

Homework 6: Transportation Planning

There are 3 routes from suburb to city. Each morning, 150,000 households generate trips from the suburbs to the city. Each trip chooses one of three routes. A poisson regression model for trip generation and a logit model for mode choice are available for these same 150,000 households during the morning peak hour. A previous study concluded that each of the households could be placed in one of four profile categories. Each profile category is associated with a specific set of variables for each model as listed in the “Trip Generation Poisson Regression Model” and “Mode Choice Logit Model” tables on the following pages.

Assume that a car carries one person only, a carpool accommodates 2.2 person-trips on the average, and a bus accommodates 25 person-trips on the average.

The highway performance functions (HPFs) for the three routes are:

$$t_1 = 13 + 2.154x_1$$

$$t_2 = 20 + 3.211x_2$$

$$t_3 = 15 + 1.623x_3$$

The “t” values are in minutes and the “x” values are in thousands of vehicles per hour.

Determine the total number of car and bus trips on each route for the 150,000 subject households during the morning peak hour.

A fourth route choice is being considered with the following link performance function:

$$t_4 = 15 + 3.194x_4$$

What is the expected traffic flow on this route? What impact will the introduction of this route have on total travel time (travel time required for all travelers to make their journey)?

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Trip Generation Poisson Regression Model

		Profile 1	Profile 2	Profile 3	Profile 4
Number of Households in the profile		50,000	30,000	60,000	10,000
Model Parameters					
Variable	Coefficient	Profile 1 values	Profile 2 values	Profile 3 values	Profile 4 values
Constant	-0.2	1	1	1	1
Education (undergraduate degree or higher)	0.08	0	1	1	1
Income	0.000012	55,000	40,000	75,000	62,000
Whether or not household uses car to work more than three times a week	0.065	1	0	1	1
Whether or not household uses the bus to work at least once a week	-0.12	0	0	0	1
Number of autos owned in the last ten years	0.06	1	3	4	2
Number of non-workers	-1	1	2	1.5	0
Senior household (age>60 for all members)	-1	0	1	0	0
Internet connection at home	-0.1	1	0	1	0
Number of kids	0.15	0	0	1.5	0

Mode Choice Logit Model

Variable	Coefficient	Profile 1 values	Profile 2 values	Profile 3 values	Profile 4 values
Car logit equation					
Constant	0.1	1	1	1	1
Car Accessibility/Availability (High)	0.15	0	1	1	0
Peak Hour Destination Parking in dollars per hour	-0.025	2	1	3	4
Travel Time Cost for Car (1 if High)	-0.05	0	0	1	1
Income	0.025	55	40	75	62
Master's Degree or Higher	-0.025	0	0	1	1
Kids	0.2	0	0	1.5	0
Carpool logit equation					
Constant	0.05	1	1	1	1
Carpool Accessibility/Availability (High)	0.15	0	1	0	1
Peak Hour Destination Parking Waive for Carpool	0.3	0	1	1	1
Travel Time Cost for Carpool (1 if High)	-0.1	0	0	1	0
Income	-0.01	55	40	75	62
Master's Degree or Higher	0.2	0	0	1	1
Kids	-0.1	0	0	1.5	0
Bus logit equation					
Bus Accessibility/Availability (High)	0.3	0	1	1	1
Travel Time Cost for Bus (1 if High)	-0.15	1	1	1	0

