Proof t-test^2 = F-test

```
*Run regression
. reg y x1 x2 x3 x4 x5

      Source |       SS           df       MS      Number of obs   =        23
-------------+----------------------------------   F(5, 17)        =     57.63
       Model |  1129.30649         5  225.861299   Prob > F        =    0.0000
    Residual |   66.622243        17  3.91895547   R-squared       =    0.9443
-------------+----------------------------------   Adj R-squared   =    0.9279
       Total |  1195.92874        22  54.3603971   Root MSE        =    1.9796

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0048894   .0049619     0.99   0.338    -.0055794    .0153581
          x2 |  -.6518875   .1743999    -3.74   0.002    -1.019839   -.2839359
          x3 |   .2432418   .0895442     2.72   0.015       .05432    .4321636
          x4 |   .1043175   .0706436     1.48   0.158    -.0447275    .2533625
          x5 |  -.0711103   .0983811    -0.72   0.480    -.2786762    .1364556
       _cons |   38.59691   4.214487     9.16   0.000     29.70512     47.4887
------------------------------------------------------------------------------

*Obtain estimated coefficients
. mat beta=e(b)

. mat list beta

beta[1,6]
            x1          x2          x3          x4          x5       _cons
y1   .00488935  -.65188752   .24324181   .10431748  -.07111027   38.596911

. sca b4=el(beta,1,4)

. sca b5=el(beta,1,5)

*Obtain Variance-Covariance matrix of estimated coefficients
. mat V=e(V)

. mat list V

symmetric V[6,6]
               x1          x2          x3          x4          x5       _cons
   x1   .00002462
   x2   .00022013   .03041532
   x3  -.00017787  -.01166837   .00801817
   x4  -.00023346  -.00540615   .00392333   .00499052
   x5   .00001652   .00554156  -.00610215  -.00473864   .00967883
_cons   .00729795  -.55783048   .18926952   .03656747  -.18572828   17.761903

. sca Vb4=el(V,4,4)

. sca Vb5=el(V,5,5)

. sca Vb4b5=el(V,5,4)
```

```
. sca list Vb4 Vb5 Vb4b5
       Vb4 =  .00499052
       Vb5 =  .00967883
     Vb4b5 = -.00473864
```

***Compute Standard Error b4+b5**

```
. sca SEb4b5=sqrt(Vb4+Vb5+2*(Vb4b5))

. sca list SEb4b5
    SEb4b5 =  .07205608
```

***Compute t-test of b4+b5**

```
. sca ttest=(b4+b5)/SEb4b5

. sca pvalue=ttail(17,abs(ttest))*2

. sca list ttest pvalue
     ttest =  .46085224
    pvalue =  .65074559
```

***Compute t-test^2**

```
. sca F=ttest^2

. sca list F
         F =  .21238479
```

***Perform Restricted-F-test using STATA command**

```
. test x4+x5=0

 ( 1)  x4 + x5 = 0

       F(  1,    17) =    0.21
            Prob > F =    0.6507
```

Proof STATA Command test and Restricted-Unrestricted F-test Formula

***Run Unrestricted Model and Perform the test using STATA command**

```
. reg y x1 x2 x3 x4 x5

      Source |       SS           df       MS      Number of obs   =        23
-------------+----------------------------------   F(5, 17)        =     57.63
       Model |  1129.30649         5  225.861299   Prob > F        =    0.0000
    Residual |   66.622243        17  3.91895547   R-squared       =    0.9443
-------------+----------------------------------   Adj R-squared   =    0.9279
       Total |  1195.92874        22  54.3603971   Root MSE        =    1.9796

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0048894   .0049619     0.99   0.338    -.0055794    .0153581
          x2 |  -.6518875   .1743999    -3.74   0.002    -1.019839   -.2839359
          x3 |   .2432418   .0895442     2.72   0.015       .05432    .4321636
          x4 |   .1043175   .0706436     1.48   0.158    -.0447275    .2533625
          x5 |  -.0711103   .0983811    -0.72   0.480    -.2786762    .1364556
       _cons |   38.59691   4.214487     9.16   0.000     29.70512     47.4887
------------------------------------------------------------------------------

. sca rss_ur=e(rss)

. test x4 x5

 ( 1)  x4 = 0
 ( 2)  x5 = 0

       F(  2,    17) =    1.17
            Prob > F =    0.3354

. sca F_x4x5=r(F)

. sca p_Fx4x5=r(p)
```

