Microeconometrics Using Stata

Nonlinear optimization methods

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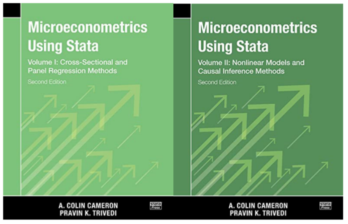

Outline

Exercise 1

Exercise 1

Consider estimation of the logit model covered in **section 10.5** and **chapter 17**. Then $Q(\beta) = \sum_i \{y_i \ln \Lambda_i + (1 - y_i)\Lambda_i\}$, where $\Lambda_i = \Lambda(\mathbf{x}_i'\beta) = exp(\mathbf{x}_i'\beta)/\{1 + \mathbf{x}_i'\beta\}$. Show that $g(\beta) = \sum_i (y_i - \Lambda_i)\mathbf{x}_i$ and $H(\beta) = \sum_i -\Lambda_i (1 - \Lambda_i)\mathbf{x}_i\mathbf{x}_i'$. Hint: $\partial\Lambda(z)/\partial z = \Lambda(z)\{1 - \Lambda(z)\}$. Use the data on **docvis** to generate the binary variable **d_dv** for whether there are any doctor visits. Using just 2002 data, as in this chapter, use **logit** to perform logistic regression of the binary variable **d_dv** on **private**, **chronic**, **female**, **income**, and an intercept. Obtain robust estimates of the standard errors. You should find that the coefficient of **private**, for example, equals 1.27266 , with a robust standard error of 0.0896928.

Exercise 2

Exercise 2

Adapt the code of **section 16.2.3** to fit the logit model of exercise 1 using **NR** iterations coded in Mata. **Hint:** In defining an $n \times 1$ column vector with entries Λ_i , you may find it helpful to use the fact that $J(n, 1, 1)$ creates an $n \times 1$ vector of 1s.

Exercise 3

Exercise 3

Adapt the code of **section 16.5.3** to fit the logit model of **exercise 1** using the **ml** command method **lf**.

Exercise 4

Exercise 4

Generate $100,000$ observations from the following logit model **DGP**, $y_i = 1$ if $\beta_1 + \beta_2 x_i > 0$ and $y_i = 0$ otherwise; $(\beta_1, \beta_2) = (0, 1)$; $x_i \sim N(0, 1)$ where u_i is logistically distributed. Using the inverse transformation method, you can compute a draw u from the logistic distribution as $u = -\ln\{(1-r)/r\}$, where r is a draw from the uniform distribution. Use data from this **DGP** to check the consistency of your estimation method in **exercise 3** or, more simply, of the **logit** command.

Exercise 5

Exercise 5

Consider the **NLS** example in **section 16.5.5** with an exponential conditional mean. Fit the model using the **ml** command and the **lfnls** program. Also, fit the model using the **nl** command, given in **section 13.3.6**. Verify that these two methods give the same parameter estimates but, as noted in the text, the robust standard errors differ.

Exercise 6

Exercise 6

Exercise 6

Continue the preceding exercise. Fit the model using the **ml** command and the **lfnls** program with default standard errors. These implicitly assume that the **NLS** model error has a variance of $\sigma^2 = 1$. Obtain an estimate of

$$s^2 = \left(\frac{1}{N-K}\right)\sum_i \left\{y_i - \exp\left(\mathbf{x}_i'\hat{\beta}\right)\right\}^2 \tag{1}$$

, using the **predictnl** postestimation command to obtain $\exp\left(\mathbf{x}_i'\hat{\beta}\right)$. Then, obtain an estimate of the **VCE** by multiplying the stored result **e(V)** by s^2. Obtain the standard error of $\hat{\beta}_{private}$, and compare this with the standard error obtained when the **NLS** model is fit using the **nl** command with a default estimate of the **VCE**.

Exercise 7

Exercise 7

Consider a Poisson regression of **docvis** on the regressors **private**, **chronic**, **female**, and **income** and the programs given in section 16.7. Run the **ml model d0 d0pois** command, and confirm that you get the same output as produced by the code in section 16.7.3. Confirm that the nonrobust standard errors are the same as those obtained using **poisson** with default standard errors. Run **ml model d1 d1pois**, and confirm that you get the same output as produced by the code in section 16.7.3. Run **ml model d2 d2pois**, and confirm that you get the same output as that given in section 16.7.3.

Exercise 8

Exercise 8

Exercise 8

Adapt the code of **section 16.7.3** to fit the logit model of exercise 1 by using **ml** command method **d0**.

Exercise 9

Exercise 9

Adapt the code of **section 16.7.2** to fit the logit model of exercise 1 by using **ml** command method **lf1** with robust standard errors reported.

Exercise 10

Exercise 10

Adapt the code of **section 16.7.3** to fit the logit model of exercise 1 by using **ml** command method **d2**.

Exercise 11

Exercise 11

Consider the negative binomial example given in **section 16.5.4**. Fit this same model by using the **ml** command method **d0**. Hint: See the Weibull example in [R] **ml**.

References I

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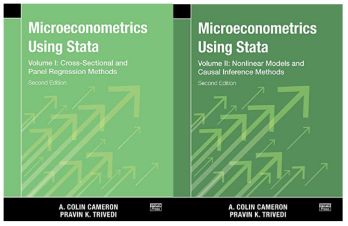

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