

Chapter 6: Specification: Choosing the Independent Variables

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Adding or deleting variables to/from an OLS model in EViews (UE 6.1.2 - 6.3):

EViews makes it easy to try alternative versions of an OLS model in order to determine whether omitting a variable is likely to result in specification bias or whether the variable is irrelevant. The four important specification criteria (UE, pp. 167-168) don't always agree. However, when the theory is not absolutely clear about the relevancy of including a specific variable in a model, the other three criteria (i.e., t-test, adjusted R^2 , and bias) should be considered. The only way to check these criteria is to run the regression with and without the variable and evaluate the results in terms of t-test, adjusted R^2 , and bias. The following steps outline a procedure to determine whether the price of beef (PB) is a relevant variable in the demand for chicken model (UE, Equation 6.8, p. 160):

- Step 1.** Open the EViews workfile named *Chick6.wf1*.
- Step 2.** Select **Objects/New Object/Equation** on the workfile menu bar, enter *Y C PC PB YD* in the **Equation Specification** window, and click **OK**.
- Step 3.** To preserve this EViews Estimation Output view of UE, Equation 6.8, p. 160, for later comparison, select **Name** on the equation menu bar, enter *EQ01* in the **Name to identify object** window, and click **OK**.¹
- Step 4.** Create a duplicate copy of *EQ01* by selecting **Objects/Clone object...** on the *EQ01* menu bar. A new UNTITLED copy of *EQ01* Estimation Output appears. In this new equation window, select **Estimate** on the equation menu bar, delete PB from the **Equation Specification** window, and click **OK**.
- Step 5.** To preserve this EViews Estimation Output of UE, Equation 6.9, p. 161, for later comparison, select **Name** on the equation menu bar, enter *EQ02* in the **Name to identify object** window, and click **OK**.
- Step 6.** Compare and evaluate the two equations based on t-statistics, adjusted R^2 , and bias.

¹ Alternately, the EViews Estimation Output could have been preserved by selecting **Freeze** on the equation menu bar. The **Freeze** button on the objects toolbar creates a duplicate of the current view of the original object. The primary feature of freezing an object is that the tables and graphs created by freeze may be edited for presentations or reports. Frozen views do not change when the workfile sample is changed or when the data change. The purpose for freezing the regression output table is to allow us to view it later by double clicking the objects icon in the workfile window. In order to do that, the frozen object must be named.

Lagging variables in an OLS model using EViews (UE 6.5):

EViews makes it easy to lag variables in an equation.² Equations 6.22 & 6.23 refer to a hypothetical model and they are not actually estimated in *UE*. However, the demand for chicken model (*UE*, Equation 6.8, p. 160) will be used to show how to lag variables in EViews.

Step 1. Open the EViews workfile named *Chick6.wf1*.

Step 2. To run the regression for Y_t on PC_{t-1} , PB_t and YD_t , select **Objects/New Object/Equation** on the workfile menu bar, enter *Y C PC(-1) PB YD* in the **Equation Specification** window (see the graphic to the right), and click **OK**.

Equation Specification

Equation Specification:
Dependent variable followed by list of regressors including ARMA and PDL terms, OR an explicit equation like $Y=c[1]+c[2]*X$.

Y C PC(-1) PB YD

Estimation Settings:
Method: LS - Least Squares (NLS and ARMA)
Sample: 1951 1994

OK Cancel Options

Note that EViews reports that it has adjusted the sample (see the graphic to the right). The range and sample in the workfile window show **1951 1994** but the equation output reports **Sample(adjusted): 1952 1994**. You should be aware that if you include lagged variables in a regression, the degree of sample adjustment will

EViews Student Version

File Edit Objects View Procs Quick Options Window Help

Workfile: CHICK6 - (c:\web\evIEWS files\chick6.wf1)

