Economics 101A
(Lecture 25)

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December 7, 2004

Outline

1. Example
2. Welfare Theorems
3. Existence and Uniqueness
4. Empirical Economics

1 Example

- Consumer 1 has Leontieff preferences:

$$u(x_{1,}x_2) = \min\left(x_1^1, x_2^1\right)$$

- Bundle demanded by consumer 1:

$$\begin{aligned} x_1^{1*} &= x_2^{1*} = x^{1*} = \frac{p_1\omega_1^1 + p_2\omega_2^1}{p_1 + p_2} = \\ &= \frac{\omega_1^1 + (p_2/p_1)\,\omega_2^1}{1 + (p_2/p_1)} \end{aligned}$$

- Graphically

- Comparative statics:
  - increase in ω
  - increase in p_2/p_1:

$$\frac{dx_1^{1*}}{dp_2/p_1} = \frac{\begin{array}{c}\omega_2^1 \left(1 + (p_2/p_1)\right) \\ -\left(\omega_1^1 + (p_2/p_1)\, \omega_2^1\right)\end{array}}{\left(1 + (p_2/p_1)\right)^2} = $$
$$= \frac{\omega_2^1 - \omega_1^1}{\left(1 + (p_2/p_1)\right)^2}$$

  - Effect depends on income effect through endowments:
    * A lot of good 2 –> increase in price of good 2 makes richer
    * Little good 2 –> increase in price of good 2 makes poorer

- Notice: Only ratio of prices matters (general feature)

- Consumer 2 has Cobb-Douglas preferences:

$$u(x_1, x_2) = \left(x_1^2\right)^{.5} \left(x_2^2\right)^{.5}$$

- Graphically

- Demands of consumer 2:

$$x_1^{2*} = \frac{.5\left(p_1\omega_1^1 + p_2\omega_2^1\right)}{p_1} = .5\left(\omega_1^1 + \frac{p_2}{p_1}\omega_2^1\right)$$

and

$$x_2^{2*} = \frac{.5\left(p_1\omega_1^1 + p_2\omega_2^1\right)}{p_2} = .5\left(\frac{p_1}{p_2}\omega_1^1 + \omega_2^1\right)$$

- Impose Walrasian equilibrium in market 1:

$$x_1^{1*} + x_1^{2*} = \omega_1^1 + \omega_1^2$$

This implies

$$\frac{\omega_1^1 + (p_2/p_1)\,\omega_2^1}{1 + (p_2/p_1)} + .5\left(\omega_1^1 + \frac{p_2}{p_1}\omega_2^1\right) = \omega_1^1 + \omega_1^2$$

or

$$\frac{.5 - .5\,(p_2/p_1)}{1 + (p_2/p_1)}\omega_1^1 + \frac{.5\,(p_2/p_1) + .5\,(p_2/p_1)^2 - 1}{1 + (p_2/p_1)}\omega_2^1 = 0$$

or

$$\left(\omega_1^1 - 2\omega_2^1\right) + \left(\omega_1^1 + \omega_2^1\right)(p_2/p_1) + \omega_2^1\,(p_2/p_1)^2 = 0$$

- Solution for p_2/p_1:

$$\frac{p_2}{p_1} = \frac{-\left(\omega_1^1 - 2\omega_2^1\right) + \sqrt{\begin{array}{c}\left(\omega_1^1 + \omega_2^1\right)^2 \\ -4\left(\omega_1^1 - 2\omega_2^1\right)\omega_2^1\end{array}}}{2\left(\omega_1^1 - 2\omega_2^1\right)}$$

- Some complicated solution!

- Problem set has solution that is much easier to compute (and interpret)

2 Existence, Uniqueness

- Does Walrasian Equilibrium always exist?

- In general, yes, as long as preference convex

- (Example of nonexistence with non-convexity)

- Is Walrasian Equilibrium always unique?

- Not necessarily

- Counterexample.

3 Welfare Theorems

- **First Fundamental Welfare Theorem.** All Walrasian Equilibria are on Contract Curve (and therefore are Pareto Efficient).

