

Nonlinear Meta-Regression for Benefit Transfer



Klaus Moeltner



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EPA. No agency endorsement should be inferred.



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RESOURCE AND ENERGY ECONOMICS

Resource quality information willingness to pay in contour

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Abstract

The status of valid statements of contingent value is familiar with the environmental resource stage. A particular issue is to assess uncertainty by providing relevant quality information to respondents from their bids. By presenting survey participants with information about wetland restoration efforts in a delineation study, the authors test for differences about quality in a delineation study. Information about resource quality will result in more valid valuations of changes in value. © 1998 Elsevier Science B.V.

JEL classification: J25

Keywords: Wetlands; Information; Contingent valuation

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ICES Journal of Marine Science

Public perceptions of wetland

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We conducted a cross-section survey investigating public perceptions of wetland restoration projects. The survey included information on the extent and location of wetland restoration projects, the perceived benefits from restoration, and the perceived costs of restoration. The results show that public perceptions of wetland restoration projects are generally positive, and that the perceived benefits from restoration are greater than the perceived costs of restoration.

Introduction
Wetlands have long been recognized as one of the most productive forms of natural resources. In addition to providing habitat for a wide variety of plants and animals, wetlands also provide a number of other important services, including flood control, water purification, and carbon sequestration. However, wetlands have been lost at an alarming rate over the past few decades, and this loss has led to a number of environmental problems, including increased flooding, reduced water quality, and loss of biodiversity.

In the United States, the National Wetlands Inventory (NWI) is the most comprehensive inventory of wetlands. The NWI provides information on the location, extent, and condition of wetlands. However, the NWI does not provide information on the public's perceptions of wetlands. This paper examines public perceptions of wetlands and the willingness to pay for wetland restoration projects. The survey included information on the extent and location of wetland restoration projects, the perceived benefits from restoration, and the perceived costs of restoration. The results show that public perceptions of wetland restoration projects are generally positive, and that the perceived benefits from restoration are greater than the perceived costs of restoration.

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America's Wetland: A National Survey of Willingness to Pay for Restoration of Louisiana's Coastal Wetlands

Final Project Report
Department of Agricultural Economics
Mississippi State University
November/April 1, 2003

David R. Perrella*

COMBINING ECONOMIC AND ECOLOGICAL INDICATORS TO PRIORITIZE SALT MARSH RESTORATION ACTIONS

ROBERT J. JENNISON, GREGG MANNING, MARIA J. MAZZOTTA, AND JAMES J. O'NEILL

Restoration of damaged or degraded ecosystems often represents an important component of environmental management (National Research Council). However, funds are typically insufficient to restore all candidate sites. This paper examines an ecological-economic model designed to assist managers in prioritizing and selecting restoration actions. The model integrates information concerning both the production (ecology) and value (economics) of wetland habitat functions. Although the project focuses on salt marshes in Management Plan (MP), the approach is more generally applicable to assessing habitat restoration actions.

public preferences. Heavily inland residents' preferences for salt marsh functions were estimated through an application of stated preference (contingent) analysis. The two models were designed to integrate production with values of wetland functions, thereby providing insight into the relative value of restoration actions that would affect the greatest potential for value improvement given a fixed restoration budget. This paper discusses the design, implementation and estimation of the integrated model, and provides an example of how the model may be used to prioritize restoration actions.

Estimating Production Relationships: The Expert Survey

Consultation with wetlands experts revealed that the production of wildlife habitat was likely the most significant function of Management Plan salt marshes. This also represents a primary function for which sufficient information could be administered to differentiate among alternative restoration actions. The expert survey instrument was designed to determine the extent to which the production of wildlife habitat and other ecological functions are determined by ecological (physical relationships), social (human) factors, and other factors as determined by experts.

Wetland habitat functions are determined by ecological (physical relationships), social (human) factors, and other factors as determined by experts. This paper examines the relationship between the production of wildlife habitat and other ecological functions and the physical and social factors that determine them. The results show that the production of wildlife habitat is primarily determined by physical factors, such as soil type, water level, and vegetation. Social factors, such as land use and management, also play a role in determining the production of wildlife habitat.







American Journal of Agricultural Economics

This research was funded by the NOAA Office of Wetlands, Marshes, Public and Private Lands.

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LONDOÑO CADAVID AND ANDO: VALUES OF STORMWATER MANAGEMENT OUTCOMES

10. Suppose your city could do a project that would change features of stormwater control near you. Options A and B are the **only** choices you can have instead of your **current situation**. Which option would you choose? Please read all the features of each option and then check the box that represents your choice **below**. If you don't like option A or B, then choose the box "current situation" - that means no project is done, so flooding and environmental quality stay the same and there is no cost.