***Run Restricted Model**

```
. reg y x1 x2 x3

      Source |       SS           df       MS      Number of obs   =        23
-------------+----------------------------------   F(3, 19)        =     93.65
       Model |  1120.17021         3  373.390069   Prob > F        =    0.0000
    Residual |  75.7585287        19  3.98729099   R-squared       =    0.9367
-------------+----------------------------------   Adj R-squared   =    0.9267
       Total |  1195.92874        22  54.3603971   Root MSE        =    1.9968

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0108762   .0023812     4.57   0.000     .0058922    .0158602
          x2 |  -.5410846   .1579697    -3.43   0.003    -.8717189   -.2104503
          x3 |   .1740546   .0625307     2.78   0.012     .0431764    .3049328
       _cons |    38.6472     3.6496    10.59   0.000      31.0085     46.2859
------------------------------------------------------------------------------
```

```
. sca rss_r=e(rss)
```

***Compute Restricted-Unrestricted F-test using Formula**

```
. sca F_r_ur=((rss_r-rss_ur)/2)/(rss_ur/17)

. sca p_F_r_ur=Ftail(2,17,F_r_ur)
```

***Compare the tests**

```
. sca list F_r_ur p_F_r_ur F_x4x5 p_Fx4x5
    F_r_ur =  1.1656532
  p_F_r_ur =  .33542514
    F_x4x5 =  1.1656532
   p_Fx4x5 =  .33542514
```

Proof Chow-test and Dummy Variables Technique

```
*Chow-Structural-Break-Test
*Estimate using all observations
. reg y x1 x2 x3 x4 x5

      Source |       SS           df       MS      Number of obs   =        23
-------------+----------------------------------   F(5, 17)        =     57.63
       Model |  1129.30649         5  225.861299   Prob > F        =    0.0000
    Residual |   66.622243        17  3.91895547   R-squared       =    0.9443
-------------+----------------------------------   Adj R-squared   =    0.9279
       Total |  1195.92874        22  54.3603971   Root MSE        =    1.9796

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0048894   .0049619     0.99   0.338    -.0055794    .0153581
          x2 |  -.6518875   .1743999    -3.74   0.002    -1.019839   -.2839359
          x3 |   .2432418   .0895442     2.72   0.015       .05432    .4321636
          x4 |   .1043175   .0706436     1.48   0.158    -.0447275    .2533625
          x5 |  -.0711103   .0983811    -0.72   0.480    -.2786762    .1364556
       _cons |   38.59691   4.214487     9.16   0.000     29.70512     47.4887
------------------------------------------------------------------------------

. sca rss1=e(rss)

*Estimate two sub-sample periods
. reg y x1 x2 x3 x4 x5 if obs<1972

      Source |       SS           df       MS      Number of obs   =        12
-------------+----------------------------------   F(5, 6)         =    292.39
       Model |  205.672619         5  41.1345239   Prob > F        =    0.0000
    Residual |  .844097685         6  .140682947   R-squared       =    0.9959
-------------+----------------------------------   Adj R-squared   =    0.9925
       Total |  206.516717        11   18.774247   Root MSE        =    .37508

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0181174   .0033991     5.33   0.002        .0098    .0264348
          x2 |  -.2427424   .1023535    -2.37   0.055    -.4931923    .0077075
          x3 |    .244597   .1293168     1.89   0.107    -.0718297    .5610238
          x4 |   .0683535   .1537339     0.44   0.672    -.3078199    .4445268
          x5 |  -.0912344   .2909469    -0.31   0.764    -.8031558     .620687
       _cons |   19.23903   4.279744     4.50   0.004      8.76687    29.71118
------------------------------------------------------------------------------

. sca rss2=e(rss)

. reg y x1 x2 x3 x4 x5 if obs>=1972

      Source |       SS           df       MS      Number of obs   =        11
-------------+----------------------------------   F(5, 5)         =     75.54
       Model |  240.176756         5  48.0353511   Prob > F        =    0.0001
    Residual |  3.17961169         5  .635922339   R-squared       =    0.9869
-------------+----------------------------------   Adj R-squared   =    0.9739
```

```
       Total |  243.356367        10  24.3356367   Root MSE        =    .79745

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |    .008905   .0023553     3.78   0.013     .0028504    .0149595
          x2 |  -.0725872   .1149666    -0.63   0.556    -.3681184    .2229439
          x3 |   .0107341   .0509495     0.21   0.841    -.1202356    .1417039
          x4 |   .1114002   .0297072     3.75   0.013     .0350353    .1877651
          x5 |  -.1610332   .0441186    -3.65   0.015    -.2744438   -.0476226
       _cons |     39.218   3.041486    12.89   0.000     31.39961    47.03639
------------------------------------------------------------------------------

. sca rss3=e(rss)
```

