MOOC Econometrics

Training Exercise 5.5

Notes:

- This exercise uses the datafile `TrainExer5-5 tool.xls` and requires a computer.

- The dataset `TrainExer5-5 tool.xls` is available on the website.

- You can solve the question using MS Excel (install add-in solver) or Libre Office Calc (install libreoffice-nlpsolver) or any other statisical/econometric software package which allows you to estimate the parameters of a binary logit model.

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
Log-likelihood	-601.862			

(a) Use the solver in Excel to replicate the estimation of the parameters of the logit model using maximum likelihood. The log-likelihood is given in cell L30 and the parameters are given in cells D3:H3. Use the GRG nonlinear solver (in Libre Office Excel the DEPS evolutionary algorithm). You can of course also use another software package which allows you to estimate the parameters of a logit model using maximum likelihood.

(b) The researcher assumes that a value of 1 corresponds with positive response. What happens if we impose that that positive response is zero and negative response equals 1. The new response variable can be obtained from the old response variable by the following transformation $\text{resp}_i^{\text{new}} = -\text{resp}_i + 1$. (All zero observations become one and all one observations become zero).

Estimate the parameters of the same logit specification but use now the new response variable $\text{resp}_i^{\text{new}}$ as dependent variable. Compare the parameter estimates with the original logit model and comment.

(c) Test the null hypothesis $H_0: \beta_1 = \beta_2 = 0$ versus H_1: no restrictions on β_1 and β_2, using a likelihood ratio test.