ECON 200A: MICROECONOMICS ("DECISIONS")

Fall 2004 **Mon, Wed 1:30-3:20pm** **ECON 300**

Mark Machina **Office: ECON 217** **Hours: Wed 9:30-11:30am**

The topics of this course are the economic theories of consumer and producer behavior.

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

Kreps, D., *A Course in Microeconomic Theory.* Princeton: Princeton Univ. Press, 1990.

Mas-Colell, A., M. Whinston and J. Green ("MWG"), *Microeconomic Theory,* Oxford: Oxford Univ. Press, 1995.

Varian, H., *Microeconomic Analysis, 3rd ed.* New York: W.W. Norton & Co., 1992.

There will also be a Mathematical Handout for this course, and additional in-class handouts.

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

Dixon, P., S. Bowles and D. Kendrick, *Notes and Problems in Microeconomic Theory*, 1985, (Amsterdam: North-Holland)

Other useful readings include the relevant chapters of:

Debreu, G., *Theory of Value*, 1959, (New York: Wiley).

Henderson, J. and R. Quandt, *Microeconomic Theory: A Mathematical Approach,* 3rd ed., 1980 (New York: McGraw-Hill)

Malinvaud, E., *Lectures on Microeconomic Theory*, 1972 (Amsterdam: North-Holland)

Russell, R. and M. Wilkinson, *Microeconomics: A Synthesis of Modern and Neoclassical Theory*, 1979, (New York: Wiley)

EXAMS: Your grade the course will be determined on the basis of two midterms (dates to be determined) and the final exam (Monday, Dec. 6, 11:30am-2:30pm).

OPTIONAL QUESTIONS: For those who would like prior practice working with the material at a more basic level, or whose microeconomics background is not strong, there is an Econ 100A package available at Soft Reserve. This package contains approximately ∞ practice questions, which sometimes accidentally find their way onto Econ 200A midterms and final exams. Even onto Micro Qualifiers ...

ECONOMICS 200A COURSE OUTLINE

Fall 2004 **Mark Machina**

I. INTRODUCTION AND BASIC MATHEMATICAL IDEAS

a.Som e 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

d. Possible Properties of Functions
- Cardinal vs. Ordinal Properties of Functions
- Scale Invariance and Constant Returns to Scale
- Homogeneous Functions 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
- Second Order Conditions

d. Comparative Statics of Solution Functions – Implicit Differentiation
- Differentiation of 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. The Consumer's Preference Ranking

- Weak Preference, Strict Preference and Indifference
- Preferences are Defined over Commodity Bundles, *not* Individual Commodities
- General Properties of the Preference Ranking:
  - Completeness, Reflexivity and Transitivity
  - Continuity
    - Alternative Definitions of Continuity
    - Example of Non-Continuous Preferences: Lexicographic Preferences
- Possible Additional Properties of the Preference Ranking
  - Weak Monotonicity/Strong Monotonicity
  - Local Nonsatiation
  - Weak Convexity/Convexity/Strong Convexity

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 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)

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
- "Marginal Utility of Income"
- Second Order Conditions (Hypothesis of Diminishing MRS)
- Algebraic Examples: Cobb-Douglas, Leontief, Linear
- Corner Solutions

b. Regular or "Marshallian" Demand Functions

- Definition of Regular Demand Functions
  - Examples: Cobb-Douglas, Leontief, Linear
- General Properties of Demand Functions:
  - *Not* Necessarily Nonincreasing in "Own Price"
  - 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
- Utility-Income Curves
- Price Indifference Curves
- Effect of Monotonic Transformation of Utility
- Examples: Cobb-Douglas, Leontief, Linear

d. Compensated Demand Functions and the Expenditure Function

- The Expenditure Minimization Problem
  - First Order Conditions for Expenditure Minimization
- Compensated or "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

V. COMPARATIVE STATICS OF DEMAND

a.Chan ges 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
- Graphical Illustration of a Compensated Demand Curves
- 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

- Expressing Each of the Three Basic Changes in Terms of the Other Two
- Graphical Illustration
- Algebraic Formulation
- Giffen Goods

e. Some Important Results

- Economic Interpretation of the Lagrangian Multiplier
- Roy's Identity (Linking the Indirect Utility and Demand Functions)
- Relationship Between the Expenditure and Compensated Demand Functions
- A One-Line Proof of the Slutsky Equation
- Justification of the Two-Good Approach: The Composite Commodity Theorem

VI. PRODUCTION, COST AND DUALITY

a.Fa ctors of Production

- The Stock-Flow Distinction
- Types of Factors and Their Income

b. Production Functions and Production Sets

- Definition and Important Examples of Production Functions
- Marginal Products and the Law of Diminishing Marginal Returns
- Average Products and the Average-Marginal Relationship
- Returns to Scale
- Technical Progress
  - Three Implications of Technical Progress
  - Hicks-Neutral, Harrod-Neutral and Solow-Neutral Technical Progress
  - Continuous Technical Progress
- Production Sets and Input Requirement Sets

c. Isoquants and the Marginal Rate of Technical Substitution (MRTS)

