Erasmus School of Economics

MOOC Econometrics

Test Exercise 5

Notes:

- See website for how to submit your answers and how feedback is organized

Goals and skills being used:

- Get experience with the interpretation of parameters of the logit model
- Get experience with the interpretation of the effect of dummy variables

Questions

Consider again the application in lecture 5.5, where we have analyzed response to a direct mailing using the following logit specification

$$\Pr[\text{resp}_i = 1] = \frac{\exp(\beta_0 + \beta_1 \text{male}_i + \beta_2 \text{active}_i + \beta_3 \text{age}_i + \beta_4 (\text{age}_i/10)^2)}{1 + \exp(\beta_0 + \beta_1 \text{male}_i + \beta_2 \text{active}_i + \beta_3 \text{age}_i + \beta_4 (\text{age}_i/10)^2)}$$

for $i = 1, \ldots, 925$. The maximum likelihood estimates of the parameters are given by

Variable	Coefficient	Std. Error	t-value	p-value
Intercept	-2.488	0.890	-2.796	0.005
Male	0.954	0.158	6.029	0.000
Active	0.914	0.185	4.945	0.000
Age	0.070	0.036	1.964	0.050
$(\text{Age}/10)^2$	-0.069	0.034	-2.015	0.044

(a) The marginal effect of activity status is defined as

$$\frac{\partial \Pr[\text{resp}_i = 1]}{\partial \text{active}_i} = \Pr[\text{resp}_i = 1] \Pr[\text{resp}_i = 0] \beta_2.$$

We could use this result to construct an activity status elasticity

$$\frac{\partial \Pr[\text{resp}_i = 1]}{\partial \text{active}_i} \frac{\text{active}_i}{\Pr[\text{resp}_i = 1]} = \Pr[\text{resp}_i = 0] \text{active}_i \beta_2.$$

Use this results to compute the elasticity effect of active status for a 50 years old active male customer. Do the same for an 50 years old inactive male customer.

(b) The activity status variable is only a dummy variable and hence it can take only two values. It is therefore better to define the elasticity as

$$\frac{\Pr[\text{resp}_i = 1 | \text{active}_i = 1] - \Pr[\text{resp}_i = 1 | \text{active}_i = 0]}{\Pr[\text{resp}_i = 1 | \text{active}_i = 0]}.$$

Show that you can simplify the expression for the elasticity as

$$(\exp(\beta_2) - 1) \Pr[\text{resp}_i = 0 | \text{active}_i = 1].$$

(c) Use the formula in (b) to compute the activity elasticity of 50 years old male active customer.

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