSE      =  511.87

------------------------------------------------------------------------------
      salary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        mhat |   1.116857   .0470953    23.71   0.000     1.023912    1.209801
------------------------------------------------------------------------------
```

Predicted salary

display _b[mhat]*exp(7.013)
1240.9674

Example 6.8: Predicting CEO Salaries

use http://fmwww.bc.edu/ec-p/data/wooldridge/CEOSAL2

reg salary sales mktval ceoten

```
      Source |       SS       df       MS              Number of obs =     177
-------------+------------------------------           F(  3,   173) =   14.53
       Model |  12230632.6     3  4076877.52           Prob > F      =  0.0000
    Residual |  48535332.2   173  280551.053           R-squared     =  0.2013
-------------+------------------------------           Adj R-squared =  0.1874
       Total |  60765964.7   176  345261.163           Root MSE      =  529.67

------------------------------------------------------------------------------
      salary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       sales |   .0190191   .0100561     1.89   0.060    -.0008294    .0388676
      mktval |   .0234003   .0094826     2.47   0.015     .0046839    .0421167
```

```
      ceoten |   12.70337   5.618052     2.26   0.025     1.614616    23.79211
       _cons |   613.4361   65.23685     9.40   0.000     484.6735    742.1987
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 7 - Multiple Regression Analysis with Qualitative Information: Binary (or Dummy) Variables

Example 7.1: Hourly Wage Equation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1
```

```
reg wage female educ exper tenure
```

```
      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  4,   521) =   74.40
       Model |  2603.10658     4  650.776644            Prob > F      =  0.0000
    Residual |  4557.30771   521   8.7472317           R-squared     =  0.3635
-------------+------------------------------           Adj R-squared =  0.3587
       Total |  7160.41429   525  13.6388844           Root MSE      =  2.9576

------------------------------------------------------------------------------
        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -1.810852   .2648252    -6.84   0.000    -2.331109   -1.290596
        educ |   .5715048   .0493373    11.58   0.000     .4745803    .6684293
       exper |   .0253959   .0115694     2.20   0.029     .0026674    .0481243
      tenure |   .1410051   .0211617     6.66   0.000     .0994323    .1825778
       _cons |  -1.567939   .7245511    -2.16   0.031    -2.991339    -.144538
------------------------------------------------------------------------------
```

```
reg wage female
```

```
      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  1,   524) =   68.54
       Model |  828.220467     1  828.220467            Prob > F      =  0.0000
    Residual |  6332.19382   524  12.0843394           R-squared     =  0.1157
-------------+------------------------------           Adj R-squared =  0.1140
       Total |  7160.41429   525  13.6388844           Root MSE      =  3.4763

------------------------------------------------------------------------------
        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |   -2.51183   .3034092    -8.28   0.000    -3.107878   -1.915782
       _cons |   7.099489   .2100082    33.81   0.000     6.686928    7.51205
------------------------------------------------------------------------------
```

Average wage for women

```
lincom female+_cons
```

```
 ( 1)  female + _cons = 0.0

------------------------------------------------------------------------------
        wage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   4.587659   .2189834    20.95   0.000     4.157466    5.017852
------------------------------------------------------------------------------
```

Example 7.2: Effects of Computer Ownership on College GPA

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA1
```

```
reg colGPA PC hsGPA ACT
```

```
      Source |       SS       df       MS              Number of obs =     141
-------------+------------------------------           F(  3,   137) =   12.83
       Model |  4.25741863     3  1.41913954            Prob > F      =  0.0000
    Residual |  15.1486808   137  .110574313           R-squared     =  0.2194
-------------+------------------------------           Adj R-squared =  0.2023
       Total |  19.4060994   140  .138614996           Root MSE      =  .33253

------------------------------------------------------------------------------
      colGPA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          PC |   .1573092   .0572875     2.75   0.007     .0440271    .2705913
       hsGPA |   .4472417   .0936475     4.78   0.000     .2620603     .632423
         ACT |    .008659   .0105342     0.82   0.413    -.0121717    .0294897
------------------------------------------------------------------------------
```

```
       _cons |    1.26352   .3331255     3.79   0.000     .6047871    1.922253
------------------------------------------------------------------------------
```

reg colGPA PC

```
      Source |       SS       df       MS              Number of obs =     141
-------------+------------------------------           F(  1,   139) =    7.31
       Model |  .970092892     1  .970092892           Prob > F      =  0.0077
    Residual |  18.4360066   139  .132633141           R-squared     =  0.0500
-------------+------------------------------           Adj R-squared =  0.0432
       Total |  19.4060994   140  .138614996           Root MSE      =  .36419

------------------------------------------------------------------------------
      colGPA |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          PC |   .1695168   .0626805     2.70   0.008     .0455864    .2934472
       _cons |   2.989412   .0395018    75.68   0.000      2.91131    3.067514
------------------------------------------------------------------------------
```

Example 7.3: Effects of Training Grants on Hours of Training in 1988

use http://fmwww.bc.edu/ec-p/data/wooldridge/JTRAIN

reg hrsemp grant lsales lemploy if year==1988

```
      Source |       SS       df       MS              Number of obs =     105
-------------+------------------------------           F(  3,   101) =   10.44
       Model |  18622.7243     3  6207.57476           Prob > F      =  0.0000
    Residual |  60031.0957   101  594.367284           R-squared     =  0.2368
-------------+------------------------------           Adj R-squared =  0.2141
       Total |    78653.82   104  756.286731           Root MSE      =   24.38

------------------------------------------------------------------------------
      hrsemp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       grant |    26.2545   5.591766     4.70   0.000     15.16194    37.34706
      lsales |  -.9845776   3.539904    -0.28   0.781    -8.006795     6.03764
     lemploy |  -6.069873   3.882894    -1.56   0.121    -13.77249    1.632744
       _cons |   46.66504   43.41211     1.07   0.285     -39.4529     132.783
------------------------------------------------------------------------------
```

Example 7.4: Housing Price Regression

use http://fmwww.bc.edu/ec-p/data/wooldridge/HPRICE1

reg lprice llotsize lsqrft bdrms colonial

```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  4,    83) =   38.38
       Model |  5.20400088     4  1.30100022           Prob > F      =  0.0000
    Residual |  2.81362108    83  .033899049           R-squared     =  0.6491
-------------+------------------------------           Adj R-squared =  0.6322
       Total |  8.01762195    87  .092156574           Root MSE      =  .18412

------------------------------------------------------------------------------
      lprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    llotsize |   .1678202   .0381806     4.40   0.000     .0918805    .2437599
      lsqrft |   .7071932   .0928019     7.62   0.000     .5226139    .8917725
       bdrms |   .0268308   .0287235     0.93   0.353    -.0302992    .0839608
    colonial |   .0537949   .0447732     1.20   0.233    -.0352572     .142847
       _cons |   5.558154   .6510406     8.54   0.000     4.263261    6.853048
------------------------------------------------------------------------------
```

Example 7.5: Log Hourly Wage Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1

reg lwage female educ exper expersq tenure tenursq

```
      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  6,   519) =   68.18
       Model |  65.3791002     6  10.8965167           Prob > F      =  0.0000
```

```
    Residual |  82.9506616   519  .159827864           R-squared     =  0.4408
-------------+----------------------------           Adj R-squared =  0.4343
       Total |  148.329762   525   .28253288           Root MSE      =  .39978

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |   -.296511   .0358055    -8.28   0.000    -.3668524   -.2261695
        educ |   .0801967   .0067573    11.87   0.000     .0669217    .0934716
       exper |   .0294324   .0049752     5.92   0.000     .0196584    .0392063
     expersq |  -.0005827   .0001073    -5.43   0.000    -.0007935   -.0003719
      tenure |   .0317139   .0068452     4.63   0.000     .0182663    .0451616
     tenursq |  -.0005852   .0002347    -2.49   0.013    -.0010463   -.0001241
       _cons |   .4166909   .0989279     4.21   0.000     .2223425    .6110393
------------------------------------------------------------------------------
```

Difference between woman's and man's wage

```
di exp(_b[female]*1)-1
-.25659254
```

Example 7.6: Log Hourly Wage Equation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE1

gen male = (!female)

gen single = (~married)

gen marrmale = (married & ~female)

gen marrfem = (married & female)

gen singfem = (female & ~married)

gen singmale = (~female & ~married)

reg lwage marrmale marrfem singfem educ exper expersq tenure tenursq

      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  8,   517) =   55.25
       Model |  68.3617614     8  8.54522017           Prob > F      =  0.0000
    Residual |  79.9680004   517  .154676983           R-squared     =  0.4609
-------------+------------------------------           Adj R-squared =  0.4525
       Total |  148.329762   525   .28253288           Root MSE      =  .39329

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    marrmale |   .2126756   .0553572     3.84   0.000      .103923    .3214283
     marrfem |  -.1982676   .0578355    -3.43   0.001    -.3118891   -.0846462
     singfem |  -.1103502   .0557421    -1.98   0.048     -.219859   -.0008414
        educ |   .0789103   .0066945    11.79   0.000     .0657585    .0920621
       exper |   .0268006   .0052428     5.11   0.000     .0165007    .0371005
     expersq |  -.0005352   .0001104    -4.85   0.000    -.0007522   -.0003183
      tenure |   .0290875    .006762     4.30   0.000     .0158031    .0423719
     tenursq |  -.0005331   .0002312    -2.31   0.022    -.0009874   -.0000789
       _cons |    .321378    .100009     3.21   0.001     .1249041     .517852
------------------------------------------------------------------------------
```

Difference in lwage between married and single women

```
lincom singfem-marrfem

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .0879174   .0523481     1.68   0.094    -.0149238    .1907587
------------------------------------------------------------------------------

reg lwage marrmale singmale singfem educ exper expersq tenure tenursq

      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  8,   517) =   55.25
       Model |  68.3617614     8  8.54522017           Prob > F      =  0.0000
    Residual |  79.9680004   517  .154676983           R-squared     =  0.4609
```

```
-------------+------------------------------           Adj R-squared =  0.4525
       Total |  148.329762   525   .28253288           Root MSE      =  .39329

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    marrmale |   .4109433   .0457709     8.98   0.000     .3210234    .5008631
    singmale |   .1982676   .0578355     3.43   0.001     .0846462    .3118891
     singfem |   .0879174   .0523481     1.68   0.094    -.0149238    .1907587
        educ |   .0789103   .0066945    11.79   0.000     .0657585    .0920621
       exper |   .0268006   .0052428     5.11   0.000     .0165007    .0371005
     expersq |  -.0005352   .0001104    -4.85   0.000    -.0007522   -.0003183
      tenure |   .0290875    .006762     4.30   0.000     .0158031    .0423719
     tenursq |  -.0005331   .0002312    -2.31   0.022    -.0009874   -.0000789
       _cons |   .1231104   .1057937     1.16   0.245     -.084728    .3309488
------------------------------------------------------------------------------
```

Example 7.7: Effects of Physical Attractiveness on Wage

Dataset is not available

Example 7.8: Effects of Law School Rankings on Starting Salaries

use http://fmwww.bc.edu/ec-p/data/wooldridge/LAWSCH85

gen r61_100 = (rank>60 & rank<101)

reg lsalary top10 r11_25 r26_40 r41_60 r61_100 LSAT GPA llibvol lcost

```
      Source |       SS       df       MS              Number of obs =     136
-------------+------------------------------           F(  9,   126) =  143.20
       Model |  9.45225307     9  1.05025034           Prob > F      =  0.0000
    Residual |  .924109594   126  .007334203           R-squared     =  0.9109
-------------+------------------------------           Adj R-squared =  0.9046
       Total |  10.3763627   135  .076861946           Root MSE      =  .08564

------------------------------------------------------------------------------
     lsalary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       top10 |   .6995646   .0534919    13.08   0.000     .5937057    .8054236
      r11_25 |   .5935444     .03944    15.05   0.000     .5154938    .6715951
      r26_40 |   .3750779   .0340812    11.01   0.000     .3076322    .4425236
      r41_60 |     .26282    .027962     9.40   0.000     .2074839    .3181561
     r61_100 |   .1315946   .0210418     6.25   0.000     .0899535    .1732358
        LSAT |   .0056908    .003063     1.86   0.066    -.0003708    .0117524
         GPA |   .0137274   .0741919     0.19   0.854    -.1330962    .1605509
     llibvol |   .0363614   .0260165     1.40   0.165    -.0151245    .0878472
       lcost |   .0008418    .025136     0.03   0.973    -.0489017    .0505852
       _cons |   9.165292   .4114241    22.28   0.000     8.351096    9.979488
------------------------------------------------------------------------------
```

Difference in starting wage between top 10 below 100 school

di exp(_[top10]*1)-1

```
1.0137
```

reg lsalary rank LSAT GPA llibvol lcost

```
      Source |       SS       df       MS              Number of obs =     136
-------------+------------------------------           F(  5,   130) =  138.23
       Model |  8.73363382     5  1.74672676           Prob > F      =  0.0000
    Residual |  1.64272884   130  .012636376           R-squared     =  0.8417
-------------+------------------------------           Adj R-squared =  0.8356
       Total |  10.3763627   135  .076861946           Root MSE      =  .11241

------------------------------------------------------------------------------
     lsalary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        rank |  -.0033246   .0003485    -9.54   0.000     -.004014   -.0026352
        LSAT |   .0046964   .0040105     1.17   0.244    -.0032379    .0126307
         GPA |   .2475245    .090037     2.75   0.007      .069397    .4256519
     llibvol |   .0949925   .0332543     2.86   0.005     .0292028    .1607823
       lcost |   .0375543   .0321061     1.17   0.244    -.0259637    .1010723
       _cons |   8.343234   .5325191    15.67   0.000     7.289709    9.396759
```

```
------------------------------------------------------------------------------
```

Example 7.9: Effects of Computer Usage on Wages

Dataset is not available

Example 7.10: Log Hourly Wage Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE2

gen femed = female*educ

reg lwage female educ femed exper expersq tenure tenursq

```
      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  7,   518) =   58.37
       Model |  65.4081526     7   9.3440218           Prob > F      =  0.0000
    Residual |  82.9216091   518  .160080326           R-squared     =  0.4410
-------------+------------------------------           Adj R-squared =  0.4334
       Total |  148.329762   525   .28253288           Root MSE      =   .4001

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |  -.2267887   .1675394    -1.35   0.176     -.555929    .1023516
        educ |   .0823692   .0084699     9.72   0.000     .0657296    .0990088
       femed |  -.0055645   .0130618    -0.43   0.670    -.0312252    .0200962
       exper |   .0293366   .0049842     5.89   0.000      .019545    .0391283
     expersq |  -.0005804   .0001075    -5.40   0.000    -.0007916   -.0003691
      tenure |   .0318967    .006864     4.65   0.000      .018412    .0453814
     tenursq |    -.00059   .0002352    -2.51   0.012     -.001052    -.000128
       _cons |    .388806   .1186871     3.28   0.001     .1556388    .6219733
------------------------------------------------------------------------------
```

reg lwage female educ exper expersq tenure tenursq

```
      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  6,   519) =   68.18
       Model |  65.3791002     6  10.8965167           Prob > F      =  0.0000
    Residual |  82.9506616   519  .159827864           R-squared     =  0.4408
-------------+------------------------------           Adj R-squared =  0.4343
       Total |  148.329762   525   .28253288           Root MSE      =  .39978

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      female |   -.296511   .0358055    -8.28   0.000    -.3668524   -.2261695
        educ |   .0801967   .0067573    11.87   0.000     .0669217    .0934716
       exper |   .0294324   .0049752     5.92   0.000     .0196584    .0392063
     expersq |  -.0005827   .0001073    -5.43   0.000    -.0007935   -.0003719
      tenure |   .0317139   .0068452     4.63   0.000     .0182663    .0451616
     tenursq |  -.0005852   .0002347    -2.49   0.013    -.0010463   -.0001241
       _cons |   .4166909   .0989279     4.21   0.000     .2223425    .6110393
------------------------------------------------------------------------------
```

Example 7.11: Effects of Race on Baseball Player Salaries

use http://fmwww.bc.edu/ec-p/data/wooldridge/MLB1

reg lsalary years gamesyr bavg hrunsyr rbisyr runsyr fldperc allstar black hispan blckpb hisp

```
      Source |       SS       df       MS              Number of obs =     330
-------------+------------------------------           F( 12,   317) =   46.48
       Model |  283.782211    12  23.6485176           Prob > F      =  0.0000
    Residual |  161.279291   317   .50876748           R-squared     =  0.6376
-------------+------------------------------           Adj R-squared =  0.6239
       Total |  445.061503   329  1.35277053           Root MSE      =  .71328

------------------------------------------------------------------------------
     lsalary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       years |   .0673458   .0128915     5.22   0.000     .0419821    .0927094
     gamesyr |   .0088778   .0033837     2.62   0.009     .0022205    .0155352
```

```
        bavg |   .0009451   .0015133     0.62   0.533    -.0020322    .0039225
     hrunsyr |   .0146206   .0164522     0.89   0.375    -.0177488      .04699
      rbisyr |   .0044938    .007575     0.59   0.553    -.0104098    .0193974
      runsyr |   .0072029   .0045671     1.58   0.116    -.0017827    .0161884
     fldperc |   .0010865   .0021195     0.51   0.609    -.0030836    .0052566
     allstar |   .0075307   .0028735     2.62   0.009     .0018771    .0131843
       black |  -.1980075   .1254968    -1.58   0.116    -.4449192    .0489043
      hispan |  -.1900079   .1530902    -1.24   0.215     -.491209    .1111933
      blckpb |   .0124513   .0049628     2.51   0.013     .0026871    .0222154
      hispph |   .0200862   .0097933     2.05   0.041     .0008181    .0393543
       _cons |   10.34369   2.182538     4.74   0.000       6.0496    14.63778
------------------------------------------------------------------------------
```

Difference in lwage between black and white in cities with 10% of blacks

```
lincom _b[black]+_b[blckpb]*10
```

```
 ( 1)  black + 10.0 blckpb = 0.0

------------------------------------------------------------------------------
     lsalary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |  -.0734949   .0997916    -0.74   0.462    -.2698324    .1228426
------------------------------------------------------------------------------
```

Difference in lwage between black and white in cities with 20% of blacks

```
lincom _b[black]+_b[blckpb]*20
```

```
 ( 1)  black + 20.0 blckpb = 0.0

------------------------------------------------------------------------------
     lsalary |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .0510177   .0953577     0.54   0.593    -.1365962    .2386316
------------------------------------------------------------------------------
```

City percentage of hispanic people when wages of hispanic and whites are equal

```
di _b[hispan]*-1/_b[hispph]
```

```
9.4596276
```

Example 7.12: A Linear Probability Model of Arrests

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME1
```

```
gen arr86=(~narr86)
```

```
reg arr86 pcnv avgsen tottime ptime86 qemp86
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  5,  2719) =   27.03
       Model |  25.8452455     5  5.16904909           Prob > F      =  0.0000
    Residual |  519.971268  2719  .191236215           R-squared     =  0.0474
-------------+------------------------------           Adj R-squared =  0.0456
       Total |  545.816514  2724   .20037317           Root MSE      =  .43731

------------------------------------------------------------------------------
       arr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |   .1624448   .0212368     7.65   0.000      .120803    .2040866
      avgsen |  -.0061127    .006452    -0.95   0.344     -.018764    .0065385
     tottime |   .0022616   .0049781     0.45   0.650    -.0074997    .0120229
     ptime86 |   .0219664   .0046349     4.74   0.000     .0128781    .0310547
      qemp86 |   .0428294   .0054046     7.92   0.000     .0322319    .0534268
       _cons |   .5593846   .0172329    32.46   0.000     .5255937    .5931754
------------------------------------------------------------------------------
```

Change in probability of arrest if pcnv increases by .5

```
lincom _b[pcnv]*.5
```

```
 ( 1)  .5 pcnv = 0.0

------------------------------------------------------------------------------
       arr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
         (1) |   .0812224   .0106184     7.65   0.000     .0604015    .1020433
------------------------------------------------------------------------------
```

Change in probability of arrest if ptime86 increases by 6

```
lincom _b[ptime86]*6
```

```
 ( 1)  6.0 ptime86 = 0.0

------------------------------------------------------------------------------
       arr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .1317984   .0278095     4.74   0.000     .0772686    .1863282
------------------------------------------------------------------------------
```

Change in probability of arrest if ptime86 decreases by 12

```
lincom _b[_cons]- _b[ptime86]*12
```

```
 ( 1) - 12.0 ptime86 + _cons = 0.0

------------------------------------------------------------------------------
       arr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .2957878    .061983     4.77   0.000     .1742492    .4173264
------------------------------------------------------------------------------
```

Change in probability of arrest if qemp86 increases by 4

```
lincom _b[qemp86]*4
```

```
 ( 1)  4.0 qemp86 = 0.0

------------------------------------------------------------------------------
       arr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         (1) |   .1713175   .0216182     7.92   0.000     .1289277    .2137073
------------------------------------------------------------------------------
```

```
reg arr86 pcnv avgsen tottime ptime86 qemp86 black hispan
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  7,  2717) =   28.41
       Model |  37.2205275     7  5.31721822           Prob > F      =  0.0000
    Residual |  508.595986  2717  .187190278           R-squared     =  0.0682
-------------+------------------------------           Adj R-squared =  0.0658
       Total |  545.816514  2724   .20037317           Root MSE      =  .43265

------------------------------------------------------------------------------
       arr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |    .152062   .0210655     7.22   0.000     .1107561     .193368
      avgsen |  -.0046191   .0063888    -0.72   0.470    -.0171465    .0079083
     tottime |   .0025619   .0049259     0.52   0.603    -.0070969    .0122207
     ptime86 |   .0236954   .0045948     5.16   0.000     .0146858     .032705
      qemp86 |   .0384737   .0054016     7.12   0.000     .0278821    .0490653
       black |  -.1697631   .0236738    -7.17   0.000    -.2161836   -.1233426
      hispan |  -.0961866   .0207105    -4.64   0.000    -.1367965   -.0555766
       _cons |   .6195717   .0187272    33.08   0.000     .5828507    .6562927
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 8 - Heteroskedasticity

Example 8.1: Log Wage Equation with Heteroscedasticity-Robust Standard Errors

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE2
gen single=(~married)
gen male=(~female)
gen marrmale=male*married
gen marrfem=female*married
gen singfem=single*female
reg lwage marrmale marrfem singfem educ exper expersq tenure tenursq, robust
```

```
Regression with robust standard errors                Number of obs =     526
                                                      F(  8,   517) =   51.70
                                                      Prob > F      =  0.0000
                                                      R-squared     =  0.4609
                                                      Root MSE      =  .39329
------------------------------------------------------------------------------
             |               Robust
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    marrmale |   .2126756   .0571419     3.72   0.000     .1004167    .3249345
     marrfem |  -.1982676     .05877    -3.37   0.001     -.313725   -.0828102
     singfem |  -.1103502   .0571163    -1.93   0.054    -.2225587    .0018583
        educ |   .0789103   .0074147    10.64   0.000     .0643437    .0934769
       exper |   .0268006   .0051391     5.22   0.000     .0167044    .0368967
     expersq |  -.0005352   .0001063    -5.03   0.000    -.0007442   -.0003263
      tenure |   .0290875   .0069409     4.19   0.000     .0154516    .0427234
     tenursq |  -.0005331   .0002437    -2.19   0.029    -.0010119   -.0000544
       _cons |    .321378    .109469     2.94   0.003     .1063193    .5364368
------------------------------------------------------------------------------
```

```
reg lwage marrmale marrfem singfem educ exper expersq tenure tenursq
```

```
      Source |       SS       df       MS              Number of obs =     526
-------------+------------------------------           F(  8,   517) =   55.25
       Model |  68.3617614     8  8.54522017           Prob > F      =  0.0000
    Residual |  79.9680004   517  .154676983           R-squared     =  0.4609
-------------+------------------------------           Adj R-squared =  0.4525
       Total |  148.329762   525   .28253288           Root MSE      =  .39329

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    marrmale |   .2126756   .0553572     3.84   0.000      .103923    .3214283
     marrfem |  -.1982676   .0578355    -3.43   0.001    -.3118891   -.0846462
     singfem |  -.1103502   .0557421    -1.98   0.048     -.219859   -.0008414
        educ |   .0789103   .0066945    11.79   0.000     .0657585    .0920621
       exper |   .0268006   .0052428     5.11   0.000     .0165007    .0371005
     expersq |  -.0005352   .0001104    -4.85   0.000    -.0007522   -.0003183
      tenure |   .0290875    .006762     4.30   0.000     .0158031    .0423719
     tenursq |  -.0005331   .0002312    -2.31   0.022    -.0009874   -.0000789
       _cons |    .321378    .100009     3.21   0.001     .1249041     .517852
------------------------------------------------------------------------------
```

Example 8.2: Heteroscedastisity-Robust F Statistics

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA3
```

reg cumgpa sat hsperc tothrs female black white if term==2, robust

```
Regression with robust standard errors                Number of obs =     366
                                                      F(  6,   359) =   39.30
                                                      Prob > F      =  0.0000
                                                      R-squared     =  0.4006
                                                      Root MSE      =  .46929

------------------------------------------------------------------------------
             |               Robust
      cumgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         sat |   .0011407   .0001915     5.96   0.000     .0007641    .0015174
      hsperc |  -.0085664   .0014179    -6.04   0.000    -.0113548   -.0057779
      tothrs |    .002504   .0007406     3.38   0.001     .0010475    .0039605
      female |   .3034333   .0591378     5.13   0.000     .1871332    .4197334
       black |  -.1282837   .1192413    -1.08   0.283    -.3627829    .1062155
       white |  -.0587217    .111392    -0.53   0.598    -.2777846    .1603411
       _cons |   1.470065   .2206802     6.66   0.000     1.036076    1.904053
------------------------------------------------------------------------------
```

reg cumgpa sat hsperc tothrs female black white if term==2

```
     Source |       SS       df       MS              Number of obs =     366
-------------+------------------------------           F(  6,   359) =   39.98
       Model |   52.831358     6  8.80522634           Prob > F      =  0.0000
    Residual |   79.062328   359  .220229326           R-squared     =  0.4006
-------------+------------------------------           Adj R-squared =  0.3905
       Total |  131.893686   365  .361352564           Root MSE      =  .46929

------------------------------------------------------------------------------
      cumgpa |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         sat |   .0011407   .0001786     6.39   0.000     .0007896    .0014919
      hsperc |  -.0085664   .0012404    -6.91   0.000    -.0110058    -.006127
      tothrs |    .002504    .000731     3.43   0.001     .0010664    .0039415
      female |   .3034333   .0590203     5.14   0.000     .1873643    .4195023
       black |  -.1282837   .1473701    -0.87   0.385    -.4181009    .1615335
       white |  -.0587217   .1409896    -0.42   0.677    -.3359909    .2185475
       _cons |   1.470065   .2298031     6.40   0.000     1.018135    1.921994
------------------------------------------------------------------------------
```

Example 8.3: Heteroskedasticity-Robust LM Statistic

use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME1

gen avgsensq=avgsen*avgsen

reg narr86 pcnv avgsen avgsensq ptime86 qemp86 inc86 black hispan, robust

```
Regression with robust standard errors                Number of obs =    2725
                                                      F(  8,  2716) =   29.84
                                                      Prob > F      =  0.0000
                                                      R-squared     =  0.0728
                                                      Root MSE      =  .82843

------------------------------------------------------------------------------
             |               Robust
      narr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |  -.1355954   .0336218    -4.03   0.000    -.2015223   -.0696685
      avgsen |   .0178411   .0101233     1.76   0.078    -.0020091    .0376913
    avgsensq |  -.0005163   .0002077    -2.49   0.013    -.0009236   -.0001091
     ptime86 |    -.03936   .0062236    -6.32   0.000    -.0515634   -.0271566
      qemp86 |  -.0505072   .0142015    -3.56   0.000     -.078354   -.0226603
```