	Option A	Option B	Current situation
Number of street floods within 1 block of your house 	25% less frequent than current	50% less frequent than current	No change
Number of floods in your backyard 	50% less frequent than current	50% less frequent than current	No change
Number of floods in your basement 	50% less frequent than current	25% more frequent than current	No change
Change in quality of water in nearby streams 	better quality: fishable	better quality: swimmable	No change: boatable
Water infiltration 	less infiltration: very low	more infiltration: high	No change: medium infiltration
Annual stormwater utility bill 	\$20	\$40	\$0
I would choose:	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> Current situation

	id	origstudy	studyid	wtp	Q0	Q1	choiceexp	thesis	lyear
1	1004.1	1004	1	180.7128	70	50	0	0	1.0986123
2	1017.1	1017	2	240.93441	50	70	0	0	1.3862944
3	1017.2	1017	2	75.665351	50	70	0	0	1.3862944
4	1041.1	1041	3	36.252	25	50	0	0	0
5	1041.11	1041	3	19.836	50	70	0	0	0
6	1041.12	1041	3	57.228	25	70	0	0	0
7	1041.14	1041	3	84.132	25	50	0	0	0
8	1041.15	1041	3	42.864	50	70	0	0	0
9	1041.16	1041	3	137.256	25	70	0	0	0
10	1041.2	1041	3	40.128	25	50	0	0	0
11	1041.3	1041	3	28.272	50	70	0	0	0
12	1041.4	1041	3	71.136	25	70	0	0	0
13	1041.6	1041	3	66.804	25	50	0	0	0
14	1041.7	1041	3	28.5	50	70	0	0	0
15	1041.8	1041	3	97.812	25	70	0	0	0
16	1063.1	1063	4	390.6781	50	70	0	0	1.6094379
17	1063.2	1063	4	404.19484	50	90	0	0	1.6094379
18	1070.1	1070	5	255.00884	50	90	0	0	2.7080502
19	1070.2	1070	5	262.28511	50	90	0	0	2.7080502
20	1085.1	1085	6	124.03994	25	45	0	0	1.9459101

$$\log(wtp) = A + \beta \log(y) + \gamma_0 q_0 + \gamma_\Delta (q_1 - q_0), \quad \text{or}$$
$$wtp = y^\beta \exp(A + \gamma_0 q_0 + \gamma_\Delta (q_1 - q_0))$$

Sensitivity to scope?

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$$\frac{\partial wtp}{\partial q_1} \Big|_{q_0} = \gamma_{\Delta} * wtp,$$

$$\gamma_{\Delta} > 0?$$

Adding-up property?

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$$wtp(q_2 - q_0) \stackrel{?}{=} wtp(q_1 - q_0) + wtp(q_2 - q_1)$$

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$$y^\beta \exp(A) \exp(\gamma_0 q_0 + \gamma_\Delta (q_2 - q_0)) \neq$$

$$y^\beta \exp(A) *$$

$$(\exp(\gamma_0 q_0 + \gamma_\Delta (q_1 - q_0)) + \exp(\gamma_0 q_1 + \gamma_\Delta (q_2 - q_1))),$$

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- EPA needs to know partial benefits from partial cleanup AND benefits “still on the table”
- First raised in the peer-reviewed literature by Newbold et al. (2018)

Example: from “boatable” ($q=2.5$) to “fishable” ($q=5.1$) to “swimmable” ($q=7.0$)

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$$\hat{\gamma}_\Delta = 0.2095$$

$$q_0 = 2.5, \quad q_1 = 5.1, \quad q_2 = 7.0$$

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$$\frac{wtp(q_1 - q_0) + wtp(q_2 - q_1)}{wtp(q_2 - q_0)} = 1.09$$

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$$wtp = \int_{q_0}^{q_1} y^\beta \exp(A) \exp(\gamma q) dq =$$

$$y^\beta \exp(A) \left(\frac{1}{\gamma} (\exp(\gamma q_1) - \exp(\gamma q_0)) \right)$$

$$\log(wtp) = A + \beta \log(y) + \log \left(\frac{1}{\gamma} (\exp(\gamma q_1) - \exp(\gamma q_0)) \right)$$

$$y_{is} = \mathbf{x}'_{is}\boldsymbol{\beta} + \log \left(\gamma^{-1} (\exp(\gamma q_{1,is}) - \exp(\gamma q_{0,is})) \right) + u_s + \epsilon_{is}$$

$$u_s \sim n(0, \sigma_u^2),$$

$$\epsilon_{is} \sim n(0, \sigma_\epsilon^2 \omega_{is}), \quad \text{where} \quad \omega_{is} \sim ig\left(\frac{\nu}{2}, \frac{\nu}{2}\right)$$