***Compute Chow-Test**

```
. sca Chowtest=((rss1-rss2-rss3)/6)/((rss2+rss3)/(23-12))

. sca pvalue_Chow=Ftail(6,11,Chowtest)
```

***Dummy Variable Technique**
***Generate Dummy Variable**

```
. *g d=(obs>=1972)
. *g dx1=d*x1
. *g dx2=d*x2
. *g dx3=d*x3
. *g dx4=d*x4
. *g dx5=d*x5
```

***Estimate Model with Intercept and Slope Dummy**

```
. reg y x1 x2 x3 x4 x5 d dx1 dx2 dx3 dx4 dx5

      Source |       SS           df       MS      Number of obs   =        23
-------------+----------------------------------   F(11, 11)       =    296.22
       Model |  1191.90503        11  108.355002   Prob > F        =    0.0000
    Residual |  4.02370938        11  .365791762   R-squared       =    0.9966
-------------+----------------------------------   Adj R-squared   =    0.9933
       Total |  1195.92874        22  54.3603971   Root MSE        =    .60481

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   .0181174   .0054811     3.31   0.007     .0060536    .0301812
          x2 |  -.2427424   .1650436    -1.47   0.169     -.606001    .1205162
          x3 |    .244597   .2085216     1.17   0.266     -.214356    .7035501
          x4 |   .0683535    .247894     0.28   0.788    -.4772575    .6139644
          x5 |  -.0912344   .4691481    -0.19   0.849    -1.123822    .9413535
           d |   19.97897   7.276354     2.75   0.019     3.963824    35.99412
         dx1 |  -.0092125   .0057648    -1.60   0.138    -.0219008    .0034759
         dx2 |   .1701551   .1866606     0.91   0.382    -.2406822    .5809925
         dx3 |  -.2338629   .2120718    -1.10   0.294    -.7006298     .232904
         dx4 |   .0430467   .2489158     0.17   0.866    -.5048132    .5909066
         dx5 |  -.0697988   .4703398    -0.15   0.885     -1.10501    .9654121
       _cons |   19.23903   6.901031     2.79   0.018     4.049959    34.42809
------------------------------------------------------------------------------
```

***Compute Test for Intercept and All Slope Dummy Coefficients**

```
. test d dx1 dx2 dx3 dx4 dx5

 ( 1)  d = 0
 ( 2)  dx1 = 0
 ( 3)  dx2 = 0
 ( 4)  dx3 = 0
 ( 5)  dx4 = 0
 ( 6)  dx5 = 0

       F(  6,    11) =   28.52
            Prob > F =    0.0000

. sca ChowDummy=r(F)

. sca p_ChowDummy=r(p)
```

***Compare Chow-test & Dummy Variable Technique**

```
. sca list Chowtest pvalue_Chow ChowDummy p_ChowDummy
  Chowtest =  28.521935
pvalue_Chow =  4.335e-06
 ChowDummy =  28.521935
p_ChowDummy =  4.335e-06
```

