```
* Linear Regression in Stata
* Copyright 2013 by Ani Katchova

clear all
set more off

use C:\Econometrics\Data\regression_auto

global ylist mpg
global x1list weight1
global xlist weight1 price foreign

describe $ylist $xlist
summarize $ylist $xlist
summarize $ylist, detail

* Correlation
correlate $ylist $xlist

* Plotting the data
graph twoway (scatter $ylist $x1list)

* Simple regression
reg $ylist $x1list

* Plotting a regression line
graph twoway (scatter $ylist $x1list)(lfit $ylist $x1list)

* Predicted values for the dependent variable
predict y1hat, xb
summarize $ylist y1hat
graph twoway (scatter $ylist $x1list)(scatter y1hat $x1list)

* Regression residuals
predict e1hat, resid
summarize e1hat
graph twoway (scatter e1hat $x1list)

* Hypothesis testing (coefficient significantly different from zero)
test $x1list

* Marginal effects (at the mean and average marginal effect)
quietly reg $ylist $x1list
margins, dydx(*) atmeans
margins, dydx(*)


* Multiple regression
reg $ylist $xlist

* Predicted values for the dependent variable
predict yhat, xb
summarize $ylist yhat

* Regression residuals
```

```
predict ehat, resid
summarize ehat

* Hypothesis testing (coefficients jointly significantly different from zero)
test $xlist

* Marginal effects (at the mean and average marginal effect)
margins, dydx(*) atmeans
margins, dydx(*)
```

```
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.
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.
. use C:\Econometrics\Data\regression_auto

.
. global ylist mpg

. global x1list weight1

. global xlist weight1 price foreign

.
. describe $ylist $xlist

              storage  display     value
variable name   type   format      label      variable label
------------------------------------------------------------------------------
------------------
mpg             byte   %8.0g                  miles per gallon
weight1         float  %9.0g                  car weight in 1,000 pounds
price           int    %8.0g                  car price in 1978 dollars
foreign         byte   %8.0g                  =1 if car is foreign

. summarize $ylist $xlist

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
         mpg |        26    20.92308    4.757504         14         35
     weight1 |        26    3.099231    .6950794       2.02       4.33
       price |        26    6651.731     3371.12       3299      15906
     foreign |        26    .2692308    .4523443          0          1

. summarize $ylist, detail

