Estimating the Net Social Benefits of the National Flood Insurance Program

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Flood Disaster Management

- Flood recovery
  - Insurance program/ payout
  - Federally administered
  - Privately financed
- Flood mitigation
  - Dams, flood control
  - Building codes
  - Planning laws

United States Geological Survey

Data

- Benefit-Cost Analysis
  - Provided by FEMA:
    - NFIP financial statements
    - FMA grant summaries
  - County-level data
  - Study period is 1996-2010
- Willingness-to-Pay for Flood Insurance
  - Heinz Center for Science, Economics, and the Environment
  - Survey data and financial data, collected 1998

NFIP Theoretical Model

Benefits

- Insurance claims paid to victims
- Administrative fees paid to insurance companies
- Marginal Excess Tax Burden
- Willingness-to-pay for Flood insurance

Costs

- Insurance premiums paid to the program
- Environmental impacts of the program

Valuing Flood Insurance

$$\Delta S = \Delta C + \Delta P + \Delta G + \Delta E$$

$$\Downarrow$$

$$\Delta S = \lambda\gamma + \varphi\omega\pi - \kappa + m\kappa$$

- λ = covered amount
- γ = WTP for flood insurance
- φ = administrative fees
- ω = premiums paid to NFIP
- π = profitability ratio
- κ = claims against NFIP
- m = METB

Estimating the WTP

- Calculated using Tobit censored-data model
  - Data from Heinz survey on flood insurance
- Dependent variable is amount of flood insurance purchased
- Control variable for price is unknown, but estimated at lower and upper bounds

WTP for Flood Insurance

- Controls for several factors, e.g., location and presumed risk
- Price coefficient may be biased due to endogeneity in deciding to purchase flood insurance
- Cost / $100 of coverage

Model	Lower	Upper
Model 1	0.4971	0.9378
Model 2	0.6276	1.1999
Model 3	0.0831	0.1276

FMA Theoretical Model

- Benefits transfer
  - Uses estimates of other mitigation projects
  - Scales-up estimates to national level
  - Assumes estimate is broadly applicable across time
- Uses 2050 FMA grants during the study period
- Estimates returns to the year 2010
- Artificially discounts more recent grants due unrealized returns

Valuing Flood Mitigation

- 2005 MMC report
  - Based on sample of 28 FEMA grants
  - Used Hazus-US report to estimate benefit-cost ratio

$$\text{BCR} = 5.0 \text{ at } 2\% \text{ SDR}$$

$$\Downarrow$$

$$\cong 17.4\% \text{ annualized}$$

Multihazard Mitigation Council. (2005). *Natural hazard mitigation saves: an independent study to asses the future savings from mitigation activities*. National Institute of Building Sciences. Washington.

Net Social Benefits—2010

		Atkinson Distributional Weight				
WTP Est.	Premium	ε = 0.0	ε = 0.25	ε = 0.5	ε = 0.75	ε = 1.0
Model 1	Lower	60,832	48,492	36,899	26,435	14,597
	Upper	144,186	119,943	100,776	86,487	71,216
Model 2	Lower	85,510	69,646	55,811	44,214	31,359
	Upper	193,764	162,441	138,770	122,206	104,893
Model 3	Lower	-17,485	-18,642	-23,118	-29,890	-38,601
	Upper	-9,068	-11,426	-16,667	-23,925	-32,884

Millions of 2010 dollars

Conclusions

- Estimate of WTP for flood insurance causes wide swings in NSB estimate
- Aversion to income inequality causes smaller, but pronounced swings in NSB estimate
- If NSB is positive, the benefit is coming indirectly from government funds
  - Large NFIP debt to Treasury

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