Proof One-way ANOVA & ANOVA Regression Model

***Run One-way ANOVA test**

```
. oneway y Day, tabulate

            |          Summary of Y
        Day |        Mean   Std. Dev.       Freq.
------------+------------------------------------
          1 |  -.13904595   1.9925471          42
          2 |  -.27028511    1.533583          45
          3 |  -.19944609   1.9328141          46
          4 |     .123915   2.0204847          46
          5 |   .39229522   1.6774294          44
------------+------------------------------------
      Total |  -.01890673   1.8409723         223

                        Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      13.3272886      4   3.33182216      0.98     0.4178
 Within groups      739.070471    218   3.39023152
------------------------------------------------------------------------
    Total            752.39776    222    3.3891791

Bartlett's test for equal variances:  chi2(4) =   4.8570  Prob>chi2 = 0.302
```

***Run Model with Dummy Variables**

```
. reg y d2 d3 d4 d5

      Source |       SS           df       MS      Number of obs   =       223
-------------+----------------------------------   F(4, 218)       =      0.98
       Model |  13.3272886         4  3.33182216   Prob > F        =    0.4178
    Residual |  739.070471       218  3.39023152   R-squared       =    0.0177
-------------+----------------------------------   Adj R-squared   =   -0.0003
       Total |   752.39776       222   3.3891791   Root MSE        =    1.8413

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d2 |  -.1312392   .3950421    -0.33   0.740    -.9098299    .6473516
          d3 |  -.0604001   .3929637    -0.15   0.878    -.8348945    .7140942
          d4 |   .2629609   .3929637     0.67   0.504    -.5115334    1.037455
          d5 |   .5313412   .3972034     1.34   0.182    -.2515092    1.314192
       _cons |  -.1390459   .2841123    -0.49   0.625    -.6990045    .4209126
------------------------------------------------------------------------------
```

Dummy Variable Regression Models

ANOVA Model

In the study of seasonal effect (Monday and Friday effects), ANOVA model is estimated using both models with and without intercept term:

Model with Intercept term: $Y_t = \beta_1 + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta_5 D_{5t} + u_t$

Model without Intercept term: $Y_t = \beta_1 D_{1t} + \beta_2 D_{2t} + \beta_3 D_{3t} + \beta_4 D_{4t} + \beta_5 D_{5t} + u_t$

where: Y_t = Return on asset at time t.
D_{1t} = 1 on Monday and = 0 otherwise.
D_{2t} = 1 on Tuesday and = 0 otherwise.
D_{3t} = 1 on Wednesday and = 0 otherwise.
D_{4t} = 1 on Thursday and = 0 otherwise.
D_{5t} = 1 on Friday and = 0 otherwise.

```
. reg y d2 d3 d4 d5

      Source |       SS       df       MS              Number of obs =     995
-------------+------------------------------           F(  4,   990) =    7.60
       Model |  .00681682     4  .001704205            Prob > F      =  0.0000
    Residual | .221894717   990  .000224136            R-squared     =  0.0298
-------------+------------------------------           Adj R-squared =  0.0259
       Total | .228711537   994  .000230092            Root MSE      =  .01497

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d2 |   .0044637   .0015009     2.97   0.003     .0015184    .0074089
          d3 |   .0044351   .0015009     2.96   0.003     .0014898    .0073803
          d4 |   .0040519   .0015009     2.70   0.007     .0011067    .0069972
          d5 |   .0082592   .0015009     5.50   0.000      .005314    .0112045
       _cons |  -.0040211   .0010613    -3.79   0.000    -.0061037   -.0019385
------------------------------------------------------------------------------


. reg y d1 d2 d3 d4 d5, noconstant

      Source |       SS       df       MS              Number of obs =     995
-------------+------------------------------           F(  5,   990) =    6.13
       Model | .006865358     5  .001373072            Prob > F      =  0.0000
    Residual | .221894717   990  .000224136            R-squared     =  0.0300
-------------+------------------------------           Adj R-squared =  0.0251
       Total | .228760075   995   .00022991            Root MSE      =  .01497

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0040211   .0010613    -3.79   0.000    -.0061037   -.0019385
          d2 |   .0004426   .0010613     0.42   0.677    -.0016401    .0025252
          d3 |    .000414   .0010613     0.39   0.697    -.0016687    .0024966
          d4 |   .0000308   .0010613     0.03   0.977    -.0020518    .0021134
          d5 |   .0042381   .0010613     3.99   0.000     .0021555    .0063207
------------------------------------------------------------------------------
```

