Econometrics for Finance - some event study regressions[1]

The regression results for Conoco are

```
Model 1: OLS, using observations 1976:01-1981:05 (T = 65)
Dependent variable: excon

             coefficient   std. error   t-ratio    p-value
  ---------------------------------------------------------
  const      -0.00632991   0.00665912   -0.9506   0.3455
  exmar       0.752599     0.0968506     7.771    8.99e-011 ***

Sum squared resid    0.167786   S.E. of regression   0.051607
R-squared            0.489399   Adjusted R-squared   0.481294
F(1, 63)             60.38404   P-value(F)           8.99e-11
```

and produce the predictions in the table

```
 For 95% confidence intervals, t(63, 0.025) = 1.998

     Obs        excon    prediction    std. error        95% interval
 1981:06      0.25749     -0.01708      0.05210     -0.12119 -  0.08704
 1981:07      0.38159     -0.03985      0.05236     -0.14449 -  0.06479
 1981:08     -0.09772     -0.03846      0.05234     -0.14306 -  0.06614
 1981:09     -0.23410     -0.13769      0.05528     -0.24815 - -0.02723
```

(c) The regression output for Conoco is

```
Model 2: OLS, using observations 1976:01-1981:09 (T = 69)
Dependent variable: excon

             coefficient   std. error   t-ratio    p-value
  ---------------------------------------------------------
  const      -0.00632991   0.00665912   -0.9506   0.3455
  exmar       0.752599     0.0968506     7.771    8.99e-011 ***
  d1          0.274567     0.0521019     5.270    1.77e-06  ***
  d2          0.421441     0.0523647     8.048    2.94e-011 ***
  d3         -0.0592616    0.0523440    -1.132    0.2619
  d4         -0.0964115    0.0552761    -1.744    0.0860    *

Sum squared resid    0.167786   S.E. of regression   0.051607
R-squared            0.719957   Adjusted R-squared   0.697731
F(5, 63)             32.39306   P-value(F)           3.39e-16
```


[1]The data for the reported regressions is on my webpage, which is linked to the class MyPlace page.

and this output is related to the previous piece and to the calculations of (b) in the way that the lecture notes claim. The first null hypothesis requires a restricted estimation. It is of the same relationship as in (a) since the null excludes the dummy variables but all 69 observations are used. Here is the Conoco output

```
Model 3: OLS, using observations 1976:01-1981:09 (T = 69)
Dependent variable: excon

             coefficient   std. error   t-ratio   p-value
  -------------------------------------------------------
  const      0.00195743    0.00982548   0.1992    0.8427
  exmar      0.719659      0.139610     5.155     2.43e-06 ***

Sum squared resid     0.429005    S.E. of regression   0.080019
R-squared             0.283971    Adjusted R-squared   0.273284
F(1, 67)              26.57163    P-value(F)           2.43e-06
```

The null distribution of the F statistic is $F_{4,69-6} = F_{4,63}$ The calculated F statistic is around 24.5 for Conoco[2].
The t statistic for the second null, which is the SCAR, is most elegantly obtained by rearrangement of the estimated equation. For Conoco the output

```
Model 4: OLS, using observations 1976:01-1981:09 (T = 69)
Dependent variable: excon

             coefficient   std. error   t-ratio    p-value
  --------------------------------------------------------
  const      -0.00632991   0.00665912   -0.9506   0.3455
  exmar       0.752599     0.0968506     7.771    8.99e-011 ***
  d1          0.540335     0.111669      4.839    8.80e-06  ***
  d2md1       0.421441     0.0523647     8.048    2.94e-011 ***
  d3md1      -0.0592616    0.0523440    -1.132    0.2619
  d4md1      -0.0964115    0.0552761    -1.744    0.0860    *

Sum squared resid     0.167786    S.E. of regression   0.051607
R-squared             0.719957    Adjusted R-squared   0.697731
F(5, 63)              32.39306    P-value(F)           3.39e-16
```

[2]The other values are around 2.6 for Dupont and around 1 for Dow.

corresponds to

$$\begin{aligned}\text{excr}_t = \beta_1 + \beta_2\text{exmar}_t + (\theta_1 + \theta_2 + \theta_3 + \theta_4)D_{1t} \\ + \theta_2(D_{2t} - D_{1t}) + \theta_3(D_{3t} - D_{1t}) + \theta_4(D_{4t} - D_{1t}) + u_t\end{aligned}$$

which is

$$\text{excr}_t = \lambda_1 + \lambda_2\text{exmar}_t + \lambda_3 D_{1t} + \lambda_4(D_{2t} - D_{1t}) + \lambda_5(D_{3t} - D_{1t}) + \lambda_6(D_{4t} - D_{1t}) + u_t$$

after introducing new parameters. The CAR and SCAR are easily obtained from the output corresponding to this regression as $\hat{\lambda}_3$ and $t_{\lambda_3=0}$ respectively. The complete set of results are