View Procs Objects Save Label+/- Show Fetch Store Delete Genr Samr

Range: 1951 1994 Filter: * Default Eq: Untitled

Sample: 1951 1994

Equation: UNTITLED Workfile: CHICK6

View Procs Objects Print Name Freeze Estimate Forecast Stats Resids

Dependent Variable: Y
Method: Least Squares
Date: 07/07/00 Time: 07:20
Sample(adjusted): 1952 1994
Included observations: 43 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	32.21825	1.366773	23.57249	0.0000
PC(-1)	-0.695212	0.076741	-9.059184	0.0000
PB	0.058086	0.044349	1.309751	0.1979
YD	0.252538	0.015780	16.00357	0.0000

R-squared 0.987582 Mean dependent var 43.87674
Adjusted R-squared 0.986626 S.D. dependent var 16.70169
S.E. of regression 1.931466 Akaike info criterion 4.242844

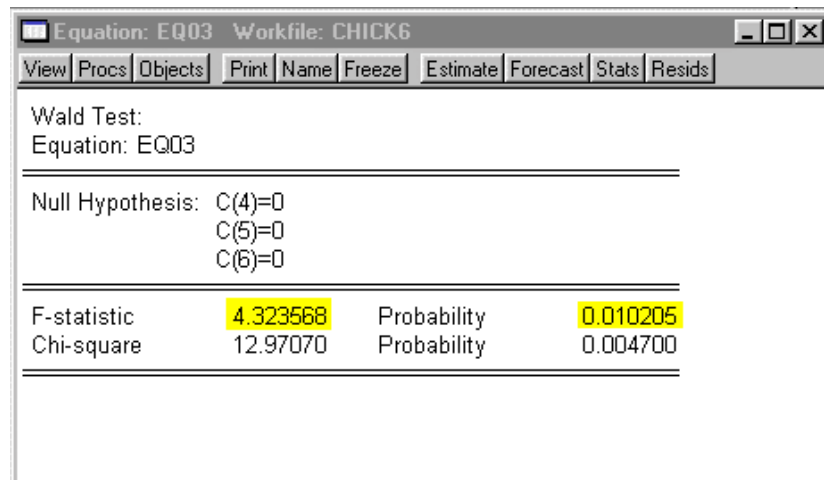
differ depending on whether data for the pre-sample period are available or not. For example, suppose the workfile range is *1950 1994* and the workfile sample is *1950 1994*. If you specify a regression with *PC* lagged one period, EViews will not adjust the sample because it can use the data for 1950 in the workfile.

² In fact, nearly any transformation of the variables using EViews functions is allowed. See **Help/Reference(Commands and Functions)/Function Reference** for a list of EViews functions.

Ramsey's Regression Specification Error Test (RESET) (UE 6.8.1):

Complete **Steps 1 - 5** of the section entitled [Adding or deleting variables to/from an OLS model in EViews](#) before attempting this section (i.e., *EQ02* should be present in the workfile). Follow these steps to carry out the Ramsey's Regression Specification Error Test (RESET) using the step-by-step approach followed in *UE*, pp. 193-195:

- Step 1.** Open the EViews workfile named *Chick6.wf1*.
- Step 2.** Open *EQ02* by double clicking its icon in the workfile window (see *UE*, Equation 6.9, p. 194).
- Step 3.** Select **Forecast** on the equation menu bar, enter *YF* in the **Forecast name:** window, and click **OK**.³
- Step 4.** Select **Objects/New Object/Equation** on the workfile menu bar, enter *Y C PC YD YF^2 YF^3 YF^4* in the **Equation Specification:** window, and click **OK** (see *UE*, Equation 6.10, p. 194).
- Step 5.** Select **Name** on the equation menu bar, enter *EQ03* in the **Name to identify object:** window, and click **OK**.
- Step 6.** Select **View/Coefficient Tests/Wald-Coefficient Restrictions** on the equation menu bar, enter *C(4)=0, C(5)=0, C(6)=0* in the **Coefficient restrictions separated by commas:** window,⁴ and click **OK** to get the graphic shown on the right.
- Step 7.** Determine the critical F-statistic from *UE*, Table B-2 or by entering the formula: `=@qfdist(0.95,3,eq03.@regobs-eq03.@ncoef)` in the command window, pressing **Enter**, and reading the value on the status line in the lower left of the screen.



