1.201 / 11.545 / ESD.210

Transportation Systems Analysis: Demand and Economics

Assignment 5

Problem 1

Wanna Buy the Brooklyn Bridge? Estimating Uncertainty in a Revenue Forecast

The New York City Department of Transportation is considering leasing the Brooklyn Bridge to a private toll-road operator to raise revenues and offload the responsibilities for maintaining and operating the bridge. The consultants on the project, Modeling Bridges Associated (MBA), have used their fancy micro-simulation models to make a prediction for the yearly revenue that the private operator can expect to collect. You are an infrastructure analyst at Fruman Sachs, Inc, the bank providing the financing for the deal. To know what interest rate to charge for your capital, you need to assign some level of risk to this revenue forecast. You have decided to use the method we have learned about in class (Bowman 2003); much of the preparatory work has already been done, you just need to put on the finishing touches. ***Please download*** the spreadsheet associated with this project from the class site (also shown in Table 1.1 on the next page). It shows the following information:

- The revenue forecast produced by the simulation model
- The variables we will use in our risk assessment, and the values used in MBA's final forecast
- The results of a number of runs with slightly changed values for each variable (one at a time)
- Simplified probability distributions for each variable

a) Estimate the elasticity of the revenue forecast with respect to each variable independently

b) Estimating the probability distribution function of the revenue forecast requires enumerating every possible scenario. To keep this assignment reasonable, we will limit ourselves to thinking about the best and worst case scenarios:

i) Estimate the revenue forecast for the best and worst case scenarios (i.e. one best case scenario forecast, and one worst case scenario forecast)

ii) Estimate the probability of the best and worst case scenarios (these will be very small numbers, so please answer in scientific notation)

c) We would like to understand how sensitive our risk assessment is to the inclusion of certain kinds of variables. Estimate new best and worst case scenario revenue forecasts under the following circumstances, and compare your results to the results from part (b):

i) If we ignore variability in the non-toll costs of driving (i.e. Fuel Efficiency, Gas Taxes, and Parking Costs)

ii) If we ignore variability in the travel-time variables (i.e. Travel Time Improvement and Value of Time)

Variable	Variable Name	Forecast Value	Value for Elasticity Test	Revenue Forecast
EG	Economic Growth Index	1	1.05	$107,108,502
FE	Fuel Efficiency (miles/gallon)	30	31.5	$106,844,037
GT	Gas Taxes ($/Gallon)	$0.32	$0.34	$104,569,634
PC	Avg Parking Cost ($/month)	$450	$473	$102,083,659
TS	Transit Service (Yearly Train and Bus-Miles)	470,000,000	493,500,000	$104,781,206
TL	Parallel Tolls	$5	$5	$101,554,728
TTI	Travel Time Improvement (minutes)	20	21	$110,229,194
VOT	Value of Time ($/hour)	$30	$32	$109,858,943
R	Revenue	$105,786,175		
Factor Distributions		**Value**	**P(Value)**	
EG	Economic Growth Index	0.75	0.2	
		1	0.3	
		1.25	0.5	
FE	Fuel Efficiency (miles/gallon)	30	0.33	
		40	0.33	
		50	0.33	
GT	Gas Taxes ($/Gallon)	$0.32	0.25	
		$0.50	0.5	
		$1.00	0.25	
PC	Avg Parking Cost ($/month)	$400	0.1	
		$450	0.4	
		$500	0.2	
		$550	0.2	
		$600	0.1	
TS	Transit Service (Yearly Train and Bus-Miles)	430,000,000	0.1	
		470,000,000	0.5	
		510,000,000	0.2	
TL	Parallel Tolls	$5.00	0.33	
		$6.00	0.33	
		$7.00	0.33	
TTI	Travel Time Improvement (minutes)	15	0.1	
		18	0.25	
		20	0.3	
		22	0.25	
		25	0.1	
VOT	Value of Time ($/hour)	$25.00	0.1	
		$30.00	0.8	
		$35.00	0.1	

Table 1.1: Inputs for Problem 1

Problem 2: Project Evaluation Case Study

The West Side Highway Project*

The case study used for this assignment was prepared at the Kennedy School of Government, Harvard University, Case C16-89-876.0, and is not available on MIT OpenCourseWare.

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