MOOC Econometrics

Test Exercise 5

**Notes:**

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

**Goals and skills being used:**

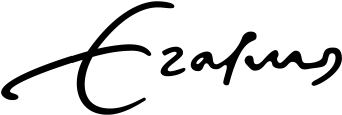
* Get experience with the interpretation of parameters of the logit model
* Get experience with the interpretation of the effect of dummy variables

**Questions**

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

exp(*β*0 + *β*1male*i* + *β*2active*i* + *β*3age*i* + *β*4(age*i*/10)2)

Pr[resp*i* = 1] = 1 + exp(*β*0 + *β*1male*i* + *β*2active*i* + *β*3agei  + *β*4(age*i*/10)2)

for *i* = 1, *...*,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 |
| (Age/10)2 | -0.069 | 0.034 | -2.015 | 0.044 |

1. The marginal effect of activity status is defined as

*∂* Pr[resp*i* = 1]

= Pr[resp*i* = 1]Pr[resp*i* = 0]*β*2.

*∂*active*i*

We could use this result to construct an activity status elasticity

*∂* Pr[resp*i* = 1] active*i*

= Pr[resp*i* = 0]active*iβ*2.   
*∂*active*i* Pr[resp*i* = 1]

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.

1. 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

Pr[resp*i* = 1|active*i* = 1] − Pr[resp*i* = 1|active*i* = 0]

.

Pr[resp*i* = 1|active*i* = 0]

Show that you can simplify the expression for the elasticity as

(exp(*β*2) − 1) Pr[resp*i* = 0|active*i* = 1].

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

Answers.  
  
(a) The elasticity of active status for a 50 years old active male customer:  
  
   
   
 Pr[resp*i* = 1] =   
  
 Pr[resp*i* = 0]active*iβ*2= (1 - Pr[resp*i* = 1])\*activei\* *β*2 = (1 - )\*1\*0.914 = 0.219  
  
The elasticity of active status for a 50 years old inactive male customer is 0 since activei = 0.

(b) The elasticity is

where   
  
 Since   
  
   
 Thus, the elasticity is:  
   
  
(c) From the formula in (b), the activity elasticity of 50 years old male active customer:  
  
   
   
   
  
  
===== Python code =====  
  
**import** math  
**import** numpy **as** np  
  
*#(a)*V = -2.488 + 0.954\*1+0.914\*1+0.070\*50-0.069\*(50/10)\*\*2  
P1 = math.exp(V)/(1+math.exp(V))  
q1 = (1-P1)\*1\*0.914  
  
print(V, P1, q1)  
  
*# (c)*q3 = (math.exp(0.914)-1)/(1+math.exp(V))  
  
print(q3)