```
       inc86 |  -.0014797   .0002295    -6.45   0.000    -.0019297   -.0010296
       black |   .3246024   .0585135     5.55   0.000     .2098669    .439338
      hispan |     .19338   .0402983     4.80   0.000     .1143616    .2723985
       _cons |   .5670128   .0402756    14.08   0.000     .4880389    .6459867
------------------------------------------------------------------------------
```

Turning point for avgsen

```
di _b[avgsen]/(2*_b[avgsensq])
-17.276862
```

```
reg narr86 pcnv ptime86 qemp86 inc86 black hispan
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  6,  2718) =   34.95
       Model |  143.977563     6  23.9962606           Prob > F      =  0.0000
    Residual |  1866.36959  2718  .686670196           R-squared     =  0.0716
-------------+------------------------------           Adj R-squared =  0.0696
       Total |  2010.34716  2724  .738012906           Root MSE      =  .82866

------------------------------------------------------------------------------
      narr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |  -.1322784   .0403406    -3.28   0.001    -.2113797   -.0531771
     ptime86 |  -.0377953    .008497    -4.45   0.000    -.0544566    -.021134
      qemp86 |  -.0509814   .0144359    -3.53   0.000    -.0792878    -.022675
       inc86 |    -.00149   .0003404    -4.38   0.000    -.0021575   -.0008224
       black |   .3296885   .0451778     7.30   0.000     .2411022    .4182748
      hispan |   .1954509   .0396929     4.92   0.000     .1176195    .2732823
       _cons |   .5703344   .0360073    15.84   0.000       .49973    .6409388
------------------------------------------------------------------------------
```

```
predict ubar1, resid
```

```
quite reg avgsen pcnv ptime86 qemp86 inc86 black hispan
```

```
predict r1, r
```

```
quite reg avgsensq pcnv ptime86 qemp86 inc86 black hispan
```

```
predict r2, r
```

```
quite gen ur1 = ubar1*r1
```

```
quite gen ur2 = ubar1*r2
```

```
gen iota = 1
```

```
reg iota ur1 ur2, noconstant
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  2,  2723) =    2.00
       Model |  3.99708536     2  1.99854268           Prob > F      =  0.1355
    Residual |  2721.00291  2723  .999266586           R-squared     =  0.0015
-------------+------------------------------           Adj R-squared =  0.0007
       Total |     2725.00  2725        1.00           Root MSE      =  .99963

------------------------------------------------------------------------------
        iota |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         ur1 |   .0277846   .0140598     1.98   0.048     .0002156    .0553537
         ur2 |  -.0010447   .0005479    -1.91   0.057     -.002119    .0000296
------------------------------------------------------------------------------
```

```
scalar hetlm = e(N)-e(rss)
```

```
scalar pval = chi2tail(2,hetlm)
```

```
display _n "Robust LM statistic : " %6.3f hetlm /*
```

```
> */ _n "Under H0, distrib Chi2(2), p-value: " %5.3f pval

Robust LM statistic :  3.997
Under H0, distrib Chi2(2), p-value: 0.136
```

```
reg narr86 pcnv ptime86 qemp86 inc86 black hispan
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  6,  2718) =   34.95
       Model |  143.977563     6  23.9962606           Prob > F      =  0.0000
    Residual |  1866.36959  2718  .686670196           R-squared     =  0.0716
-------------+------------------------------           Adj R-squared =  0.0696
       Total |  2010.34716  2724  .738012906           Root MSE      =  .82866

------------------------------------------------------------------------------
      narr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |  -.1322784   .0403406    -3.28   0.001    -.2113797   -.0531771
     ptime86 |  -.0377953    .008497    -4.45   0.000    -.0544566    -.021134
      qemp86 |  -.0509814   .0144359    -3.53   0.000    -.0792878    -.022675
       inc86 |    -.00149   .0003404    -4.38   0.000    -.0021575   -.0008224
       black |   .3296885   .0451778     7.30   0.000     .2411022    .4182748
      hispan |   .1954509   .0396929     4.92   0.000     .1176195    .2732823
       _cons |   .5703344   .0360073    15.84   0.000       .49973    .6409388
------------------------------------------------------------------------------
```

```
predict ubar2, resid
```

```
reg ubar2 pcnv avgsen avgsensq ptime86 qemp86 inc86 black hispan
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  8,  2716) =    0.43
       Model |  2.37155739     8  .296444674           Prob > F      =  0.9025
    Residual |  1863.99804  2716  .686302664           R-squared     =  0.0013
-------------+------------------------------           Adj R-squared = -0.0017
       Total |  1866.36959  2724  .685157707           Root MSE      =  .82843

------------------------------------------------------------------------------
       ubar1 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |   -.003317   .0403699    -0.08   0.935    -.0824758    .0758418
      avgsen |   .0178411    .009696     1.84   0.066    -.0011713    .0368534
    avgsensq |  -.0005163    .000297    -1.74   0.082    -.0010987    .0000661
     ptime86 |  -.0015647   .0086935    -0.18   0.857    -.0186112    .0154819
      qemp86 |   .0004742   .0144345     0.03   0.974    -.0278295    .0287779
       inc86 |   .0000103   .0003405     0.03   0.976    -.0006574     .000678
       black |  -.0050861   .0454188    -0.11   0.911     -.094145    .0839729
      hispan |  -.0020709   .0397035    -0.05   0.958    -.0799229    .0757812
       _cons |  -.0033216   .0360573    -0.09   0.927    -.0740242    .0673809
------------------------------------------------------------------------------
```

```
scalar lm1 = e(N)*e(r2)
```

```
display _n "LM statistic : " %6.3f lm1 /*
```

LM statistic : 3.5425

Example 8.4: Heteroscedasticity in Housing Price Equation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/HPRICE1
```

```
reg price lotsize sqrft bdrms
```

```
     Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  3,    84) =   57.46
       Model |  617130.701     3  205710.234           Prob > F      =  0.0000
    Residual |  300723.805    84   3580.0453           R-squared     =  0.6724
```

```
-------------+------------------------------           Adj R-squared =  0.6607
       Total |  917854.506    87  10550.0518           Root MSE      =  59.833

------------------------------------------------------------------------------
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lotsize |   .0020677   .0006421     3.22   0.002     .0007908    .0033446
       sqrft |   .1227782   .0132374     9.28   0.000     .0964541    .1491022
       bdrms |   13.85252   9.010145     1.54   0.128     -4.06514    31.77018
       _cons |  -21.77031   29.47504    -0.74   0.462    -80.38466    36.84404
------------------------------------------------------------------------------
```

whitetst, fitted

```
White's special test statistic :  16.26842  Chi-sq( 2)  P-value =  2.9e-04
```

reg lprice llotsize lsqrft bdrms

```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  3,    84) =   50.42
       Model |  5.15504028     3  1.71834676           Prob > F      =  0.0000
    Residual |  2.86256324    84  .034078134           R-squared     =  0.6430
-------------+------------------------------           Adj R-squared =  0.6302
       Total |  8.01760352    87  .092156362           Root MSE      =   .1846

------------------------------------------------------------------------------
      lprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    llotsize |   .1679667   .0382812     4.39   0.000     .0918404     .244093
      lsqrft |   .7002324   .0928652     7.54   0.000     .5155597    .8849051
       bdrms |   .0369584   .0275313     1.34   0.183    -.0177906    .0917074
       _cons |  -1.297042   .6512836    -1.99   0.050    -2.592191   -.0018931
------------------------------------------------------------------------------
```

whitetst, fitted

```
White's special test statistic :  3.447243  Chi-sq( 2)  P-value =  .1784
```

Example 8.5: Special Form of the White Test in the Log Housing Price Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/HPRICE1

reg lprice llotsize lsqrft bdrms

```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  3,    84) =   50.42
       Model |  5.15506425     3  1.71835475           Prob > F      =  0.0000
    Residual |  2.86255771    84  .034078068           R-squared     =  0.6430
-------------+------------------------------           Adj R-squared =  0.6302
       Total |  8.01762195    87  .092156574           Root MSE      =   .1846

------------------------------------------------------------------------------
      lprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    llotsize |    .167968   .0382811     4.39   0.000     .0918418    .2440941
      lsqrft |   .7002326   .0928652     7.54   0.000     .5155601    .8849051
       bdrms |   .0369585   .0275313     1.34   0.183    -.0177905    .0917075
       _cons |    5.6107   .6512829     8.61   0.000     4.315553    6.905848
------------------------------------------------------------------------------
```

whitetst, fitted

```
White's special test statistic :  3.447286  Chi-sq( 2)  P-value =  .1784
```

Example 8.6: Family Saving Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/SAVING

reg sav inc

```
      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F(  1,    98) =    6.49
       Model |  66368437.0     1  66368437.0           Prob > F      =  0.0124
    Residual |  1.0019e+09    98  10223460.8           R-squared     =  0.0621
-------------+------------------------------           Adj R-squared =  0.0526
       Total |  1.0683e+09    99  10790581.8           Root MSE      =  3197.4

------------------------------------------------------------------------------
         sav |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |   .1466283   .0575488     2.55   0.012     .0324247     .260832
       _cons |   124.8424   655.3931     0.19   0.849    -1175.764    1425.449
------------------------------------------------------------------------------
```

reg sav inc [aw = 1/inc]

```
(sum of wgt is   1.3877e-02)

      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F(  1,    98) =    9.14
       Model |  58142339.8     1  58142339.8           Prob > F      =  0.0032
    Residual |   623432468    98  6361555.80           R-squared     =  0.0853
-------------+------------------------------           Adj R-squared =  0.0760
       Total |   681574808    99  6884594.02           Root MSE      =  2522.2

------------------------------------------------------------------------------
         sav |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |   .1717555   .0568128     3.02   0.003     .0590124    .2844986
       _cons |  -124.9528   480.8606    -0.26   0.796    -1079.205    829.2994
------------------------------------------------------------------------------
```

reg sav inc size educ age black

```
      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F(  5,    94) =    1.70
       Model |  88426246.4     5  17685249.3           Prob > F      =  0.1430
    Residual |   979841351    94  10423844.2           R-squared     =  0.0828
-------------+------------------------------           Adj R-squared =  0.0340
       Total |  1.0683e+09    99  10790581.8           Root MSE      =  3228.6

------------------------------------------------------------------------------
         sav |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |    .109455   .0714317     1.53   0.129    -.0323742    .2512842
        size |   67.66119   222.9642     0.30   0.762    -375.0395    510.3619
        educ |   151.8235   117.2487     1.29   0.199    -80.97646    384.6235
         age |   .2857217   50.03108     0.01   0.995    -99.05217    99.62361
       black |   518.3934   1308.063     0.40   0.693    -2078.796    3115.583
       _cons |  -1605.416   2830.707    -0.57   0.572    -7225.851    4015.019
------------------------------------------------------------------------------
```

reg sav inc size educ age black [aw = 1/inc]

```
(sum of wgt is   1.3877e-02)

      Source |       SS       df       MS              Number of obs =     100
-------------+------------------------------           F(  5,    94) =    2.19
       Model |  71020334.9     5  14204067.0           Prob > F      =  0.0621
    Residual |   610554473    94  6495260.35           R-squared     =  0.1042
-------------+------------------------------           Adj R-squared =  0.0566
       Total |   681574808    99  6884594.02           Root MSE      =  2548.6
```

```
------------------------------------------------------------------------------
         sav |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inc |   .1005179   .0772511     1.30   0.196     -.052866    .2539017
        size |  -6.868501   168.4327    -0.04   0.968    -341.2956    327.5586
        educ |   139.4802   100.5362     1.39   0.169     -60.1368    339.0972
         age |   21.74721   41.30598     0.53   0.600    -60.26678    103.7612
       black |   137.2842   844.5941     0.16   0.871    -1539.677    1814.246
       _cons |  -1854.814   2351.797    -0.79   0.432    -6524.362    2814.734
------------------------------------------------------------------------------
```

Example 8.7: Demand for Cigarettes

use http://fmwww.bc.edu/ec-p/data/wooldridge/SMOKE

reg cigs lincome lcigpric educ age agesq restaurn

```
      Source |       SS       df       MS              Number of obs =     807
-------------+------------------------------           F(  6,   800) =    7.42
       Model |  8003.02506     6  1333.83751           Prob > F      =  0.0000
    Residual |  143750.658   800  179.688322           R-squared     =  0.0527
-------------+------------------------------           Adj R-squared =  0.0456
       Total |  151753.683   806  188.280003           Root MSE      =  13.405

------------------------------------------------------------------------------
        cigs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lincome |   .8802689   .7277838     1.21   0.227    -.5483223     2.30886
    lcigpric |  -.7508498   5.773343    -0.13   0.897    -12.08354    10.58184
        educ |  -.5014982   .1670772    -3.00   0.003    -.8294597   -.1735368
         age |   .7706936   .1601223     4.81   0.000      .456384    1.085003
       agesq |  -.0090228    .001743    -5.18   0.000    -.0124443   -.0056013
    restaurn |  -2.825085   1.111794    -2.54   0.011    -5.007462    -.642708
       _cons |  -3.639884   24.07866    -0.15   0.880     -50.9047    43.62493
------------------------------------------------------------------------------
```

Change in cigs if income increases by 10%

display _b[lincome]*10/100
```
.08802689
```

Turnover point for age

display _b[age]/2/_b[agesq]
```
-42.708116
```

whitetst, fitted

```
White's special test statistic :  26.57258  Chi-sq( 2)  P-value =  1.7e-06
```

gen lubar=log(ub*ub)

qui reg lubar lincome lcigpric educ age agesq restaurn

predict cigsh, xb

gen cigse = exp(cigsh)

reg cigs lincome lcigpric educ age agesq restaurn [aw=1/cigse]

```
(sum of wgt is   1.9977e+01)

      Source |       SS       df       MS              Number of obs =     807
-------------+------------------------------           F(  6,   800) =   17.06
       Model |  10302.6415     6  1717.10692           Prob > F      =  0.0000
    Residual |  80542.0684   800  100.677586           R-squared     =  0.1134
-------------+------------------------------           Adj R-squared =  0.1068
       Total |    90844.71   806  112.710558           Root MSE      =  10.034
```

```
------------------------------------------------------------------------------
        cigs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lincome |   1.295241   .4370118     2.96   0.003     .4374154    2.153066
    lcigpric |   -2.94028   4.460142    -0.66   0.510    -11.69524    5.814684
        educ |  -.4634462   .1201586    -3.86   0.000    -.6993095   -.2275829
         age |   .4819474   .0968082     4.98   0.000     .2919194    .6719755
       agesq |  -.0056272   .0009395    -5.99   0.000    -.0074713   -.0037831
    restaurn |  -3.461066   .7955047    -4.35   0.000    -5.022589   -1.899543
       _cons |    5.63533   17.80313     0.32   0.752    -29.31103    40.58169
------------------------------------------------------------------------------
```

Example 8.8: Labor Force Participation of Married Women

use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ

reg inlf nwifeinc educ exper expersq age kidslt6 kidsge6

```
      Source |       SS       df       MS              Number of obs =     753
-------------+------------------------------           F(  7,   745) =   38.22
       Model |  48.8080578     7  6.97257968           Prob > F      =  0.0000
    Residual |  135.919698   745  .182442547           R-squared     =  0.2642
-------------+------------------------------           Adj R-squared =  0.2573
       Total |  184.727756   752  .245648611           Root MSE      =  .42713

------------------------------------------------------------------------------
        inlf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0034052   .0014485    -2.35   0.019    -.0062488   -.0005616
        educ |   .0379953    .007376     5.15   0.000      .023515    .0524756
       exper |   .0394924   .0056727     6.96   0.000     .0283561    .0506287
     expersq |  -.0005963   .0001848    -3.23   0.001    -.0009591   -.0002335
         age |  -.0160908   .0024847    -6.48   0.000    -.0209686    -.011213
     kidslt6 |  -.2618105   .0335058    -7.81   0.000    -.3275875   -.1960335
     kidsge6 |   .0130122    .013196     0.99   0.324    -.0128935    .0389179
       _cons |   .5855192    .154178     3.80   0.000     .2828442    .8881943
------------------------------------------------------------------------------
```

reg inlf nwifeinc educ exper expersq age kidslt6 kidsge6, robust

```
Regression with robust standard errors                Number of obs =     753
                                                      F(  7,   745) =   62.48
                                                      Prob > F      =  0.0000
                                                      R-squared     =  0.2642
                                                      Root MSE      =  .42713

------------------------------------------------------------------------------
             |               Robust
        inlf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0034052   .0015249    -2.23   0.026    -.0063988   -.0004115
        educ |   .0379953    .007266     5.23   0.000      .023731    .0522596
       exper |   .0394924     .00581     6.80   0.000     .0280864    .0508983
     expersq |  -.0005963     .00019    -3.14   0.002    -.0009693   -.0002233
         age |  -.0160908    .002399    -6.71   0.000    -.0208004   -.0113812
     kidslt6 |  -.2618105   .0317832    -8.24   0.000    -.3242058   -.1994152
     kidsge6 |   .0130122   .0135329     0.96   0.337     -.013555    .0395795
       _cons |   .5855192   .1522599     3.85   0.000     .2866098    .8844287
------------------------------------------------------------------------------
```

Example 8.9: Determinants of Personal Computer Ownership

use http://fmwww.bc.edu/ec-p/data/wooldridge/GPA1

gen parcoll = (mothcoll | fathcoll)

reg PC hsGPA ACT parcoll

```
      Source |       SS       df       MS              Number of obs =     141
-------------+------------------------------           F(  3,   137) =    1.98
       Model |  1.40186813     3  .467289377            Prob > F      =  0.1201
    Residual |  32.3569971   137  .236182461            R-squared     =  0.0415
-------------+------------------------------           Adj R-squared =  0.0205
       Total |  33.7588652   140  .241134752            Root MSE      =  .48599

------------------------------------------------------------------------------
          PC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       hsGPA |   .0653943   .1372576     0.48   0.635    -.2060231    .3368118
         ACT |   .0005645   .0154967     0.04   0.971    -.0300792    .0312082
     parcoll |   .2210541    .092957     2.38   0.019      .037238    .4048702
       _cons |  -.0004322   .4905358    -0.00   0.999     -.970433    .9695686
------------------------------------------------------------------------------
```

predict phat

gen h=phat*(1-phat)

reg PC hsGPA ACT parcoll [aw=1/h]
(sum of wgt is 6.2818e+02)

```
      Source |       SS       df       MS              Number of obs =     141
-------------+------------------------------           F(  3,   137) =    2.22
       Model |  1.54663033     3  .515543445            Prob > F      =  0.0882
    Residual |  31.7573194   137  .231805251            R-squared     =  0.0464
-------------+------------------------------           Adj R-squared =  0.0256
       Total |  33.3039497   140  .237885355            Root MSE      =  .48146

------------------------------------------------------------------------------
          PC |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       hsGPA |   .0327029   .1298817     0.25   0.802    -.2241292     .289535
         ACT |    .004272   .0154527     0.28   0.783    -.0262847    .0348286
     parcoll |   .2151862   .0862918     2.49   0.014       .04455    .3858224
       _cons |   .0262099   .4766498     0.05   0.956    -.9163323    .9687521
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 9 - More on Specification and Data Problems

Example 9.1: Economic Model of Crime

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME1
```

```
reg narr86 pcnv avgsen tottime ptime86 qemp86 inc86 black hispan
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  8,  2716) =   26.47
       Model |  145.390104     8   18.173763           Prob > F      =  0.0000
    Residual |  1864.95705  2716  .686655763           R-squared     =  0.0723
-------------+------------------------------           Adj R-squared =  0.0696
       Total |  2010.34716  2724  .738012906           Root MSE      =  .82865

------------------------------------------------------------------------------
      narr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |  -.1332344   .0403502    -3.30   0.001    -.2123546   -.0541141
      avgsen |  -.0113177   .0122401    -0.92   0.355    -.0353185    .0126831
     tottime |   .0120224   .0094352     1.27   0.203    -.0064785    .0305233
     ptime86 |  -.0408417    .008812    -4.63   0.000    -.0581206   -.0235627
      qemp86 |  -.0505398   .0144397    -3.50   0.000    -.0788538   -.0222258
       inc86 |  -.0014887   .0003406    -4.37   0.000    -.0021566   -.0008207
       black |   .3265035   .0454156     7.19   0.000     .2374508    .4155561
      hispan |   .1939144   .0397113     4.88   0.000     .1160469    .2717818
       _cons |   .5686855   .0360461    15.78   0.000     .4980048    .6393661
------------------------------------------------------------------------------
```

```
reg narr86 pcnv pcnvsq avgsen tottime ptime86 pt86sq qemp86 inc86 inc86sq black hispan
```

```
      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F( 11,  2713) =   28.46
       Model |  207.979007    11  18.9071825           Prob > F      =  0.0000
    Residual |  1802.36815  2713   .66434506           R-squared     =  0.1035
-------------+------------------------------           Adj R-squared =  0.0998
       Total |  2010.34716  2724  .738012906           Root MSE      =  .81507

------------------------------------------------------------------------------
      narr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |   .5525236   .1542372     3.58   0.000     .2500892    .8549579
      pcnvsq |  -.7302119   .1561177    -4.68   0.000    -1.036333   -.4240903
      avgsen |  -.0170216   .0120539    -1.41   0.158    -.0406574    .0066142
     tottime |    .011954   .0092825     1.29   0.198    -.0062474    .0301554
     ptime86 |   .2874334   .0442582     6.49   0.000     .2006501    .3742166
      pt86sq |  -.0296076   .0038634    -7.66   0.000     -.037183   -.0220321
      qemp86 |  -.0140941   .0173612    -0.81   0.417    -.0481366    .0199485
       inc86 |  -.0034152   .0008037    -4.25   0.000    -.0049912   -.0018392
     inc86sq |   7.19e-06   2.56e-06     2.81   0.005     2.17e-06    .0000122
       black |    .292296     .04483     6.52   0.000     .2043916    .3802004
      hispan |   .1636175   .0394507     4.15   0.000     .0862609     .240974
       _cons |   .5046065   .0368353    13.70   0.000     .4323784    .5768347
------------------------------------------------------------------------------
```

Example 9.2: Housing Price Equation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/HPRICE1
```

```
reg price lotsize sqrft bdrms
```

```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  3,    84) =   57.46
       Model |  617130.701     3  205710.234           Prob > F      =  0.0000
    Residual |  300723.805    84   3580.0453           R-squared     =  0.6724
-------------+------------------------------           Adj R-squared =  0.6607
       Total |  917854.506    87  10550.0518           Root MSE      =  59.833
```

```
------------------------------------------------------------------------------
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lotsize |   .0020677   .0006421     3.22   0.002     .0007908    .0033446
       sqrft |   .1227782   .0132374     9.28   0.000     .0964541    .1491022
       bdrms |   13.85252   9.010145     1.54   0.128     -4.06514    31.77018
       _cons |  -21.77031   29.47504    -0.74   0.462    -80.38466    36.84404
------------------------------------------------------------------------------
```

predict double r1

gen double r2=r1*r1

gen double r3=r2*r1

reg price lotsize sqrft bdrms r2 r3

```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  5,    82) =   39.35
       Model |  647870.698     5   129574.14           Prob > F      =  0.0000
    Residual |  269983.807    82  3292.48546           R-squared     =  0.7059
-------------+------------------------------           Adj R-squared =  0.6879
       Total |  917854.506    87  10550.0518           Root MSE      =   57.38

------------------------------------------------------------------------------
       price |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lotsize |   .0001537    .005203     0.03   0.977    -.0101968    .0105042
       sqrft |   .0175989   .2992508     0.06   0.953    -.5777064    .6129041
       bdrms |   2.174905   33.88811     0.06   0.949    -65.23934    69.58915
          r2 |   .0003534   .0070989     0.05   0.960    -.0137686    .0144755
          r3 |   1.55e-06   6.55e-06     0.24   0.814    -.0000115    .0000146
       _cons |   166.0973   317.4325     0.52   0.602    -465.3772    797.5717
------------------------------------------------------------------------------
```

test r2 r3

```
 ( 1)  r2 = 0.0
 ( 2)  r3 = 0.0

       F(  2,    82) =    4.67
            Prob > F =    0.0120
```

reg lprice llotsize lsqrft bdrms

```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  3,    84) =   50.42
       Model |  5.15504028     3  1.71834676           Prob > F      =  0.0000
    Residual |  2.86256324    84  .034078134           R-squared     =  0.6430
-------------+------------------------------           Adj R-squared =  0.6302
       Total |  8.01760352    87  .092156362           Root MSE      =   .1846

------------------------------------------------------------------------------
      lprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    llotsize |   .1679667   .0382812     4.39   0.000     .0918404     .244093
      lsqrft |   .7002324   .0928652     7.54   0.000     .5155597    .8849051
       bdrms |   .0369584   .0275313     1.34   0.183    -.0177906    .0917074
       _cons |  -1.297042   .6512836    -1.99   0.050    -2.592191   -.0018931
------------------------------------------------------------------------------
```

predict lphat

gen lph2=lphat*lphat

gen lph3=lphat*lph2

reg lprice llotsize lsqrft bdrms lph2 lph3

```
      Source |       SS       df       MS              Number of obs =      88
-------------+------------------------------           F(  5,    82) =   32.41
       Model |  5.32360126     5  1.06472025           Prob > F      =  0.0000
```

```
    Residual |  2.69400226    82  .032853686           R-squared     =  0.6640
-------------+------------------------------           Adj R-squared =  0.6435
       Total |  8.01760352    87  .092156362           Root MSE      =  .18126

------------------------------------------------------------------------------
      lprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    llotsize |  -4.191584   12.59578    -0.33   0.740     -29.2486    20.86543
      lsqrft |  -17.39336   52.49227    -0.33   0.741    -121.8172     87.0305
       bdrms |  -.9276645    2.76988    -0.33   0.739    -6.437838    4.582509
        lph2 |   3.921189   13.01484     0.30   0.764    -21.96948    29.81186
        lph3 |  -.1933951   .7521095    -0.26   0.798     -1.68958     1.30279
       _cons |   88.08799   240.9851     0.37   0.716    -391.3081    567.4841
------------------------------------------------------------------------------
```

test lph2 lph3

```
 ( 1)  lph2 = 0.0
 ( 2)  lph3 = 0.0

       F(  2,    82) =    2.57
            Prob > F =    0.0831
```

Example 9.3: IQ as a Price for Ability

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE2

gen educIQ=educ*IQ

reg lwage educ exper tenure married south urban black

```
      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  7,   927) =   44.75
       Model |  41.8377677     7  5.97682396           Prob > F      =  0.0000
    Residual |  123.818527   927  .133569069           R-squared     =  0.2526
-------------+------------------------------           Adj R-squared =  0.2469
       Total |  165.656294   934  .177362199           Root MSE      =  .36547

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0654307   .0062504    10.47   0.000     .0531642    .0776973
       exper |    .014043   .0031852     4.41   0.000      .007792     .020294
      tenure |   .0117473    .002453     4.79   0.000     .0069333    .0165613
     married |   .1994171   .0390502     5.11   0.000     .1227802    .2760541
       south |  -.0909036   .0262485    -3.46   0.001     -.142417   -.0393903
       urban |   .1839121   .0269583     6.82   0.000     .1310056    .2368185
       black |  -.1883499   .0376666    -5.00   0.000    -.2622717   -.1144282
       _cons |   5.395497    .113225    47.65   0.000      5.17329    5.617704
------------------------------------------------------------------------------
```

reg lwage educ exper tenure married south urban black IQ

```
      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  8,   926) =   41.27
       Model |  43.5360229     8  5.44200287           Prob > F      =  0.0000
    Residual |  122.120271   926  .131879343           R-squared     =  0.2628
-------------+------------------------------           Adj R-squared =  0.2564
       Total |  165.656294   934  .177362199           Root MSE      =  .36315

