Theoretical foundations – 2.4 Random utility theory

Michel Bierlaire

Consider the general choice model

$$P_n(i|\mathcal{C}_n) = \int_{\varepsilon=-\infty}^{+\infty} \frac{\partial F_{\varepsilon_{1n},\varepsilon_{2n},\dots,\varepsilon_{Jn}}}{\partial \varepsilon_i}(\dots, V_{in}-V_{(i-1)n}+\varepsilon, \varepsilon, V_{in}-V_{(i+1)n}+\varepsilon, \dots)d\varepsilon.$$

Derive it for alternative i in the binary case with $\mathcal{C}_n = \{i, j\}$ and the CDF of the error terms is given by

$$F_\varepsilon(\varepsilon_i, \varepsilon_j) = e^{-e^{-\varepsilon_i}}e^{-e^{-\varepsilon_j}}. \tag{1}$$

Hint

The change of variable $t = -e^{-\varepsilon}$ conveniently simplifies the integral.