                      miles per gallon
-------------------------------------------------------------
      Percentiles      Smallest
 1%           14             14
 5%           14             14
10%           15             15       Obs                  26
25%           17             16       Sum of Wgt.          26

50%           21                      Mean           20.92308
                        Largest       Std. Dev.      4.757504
75%           23             25
90%           26             26       Variance       22.63385
95%           29             29       Skewness       .8806144
99%           35             35       Kurtosis       4.243808
```
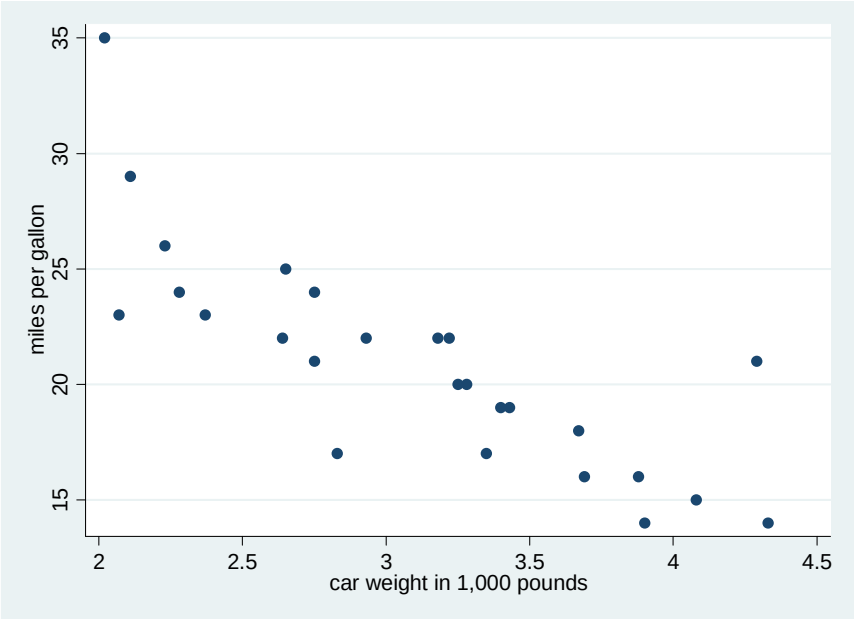
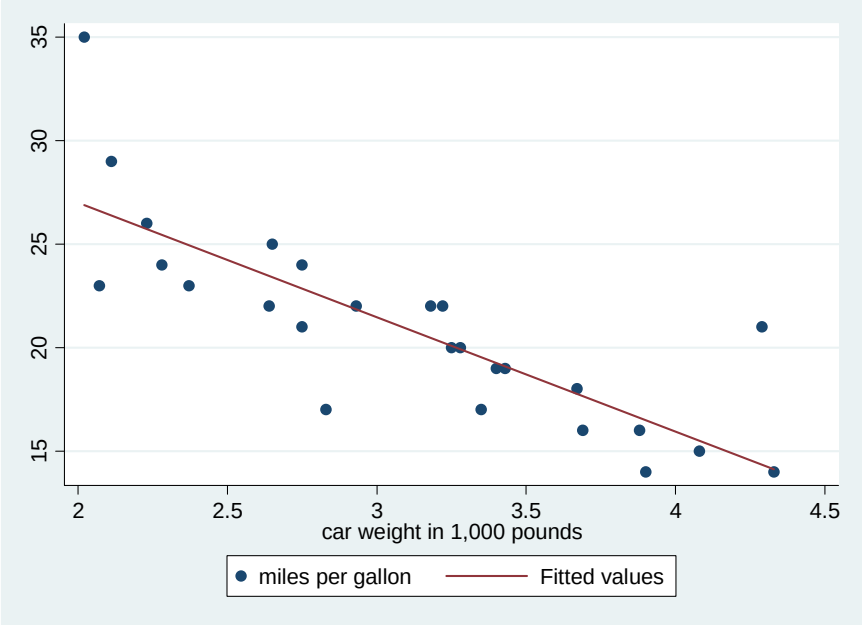

```
.
. * Correlation
. correlate $ylist $xlist
(obs=26)

             |      mpg  weight1    price  foreign
-------------+------------------------------------
         mpg |   1.0000
     weight1 |  -0.8082   1.0000
       price |  -0.4385   0.5561   1.0000
     foreign |   0.4003  -0.6011   0.0835   1.0000


.
. * Plotting the data
. graph twoway (scatter $ylist $x1list)

.
. * Simple regression
. reg $ylist $x1list

      Source |       SS       df       MS              Number of obs =      26
-------------+------------------------------           F(  1,    24) =   45.19
       Model |  369.567767     1  369.567767           Prob > F      =  0.0000
    Residual |  196.278387    24  8.17826611           R-squared     =  0.6531
-------------+------------------------------           Adj R-squared =  0.6387
       Total |  565.846154    25  22.6338462           Root MSE      =  2.8598

------------------------------------------------------------------------------
         mpg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     weight1 |  -5.531496   .8228604    -6.72   0.000    -7.229797   -3.833196
       _cons |   38.06646   2.611177    14.58   0.000     32.67726    43.45566
------------------------------------------------------------------------------

.
. * Plotting a regression line
. graph twoway (scatter $ylist $x1list)(lfit $ylist $x1list)

.
. * Predicted values for the dependent variable
. predict y1hat, xb

. summarize $ylist y1hat

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
         mpg |        26    20.92308    4.757504         14         35
       y1hat |        26    20.92308    3.844829   14.11508   26.89284

. graph twoway (scatter $ylist $x1list)(scatter y1hat $x1list)

.