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0544106   .0069285     7.85   0.000     .0408133     .068008
       exper |   .0141458   .0031651     4.47   0.000     .0079342    .0203575
      tenure |   .0113951   .0024394     4.67   0.000     .0066077    .0161825
     married |   .1997644   .0388025     5.15   0.000     .1236134    .2759154
       south |  -.0801695   .0262529    -3.05   0.002    -.1316916   -.0286473
       urban |   .1819463   .0267929     6.79   0.000     .1293645    .2345281
       black |  -.1431253   .0394925    -3.62   0.000    -.2206304   -.0656202
```

```
          IQ |   .0035591   .0009918     3.59   0.000     .0016127    .0055056
       _cons |   5.176439   .1280006    40.44   0.000     4.925234    5.427644
------------------------------------------------------------------------------
```

reg lwage educ exper tenure married south urban black IQ educIQ

```
      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  9,   925) =   36.76
       Model |  43.6401304     9  4.84890337           Prob > F      =  0.0000
    Residual |  122.016164   925  .131909366           R-squared     =  0.2634
-------------+------------------------------           Adj R-squared =  0.2563
       Total |  165.656294   934  .177362199           Root MSE      =  .36319

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0184558   .0410608     0.45   0.653    -.0621273     .099039
       exper |   .0139072   .0031768     4.38   0.000     .0076725    .0201418
      tenure |   .0113929   .0024397     4.67   0.000     .0066049    .0161808
     married |   .2008658   .0388267     5.17   0.000     .1246672    .2770644
       south |  -.0802354    .026256    -3.06   0.002    -.1317637   -.0287071
       urban |   .1835758   .0268586     6.83   0.000     .1308649    .2362867
       black |  -.1466989   .0397013    -3.70   0.000    -.2246139   -.0687839
          IQ |  -.0009418   .0051625    -0.18   0.855    -.0110734    .0091899
       educIQ |   .0003399   .0003826     0.89   0.375    -.0004109    .0010907
       _cons |   5.648249   .5462963    10.34   0.000     4.576125    6.720373
------------------------------------------------------------------------------
```

Example 9.4: City Crime Rates

use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME2

reg lcrmrte unem llawexpc if d87==1

```
      Source |       SS       df       MS              Number of obs =      46
-------------+------------------------------           F(  2,    43) =    1.30
       Model |  .271987199     2    .1359936           Prob > F      =  0.2824
    Residual |  4.48998214    43  .104418189           R-squared     =  0.0571
-------------+------------------------------           Adj R-squared =  0.0133
       Total |  4.76196934    45  .105821541           Root MSE      =  .32314

------------------------------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |  -.0290032   .0323387    -0.90   0.375    -.0942205    .0362141
    llawexpc |   .2033652   .1726534     1.18   0.245    -.1448236    .5515539
       _cons |   3.342899   1.250527     2.67   0.011     .8209721    5.864826
------------------------------------------------------------------------------
```

reg lcrmrte unem llawexpc lcrmrt_1

```
      Source |       SS       df       MS              Number of obs =      46
-------------+------------------------------           F(  3,    42) =   29.73
       Model |  3.23732846     3  1.07910949           Prob > F      =  0.0000
    Residual |  1.52464088    42  .036300973           R-squared     =  0.6798
-------------+------------------------------           Adj R-squared =  0.6570
       Total |  4.76196934    45  .105821541           Root MSE      =  .19053

------------------------------------------------------------------------------
     lcrmrte |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |    .008621   .0195166     0.44   0.661    -.0307652    .0480072
    llawexpc |  -.1395764   .1086412    -1.28   0.206    -.3588231    .0796704
    lcrmrt_1 |   1.193923   .1320985     9.04   0.000     .9273371    1.460508
       _cons |   .0764511   .8211433     0.09   0.926    -1.580683    1.733585
------------------------------------------------------------------------------
```

Example 9.5: Saving Function with Measurement Error

Dataset is not provided

Example 9.6: Measurement Error in Scrap Rates

Dataset is not provided

Example 9.7: GPA Equation with Measurement Error

Dataset is not provided

Example 9.8: R&D Intensity and Firm Size

use http://fmwww.bc.edu/ec-p/data/wooldridge/RDCHEM

reg rdintens sales profmarg

```
      Source |       SS       df       MS              Number of obs =      32
-------------+------------------------------           F(  2,    29) =    1.19
       Model |  8.28423732     2  4.14211866            Prob > F      =  0.3173
    Residual |  100.549233    29  3.46721493            R-squared     =  0.0761
-------------+------------------------------           Adj R-squared =  0.0124
       Total |   108.83347    31  3.51075711            Root MSE      =   1.862

------------------------------------------------------------------------------
    rdintens |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       sales |   .0000534   .0000441     1.21   0.236    -.0000368    .0001435
    profmarg |   .0446166   .0461805     0.97   0.342    -.0498332    .1390664
       _cons |   2.625261   .5855328     4.48   0.000     1.427712     3.82281
------------------------------------------------------------------------------
```

reg rdintens sales profmarg if sales<20000

```
      Source |       SS       df       MS              Number of obs =      31
-------------+------------------------------           F(  2,    28) =    2.92
       Model |  18.7880289     2  9.39401445            Prob > F      =  0.0702
    Residual |  89.9330615    28  3.21189505            R-squared     =  0.1728
-------------+------------------------------           Adj R-squared =  0.1137
       Total |   108.72109    30  3.62403635            Root MSE      =  1.7922

------------------------------------------------------------------------------
    rdintens |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       sales |   .0001856   .0000842     2.20   0.036     .0000131    .0003581
    profmarg |   .0478411   .0444831     1.08   0.291    -.0432784    .1389605
       _cons |   2.296851   .5918045     3.88   0.001     1.084594    3.509107
------------------------------------------------------------------------------
```

Example 9.9: R&D Intensity

use http://fmwww.bc.edu/ec-p/data/wooldridge/RDCHEM

reg lrd lsales profmarg

```
      Source |       SS       df       MS              Number of obs =      32
-------------+------------------------------           F(  2,    29) =  162.24
       Model |   85.597056     2   42.798528            Prob > F      =  0.0000
    Residual |   7.6502049    29  .263800169            R-squared     =  0.9180
-------------+------------------------------           Adj R-squared =  0.9123
       Total |  93.2472609    31  3.00797616            Root MSE      =  .51361

------------------------------------------------------------------------------
         lrd |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lsales |   1.084228   .0601941    18.01   0.000     .9611173    1.207339
    profmarg |   .0216594    .012782     1.69   0.101    -.0044827    .0478015
       _cons |  -4.378349   .4680132    -9.36   0.000    -5.335544   -3.421155
------------------------------------------------------------------------------
```

reg lrd lsales profmarg if sales<20000

```
      Source |       SS       df       MS              Number of obs =      31
-------------+------------------------------           F(  2,    28) =  131.42
       Model |  71.7655416     2  35.8827708           Prob > F      =  0.0000
    Residual |  7.64489638    28  .273032014           R-squared     =  0.9037
-------------+------------------------------           Adj R-squared =  0.8969
       Total |   79.410438    30   2.6470146           Root MSE      =  .52252

------------------------------------------------------------------------------
         lrd |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lsales |   1.088057   .0671128    16.21   0.000     .9505826    1.225531
    profmarg |    .021759   .0130233     1.67   0.106     -.004918     .048436
       _cons |  -4.404225   .5110168    -8.62   0.000    -5.450995   -3.357454
------------------------------------------------------------------------------
```

Example 9.10: State Infant Mortality Rates

use http://fmwww.bc.edu/ec-p/data/wooldridge/INFMRT

reg infmort lpcinc lphysic lpopul if year==1990

```
      Source |       SS       df       MS              Number of obs =      51
-------------+------------------------------           F(  3,    47) =    2.53
       Model |  32.1624527     3  10.7208176           Prob > F      =  0.0684
    Residual |  199.085016    47  4.23585141           R-squared     =  0.1391
-------------+------------------------------           Adj R-squared =  0.0841
       Total |  231.247469    50  4.62494938           Root MSE      =  2.0581

------------------------------------------------------------------------------
     infmort |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lpcinc |  -4.684585   2.604134    -1.80   0.078    -9.923426    .5542562
     lphysic |   4.153227   1.512663     2.75   0.009     1.110143    7.196312
      lpopul |  -.0878245   .2872503    -0.31   0.761    -.6656976    .4900486
       _cons |   33.85875   20.42792     1.66   0.104    -7.236927    74.95444
------------------------------------------------------------------------------
```

reg infmort lpcinc lphysic lpopul if infmort<20 & year==1990

```
      Source |       SS       df       MS              Number of obs =      50
-------------+------------------------------           F(  3,    46) =    5.76
       Model |  26.8600392     3  8.95334639           Prob > F      =  0.0020
    Residual |  71.4631627    46  1.55354702           R-squared     =  0.2732
-------------+------------------------------           Adj R-squared =  0.2258
       Total |  98.3232019    49  2.00659596           Root MSE      =  1.2464

------------------------------------------------------------------------------
     infmort |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lpcinc |  -.5669247   1.641217    -0.35   0.731    -3.870523    2.736674
     lphysic |   -2.74184   1.190771    -2.30   0.026    -5.138737    -.344943
      lpopul |   .6292351   .1911062     3.29   0.002     .2445584    1.013912
       _cons |   23.95478   12.41949     1.93   0.060    -1.044345    48.95391
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 10 - Basic Regression Analysis with Time Series Data

Example 10.1: Static Phillips Curve

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS
```

```
reg inf unem
```

```
      Source |       SS       df       MS              Number of obs =      49
-------------+------------------------------           F(  1,    47) =    2.62
       Model |  25.6369575     1  25.6369575           Prob > F      =  0.1125
    Residual |   460.61979    47  9.80042107           R-squared     =  0.0527
-------------+------------------------------           Adj R-squared =  0.0326
       Total |  486.256748    48  10.1303489           Root MSE      =  3.1306

------------------------------------------------------------------------------
         inf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |   .4676257   .2891262     1.62   0.112    -.1140212    1.049273
       _cons |    1.42361   1.719015     0.83   0.412    -2.034602    4.881822
------------------------------------------------------------------------------
```

Example 10.2: Effects of Inflation and Deficits on Interst Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/INTDEF
```

```
reg i3 inf def
```

```
      Source |       SS       df       MS              Number of obs =      49
-------------+------------------------------           F(  2,    46) =   52.78
       Model |  294.032897     2  147.016449           Prob > F      =  0.0000
    Residual |  128.133943    46  2.78552049           R-squared     =  0.6965
-------------+------------------------------           Adj R-squared =  0.6833
       Total |   422.16684    48   8.7951425           Root MSE      =   1.669

------------------------------------------------------------------------------
          i3 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inf |   .6131825   .0757753     8.09   0.000     .4606547    .7657104
         def |   .7004054     .11807     5.93   0.000     .4627427     .938068
       _cons |   1.252032   .4416346     2.83   0.007     .3630674    2.140996
------------------------------------------------------------------------------
```

Example 10.3: Puerto Rican Employment and the Minimum Wage

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PRMINWGE
```

```
reg lprepop lmincov lusgnp
```

```
      Source |       SS       df       MS              Number of obs =      38
-------------+------------------------------           F(  2,    35) =   34.04
       Model |  .211258194     2  .105629097           Prob > F      =  0.0000
    Residual |  .108600157    35  .003102862           R-squared     =  0.6605
-------------+------------------------------           Adj R-squared =  0.6411
       Total |  .319858351    37   .00864482           Root MSE      =   .0557

------------------------------------------------------------------------------
     lprepop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lmincov |  -.1544433   .0649015    -2.38   0.023    -.2862003   -.0226863
      lusgnp |  -.0121899   .0885134    -0.14   0.891    -.1918817    .1675019
       _cons |  -1.054413   .7654066    -1.38   0.177    -2.608271    .4994452
------------------------------------------------------------------------------
```

Example 10.4: Effects of Personal Exemption on Fertility Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/FERTIL3
```

```
summ pe
```

```
    Variable |     Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
```

```
          pe |      72    100.4015   65.87563          0     243.83
```

reg gfr pe ww2 pill

```
      Source |       SS       df       MS              Number of obs =      72
-------------+------------------------------           F(  3,    68) =   20.38
       Model |  13183.6215     3  4394.54049            Prob > F      =  0.0000
    Residual |  14664.2739    68  215.651087            R-squared     =  0.4734
-------------+------------------------------           Adj R-squared =  0.4502
       Total |  27847.8954    71  392.223879            Root MSE      =  14.685

------------------------------------------------------------------------------
         gfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pe |     .08254   .0296462     2.78   0.007     .0233819    .1416981
         ww2 |   -24.2384   7.458253    -3.25   0.002    -39.12111   -9.355684
        pill |  -31.59403   4.081068    -7.74   0.000    -39.73768   -23.45039
       _cons |   98.68176   3.208129    30.76   0.000     92.28003    105.0835
------------------------------------------------------------------------------
```

reg gfr pe ww2 pill pe_1 pe_2

```
      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  5,    64) =   12.73
       Model |  12959.7886     5  2591.95772            Prob > F      =  0.0000
    Residual |  13032.6443    64  203.635067            R-squared     =  0.4986
-------------+------------------------------           Adj R-squared =  0.4594
       Total |  25992.4329    69  376.701926            Root MSE      =   14.27

------------------------------------------------------------------------------
         gfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pe |   .0726718   .1255331     0.58   0.565    -.1781094     .323453
         ww2 |   -22.1265   10.73197    -2.06   0.043    -43.56608   -.6869198
        pill |  -31.30499   3.981559    -7.86   0.000    -39.25907   -23.35091
        pe_1 |  -.0057796   .1556629    -0.04   0.970     -.316752    .3051929
        pe_2 |   .0338268   .1262574     0.27   0.790    -.2184013     .286055
       _cons |    95.8705   3.281957    29.21   0.000     89.31403     102.427
------------------------------------------------------------------------------
```

test pe_1 pe_2

```
 ( 1)  pe_1 = 0.0
 ( 2)  pe_2 = 0.0

       F(  2,    64) =    0.05
            Prob > F =    0.9480
```

Estimated LRP

display _b[pe]+_b[pe_1]+_b[pe_2]

```
.10071909
```

gen dif1=pe_1-pe

gen dif2=pe_2-pe

reg gfr pe dif1 dif2 ww2 pill

```
      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  5,    64) =   12.73
       Model |  12959.7886     5  2591.95772            Prob > F      =  0.0000
    Residual |  13032.6443    64  203.635067            R-squared     =  0.4986
-------------+------------------------------           Adj R-squared =  0.4594
       Total |  25992.4329    69  376.701926            Root MSE      =   14.27

------------------------------------------------------------------------------
         gfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pe |   .1007191   .0298027     3.38   0.001     .0411814    .1602568
        dif1 |  -.0057796   .1556629    -0.04   0.970     -.316752    .3051929
        dif2 |   .0338268   .1262574     0.27   0.790    -.2184013     .286055
         ww2 |   -22.1265   10.73197    -2.06   0.043    -43.56608   -.6869198
        pill |  -31.30499   3.981559    -7.86   0.000    -39.25907   -23.35091
       _cons |    95.8705   3.281957    29.21   0.000     89.31403     102.427
```

```
------------------------------------------------------------------------------
```

Example 10.5: Antidumping Filings and Chemical Import

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/BARIUM

reg lchnimp lchempi lgas lrtwex befile6 affile6 afdec6

      Source |       SS       df       MS              Number of obs =     131
-------------+------------------------------           F(  6,   124) =    9.06
       Model |  19.4051456     6  3.23419093           Prob > F      =  0.0000
    Residual |  44.2471061   124  .356831501           R-squared     =  0.3049
-------------+------------------------------           Adj R-squared =  0.2712
       Total |  63.6522517   130  .489632706           Root MSE      =  .59735

------------------------------------------------------------------------------
     lchnimp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lchempi |      3.1172    .479202     6.50   0.000     2.168725    4.065675
        lgas |    .1963049   .9066233     0.22   0.829    -1.598157    1.990766
      lrtwex |    .9830093   .4001536     2.46   0.015     .1909934    1.775025
     befile6 |    .0595742     .26097     0.23   0.820    -.4569584    .5761068
     affile6 |   -.0324067   .2642973    -0.12   0.903    -.5555252    .4907118
      afdec6 |   -.5652446   .2858353    -1.98   0.050    -1.130993    .0005035
       _cons |   -17.80195   21.04551    -0.85   0.399    -59.45692    23.85301
------------------------------------------------------------------------------
```

Change in Chinese export of barium

```
display 100*(exp(_b[afdec6])-1)
-43.177885
```

Example 10.6: Election Outcomes and Economic Performance

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/FAIR

reg demvote partyWH incum pWHgnews  pWHinf if year<1996


      Source |       SS       df       MS              Number of obs =      20
-------------+------------------------------           F(  4,    15) =    7.37
       Model |  .072465402     4  .018116351           Prob > F      =  0.0017
    Residual |  .036853881    15  .002456925           R-squared     =  0.6629
-------------+------------------------------           Adj R-squared =  0.5730
       Total |  .109319283    19  .005753646           Root MSE      =  .04957

------------------------------------------------------------------------------
     demvote |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     partyWH |   -.0434752    .040459    -1.07   0.300    -.1297114    .0427611
       incum |    .0543902   .0234166     2.32   0.035      .004479    .1043014
    pWHgnews |    .0108466   .0041267     2.63   0.019     .0020508    .0196424
      pWHinf |   -.0077017   .0032567    -2.36   0.032    -.0146432   -.0007602
       _cons |     .481062   .0122631    39.23   0.000     .4549238    .5072002
------------------------------------------------------------------------------
```

Predicted value of demvote

```
display _b[_cons]+_b[partyWH]+_b[incum]+_b[pWHgnews]*3+_b[pWHinf]*3.019
.5012655
```

Example 10.7: Housing Investment and Prices

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/HSEINV

reg linvpc lprice

      Source |       SS       df       MS              Number of obs =      42
-------------+------------------------------           F(  1,    40) =   10.53
       Model |  .254364572     1  .254364572           Prob > F      =  0.0024
    Residual |  .966255373    40  .024156384           R-squared     =  0.2084
-------------+------------------------------           Adj R-squared =  0.1886
       Total |  1.22061994    41  .029771218           Root MSE      =  .15542

------------------------------------------------------------------------------
```

```
      linvpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lprice |   1.240944   .3824192     3.24   0.002     .4680455    2.013842
       _cons |  -.5502345   .0430266   -12.79   0.000    -.6371945   -.4632745
------------------------------------------------------------------------------
```

reg linvpc lprice t

```
      Source |       SS       df       MS              Number of obs =      42
-------------+------------------------------           F(  2,    39) =   10.08
       Model |  .415945135     2  .207972568           Prob > F      =  0.0003
    Residual |  .804674809    39  .020632687           R-squared     =  0.3408
-------------+------------------------------           Adj R-squared =  0.3070
       Total |  1.22061994    41  .029771218           Root MSE      =  .14364

------------------------------------------------------------------------------
      linvpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lprice |  -.3809609   .6788352    -0.56   0.578    -1.754035     .992113
           t |   .0098287   .0035122     2.80   0.008     .0027246    .0169328
       _cons |  -.9130595   .1356134    -6.73   0.000    -1.187363   -.6387556
------------------------------------------------------------------------------
```

Example 10.8: Fertility Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/FERTIL3

reg gfr pe ww2 pill t

```
      Source |       SS       df       MS              Number of obs =      72
-------------+------------------------------           F(  4,    67) =   32.84
       Model |  18441.2357     4  4610.30894           Prob > F      =  0.0000
    Residual |  9406.65967    67  140.397905           R-squared     =  0.6622
-------------+------------------------------           Adj R-squared =  0.6420
       Total |  27847.8954    71  392.223879           Root MSE      =  11.849

------------------------------------------------------------------------------
         gfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pe |   .2788778   .0400199     6.97   0.000     .1989978    .3587578
         ww2 |  -35.59228   6.297377    -5.65   0.000     -48.1619   -23.02266
        pill |   .9974479    6.26163     0.16   0.874    -11.50082    13.49571
           t |  -1.149872   .1879038    -6.12   0.000    -1.524929   -.7748146
       _cons |   111.7694   3.357765    33.29   0.000     105.0673    118.4716
------------------------------------------------------------------------------
```

reg gfr pe ww2 pill t tsq

```
      Source |       SS       df       MS              Number of obs =      72
-------------+------------------------------           F(  5,    66) =   35.09
       Model |  20236.3981     5  4047.27961           Prob > F      =  0.0000
    Residual |  7611.49734    66  115.325717           R-squared     =  0.7267
-------------+------------------------------           Adj R-squared =  0.7060
       Total |  27847.8954    71  392.223879           Root MSE      =  10.739

------------------------------------------------------------------------------
         gfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pe |   .3478126   .0402599     8.64   0.000     .2674311     .428194
         ww2 |  -35.88028   5.707921    -6.29   0.000    -47.27651   -24.48404
        pill |  -10.11972   6.336094    -1.60   0.115    -22.77014    2.530696
           t |  -2.531426   .3893863    -6.50   0.000    -3.308861   -1.753991
         tsq |   .0196126    .004971     3.95   0.000     .0096876    .0295377
       _cons |   124.0919   4.360738    28.46   0.000     115.3854    132.7984
------------------------------------------------------------------------------
```

Example 10.9: Puerto Rican Employment

use http://fmwww.bc.edu/ec-p/data/wooldridge/PRMINWGE

reg lprepop lmincov lusgnp t

```
      Source |       SS       df       MS              Number of obs =      38
```

```
-------------+------------------------------           F(  3,    34) =   62.78
       Model |  .270947898     3  .090315966           Prob > F      =  0.0000
    Residual |  .048910453    34  .001438543           R-squared     =  0.8471
-------------+------------------------------           Adj R-squared =  0.8336
       Total |  .319858351    37   .00864482           Root MSE      =  .03793

------------------------------------------------------------------------------
     lprepop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lmincov |  -.1686946   .0442464    -3.81   0.001    -.2586142    -.078775
      lusgnp |   1.057349   .1766381     5.99   0.000     .6983776    1.416321
           t |  -.0323541   .0050228    -6.44   0.000    -.0425616   -.0221467
       _cons |  -8.696287   1.295773    -6.71   0.000    -11.32961    -6.06296
------------------------------------------------------------------------------
```

reg lprepop lmincov lusgnp

```
      Source |       SS       df       MS              Number of obs =      38
-------------+------------------------------           F(  2,    35) =   34.04
       Model |  .211258194     2  .105629097           Prob > F      =  0.0000
    Residual |  .108600157    35  .003102862           R-squared     =  0.6605
-------------+------------------------------           Adj R-squared =  0.6411
       Total |  .319858351    37   .00864482           Root MSE      =   .0557

------------------------------------------------------------------------------
     lprepop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lmincov |  -.1544433   .0649015    -2.38   0.023    -.2862003   -.0226863
      lusgnp |  -.0121899   .0885134    -0.14   0.891    -.1918817    .1675019
       _cons |  -1.054413   .7654066    -1.38   0.177    -2.608271    .4994452
------------------------------------------------------------------------------
```

Example 10.10: Housing Investment

use http://fmwww.bc.edu/ec-p/data/wooldridge/HSEINV

reg linvpc t

```
      Source |       SS       df       MS              Number of obs =      42
-------------+------------------------------           F(  1,    40) =   20.19
       Model |  .409447014     1  .409447014           Prob > F      =  0.0001
    Residual |   .81117293    40  .020279323           R-squared     =  0.3354
-------------+------------------------------           Adj R-squared =  0.3188
       Total |  1.22061994    41  .029771218           Root MSE      =  .14241

------------------------------------------------------------------------------
      linvpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           t |   .0081459   .0018129     4.49   0.000     .0044819    .0118098
       _cons |  -.8412918    .044744   -18.80   0.000    -.9317228   -.7508608
------------------------------------------------------------------------------
```

predict linvpch, res

reg linvpch lprice t

```
      Source |       SS       df       MS              Number of obs =      42
-------------+------------------------------           F(  2,    39) =    0.16
       Model |  .006498121     2  .003249061           Prob > F      =  0.8548
    Residual |  .804674806    39  .020632687           R-squared     =  0.0080
-------------+------------------------------           Adj R-squared = -0.0429
       Total |  .811172927    41  .019784706           Root MSE      =  .14364

------------------------------------------------------------------------------
     linvpch |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lprice |  -.3809609   .6788352    -0.56   0.578    -1.754035     .992113
           t |   .0016828   .0035122     0.48   0.635    -.0054213    .0087869
       _cons |  -.0717677   .1356134    -0.53   0.600    -.3460716    .2025362
------------------------------------------------------------------------------
```

reg linvpc lprice t

```
      Source |       SS       df       MS              Number of obs =      42
```

```
-------------+------------------------------           F(  2,    39) =   10.08
       Model |  .415945135     2  .207972568           Prob > F      =  0.0003
    Residual |  .804674809    39  .020632687           R-squared     =  0.3408
-------------+------------------------------           Adj R-squared =  0.3070
       Total |  1.22061994    41  .029771218           Root MSE      =  .14364

------------------------------------------------------------------------------
       linvpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lprice |  -.3809609   .6788352    -0.56   0.578    -1.754035     .992113
            t |   .0098287   .0035122     2.80   0.008     .0027246    .0169328
        _cons |  -.9130595   .1356134    -6.73   0.000    -1.187363   -.6387556
------------------------------------------------------------------------------
```

Example 10.11: Effects of Antidumping Filings

use http://fmwww.bc.edu/ec-p/data/wooldridge/BARIUM

reg lchnimp lchempi lgas lrtwex befile6 affile6 afdec6 feb mar apr may jun jul aug sep oct nc

```
      Source |       SS       df       MS              Number of obs =     131
-------------+------------------------------           F( 17,   113) =    3.71
       Model |  22.8083791    17  1.34166936           Prob > F      =  0.0000
    Residual |  40.8438726   113    .3614502           R-squared     =  0.3583
-------------+------------------------------           Adj R-squared =  0.2618
       Total |  63.6522517   130  .489632706           Root MSE      =  .60121

------------------------------------------------------------------------------
     lchnimp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lchempi |   3.265067   .4929297     6.62   0.000     2.288485     4.24165
        lgas |  -1.278206   1.389015    -0.92   0.359    -4.030094    1.473683
      lrtwex |   .6630341    .471303     1.41   0.162    -.2707021     1.59677
     befile6 |   .1397036   .2668075     0.52   0.602      -.38889    .6682973
     affile6 |   .0126343   .2786866     0.05   0.964    -.5394941    .5647627
      afdec6 |  -.5213008   .3019498    -1.73   0.087    -1.119518    .0769161
         feb |   -.417716   .3044432    -1.37   0.173    -1.020873    .1854408
         mar |   .0590529   .2647304     0.22   0.824    -.4654258    .5835316
         apr |  -.4514835   .2683861    -1.68   0.095    -.9832049    .0802378
         may |   .0333114   .2692426     0.12   0.902    -.5001067    .5667294
         jun |  -.2063286   .2692517    -0.77   0.445    -.7397648    .3271076
         jul |   .0038404   .2787666     0.01   0.989    -.5484466    .5561273
         aug |   -.157059   .2779935    -0.56   0.573    -.7078142    .3936962
         sep |  -.1341598   .2676556    -0.50   0.617    -.6644338    .3961142
         oct |    .051691   .2668511     0.19   0.847    -.4769892    .5803712
         nov |   -.246259   .2628271    -0.94   0.351    -.7669669    .2744489
         dec |   .1328415   .2714237     0.49   0.625    -.4048978    .6705809
       _cons |   16.78074    32.4288     0.52   0.606    -47.46656    81.02804
------------------------------------------------------------------------------
```

test feb mar apr may jun jul aug sep oct nov dec

