Chapter 13 Valuing Impacts from Observed Behavior: Direct Estimation of Demand Curves



Constant Elasticity Demand Curve

Price



Extrapolating from Observations



Econometric Estimation

 $q = \propto_0 + \propto_1 p + \propto_2 I + \propto_3 T + \epsilon$

q: explained (dependent) variables

p, I, T: explanatory (independent) variables



Presentation & Report

- 1. Select one method of Valuing Market or Non-Market Goods from Chapter 9, 13, 14, 15 and 16.
- 2. Find one paper from **"international scientific journals"** from any research fields to use your selected method.
- 3. Explain your selected paper by presentation software.

Presentation (7 mins) and discussion (5 mins) for each.

Report Submission

Deadline: 7 August 2013 (Wed), 13:00

Summarize 4 pages report and submit by email to my secretary, Ms Hattori. (hattori.n.ad@m.titech.ac.jp):

- 1) Reasons to select this paper.
- 2) Advantages and disadvantages of your selected method in the context of your selected topic. Discuss whether other methods are possible to apply for the selected topic.
- 3) Respond some questions by me if you need.
- 4) Impression (comments, requests, etc) of this course.

Chapter 14 Valuing Impacts from Observed Behavior: Indirect Market Methods

Observed Behavior = Revealed Preference ←→ Stated Preference

- 1. Market Analogy Method (Trade-off Method)
- 2. Intermediate Good Method
- 3. Asset Valuation Method
- 4. Hedonic Pricing Method
- 5. Travel Cost Method

Analogous Good



How to estimate Value of Time (VOT)? Case of Transport Project

Generalized Cost

is an amount of money representing the overall disutility (or inconvenience) of traveling between origin i and destination j by a particular mode.



Zoning Origin *i* Destination *j*

Components of Generalized Cost

Public Transport

Fare, Giving up time,

Car

Giving up time,

Toll Charge,

VOC (Vehicle Operating Costs): Fuel, Oil, Tire & Tube, Maintenance and Depreciation

Other components?

Market in Transport Service

Price = Generalized Cost

WTP is the maximum amount of money that a user would be willing to pay to make a trip. (can be interpreted as a maximum generalized cost that they are prepared to accept a trip)

Generalized Cost Function

 $GC = \alpha T + \beta L$

GC: generalized cost by day and by vehicle type [yen/ vehicle]

- α : value of time by day and by vehicle type [yen/ vehicle*minute]
- β : VOC by vehicle type [yen/ vehicle*km]
- T : average travel time by vehicle type [minute]
- L : travel distance by vehicle type [km]

How to improve society by transport projects

> Reduce Generalized Cost e.g. time saving, accidents reductions

Measurement of "Value of Time"

1) Resource value,

based on <u>Opportunity Cost</u> (**Trade-Off Method**)

- The value of what one gives up to get something
- a) Average (expected) gross wage rate (per hour)
- b) National annual income data (instead of gross wage rate)

ex. VOT = GDP / number of employment / working time

2) Behavioral value, based on Generalized Cost Function

Utility = GC = -0.147TW-0.0411TT-2.24C

(estimated by mode choice model)

VOT = 0.0411 *60mins/ 2.24

= 1.10 US/hr/person

Note: Utility for Commuting

Mode choice for commuting:

travel time, waiting time, fares, comfort....

 $U(x_1, x_2, ..., x_n) = \beta_1 x_1 + \beta_2 x_2 + ... + \beta_n x_n \qquad \beta_1, \beta_2$: parameters

The economic characteristics of transport Derived nature of the demand

- benefit to travel as short as possible
- "joy riders", "tourists" to be in the minority

Mode choice model bus or car

U = -0.147TW-0.0411TT-2.24C

TW: access time (total walking time to and from bus or car) *TT*: total time of trip

- *C*: total cost of trip
- * Daniel McFadden (1975) Urban Travel Demand, North-Holland He was awarded the Nobel Prize in Economics in 2000.

The Value of a Statistical Life - Simple Consumer Purchase Studies -



The Value of a Statistical Life

Forgone Earnings Method

The value of a life saved = Persons discount future earnings Used by the courts. However, many problems exist. e.g. It ignores individual's WTP to reduce the risk of their deaths

Simple Labor Market Studies

Two indifferent supposition for job fatality risk (1/1,000) V(life) = \$3,500. Then, V(life) = \$3.5 million Greater chance Riskier job of fatal injury offers

* People overestimate the occurrence of low-probability *bad* event: e.g. swine influenza, radiation contamination.

Intermediate Good Method

To value "education and training programs" as *human capital*. Annual Benefit = Income (with project) – Income (without project)

Asset Valuation Method

Project affect the prices of assets (e.g. land, housing, stocks, etc). The impacts are said to be *capitalized* into the market value of the assets. Observed increase (or decrease) in asset values can be used to estimate the benefits (costs or disbenefits) of projects.

Hedonic Pricing Method

Problems with Simple Valuation Methods

- 1. Omitted Variable Problem
- 2. Self-Selection Bias
- > Hedonic Pricing Method overcome these two problems.

Hedonic Pricing Method = Hedonic Regression Method



(marginal) hedonic price, implicit price, rent differential of the attribute

 $P = \beta_0 CBD^{\beta_1} SIZE^{\beta_2} VIEW^{\beta_3} NBHD^{\beta_4} e^{\varepsilon}$ $\ln(P) = \ln \beta_0 + \beta_1 \ln(CBD) + \beta_2 \ln(SIZE) + \beta_3 \ln(VIEW) + \beta_4 \ln(NBHD) + \varepsilon$



Hedonic price of scenic views: Slope

$$r_{v} = \beta_{3} \frac{P}{VIEW}$$

Decreases as the level of the scenic view increases

$$r_v = W(VIEW, Y, Z)$$

Y: household incomeZ: household characteristics

Value of Statistical Life

Nonlinear Regression Model

 $\begin{aligned} \ln(wagerate) &= \beta_0 + \beta_1 \ln(fatality \ risk) \\ &+ \beta_2 \ln(injury \ risk) \\ &+ \beta_3 \ln(job \ tenure) \\ &+ \beta_4 \ln(education) \\ &+ \beta_5 \ln(age) + \varepsilon \end{aligned}$

Travel Cost Method

To value "Recreational Sites"

Zone Travel Cost Methods

 $\ln(\frac{V}{POP}) = \beta_0 + \beta_1 \ln \overline{p} + \beta_2 \ln \overline{p}_s + \beta_3 \ln \overline{Y} + \beta_4 \ln \overline{Z} + \varepsilon$

Zone	Travel Time (hours)	Travel Distance (km)	Average Total Cost per Person (\$)	Average Number of Visits per Person	Consumer Surplus per Person	Consumer Surplus per Zone (\$ thousands)	Trips per Zone (thousands)
А	0.5	2	20	15	525	5,250	150
В	1.0	30	30	13	390	3,900	130
С	2.0	90	65	6	75	1,500	120
D	3.0	140	80	3	15	150	30
E	3.5	150	90	1	0	0	10
Total	i the f	11 1 1 1 1 1 1		And + 64 -	BOA Star	10,800	440

Different value of time for estimating average total cost:

A for \$9.40/hr, B for \$5.50/hr, C for \$10.35/hr, D and E for \$8/hr (as wage rate)

Total cost is generally composed of driving, parking, walking and loading and unloading vehicles. Zone E needs customs and immigration crossing the border.

