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)

Send your questions/comments/suggestions to Kit Baum at **baum@bc.edu**
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