```
 ( 1)  feb = 0.0
 ( 2)  mar = 0.0
 ( 3)  apr = 0.0
 ( 4)  may = 0.0
 ( 5)  jun = 0.0
 ( 6)  jul = 0.0
 ( 7)  aug = 0.0
 ( 8)  sep = 0.0
 ( 9)  oct = 0.0
 (10)  nov = 0.0
 (11)  dec = 0.0

       F( 11,   113) =    0.86
            Prob > F =    0.5852
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 11 - Further Issues in Using OLS with Time Series Data

Example 11.1: Static Model

Dataset is not available

Example 11.2: Finite Distributed Lag Model

Dataset is not available

Example 11.3: AR[1] Model

Dataset is not available

Example 11.4: Efficient Market Hypothesis

use http://fmwww.bc.edu/ec-p/data/wooldridge/NYSE

summ return

```
    Variable |     Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      return |     690    .1957843    2.114532  -15.32173   8.448762
```

reg return return_1

```
      Source |       SS       df       MS              Number of obs =     689
-------------+------------------------------           F(  1,   687) =    2.40
       Model |  10.6866237     1  10.6866237           Prob > F      =  0.1218
    Residual |  3059.73813   687   4.4537673           R-squared     =  0.0035
-------------+------------------------------           Adj R-squared =  0.0020
       Total |  3070.42476   688  4.46282668           Root MSE      =  2.1104

------------------------------------------------------------------------------
      return |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    return_1 |   .0588984   .0380231     1.55   0.122    -.0157569    .1335538
       _cons |    .179634   .0807419     2.22   0.026     .0211034    .3381646
------------------------------------------------------------------------------
```

Example 11.5: Expectation Augmented Phillips Curve

use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS

reg cinf unem

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =    5.56
       Model |  33.3829988     1  33.3829988           Prob > F      =  0.0227
    Residual |   276.30513    46  6.00663326           R-squared     =  0.1078
-------------+------------------------------           Adj R-squared =  0.0884
       Total |  309.688129    47  6.58910913           Root MSE      =  2.4508

------------------------------------------------------------------------------
        cinf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |  -.5425869   .2301559    -2.36   0.023    -1.005867    -.079307
       _cons |   3.030581    1.37681     2.20   0.033     .2592061    5.801955
------------------------------------------------------------------------------
```

Natural rate of unemployment

display _b[_cons]/-_b[unem]
5.5854288

Example 11.6: Fertility Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/FERTIL3

reg gfr gfr_1

```
      Source |       SS       df       MS              Number of obs =      71
-------------+------------------------------           F(  1,    69) = 1413.53
       Model |   25734.824     1   25734.824           Prob > F      =  0.0000
    Residual |  1256.21904    69  18.2060731           R-squared     =  0.9535
-------------+------------------------------           Adj R-squared =  0.9528
       Total |   26991.043    70  385.586329           Root MSE      =  4.2669

------------------------------------------------------------------------------
         gfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       gfr_1 |   .9777202   .0260053    37.60   0.000      .925841    1.029599
       _cons |   1.304937   2.548821     0.51   0.610    -3.779822    6.389695
------------------------------------------------------------------------------
```

reg pe pe_1

```
      Source |       SS       df       MS              Number of obs =      71
-------------+------------------------------           F(  1,    69) =  895.85
       Model |   276585.96     1   276585.96           Prob > F      =  0.0000
    Residual |  21303.1151    69  308.740798           R-squared     =  0.9285
-------------+------------------------------           Adj R-squared =  0.9274
       Total |  297889.075    70  4255.55822           Root MSE      =  17.571

------------------------------------------------------------------------------
          pe |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pe_1 |   .9478853   .0316692    29.93   0.000     .8847069    1.011064
       _cons |   6.426196   3.808601     1.69   0.096    -1.171754    14.02415
------------------------------------------------------------------------------
```

reg cgfr cpe

```
      Source |       SS       df       MS              Number of obs =      71
-------------+------------------------------           F(  1,    69) =    2.26
       Model |  40.3237245     1  40.3237245           Prob > F      =  0.1370
    Residual |  1229.25863    69  17.8153424           R-squared     =  0.0318
-------------+------------------------------           Adj R-squared =  0.0177
       Total |  1269.58235    70  18.1368908           Root MSE      =  4.2208

------------------------------------------------------------------------------
        cgfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpe |  -.0426776   .0283672    -1.50   0.137    -.0992686    .0139134
       _cons |  -.7847796   .5020398    -1.56   0.123    -1.786322    .2167625
------------------------------------------------------------------------------
```

reg cgfr cpe cpe_1 cpe_2

```
      Source |       SS       df       MS              Number of obs =      69
-------------+------------------------------           F(  3,    65) =    6.56
       Model |  293.259833     3  97.7532778           Prob > F      =  0.0006
    Residual |   968.19996    65   14.895384           R-squared     =  0.2325
-------------+------------------------------           Adj R-squared =  0.1971
       Total |  1261.45979    68  18.5508793           Root MSE      =  3.8595

------------------------------------------------------------------------------
        cgfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpe |  -.0362021   .0267737    -1.35   0.181     -.089673    .0172687
       cpe_1 |  -.0139706    .027554    -0.51   0.614    -.0689997    .0410584
```

```
       cpe_2 |   .1099896   .0268797     4.09   0.000     .0563071    .1636721
       _cons |  -.9636787   .4677599    -2.06   0.043     -1.89786   -.0294976
------------------------------------------------------------------------------
```

Example 11.7: Wages and Productivity

use http://fmwww.bc.edu/ec-p/data/wooldridge/EARNS

reg lhrwage loutphr t

```
      Source |       SS       df       MS              Number of obs =      41
-------------+------------------------------           F(  2,    38) =  641.23
       Model |  1.04458054     2  .522290269           Prob > F      =  0.0000
    Residual |  .030951697    38  .000814518           R-squared     =  0.9712
-------------+------------------------------           Adj R-squared =  0.9697
       Total |  1.07553224    40  .026888306           Root MSE      =  .02854

------------------------------------------------------------------------------
     lhrwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     loutphr |   1.639637    .093347    17.56   0.000     1.450666    1.828608
           t |  -.0182299   .0017482   -10.43   0.000     -.021769   -.0146909
       _cons |  -5.328446   .3744486   -14.23   0.000    -6.086478   -4.570415
------------------------------------------------------------------------------
```

reg ghrwage goutphr

```
      Source |       SS       df       MS              Number of obs =      40
-------------+------------------------------           F(  1,    38) =   21.77
       Model |  .006255013     1  .006255013           Prob > F      =  0.0000
    Residual |  .010917977    38  .000287315           R-squared     =  0.3642
-------------+------------------------------           Adj R-squared =  0.3475
       Total |  .017172989    39  .000440333           Root MSE      =  .01695

------------------------------------------------------------------------------
     ghrwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     goutphr |   .8093157   .1734535     4.67   0.000     .4581774    1.160454
       _cons |  -.0036621     .00422    -0.87   0.391    -.0122051    .0048808
------------------------------------------------------------------------------
```

Example 11.8: Fertility Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/FERTIL3

reg cgfr cpe cpe_1 cpe_2 cgfr_1

```
      Source |       SS       df       MS              Number of obs =      69
-------------+------------------------------           F(  4,    64) =    7.46
       Model |  401.286124     4  100.321531           Prob > F      =  0.0001
    Residual |   860.17367    64  13.4402136           R-squared     =  0.3181
-------------+------------------------------           Adj R-squared =  0.2755
       Total |  1261.45979    68  18.5508793           Root MSE      =  3.6661

------------------------------------------------------------------------------
        cgfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         cpe |  -.0454721   .0256417    -1.77   0.081    -.0966972     .005753
       cpe_1 |    .002064   .0267776     0.08   0.939    -.0514303    .0555584
       cpe_2 |   .1051346   .0255904     4.11   0.000      .054012    .1562572
      cgfr_1 |   .3002422   .1059034     2.84   0.006     .0886757    .5118086
       _cons |  -.7021595   .4537988    -1.55   0.127    -1.608727    .2044079
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 12 - Serial Correlation and Heteroskedasticity in Time Series Regressions

Example 12.1: Testing for AR(1) Serial Correlation in the Phillips Curve

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS
```

```
tsset year, yearly
```

```
reg inf unem
```

```
      Source |       SS       df       MS              Number of obs =      49
-------------+------------------------------           F(  1,    47) =    2.62
       Model |  25.6369575     1  25.6369575           Prob > F      =  0.1125
    Residual |   460.61979    47  9.80042107           R-squared     =  0.0527
-------------+------------------------------           Adj R-squared =  0.0326
       Total |  486.256748    48  10.1303489           Root MSE      =  3.1306

------------------------------------------------------------------------------
         inf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |   .4676257   .2891262     1.62   0.112    -.1140212    1.049273
       _cons |    1.42361   1.719015     0.83   0.412    -2.034602    4.881822
------------------------------------------------------------------------------
```

```
predict double uh, resid
```

```
reg uh L.uh
```

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =   24.34
       Model |   150.91704     1   150.91704           Prob > F      =  0.0000
    Residual |  285.198417    46  6.19996558           R-squared     =  0.3460
-------------+------------------------------           Adj R-squared =  0.3318
       Total |  436.115457    47  9.27905227           Root MSE      =    2.49

------------------------------------------------------------------------------
uh           |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
uh           |
          L1 |   .5729695   .1161334     4.93   0.000     .3392052    .8067338
_cons        |  -.1133967    .359404    -0.32   0.754    -.8368393     .610046
------------------------------------------------------------------------------
```

```
reg cinf unem
```

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =    5.56
       Model |  33.3829988     1  33.3829988           Prob > F      =  0.0227
    Residual |   276.30513    46  6.00663326           R-squared     =  0.1078
-------------+------------------------------           Adj R-squared =  0.0884
       Total |  309.688129    47  6.58910913           Root MSE      =  2.4508

------------------------------------------------------------------------------
        cinf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |  -.5425869   .2301559    -2.36   0.023    -1.005867    -.079307
       _cons |   3.030581    1.37681     2.20   0.033     .2592061    5.801955
------------------------------------------------------------------------------
```

```
predict double uh2, resid
```

```
reg uh2 L.uh2
```

```
      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  1,    45) =    0.08
       Model |  .350023883     1  .350023883           Prob > F      =  0.7752
```

```
    Residual |  190.837374    45  4.24083054           R-squared     =  0.0018
-------------+------------------------------           Adj R-squared = -0.0204
       Total |  191.187398    46  4.15624779           Root MSE      =  2.0593

------------------------------------------------------------------------------
uh2          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
uh2          |
         L1 |  -.0355928   .1238908    -0.29   0.775    -.2851216     .213936
_cons       |   .1941655   .3003839     0.65   0.521    -.4108387    .7991698
------------------------------------------------------------------------------
```

Example 12.2: Testing for AR(1) Serial Correlation in the Minimum Wage Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/PRMINWGE

tsset year, yearly

reg lprepop lmincov lprgnp lusgnp t

```
      Source |       SS       df       MS              Number of obs =      38
-------------+------------------------------           F(  4,    33) =   66.23
       Model |  .284429802     4  .071107451           Prob > F      =  0.0000
    Residual |  .035428549    33  .001073592           R-squared     =  0.8892
-------------+------------------------------           Adj R-squared =  0.8758
       Total |  .319858351    37   .00864482           Root MSE      =  .03277

------------------------------------------------------------------------------
     lprepop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lmincov |  -.2122611   .0401525    -5.29   0.000     -.293952   -.1305703
      lprgnp |   .2852399   .0804923     3.54   0.001     .1214771    .4490027
      lusgnp |   .4860416   .2219838     2.19   0.036     .0344121     .937671
           t |  -.0266632   .0046267    -5.76   0.000    -.0360764    -.01725
       _cons |  -6.663407   1.257838    -5.30   0.000    -9.222497   -4.104317
------------------------------------------------------------------------------
```

predict uh, res

reg uh lmincov lprgnp lusgnp t L.uh

```
      Source |       SS       df       MS              Number of obs =      37
-------------+------------------------------           F(  5,    31) =    1.98
       Model |  .007527219     5  .001505444           Prob > F      =  0.1089
    Residual |  .023530495    31  .000759048           R-squared     =  0.2424
-------------+------------------------------           Adj R-squared =  0.1202
       Total |  .031057714    36  .000862714           Root MSE      =  .02755

------------------------------------------------------------------------------
uh           |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lmincov      |   .0375001   .0352124     1.06   0.295    -.0343161    .1093164
lprgnp       |  -.0784652   .0705241    -1.11   0.274       -.2223    .0653696
lusgnp       |   .2039314   .1951597     1.04   0.304    -.1940995    .6019622
t            |  -.0034662   .0040736    -0.85   0.401    -.0117744    .0048419
uh           |
         L1 |   .4805079   .1664442     2.89   0.007     .1410428     .819973
_cons       |  -.8507673   1.092697    -0.78   0.442    -3.079338    1.377804
------------------------------------------------------------------------------
```

reg uh L.uh

```
      Source |       SS       df       MS              Number of obs =      37
-------------+------------------------------           F(  1,    35) =    6.89
       Model |  .005111108     1  .005111108           Prob > F      =  0.0127
    Residual |  .025946606    35  .000741332           R-squared     =  0.1646
-------------+------------------------------           Adj R-squared =  0.1407
```

```
       Total |  .031057714    36  .000862714           Root MSE      =  .02723

------------------------------------------------------------------------------
uh           |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
uh           |
         L1 |   .4173216    .158935     2.63   0.013     .0946664    .7399768
_cons       |  -.0008953   .0044883    -0.20   0.843    -.0100071    .0082166
------------------------------------------------------------------------------
```

Example 12.3: Testing for AR(3) Serial Correlation

use http://fmwww.bc.edu/ec-p/data/wooldridge/BARIUM

tsset t, yearly

reg lchnimp lchempi lgas lrtwex befile6 affile6 afdec6

```
      Source |       SS       df       MS              Number of obs =     131
-------------+------------------------------           F(  6,   124) =    9.06
       Model |  19.4051456     6  3.23419093           Prob > F      =  0.0000
    Residual |  44.2471061   124  .356831501           R-squared     =  0.3049
-------------+------------------------------           Adj R-squared =  0.2712
       Total |  63.6522517   130  .489632706           Root MSE      =  .59735

------------------------------------------------------------------------------
     lchnimp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lchempi |     3.1172    .479202     6.50   0.000     2.168725    4.065675
        lgas |   .1963049   .9066233     0.22   0.829    -1.598157    1.990766
      lrtwex |   .9830093   .4001536     2.46   0.015     .1909934    1.775025
     befile6 |   .0595742     .26097     0.23   0.820    -.4569584    .5761068
     affile6 |  -.0324067   .2642973    -0.12   0.903    -.5555252    .4907118
      afdec6 |  -.5652446   .2858353    -1.98   0.050    -1.130993    .0005035
       _cons |  -17.80195   21.04551    -0.85   0.399    -59.45692    23.85301
------------------------------------------------------------------------------
```

predict uh, res

reg uh lchempi lgas lrtwex befile6 affile6 afdec6 L(1/3).uh

```
      Source |       SS       df       MS              Number of obs =     128
-------------+------------------------------           F(  9,   118) =    1.72
       Model |  5.03366421     9  .559296023           Prob > F      =  0.0920
    Residual |  38.3937238   118  .325370541           R-squared     =  0.1159
-------------+------------------------------           Adj R-squared =  0.0485
       Total |   43.427388   127  .341947937           Root MSE      =  .57041

------------------------------------------------------------------------------
uh           |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lchempi      |  -.1431572   .4720255    -0.30   0.762    -1.077896    .7915818
lgas         |   .6232994   .8859803     0.70   0.483    -1.131183    2.377782
lrtwex       |   .1786641   .3910344     0.46   0.649    -.5956904    .9530186
befile6      |  -.0859232   .2510069    -0.34   0.733    -.5829851    .4111387
affile6      |  -.1221207   .2546985    -0.48   0.632    -.6264931    .3822517
afdec6       |  -.0668277   .2743671    -0.24   0.808    -.6101492    .4764937
uh           |
         L1 |   .2214896   .0916573     2.42   0.017     .0399832    .4029959
         L2 |   .1340417   .0921595     1.45   0.148    -.0484592    .3165427
         L3 |    .125542   .0911194     1.38   0.171    -.0548992    .3059831
_cons       |  -14.36897   20.65581    -0.70   0.488    -55.27309    26.53516
------------------------------------------------------------------------------
```

test L1.uh L2.uh L3.uh

```
 ( 1)  L.uh = 0.0
```

```
 ( 2)  L2.uh = 0.0
 ( 3)  L3.uh = 0.0

       F(  3,   118) =    5.12
            Prob > F =    0.0023
```

Example 12.4: Cohrane-Orcutt Estimation in the Event Study

use http://fmwww.bc.edu/ec-p/data/wooldridge/BARIUM

reg lchnimp lchempi lgas lrtwex befile6 affile6 afdec6

```
      Source |       SS       df       MS              Number of obs =     131
-------------+------------------------------           F(  6,   124) =    9.06
       Model |  19.4051456     6  3.23419093           Prob > F      =  0.0000
    Residual |  44.2471061   124  .356831501           R-squared     =  0.3049
-------------+------------------------------           Adj R-squared =  0.2712
       Total |  63.6522517   130  .489632706           Root MSE      =  .59735

------------------------------------------------------------------------------
     lchnimp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lchempi |      3.1172    .479202     6.50   0.000     2.168725    4.065675
        lgas |    .1963049   .9066233     0.22   0.829    -1.598157    1.990766
      lrtwex |    .9830093   .4001536     2.46   0.015     .1909934    1.775025
     befile6 |    .0595742     .26097     0.23   0.820    -.4569584    .5761068
     affile6 |   -.0324067   .2642973    -0.12   0.903    -.5555252    .4907118
      afdec6 |   -.5652446   .2858353    -1.98   0.050    -1.130993    .0005035
       _cons |   -17.80195   21.04551    -0.85   0.399    -59.45692    23.85301
------------------------------------------------------------------------------
```

tsset t

prais lchnimp lchempi lgas lrtwex befile6 affile6 afdec6, corc

```
Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.2708
Iteration 2:  rho = 0.2912
Iteration 3:  rho = 0.2931
Iteration 4:  rho = 0.2933
Iteration 5:  rho = 0.2934
Iteration 6:  rho = 0.2934
Iteration 7:  rho = 0.2934

Cochrane-Orcutt AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =     130
-------------+------------------------------           F(  6,   123) =    4.88
       Model |   9.7087769     6  1.61812948           Prob > F      =  0.0002
    Residual |  40.7583376   123  .331368598           R-squared     =  0.1924
-------------+------------------------------           Adj R-squared =  0.1530
       Total |  50.4671145   129  .391217942           Root MSE      =  .57565

------------------------------------------------------------------------------
     lchnimp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lchempi |   2.947445   .6455564     4.57   0.000     1.669605    4.225284
        lgas |   1.054786   .9909084     1.06   0.289    -.9066561    3.016229
      lrtwex |   1.136903   .5135093     2.21   0.029     .1204431    2.153364
     befile6 |  -.0163727   .3207215    -0.05   0.959    -.6512212    .6184757
     affile6 |  -.0330837   .3231511    -0.10   0.919    -.6727414    .6065741
      afdec6 |  -.5771574   .3434533    -1.68   0.095    -1.257002    .1026874
       _cons |  -37.32057   23.22152    -1.61   0.111    -83.28615    8.645004
-------------+----------------------------------------------------------------
         rho |   .2933587
------------------------------------------------------------------------------
```

```
Durbin-Watson statistic (original)    1.458417
Durbin-Watson statistic (transformed) 2.063302
```

Example 12.5: Static Phillips Curve

use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS

reg lchnimp lchempi lgas lrtwex befile6 affile6 afdec6

```
      Source |       SS       df       MS              Number of obs =      49
-------------+------------------------------           F(  1,    47) =    2.62
       Model |  25.6369575     1  25.6369575           Prob > F      =  0.1125
    Residual |   460.61979    47  9.80042107           R-squared     =  0.0527
-------------+------------------------------           Adj R-squared =  0.0326
       Total |  486.256748    48  10.1303489           Root MSE      =  3.1306

------------------------------------------------------------------------------
         inf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |   .4676257   .2891262     1.62   0.112    -.1140212    1.049273
       _cons |    1.42361   1.719015     0.83   0.412    -2.034602    4.881822
------------------------------------------------------------------------------
```

tsset year

prais inf unem, corc

```
Iteration 0:  rho = 0.0000
Iteration 1:  rho = 0.5727
Iteration 2:  rho = 0.7160
Iteration 3:  rho = 0.7611
Iteration 4:  rho = 0.7715
Iteration 5:  rho = 0.7735
Iteration 6:  rho = 0.7740
Iteration 7:  rho = 0.7740
Iteration 8:  rho = 0.7740
Iteration 9:  rho = 0.7741
Iteration 10:  rho = 0.7741

Cochrane-Orcutt AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =    4.33
       Model |  22.4790685     1  22.4790685           Prob > F      =  0.0430
    Residual |  238.604008    46  5.18704365           R-squared     =  0.0861
-------------+------------------------------           Adj R-squared =  0.0662
       Total |  261.083076    47  5.55495907           Root MSE      =  2.2775

------------------------------------------------------------------------------
         inf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        unem |  -.6653356   .3196035    -2.08   0.043    -1.308664   -.0220071
       _cons |   7.583458    2.38053     3.19   0.003       2.7917    12.37522
-------------+----------------------------------------------------------------
         rho |   .7740512
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.802700
Durbin-Watson statistic (transformed) 1.593634
```

Example 12.6: Differencing the Interest Rate Equation

use http://fmwww.bc.edu/ec-p/data/wooldridge/INTDEF

tsset year

reg i3 inf def

```
      Source |       SS       df       MS              Number of obs =      49
-------------+------------------------------           F(  2,    46) =   52.78
       Model |  294.032897     2  147.016449            Prob > F      =  0.0000
    Residual |  128.133943    46  2.78552049            R-squared     =  0.6965
-------------+------------------------------           Adj R-squared =  0.6833
       Total |   422.16684    48   8.7951425           Root MSE      =   1.669

------------------------------------------------------------------------------
          i3 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         inf |   .6131825   .0757753     8.09   0.000     .4606547    .7657104
         def |   .7004054     .11807     5.93   0.000     .4627427     .938068
       _cons |   1.252032   .4416346     2.83   0.007     .3630674    2.140996
------------------------------------------------------------------------------
```

dwstat

```
Durbin-Watson d-statistic(  3,    49) =  .9142607
```

predict uh, res

reg uh L.uh

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =   18.48
       Model |  35.6747689     1  35.6747689            Prob > F      =  0.0001
    Residual |   88.824587    46  1.93096928            R-squared     =  0.2865
-------------+------------------------------           Adj R-squared =  0.2710
       Total |  124.499356    47  2.64892247            Root MSE      =  1.3896

------------------------------------------------------------------------------
uh           |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
uh           |
         L1 |   .5295517   .1232013     4.30   0.000     .2815602    .7775431
_cons        |   .0497676   .2005853     0.25   0.805    -.3539896    .4535247
------------------------------------------------------------------------------
```

reg ci3 cinf cdef

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  2,    45) =    4.32
       Model |  14.4340809     2  7.21704047            Prob > F      =  0.0193
    Residual |  75.2395041    45  1.67198898            R-squared     =  0.1610
-------------+------------------------------           Adj R-squared =  0.1237
       Total |   89.673585    47  1.90794862            Root MSE      =  1.2931

------------------------------------------------------------------------------
         ci3 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        cinf |   .1683474    .100197     1.68   0.100    -.0334596    .3701544
        cdef |  -.1075013   .1719174    -0.63   0.535    -.4537607     .238758
       _cons |   .1144652     .18737     0.61   0.544    -.2629172    .4918477
------------------------------------------------------------------------------
```

dwstat

```
Durbin-Watson d-statistic(  3,    48) =  1.806339
```

predict uh2, res

reg uh2 L.uh2

```
      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  1,    45) =    0.22
       Model |  .342371554     1  .342371554            Prob > F      =  0.6432
    Residual |  70.8327461    45  1.57406102            R-squared     =  0.0048
```

```
-------------+------------------------------           Adj R-squared = -0.0173
       Total |  71.1751176    46  1.54728517           Root MSE      =  1.2546

------------------------------------------------------------------------------
uh2          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
uh2          |
          L1 |   .0677054   .1451729     0.47   0.643    -.2246878    .3600986
_cons        |  -.0435038   .1830186    -0.24   0.813    -.4121222    .3251146
------------------------------------------------------------------------------
```

Example 12.7: The Puerto Rican Minimum Wage

use http://fmwww.bc.edu/ec-p/data/wooldridge/PRMINWGE

tsset t

reg lprepop lmincov lprgnp lusgnp t

```
      Source |       SS       df       MS              Number of obs =      38
-------------+------------------------------           F(  4,    33) =   66.23
       Model |  .284429802     4  .071107451           Prob > F      =  0.0000
    Residual |  .035428549    33  .001073592           R-squared     =  0.8892
-------------+------------------------------           Adj R-squared =  0.8758
       Total |  .319858351    37   .00864482           Root MSE      =  .03277

------------------------------------------------------------------------------
     lprepop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lmincov |  -.2122611   .0401525    -5.29   0.000     -.293952   -.1305703
      lprgnp |   .2852399   .0804923     3.54   0.001     .1214771    .4490027
      lusgnp |   .4860416   .2219838     2.19   0.036     .0344121     .937671
           t |  -.0266632   .0046267    -5.76   0.000    -.0360764    -.01725
       _cons |  -6.663407   1.257838    -5.30   0.000    -9.222497   -4.104317
------------------------------------------------------------------------------
```

newey lprepop lmincov lprgnp lusgnp t, lag(2)

```
Regression with Newey-West standard errors          Number of obs  =        38
maximum lag : 2                                     F(  4,    33)  =     37.84
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
     lprepop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     lmincov |  -.2122611   .0457188    -4.64   0.000    -.3052768   -.1192455
      lprgnp |   .2852399   .0996364     2.86   0.007      .082528    .4879518
      lusgnp |   .4860416   .2791144     1.74   0.091     -.081821    1.053904
           t |  -.0266632   .0057559    -4.63   0.000    -.0383736   -.0149528
       _cons |  -6.663407   1.536445    -4.34   0.000    -9.789328   -3.537485
------------------------------------------------------------------------------
```

prais lprepop lmincov lprgnp lusgnp t, corc

```
Cochrane-Orcutt AR(1) regression -- iterated estimates

      Source |       SS       df       MS              Number of obs =      37
-------------+------------------------------           F(  4,    32) =   11.06
       Model |  .031015685     4  .007753921           Prob > F      =  0.0000
    Residual |  .022428371    32  .000700887           R-squared     =  0.5803
-------------+------------------------------           Adj R-squared =  0.5279
       Total |  .053444056    36  .001484557           Root MSE      =  .02647

------------------------------------------------------------------------------
     lprepop |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
     lmincov |   -.110755   .0446556    -2.48   0.019    -.2017155   -.0197944
      lprgnp |   .2673698   .1119371     2.39   0.023     .0393614    .4953782
      lusgnp |   .3664558   .2201901     1.66   0.106    -.0820568    .8149684
           t |  -.0243278    .005792    -4.20   0.000    -.0361256     -.01253
       _cons |   -5.51891   1.339621    -4.12   0.000     -8.24763   -2.790191
-------------+----------------------------------------------------------------
         rho |    .643343
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    1.013709
Durbin-Watson statistic (transformed) 1.630403
```

Example 12.8: Heteroscedasticity and the Efficient Markets Hypothesis

use http://fmwww.bc.edu/ec-p/data/wooldridge/NYSE

reg return return_1