Interpretations of the estimated results of the two models are as follows:

Model	**With intercept term**	**Without intercept**
Monday	$\hat{Y}_t = \hat{\beta}_1$ = -0.004021	$\hat{Y}_t = \hat{\beta}_1$ = -0.004021
Tuesday	$\hat{Y}_t = \hat{\beta}_1 + \hat{\beta}_2$ = -0.004021+0.004464 = 0.000443	$\hat{Y}_t = \hat{\beta}_2$ = 0.000443
Wednesday	$\hat{Y}_t = \hat{\beta}_1 + \hat{\beta}_3$ = -0.004021+0.004435 = 0.000414	$\hat{Y}_t = \hat{\beta}_3$ = 0.000414
Thursday	$\hat{Y}_t = \hat{\beta}_1 + \hat{\beta}_4$ = -0.004021+0.004052 = 0.000031	$\hat{Y}_t = \hat{\beta}_4$ = 0.000031
Friday	$\hat{Y}_t = \hat{\beta}_1 + \hat{\beta}_5$ = -0.004021+0.008259 = 0.004238	$\hat{Y}_t = \hat{\beta}_5$ = 0.004238

For the purpose of testing only Monday and Friday effect, the model can be stated as:

Model to test Monday and Friday effect: $Y_t = \beta_0 + \beta_1 D_{1t} + \beta_5 D_{5t} + u_t$

```
. reg y d1 d5

      Source |       SS       df       MS              Number of obs =     995
-------------+------------------------------           F(  2,   992) =   15.19
       Model |  .006795783     2  .003397892           Prob > F      =  0.0000
    Residual |  .221915754   992  .000223705           R-squared     =  0.0297
-------------+------------------------------           Adj R-squared =  0.0278
       Total |  .228711537   994  .000230092           Root MSE      =  .01496

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0043169   .0012243    -3.53   0.000    -.0067194   -.0019144
          d5 |   .0039423   .0012243     3.22   0.001     .0015399    .0063448
       _cons |   .0002958   .0006121     0.48   0.629    -.0009055     .001497
------------------------------------------------------------------------------
```

Interpretation of the estimated result of the model is as follow:

Model	
Tuesday **Wednesday** **Thursday**	$\hat{Y}_t = \hat{\beta}_0$ = 0.000296
Monday	$\hat{Y}_t = \hat{\beta}_0 + \hat{\beta}_1$ = 0.000296 - 0.004317 = -0.004021
Friday	$\hat{Y}_t = \hat{\beta}_1 + \hat{\beta}_5$ = 0.000296 - 0.003942 = 0.004238

ANCOVA Model

If the model also includes quantitative independent variable *(X_t)*, the model can be stated as:

Model with intercept dummy: $Y_t = \beta_0 + \beta_1 X_{1t} + \gamma_0 D_{1t} + \lambda_0 D_{5t} + u_t$

This model can be interpreted as:

Model for Tuesday, Wednesday and Thursday: $Y_t = \beta_0 + \beta_1 X_{1t} + u_t$
Model for Monday: $Y_t = (\beta_0 + \gamma_0) + \beta_1 X_{1t} + u_t$
Model for Friday: $Y_t = (\beta_0 + \lambda_0) + \beta_1 X_{1t} + u_t$

```
. reg y x1 d1 d5

      Source |       SS       df       MS              Number of obs =     995
-------------+------------------------------           F(  3,   991) =   11.68
       Model |  .007808227     3  .002602742           Prob > F      =  0.0000
    Residual |  .220903311   991  .000222909           R-squared     =  0.0341
-------------+------------------------------           Adj R-squared =  0.0312
       Total |  .228711537   994  .000230092           Root MSE      =  .01493

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          x1 |   1.90e-06   8.91e-07     2.13   0.033     1.50e-07    3.65e-06
          d1 |  -.0043131   .0012221    -3.53   0.000    -.0067113   -.0019149
          d5 |   .0039385   .0012221     3.22   0.001     .0015403    .0063368
       _cons |  -.0708331   .0333809    -2.12   0.034    -.1363383   -.0053278
------------------------------------------------------------------------------
```

