Economic Valuation of Ecosystem Services

"Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth the cost in wild things natural, wild, and free."

--Foreword to Sand County Almanac, Aldo Leopold

Two myths about economics:

- It's all about money
- It's all about markets
  - Why do economists like markets?

What is nonmarket valuation? What is the fundamental question that nonmarket valuation addresses in the context of ecosystem services?

- Nonmarket valuation: The valuation of goods or services that are not correctly priced in the market
- Fundamental question: What is the value of an incremental (marginal) change in the provision/consumption of an ecosystem service?
First of four asides about BCA and Nonmarket Valuation…

Q: Which commodity is more valuable, water or diamonds? (Adam Smith, "The Wealth of Nations", 1776)

Paradox:
- Useful items => low prices
- Non-essential items => high prices

1. Emphasis on incremental changes

Second of four asides about BCA and Nonmarket Valuation…

2. Benefit-Cost Analysis (and nonmarket valuation in its service) is only interesting in the context of difficult policy choices

- Solow: “First of all, it is not the case that cost-benefit analysis works, or must work, by “monetizing” everything from mother love to patriotism. Cost-benefit analysis is needed only when society must give up some of one good thing in order to get more of another good thing.”
- DeLong: “The decisions that must be made by contemporary government indeed involve painful choices”.

Third of four asides…

3. Expenditure studies are NOT measures of nonmarket value, and often lack a serious policy implication…

Fourth of four asides…

4. Is there too little/too much nonmarket valuation of ecosystem goods/services?
   ...Way too little (in my opinion)
   Ex: Ethanol
   Ex: Dane County Shoreland Zoning Ordinance
Methods of Nonmarket Valuation

- Travel Cost Method
- Hedonic Pricing Method
- Contingent Valuation Method

Contingent Valuation Method (CVM)

- CVM estimates non-market benefits of a good by simply asking respondents how they would behave if such a market existed.
  - Ex: How much would you be willing to pay to prevent a Milfoil infestation?
  - Ex: How much would you be willing to pay to conserve habitat for wolves?

Contingent Valuation Method (CVM)

- CVM originated in 1960s, but became widely used in late 1970s.
- CVM is now sanctioned for use in government decision making in the U.S. and in environmental damage claims through the courts.
- Main Critique: “Hypothetical Bias”
- Large amount of research has been devoted to survey design issues to elicit respondents’ “true” willingness to pay

Hypothetical bias in CVM studies; Case Study I: Value of a Goose Hunting Permit

- Bishop and Heberlein (1979): the value of goose hunting in the Horicon Marsh.
- Horicon Marsh: now over 200,000 Canada Geese migrate through each year, but in the 1970s populations were low, population recovered sufficiently for hunting in 1978.
- Seminal study, won an award
Hypothetical bias in CVM studies; Case Study II: Value of a Goose Hunting Permit

<table>
<thead>
<tr>
<th>Value/Permit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CV:WTP</td>
<td>$21</td>
</tr>
<tr>
<td>CV:WTA</td>
<td>$101</td>
</tr>
<tr>
<td>Actual Market</td>
<td>$63</td>
</tr>
</tbody>
</table>

CVM Case Study I: Water Quality of Lake Mendota

Description of Method and C.V. Format:
- Refined through four focus group sessions
- Mailed to 500 randomly selected households in Dane County
- Packages included letters, information sheets, a quiz, and the CV questionnaire
- Sample split between a 3 year payment horizon and a 10 year payment horizon

Analysis:
- Of the 443 delivered surveys, 193 were returned at least partially completed (response rate: 193/443 = 44%)
- In the true/false quiz, 88% of respondents made one mistake or fewer in nine questions
- 8% of responses to WTP question were $0.
- One person expressed a WTP in excess of 1% of household income.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sign of Estimate</th>
<th>Significant at 10%?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Distance</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>Income</td>
<td>+</td>
<td>*</td>
</tr>
</tbody>
</table>
CVM Case Study I: Water Quality of Lake Mendota

<table>
<thead>
<tr>
<th></th>
<th>Average WTP over 3/10 years:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dane County</td>
<td>$85 $38</td>
</tr>
<tr>
<td>AAE 343 1999</td>
<td>$78 $67</td>
</tr>
<tr>
<td>AAE 343 2000</td>
<td>$84 $81</td>
</tr>
<tr>
<td>AAE 343 2002</td>
<td>$76 $72</td>
</tr>
<tr>
<td>AAE 343 Spring 2007</td>
<td>$72</td>
</tr>
<tr>
<td>AAE 343 Fall 2007</td>
<td>$57</td>
</tr>
<tr>
<td>AAE 343 Spring 2008</td>
<td>$79</td>
</tr>
</tbody>
</table>

Zoo 955: $169

Average WTP 3 years: $85/yr
Average WTP 10 years: $38/yr

Estimated cost of watershed cleanup: $17.8 million
Estimated aggregate WTP for Dane County residents: $52.5 million

95% Confidence interval: $41 - $64 million
Program passes benefit-cost criterion if CV study accurately reflects preferences.

Hypothetical Bias in CVM

- In field experiments, CVM values are close to revealed-preference (RP) values when compared.
  - CVM/RP = 0.89.
  - Caveat: these studies are for "use values", e.g. goose permit, trip to Boundary Waters Canoe Wilderness, etc.

Contingent Valuation Method (CVM)

- The issue of hypothetical bias notwithstanding, there are several advantages of CVM:
  - Experimental design eliminates problems typical of other methods
    - Hedonic method
      - Correlations in attributes (Ex/ the value of water clarity in Green Bay)
      - Endogeneity with unobserved variables (Ex/ lakeshore development)
    - Travel cost method
    - Time cost of travel
    - Identification of the choice set
  - It is capable of measuring both use and non-use values => it is the only method for measuring non-use values
    - Option value
    - Existence value
From “The myth of market prices and efficiency”, R. Stavins
- “Economists are wary of asking people how much they value something, because respondents may not provide honest assessments of their own valuations. Instead, economists prefer to watch how people reveal their preferences, such as when they pay more for a house in a neighborhood with cleaner air, all else equal.”

My view:
- No reason to presume that RP methods are superior to CVM
- CVM works best when respondent population is familiar with the good, and when the good is dominated by “use value”, e.g. goose permit, water clarity improvements, determining economic loss of CWD, etc.