Overview: Demand

- Demand for Anti-Ulcer Drugs
  - Data, Estimation
  - Interpretation of Empirical Results
- Modeling of Consumer Choice

Demand Analysis

- Today
  - Empirical Demand Analysis
  - Modeling of Consumer Demand
- Later
  - Demand and Product Characteristics
  - Discrete Choice Models
  - Network Effects
  - Dynamic Adjustments in Demand

Market Demand for Anti Ulcer Drugs

- Typical Empirical Application
  - Rapid Growth Market
  - Changes in Market Structure
- Focus on Price Effects and Advertising Effects
  - Price Elasticity and Advertising Elasticity
- Example of Practical Modeling Considerations

Market Demand for Anti-Ulcer Drugs

- Monthly Observations, Aug. 1977 - May 1993
- Four Drugs: Tagamet, Axid, Pepcid, Zantac
  Prescription (prior to OTC versions)
- Variables
  LQ - Log (Market Quantity)
  LP - Log (Market Price)
  LADV - Log (Cumulative Advertising)
  T - Time Trend
- Data Source: Berndt, Bui, Reiley and Urban (1994)

Market Demand for Anti-Ulcer Drugs

- Model is of the Form:
  $LQ = \alpha + Elas_P\ LP + Elas_{ADV}\ LADV + \tau\ T + \varepsilon$
- Basic Estimates
  $LQ = -10.04 - 1.16\ LP + .88\ LADV + .001\ T + \varepsilon$
- Namely $Elas_P = -1.16$, $Elas_{ADV} = .88$ (Not bad!)
- But….

Model Specification Analysis

Yikes!!! Something is wrong!!!

- What Could Cause the Residual Pattern?
- What should we do about it ???

Introduction of Anti-Ulcer Drugs

- Drugs Did Not Appear Simultaneously
- Introduction Dates

  Tagamet (Smith Kline): August 1977
  Zantac (Glaxo): June 1983
  Pepcid (Merck): October 1986
  Axid (Lilly): April 1988

- How is this incorporated?

Final Estimation Results

- Refined Model is of the Form:

$$LQ = \alpha + Elas_P \ LP + \ Elas_{ADV} \ LADV + \varepsilon$$

where

	Elasticities	
	P	ADV
One Drug	-1.67	0.77
Two Drugs	-0.65	0.4
Three Drugs	-0.65	0.4
Four Drugs	-0.65	0

Retail Pricing and Promotions

- Retail pricing involves list prices as well as promotions, or temporary price reductions
- Modeling and estimation applied here too, in early growth phase
- Household models and targeted couponing

Consumer Choice Models

- How Do Consumers Make Decisions?
- Behavioral Assumption: Consumers Act in Their Best Interests
  - Interests = "Preferences" or "Utility"
  - Best Interests = "Maximize Utility" over available choices.
- Utility Maximization

  Choose Quantities of Goods: A, B, ... by

  maximizing Utility Function

  $U(A,B,...)$

  subject to Budget Constraint: $p_A A + p_B B + ... = I$

Consumer Choice Models (2)

Optimal: $MRS_{AB} = p_A / p_B$, etc., namely

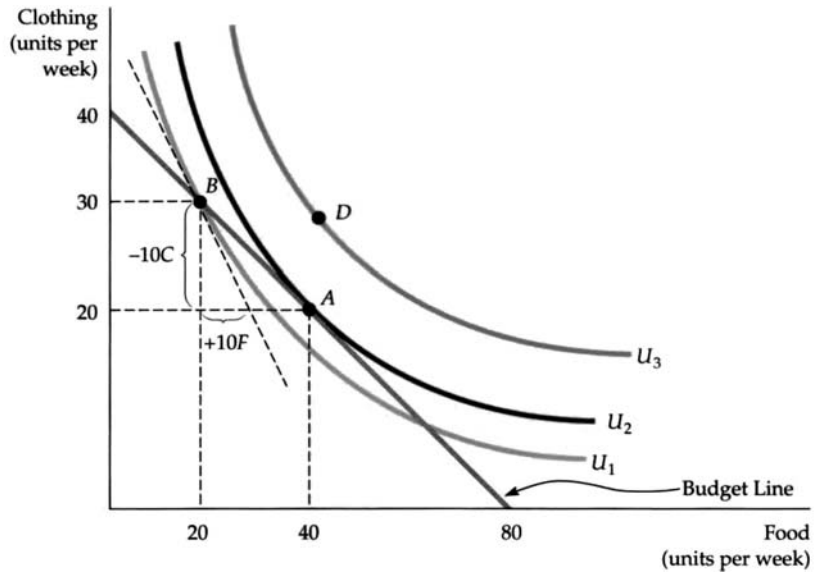
$MU_A/p_A = MU_B/p_B$ = (all goods); "Equal Bang per Buck"

Result: Individual Demand Functions

$A = D_A(p_A,p_B,...,I)$ $B = D_B(p_A,p_B,...,I)$

Empirical Models Build in Consumer Differences, Demographics, etc.

Figure 3.12 Maximizing Consumer Satisfaction



Take Away Points

- Demand curves are real: they can be estimated!
- Estimation involves
  - Model specification
  - Estimation
  - Interpretation and modification
- A basic understanding of regression output allows you to critically assess claims based on it.
- Utility maximization models are the workhorse of economics and finance, among others