Equation: EQ03 Workfile: CHICK6			
View Procs Objects Print Name Freeze Estimate Forecast Stats Resids			
Wald Test: Equation: EQ03			
Null Hypothesis: C(4)=0 C(5)=0 C(6)=0			
F-statistic	4.323568	Probability	0.010205
Chi-square	12.97070	Probability	0.004700

- Step 8.** The F-statistic, highlighted in yellow, is the same as reported in *UE*, p. 195.⁵ Since the calculated F-statistic of 4.32 exceeds the critical F-statistic of 2.85, the null hypothesis that the coefficients on the added variables are jointly zero can be rejected at the 5% level. This is in spite of the fact that none of their coefficients are individually significant.

³ This creates a new series with forecast values of Y based on the estimated coefficients for *EQ02*.

⁴ Note that the coefficient restrictions are written as C(i), where i represents the coefficient order number of the variable as it was entered in the **Equation Specification:** window, following the dependent variable. Thus, *C(4), C(5)* and *C(6)* represent the coefficients for *YF^2 YF^3 YF^4* in the **Equation Specification:** *Y C PC YD YF^2 YF^3 YF^4*.

⁵ The Chi-square statistic is equal to the F-statistic times the number of restrictions under test. In this example, there are three restrictions, so the Chi-square test statistic is three times the size of the F-statistic, but the p-values of both statistics indicate that we can decisively reject the null hypothesis that the three coefficients are zero.

Ramsey's Regression Specification Error Test (RESET) (EViews):

Complete **Steps 1 - 5** of the section entitled [Adding or deleting variables to/from an OLS model in EViews](#) before attempting this section (i.e., *EQ02* should be present in the workfile). Follow these steps to carry out the Ramsey's Regression Specification Error Test (RESET) using EViews, built in **Ramsey's RESET Test**:

- Step 1.** Open the EViews workfile named *Chick6.wf1*.
Step 2. Open *EQ02* by double clicking its icon in the workfile window (see *UE*, Equation 6.9, p. 194).
Step 3. Select **View/Stability Tests/Ramsey RESET Test...**, enter 3 in the **Number of fitted terms**⁶ window⁶, and click **OK** to get the table below.

Note that the output is very similar to the output achieved with the step-by-step approach in the previous section. In this case, the test results are printed above the regression output table.

Since the calculated F-statistic of **4.32** exceeds the critical F-statistic of 2.85, the null hypothesis that the coefficients on the added variables are jointly zero can be rejected at the 5% level. This is in spite of the fact that all of their individual **t-statistics are insignificant**.

Ramsey RESET Test:				
F-statistic	4.323568	Probability		0.010205
Log likelihood ratio	12.92125	Probability		0.004810
Test Equation:				
Dependent Variable: Y				
Method: Least Squares				
Date: 07/27/00 Time: 07:26				
Sample: 1951 1994				
Included observations: 44				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	23.80305	55.36771	0.429908	0.6697
PC	-0.591937	1.718030	-0.344544	0.7323
YD	0.360179	0.714812	0.503880	0.6173
FITTED^2	0.023868	0.082475	0.289394	0.7739
FITTED^3	-0.000748	0.001106	-0.676301	0.5029
FITTED^4	5.48E-06	5.36E-06	1.022646	0.3129
R-squared	0.988647	Mean dependent var		43.37500
Adjusted R-squared	0.987154	S.D. dependent var		16.83854
S.E. of regression	1.908510	Akaike info criterion		4.256646
Sum squared resid	138.4116	Schwarz criterion		4.499945
Log likelihood	-87.64622	F-statistic		661.8504
Durbin-Watson stat	0.861509	Prob(F-statistic)		0.000000

⁶ The fitted terms are the powers of the fitted values from the original regression, starting with the square or second power. For example, if you specify 3, then the test will add \hat{y}^2 , \hat{y}^3 , and \hat{y}^4 in the regression. If you specify a large number of fitted terms, EViews may report a near singular matrix error message since the powers of the fitted values are likely to be highly collinear. The Ramsey RESET test is applicable only to an equation estimated by least squares.

