

Model specification of a Mixed MNL model with variout levels of heterogeneity on red tide

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Model specification

Given the red tide dataset, we specify the utility of alternative j for individual n in choice situation t in willingness to pay space as:

$$V_{n,j,t} = \delta_j + \beta_{cov,n,t} * COV_{n,j,t} + \beta_{acc1,n,t} * acc1_{n,j,t} + \beta_{acc2,n,t} * acc2_{n,j,t} + \beta_{bid,n,t} * bid_{n,j,t} \quad (1)$$

where $COV_{n,j,t}$, $acc1_{n,j,t}$, $acc2_{n,j,t}$ and $bid_{n,j,t}$ refer to coverage (6/12 miles), accuracy for the first 12 hours (50, 75 and 100), accuracy for the second 12 hours (50, 75 and 100) and bid values, respectively, for alternative j in choice situation t for individual n . In our application, we have three alternatives: option A, option B and status quo, which corresponds to three choices in the survey.

For all these variables, we begin with a lognormal distribution at the inter-individual level and add additional heterogeneity across choices for the same individual. Therefore, we add the intra-individual¹ and inter-individual heterogeneity².

$$\beta_{cov,n,t} = \exp(\mu_{\log(\beta_{cov})} + \sigma_{\log(\beta_{cov}),inter} * \xi_{cov,n} + \sigma_{\log(\beta_{cov}),intra} * \xi_{cov,nt}) \quad (2)$$

$$\beta_{acc1,n,t} = \exp(\mu_{\log(\beta_{acc1})} + \sigma_{\log(\beta_{acc1}),inter} * \xi_{acc1,n} + \sigma_{\log(\beta_{acc1}),intra} * \xi_{acc1,nt}) \quad (3)$$

¹Heterogeneity across choices for the same individual

²Heterogeneity across individuals

$$\begin{aligned}\beta_{acc2,n,t} = & \exp(\mu_{\log(\beta_{acc2})} + \sigma_{\log(\beta_{acc2}),inter} * \xi_{acc2,n} \\ & + \sigma_{\log(\beta_{acc2}),intra} * \xi_{acc2,nt})\end{aligned}\tag{4}$$

$$\begin{aligned}\beta_{bid,n,t} = & \exp(\mu_{\log(\beta_{bid})} + \sigma_{\log(\beta_{bid}),inter} * \xi_{bid,n} \\ & + \sigma_{\log(\beta_{bid}),intra} * \xi_{bid,nt})\end{aligned}\tag{5}$$

When adding more variables, such as income, watercolor and respiratory for each individual, we can observe heterogeneity across individuals of these variables. For each individual, there are four choice situations based on the combinations of coverage, accuracy for the first and second 12 hours. In total, we have $502 * 4 = 2008$ observations.

References