

CHOICE MODELING IN R

CLASS 3

Wiktor Budziński

CHOICE MODELING

ELASTICITIES

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For now, we have only looked at WTP/WTB as a quantitative output from the choice model

Another popular metric are elasticities

- If given attribute increases by 1%, by how many % will choice probability change?
- We usually look at average

Informs about changes in market shares

- For the mode-choice example, it can tell how much will the use of public transport increase if the ticket price drops by 1%

EXERCISE

Calculate WTA and elasticities for the airline example

CMiR_3.R file

Pick Your Preferred Flight

Three flight options are described for your trip from Chicago to San Diego. These are options that might be available on this route or might be new options actively being considered for this route as well as replacing some options that are offered now. The options differ from each other in one or more of the features described on the left.

Please evaluate these options, assuming that everything about the options is the same except these particular features. Indicate your choices at the bottom of the appropriate column and press the Continue button.

FEATURES	Non-Stop (Option 1)	1 Stop (Option 2)	1 Stop (Option 3)
Departure time (local)	6:00 PM	4:30 PM	6:00 PM
Arrival time (local)	8:14 PM	8:44 PM	9:44 PM
Total time in air	4 hr 14 min	4 hr 44 min	4 hr 44 min
Total trip time	4 hr 14 min	6 hr 14 min	5 hr 44 min
Legroom ☐	typical legroom	2-in more of legroom	4-in more of legroom
Airline [Airplane]	Depart Chicago Continental Airlines [B737] to San Diego	Depart Chicago Southwest Airlines [A320], connecting with Southwest Airlines [MD80] to San Diego	Depart Chicago Northwest Airlines [MD80], connecting with American Airlines [DC9] to San Diego
Fare	\$565	\$485	\$620

1. Which is MOST attractive? ☐ Option 1 ☐ Option 2 ☐ Option 3

2. Which is LEAST attractive? ☐ Option 1 ☐ Option 2 ☐ Option 3

3. If these were the ONLY three options available, I would NOT make this trip by air. ☐ Yes ☐ No

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Option 3

Let's go to



CHOICE MODELING

NESTED LOGIT

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The nested multinomial logit is an extension of the basic model that allows us to introduce some dependence in the error term structure

We group the alternatives into several “*nests*”

- IIA still holds within a given nest, but does not have to between the nests
- For example, public transport vs. private car

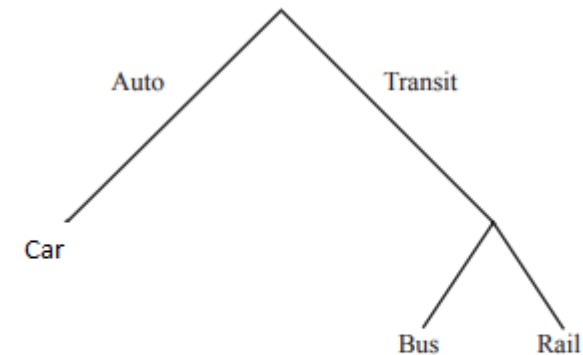


Figure 4.1: Tree diagram for mode choice.

NESTED LOGIT

You can think about it as a two step process

- More steps needed for larger “tree structure”

First consumer chooses k'th nest $P(y_i \in N_k) = \frac{\exp(\lambda_k I_k)}{\sum_{m=1}^K \exp(\lambda_m I_m)}$

It is a multinomial logit function with inclusive value of a given nest as independent variable

- Expected utility from the given nest

$$I_k = \log \left(\sum_{l=1}^{J_k} \exp \left(\frac{\mathbf{X}_{il} \boldsymbol{\beta} + \mathbf{Z}_i \boldsymbol{\gamma}_l}{\lambda_k} \right) \right)$$

NESTED LOGIT

In the 2nd step respondent chooses alternative j from this nest

$$P(y_i = j | N_k) = \frac{\exp\left(\frac{\mathbf{X}_{ij}\boldsymbol{\beta} + \mathbf{Z}_i\boldsymbol{\gamma}_j}{\lambda_k}\right)}{\sum_{l=1}^{J_k} \exp\left(\frac{\mathbf{X}_{il}\boldsymbol{\beta} + \mathbf{Z}_i\boldsymbol{\gamma}_l}{\lambda_k}\right)}$$

Probability of choosing the alternative is given as a product of these two probabilities

- Lambdas are coefficients that need to be estimated, which should be smaller than 1
- Nested logit can be also formulated as error terms following a generalized extreme value distribution

EXERCISE

Estimate the Nested logit
for the airline dataset

Does it change WTA
estimates?

What about elasticities?

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