HW: Mode choice

Due Sep 15, 2025 by 11:30pm **Points** 100

Mode choice

The objective of this homework is to gain experience applying mode choice models, analyzing scenarios, and interpreting results. **Complete the following problems, showing your work and highlighting your answers.** Your responses should be handwritten. You may do your calculations in Excel or another software program, but be sure to show all of your steps and submit that file with your submission. (For instance, show: input data, utility equations, utilities, exponentiated utilities, probabilities.)

Problems 1–3 make use of the following information about commutes to the MIST campus. Assume that all modes are available to all commuters.

Origin	Mode	IVTT (min)	OVTT (min)	TT (min)	Stress	Cost (BDT)
DOHS	Auto	15	10	25	—	120
DOHS	Bus	20	15	35	—	30
DOHS	Bike	20	0	20	7	0
DOHS	Walk	35	0	35	—	0
Pallabi	Auto	25	10	35	—	120
Pallabi	Bus	30	20	50	—	30
Pallabi	Bike	30	0	30	8	0
Pallabi	Walk	60	0	60	—	0

The mode choice models in Problems 1–3 are multinomial logit models with the following mode-specific utility equations:

- V(auto) = (0.00) + (−0.20) × IVTT + (−0.30) × OVTT + (−0.0075) × Cost
- V(bus) = (−2.00) + (−0.15) × IVTT + (−0.30) × OVTT + (−0.0075) × Cost
- V(bike) = (−1.50) + (−0.30) × TT + (−0.80) × Stress
- V(walk) = (−1.00) + (−0.30) × TT

1. Predict the mode shares for MIST commuters coming from the Mirpur DOHS.

2. Predict the mode shares for MIST commuters coming from Pallabi.

3. In about 2 paragraphs of complete sentences, compare the mode shares you predicted for the Mirpur DOHS and Pallabi. How are they different? Which modes are more or less common among each set of commuters? What characteristics of the neighborhoods or the commutes were the primary reasons for these differences?

4. As part of MIST's transportation plan, the University is implementing several steps to encourage non- auto commuting to campus from the north.

- Parking costs for auto increase by $2.00.
- Out-of-vehicle travel times for auto increase by 2 minutes due to redevelopment of a nearby parking lot.
- In-vehicle travel times for transit decrease by 3 minutes due to a new, more-direct CVTD bus route.
- Out-of-vehicle travel times for transit decrease by 3 minutes because shorter walks to the new bus stops.
- Traffic stress ratings for bicycling decrease by 1 point from the installation of protected bike lanes towards campus.

Based on all of these changes, predict the new mode shares for MIST commuters coming from Mirpur DOHS. Discuss your results (in about 1 paragraph): Which mode shares changed, in what direction, and by how much? Why?

5. In your own words (in about 2 paragraphs), explain what the "independence from irrelevant alternatives (IIA)" property of multinomial logit models is and why it can lead to problems like the red bus / blue bus paradox. Come up with and describe a non-transportation example of a similar (nearly identical) alternative being added to a choice problem.

6. In your own words (in about 2 paragraphs), discuss what considerations (explanatory factors or independent variables) are missing from the mode choice utility equations. What things influence mode choice but are not included in the model? You are encouraged to relate your answer to your own experiences choosing how to travel.

Extra credit. Answer either Problem 1 or Problem 2, assuming a nested logit model in which walk, bike, and bus are in one nest with m = 0.50.

Upload a single PDF document, showing your work and highlighting your answers. If you did your work in Excel or another software program, submit that file as well.

Rubric:

- *Full credit* (100%): Work fully shown, correct calculations, & correct answer.

- *Mostly full but partial credit* (≥90%): Work fully shown, only minor calculation error.
- *Partial credit* (≥80%): Work fully shown, but major or several calculation error(s).
- *Even less partial credit* (<80%): Work not fully shown, even if correct answer.

Homework 6		
Criteria	**Ratings**	**Pts**
Question 1		15 pts
Question 2		15 pts
Question 3		15 pts
Question 4		30 pts
Question 5		10 pts
Question 6		10 pts
Formatting		5 pts
Extra credit (+10)		0 pts
		Total Points: 100