- Definition and General Properties of Isoquants
- Definition of MRTS
- Expressing MRTS in Terms of Marginal Products
- Hypothesis of Diminishing MRTS
- Elasticity of Substitution

d. The Nature of Cost

- Definition of Cost
- Accounting Cost vs. Opportunity Cost of Owned Factors
- Cost of Entrepreneurial Ability and Definition of "Normal Profits"
- Short Run versus Long Run Planning Horizons

e. Long Run Minimization and Long Run Cost Functions

- Isocost Lines
- Long Run Cost Minimization
  - First Order Conditions and Output-Constrained Factor Demands
    - Two Interpretations of the First Order Conditions
  - Second Order Conditions and the Hypothesis of Diminishing MRTS
  - Equivalence to Constrained Output Maximization
- The Long Run Expansion Path
- Long Run Total Cost Function (LTC)
  - Properties of LTC:
    - Increasing in Output, Nondecreasing in Factor Prices
    - Homogeneous of Degree One in Factor Prices
    - Concave in Factor Prices
  - Deriving Output-Constrained Factor Demands from LTC
- Long Run Marginal Cost Function (LMC)
  - Relation of LMC to Marginal Products and Factor Prices
- Long Run Average Cost Function (LAC)
  - Returns to Scale and Long Run Average Cost
  - Average-Marginal Relationship
- Relation Between Long Run and Short Run Total, Average and Marginal Cost Curves

f. Short Run Cost Functions

Expansion Path in the Short Run
Graphical Derivation of the Short Run Total Cost Curve
Algebraic Derivation of Short Run Total Cost Function (STC)
Examples: Linear, Leontief, Cobb-Douglas
Short Run Variable Cost Function (SVC)
Short Run Fixed Cost Function (SFC)
Short Run Marginal Cost Function (SMC)
Relation of SMC to Marginal Product of Labor and Wage Rate
Short Run Average Total Cost Function (SATC)
Short Run Average Variable Cost Function (SAVC)
Short Run Average Fixed Cost Function (SAFC)
Average-Marginal Relationships
Effects and Interpretation of "Changes in Fixed Capital $\bar{K}$"

g.Duali ty Between Production and Cost

Equivalence of Cost Minimization and Constrained Output Maximization
Convexification of Input Requirement Sets and Competitive Production
Recovery of Production Function and Cost Functions from Each Other
Characterization of Cost Functions:
Positive
Nondecreasing in Output and Factor Prices
Homogeneous Degree One in Factor Prices
Concave in Factor Prices
Relationship Between Isocost Curves (in the Factor Price Plane) and Isoquants

VII. PROFIT MAXIMIZATION AND SUPPLY

a.Long R un Profit Maximization and Supply

Long Run Profit Maximization (Graphical Illustration and Algebraic Formulation)
First Order Conditions and Interpretation
Second Order Condition (Increasing Marginal Cost)
The Long Run Supply Function of the Firm
Properties:
Increasing in Price, Nonincreasing in Factor Prices
Scale Invariant in Output and Factor Prices
Long Run Elasticity of Supply
Cobb-Douglas Example
The Long Run Profit Function
Properties:
Increasing in Price, Nonincreasing in Factor Prices
Homogeneous of Degree One in All (Output and Factor) Prices
Convex in Output and Factor Prices
Cobb-Douglas Example
Identity Linking the Long Run Profit and Supply Functions

b. Short Run Profit Maximization and Supply

The Three Relevant Regions and the Shut Down Decision
Illustration in Terms of STC and SVC Curves
Illustration in Terms of SATC and SAVC Curves
The Short Run Supply Curve of the Firm
The Short Run Supply Function of the Firm
Properties:
Increasing in p, Nonincreasing in (w,r)
Scale Invariant in (p,w)
Effects of Changes in $\overline{K}$
Short Run Elasticity of Supply
Cobb-Douglas Example
The Short Run Profit Function
Properties
Increasing in p, Nonincreasing in (w,r)
Homogeneous Degree One in (p,w,r)
Convex in (p,w,r)
Effects of Changes in $\overline{K}$
Cobb-Douglas Example
Identity Linking the Short Run Profit and Supply Functions
Comparison of Short Run and Long Run Profit Functions
Comparison of Short Run and Long Run Supply Elasticities

c. Factor Demand Functions

Maximizing Profits by Choosing Optimal Input Levels
Marginal Value Product of a Factor of Production
Short Run Factor Demand
First Order Condition for Short Run Profit Maximization
Short Run Factor Demand Functions
Nonincreasing in Own Factor Price
Scale Invariant in Output Price and Prices of Variable Factors
Relation to Short Run Supply Function
Long Run Factor Demand
First Order Conditions for Long Run Profit Maximization
Long Run Factor Demand Functions
Nonincreasing in Own Factor Price
Scale Invariant in Output Price and Factor Prices
Relation to Long Run Supply Function
Relation to the Profit Function
Properties:
Nonincreasing in Own Price
Scale Invariant in (p,w,r)
Symmetric Cross Factor Price Effects

Demand for Insurance

b. Subjective Uncertainty

States, Events, Outcomes and Acts

c. **Intertemporal Production: The Demand for Capital**

Two-Period Illustration

Finite-Period Production and Investment

Continuous Time Production: When to Cut a Tree

d. **Relationship between Rental Market and Sales Market for Capital**

X. SPECIFICATION AND ESTIMATION OF DEMAND, COST AND SUPPLY

a.P **arametric Estimation of Demand Systems**

b. **Parametric Estimation of Production and Cost Systems**

c. **Nonparametric Testing of the Maximization Hypothesis**