1.201J / 11.545J / ESD.210J Transportation Systems

FALL 2006

ASSIGNMENT 4: Transportation Demand and Costs

Date assigned: October 17, 2006

Date due: **November 2, 2006**

Value: **9 points**

To be done in teams of 2. You cannot partner with the same person as in Assignment 3.

Both members on the team should work collaboratively on all parts of the assignment. Dividing the work and working separately on different questions or different parts of questions is not appropriate. Both team members will be responsible for the final answers.

Consider the following inter-city travel situation: MIT students are traveling from Boston to downtown Washington DC for the Annual TRB meeting which is from January 21-25, 2007.

1. Identify the travel options available to such a traveler and for each option determine/estimate the cost, time and other relevant attributes which might affect the travel choices. Remember that for most intercity trips there is an urban trip at both ends to complete the origin to destination travel.

2. Select the option which would be best for you and explain your choice. Think carefully about how you made your decision.

3. Deduce what you can about the relative importance of different trip attributes and the specific choices to you. Consider both the intercity leg and the urban legs of your trip.

4. Develop a nested logit model structure describing the choices available and explain why you have selected this structure. Discuss explicitly the violations of the i.i.d. assumption of the error term in the standard multinomial logit model which your proposed structure attempts to deal with.

5. Deduce what you can about the relative importance of different trip attributes to different types of travelers from Boston to Washington DC. Typical travelers would include business travelers, leisure travelers both single and in groups.

6. Estimate the number of people per day (averaged over a year) taking each of the intercity modes from the Boston metropolitan area to the Washington DC metropolitan area. Explain and defend your assumptions and analysis. Hint: an upper bound is the capacity provided by the market but this will depend on route and network structure and other origin-destinations served by a route.

7. An early Northeast Corridor study estimated to following mode share model for the major intercity modes in the Northeast Corridor:

$$S_j = \frac{a_{oj} t_j^{a_1} c_j^{a_2} f'_j{}^{a_3}}{\sum_{i=1}^{m} a_{oi} t_i^{a_1} c_i^{a_2} f'_i{}^{a_3}} \qquad \text{for all modes j from 1 to m}$$

Where

$$f' = 1 - e^{-kf}$$

t_j = door to door travel time (hours) for mode j

c_j = door to door price (\$) for mode j

f_j = daily one way vehicle trips supplied by mode i

Parameters

business	mode	a_0	a_1	a_2	a_3	k
	air	1.1232	-3.384	-0.483	2.279	0.12
	rail	1.4813	-3.384	-0.483	2.279	0.12
	bus	0.3767	-3.384	-0.483	1.0	1.0
	automobile	1.0	-3.384	-0.483	1.0	1.0

non-business	mode	a_0	a_1	a_2	a_3	K
	air	0.7767	-1.5821	-1.5821	2.0462	0.18
	rail	1.9881	-1.5821	-1.5821	2.0462	0.18
	bus	1.3872	-1.5821	-1.5821	1.0	1.0
	automobile	1.0	-1.5821	-1.5821	1.0	1.0

a. Compare this model's forecasts for mode share with your estimates from Question 6 above and comment on the results.

b. Can you estimate the demand elasticity with respect to price for mode j from this mode share model alone? Explain your response.

c. Critically assess this mode share model.