```
      Source |       SS       df       MS              Number of obs =     689
-------------+------------------------------           F(  1,   687) =    2.40
       Model |  10.6866237     1  10.6866237           Prob > F      =  0.1218
    Residual |  3059.73813   687   4.4537673           R-squared     =  0.0035
-------------+------------------------------           Adj R-squared =  0.0020
       Total |  3070.42476   688  4.46282668           Root MSE      =  2.1104

------------------------------------------------------------------------------
      return |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    return_1 |   .0588984   .0380231     1.55   0.122    -.0157569    .1335538
       _cons |    .179634   .0807419     2.22   0.026     .0211034    .3381646
------------------------------------------------------------------------------
```

predict uh, res

gen uh2=uh^2

bpagan return_1

```
Breusch-Pagan LM statistic:  95.21722  Chi-sq( 1)  P-value =  1.7e-22
```

reg uh2 return_1

```
      Source |       SS       df       MS              Number of obs =     689
-------------+------------------------------           F(  1,   687) =   30.05
       Model |  3755.56757     1  3755.56757           Prob > F      =  0.0000
    Residual |  85846.3162   687  124.958248           R-squared     =  0.0419
-------------+------------------------------           Adj R-squared =  0.0405
       Total |  89601.8838   688  130.235296           Root MSE      =  11.178

------------------------------------------------------------------------------
         uh2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    return_1 |  -1.104132   .2014029    -5.48   0.000    -1.499572   -.7086932
       _cons |   4.656501   .4276789    10.89   0.000     3.816786    5.496216
------------------------------------------------------------------------------
```

Example 12.9: ARCH in Stock Returns

use http://fmwww.bc.edu/ec-p/data/wooldridge/NYSE

tsset t

reg return return_1

```
      Source |       SS       df       MS              Number of obs =     689
-------------+------------------------------           F(  1,   687) =    2.40
       Model |  10.6866237     1  10.6866237           Prob > F      =  0.1218
    Residual |  3059.73813   687   4.4537673           R-squared     =  0.0035
```

```
-------------+------------------------------           Adj R-squared =  0.0020
       Total |  3070.42476   688  4.46282668           Root MSE      =  2.1104

------------------------------------------------------------------------------
      return |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    return_1 |   .0588984   .0380231     1.55   0.122    -.0157569    .1335538
       _cons |    .179634   .0807419     2.22   0.026     .0211034    .3381646
------------------------------------------------------------------------------
```

predict uh1, res

gen uh21=uh1^2

gen uh21_1=uh1[_n-1]^2

archlm

```
ARCH LM test statistic, order(  1):  78.16118  Chi-sq( 1)  P-value =  9.5e-19
```

reg uh21 uh21_1

```
      Source |       SS       df       MS              Number of obs =     688
-------------+------------------------------           F(  1,   686) =   87.92
       Model |  10177.7088     1  10177.7088           Prob > F      =  0.0000
    Residual |  79409.7826   686  115.757701           R-squared     =  0.1136
-------------+------------------------------           Adj R-squared =  0.1123
       Total |  89587.4914   687  130.403918           Root MSE      =  10.759

------------------------------------------------------------------------------
        uh21 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      uh21_1 |   .3370622   .0359468     9.38   0.000     .2664833    .4076411
       _cons |   2.947434   .4402343     6.70   0.000     2.083065    3.811802
------------------------------------------------------------------------------
```

reg uh1 L.uh1

```
      Source |       SS       df       MS              Number of obs =     688
-------------+------------------------------           F(  1,   686) =    0.00
       Model |  .006037908     1  .006037908           Prob > F      =  0.9707
    Residual |   3059.0813   686  4.45930219           R-squared     =  0.0000
-------------+------------------------------           Adj R-squared = -0.0015
       Total |  3059.08734   687     4.45282           Root MSE      =  2.1117

------------------------------------------------------------------------------
uh1          |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
uh1          |
          L1 |   .0014048   .0381773     0.04   0.971    -.0735537    .0763633
_cons        |  -.0011708    .080508    -0.01   0.988    -.1592425     .156901
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 13 - Pooling Cross Sections Across Time. Simple Panel Data Methods

Example 13.1: Woman's Fertility Over Time

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/FERTIL1
```

```
reg kids educ age agesq black east northcen west farm othrural town smcity y74 y76 y78 y80 y8
```

```
      Source |       SS       df       MS              Number of obs =    1129
-------------+------------------------------           F( 17,  1111) =    9.72
       Model |  399.610888    17  23.5065228           Prob > F      =  0.0000
    Residual |  2685.89841  1111  2.41755033           R-squared     =  0.1295
-------------+------------------------------           Adj R-squared =  0.1162
       Total |   3085.5093  1128  2.73538059           Root MSE      =  1.5548

------------------------------------------------------------------------------
        kids |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |  -.1284268   .0183486    -7.00   0.000    -.1644286    -.092425
         age |   .5321346   .1383863     3.85   0.000     .2606065    .8036626
       agesq |   -.005804   .0015643    -3.71   0.000    -.0088733   -.0027347
       black |   1.075658   .1735356     6.20   0.000     .7351631    1.416152
        east |    .217324   .1327878     1.64   0.102    -.0432192    .4778672
    northcen |    .363114   .1208969     3.00   0.003      .125902    .6003261
        west |   .1976032   .1669134     1.18   0.237    -.1298978    .5251041
        farm |  -.0525575    .14719    -0.36   0.721    -.3413592    .2362443
    othrural |  -.1628537   .175442    -0.93   0.353    -.5070887    .1813814
        town |   .0843532   .124531     0.68   0.498    -.1599893    .3286957
      smcity |   .2118791   .160296     1.32   0.187    -.1026379    .5263961
         y74 |   .2681825   .172716     1.55   0.121    -.0707039    .6070689
         y76 |  -.0973795   .1790456    -0.54   0.587     -.448685    .2539261
         y78 |  -.0686665   .1816837    -0.38   0.706    -.4251483    .2878154
         y80 |  -.0713053   .1827707    -0.39   0.697      -.42992    .2873093
         y82 |  -.5224842   .1724361    -3.03   0.003    -.8608214    -.184147
         y84 |  -.5451661   .1745162    -3.12   0.002    -.8875846   -.2027477
       _cons |  -7.742457   3.051767    -2.54   0.011    -13.73033   -1.754579
------------------------------------------------------------------------------
```

```
test y74 y76 y78 y80 y82 y84
```

```
 ( 1)  y74 = 0.0
 ( 2)  y76 = 0.0
 ( 3)  y78 = 0.0
 ( 4)  y80 = 0.0
 ( 5)  y82 = 0.0
 ( 6)  y84 = 0.0

       F(  6,  1111) =    5.87
            Prob > F =    0.0000
```

Example 13.2: Changes in the Return to Education and the Gender Wage Gap

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CPS78_85
```

```
reg lwage y85 educ y85educ exper expersq union female y85fem
```

```
      Source |       SS       df       MS              Number of obs =    1084
-------------+------------------------------           F(  8,  1075) =   99.80
       Model |  135.992074     8  16.9990092           Prob > F      =  0.0000
    Residual |  183.099094  1075  .170324738           R-squared     =  0.4262
-------------+------------------------------           Adj R-squared =  0.4219
       Total |  319.091167  1083   .29463635           Root MSE      =   .4127

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         y85 |   .1178062   .1237817     0.95   0.341     -.125075    .3606874
        educ |   .0747209   .0066764    11.19   0.000     .0616206    .0878212
     y85educ |   .0184605   .0093542     1.97   0.049      .000106     .036815
       exper |   .0295843   .0035673     8.29   0.000     .0225846     .036584
     expersq |  -.0003994   .0000775    -5.15   0.000    -.0005516   -.0002473
       union |   .2021319   .0302945     6.67   0.000     .1426888    .2615749
```

```
      female |  -.3167086   .0366215    -8.65   0.000    -.3885663    -.244851
      y85fem |    .085052    .051309     1.66   0.098    -.0156251     .185729
       _cons |   .4589329   .0934485     4.91   0.000     .2755707     .642295
------------------------------------------------------------------------------
```

Example 13.3: Effect of a Garbage Incinerator's Location on Housing Prices

use http://fmwww.bc.edu/ec-p/data/wooldridge/KIELMC

reg rprice nearinc if year==1981

```
      Source |       SS       df       MS              Number of obs =     142
-------------+------------------------------           F(  1,   140) =   27.73
       Model |  2.7059e+10     1  2.7059e+10           Prob > F      =  0.0000
    Residual |  1.3661e+11   140   975815069           R-squared     =  0.1653
-------------+------------------------------           Adj R-squared =  0.1594
       Total |  1.6367e+11   141  1.1608e+09           Root MSE      =   31238

------------------------------------------------------------------------------
      rprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     nearinc |  -30688.27   5827.709    -5.27   0.000    -42209.97   -19166.58
       _cons |   101307.5   3093.027    32.75   0.000     95192.43    107422.6
------------------------------------------------------------------------------
```

scalar b1=_b[nearinc]

reg rprice nearinc if year==1978

```
      Source |       SS       df       MS              Number of obs =     179
-------------+------------------------------           F(  1,   177) =   15.74
       Model |  1.3636e+10     1  1.3636e+10           Prob > F      =  0.0001
    Residual |  1.5332e+11   177   866239953           R-squared     =  0.0817
-------------+------------------------------           Adj R-squared =  0.0765
       Total |  1.6696e+11   178   937979126           Root MSE      =   29432

------------------------------------------------------------------------------
      rprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     nearinc |  -18824.37   4744.594    -3.97   0.000    -28187.62   -9461.118
       _cons |   82517.23    2653.79    31.09   0.000     77280.09    87754.37
------------------------------------------------------------------------------
```

scalar b2=_b[nearinc]

The difference in two coefficients on nearinc

display b1-b2

```
-11863.903
```

reg rprice nearinc y81 y81nrinc

```
      Source |       SS       df       MS              Number of obs =     321
-------------+------------------------------           F(  3,   317) =   22.25
       Model |  6.1055e+10     3  2.0352e+10           Prob > F      =  0.0000
    Residual |  2.8994e+11   317   914632749           R-squared     =  0.1739
-------------+------------------------------           Adj R-squared =  0.1661
       Total |  3.5099e+11   320  1.0969e+09           Root MSE      =   30243

------------------------------------------------------------------------------
      rprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     nearinc |  -18824.37   4875.322    -3.86   0.000    -28416.45   -9232.293
         y81 |   18790.29   4050.065     4.64   0.000     10821.88    26758.69
    y81nrinc |   -11863.9   7456.646    -1.59   0.113    -26534.67    2806.866
       _cons |   82517.23    2726.91    30.26   0.000      77152.1    87882.36
------------------------------------------------------------------------------
```

reg rprice nearinc y81 y81nrinc age agesq

```
      Source |       SS       df       MS              Number of obs =     321
-------------+------------------------------           F(  5,   315) =   44.59
       Model |  1.4547e+11     5  2.9094e+10           Prob > F      =  0.0000
    Residual |  2.0552e+11   315   652459465           R-squared     =  0.4144
-------------+------------------------------           Adj R-squared =  0.4052
```

```
       Total |  3.5099e+11   320  1.0969e+09           Root MSE      =   25543

------------------------------------------------------------------------------
      rprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     nearinc |   9397.936   4812.222     1.95   0.052    -70.22392     18866.1
         y81 |   21321.04   3443.631     6.19   0.000     14545.62    28096.47
    y81nrinc |  -21920.27   6359.745    -3.45   0.001    -34433.22   -9407.322
         age |  -1494.424   131.8603   -11.33   0.000    -1753.862   -1234.986
       agesq |   8.691277   .8481268    10.25   0.000     7.022567    10.35999
       _cons |   89116.54   2406.051    37.04   0.000     84382.57     93850.5
------------------------------------------------------------------------------
```

reg rprice nearinc y81 y81nrinc age agesq intst land area rooms baths

```
      Source |       SS       df       MS              Number of obs =     321
-------------+------------------------------           F( 10,   310) =   60.19
       Model |  2.3167e+11    10  2.3167e+10           Prob > F      =  0.0000
    Residual |  1.1932e+11   310   384905873           R-squared     =  0.6600
-------------+------------------------------           Adj R-squared =  0.6491
       Total |  3.5099e+11   320  1.0969e+09           Root MSE      =   19619

------------------------------------------------------------------------------
      rprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     nearinc |   3780.334   4453.415     0.85   0.397     -4982.41    12543.08
         y81 |   13928.48   2798.747     4.98   0.000     8421.533    19435.42
    y81nrinc |  -14177.93   4987.267    -2.84   0.005    -23991.11   -4364.759
         age |   -739.451   131.1272    -5.64   0.000    -997.4629   -481.4391
       agesq |    3.45274   .8128214     4.25   0.000     1.853395    5.052084
       intst |  -.5386353   .1963359    -2.74   0.006    -.9249549   -.1523158
        land |   .1414196   .0310776     4.55   0.000     .0802698    .2025693
        area |   18.08621   2.306064     7.84   0.000     13.54869    22.62373
       rooms |   3304.225   1661.248     1.99   0.048     35.47769    6572.973
       baths |   6977.318   2581.321     2.70   0.007     1898.192    12056.44
       _cons |   13807.67   11166.59     1.24   0.217     -8164.23    35779.58
------------------------------------------------------------------------------
```

reg lprice nearinc y81 y81nrinc

```
      Source |       SS       df       MS              Number of obs =     321
-------------+------------------------------           F(  3,   317) =   73.15
       Model |  25.1331556     3  8.37771854           Prob > F      =  0.0000
    Residual |  36.3057473   317  .114529171           R-squared     =  0.4091
-------------+------------------------------           Adj R-squared =  0.4035
       Total |  61.4389029   320  .191996572           Root MSE      =  .33842

------------------------------------------------------------------------------
      lprice |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     nearinc |  -.3399216   .0545554    -6.23   0.000    -.4472581   -.2325851
         y81 |   .4569954   .0453207    10.08   0.000      .367828    .5461628
    y81nrinc |  -.0626505   .0834408    -0.75   0.453    -.2268181    .1015172
       _cons |   11.28542   .0305144   369.84   0.000     11.22539    11.34546
------------------------------------------------------------------------------
```

Example 13.4: Effect of Worker Compensation laws on Duration

use http://fmwww.bc.edu/ec-p/data/wooldridge/INJURY

reg ldurat afchnge highearn afhigh if ky

```
      Source |       SS       df       MS              Number of obs =    5626
-------------+------------------------------           F(  3,  5622) =   39.54
       Model |  191.071427     3  63.6904757           Prob > F      =  0.0000
    Residual |  9055.93393  5622   1.6108029           R-squared     =  0.0207
-------------+------------------------------           Adj R-squared =  0.0201
       Total |  9247.00536  5625  1.64391206           Root MSE      =  1.2692

------------------------------------------------------------------------------
      ldurat |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     afchnge |   .0076573   .0447173     0.17   0.864    -.0800058    .0953204
```

```
    highearn |   .2564785   .0474464     5.41   0.000     .1634652    .3494918
      afhigh |   .1906012   .0685089     2.78   0.005     .0562973    .3249051
       _cons |   1.125615   .0307368    36.62   0.000     1.065359    1.185871
------------------------------------------------------------------------------
```

Example 13.5: Sleeping Versus Working

use http://fmwww.bc.edu/ec-p/data/wooldridge/SLP75_81

reg cslpnap ctotwrk ceduc cmarr cyngkid cgdhlth

```
      Source |       SS       df       MS              Number of obs =     239
-------------+------------------------------           F(  5,   233) =    8.19
       Model |  14674698.2     5  2934939.64           Prob > F      =  0.0000
    Residual |  83482611.7   233  358294.471           R-squared     =  0.1495
-------------+------------------------------           Adj R-squared =  0.1313
       Total |  98157309.9   238  412425.672           Root MSE      =  598.58

------------------------------------------------------------------------------
     cslpnap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     ctotwrk |  -.2266694    .036054    -6.29   0.000    -.2977029   -.1556359
       ceduc |  -.0244717   48.75938    -0.00   1.000    -96.09007    96.04113
       cmarr |   104.2139   92.85536     1.12   0.263    -78.72946    287.1574
     cyngkid |    94.6654   87.65252     1.08   0.281    -78.02738    267.3582
     cgdhlth |   87.57785   76.59913     1.14   0.254    -63.33758    238.4933
       _cons |  -92.63404    45.8659    -2.02   0.045    -182.9989   -2.269154
------------------------------------------------------------------------------
```

test ceduc cmarr cyngkid cgdhlth

```
 ( 1)  ceduc = 0.0
 ( 2)  cmarr = 0.0
 ( 3)  cyngkid = 0.0
 ( 4)  cgdhlth = 0.0

       F(  4,   233) =    0.86
            Prob > F =    0.4857
```

Example 13.6: Distributed Lag of Crime Rate on Clear-up Rate

use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME3

reg clcrime cclrprc1 cclrprc2

```
      Source |       SS       df       MS              Number of obs =      53
-------------+------------------------------           F(  2,    50) =    5.99
       Model |  1.42294706     2  .711473529           Prob > F      =  0.0046
    Residual |  5.93723982    50  .118744796           R-squared     =  0.1933
-------------+------------------------------           Adj R-squared =  0.1611
       Total |  7.36018687    52  .141542055           Root MSE      =  .34459

------------------------------------------------------------------------------
     clcrime |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    cclrprc1 |  -.0040475   .0047199    -0.86   0.395    -.0135276    .0054326
    cclrprc2 |  -.0131966   .0051946    -2.54   0.014    -.0236302   -.0027629
       _cons |   .0856556   .0637825     1.34   0.185    -.0424553    .2137665
------------------------------------------------------------------------------
```

Example 13.7: Effect of Drunk Driving Laws on Traffic Fatalities

use http://fmwww.bc.edu/ec-p/data/wooldridge/TRAFFIC1

reg cdthrte copen cadmn

```
      Source |       SS       df       MS              Number of obs =      51
-------------+------------------------------           F(  2,    48) =    3.23
       Model |  .762579679     2   .38128984           Prob > F      =  0.0482
    Residual |   5.6636945    48  .117993635           R-squared     =  0.1187
-------------+------------------------------           Adj R-squared =  0.0819
       Total |  6.42627418    50  .128525484           Root MSE      =   .3435
```

```
------------------------------------------------------------------------------
     cdthrte |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       copen |  -.4196787   .2055948    -2.04   0.047    -.8330547   -.0063028
       cadmn |  -.1506024   .1168223    -1.29   0.204    -.3854894    .0842846
       _cons |  -.4967872   .0524256    -9.48   0.000    -.6021959   -.3913784
------------------------------------------------------------------------------
```

Example 13.8: Effect of Enterprise Zones on Unemployment Claims

use http://fmwww.bc.edu/ec-p/data/wooldridge/EZUNEM

reg guclms d82 d83 d84 d85 d86 d87 d88 cez

```
      Source |       SS       df       MS              Number of obs =     176
-------------+------------------------------           F(  8,   167) =   34.50
       Model |  12.8826331     8  1.61032914            Prob > F      =  0.0000
    Residual |  7.79583789   167  .046681664           R-squared     =  0.6230
-------------+------------------------------           Adj R-squared =  0.6049
       Total |   20.678471   175  .118162691           Root MSE      =  .21606

------------------------------------------------------------------------------
      guclms |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         d82 |   .7787595   .0651444    11.95   0.000     .6501469    .9073721
         d83 |  -.0331192   .0651444    -0.51   0.612    -.1617318    .0954934
         d84 |  -.0171382   .0685455    -0.25   0.803    -.1524655     .118189
         d85 |    .323081   .0666774     4.85   0.000     .1914418    .4547202
         d86 |    .292154   .0651444     4.48   0.000     .1635413    .4207666
         d87 |   .0539481   .0651444     0.83   0.409    -.0746645    .1825607
         d88 |  -.0170526   .0651444    -0.26   0.794    -.1456652      .11156
         cez |  -.1818775   .0781862    -2.33   0.021    -.3362382   -.0275169
       _cons |  -.3216319    .046064    -6.98   0.000    -.4125748    -.230689
------------------------------------------------------------------------------
```

bpagan d82 d83 d84 d85 d86 d87 d88 cez

```
Breusch-Pagan LM statistic:   6.58428  Chi-sq( 8)  P-value =  .5821
```

Example 13.9: Country Crime Rates in North Carolina

use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME4

reg clcrmrte d83 d84 d85 d86 d87 clprbarr clprbcon clprbpri clavgsen clpolpc

```
      Source |       SS       df       MS              Number of obs =     540
-------------+------------------------------           F( 10,   529) =   40.32
       Model |  9.60042816    10  .960042816            Prob > F      =  0.0000
    Residual |  12.5963761   529  .023811675           R-squared     =  0.4325
-------------+------------------------------           Adj R-squared =  0.4218
       Total |  22.1968043   539  .041181455           Root MSE      =  .15431

------------------------------------------------------------------------------
    clcrmrte |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         d83 |  -.0998658   .0238953    -4.18   0.000    -.1468071   -.0529246
         d84 |  -.0479374   .0235021    -2.04   0.042    -.0941063   -.0017686
         d85 |  -.0046111   .0234998    -0.20   0.845    -.0507756    .0415533
         d86 |   .0275143   .0241494     1.14   0.255    -.0199261    .0749548
         d87 |   .0408267   .0244153     1.67   0.095    -.0071361    .0887895
    clprbarr |  -.3274942   .0299801   -10.92   0.000    -.3863889   -.2685994
    clprbcon |  -.2381066   .0182341   -13.06   0.000    -.2739268   -.2022864
    clprbpri |  -.1650462    .025969    -6.36   0.000    -.2160613   -.1140312
    clavgsen |  -.0217607   .0220909    -0.99   0.325    -.0651574    .0216361
     clpolpc |   .3984264    .026882    14.82   0.000     .3456177    .4512351
       _cons |   .0077134   .0170579     0.45   0.651    -.0257961    .0412229
------------------------------------------------------------------------------
```

whitetst, fitted

```
White's special test statistic :  118.4921  Chi-sq( 2)  P-value =  1.9e-26
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 14 - Advanced Panel Data Methods

Example 14.1: Effect of Job Training on Firm Scrap Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/JTRAIN

iis fcode

tis year

xtreg lscrap d88 d89 grant grant_1, fe
```

```
Fixed-effects (within) regression               Number of obs      =       162
Group variable (i) : fcode                      Number of groups   =        54

R-sq:  within  = 0.2010                         Obs per group: min =         3
       between = 0.0079                                        avg =       3.0
       overall = 0.0068                                        max =         3

                                                F(4,104)           =      6.54
corr(u_i, Xb)  = -0.0714                        Prob > F           =    0.0001

------------------------------------------------------------------------------
      lscrap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         d88 |  -.0802157   .1094751    -0.73   0.465    -.2973089    .1368776
         d89 |  -.2472028   .1332183    -1.86   0.066    -.5113797     .016974
       grant |  -.2523149    .150629    -1.68   0.097    -.5510178     .046388
     grant_1 |  -.4215895      .2102    -2.01   0.047    -.8384239   -.0047551
       _cons |    .597434   .0677344     8.82   0.000     .4631142    .7317539
-------------+----------------------------------------------------------------
     sigma_u |   1.438982
     sigma_e |   .4977442
         rho |  .89313867   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(53, 104) =    24.66                 Prob > F = 0.0000
```

Change in firm's scrap rate in 1989 if the training grant was received in 1988

```
display exp(_b[grant_1])-1
```

```
-.34399671
```

```
xtreg lscrap d88 d89 grant, fe
```

```
Fixed-effects (within) regression               Number of obs      =       162
Group variable (i) : fcode                      Number of groups   =        54

R-sq:  within  = 0.1701                         Obs per group: min =         3
       between = 0.0189                                        avg =       3.0
       overall = 0.0130                                        max =         3

                                                F(3,105)           =      7.18
corr(u_i, Xb)  = -0.0109                        Prob > F           =    0.0002

------------------------------------------------------------------------------
      lscrap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         d88 |  -.1400659    .106835    -1.31   0.193    -.3518999    .0717681
         d89 |    -.42704   .0999338    -4.27   0.000    -.6251903   -.2288897
       grant |  -.0822141   .1262632    -0.65   0.516    -.3325706    .1681424
       _cons |    .597434   .0687024     8.70   0.000     .4612098    .7336583
-------------+----------------------------------------------------------------
     sigma_u |  1.4283441
     sigma_e |  .50485773
```

```
         rho |  .88894293   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(53, 105) =    23.90             Prob > F = 0.0000
```

Example 14.2: Has the Return to Education Changed Over Time

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGEPAN

iis nr

tis year

gen edd81 = educ*d81

gen edd82 = educ*d82

gen edd83 = educ*d83

gen edd84 = educ*d84

gen edd85 = educ*d85

gen edd86 = educ*d86

gen edd87 = educ*d87

xtreg lwage expersq union married d81-d87 edd81-edd87, fe

Fixed-effects (within) regression               Number of obs      =      4360
Group variable (i) : nr                         Number of groups   =       545

R-sq:  within  = 0.1814                         Obs per group: min =         8
       between = 0.0211                                        avg =       8.0
       overall = 0.0784                                        max =         8

                                                F(17,3798)         =     49.49
corr(u_i, Xb)  = -0.1732                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     expersq |  -.0060437   .0008633    -7.00   0.000    -.0077362   -.0043512
       union |   .0789759   .0193328     4.09   0.000     .0410722    .1168796
     married |   .0474337   .0183277     2.59   0.010     .0115006    .0833668
         d81 |     .09842    .145999     0.67   0.500     -.187824     .384664
         d82 |   .2472014   .1493785     1.65   0.098    -.0456685    .5400712
         d83 |   .4088129   .1557146     2.63   0.009     .1035206    .7141052
         d84 |   .6399246   .1652396     3.87   0.000     .3159577    .9638916
         d85 |   .7729394   .1779911     4.34   0.000      .423972    1.121907
         d86 |   .9699322   .1941747     5.00   0.000     .5892354    1.350629
         d87 |   1.188776   .2135856     5.57   0.000     .7700229     1.60753
       edd81 |   .0049906    .012222     0.41   0.683    -.0189718     .028953
       edd82 |    .001651   .0123304     0.13   0.893    -.0225239    .0258259
       edd83 |  -.0026621   .0125098    -0.21   0.831    -.0271886    .0218644
       edd84 |  -.0098257   .0127593    -0.77   0.441    -.0348414      .01519
       edd85 |  -.0092145   .0130721    -0.70   0.481    -.0348436    .0164146
       edd86 |  -.0121382   .0134419    -0.90   0.367    -.0384922    .0142159
       edd87 |  -.0157891    .013868    -1.14   0.255    -.0429785    .0114002
       _cons |   1.436283   .0192766    74.51   0.000     1.398489    1.474076
-------------+----------------------------------------------------------------
     sigma_u |  .39876324
     sigma_e |  .35114511
         rho |   .5632436   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(544, 3798) =     8.25             Prob > F = 0.0000

test edd81 edd82 edd83 edd84 edd85 edd86 edd87
```

```
 ( 1)  edd81 = 0.0
 ( 2)  edd82 = 0.0
 ( 3)  edd83 = 0.0
 ( 4)  edd84 = 0.0
 ( 5)  edd85 = 0.0
 ( 6)  edd86 = 0.0
 ( 7)  edd87 = 0.0