	Dupont	Dow	Conoco
CAR	−0.0880447	−0.0463555	0.5403345
SCAR	−0.7761	−0.3956	4.839

We decided in the lectures that

$$H_0 : \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$$

is 'no event' whereas

$$H_0 : \theta_1 + \theta_2 + \theta_3 + \theta_4 = 0$$

is something like 'no event in total' or 'no event on average'.
In (d) the definition of the various dummy variables implies that

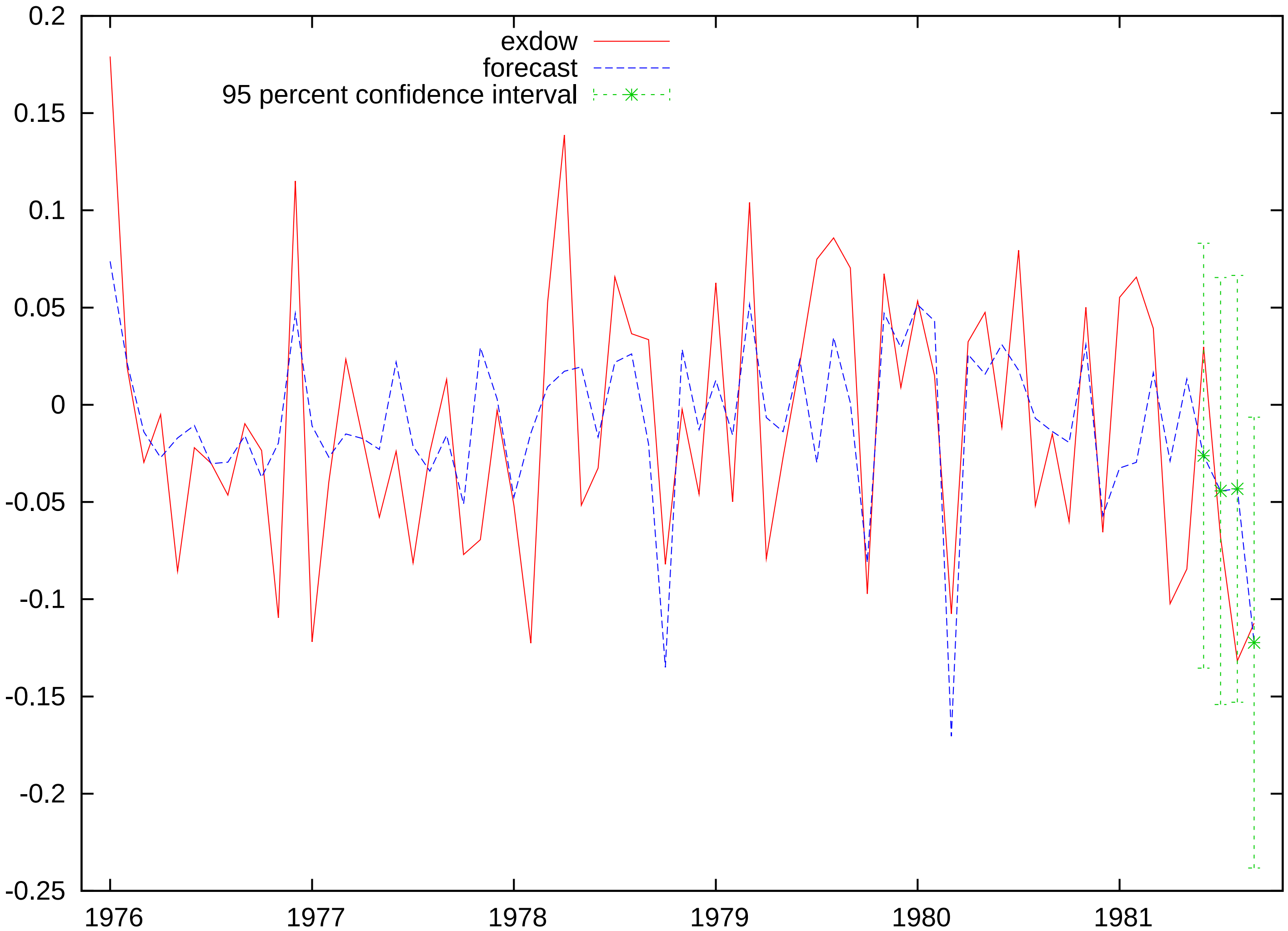
$$D_t = D_{1t} + D_{2t} + D_{3t} + D_{4t}$$

and the required restrictions are therefore $\theta_1 = \theta_2 = \theta_3 = \theta_4$ since