Akaike's Information Criterion (AIC) and the Schwartz Criterion (SC):

Complete **Steps 1 - 5** of the section entitled [Adding or deleting variables to/from an OLS model in EViews](#) before attempting this section (i.e., *EQ01* and *EQ02* should be present in the workfile). The Akaike's Information Criterion (AIC) and Schwartz Criterion (SC) are both printed in the **Estimation Output** of EViews' OLS regressions.

Step 1. Open the EViews workfile named *Chick6.wf1*.

Step 2. Open *EQ01* by double clicking its icon in the workfile window (see *UE*, Equation 6.8, p. 160 or 196) to get the **Estimation Output** below.

Dependent Variable: Y				
Method: Least Squares				
Date: 07/26/00 Time: 09:11				
Sample: 1951 1994				
Included observations: 44				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	31.49604	1.312586	23.99541	0.0000
PC	-0.729695	0.080020	-9.118941	0.0000
PB	0.114148	0.045686	2.498536	0.0167
YD	0.233830	0.016447	14.21738	0.0000
R-squared	0.986828	Mean dependent var		43.37500
Adjusted R-squared	0.985840	S.D. dependent var		16.83854
S.E. of regression	2.003702	Akaike info criterion		4.314378
Sum squared resid	160.5929	Schwarz criterion		4.476577
Log likelihood	-90.91632	F-statistic		998.9207
Durbin-Watson stat	0.978759	Prob(F-statistic)		0.000000

Step 3. Open *EQ02* by double clicking its icon in the workfile window (see *UE*, Equation 6.9, p. 161) to get the **Estimation Output** below.

Dependent Variable: Y				
Method: Least Squares				
Date: 07/26/00 Time: 08:01				
Sample: 1951 1994				
Included observations: 44				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	32.94193	1.251191	26.32845	0.0000
PC	-0.700954	0.084099	-8.334841	0.0000
YD	0.272477	0.005936	45.90552	0.0000
R-squared	0.984772	Mean dependent var		43.37500
Adjusted R-squared	0.984030	S.D. dependent var		16.83854
S.E. of regression	2.127957	Akaike info criterion		4.413948
Sum squared resid	185.6562	Schwarz criterion		4.535597
Log likelihood	-94.10685	F-statistic		1325.737
Durbin-Watson stat	0.946570	Prob(F-statistic)		0.000000

Note that the AIC & SC information criterion reported in EViews (see numbers highlighted in **yellow**) are larger when *PB* is omitted from the OLS regression (i.e., *EQ02*). Both Akaike's and the Schwartz Criterion provide evidence that *UE*, Equation 6.8 (i.e., EViews *EQ01*) is preferable to *UE*, Equation 6.9 (i.e., EViews *EQ02*).

Exercise:

15. Open the EViews workfile named *Drugs.wfl*.
 - a.
 - i) Select **Objects/New Object/Equation** on the workfile menu bar, enter $P\ C\ GDPN\ CVN\ PP\ DPC\ IPC\ CV$ in the **Equation Specification:** window, and click **OK**. Select **Name** on the equation window menu bar, enter *EQ01* in the **Name to identify object:** window, and click **OK**.
 - ii) Select **Objects/New Object/Equation** on the workfile menu bar, enter $P\ C\ GDPN\ CVN\ PP\ DPC\ IPC\ N$ in the **Equation Specification:** window, and click **OK**. Select **Name** on the equation window menu bar, enter *EQ02* in the **Name to identify object:** window, and click **OK**.
 - b. Open *EQ01* and *EQ02* at the same time. Use information in these tables, *UE 6.8* (Appendix) and the procedures outlined in this guide to determine whether *CV* and/or *N* are irrelevant or omitted variables.
 - c.
 - d.