

## Choice with multiple alternatives – 5.2

### Specification of the deterministic part

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*Practice quiz: parameters*

Consider a mode choice model with three alternatives: (i) bicycle, (ii) walk and (iii) metro. The specification includes alternative specific constants (ASCs) and a coefficient associated with the effect of travel time ( $\beta_{\text{time}}$ ):

$$\begin{aligned}V_{\text{bicycle},n} &= \text{ASC}_{\text{bicycle}} + \beta_{\text{time}} \cdot \text{travel time}_{\text{bicycle},n}, \\V_{\text{walk},n} &= \text{ASC}_{\text{walk}} + \beta_{\text{time}} \cdot \text{travel time}_{\text{walk},n}, \\V_{\text{metro},n} &= \text{ASC}_{\text{metro}} + \beta_{\text{time}} \cdot \text{travel time}_{\text{metro},n}.\end{aligned}$$

The travel time attribute in the dataset is expressed in minutes. The alternative specific constant of the bicycle alternative has been normalized to zero, and the value of the other parameters estimated from data. The estimates are:

- $\text{ASC}_{\text{walk}}$ : -0.01,
- $\text{ASC}_{\text{metro}}$ : 0.2,
- $\beta_{\text{time}}$ : -0.05.

1. Consider now the same model where the alternative specific constant of the walk alternative has been normalized to zero. What are the estimates of the parameters?

- $\text{ASC}_{\text{bicycle}}$ :
- $\text{ASC}_{\text{walk}}$ :
- $\text{ASC}_{\text{metro}}$ :
- $\beta_{\text{time}}$ :

2. Consider again the first model, where the alternative specific constant of the bicycle alternative has been normalized to zero. Consider also a data set where the travel time attribute is expressed in hours. What are the estimates of the parameters?

- $ASC_{\text{bicycle}}$ :
- $ASC_{\text{walk}}$ :
- $ASC_{\text{metro}}$ :
- $\beta_{\text{time}}$ :

3. The data set includes a variable  $\text{man}_n$  that indicates the gender of each individual in the sample. It is equal to 1 if the individual is a man, 0 otherwise. It is included in the model as follows.

$$\begin{aligned} V_{\text{bicycle},n} &= ASC_{\text{bicycle}} + \beta_{\text{time}} \cdot \text{travel time}_{\text{bicycle},n} + \beta_{\text{man,bicycle}} \cdot \text{man}_n, \\ V_{\text{walk},n} &= ASC_{\text{walk}} + \beta_{\text{time}} \cdot \text{travel time}_{\text{walk},n} + \beta_{\text{man,walk}} \cdot \text{man}_n, \\ V_{\text{metro},n} &= ASC_{\text{metro}} + \beta_{\text{time}} \cdot \text{travel time}_{\text{metro},n} + \beta_{\text{man,metro}} \cdot \text{man}_n. \end{aligned}$$

This specification is invalid. Explain why.