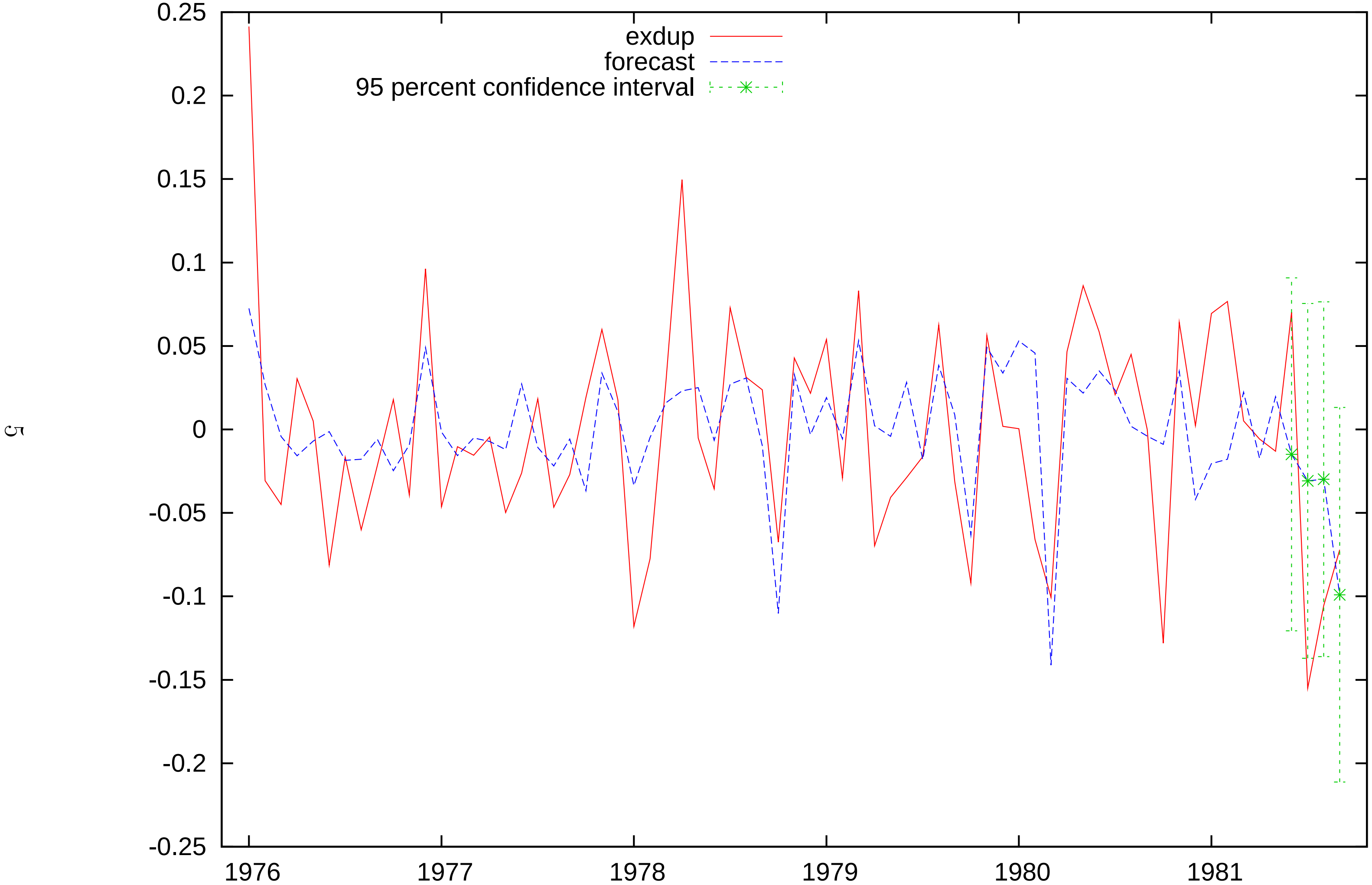
$$\theta_1 D_{1t} + \theta_2 D_{2t} + \theta_3 D_{3t} + \theta_4 D_{4t} = \theta_1(D_{1t} + D_{2t} + D_{3t} + D_{4t}) = \theta_1 D_t$$

then follows. No testing is asked for[3]. The key thing is to spot that one estimation is a restricted version of the other.
Most econometrics packages will produce forecasts automatically and also produces some nice pictures. In the current example gretl produces