       F(  7,  3798) =    0.52
            Prob > F =    0.8202
```

Example 14.3: Effect of Job Training on Firm Scrap Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/JTRAIN

iis fcode

tis year

xtreg lscrap d88 d89 grant grant_1 lsales lemploy, fe

Fixed-effects (within) regression               Number of obs      =       148
Group variable (i) : fcode                      Number of groups   =        51

R-sq:  within  = 0.2131                         Obs per group: min =         1
       between = 0.0341                                        avg =       2.9
       overall = 0.0004                                        max =         3

                                                F(6,91)            =      4.11
corr(u_i, Xb)  = -0.2258                        Prob > F           =    0.0011

------------------------------------------------------------------------------
      lscrap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         d88 |  -.0039605   .1195487    -0.03   0.974    -.2414293    .2335083
         d89 |  -.1321925   .1536863    -0.86   0.392    -.4374715    .1730865
       grant |  -.2967544    .157086    -1.89   0.062    -.6087866    .0152777
     grant_1 |  -.5355783    .224206    -2.39   0.019    -.9809359   -.0902207
      lsales |  -.0868607   .2596993    -0.33   0.739    -.6027214    .4290001
     lemploy |  -.0763642   .3502912    -0.22   0.828    -.7721747    .6194462
       _cons |   2.115513   3.108438     0.68   0.498    -4.059017    8.290043
-------------+----------------------------------------------------------------
     sigma_u |  1.4415147
     sigma_e |  .49149052
         rho |  .89585684   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(50, 91) =    20.75                 Prob > F = 0.0000
```

Example 14.4: Has the Return to Education Changed Over Time

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGEPAN

iis nr

tis year

reg lwage educ black hisp exper expersq married union d81-d87

      Source |       SS       df       MS              Number of obs =    4360
-------------+------------------------------           F( 14,  4345) =   72.46
       Model |  234.048277    14  16.7177341           Prob > F      =  0.0000
    Residual |  1002.48136  4345  .230720682           R-squared     =  0.1893
-------------+------------------------------           Adj R-squared =  0.1867
       Total |  1236.52964  4359  .283672779           Root MSE      =  .48033

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
------------+----------------------------------------------------------------
       educ |   .0913498   .0052374    17.44   0.000     .0810819    .1016177
      black |  -.1392342   .0235796    -5.90   0.000    -.1854622   -.0930062
       hisp |   .0160195   .0207971     0.77   0.441    -.0247535    .0567925
      exper |   .0672345   .0136948     4.91   0.000     .0403856    .0940834
    expersq |  -.0024117     .00082    -2.94   0.003    -.0040192   -.0008042
    married |   .1082529   .0156894     6.90   0.000     .0774937    .1390122
      union |   .1824613   .0171568    10.63   0.000     .1488253    .2160973
        d81 |     .05832   .0303536     1.92   0.055    -.0011886    .1178286
        d82 |   .0627744   .0332141     1.89   0.059    -.0023421    .1278909
        d83 |   .0620117   .0366601     1.69   0.091    -.0098608    .1338843
        d84 |   .0904672   .0400907     2.26   0.024      .011869    .1690654
        d85 |   .1092463   .0433525     2.52   0.012     .0242533    .1942393
        d86 |   .1419596    .046423     3.06   0.002     .0509469    .2329723
        d87 |   .1738334    .049433     3.52   0.000     .0769194    .2707474
      _cons |   .0920558   .0782701     1.18   0.240    -.0613935    .2455051
------------------------------------------------------------------------------
```

xtreg lwage educ black hisp exper expersq married union, re

```
Random-effects GLS regression                   Number of obs      =      4360
Group variable (i) : nr                         Number of groups   =       545

R-sq:  within  = 0.1799                         Obs per group: min =         8
       between = 0.1860                                        avg =       8.0
       overall = 0.1830                                        max =         8

Random effects u_i ~ Gaussian                   Wald chi2(14)      =    957.77
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       educ |   .0918763   .0106597     8.62   0.000     .0709836    .1127689
      black |  -.1393767   .0477228    -2.92   0.003    -.2329117   -.0458417
       hisp |   .0217317   .0426063     0.51   0.610    -.0617751    .1052385
      exper |   .1057545   .0153668     6.88   0.000     .0756361    .1358729
    expersq |  -.0047239   .0006895    -6.85   0.000    -.0060753   -.0033726
    married |    .063986   .0167742     3.81   0.000     .0311091    .0968629
      union |   .1061344   .0178539     5.94   0.000     .0711415    .1411273
        d81 |    .040462   .0246946     1.64   0.101    -.0079385    .0888626
        d82 |   .0309212   .0323416     0.96   0.339    -.0324672    .0943096
        d83 |   .0202806    .041582     0.49   0.626    -.0612186    .1017798
        d84 |   .0431187   .0513163     0.84   0.401    -.0574595    .1436969
        d85 |   .0578155   .0612323     0.94   0.345    -.0621977    .1778286
        d86 |   .0919476   .0712293     1.29   0.197    -.0476592    .2315544
        d87 |   .1349289   .0813135     1.66   0.097    -.0244427    .2943005
      _cons |   .0235864   .1506683     0.16   0.876     -.271718    .3188907
-------------+----------------------------------------------------------------
     sigma_u |  .32460315
     sigma_e |  .35099001
         rho |  .46100216   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

xtreg lwage expersq married union d81-d87, fe

```
Fixed-effects (within) regression               Number of obs      =      4360
Group variable (i) : nr                         Number of groups   =       545

R-sq:  within  = 0.1806                         Obs per group: min =         8
       between = 0.0286                                        avg =       8.0
       overall = 0.0888                                        max =         8

                                                F(10,3805)         =     83.85
corr(u_i, Xb)  = -0.1222                        Prob > F           =    0.0000
```

```
------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     expersq |  -.0051855   .0007044    -7.36   0.000    -.0065666   -.0038044
     married |   .0466804   .0183104     2.55   0.011     .0107811    .0825796
       union |   .0800019   .0193103     4.14   0.000     .0421423    .1178614
         d81 |   .1511912   .0219489     6.89   0.000     .1081584     .194224
         d82 |   .2529709   .0244185    10.36   0.000     .2050963    .3008454
         d83 |   .3544437   .0292419    12.12   0.000     .2971125    .4117749
         d84 |   .4901148   .0362266    13.53   0.000     .4190894    .5611402
         d85 |   .6174823   .0452435    13.65   0.000     .5287784    .7061861
         d86 |   .7654966   .0561277    13.64   0.000     .6554532    .8755399
         d87 |   .9250249   .0687731    13.45   0.000     .7901893    1.059861
       _cons |   1.426019   .0183415    77.75   0.000     1.390058    1.461979
-------------+----------------------------------------------------------------
     sigma_u |  .39176195
     sigma_e |  .35099001
         rho |  .55472817   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(544, 3805) =     9.16                 Prob > F = 0.0000
```

This page prepared by Oleksandr Talavera (revised 8 Nov 2002)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2nd eds.)
Chapter 15 - Instrumental Variables Estimation and Two Stage Least Squares

Example 15.1: Estimating the Return to Education for Married Women

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ

reg lwage educ

      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  1,   426) =   56.93
       Model |  26.3264237     1  26.3264237           Prob > F      =  0.0000
    Residual |  197.001028   426  .462443727           R-squared     =  0.1179
-------------+------------------------------           Adj R-squared =  0.1158
       Total |  223.327451   427  .523015108           Root MSE      =  .68003

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .1086487   .0143998     7.55   0.000     .0803451    .1369523
       _cons |  -.1851969   .1852259    -1.00   0.318    -.5492674    .1788735
------------------------------------------------------------------------------

ivreg lwage (educ = fatheduc )

Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  1,   426) =    2.84
       Model |  20.8673618     1  20.8673618           Prob > F      =  0.0929
    Residual |  202.460089   426  .475258426           R-squared     =  0.0934
-------------+------------------------------           Adj R-squared =  0.0913
       Total |  223.327451   427  .523015108           Root MSE      =  .68939

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0591735   .0351418     1.68   0.093    -.0098994    .1282463
       _cons |   .4411035   .4461018     0.99   0.323    -.4357311    1.317938
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   fatheduc
------------------------------------------------------------------------------
```

Example 15.2: Estimating the Return to Education for Men

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE2

ivreg lwage (educ = sibs )

Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  1,   933) =   21.59
       Model |  -1.5197389     1  -1.5197389           Prob > F      =  0.0000
    Residual |  167.176033   933  .179181172           R-squared     =       .
-------------+------------------------------           Adj R-squared =       .
       Total |  165.656294   934  .177362199           Root MSE      =   .4233

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .1224327   .0263506     4.65   0.000     .0707194    .1741459
       _cons |   5.130026   .3551712    14.44   0.000     4.432999    5.827053
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   sibs
------------------------------------------------------------------------------

reg lwage educ

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  1,   933) =  100.70
```

```
       Model |  16.1377074     1  16.1377074           Prob > F      =  0.0000
    Residual |  149.518587   933   .16025572           R-squared     =  0.0974
-------------+------------------------------           Adj R-squared =  0.0964
       Total |  165.656294   934  .177362199           Root MSE      =  .40032

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0598392   .0059631    10.03   0.000     .0481366    .0715418
       _cons |   5.973062   .0813737    73.40   0.000     5.813366    6.132759
------------------------------------------------------------------------------
```

Example 15.3: Estimating the Effect of Smoking on Birth Weight

use http://fmwww.bc.edu/ec-p/data/wooldridge/BWGHT

ivreg lbwght (packs = cigprice), first

```
First-stage regressions
-----------------------

      Source |       SS       df       MS              Number of obs =    1388
-------------+------------------------------           F(  1,  1386) =    0.13
       Model |  .011648626     1  .011648626           Prob > F      =  0.7179
    Residual |  123.684481  1386  .089238442           R-squared     =  0.0001
-------------+------------------------------           Adj R-squared = -0.0006
       Total |  123.696129  1387  .089182501           Root MSE      =  .29873

------------------------------------------------------------------------------
       packs |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    cigprice |   .0002829    .000783     0.36   0.718    -.0012531    .0018188
       _cons |   .0674257   .1025384     0.66   0.511    -.1337215    .2685728
------------------------------------------------------------------------------


Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =    1388
-------------+------------------------------           F(  1,  1386) =    0.12
       Model | -1171.28083     1 -1171.28083           Prob > F      =  0.7312
    Residual |  1221.70115  1386  .881458263           R-squared     =       .
-------------+------------------------------           Adj R-squared =       .
       Total |  50.4203246  1387  .036352073           Root MSE      =  .93886

------------------------------------------------------------------------------
      lbwght |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       packs |   2.988674   8.698884     0.34   0.731    -14.07573    20.05307
       _cons |   4.448137   .9081547     4.90   0.000      2.66663    6.229643
------------------------------------------------------------------------------
Instrumented:  packs
Instruments:   cigprice
------------------------------------------------------------------------------
```

Example 15.4: Using College Proximity as an IV for Education

use http://fmwww.bc.edu/ec-p/data/wooldridge/CARD

ivreg lwage (educ = nearc4) exper expersq black smsa south, first

```
First-stage regressions
-----------------------

      Source |       SS       df       MS              Number of obs =    3010
-------------+------------------------------           F(  6,  3003) =  451.87
       Model |  10230.4843     6  1705.08072           Prob > F      =  0.0000
    Residual |  11331.5958  3003  3.77342516           R-squared     =  0.4745
-------------+------------------------------           Adj R-squared =  0.4734
       Total |  21562.0801  3009  7.16586243           Root MSE      =  1.9425

------------------------------------------------------------------------------
        educ |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
```

```
-------------+----------------------------------------------------------------
       exper |  -.4100081   .0336939   -12.17   0.000    -.4760735   -.3439427
     expersq |   .0007323   .0016499     0.44   0.657    -.0025029    .0039674
       black |  -1.006138   .0896454   -11.22   0.000    -1.181911   -.8303656
        smsa |   .4038769   .0848872     4.76   0.000     .2374339    .5703199
       south |   -.291464   .0792247    -3.68   0.000    -.4468042   -.1361238
      nearc4 |   .3373208   .0825004     4.09   0.000     .1755577    .4990839
       _cons |   16.65917   .1763889    94.45   0.000     16.31332    17.00503
------------------------------------------------------------------------------


Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =    3010
-------------+------------------------------           F(  6,  3003) =  120.83
       Model |  133.463217     6  22.2438695           Prob > F      =  0.0000
    Residual |  459.178394  3003  .152906558           R-squared     =  0.2252
-------------+------------------------------           Adj R-squared =  0.2237
       Total |  592.641611  3009  .196956335           Root MSE      =  .39103

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .1322888   .0492332     2.69   0.007     .0357545     .228823
       exper |    .107498   .0213006     5.05   0.000     .0657327    .1492632
     expersq |  -.0022841   .0003341    -6.84   0.000    -.0029392   -.0016289
       black |   -.130802   .0528723    -2.47   0.013    -.2344716   -.0271324
        smsa |   .1313237   .0301298     4.36   0.000     .0722465    .1904009
       south |  -.1049005   .0230731    -4.55   0.000    -.1501412   -.0596599
       _cons |   3.752783   .8293408     4.53   0.000     2.126649    5.378916
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   exper expersq black smsa south nearc4
------------------------------------------------------------------------------
```

reg lwage educ exper expersq black smsa south

```
      Source |       SS       df       MS              Number of obs =    3010
-------------+------------------------------           F(  6,  3003) =  204.93
       Model |  172.165615     6  28.6942691           Prob > F      =  0.0000
    Residual |  420.475997  3003  .140018647           R-squared     =  0.2905
-------------+------------------------------           Adj R-squared =  0.2891
       Total |  592.641611  3009  .196956335           Root MSE      =  .37419

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |    .074009   .0035054    21.11   0.000     .0671357    .0808823
       exper |   .0835958   .0066478    12.57   0.000     .0705612    .0966305
     expersq |  -.0022409   .0003178    -7.05   0.000    -.0028641   -.0016177
       black |  -.1896316   .0176266   -10.76   0.000    -.2241929   -.1550702
        smsa |    .161423   .0155733    10.37   0.000     .1308876    .1919583
       south |  -.1248615   .0151182    -8.26   0.000    -.1545046   -.0952184
       _cons |   4.733664   .0676026    70.02   0.000     4.601112    4.866217
------------------------------------------------------------------------------
```

Example 15.5: Return to Education for Working Women

use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ

reg educ exper expersq motheduc fatheduc

```
      Source |       SS       df       MS              Number of obs =     753
-------------+------------------------------           F(  4,   748) =   66.52
       Model |  1025.94324     4   256.48581           Prob > F      =  0.0000
    Residual |   2884.0966   748  3.85574412           R-squared     =  0.2624
-------------+------------------------------           Adj R-squared =  0.2584
       Total |  3910.03984   752  5.19952106           Root MSE      =  1.9636

------------------------------------------------------------------------------
        educ |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       exper |    .085378   .0255485     3.34   0.001     .0352228    .1355333
```

```
     expersq |  -.0018564   .0008276    -2.24   0.025    -.0034812   -.0002317
    motheduc |   .1856173   .0259869     7.14   0.000     .1346014    .2366331
    fatheduc |   .1845745   .0244979     7.53   0.000     .1364817    .2326674
       _cons |   8.366716   .2667111    31.37   0.000     7.843125    8.890307
------------------------------------------------------------------------------
```

test motheduc fatheduc

```
 ( 1)  motheduc = 0.0
 ( 2)  fatheduc = 0.0

       F(  2,   748) =  124.76
            Prob > F =    0.0000
```

ivreg lwage (educ = motheduc fatheduc) exper expersq

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  3,   424) =    8.14
       Model |  30.3074295     3  10.1024765           Prob > F      =  0.0000
    Residual |  193.020022   424    .4552359           R-squared     =  0.1357
-------------+------------------------------           Adj R-squared =  0.1296
       Total |  223.327451   427  .523015108           Root MSE      =  .67471

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0613966   .0314367     1.95   0.051    -.0003945    .1231878
       exper |   .0441704   .0134325     3.29   0.001     .0177679    .0705729
     expersq |   -.000899   .0004017    -2.24   0.026    -.0016885   -.0001094
       _cons |   .0481003   .4003281     0.12   0.904    -.7387744     .834975
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   exper expersq motheduc fatheduc
------------------------------------------------------------------------------
```

Example 15.6: Using Two Test Scores as Indicators of Ability

use http://fmwww.bc.edu/ec-p/data/wooldridge/WAGE2

ivreg lwage educ exper tenure married south urban black (IQ =KWW)

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     935
-------------+------------------------------           F(  8,   926) =   36.96
       Model |  31.4665073     8  3.93331341           Prob > F      =  0.0000
    Residual |  134.189787   926  .144913377           R-squared     =  0.1900
-------------+------------------------------           Adj R-squared =  0.1830
       Total |  165.656294   934  .177362199           Root MSE      =  .38067

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          IQ |   .0130473   .0049341     2.64   0.008     .0033641    .0227305
        educ |   .0250321   .0166068     1.51   0.132    -.0075591    .0576234
       exper |     .01442   .0033208     4.34   0.000     .0079029    .0209371
      tenure |   .0104562   .0026012     4.02   0.000     .0053512    .0155612
     married |   .2006904   .0406775     4.93   0.000     .1208596    .2805212
       south |  -.0515532   .0311279    -1.66   0.098    -.1126426    .0095362
       urban |   .1767058   .0282117     6.26   0.000     .1213394    .2320722
       black |  -.0225611   .0739597    -0.31   0.760    -.1677092     .122587
       _cons |   4.592453   .3257807    14.10   0.000     3.953099    5.231807
------------------------------------------------------------------------------
Instrumented:  IQ
Instruments:   educ exper tenure married south urban black KWW
------------------------------------------------------------------------------
```

Example 15.7: Return to Education for Working Women

use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ

reg educ exper expersq motheduc fatheduc if lwage<.

```
      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  4,   423) =   28.36
       Model |  471.620998     4   117.90525            Prob > F      =  0.0000
    Residual |  1758.57526   423  4.15738833            R-squared     =  0.2115
-------------+------------------------------           Adj R-squared =  0.2040
       Total |  2230.19626   427  5.22294206            Root MSE      =   2.039

------------------------------------------------------------------------------
        educ |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       exper |   .0452254   .0402507     1.12   0.262    -.0338909    .1243417
     expersq |  -.0010091   .0012033    -0.84   0.402    -.0033744    .0013562
    motheduc |    .157597   .0358941     4.39   0.000      .087044    .2281501
    fatheduc |   .1895484   .0337565     5.62   0.000     .1231971    .2558997
       _cons |    9.10264   .4265614    21.34   0.000     8.264196    9.941084
------------------------------------------------------------------------------
```

predict double uhat1, res

reg lwage educ exper expersq uhat1

```
      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  4,   423) =   20.50
       Model |  36.2573159     4  9.06432898            Prob > F      =  0.0000
    Residual |  187.070135   423  .442246183            R-squared     =  0.1624
-------------+------------------------------           Adj R-squared =  0.1544
       Total |  223.327451   427  .523015108            Root MSE      =  .66502

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0613966   .0309849     1.98   0.048      .000493    .1223003
       exper |   .0441704   .0132394     3.34   0.001     .0181471    .0701937
     expersq |   -.000899   .0003959    -2.27   0.024    -.0016772   -.0001208
       uhat1 |   .0581666   .0348073     1.67   0.095    -.0102501    .1265834
       _cons |   .0481003   .3945753     0.12   0.903    -.7274721    .8236727
------------------------------------------------------------------------------
```

reg lwage educ exper expersq

```
      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  3,   424) =   26.29
       Model |  35.0223023     3  11.6741008            Prob > F      =  0.0000
    Residual |  188.305149   424  .444115917            R-squared     =  0.1568
-------------+------------------------------           Adj R-squared =  0.1509
       Total |  223.327451   427  .523015108            Root MSE      =  .66642

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .1074896   .0141465     7.60   0.000     .0796837    .1352956
       exper |   .0415665   .0131752     3.15   0.002     .0156697    .0674633
     expersq |  -.0008112   .0003932    -2.06   0.040    -.0015841   -.0000382
       _cons |  -.5220407   .1986321    -2.63   0.009    -.9124668   -.1316145
------------------------------------------------------------------------------
```

ivreg lwage (educ = motheduc fatheduc) exper expersq

Instrumental variables (2SLS) regression

```
      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  3,   424) =    8.14
       Model |  30.3074295     3  10.1024765            Prob > F      =  0.0000
    Residual |  193.020022   424    .4552359            R-squared     =  0.1357
-------------+------------------------------           Adj R-squared =  0.1296
       Total |  223.327451   427  .523015108            Root MSE      =  .67471

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0613966   .0314367     1.95   0.051    -.0003945    .1231878
```

```
       exper |   .0441704   .0134325     3.29   0.001     .0177679    .0705729
     expersq |   -.000899   .0004017    -2.24   0.026    -.0016885   -.0001094
       _cons |   .0481003   .4003281     0.12   0.904    -.7387744     .834975
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   exper expersq motheduc fatheduc
------------------------------------------------------------------------------
```

Example 15.8: Return to Education for Working Women

use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ

ivreg lwage (educ = motheduc fatheduc) exper expersq

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  3,   424) =    8.14
       Model |  30.3074295     3  10.1024765           Prob > F      =  0.0000
    Residual |  193.020022   424    .4552359           R-squared     =  0.1357
-------------+------------------------------           Adj R-squared =  0.1296
       Total |  223.327451   427  .523015108           Root MSE      =  .67471

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0613966   .0314367     1.95   0.051    -.0003945    .1231878
       exper |   .0441704   .0134325     3.29   0.001     .0177679    .0705729
     expersq |   -.000899   .0004017    -2.24   0.026    -.0016885   -.0001094
       _cons |   .0481003   .4003281     0.12   0.904    -.7387744     .834975
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   exper expersq motheduc fatheduc
------------------------------------------------------------------------------
```

ssc install overid, replace

overid

```
Test of overidentifying restrictions:   .378071  Chi-sq( 1)  P-value =  .5386
```

ivreg lwage (educ = motheduc fatheduc huseduc) exper expersq

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  3,   424) =   11.52
       Model |  33.3927427     3  11.1309142           Prob > F      =  0.0000
    Residual |  189.934709   424  .447959218           R-squared     =  0.1495
-------------+------------------------------           Adj R-squared =  0.1435
       Total |  223.327451   427  .523015108           Root MSE      =   .6693

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .0803918    .021774     3.69   0.000     .0375934    .1231901
       exper |   .0430973   .0132649     3.25   0.001     .0170242    .0691704
     expersq |  -.0008628   .0003962    -2.18   0.030    -.0016415   -.0000841
       _cons |  -.1868574   .2853959    -0.65   0.513    -.7478243    .3741096
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   exper expersq motheduc fatheduc huseduc
------------------------------------------------------------------------------
```

overid

```
Test of overidentifying restrictions:  1.115043  Chi-sq( 2)  P-value =  .5726
```

Example 15.9: Return of Education to Fertility

use http://fmwww.bc.edu/ec-p/data/wooldridge/FERTIL1

ivreg kids (educ = meduc feduc) age agesq black east northcen west farm othrural town smcity

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =    1129
-------------+------------------------------           F( 17,  1111) =    7.72
       Model |   395.36632    17  23.2568424           Prob > F      =  0.0000
    Residual |  2690.14298  1111  2.42137082           R-squared     =  0.1281
-------------+------------------------------           Adj R-squared =  0.1148
       Total |   3085.5093  1128  2.73538059           Root MSE      =  1.5561

------------------------------------------------------------------------------
        kids |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |  -.1527395   .0392232    -3.89   0.000    -.2296993   -.0757796
         age |   .5235536   .1390348     3.77   0.000     .2507532     .796354
       agesq |   -.005716   .0015705    -3.64   0.000    -.0087976   -.0026345
       black |   1.072952   .1737155     6.18   0.000      .732105      1.4138
        east |   .2285554   .1338537     1.71   0.088    -.0340792      .49119
    northcen |   .3744188    .122061     3.07   0.002     .1349228     .6139148
        west |   .2076398   .1676568     1.24   0.216    -.1213199     .5365995
        farm |  -.0770015   .1513718    -0.51   0.611    -.3740083     .2200052
    othrural |  -.1952451    .181551    -1.08   0.282    -.5514666     .1609764
        town |     .08181   .1246821     0.66   0.512     -.162829     .3264489
      smcity |   .2124996    .160425     1.32   0.186    -.1022706     .5272698
         y74 |   .2721292    .172944     1.57   0.116    -.0672045     .6114629
         y76 |  -.0945483   .1792324    -0.53   0.598    -.4462205     .2571239
         y78 |  -.0572543   .1825536    -0.31   0.754     -.415443     .3009343
         y80 |   -.053248   .1847175    -0.29   0.773    -.4156825     .3091865
         y82 |  -.4962149   .1765888    -2.81   0.005       -.8427    -.1497298
         y84 |  -.5213604   .1779205    -2.93   0.003    -.8704586    -.1722623
       _cons |  -7.241244   3.136642    -2.31   0.021    -13.39565   -1.086834
------------------------------------------------------------------------------
Instrumented:  educ
Instruments:   age agesq black east northcen west farm othrural town smcity y74
               y76 y78 y80 y82 y84 meduc feduc
------------------------------------------------------------------------------
```

reg kids educ age agesq black east northcen west farm othrural town smcity y74 y76 y78 y80 y8

```
      Source |       SS       df       MS              Number of obs =    1129
-------------+------------------------------           F( 17,  1111) =    9.72
       Model |  399.610888    17  23.5065228           Prob > F      =  0.0000
    Residual |  2685.89841  1111  2.41755033           R-squared     =  0.1295
-------------+------------------------------           Adj R-squared =  0.1162
       Total |   3085.5093  1128  2.73538059           Root MSE      =  1.5548

------------------------------------------------------------------------------
        kids |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |  -.1284268   .0183486    -7.00   0.000    -.1644286    -.092425
         age |   .5321346   .1383863     3.85   0.000     .2606065    .8036626
       agesq |   -.005804   .0015643    -3.71   0.000    -.0088733   -.0027347
       black |   1.075658   .1735356     6.20   0.000     .7351631    1.416152
        east |    .217324   .1327878     1.64   0.102    -.0432192    .4778672
    northcen |    .363114   .1208969     3.00   0.003     .125902    .6003261
        west |   .1976032   .1669134     1.18   0.237    -.1298978    .5251041
        farm |  -.0525575    .14719    -0.36   0.721    -.3413592    .2362443
    othrural |  -.1628537   .175442    -0.93   0.353    -.5070887    .1813814
        town |   .0843532   .124531     0.68   0.498    -.1599893    .3286957
      smcity |   .2118791   .160296     1.32   0.187    -.1026379    .5263961
         y74 |   .2681825   .172716     1.55   0.121    -.0707039    .6070689
         y76 |  -.0973795   .1790456    -0.54   0.587     -.448685    .2539261
         y78 |  -.0686665   .1816837    -0.38   0.706    -.4251483    .2878154
         y80 |  -.0713053   .1827707    -0.39   0.697      -.42992    .2873093
         y82 |  -.5224842   .1724361    -3.03   0.003    -.8608214    -.184147
         y84 |  -.5451661   .1745162    -3.12   0.002    -.8875846   -.2027477
       _cons |  -7.742457   3.051767    -2.54   0.011    -13.73033   -1.754579
------------------------------------------------------------------------------
```

reg educ meduc feduc age agesq black east northcen west farm othrural town smcity y74 y76 y78

```
      Source |       SS       df       MS              Number of obs =    1129
-------------+------------------------------           F( 18,  1110) =   24.82
       Model |  2256.26171    18  125.347873           Prob > F      =  0.0000
```

```
    Residual |  5606.85432  1110  5.05122011           R-squared     =  0.2869
-------------+------------------------------           Adj R-squared =  0.2754
       Total |  7863.11603  1128  6.97084755           Root MSE      =  2.2475