Meta-Data:

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- 140 obs., 51 studies

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- 22 explanatory variables
- used by EPA to inform **steam electric rule** revision (ongoing)

Model comparison via Bayes Factors

NL-MRM vs: log-Bayes Factor

MRM1linlin	-24.285
MRM1linlog	-20.958
MRM1loglog	-23.742
MRM2	-6.560
MRM2Slin	-9.053
MRM2Slog	-23.870

BT context:

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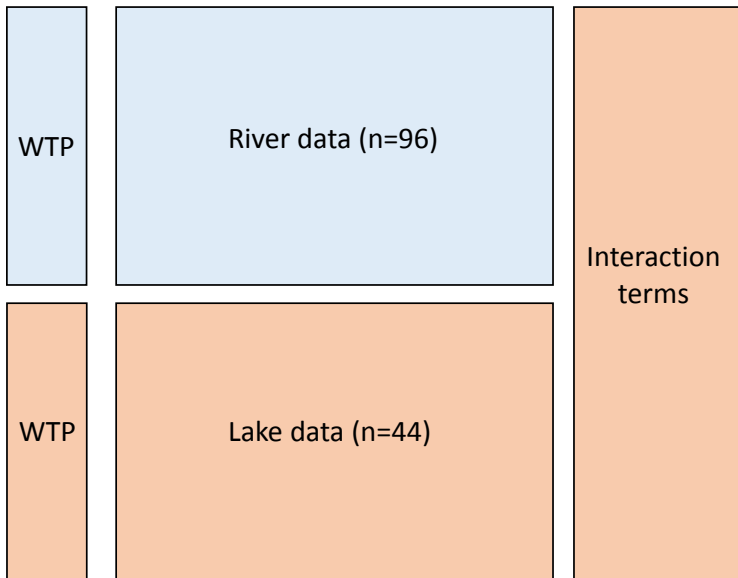
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- can be borrow from remaining (lake) data?

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- can we borrow from remaining (lake) data?
- Bayesian **Stochastic Search Variable Selection**



$$\begin{aligned}
 \mathbf{y}_s = & \mathbf{X}_{1s}\boldsymbol{\beta}_x + \mathbf{M}_s\boldsymbol{\beta}_m + \mathbf{Z}_s\boldsymbol{\delta} + \\
 & \log \left((\gamma + \delta_\gamma \mathbf{d}_s)^{-1} \left(\exp((\gamma + \delta_\gamma \mathbf{d}_s) \mathbf{q}_{1,s}) - \exp((\gamma + \delta_\gamma \mathbf{d}_s) \mathbf{q}_{0,s}) \right) \right) \\
 & + \mathbf{i}_s u_s + \boldsymbol{\epsilon}_s
 \end{aligned}$$

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 &+ \mathbf{i}_s u_s + \boldsymbol{\epsilon}_s
 \end{aligned}$$

$$p(\delta_j) = p_0 * n(0, c^2 t^2) + (1 - p_0) n(0, t^2),$$

Scenario 1: WQI 25-51, 51-70 (boatable, fishable, swimmable)

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BT results, SSVS, total WTP (\$)

scenario (WQI)	NL-MRM			MRM1linlin		
	low	mean	high	low	mean	high
25 to 51	0.00	50.99	156.53	0.72	32.33	85.59
51 to 70	0.00	26.33	80.10	0.94	24.08	63.65
25 to 70	0.00	77.19	235.89	0.91	41.12	108.12
adding-up error		0.17%			37.18%	

Scenario 2: WQI 73-73.5, 73.5-74
(option D of Steam Electric rule)

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BT results, SSVS, total WTP (\$)

scenario (WQI)	NL-MRM			MRM1linlin		
	low	mean	high	low	mean	high
73 to 73.5	0.00	0.57	1.74	0.46	16.26	43.89
73.5 to 74	0.00	0.57	1.73	0.47	16.21	43.79
73 to 74	0.00	1.14	3.47	0.28	16.36	43.98
adding-up error		0.18%			98.40%	

- Option D of SER: \$ 1.14/HH

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- 84.5 million HHs affected

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- 84.5 million HHs affected
- Benefits: \$96 million (2007 dollars)

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THANK YOU!