ECON 200A (first half) MICROECONOMICS: DECISIONS

Fall 2014  Monday, Wednesday 11:00am-12:20pm  Econ Bldg 200

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TA: John Rehbeck  Sequoyah Hall 207  Tue & Thu 10:00-11:00am

The texts for the 200A/B/C sequence are:


There will also be a Mathematical Handout and additional in-class handouts.

An extremely useful book of problems, designed to hone your analytical ability is:


Other useful readings include the relevant chapters of:


The exam for this half of 200A will be Wednesday November 5. The exam for the second half will be given at the end of the quarter, and each exam will have equal weight.

I. Introduction and Basic Mathematical Ideas
   a. Some Introductory Ideas
      Domain of Microeconomic Analysis
      Role of Models in Economics
      The Circular Flow Diagram
      Stocks versus Flows and the Dimensions of Economic Variables
   b. Elasticity
   c. Level Curves of Functions
      Formula for the Slope of a Level Curve
      Gradient Vectors and their Relation to Level Curves
   d. Possible Properties of Functions
      Cardinal vs. Ordinal Properties of Functions
      Scale Invariance and Constant Returns to Scale
      Homogeneity and Euler’s Theorem
      Homotheticity
      Concavity and Convexity
      Quasiconcavity and Quasiconvexity
      Additive and Multiplicative Separability
   e. Systems of Linear Equations and Cramer’s Rule

II. Mathematics of Optimization
   a. The General Structure of Optimization Problems
      Objective Functions, Control Variables, Parameters, Constraints
      Solution Functions and Optimal Value Functions
   b. Unconstrained Optimization
      First Order Conditions
      Second Order Conditions
   c. Constrained Optimization
      First Order Conditions
      Lagrangians
      Corner Solutions
      Shadow Prices of Constraints
      Second Order Conditions
   d. Comparative Statics of Solution Functions – Implicit Differentiation
      Differentiation of the First Order Conditions
      A Related Application: Comparative Statics of Equilibria
   e. Comparative Statics of Optimal Value Functions – The Envelope Theorem
      Unconstrained Case: Differentiation of the Objective Function
      Constrained Case: Differentiation of the Lagrangian
III. CONSUMER PREFERENCES AND THE UTILITY FUNCTION

a. The Choice Space
   The Objects of Choice
   The Relevant Time Period
   The Issue of Divisibility

b. Preference Relations
   Definitions and General Properties of Preference Relations
      Defined over Commodity Bundles, not Individual Commodities
      Weak Preference, Strict Preference and Indifference
      Completeness, Reflexivity and Transitivity
   Possible Additional Properties of Preference Relations
      Continuity
      Weak Monotonicity/Strong Monotonicity/Local Nonsatiation
      Weak Convexity/Strong Convexity
   Equivalent Variation versus Compensation Variation
   The Theory of Revealed Preference
      Representation of a Choice Function by a Preference Relation
      Revealed Preference over Budget Sets

c. Indifference Curves and the Marginal Rate of Substitution
   Better-Than Sets, Worse-Than Sets and Indifference Sets
   Typical Properties of Indifference Curves
      One Through Each Point
      Downward Sloping and “Thin”
      Can’t Cross
   Marginal Rate of Substitution (MRS)
      Definition of MRS
      Graphical Interpretation: Slope of the Indifference Curve
      Convexity of Preferences and the Hypothesis of Diminishing MRS

d. Utility Functions
   Representation of a Preference Ranking by a Utility Function
   Monotonic Invariance of Utility Functions
   Possible Properties of a Utility Function:
      Weak/Strong Monotonicity
      Weak/Strong Quasiconcavity
      Homotheticity
      Additive/Multiplicative Separability
   Expressing the MRS in Terms of Marginal Utilities
   Monotonic Invariance of the MRS
   Hypothesis of Diminishing MRS
      Algebraic Condition for Hypothesis of Diminishing MRS
   Important Examples of Utility Functions
      Linear
      Cobb-Douglas
      Leontief
      Constant Elasticity of Substitution (CES)
      Quasilinear
IV. UTILITY MAXIMIZATION AND DEMAND FUNCTIONS

a. Utility Maximization Subject to a Budget Constraint
   - Graphical Illustration
   - First Order Conditions for Utility Maximization
     - Two Interpretations of the First Order Conditions
     - Monotonic Invariance of the First Order Conditions
     - Corner Solutions
   - Economic Interpretation of the Lagrangian Multiplier
   - Second Order Conditions (Hypothesis of Diminishing MRS)
   - Algebraic Examples: Cobb-Douglas, Leontief, Linear

b. Regular (“Marshallian”) Demand Functions
   - Definition of Regular Demand Functions
   - Examples: Cobb-Douglas, Leontief, Linear
   - General Properties of Demand Functions:
     - Walras’ Law
     - Scale Invariant in Prices and Income
     - Relationship between Price Elasticities & Income Elasticity for a Good
     - Market Demand Functions