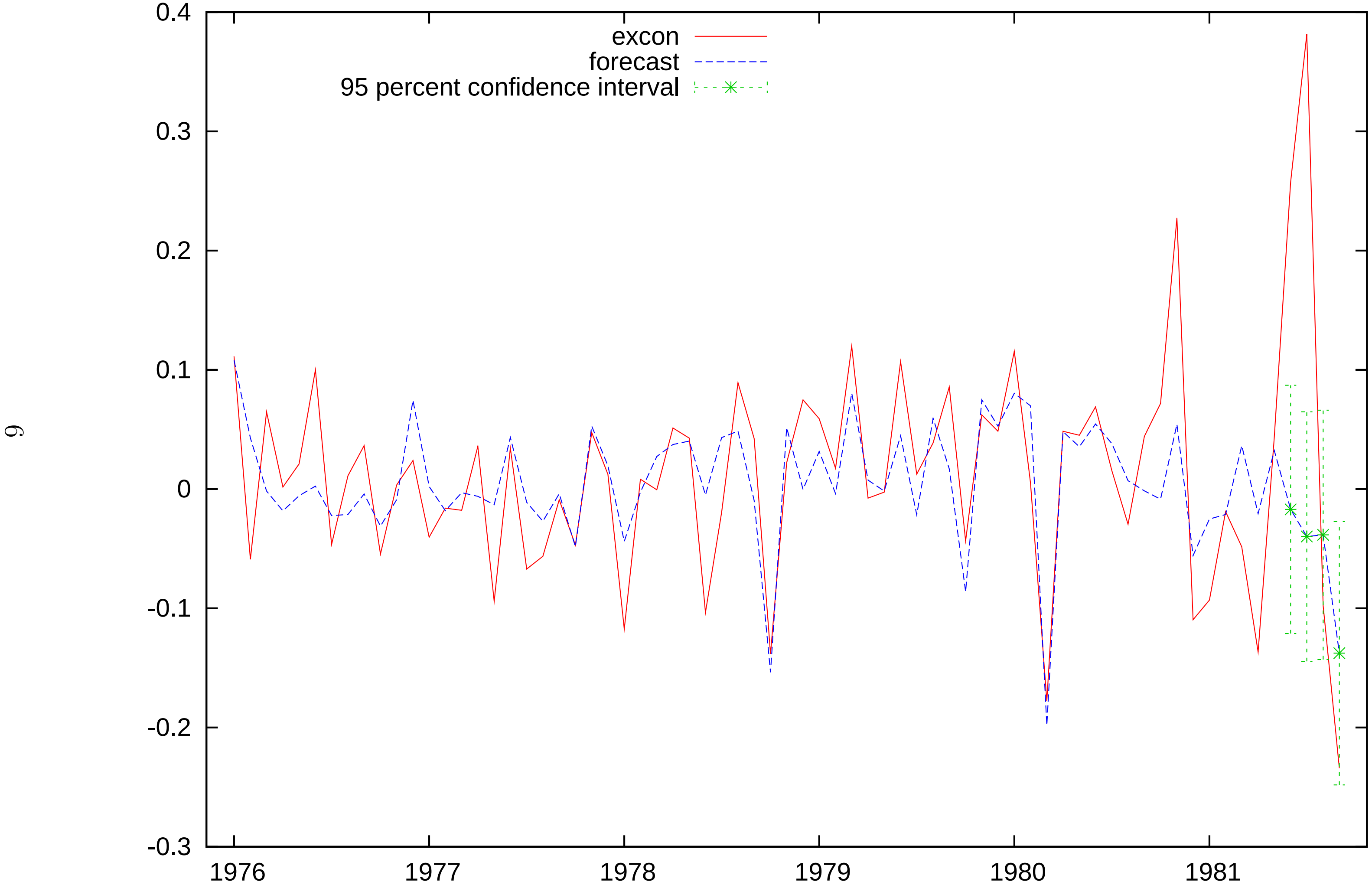
[3]But the calculated statistic is around 23.6 for Conoco, around 3.3 for Dupont and around 1.3 for Dow. The null distribution for the relevant test procedure is $F_{3,63}$.



exdow
forecast
95 percent confidence interval
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
1976
1977
1978
1979
1980
1981



exdup
forecast
95 percent confidence interval
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
1976
1977
1978
1979
1980
1981



excon
forecast
95 percent confidence interval
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
g
1976
1977
1978
1979
1980
1981