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)

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