Chapter 13: Dummy Dependent Variable Techniques

In this chapter:

The workfile named *women13.wf1* will be used to demonstrate the procedures explained in *UE*, Chapter 13. The data for this example are printed in *UE*, Table 13.1, p. 440. The name of the dummy variable is changed from *D*, in *UE*, Table 13.1, to *j* in the *Women13.wf1* workfile (D is a reserved name in EViews).

Estimating the linear probability model (*UE* 13.1.3):

To estimate the linear probability model printed in *UE*, Equation 13.6, follow these steps:

Step 1. Open the EViews workfile named *Women13.wf1*.

Step 2. Select **Objects/New Object/Equation** on the workfile menu bar, enter *J C M S* in the Equation Specification: window, and click **OK**.

Step 3. Select **Name** on the equation menu bar, enter *EQ01* in the Name to identify object: window, and click **OK**.

Step 4. Select **Forecast** on the equation menu bar, enter *JFOLS* in the Forecast name: window, and click **OK**.

Step 5. Enter the formula *series JFOLSP = JFOLS >= 0.5* in the command window and press **Enter**. A series named *JFOLSP* is created that predicts whether a women is expected to be in the labor force based on the linear probability model. The formula applies the decision rule: *JFOLSP* is *1* if, the probability value, $JFOLS_i \geq 0.5$ and *JFOLSP* is *0* if $JFOLS_i < 0.5$.

Step 6. Enter the formula *series OLSP = JFOLSP=J* in the command window and press **Enter** to calculate a series that equals 1 if the OLS model predicted correctly and 0 if not.

Step 7. Enter the formula *scalar R2pOLS = @sum(OLSP)/@obs(OLSP)* in the command window and press **Enter** to calculate the R^2_p value for the OLS model. Double click the ⊞ r2pols icon to reveal the percentage of correct predictions from the OLS model on the status line in the lower left of the screen (0.8 for this exercise).

Step 8. Select **Save** on the workfile menu bar to save your changes.

Estimating the Weighted Least Squares (WLS) correction for heteroskedasticity in the linear probability model (*UE 13.1.3, pp. 441-442*):

To estimate the weighted least squares model specified in *UE*, Equations 13.7 & 13.8, follow these steps:

Step 1. Open the EViews workfile named *women13.wf1*.

Step 2. Select **Objects/New Object/Equation** on the workfile menu bar, enter *J/Z C 1/Z M/Z S/Z* in the Equation Specification: window, and click **OK** to generate the same coefficients and standard errors reported in *UE*, Equation 13.8.

Step 3. Select **Name** on the equation menu bar, enter *EQ02a* in the Name to identify object: window, and click **OK**.

Step 4. To perform the same analysis using the WLS feature in EViews: select **Objects/New Object/Equation** on the workfile menu bar, enter *J Z C M S* in the Equation Specification: window, select the ⬤Options button, check Weighted LS/TSLS and type *1/Z* in the Weight: window. Click **OK** twice to generate the same coefficients and standard errors reported in *UE*, Equation 13.8. Note that the coefficient on the *Z* variable is the constant (i.e., $Z*(1/Z) = 1$) and the coefficient on the constant, *C*, is the coefficient on the variable 1/Z (i.e., $C*(1/Z)$).

Step 5. Select **Name** on the equation menu bar, enter *EQ02b* in the Name to identify object: window, and click **OK**.

Step 6. Select **Forecast** on the equation menu bar, enter *JFWLS* in the Forecast name: window, and click **OK**.

Step 7. Enter the formula *series JFWLSP = JFWLS >= 0.5* in the command window and press **Enter**. A series named *JFWLSP* is created that predicts whether a women is expected to be in the labor force based on the linear probability model. The formula applies the decision rule: *JFWLSP* is *1* if, the probability value, $JFWLS_i \geq 0.5$ and *JFWLSP* is *0* if $JFWLS_i < 0.5$.

Step 8. Enter the formula *series WLSP =JFWLSP=J* in the command window and press **Enter** to calculate a series that equals 1 if the WLS model predicted correctly and 0 if not.

Step 9. Enter the formula *scalar R2pWLS = @sum(WLSP)/@obs(WLSP)* in the command window and press **Enter** to calculate the R^2_p value for the WLS model. Double click the *R2pWLS* icon to reveal the percentage of correct predictions from the WLS model (0.83 for this exercise).

Step 10. Select **Save** on the workfile menu bar to save your changes.

Estimating the binomial logit model (*UE* 13.2):

To estimate the binomial logit model printed in *UE*, Equation 13.15, follow these steps:

Step 1. Open the EViews workfile named *women13.wf1*.

Step 2. Select **Objects/New Object/Equation** on the workfile menu bar.

Step 3. From the Estimation Settings:, Method: window, select the *BINARY - Binary choice (logit, probit, extreme value…)* estimation method. The window will change to reflect your choice.