- Figure

- **Second Fundamental Welfare theorem.** Given convex preferences, for every Pareto efficient allocation $\Big((x_1^1, x_1^1), (x_1^2, x_2^2)\Big)$ there exists some endowment (ω_1, ω_2) such that $\Big((x_1^1, x_1^1), (x_1^2, x_2^2)\Big)$ is a Walrasian Equilibrium for endowment (ω_1, ω_2).

- Figure

- Significance of these results:
  - First Theorem: Smithian Invisible Hand. Market leads to an allocation that is Pareto Efficient.
  - BUT: problems with externalities and public good
  - BUT: what about distribution?
  - Second Theorem: Can redistribute endowments to achieve any efficient outcome as a WE.
  - But redistribution is hard to implement, and distortive.

4 Empirical Economics

- So far we have focused on economic theory

- What have we learnt (maybe)?

- Power of models

- **Consumers**. We tried to capture:

  - savings decisions (consumer today/consumer in future)

  - work-leisure trade-off (how much to work?)

  - attitudes toward risk (insurance, investment)

  - self-control problems (health club, retirement saving)

  - altruism (charitable contribution, volunteer work)

- **Producers.**

- Beauty of competitive markets:
  - price equals marginal costs
  - zero profit with entry into market
  - welfare optimality (no deadweight loss)

- Market power, the realistic scenario:
  - choice of price to maximize profits
  - single price or price discrimination
  - interaction between oligopolists

- But this is only half of economics!

- The other half is empirical economics

- Creative and careful use of data

- Get empirical answers to questions above (and other questions)

- Today:

  - Justin Sydnor, graduate student in economics at Berkeley

  - Home insurance and deductible choice

- Brief intro
- Topic.
  - Risk aversion. Desire to minimize risk
  - Focus on small risks
  - How much do people pay to minimize those?

- Methodology:
  - **Methodology 1 in Empirical Economics.** Consumers choose in a menu of options
  - Choice among options reveals preferences
  - Ex.: Health Club paper
  - Estimates of time preferences, altruism, risk aversion in lab

How Much Do Homeowners Pay for Low Deductibles?

Justin Sydnor
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December 7, 2004

HOMEOWNERS INSURANCE INDUSTRY

- What does insurance cover?
- What types of losses are typical?
- How common are claims?
- How costly are claims?
- How big is this industry?

My Dataset

- Overview of Data
- Summary Statistics
- What is a Deductible?
- The Premium-Deductible Menu

Table 1. Summary Statistics: Policy Variables

Variable	Full Sample	Deductible Level 100	250	500	1000
Insured Home Value[1]	206,917 (91,178)	164,485 (53,808)	180,895 (65,089)	205,026 (81,834)	266,461 (127,773)
Insured Personal Property Limit	142,711 (63,394)	113,890 (38,181)	124,448 (45,523)	142,008 (56,869)	182,740 (89,178)
Insured Liability Limit	435,384 (227,338)	307,383 (196,281)	321,715 (182,788)	471,205 (207,053)	571,507 (255,394)
Average Age of HH members	53.7 (15.8)	66.6 (15.5)	59.8 (15.9)	50.5 (14.9)	50.1 (14.5)
Year Home Built	1970 (20.1)	1962 (15.2)	1966 (17.6)	1973 (20.3)	1972 (22.9)
Number of Claims in Sample Year	.042 (.216)	.047 (.212)	.049 (.234)	.043 (.217)	.025 (.167)
Yearly Premium	719.80 (312.76)	709.78 (269.34)	687.19 (267.82)	715.6 (300.39)	798.6 (405.78)
Losses per Claim net of Deductible	5,571.53 (21,022.20)	2,679.50 (4,584.58)	4,496.38 (16,298.04)	6,227.63 (25,234.58)	6,880.77 (15,583)
Number of Years Insured by Company	8.4 (7.1)	13.2 (6.7)	13.5 (7.0)	5.8 (5.2)	5.1 (5.6)
Index of Prior Losses[2]	.071 (.295)	.101 (.344)	.087 (.321)	.068 (.293)	.045 (.239)
N	49,992	149	17,536	23,782	8,525
Percent of Sample	100%	0.30%	35.08%	47.57%	17.05%

Note: The table reports means for each variable with standard deviations in parentheses.