------------------------------------------------------------------------------
        educ |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       meduc |   .1723015   .0221964     7.76   0.000     .1287499    .2158531
       feduc |   .2074188   .0254604     8.15   0.000     .1574629    .2573747
         age |  -.2243687   .2000013    -1.12   0.262     -.616792    .1680546
       agesq |   .0025664   .0022605     1.14   0.256     -.001869    .0070018
       black |   .3667819   .2522869     1.45   0.146    -.1282311     .861795
        east |   .2488042   .1920135     1.30   0.195    -.1279462    .6255546
    northcen |   .0913945   .1757744     0.52   0.603    -.2534931    .4362821
        west |   .1010676   .2422408     0.42   0.677    -.3742339    .5763691
        farm |  -.3792615   .2143864    -1.77   0.077    -.7999099    .0413869
    othrural |   -.560814   .2551196    -2.20   0.028    -1.061385    -.060243
        town |   .0616337   .1807832     0.34   0.733    -.2930816     .416349
      smcity |   .0806634   .2317387     0.35   0.728    -.3740319    .5353587
         y74 |   .0060993    .249827     0.02   0.981    -.4840872    .4962858
         y76 |   .1239104   .2587922     0.48   0.632    -.3838667    .6316874
         y78 |   .2077861   .2627738     0.79   0.429    -.3078033    .7233755
         y80 |   .3828911   .2642433     1.45   0.148    -.1355816    .9013638
         y82 |   .5820401   .2492372     2.34   0.020     .0930108    1.071069
         y84 |   .4250429   .2529006     1.68   0.093    -.0711741      .92126
       _cons |   13.63334   4.396773     3.10   0.002     5.006421    22.26027
------------------------------------------------------------------------------
```

predict v, res

reg kids educ age agesq black east northcen west farm othrural town smcity y74 y76 y78 y80 y8

```
      Source |       SS       df       MS              Number of obs =    1129
-------------+------------------------------           F( 18,  1110) =    9.21
       Model |  400.802376    18  22.2667987           Prob > F      =  0.0000
    Residual |  2684.70692  1110  2.41865489           R-squared     =  0.1299
-------------+------------------------------           Adj R-squared =  0.1158
       Total |   3085.5093  1128  2.73538059           Root MSE      =  1.5552

------------------------------------------------------------------------------
        kids |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |  -.1527395   .0392012    -3.90   0.000    -.2296562   -.0758227
         age |   .5235536   .1389568     3.77   0.000      .250906    .7962012
       agesq |   -.005716   .0015697    -3.64   0.000    -.0087959   -.0026362
       black |   1.072952    .173618     6.18   0.000     .7322958    1.413609
        east |   .2285554   .1337787     1.71   0.088    -.0339321     .491043
    northcen |   .3744188   .1219925     3.07   0.002     .1350569    .6137807
        west |   .2076398   .1675628     1.24   0.216    -.1211357    .5364153
        farm |  -.0770015   .1512869    -0.51   0.611     -.373842    .2198389
    othrural |  -.1952451   .1814491    -1.08   0.282    -.5512671    .1607769
        town |     .08181   .1246122     0.66   0.512     -.162692    .3263119
      smcity |   .2124996    .160335     1.33   0.185    -.1020943    .5270935
         y74 |   .2721292    .172847     1.57   0.116    -.0670144    .6112729
         y76 |  -.0945483   .1791319    -0.53   0.598    -.4460236    .2569269
         y78 |  -.0572543   .1824512    -0.31   0.754    -.4152424    .3007337
         y80 |   -.053248   .1846139    -0.29   0.773    -.4154795    .3089836
         y82 |  -.4962149   .1764897    -2.81   0.005     -.842506   -.1499238
         y84 |  -.5213604   .1778207    -2.93   0.003    -.8702631   -.1724578
           v |   .0311374   .0443634     0.70   0.483    -.0559081    .1181829
       _cons |  -7.241244   3.134883    -2.31   0.021    -13.39221    -1.09028
------------------------------------------------------------------------------
```

Example 15.10: Job Training and Worker Productivity

use http://fmwww.bc.edu/ec-p/data/wooldridge/JTRAIN

tsset fcode year

sort fcode year

drop if year==1989

ivreg D.lscrap (D.hrsemp = D.grant)

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =      45
-------------+------------------------------           F(  1,    43) =    3.20
       Model |  .274952567     1  .274952567           Prob > F      =  0.0808
    Residual |  17.0148863    43   .39569503           R-squared     =  0.0159
-------------+------------------------------           Adj R-squared = -0.0070
       Total |  17.2898389    44  .392950883           Root MSE      =  .62904

------------------------------------------------------------------------------
D.lscrap     |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
hrsemp       |
          D1 |  -.0141532   .0079147    -1.79   0.081    -.0301148    .0018084
_cons        |  -.0326684   .1269512    -0.26   0.798    -.2886898     .223353
------------------------------------------------------------------------------
Instrumented:  D.hrsemp
Instruments:   D.grant
------------------------------------------------------------------------------
```

reg D.lscrap D.hrsemp

```
      Source |       SS       df       MS              Number of obs =      45
-------------+------------------------------           F(  1,    43) =    2.84
       Model |  1.07071319     1  1.07071319           Prob > F      =  0.0993
    Residual |  16.2191257    43  .377188969           R-squared     =  0.0619
-------------+------------------------------           Adj R-squared =  0.0401
       Total |  17.2898389    44  .392950883           Root MSE      =  .61416

------------------------------------------------------------------------------
D.lscrap     |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
hrsemp       |
          D1 |  -.0076007   .0045112    -1.68   0.099    -.0166984    .0014971
_cons        |  -.1035161    .103736    -1.00   0.324    -.3127197    .1056875
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera (revised 8 Dec 2002)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2d eds.)
Chapter 16 - Simultaneous Equations Models

Example 16.1: Murder Rates and Size of the Police Force

Dataset is not available

Example 16.2: Housing Expenditures and Saving

Dataset is not available

Example 16.4: Labor Supply of Married, Working Women

Dataset is not available

Example 16.4: Inflation and Openness

Dataset is not available

Example 16.5: Labor Supply of Married, Working Women

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ, clear
```

```
ivreg hours (lwage = exper expersq ) educ age kidslt6 nwifeinc
```

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  5,   422) =    3.44
       Model |  -516582090     5  -103316418           Prob > F      =  0.0046
    Residual |   773893110   422  1833869.93           R-squared     =       .
-------------+------------------------------           Adj R-squared =       .
       Total |   257311020   427   602601.92           Root MSE      =  1354.2

------------------------------------------------------------------------------
       hours |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lwage |   1639.556   470.5757     3.48   0.001     714.5914     2564.52
        educ |  -183.7513   59.09981    -3.11   0.002     -299.918   -67.58463
         age |  -7.806094   9.378013    -0.83   0.406    -26.23953    10.62734
     kidslt6 |  -198.1543   182.9291    -1.08   0.279      -557.72    161.4115
    nwifeinc |  -10.16959   6.614743    -1.54   0.125    -23.17154    2.832358
       _cons |   2225.662   574.5641     3.87   0.000     1096.298    3355.026
------------------------------------------------------------------------------
Instrumented:  lwage
Instruments:   educ age kidslt6 nwifeinc exper expersq
------------------------------------------------------------------------------
```

```
reg hours lwage educ age kidslt6 nwifeinc
```

```
      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  5,   422) =    3.16
       Model |  9290528.53     5  1858105.71           Prob > F      =  0.0082
    Residual |   248020491   422  587726.283           R-squared     =  0.0361
-------------+------------------------------           Adj R-squared =  0.0247
       Total |   257311020   427   602601.92           Root MSE      =  766.63

------------------------------------------------------------------------------
       hours |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lwage |    -2.0468   54.88014    -0.04   0.970    -109.9193    105.8257
        educ |  -6.621869   18.11627    -0.37   0.715    -42.23123    28.98749
         age |    .562254   5.140012     0.11   0.913    -9.540961    10.66547
     kidslt6 |  -328.8584   101.4573    -3.24   0.001    -528.2831   -129.4338
    nwifeinc |  -5.918458   3.683341    -1.61   0.109    -13.15844    1.321522
       _cons |   1523.775   305.5755     4.99   0.000     923.1353    2124.414
------------------------------------------------------------------------------
```

```
ivreg lwage (hours = age kidslt6 nwifeinc) educ exper expersq
```

```
Instrumental variables (2SLS) regression
```

```
      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  4,   423) =   19.03
       Model |  28.0618854     4  7.01547135           Prob > F      =  0.0000
    Residual |  195.265566   423  .461620723           R-squared     =  0.1257
-------------+------------------------------           Adj R-squared =  0.1174
       Total |  223.327451   427  .523015108           Root MSE      =  .67943

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       hours |   .0001259   .0002546     0.49   0.621    -.0003746    .0006264
        educ |     .11033   .0155244     7.11   0.000     .0798155    .1408445
       exper |   .0345824   .0194916     1.77   0.077      -.00373    .0728947
     expersq |  -.0007058   .0004541    -1.55   0.121    -.0015983    .0001868
       _cons |  -.6557256   .3377883    -1.94   0.053    -1.319678     .008227
------------------------------------------------------------------------------
Instrumented:  hours
Instruments:   educ exper expersq age kidslt6 nwifeinc
------------------------------------------------------------------------------
```

Example 16.6: Inflation and Openness

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/OPENNESS, clear
ivreg inf (open = lland) lpcinc, first

First-stage regressions
-----------------------

      Source |       SS       df       MS              Number of obs =     114
-------------+------------------------------           F(  2,   111) =   45.17
       Model |   28606.193     2  14303.0965           Prob > F      =  0.0000
    Residual |  35151.7973   111  316.682858           R-squared     =  0.4487
-------------+------------------------------           Adj R-squared =  0.4387
       Total |  63757.9902   113  564.230002           Root MSE      =  17.796

------------------------------------------------------------------------------
        open |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lpcinc |   .5464794    1.49324     0.37   0.715    -2.412475    3.505433
       lland |  -7.567103   .8142162    -9.29   0.000    -9.180527   -5.953679
       _cons |   117.0845    15.8483     7.39   0.000     85.68007     148.489
------------------------------------------------------------------------------


Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     114
-------------+------------------------------           F(  2,   111) =    2.79
       Model |   2009.2308     2   1004.6154           Prob > F      =  0.0657
    Residual |  63064.1909   111  568.145864           R-squared     =  0.0309
-------------+------------------------------           Adj R-squared =  0.0134
       Total |  65073.4217   113  575.870989           Root MSE      =  23.836

------------------------------------------------------------------------------
         inf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        open |  -.3374869   .1441212    -2.34   0.021    -.6230726   -.0519012
      lpcinc |   .3758232   2.015081     0.19   0.852    -3.617194     4.36884
       _cons |   26.89934    15.4012     1.75   0.083    -3.619157    57.41784
------------------------------------------------------------------------------
Instrumented:  open
Instruments:   lpcinc lland
------------------------------------------------------------------------------
```

Example 16.7: Testing the Permanent Income Hypothesis

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CONSUMP, clear
tsset year
ivreg gc gy (r3 = L.gc L.gy L.r3)
```

```
Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =      35
-------------+------------------------------           F(  2,    32) =   33.68
       Model |  .003759528     2  .001879764           Prob > F      =  0.0000
    Residual |  .001786069    32  .000055815           R-squared     =  0.6779
-------------+------------------------------           Adj R-squared =  0.6578
       Total |  .005545597    34  .000163106           Root MSE      =  .00747

------------------------------------------------------------------------------
gc           |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
r3           |  -.0002698   .0007639    -0.35   0.726    -.0018258    .0012861
gy           |   .5826032   .0747338     7.80   0.000     .4303755    .7348309
_cons        |   .0081396    .002054     3.96   0.000     .0039557    .0123236
------------------------------------------------------------------------------
Instrumented:  r3
Instruments:   gy L.gc L.gy L.r3
------------------------------------------------------------------------------
```

Example 16.8: Effect of Prison Population on Violent Crime Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PRISON, clear

tsset state year

reg gcriv cag0_14 cag15_17 cag18_24 cag25_34 cunem cblack cmetro gincpc gpolpc gpris

      Source |       SS       df       MS              Number of obs =     714
-------------+------------------------------           F( 10,   703) =    8.09
       Model |  .576975497    10   .05769755           Prob > F      =  0.0000
    Residual |  5.01453125   703  .007133046           R-squared     =  0.1032
-------------+------------------------------           Adj R-squared =  0.0904
       Total |  5.59150675   713  .007842225           Root MSE      =  .08446

------------------------------------------------------------------------------
       gcriv |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     cag0_14 |  -2483.038    1400.61    -1.77   0.077    -5232.917    266.8405
    cag15_17 |   10.79079   2.677477     4.03   0.000     5.533976    16.04759
    cag18_24 |  -.4464182   1.756685    -0.25   0.799    -3.895395    3.002558
    cag25_34 |  -4.329303   1.407631    -3.08   0.002    -7.092966    -1.56564
       cunem |   .0053237   .0027825     1.91   0.056    -.0001393    .0107867
      cblack |  -.0021635   .0358322    -0.06   0.952    -.0725144    .0681874
      cmetro |   .0018484   .0108955     0.17   0.865    -.0195432      .02324
      gincpc |   .9395616    .151253     6.21   0.000     .6425999    1.236523
      gpolpc |   .0854818   .0585893     1.46   0.145    -.0295491    .2005127
       gpris |  -.1739892   .0482266    -3.61   0.000    -.2686747   -.0793038
       _cons |   .0386684   .0335862     1.15   0.250    -.0272729    .1046097
------------------------------------------------------------------------------

ivreg gcriv cag0_14 cag15_17 cag18_24 cag25_34 cunem cblack cmetro gincpc gpolpc (gpris = fir


Instrumental variables (2SLS) regression

      Source |       SS       df       MS              Number of obs =     714
-------------+------------------------------           F( 10,   703) =    5.58
       Model | -1.48643443    10 -.148643443           Prob > F      =  0.0000
    Residual |  7.07794118   703  .010068195           R-squared     =       .
-------------+------------------------------           Adj R-squared =       .
       Total |  5.59150675   713  .007842225           Root MSE      =  .10034

------------------------------------------------------------------------------
       gcriv |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       gpris |  -.9942312   .3589068    -2.77   0.006    -1.698889   -.2895738
     cag0_14 |  -3138.017   1687.888    -1.86   0.063    -6451.922    175.8876
    cag15_17 |   5.211254   3.990898     1.31   0.192    -2.624253    13.04676
    cag18_24 |  -2.638793   2.291848    -1.15   0.250    -7.138478    1.860893
    cag25_34 |  -5.737185   1.779489    -3.22   0.001    -9.230934   -2.243436
       cunem |    .008557   .0035887     2.38   0.017     .0015112    .0156027
      cblack |   -.003239   .0425733    -0.08   0.939    -.0868251     .080347
```

```
      cmetro |  -.0045437   .0132357    -0.34   0.731      -.03053    .0214425
      gincpc |   .9112354   .1801137     5.06   0.000     .5576101    1.264861
      gpolpc |   .0641088   .0702171     0.91   0.362    -.0737516    .2019692
       _cons |   .0987133    .047591     2.07   0.038     .0052758    .1921508
------------------------------------------------------------------------------
Instrumented:  gpris
Instruments:   cag0_14 cag15_17 cag18_24 cag25_34 cunem cblack cmetro gincpc
               gpolpc final1 final2
------------------------------------------------------------------------------
```

This page prepared by Oleksandr Talavera

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2d eds.)
Chapter 17 - Limited Dependent Variable Models and Sample Selection Corrections

Example 17.1: Married Woman's Labor Force Participation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ, clear
```

```
regress inlf nwifeinc educ exper expersq age kidslt6 kidsge6
```

```
      Source |       SS       df       MS              Number of obs =     753
-------------+------------------------------           F(  7,   745) =   38.22
       Model |  48.8080578     7  6.97257968            Prob > F      =  0.0000
    Residual |  135.919698   745  .182442547            R-squared     =  0.2642
-------------+------------------------------           Adj R-squared =  0.2573
       Total |  184.727756   752  .245648611           Root MSE      =  .42713

------------------------------------------------------------------------------
        inlf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0034052   .0014485    -2.35   0.019    -.0062488   -.0005616
        educ |   .0379953    .007376     5.15   0.000      .023515    .0524756
       exper |   .0394924   .0056727     6.96   0.000     .0283561    .0506287
     expersq |  -.0005963   .0001848    -3.23   0.001    -.0009591   -.0002335
         age |  -.0160908   .0024847    -6.48   0.000    -.0209686    -.011213
     kidslt6 |  -.2618105   .0335058    -7.81   0.000    -.3275875   -.1960335
     kidsge6 |   .0130122    .013196     0.99   0.324    -.0128935    .0389179
       _cons |   .5855192    .154178     3.80   0.000     .2828442    .8881943
------------------------------------------------------------------------------
```

```
logit inlf nwifeinc educ exper expersq age kidslt6 kidsge6
```

```
Iteration 0:   log likelihood =  -514.8732
Iteration 1:   log likelihood = -406.94123
Iteration 2:   log likelihood = -401.85151
Iteration 3:   log likelihood = -401.76519
Iteration 4:   log likelihood = -401.76515

Logit estimates                                   Number of obs   =        753
                                                  LR chi2(7)      =     226.22
                                                  Prob > chi2     =     0.0000
Log likelihood = -401.76515                       Pseudo R2       =     0.2197

------------------------------------------------------------------------------
        inlf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0213452   .0084214    -2.53   0.011    -.0378509   -.0048394
        educ |   .2211704   .0434396     5.09   0.000     .1360303    .3063105
       exper |   .2058695   .0320569     6.42   0.000     .1430391    .2686999
     expersq |  -.0031541   .0010161    -3.10   0.002    -.0051456   -.0011626
         age |  -.0880244    .014573    -6.04   0.000     -.116587   -.0594618
     kidslt6 |  -1.443354   .2035849    -7.09   0.000    -1.842373   -1.044335
     kidsge6 |   .0601122   .0747897     0.80   0.422     -.086473    .2066974
       _cons |   .4254524   .8603696     0.49   0.621    -1.260841    2.111746
------------------------------------------------------------------------------
```

```
probit inlf nwifeinc educ exper expersq age kidslt6 kidsge6
```

```
Iteration 0:   log likelihood =  -514.8732
Iteration 1:   log likelihood = -405.78215
Iteration 2:   log likelihood = -401.32924
Iteration 3:   log likelihood = -401.30219
Iteration 4:   log likelihood = -401.30219

Probit estimates                                  Number of obs   =        753
                                                  LR chi2(7)      =     227.14
                                                  Prob > chi2     =     0.0000
Log likelihood = -401.30219                       Pseudo R2       =     0.2206

------------------------------------------------------------------------------
        inlf |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -.0120237   .0048398    -2.48   0.013    -.0215096   -.0025378
```

```
        educ |   .1309047   .0252542     5.18   0.000     .0814074     .180402
       exper |   .1233476   .0187164     6.59   0.000     .0866641    .1600311
     expersq |  -.0018871      .0006    -3.15   0.002     -.003063   -.0007111
         age |  -.0528527   .0084772    -6.23   0.000    -.0694678   -.0362376
      kidslt6 |  -.8683285   .1185223    -7.33   0.000    -1.100628    -.636029
      kidsge6 |    .036005   .0434768     0.83   0.408     -.049208    .1212179
        _cons |   .2700768    .508593     0.53   0.595    -.7267472    1.266901
------------------------------------------------------------------------------
```

Changes in probability if kidslt6 changes

mfx compute, at(mean kidslt6=1)

```
Marginal effects after probit
      y  = Pr(inlf) (predict)
         =  .32416867
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.      z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
nwifeinc |   -.004323      .00175   -2.48   0.013  -.007744 -.000902   20.1290
    educ |    .047065      .00912    5.16   0.000   .029187  .064943   12.2869
   exper |   .0443479      .00704    6.30   0.000    .03055  .058146   10.6308
 expersq |  -.0006785      .00022   -3.11   0.002  -.001106 -.000251   178.039
     age |  -.0190025      .00284   -6.69   0.000  -.024568 -.013437   42.5378
 kidslt6 |  -.3121957      .03077  -10.15   0.000  -.372509 -.251882   1.00000
 kidsge6 |   .0129451       .0157    0.82   0.410  -.017829   .04372   1.35325
------------------------------------------------------------------------------
```

mfx compute, at(mean kidslt6=1.5)

```
Marginal effects after probit
      y  = Pr(inlf) (predict)
         =   .1866692
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.      z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
nwifeinc |  -.0032274      .00136   -2.37   0.018  -.005892 -.000563   20.1290
    educ |   .0351375      .00789    4.46   0.000   .019683  .050592   12.2869
   exper |    .033109      .00683    4.85   0.000   .019731  .046487   10.6308
 expersq |  -.0005065      .00018   -2.88   0.004  -.000851 -.000162   178.039
     age |  -.0141867      .00232   -6.12   0.000  -.018733  -.00964   42.5378
 kidslt6 |  -.2330773      .01067  -21.84   0.000  -.253993 -.212162   1.50000
 kidsge6 |   .0096645      .01189    0.81   0.416  -.013647  .032976   1.35325
------------------------------------------------------------------------------
```

Example 17.2: Married Women's Annual Labor Supply

use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ, clear

regress hours nwifeinc educ exper expersq age kidslt6 kidsge6

```
      Source |       SS       df       MS              Number of obs =     753
-------------+------------------------------           F(  7,   745) =   38.50
       Model |   151647606     7  21663943.7           Prob > F      =  0.0000
    Residual |   419262118   745  562767.944           R-squared     =  0.2656
-------------+------------------------------           Adj R-squared =  0.2587
       Total |   570909724   752  759188.463           Root MSE      =  750.18

------------------------------------------------------------------------------
       hours |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -3.446636      2.544    -1.35   0.176    -8.440898    1.547626
        educ |   28.76112   12.95459     2.22   0.027     3.329284    54.19297
       exper |   65.67251   9.962983     6.59   0.000     46.11365    85.23138
     expersq |  -.7004939   .3245501    -2.16   0.031    -1.337635   -.0633524
         age |  -30.51163   4.363868    -6.99   0.000    -39.07858   -21.94469
      kidslt6 |  -442.0899    58.8466    -7.51   0.000    -557.6148    -326.565
      kidsge6 |  -32.77923   23.17622    -1.41   0.158     -78.2777    12.71924
        _cons |   1330.482   270.7846     4.91   0.000     798.8906    1862.074
------------------------------------------------------------------------------
```

tobit hours nwifeinc educ exper expersq age kidslt6 kidsge6, ll(0)

```
Tobit estimates                                   Number of obs   =        753
```

```
                                                LR chi2(7)      =     271.59
                                                Prob > chi2     =     0.0000
Log likelihood = -3819.0946                     Pseudo R2       =     0.0343

------------------------------------------------------------------------------
       hours |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    nwifeinc |  -8.814243   4.459096    -1.98   0.048    -17.56811   -.0603725
        educ |   80.64561   21.58322     3.74   0.000     38.27453    123.0167
       exper |   131.5643   17.27938     7.61   0.000     97.64231    165.4863
     expersq |  -1.864158   .5376615    -3.47   0.001    -2.919667   -.8086479
         age |  -54.40501   7.418496    -7.33   0.000    -68.96862    -39.8414
     kidslt6 |  -894.0217   111.8779    -7.99   0.000    -1113.655   -674.3887
     kidsge6 |    -16.218   38.64136    -0.42   0.675    -92.07675    59.64075
       _cons |   965.3053   446.4358     2.16   0.031     88.88531    1841.725
-------------+----------------------------------------------------------------
         _se |   1122.022   41.57903           (Ancillary parameter)
------------------------------------------------------------------------------

  Obs. summary:        325  left-censored observations at hours<=0
                       428     uncensored observations
```

Changes in probability

```
* fixup for expersq : take square of mean rather than mean of square per JMW
summ exper,meanonly
local exp2=r(mean)^2
mfx compute, at(mean expersq=`exp2') predict(ystar(0,.))

Marginal effects after tobit
      y  = E(hours*|hours>0) (predict, ystar(0,.))
         =  687.31745
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.      z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
nwifeinc |  -5.687381     2.87788   -1.98   0.048  -11.3279 -.046836   20.1290
    educ |   52.03649       13.82    3.77   0.000   24.9495  79.1234   12.2869
   exper |   84.89173      12.398    6.85   0.000    60.593   109.19   10.6308
 expersq |  -1.202846      .36661   -3.28   0.001  -1.92139 -.484297   113.014
     age |  -35.10478     4.66947   -7.52   0.000  -44.2568 -25.9528   42.5378
 kidslt6 |  -576.8666       70.93   -8.13   0.000  -715.887 -437.847   .237716
 kidsge6 |  -10.46465       24.94   -0.42   0.675  -59.3456  38.4163   1.35325
------------------------------------------------------------------------------
* marginal effects conditional on positive hours
mfx compute, at(mean expersq=`exp2') predict(e(0,.))