c. The Indirect Utility Function
   - Properties:
     - Increasing in Income, Nonincreasing in Prices
     - Scale Invariant in Prices and Income
     - Quasiconvex in Prices and Income
   - Roy’s Identity
   - Price Indifference Curves
   - Effect of Monotonic Transformation of Utility
   - Examples: Cobb-Douglas, Leontief, Linear
   - Justification of the Two-Good Approach: The Composite Commodity Theorem

d. Compensated (“Hicksian”) Demand Functions and the Expenditure Function
   - The Expenditure Minimization Problem
   - First Order Conditions for Expenditure Minimization
   - Compensated (“Hicksian”) Demand Functions
     - Properties:
       - Scale Invariant in Prices
       - Nonincreasing in “Own Price”
   - Identities Linking the Marshallian and Hicksian Demand Functions
   - Examples: Cobb-Douglas, Leontief, Linear
   - The Expenditure Function
     - Properties:
       - Increasing in Utility, Nondecreasing in Prices
       - Homogeneous of Degree One in Prices
       - Concave in Prices
     - Identities Linking the Expenditure and Indirect Utility Functions
   - Consumer Surplus
V. COMPARATIVE STATICS OF DEMAND

a. Changes in Income
   Income-Consumption Loci
   Engel Curves: Definition and Graphical Derivation
   Income Elasticity
      Superior, Normal and Inferior Goods
      Income Elasticity and Budget Shares
      Relationship Between Income Elasticities of All Goods
   Algebraic Derivation of the Effect of an Income Change
   Relationship Between Income Elasticities for All Goods

b. Changes in Prices
   Price-Consumption Loci
   Graphical Derivation of Marshallian Demand Curves
   Own Price Elasticity
      Price Elasticity and Budget Shares
   Cross Price Elasticity
      Gross Substitutes and Gross Complements
   Algebraic Derivation of the Effect of a Price Change
   Relationship Between All Price and Income Elasticities for a Good

c. Compensated Price Changes
   Graphical Illustration of a Compensated Price Change
   Algebraic Derivation of the Effect of a Compensated Price Change
   Nonpositivity of Own Compensated Price Effect
   Compensated Cross Price Elasticity
      Net Substitutes and Net Complements

d. The Slutsky Equation
   Graphical Illustration of the Slutsky Decomposition
   Algebraic Statement and Proofs
   Giffen Goods

VI. SUPPLY OF FACTORS OF PRODUCTION

a. Supply of Labor: The Labor-Leisure Decision
   Income-Leisure Space and the Labor-Leisure Decision
   First Order Conditions for Optimal Supply of Labor
   Comparative Statics: Income and Substitution Effects
   Backward Bending Supply of Labor Curves
   Kinked Budget Lines and the Overtime Decision

b. Supply of Capital: The Consumption-Savings Decision
   Intertemporal Income and Consumption Streams
   Interest Rates and the Discounted Present Value of a Stream
   Relationship between the Rental Rate and the Price of Capital
   Intertemporal Utility Maximization
      First Order Conditions and Interpretation
   Comparative Statics: Income and Substitution Effects
VII. CHOICE UNDER UNCERTAINTY

a. Objective Uncertainty
   Objects of Choice and Preference Functionals
   Structure of Expected Utility Preferences
   Axiomatic Characterization of Expected Utility
   Arrow-Pratt Characterization of Comparative Risk Aversion
   Risk Aversion and Wealth
   Rothschild-Stiglitz Characterization of Comparative Risk
   Demand for Insurance

b. Subjective Uncertainty
   States, Events, Outcomes and Acts
   Probabilistic Sophistication
   Expected Utility Preferences over Subjective Acts
   State-Dependent Utility

c. Evidence and Alternative Models
   Evidence on the Independence Axiom
   Non-Expected Utility Preference Functionals
   Generalized Expected Utility Analysis
   Evidence on Probabilistic Sophistication and the Stability of Preferences

VIII. SPECIFICATION AND ESTIMATION OF DEMAND, COST AND SUPPLY

a. Parametric Estimation of Demand Systems
b. Parametric Estimation of Production and Cost Systems
c. Nonparametric Testing of the Maximization Hypothesis
ECONOMICS 200A (first half): READINGS BY TOPIC

Fall 2014

Mark Machina

I. Introduction and Basic Mathematical Ideas
   Required: Math Handout, Sections A through F; Kreps Ch.1
   Also suggested: MWG App.A-E; Varian Ch.26

II. Mathematics of Optimization
   Required: Mathematical Handout, Sections G through I
   Also suggested: Kreps App.1; MWG App. J-L; Varian Ch.27

III. Consumer Preferences and the Utility Function
   Required: Kreps Sect.2.1; MWG Ch.1, Sects.2A-2C,3A-3C; Varian Sect. 7.1
   Also suggested: Suggested readings will be provided in an in-class handout

IV. Utility Maximization and Demand Functions
   Required: Kreps Ch.2; MWG Sects.2D,3D; Varian Sects.7.2-7.5
   Also suggested: Henderson & Quandt, Sects.2.1-2.3