[1] Insured Home Value is the value of the structure of the home (the cost of rebuilding). Insured Personal Property Limit is the value of the goods inside the home (electronics, furniture, etc…). Insured Liability Limit is the limit of the insurance to cover liability claims relating to a customer's home (e.g. a fire in the house spreads to neighboring property)

[2] The index of prior losses covers the three years prior to the sample year. Any losses over $1000 to the company (that is over claims of at least $1000 over the deductible) in the prior three years are given 1 point. In addition certain types of these claims are given 2 points instead of 1. The types of claims incurring this double point policy are unknown to me, but may include water damage claims.

Premium-Deductible Menu

- **$(Premium_i \mid Deductible_i = D_j) = d_j*f(X_i) + g(X_i)$**
  - **$f(X_i)$ = base premium (expected losses)**
  - **$g(X_i)$ = usually discounts (such as burglar alarm)**

- **Examples**

Policyholder 1: Home was built in 1966 and had an insured value of $181,700. The average age of the household members was 64.5. The policyholder had coverage with the company for 5 years, and filed no claims in the three years prior to the sample year. The menu offered to this policyholder in the sample year was:

Deductible	Premium	Chosen
100	$ 773	
250	$ 661	X
500	$ 588	
1000	$ 504	

Policyholder 2: Home was built in 1992 and had an insured value of $266,100. The average age of the household members was 53. The policyholder had coverage with the company for 4 years, and filed no claims in the three years prior to the sample year. The menu offered to this policyholder in the sample year was:

Deductible	Premium	Chosen
100	$ 1,171	
250	$ 999	
500	$ 885	
1000	$ 757	X

Marginal Insurance Value of Lower Deductibles

- (Number of Claims)*(Difference in Deductible)
  - Ex: (.05)(500-250) = 12.50
- Cost to Policyholder of Lower Deductibles
  - Δp
- Expected Savings From Higher Deductibles
  - $\Delta p - \lambda\Delta d$

Table 2. Expected Savings from Holding a Higher Deductible

Deductible		λ (# Claims)	Switching to the \$1000 Deductible: Reduction in Yearly Premium Δp^{1000}	Switching to the \$1000 Deductible: Expected Savings $[\Delta p^{1000} - \lambda(1000 - D)]$	Switching to the \$500 Deductible: Reduction in Yearly Premium Δp^{500}	Switching to the \$500 Deductible: Expected Savings $[\Delta p^{500} - \lambda(500 - D)]$
100	N = 149 (0.30%)	.047 (.017)	242.40 (6.76)	200.12 (6.76)	166.65 (4.65)	147.86 (4.65)
250	N = 17,536 (35.08%)	.049 (.002)	158.93 (.447)	122.02 (.447)	73.79 (.208)	61.48 (.208)
500	N = 23,782 (47.57%)	.043 (.001)	99.85 (.264)	78.60 (.264)	--	--
1000	N = 8,525 (17.05%)	.025 (.002)	--	--	-130.89 (.702)	-118.28 (.702)
Sample	N = 49,992 (100%)	.042 (.001)				

Note: Standard errors in parentheses.[3]

[3] Δp^{1000} is the difference in yearly premium to the policyholder if they held the \$1000 deductible instead of the deductible they chose in the sample year. Expected savings are calculated by subtracting the expected number of claims (the sample average for the deductible group) multiplied by the increase in deductible payments per claim from switching up to the \$1000 deductible. The full increase in deductible payments is assumed for each claim, which is akin to assuming that every claim made is for over \$1000. This understates the true expected savings to holding a higher deductible.

5 Next Lecture

- Other empirical methodologies

- Metholology 2.
  - Differences-in-differences
  - Fox News paper

- Methodology 3.
  - Field experiment
  - Name paper and discrimination