Marginal effects after tobit
      y  = E(hours|hours>0) (predict, e(0,.))
         =  1065.1973
------------------------------------------------------------------------------
variable |      dy/dx    Std. Err.      z    P>|z|  [    95% C.I.   ]      X
---------+--------------------------------------------------------------------
nwifeinc |  -3.987413     2.01764   -1.98   0.048  -7.94192 -.032909   20.1290
    educ |   36.48269     9.68927    3.77   0.000   17.4921  55.4733   12.2869
   exper |   59.51744     8.68378    6.85   0.000   42.4975  76.5373   10.6308
 expersq |   -.843313      .25692   -3.28   0.001  -1.34686 -.339765   113.014
     age |   -24.6119     3.27362   -7.52   0.000  -31.0281 -18.1957   42.5378
 kidslt6 |  -404.4402      49.722   -8.13   0.000  -501.893 -306.987   .237716
 kidsge6 |  -7.336744      17.485   -0.42   0.675   -41.607  26.9335   1.35325
------------------------------------------------------------------------------
```

Example 17.3: Poisson Regression for Number of Arrests

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/CRIME1, clear
reg narr86 pcnv avgsen tottime ptime86 qemp86 inc86 black hispan born60

      Source |       SS       df       MS              Number of obs =    2725
-------------+------------------------------           F(  9,  2715) =   23.57
       Model |  145.702778     9  16.1891976           Prob > F      =  0.0000
```

```
    Residual |  1864.64438  2715  .686793509          R-squared     =  0.0725
-------------+------------------------------          Adj R-squared =  0.0694
       Total |  2010.34716  2724  .738012906          Root MSE      =  .82873

------------------------------------------------------------------------------
      narr86 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |   -.131886   .0404037    -3.26   0.001    -.2111112   -.0526609
      avgsen |  -.0113316   .0122413    -0.93   0.355    -.0353348    .0126717
     tottime |   .0120693   .0094364     1.28   0.201     -.006434    .0305725
     ptime86 |  -.0408735    .008813    -4.64   0.000    -.0581544   -.0235925
      qemp86 |  -.0513099   .0144862    -3.54   0.000     -.079715   -.0229047
       inc86 |  -.0014617    .000343    -4.26   0.000    -.0021343   -.0007891
       black |   .3270097   .0454264     7.20   0.000     .2379359    .4160835
      hispan |   .1938094   .0397156     4.88   0.000     .1159335    .2716853
      born60 |   -.022465   .0332945    -0.67   0.500    -.0877502    .0428202
       _cons |    .576566   .0378945    15.22   0.000      .502261    .6508711
------------------------------------------------------------------------------
```

poisson narr86 pcnv avgsen tottime ptime86 qemp86 inc86 black hispan born60

```
Iteration 0:   log likelihood = -2249.0104
Iteration 1:   log likelihood = -2248.7614
Iteration 2:   log likelihood = -2248.7611
Iteration 3:   log likelihood = -2248.7611

Poisson regression                                Number of obs   =       2725
                                                  LR chi2(9)      =     386.32
                                                  Prob > chi2     =     0.0000
Log likelihood = -2248.7611                       Pseudo R2       =     0.0791

------------------------------------------------------------------------------
      narr86 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        pcnv |  -.4015713   .0849712    -4.73   0.000    -.5681117   -.2350308
      avgsen |  -.0237723    .019946    -1.19   0.233    -.0628658    .0153212
     tottime |   .0244904   .0147504     1.66   0.097    -.0044199    .0534006
     ptime86 |  -.0985584   .0206946    -4.76   0.000    -.1391192   -.0579977
      qemp86 |  -.0380187   .0290242    -1.31   0.190    -.0949051    .0188677
       inc86 |  -.0080807    .001041    -7.76   0.000     -.010121   -.0060404
       black |   .6608376   .0738342     8.95   0.000     .5161252      .80555
      hispan |   .4998133   .0739267     6.76   0.000     .3549196     .644707
      born60 |  -.0510286   .0640518    -0.80   0.426    -.1765678    .0745106
       _cons |  -.5995888   .0672501    -8.92   0.000    -.7313966    -.467781
------------------------------------------------------------------------------
```

Change in expected arrests if pcnv changes by .10

display "Change in expected arrests if pcnv changes by .10 is " _b[pcnv]*.10

```
Change in expected arrests if pcnv changes by .10 is -.04015713
```

Example 17.4: Duration of Recidivism

use http://fmwww.bc.edu/ec-p/data/wooldridge/RECID, clear

cnreg ldurat workprg priors tserved felon alcohol drugs black married educ age, censored(cens

```
Censored normal regression                        Number of obs   =       1445
                                                  LR chi2(10)     =     166.74
                                                  Prob > chi2     =     0.0000
Log likelihood =  -1597.059                       Pseudo R2       =     0.0496

------------------------------------------------------------------------------
      ldurat |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     workprg |  -.0625715   .1200369    -0.52   0.602    -.2980382    .1728951
      priors |  -.1372529   .0214587    -6.40   0.000    -.1793466   -.0951592
     tserved |  -.0193305   .0029779    -6.49   0.000    -.0251721    -.013489
       felon |   .4439947   .1450865     3.06   0.002     .1593903    .7285991
     alcohol |  -.6349093   .1442166    -4.40   0.000    -.9178072   -.3520113
       drugs |  -.2981602   .1327356    -2.25   0.025    -.5585367   -.0377836
```

```
       black |  -.5427179   .1174428    -4.62   0.000    -.7730958     -.31234
     married |   .3406837   .1398431     2.44   0.015      .066365    .6150024
        educ |   .0229196   .0253974     0.90   0.367    -.0269004    .0727395
         age |   .0039103   .0006062     6.45   0.000     .0027211    .0050994
       _cons |   4.099386   .3475351    11.80   0.000     3.417655    4.781117
-------------+----------------------------------------------------------------
         _se |    1.81047   .0623022           (Ancillary parameter)
------------------------------------------------------------------------------

  Obs. summary:        552     uncensored observations
                       893 right-censored observations
```

Change in durat if a man serves for a felony

```
mfx compute, nose

Marginal effects after cnreg
      y  = Fitted values (predict)
         =  4.8341597
------------------------------------------------------------------------------
                         variable |          dy/dx                 X
----------------------------------+-------------------------------------------
                         workprg*|       -.0625715            .465052
                          priors |       -.1372529            1.43183
                         tserved |       -.0193305            19.1820
                           felon*|        .4439947            .314187
                         alcohol*|       -.6349093            .209689
                           drugs*|       -.2981602            .241522
                           black*|       -.5427179            .485121
                         married*|        .3406837            .255363
                            educ |        .0229196            9.70242
                             age |        .0039103            345.436
------------------------------------------------------------------------------
(*) dy/dx is for discrete change of dummy variable from 0 to 1
```

```
mat pct=e(Xmfx_dydx)

matmap pct pct, m(100*(exp(@)-1))

mat list pct

pct[1,10]
       workprg      priors     tserved       felon     alcohol       drugs
r1  -6.0654125  -12.825026  -1.9144899   55.892217  -47.001643  -25.781754

         black     married        educ         age
r1  -41.883343   40.590851   2.3184231   .39179407
```

Example 17.5: Wage Offer Equation for Married Women

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/MROZ, clear

reg lwage educ exper expersq

      Source |       SS       df       MS              Number of obs =     428
-------------+------------------------------           F(  3,   424) =   26.29
       Model |  35.0223023     3  11.6741008           Prob > F      =  0.0000
    Residual |  188.305149   424  .444115917           R-squared     =  0.1568
-------------+------------------------------           Adj R-squared =  0.1509
       Total |  223.327451   427  .523015108           Root MSE      =  .66642

------------------------------------------------------------------------------
       lwage |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        educ |   .1074896   .0141465     7.60   0.000     .0796837    .1352956
       exper |   .0415665   .0131752     3.15   0.002     .0156697    .0674633
     expersq |  -.0008112   .0003932    -2.06   0.040    -.0015841   -.0000382
       _cons |  -.5220407   .1986321    -2.63   0.009    -.9124668   -.1316145
------------------------------------------------------------------------------
```

```
heckman lwage  educ exper expersq, sel(inlf = nwifeinc educ exper expersq age kidslt6 kidsge6

Heckman selection model -- two-step estimates   Number of obs      =       753
(regression model with sample selection)        Censored obs       =       325
                                                Uncensored obs     =       428

                                                Wald chi2(6)       =    180.10
                                                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lwage        |
        educ |   .1090655    .015523     7.03   0.000     .0786411      .13949
       exper |   .0438873   .0162611     2.70   0.007     .0120163    .0757584
     expersq |  -.0008591   .0004389    -1.96   0.050    -.0017194    1.15e-06
       _cons |  -.5781033   .3050062    -1.90   0.058    -1.175904    .0196979
-------------+----------------------------------------------------------------
inlf         |
    nwifeinc |  -.0120237   .0048398    -2.48   0.013    -.0215096   -.0025378
        educ |   .1309047   .0252542     5.18   0.000     .0814074     .180402
       exper |   .1233476   .0187164     6.59   0.000     .0866641    .1600311
     expersq |  -.0018871      .0006    -3.15   0.002     -.003063   -.0007111
         age |  -.0528527   .0084772    -6.23   0.000    -.0694678   -.0362376
      kidslt6 |  -.8683285   .1185223    -7.33   0.000    -1.100628    -.636029
      kidsge6 |    .036005   .0434768     0.83   0.408     -.049208    .1212179
       _cons |   .2700768    .508593     0.53   0.595    -.7267472    1.266901
-------------+----------------------------------------------------------------
mills        |
      lambda |   .0322619   .1336246     0.24   0.809    -.2296376    .2941613
-------------+----------------------------------------------------------------
         rho |    0.04861
       sigma |  .66362876
      lambda |  .03226186   .1336246
------------------------------------------------------------------------------
```

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Stata Textbook Examples
Introductory Econometrics: A Modern Approach by Jeffrey M. Wooldridge (1st & 2d eds.)
Chapter 18 - Advanced Time Series Topics

Example 18.1: Housing Investment and Residential Price Inflation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/HSEINV
```

```
tsset year
```

```
time variable:  year, 1947 to 1988
```

```
reg linvpc t
```

```
      Source |       SS       df       MS              Number of obs =      42
-------------+------------------------------           F(  1,    40) =   20.19
       Model |  .409447014     1  .409447014           Prob > F      =  0.0001
    Residual |   .81117293    40  .020279323           R-squared     =  0.3354
-------------+------------------------------           Adj R-squared =  0.3188
       Total |  1.22061994    41  .029771218           Root MSE      =  .14241

------------------------------------------------------------------------------
      linvpc |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
           t |   .0081459   .0018129     4.49   0.000     .0044819    .0118098
       _cons |  -.8412918    .044744   -18.80   0.000    -.9317228   -.7508608
------------------------------------------------------------------------------
```

```
predict elinvpc,r
```

```
reg elinvpc gprice L.elinvpc
```

```
      Source |       SS       df       MS              Number of obs =      41
-------------+------------------------------           F(  2,    38) =   13.02
       Model |  .322534831     2  .161267415           Prob > F      =  0.0000
    Residual |  .470603501    38  .012384303           R-squared     =  0.4067
-------------+------------------------------           Adj R-squared =  0.3754
       Total |  .793138332    40  .019828458           Root MSE      =  .11128

------------------------------------------------------------------------------
elinvpc      |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
gprice       |   3.094828   .9333266     3.32   0.002     1.205407    4.984249
elinvpc      |
         L1 |   .3399015   .1315881     2.58   0.014     .0735154    .6062876
_cons        |  -.0099629    .017916    -0.56   0.581     -.046232    .0263061
------------------------------------------------------------------------------
```

```
scalar lrpGDL = _b[gprice]/(1-_b[L.elinvpc])
```

```
display _n "long run propensity : " lrpGDL
```

```
long run propensity : 4.6884339
```

```
reg elinvpc gprice L.elinvpc L.gprice
```

```
      Source |       SS       df       MS              Number of obs =      40
-------------+------------------------------           F(  3,    36) =   14.20
       Model |  .429863193     3  .143287731           Prob > F      =  0.0000
    Residual |    .3632598    36   .01009055           R-squared     =  0.5420
-------------+------------------------------           Adj R-squared =  0.5038
       Total |  .793122992    39  .020336487           Root MSE      =  .10045

------------------------------------------------------------------------------
elinvpc      |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
gprice       |   3.256352   .9703223     3.36   0.002     1.288447    5.224257
elinvpc      |
         L1 |   .5471706   .1516713     3.61   0.001     .2395669    .8547743
gprice       |
         L1 |  -2.936344   .9731857    -3.02   0.005    -4.910056   -.9626315
_cons        |   .0058685   .0169326     0.35   0.731    -.0284725    .0402095
```

```
------------------------------------------------------------------------------
```

```
scalar lrpRDL = (_b[gprice]+_b[L.gprice])/(1-_b[L.elinvpc])
```

```
display _n "long run propensity : " lrpRDL
```

```
long run propensity : .70668588
```

Example 18.2: Unit Root Test for Three-Month T-Bill Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/INTQRT
```

```
reg cr3 r3_1
```

```
      Source |       SS       df       MS              Number of obs =     123
-------------+------------------------------           F(  1,   121) =    6.12
       Model |  9.22556712     1  9.22556712           Prob > F      =  0.0148
    Residual |  182.506041   121  1.50831439           R-squared     =  0.0481
-------------+------------------------------           Adj R-squared =  0.0403
       Total |  191.731608   122  1.57157056           Root MSE      =  1.2281

------------------------------------------------------------------------------
         cr3 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        r3_1 |  -.0907106   .0366782    -2.47   0.015    -.1633247   -.0180965
       _cons |   .6253371   .2608254     2.40   0.018     .1089645    1.14171
------------------------------------------------------------------------------
```

```
display "rho=" 1+_b[r3_1]
```

```
rho=.90928937
```

Example 18.3: Unit Root Test for Annual U.S. Inflation

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS
```

```
reg cinf inf_1 cinf_1
```

```
      Source |       SS       df       MS              Number of obs =      47
-------------+------------------------------           F(  2,    44) =    4.57
       Model |  38.4043268     2  19.2021634           Prob > F      =  0.0158
    Residual |  184.960355    44  4.20364442           R-squared     =  0.1719
-------------+------------------------------           Adj R-squared =  0.1343
       Total |  223.364681    46  4.85575395           Root MSE      =  2.0503

------------------------------------------------------------------------------
        cinf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       inf_1 |  -.3103252   .1027077    -3.02   0.004     -.517319   -.1033315
      cinf_1 |   .1383615   .1264025     1.09   0.280    -.1163861    .3931091
       _cons |   1.360791   .5167103     2.63   0.012     .3194297    2.402152
------------------------------------------------------------------------------
```

```
display "rho=" 1+_b[inf_1]
```

```
rho=.68967477
```

Example 18.4: Unit Root in the Log of U.S. Real Gross Domestic Product

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/INVEN
```

```
tsset year
```

```
        time variable:  year, 1959 to 1995
```

```
gen lgdp=log(gdp)
```

```
reg D.lgdp year L.lgdp L.D.lgdp
```

```
      Source |       SS       df       MS              Number of obs =      35
-------------+------------------------------           F(  3,    31) =    3.78
       Model |  .004591884     3  .001530628           Prob > F      =  0.0201
```

```
    Residual |  .012541804    31  .000404574           R-squared     =  0.2680
-------------+----------------------------           Adj R-squared =  0.1972
       Total |  .017133688    34  .000503932           Root MSE      =  .02011

------------------------------------------------------------------------------
D.lgdp       |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
year         |   .0058696    .002696     2.18   0.037     .0003711    .0113681
lgdp         |
          L1 |  -.2096203   .0865941    -2.42   0.022    -.3862301   -.0330104
          LD |   .2637479   .1647397     1.60   0.120    -.0722409    .5997367
_cons        |  -9.841804   4.620125    -2.13   0.041    -19.26461   -.4189969
------------------------------------------------------------------------------
```

display "rho=" 1+_b[L.lgdp]

```
rho=.79037972
```

reg D.lgdp L.lgdp L.D.lgdp

```
      Source |       SS       df       MS              Number of obs =      35
-------------+------------------------------           F(  2,    32) =    2.96
       Model |  .002674165     2  .001337083           Prob > F      =  0.0662
    Residual |  .014459523    32   .00045186           R-squared     =  0.1561
-------------+------------------------------           Adj R-squared =  0.1033
       Total |  .017133688    34  .000503932           Root MSE      =  .02126

------------------------------------------------------------------------------
D.lgdp       |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
lgdp         |
          L1 |  -.0226876   .0118894    -1.91   0.065    -.0469056    .0015304
          LD |   .1671587    .167669     1.00   0.326    -.1743718    .5086892
_cons        |   .2148862    .100468     2.14   0.040     .0102395    .4195328
------------------------------------------------------------------------------
```

display "rho=" 1+_b[L.lgdp]

```
rho=.9773124
```

Example 18.5: Cointegration Between Fertility and Personal Exemption

use http://fmwww.bc.edu/ec-p/data/wooldridge/FERTIL3

tsset year

```
time variable:  year, 1913 to 1984
```

reg gfr pe year

```
      Source |       SS       df       MS              Number of obs =      72
-------------+------------------------------           F(  2,    69) =   34.53
       Model |  13929.0853     2  6964.54264           Prob > F      =  0.0000
    Residual |  13918.8101    69  201.721886           R-squared     =  0.5002
-------------+------------------------------           Adj R-squared =  0.4857
       Total |  27847.8954    71  392.223879           Root MSE      =  14.203

------------------------------------------------------------------------------
         gfr |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          pe |    .186662   .0346265     5.39   0.000     .1175841    .2557399
        year |  -.9051881   .1089923    -8.31   0.000    -1.122622   -.6877543
       _cons |    1840.65   210.0516     8.76   0.000     1421.608    2259.691
------------------------------------------------------------------------------
```

predict uh, res

reg D.gfr D.pe year

```
      Source |       SS       df       MS              Number of obs =      71
-------------+------------------------------           F(  2,    68) =    1.16
       Model |  42.0144941     2  21.0072471           Prob > F      =  0.3185
```

```
    Residual |  1227.56788    68  18.0524688           R-squared     =  0.0331
-------------+------------------------------           Adj R-squared =  0.0047
       Total |  1269.58238    70  18.1368911           Root MSE      =  4.2488

------------------------------------------------------------------------------
D.gfr        |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
pe           |
          D1 |  -.0441285   .0289463    -1.52   0.132    -.1018899    .0136329
year         |   -.007633   .0249413    -0.31   0.761    -.0574026    .0421367
_cons        |   14.09361   48.61889     0.29   0.773    -82.92387    111.1111
------------------------------------------------------------------------------
```

reg D.gfr L.gfr L.D.gfr year

```
      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =    2.77
       Model |  141.284323     3  47.0947745           Prob > F      =  0.0482
    Residual |  1120.70979    66  16.9804513           R-squared     =  0.1120
-------------+------------------------------           Adj R-squared =  0.0716
       Total |  1261.99411    69  18.2897697           Root MSE      =  4.1207

------------------------------------------------------------------------------
D.gfr        |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
gfr          |
          L1 |  -.0438938   .0297773    -1.47   0.145    -.1033461    .0155585
          LD |   .3092968   .1166811     2.65   0.010     .0763355    .5422581
year         |  -.0185421   .0282515    -0.66   0.514     -.074948    .0378638
_cons        |   39.73213    56.5777     0.70   0.485    -73.22889    152.6931
------------------------------------------------------------------------------
```

reg D.pe L.pe L.D.pe year

```
      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =    2.49
       Model |  2254.87222     3  751.624073           Prob > F      =  0.0675
    Residual |   19882.889    66  301.255894           R-squared     =  0.1019
-------------+------------------------------           Adj R-squared =  0.0610
       Total |  22137.7612    69  320.837119           Root MSE      =  17.357

------------------------------------------------------------------------------
D.pe         |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
pe           |
          L1 |  -.0661281   .0449466    -1.47   0.146    -.1558668    .0236106
          LD |   .2567035   .1220926     2.10   0.039     .0129377    .5004694
year         |   .0316731   .1463908     0.22   0.829    -.2606056    .3239517
_cons        |  -54.13747   282.2287    -0.19   0.848    -617.6253    509.3503
------------------------------------------------------------------------------
```

reg D.uh L.uh L.D.uh year

```
      Source |       SS       df       MS              Number of obs =      70
-------------+------------------------------           F(  3,    66) =    3.07
       Model |  291.902357     3  97.3007857           Prob > F      =  0.0338
    Residual |  2092.94085    66   31.711225           R-squared     =  0.1224
-------------+------------------------------           Adj R-squared =  0.0825
       Total |  2384.84321    69   34.562945           Root MSE      =  5.6313

------------------------------------------------------------------------------
D.uh         |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
uh           |
          L1 |  -.1188282   .0490884    -2.42   0.018    -.2168364   -.0208201
          LD |   .2378983   .1176739     2.02   0.047     .0029547    .4728418
year         |   .0257499   .0334197     0.77   0.444    -.0409748    .0924746
_cons        |  -50.38379   65.15702    -0.77   0.442     -180.474     79.7064
------------------------------------------------------------------------------
```

Example 18.6: Cointegrated Parameter for Interest Rates

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/INTQRT

gen cr3_2 = cr3[_n-2]

gen cr3_1p = cr3[_n+1]

gen cr3_2p = cr3[_n+2]

reg r6 r3 cr3 cr3_1 cr3_2 cr3_1p cr3_2p
```

```
      Source |       SS       df       MS              Number of obs =     119
-------------+------------------------------           F(  6,   112) = 3176.06
       Model |  1148.95762     6  191.492937            Prob > F      =  0.0000
    Residual |  6.75277085   112  .060292597            R-squared     =  0.9942
-------------+------------------------------           Adj R-squared =  0.9938
       Total |  1155.71039   118  9.79415587           Root MSE      =  .24555

------------------------------------------------------------------------------
          r6 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          r3 |   1.038171   .0080773   128.53   0.000     1.022167    1.054175
         cr3 |  -.0531227   .0194406    -2.73   0.007    -.0916418   -.0146036
       cr3_1 |  -.0611365   .0190433    -3.21   0.002    -.0988684   -.0234046
       cr3_2 |  -.0437775   .0189032    -2.32   0.022    -.0812318   -.0063233
      cr3_1p |  -.0035722   .0191223    -0.19   0.852    -.0414606    .0343163
      cr3_2p |   .0123662   .0189704     0.65   0.516    -.0252213    .0499536
       _cons |   .0651458   .0569524     1.14   0.255     -.047698    .1779895
------------------------------------------------------------------------------
```

```
test r3
```

```
 ( 1)  r3 = 0.0

       F(  1,   112) =16519.67
            Prob > F =    0.0000
```

```
reg r6 r3
```

```
      Source |       SS       df       MS              Number of obs =     124
-------------+------------------------------           F(  1,   122) =17710.54
       Model |  1182.09126     1  1182.09126            Prob > F      =  0.0000
    Residual |  8.14289673   122  .066745055            R-squared     =  0.9932
-------------+------------------------------           Adj R-squared =  0.9931
       Total |  1190.23416   123   9.6767005           Root MSE      =  .25835

------------------------------------------------------------------------------
          r6 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          r3 |   1.025899   .0077088   133.08   0.000     1.010639     1.04116
       _cons |   .1353736   .0548673     2.47   0.015     .0267584    .2439889
------------------------------------------------------------------------------
```

Example 18.7: Error Correction Model for Holding Yields

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/INTQRT

gen del = hy6_1 - hy3[_n-2]

reg chy6 chy3_1 del
```

```
      Source |       SS       df       MS              Number of obs =     122
-------------+------------------------------           F(  2,   119) =  223.79
       Model |  51.8888367     2  25.9444184            Prob > F      =  0.0000
    Residual |  13.7959796   119  .115932602            R-squared     =  0.7900
-------------+------------------------------           Adj R-squared =  0.7864
       Total |  65.6848163   121  .542849722           Root MSE      =  .34049

------------------------------------------------------------------------------
        chy6 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
      chy3_1 |   1.218363   .2636012     4.62   0.000     .6964068     1.74032
         del |  -.8400495   .2441269    -3.44   0.001    -1.323445   -.3566539
       _cons |   .0898484    .042688     2.10   0.037     .0053219     .174375
------------------------------------------------------------------------------
```

Example 18.8: Forecasting the U.S. Unemployment Rate

use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS

reg unem unem_1

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =   57.13
       Model |  62.8162728     1  62.8162728           Prob > F      =  0.0000
    Residual |  50.5768515    46  1.09949677           R-squared     =  0.5540
-------------+------------------------------           Adj R-squared =  0.5443
       Total |  113.393124    47  2.41261967           Root MSE      =  1.0486

------------------------------------------------------------------------------
        unem |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      unem_1 |   .7323538   .0968906     7.56   0.000     .5373231    .9273845
       _cons |   1.571741   .5771181     2.72   0.009     .4100629     2.73342
------------------------------------------------------------------------------
```

display "Forecast for 1997: " _b[_cons] +_b[unem_1]*5.4

Forecasts for 1997: 5.5264519

reg unem unem_1 inf_1

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  2,    45) =   50.22
       Model |  78.3083336     2  39.1541668           Prob > F      =  0.0000
    Residual |  35.0847907    45  .779662015           R-squared     =  0.6906
-------------+------------------------------           Adj R-squared =  0.6768
       Total |  113.393124    47  2.41261967           Root MSE      =  .88298

------------------------------------------------------------------------------
        unem |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      unem_1 |   .6470261   .0838056     7.72   0.000     .4782329    .8158192
       inf_1 |   .1835766   .0411828     4.46   0.000     .1006302    .2665231
       _cons |   1.303797   .4896861     2.66   0.011     .3175188    2.290076
------------------------------------------------------------------------------
```

display "Forecast for 1997: " _b[_cons] +_b[unem_1]*5.4 +_b[inf_1]*3

Forecasts for 1997: 5.3484678

gen un1 = unem_1-5.4

gen inf1 = inf_1-3

reg unem un1 inf1

```
      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  2,    45) =   50.22
       Model |  78.3083334     2  39.1541667           Prob > F      =  0.0000
    Residual |  35.0847909    45  .779662019           R-squared     =  0.6906
-------------+------------------------------           Adj R-squared =  0.6768
       Total |  113.393124    47  2.41261967           Root MSE      =  .88298

------------------------------------------------------------------------------
        unem |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         un1 |   .6470261   .0838056     7.72   0.000     .4782329    .8158192
        inf1 |   .1835766   .0411828     4.46   0.000     .1006302    .2665231
       _cons |   5.348468   .1365394    39.17   0.000     5.073463    5.623472
------------------------------------------------------------------------------
```

scalar down = _b[_cons]-1.96*sqrt(_se[_cons]^2+e(rmse)^2)

```
scalar up= _b[_cons]+1.96*sqrt(_se[_cons]^2+e(rmse)^2)
display "95% forecast interval: [" down ","up "]"

95% forecast interval: [3.5972486,7.099687]
```

Example 18.9: Out-of -Sample Comparison of Unemployment Forecasts

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS
reg unem unem_1

      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =   57.13
       Model |  62.8162728     1  62.8162728           Prob > F      =  0.0000
    Residual |  50.5768515    46  1.09949677           R-squared     =  0.5540
-------------+------------------------------           Adj R-squared =  0.5443
       Total |  113.393124    47  2.41261967           Root MSE      =  1.0486

------------------------------------------------------------------------------
        unem |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      unem_1 |   .7323538   .0968906     7.56   0.000     .5373231    .9273845
       _cons |   1.571741   .5771181     2.72   0.009     .4100629     2.73342
------------------------------------------------------------------------------

display _n "RMSE : " %9.3f e(rmse)

RMSE :     1.049

qui {
predict eps1 if e(sample), r
replace eps1 = abs(eps)
summ eps1,meanonly
}
display _n "MAE : " %9.3f `r(mean)'

MAE :     0.813

reg unem unem_1 inf_1

      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  2,    45) =   50.22
       Model |  78.3083336     2  39.1541668           Prob > F      =  0.0000
    Residual |  35.0847907    45  .779662015           R-squared     =  0.6906
-------------+------------------------------           Adj R-squared =  0.6768
       Total |  113.393124    47  2.41261967           Root MSE      =  .88298

------------------------------------------------------------------------------
        unem |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      unem_1 |   .6470261   .0838056     7.72   0.000     .4782329    .8158192
       inf_1 |   .1835766   .0411828     4.46   0.000     .1006302    .2665231
       _cons |   1.303797   .4896861     2.66   0.011     .3175188    2.290076
------------------------------------------------------------------------------

display _n "RMSE : " %9.3f e(rmse)

RMSE :     0.883

qui {
predict eps if e(sample), r
replace eps = abs(eps)
summ eps,meanonly
}
```

```
display _n "MAE : " %9.3f `r(mean)'

MAE :     0.649
```

Example 18.10: Two-Year-Ahead Forecast for the Unemployment Rate

```
use http://fmwww.bc.edu/ec-p/data/wooldridge/PHILLIPS

reg inf inf_1

      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  1,    46) =   38.67
       Model |  214.647351     1  214.647351           Prob > F      =  0.0000
    Residual |  255.342659    46  5.55092736           R-squared     =  0.4567
-------------+------------------------------           Adj R-squared =  0.4449
       Total |   469.99001    47  9.99978744           Root MSE      =   2.356

------------------------------------------------------------------------------
         inf |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       inf_1 |   .6652586   .1069819     6.22   0.000     .4499151    .8806021
       _cons |    1.27665   .5576568     2.29   0.027     .1541456    2.399155
------------------------------------------------------------------------------

scalar inf1997 = _b[_cons]+_b[inf_1]*3

display "Forecast for inflation in 1997: " inf1997

Forecast for inflation in 1997: 3.2724262

reg unem unem_1 inf_1

      Source |       SS       df       MS              Number of obs =      48
-------------+------------------------------           F(  2,    45) =   50.22
       Model |  78.3083336     2  39.1541668           Prob > F      =  0.0000
    Residual |  35.0847907    45  .779662015           R-squared     =  0.6906
-------------+------------------------------           Adj R-squared =  0.6768
       Total |  113.393124    47  2.41261967           Root MSE      =  .88298

------------------------------------------------------------------------------
        unem |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      unem_1 |   .6470261   .0838056     7.72   0.000     .4782329    .8158192
       inf_1 |   .1835766   .0411828     4.46   0.000     .1006302    .2665231
       _cons |   1.303797   .4896861     2.66   0.011     .3175188    2.290076
------------------------------------------------------------------------------

display "Forecast for unemployment in 1998:  " _b[_cons]+_b[unem]*5.35+_b[inf_1]*inf1997

Forecast for unemployment in 1998:  5.3661276
```

This page prepared by Oleksandr Talavera (revised 9 Nov 2002)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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