V. Comparative Statics of Demand
   Required: MWG Sects.2E-2F, 3E-3J; Varian Chs. 8, 9
   Also suggested: MWG Ch.4; Varian Ch.10, Henderson & Quandt, Sects.2.5-2.7

VI. Supply of Factors of Production
   Required: MWG Sects.20A-20D; Varian Ch.19
   Also suggested: Kreps Ch.4, Sect.6.5; MWG Sects.19A-19B

VII. Choice Under Uncertainty
   Required: Kreps Ch.3; MWG Ch.6; Varian Ch.11;

VIII. Specification and Estimation of Demand, Cost and Supply
   Required: Varian Ch.12
   Required: Ch. 3 of Deaton & Muellbauer (1980), Economics and Consumer Behavior.
### FAMOUS OPTIMIZATION PROBLEMS IN ECONOMICS

<table>
<thead>
<tr>
<th>Optimization Problem</th>
<th>Objective Function</th>
<th>Constraint</th>
<th>Control Variables</th>
<th>Parameters</th>
<th>Solution Functions</th>
<th>Optimal Value Function</th>
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</thead>
<tbody>
<tr>
<td><strong>Consumer’s Problem</strong></td>
<td>$U(x_1,\ldots,x_n)$ utility function</td>
<td>$p_1 x_1 + \ldots + p_n x_n = I$ budget constraint</td>
<td>$x_1,\ldots,x_n$ commodity levels</td>
<td>$p_1,\ldots,p_n, I$ prices and income</td>
<td>$x_i(p_1,\ldots,p_n, I)$ regular demand functions</td>
<td>$V(p_1,\ldots,p_n, I)$ indirect utility function</td>
</tr>
<tr>
<td><strong>Expenditure Minimization Problem</strong></td>
<td>$p_1 x_1 + \ldots + p_n x_n$ expenditure level</td>
<td>$U(x_1,\ldots,x_n) = u$ desired utility level</td>
<td>$x_1,\ldots,x_n$ commodity levels</td>
<td>$p_1,\ldots,p_n, u$ prices and utility level</td>
<td>$h_i(p_1,\ldots,p_n, u)$ compensated demand functions</td>
<td>$e(p_1,\ldots,p_n, u)$ expenditure function</td>
</tr>
<tr>
<td><strong>Labor/Lesuire Decision</strong></td>
<td>$U(H,I)$ utility function</td>
<td>$I = I_0 + w(168 - H)$ budget constraint</td>
<td>$H, I$ leisure time, disposable inc.</td>
<td>$w, I_0$ wage rate and nonwage income</td>
<td>$L(w,I_0) = 168 - H(w,I_0)$ labor supply function</td>
<td>$V(w,I_0)$ indirect utility function</td>
</tr>
<tr>
<td><strong>Intertemporal Optimization</strong></td>
<td>$U(c_1,\ldots,c_n)$ utility function</td>
<td>$\sum_{i=1}^n (1+i)^t (I_i - c_i) = 0$ budget constraint</td>
<td>$c_1,\ldots,c_n$ consumption levels</td>
<td>$I_1,\ldots,I_n, i$ income stream and interest rate</td>
<td>$c_i(I_1,\ldots,I_n, i)$ indirect utility function</td>
<td>$V(I_1,\ldots,I_n, i)$ indirect utility function</td>
</tr>
<tr>
<td><strong>Long Run Cost Minimization</strong></td>
<td>$wL + rK$ total cost</td>
<td>$F(L,K) = Q$ desired output</td>
<td>$L, K$ factor levels</td>
<td>$Q, w, r$ desired output and factor prices</td>
<td>$L(Q,w,r), K(Q,w,r)$ output-constrained factor demands</td>
<td>$\text{LTC}(Q,w,r)$ long run total cost function</td>
</tr>
<tr>
<td><strong>Long Run Profit Maximization (in terms of $Q$)</strong></td>
<td>$PQ - \text{LTC}(Q,w,r)$ total profit</td>
<td>$Q$ output level</td>
<td>$P, w, r$ output price and factor prices</td>
<td>$Q(P,w,r)$ long run supply function</td>
<td>$\pi(P,w,r)$ long run profit function</td>
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</tr>
<tr>
<td><strong>Long Run Profit Maximization (in terms of $L,K$)</strong></td>
<td>$P\cdot F(L,K) - wL - rK$ total profit</td>
<td>$L, K$ factor levels</td>
<td>$P, w, r$ output price and factor prices</td>
<td>$L(P,w,r), K(P,w,r)$ factor demand functions</td>
<td>$\pi(P,w,r)$ long run profit function</td>
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<tr>
<td><strong>Long Run Profit Maximization (in terms of $Q,L,K$)</strong></td>
<td>$PQ - wL - rK$ total profit</td>
<td>$F(L,K) = Q$ production function</td>
<td>$Q, L, K$ output and factor levels</td>
<td>$P, w, r$ output price and factor prices</td>
<td>$Q(P,w,r), L(P,w,r), K(P,w,r)$ output supply &amp; factor demand functions</td>
<td>$\pi(P,w,r)$ long run profit function</td>
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