

## Chapter 8: Multicollinearity

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### Perfect multicollinearity (UE 8.1.1):

EViews is incapable of generating estimates of regression coefficients when the model specification contains two or more variables that are perfectly collinear. When the equation specification contains two or more perfectly collinear (or even some highly collinear) variables, EViews will put out the error message “*Near singular matrix.*”

The next two sections explain how EViews can be used to detect severe multicollinearity (UE 8.3). The data for the fish/Pope example found in UE, Table 8.1, p. 267, will be used to demonstrate the two methods discussed in UE.

### Detecting multicollinearity with simple correlation coefficients (UE 8.3.1):

High simple correlation coefficients between variables is a sign of multicollinearity. Follow these steps to compute the simple correlation coefficient between variables:

**Step 1.** Open the EViews workfile named *Fish8.wk1*.

**Step 2.** Create a group object for the variables found in UE, Equation 8.24, p. 268 (i.e.,  $F$   $PF$   $PB$   $\log(YD)$   $N$   $P$ ). An easy way to create a group object for a set of variables from a regression model is to select **Procs/Make Regressor Group** on the equation window menu bar (refer to [Chapter 3](#) to review the usual way of creating a group object).

**Step 3.** Select **View/Correlations** on the group object menu bar to reveal the simple correlation coefficients between all of the variables in the group.

**Step 4.** Select **Freeze** on the group object menu bar to create a table of the simple correlation coefficients. Select **Name** on the table object menu bar to name the table.

	<i>F</i>	<i>PF</i>	<i>PB</i>	<i>LOG(YD)</i>	<i>N</i>	<i>P</i>
<i>F</i>	1.000000	0.847590	0.818532	0.780012	0.736549	0.585630
<i>PF</i>	0.847590	1.000000	0.958096	0.915320	0.883207	0.734643
<i>PB</i>	0.818532	0.958096	1.000000	0.814890	0.781400	0.663162
<i>LOG(YD)</i>	0.780012	0.915320	0.814890	1.000000	0.945766	0.744500
<i>N</i>	0.736549	0.883207	0.781400	0.945766	1.000000	0.571129
<i>P</i>	0.585630	0.734643	0.663162	0.744500	0.571129	1.000000

To test whether a particular simple correlation coefficient between variables is significant, refer to [Performing the t-test of the simple correlation coefficient](#) (UE 5.3.3).

### Calculating Variance Inflation Factors (UE 8.3.2):

The procedure for calculating the Variance Inflation Factors (VIF's) for explanatory variables in a regression model is explained in *UE*, p. 257. Use the following steps to calculate the VIF for the *PF* explanatory variable in *UE*, Equation 8.24, p. 268:

- Step 1.** Open the EViews workfile named *Fish8.wk1*.
- Step 2.** Select **Objects/New Object/Equation** on the workfile menu bar, enter *PF C PB log(YD) N P* in the **Equation Specification** window, and click **OK**. Note the  $R^2 = 0.976680$ .
- Step 3.** To save this regression, select **Name** on the equation window menu bar, enter *EQPF* in the **Name to identify object** window, and click **OK**.
- Step 4.** To calculate the VIF for the variable *PF*, write the equation: *scalar VIFPF=1/(1-EQPF.@R2)* in the command window, and press **Enter**. The status line in the lower left of the screen will display the phrase "*VIFPF successfully created.*" A new variable named *VIFPF* will appear in the workfile window.
- Step 5.** Double click on the *VIFPF* icon and the value for the Variance Inflation Factor for the variable named *VIFPF* = 42.88... will be displayed on the status line (lower left of the screen). The fact that *VIFPF* is significantly greater than 5 (i.e., the common rule of thumb value stated in *UE*, p. 258), would suggest that *PF* exhibits severe multicollinearity.
- Step 6.** Repeat **Steps 2-5** to compute the Variance Inflation Factors for the rest of the explanatory variables in *UE*, Equation 8.24, p. 268.

### Transforming multicollinear variables (UE 8.4.3):

Variable transformations can be achieved by creating a new variable or by simply writing the transformation in the **Equation Specification** window in EViews. In many ways, the latter is preferred because the equation output labels depict the transformation. Otherwise, it is easy to forget what transformations have been made. The table below lists the most common transformations used to rid a model of multicollinearity, along with the EViews specification (**EViews specification**) to make it happen.

<i>Function Name</i>	<i>Description</i>	<b>EViews specification</b>
<b>Linear combination</b>	$Y_t = \beta_0 + \beta_1(X_t + Z_t)$	<b>Y C X+Z*</b>
<b>First difference</b>	$Y_t = \beta_0 + \beta_1(X_t - X_{t-1})$	<b>Y C d(X)</b>
<b>First difference of the logarithm</b>	$Y_t = \beta_0 + \beta_1(\ln X_t - \ln X_{t-1})$	<b>Y C dlog(X)</b>
<b>One-period % change (in decimal)</b>	$Y_t = \beta_0 + \beta_1[(X_t - X_{t-1})/X_t]$	<b>Y C pch(X)</b>

\* no spaces in the X+Z variable designation.

## Exercises:

8.
  - a.
  - b. Follow the steps outlined in [Detecting multicollinearity with simple correlation coefficients](#) and [Calculating Variance Inflation Factors](#) to check for high correlations and high VIF's in the implied regression model.
13. Follow the steps outlined in [Detecting multicollinearity with simple correlation coefficients](#) and [Calculating Variance Inflation Factors](#) to check *UE*, Equation 8.25, p. 269 for high correlations and high VIF's.
16.
  - f. Run the regressions for this problem using the *Mine8.wfl* data set.
    - a) Refer to [Chapter 5](#) for help with this part.
    - b) Refer to [Detecting multicollinearity with simple correlation coefficients](#) for help with this part.
    - c) Refer to [Transforming the multicollinear variables](#) for help with this part.
    - d) Refer to [Table with EViews specification for functional forms](#) for help with this part.