Step 4. There are two parts to the binary model specification. First, in the Equation Specification: field, you should type the name of the Binary dependent variable followed by a list of regressors (i.e., enter *J C M S* in the Equation Specification: window for this example). Second, check *logit* as the Binary estimation method: (this is the default setting in EViews). Click **OK** to run the logit regression.

Step 5. Select **Name** on the equation menu bar, enter *EQ03* in the Name to identify object: window, and click **OK**.

Step 6. Select **Forecast** on the equation menu bar, enter *JFLOG* in the Forecast name: window, and click **OK**.

Step 7. Enter the formula *series JFLOGP = JFLOG >= 0.5* in the command window and press **Enter**. A series named *JFLOGP* is created that predicts whether a women is expected to be in the labor force based on the linear probability model. The formula applies the decision rule: *JFLOGP is 1* if, the probability value, $JFLOG_i \geq 0.5$ and *JFLOGP is 0* if $JFLOG_i < 0.5$.

Step 8. Enter the formula *series LOGP = JFLOGP=J* in the command window and press **Enter** to calculate a series that equals 1 if the LOG model predicted correctly and 0 if not.

Step 9. Enter the formula *scalar R2pLOG = @sum(LOGP)/@obs(LOGP)* in the command window and press **Enter** to calculate the R^2_p value for the LOG model. Double click the *R2pLOG* icon to reveal the percentage of correct predictions from the LOG model (0.8 for this exercise).

Step 10. Select **Save** on the workfile menu bar to save your changes.

The linear probability model results and the binomial logit model results can be compared by opening both regression equation results in the work area (i.e., double click the *EQ01* and *EQ03* equation icons in the workfile window.

Estimating the binomial probit model (*UE* 13.3.1):

To estimate the binomial probit model printed in *UE*, Equation 13.19, follow these steps:

Step 1. Open the EViews workfile named *women13.wf1*.

Step 2. Select **Objects/New Object/Equation** on the workfile menu bar.

Step 3. From the Equation Specification: window, select the *BINARY - Binary choice (logit, probit, extreme value…)* estimation method. The window will change to reflect your choice.

Step 4. There are two parts to the binary model specification. First, in the Equation Specification: field, you should type the name of the Binary dependent variable followed by a list of regressors (i.e., enter *J C M S* in the Equation Specification: window for this example). Second, check *probit* as the Binary estimation method: (*logit* is the default setting in EViews). Click **OK** to run the probit regression.

Step 5. Select **Name** on the equation menu bar, enter*EQ04* in the Name to identify object: window, and click **OK**.

Step 6. Select **Forecast** on the equation menu bar, enter *JFPRO* in the Forecast name: window, and click **OK**.

Step 7. Enter the formula *series JFPROP = JFPRO >= 0.5* in the command window and press **Enter**. A series named *JFPROP* is created that predicts whether a women is expected to be in the labor force based on the linear probability model. The formula applies the decision rule: *JFPROP is 1* if, the probability value, $JFPRO_i \geq 0.5$ and *JFPROP is 0* if $JFPRO_i < 0.5$.

Step 8. Enter the formula *series PROP = JFPROP=J* to calculate a series that equals 1 if the PRO model predicted correctly and 0 if not.

Step 9. Enter the formula *scalar R2pPRO = @sum(PROP)/@obs(PROP)* to calculate the R^2_p value for the PRO model. Double click the *R2pPRO* icon to reveal the percentage of correct predictions from the PRO model (0.8 for this exercise).

Step 10. Select **Save** on the workfile menu bar to save your changes.

Interpreting the results of binary dependent variable regression:

The estimated coefficient on each independent variable is easy to interpret in an OLS model, but difficult to interpret in a model estimated using the probit or logit technique. However, the relative size of each coefficient reflects the relative effect of the independent variables on the predicted probability for the dependent variable. Interpretation of the coefficient values is complicated by the fact that estimated coefficients from a binary dependent model cannot be interpreted as the marginal effect on the dependent variable.

Estimating the multinomial logit model (*UE* 13.3.2):

The multinomial logit process will not be discussed in detail here because the EViews 3.1 Student Version does not have the capability of estimating such programs.

Exercises:

8.
   a.
   b. EViews gives you the error message
       Near singular matrix when the logit is
       used to estimate the model with the
       Equation Specification: *J C M S AD* (see
       graphic on the right.

9. Follow the procedures outlined in:
   a. Estimating the linear probability model.
   b. Estimating the binomial logit model.
   c. Estimating the binomial probit model.

12. Open the EViews workfile named *Mort13.wf1*.
   a.
   b. See Estimating the linear probability model.
   c. See Estimating the linear probability model.
   d.
   e. See Estimating the linear probability model and Estimating the binomial logit model.