Model with intercept and slope dummy variables:

$$Y_t = \beta_0 + \gamma_0 D_{1t} + \lambda_0 D_{5t} + \beta_1 X_{1t} + \gamma_1 D_{1t} X_{1t} + \lambda_1 D_{5t} X_{1t} + u_t$$

This model can be interpreted as:

Model for Tuesday, Wednesday and Thursday: $Y_t = \beta_0 + \beta_1 X_{1t} + u_t$
Model for Monday: $Y_t = (\beta_0 + \gamma_0) + (\beta_1 + \gamma_1) X_{1t} + u_t$
Model for Friday: $Y_t = (\beta_0 + \lambda_0) + (\beta_1 + \lambda_1) X_{1t} + u_t$

```
. g x1d1 = x1*d1

. g x1d5 = x1*d5

. reg y d1 d5 x1 x1d1 x1d5

      Source |       SS       df       MS              Number of obs =     995
-------------+------------------------------           F(  5,   989) =    7.19
       Model |  .008022894     5  .001604579           Prob > F      =  0.0000
    Residual |  .220688644   989  .000223143           R-squared     =  0.0351
-------------+------------------------------           Adj R-squared =  0.0302
       Total |  .228711537   994  .000230092           Root MSE      =  .01494

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0541205    .086225    -0.63   0.530    -.2233254    .1150844
```

```
          d5 |   .0576593   .0862319     0.67   0.504    -.1115592    .2268777
          x1 |   1.92e-06   1.15e-06     1.67   0.096    -3.39e-07    4.18e-06
        x1d1 |   1.33e-06   2.30e-06     0.58   0.564    -3.19e-06    5.85e-06
        x1d5 |  -1.43e-06   2.30e-06    -0.62   0.533    -5.95e-06    3.08e-06
       _cons |  -.0716146   .0431142    -1.66   0.097    -.1562204    .0129911
------------------------------------------------------------------------------
```

Interaction Effect

Model with interaction effect dummy:

$$Y_t = \beta_0 + \gamma_0 D_{1t} + \lambda_0 D_{JANt} + \delta_0 D_{1t}D_{JANt} + \beta_1 X_{1t} + u_t$$

where: D_{1t} = 1 for Monday and = 0 otherwise.
D_{JANt} = 1 for January and = 0 otherwise.

The meaning of $D_{1t}D_{JANt}$

$D_{1t}D_{JANt}$ = 1 for Monday in January and = 0 otherwise.

```
. g d1djan = d1*djan

. reg y d1 djan d1djan x1

      Source |       SS       df       MS              Number of obs =     995
-------------+------------------------------           F(  4,   990) =    7.55
       Model |  .006773371     4  .001693343           Prob > F      =  0.0000
    Residual |  .221938166   990   .00022418           R-squared     =  0.0296
-------------+------------------------------           Adj R-squared =  0.0257
       Total |  .228711537   994  .000230092           Root MSE      =  .01497

------------------------------------------------------------------------------
           y |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          d1 |  -.0059289   .0012667    -4.68   0.000    -.0084147   -.0034432
        djan |   .0019612   .0017065     1.15   0.251    -.0013876    .0053099
      d1djan |    .004773   .0036262     1.32   0.188    -.0023429    .0118889
          x1 |   2.08e-06   8.98e-07     2.32   0.021     3.21e-07    3.85e-06
       _cons |  -.0769402    .033645    -2.29   0.022    -.1429639   -.0109166
------------------------------------------------------------------------------
```