. * Regression residuals
. predict e1hat, resid
```

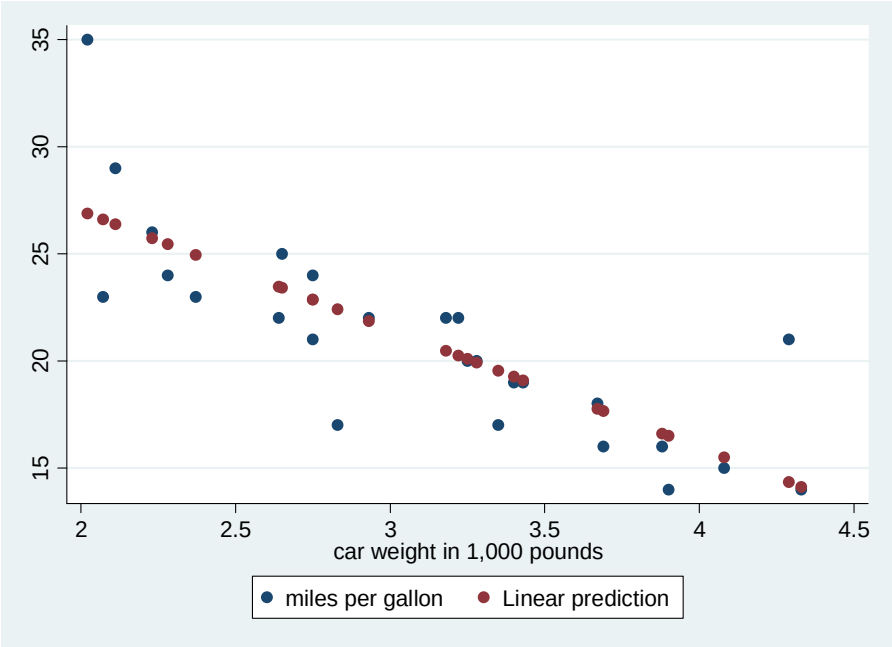
```
. summarize e1hat

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
       e1hat |        26    1.52e-08    2.801988  -5.412326   8.107162

. graph twoway (scatter e1hat $x1list)

.
. * Hypothesis testing (coefficient significantly different from zero)
. test $x1list

 ( 1)  weight1 = 0

       F(  1,    24) =   45.19
            Prob > F =    0.0000

.
. * Marginal effects (at the mean and average marginal effect)
. quietly reg $ylist $x1list

. margins, dydx(*) atmeans

Conditional marginal effects                      Number of obs   =         26
Model VCE    : OLS

Expression   : Linear prediction, predict()
dy/dx w.r.t. : weight1
at           : weight1         =    3.099231 (mean)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     weight1 |  -5.531496   .8228604    -6.72   0.000    -7.144273   -3.918719
------------------------------------------------------------------------------

. margins, dydx(*)

Average marginal effects                          Number of obs   =         26
Model VCE    : OLS

Expression   : Linear prediction, predict()
dy/dx w.r.t. : weight1

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     weight1 |  -5.531496   .8228604    -6.72   0.000    -7.144273   -3.918719
------------------------------------------------------------------------------

.
.
