

10601563 - TRANSPORTATION PLANNING

HW # 4

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- 12-17** Survey data suggest the trip interchange matrix shown below. Calibrate the friction factors for one iteration, assuming travel times are 2.0 minutes for interzonal trips and 1.0 minute for all intra-zonal trips. Assume the friction factor takes the form t^{-b} .

<i>Given Trips</i>			
<i>Zone</i>	<i>1</i>	<i>2</i>	<i>3</i>
1	10	40	70
2	20	50	80
3	30	60	90

- 12-18** Determine the share (proportion) of person-trips by each of two modes (private auto and mass transit) using the multinomial logit model and given the following information:

$$\text{Utility function: } U_k = A_k - 0.05 T_a - 0.04 T_w - 0.03 T_r - 0.014 C$$

<i>Parameter</i>	<i>Private Auto</i>	<i>Mass Transit</i>
T_a = access time (min.)	5	10
T_w = waiting time (min.)	0	15
T_r = riding time (min.)	25	40
C = out-of-pocket cost (cents)	150	100
Calibration constant, A_k	-0.01	-0.07

- 12-19** A mode choice logit model is to be developed based on the following information. A survey of travelers in an area with bus service found the following data:

<i>Model Parameter</i>	<i>Auto</i>	<i>Bus</i>
X_1 , waiting time (min.)	0	10
X_2 , travel time (min.)	20	35
X_3 , parking time (min.)	5	0
X_4 , out-of-pocket cost (cents)	225	100
A_k , calibration constant	-0.33	-0.27

The following utility functions were calibrated based on an observed mode split of 84.9% private auto use and 15.1% bus use.

$$\text{Utility function: } U_k = A_k - 0.10 X_1 - 0.13 X_2 - 0.12 X_3 - 0.0045 X_4$$

After implementing service improvements to the buses, the mode split changed to 81.6% private auto use and 18.4% bus use. Determine a value for the calibration constant for the bus mode that reflects this shift in mode split.

12-20 With reference to the information given in the Example on p. 30, answer the following:

A bus company is making costly efforts in an attempt to increase work-trip bus usage for the travel conditions described in Example 8.5. An exclusive bus lane is constructed that reduces bus travel time to 10 minutes.

- Determine the modal distribution of trips after the lane is constructed.
- If shared-ride vehicles are also permitted to use the facility, and travel time for bus and shared-ride modes is 10 min, determine the modal distribution.
- Given the conditions described in part (b), determine the modal distribution if the bus company offers free bus service.

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A total of 725 auto-mode social/recreational trips are made from an origin (residential area) during the peak hour. A logit model estimation is made, and three factors were found to influence the destination choice: (1) population at the destination, in thousands (coefficient = 0.17); (2) distance from origin to destination, in kilometers (coefficient = -0.14); and (3) square meters of amusement floor space (movie theaters, video game centers, etc.), in thousands (coefficient = 1.0). Four possible destinations have the following characteristics:

	Population (thousands)	Distance from origin (km)	Amusement space (thousands of m ²)
Destination 1	15.5	12	0.5
Destination 2	6.0	8	1.0
Destination 3	0.8	3	0.8
Destination 4	5.0	11	1.5

Determine the distribution of trips among possible destinations.