```

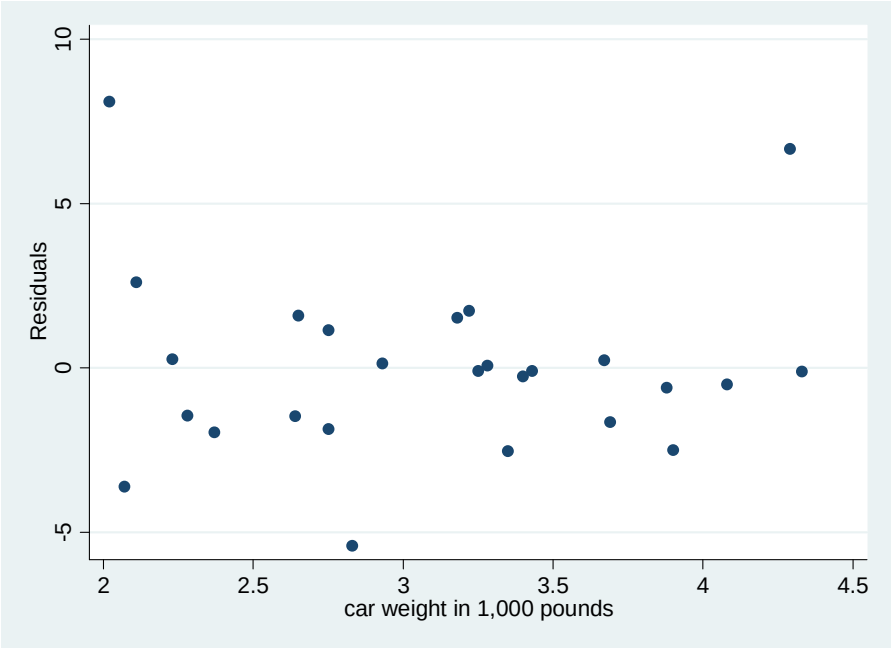
```
. * Multiple regression
. reg $ylist $xlist

      Source |       SS       df       MS              Number of obs =      26
-------------+------------------------------           F(  3,    22) =   15.25
       Model |  382.079636     3  127.359879           Prob > F      =  0.0000
    Residual |  183.766518    22  8.35302354           R-squared     =  0.6752
-------------+------------------------------           Adj R-squared =  0.6309
       Total |  565.846154    25  22.6338462           Root MSE      =  2.8902

------------------------------------------------------------------------------
         mpg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     weight1 |  -7.121111   1.604674    -4.44   0.000      -10.449   -3.793222
       price |   .0002258   .0002654     0.85   0.404    -.0003245    .0007761
     foreign |  -2.507127   2.056569    -1.22   0.236    -6.772189    1.757935
       _cons |    42.1662   4.264753     9.89   0.000     33.32164    51.01075
------------------------------------------------------------------------------

.
. * Predicted values for the dependent variable
. predict yhat, xb

. summarize $ylist yhat

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
         mpg |        26    20.92308    4.757504         14         35
        yhat |        26    20.92308    3.909372   13.90232   27.88551

.
. * Regression residuals
. predict ehat, resid

. summarize ehat

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        ehat |        26    6.59e-09     2.71121  -4.694157    8.68946

.
. * Hypothesis testing (coefficients jointly significantly different from zero)
. test $xlist

 ( 1)  weight1 = 0
 ( 2)  price = 0
 ( 3)  foreign = 0

       F(  3,    22) =   15.25
            Prob > F =    0.0000

.
. * Marginal effects (at the mean and average marginal effect)
. margins, dydx(*) atmeans
```

```
Conditional marginal effects                      Number of obs   =         26
Model VCE    : OLS

Expression   : Linear prediction, predict()
dy/dx w.r.t. : weight1 price foreign
at           : weight1         =    3.099231 (mean)
               price           =    6651.731 (mean)
               foreign         =    .2692308 (mean)

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     weight1 |  -7.121111   1.604674    -4.44   0.000    -10.26621   -3.976009
       price |   .0002258   .0002654     0.85   0.395    -.0002943    .0007459
     foreign |  -2.507127   2.056569    -1.22   0.223    -6.537927    1.523673
------------------------------------------------------------------------------

. margins, dydx(*)

Average marginal effects                          Number of obs   =         26
Model VCE    : OLS

Expression   : Linear prediction, predict()
dy/dx w.r.t. : weight1 price foreign

------------------------------------------------------------------------------
             |            Delta-method
             |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     weight1 |  -7.121111   1.604674    -4.44   0.000    -10.26621   -3.976009
       price |   .0002258   .0002654     0.85   0.395    -.0002943    .0007459
     foreign |  -2.507127   2.056569    -1.22   0.223    -6.537927    1.523673
------------------------------------------------------------------------------
```




35
30
25
20
15
2
2.5
3
3.5
4
4.5
car weight in 1,000 pounds
miles per gallon
Fitted values


35
30
25
20
15
2
2.5
3
3.5
4
4.5
car weight in 1,000 pounds
miles per gallon
Linear prediction


Residuals
10
5
0
-5
2
2.5
3
3.5
4
4.5
car weight in 1,000 pounds