

UNIVERSITY OF COLORADO
BOULDER, COLORADO

Economics 4868:
Optimization and Simulation Modeling in Microeconomics

James R. Markusen
e-mail:

August 2015

The idea behind the course is to translate economic ideas and models that are dealt with graphically and algebraically into computable, solvable simulation models. I am hoping that this will prove to be fun as well as really solidifying people's understanding of economics. We will be able to try out ideas and scenarios in order to see the quantitative effects of changes to the economy. These could include taxes and subsidies, environmental externalities, income redistribution policies, international trade restrictions and liberalizations, public goods and so forth. We will learn how to dump simulation output to excel and create graphics.

The course will use a software package called GAMS (general algebraic modeling system), a demo version which is downloadable for free - and large enough for anything we will be doing. It is already installed on all the machines in the Econ building undergraduate computer lab. GAMS is widely used by economists and engineers for optimization problems and for solving systems of equations and inequalities (e.g., GAMS is used by engineers for refinery scheduling programs, by logistics managers for airlines and shipping companies).

Look for the file "Welcome to GAMS" on my personal website for downloading and installing the software. I hope you will find it fairly easily. You can find this at:

<http://spot.colorado.edu/~markusen>

Then click on "Teaching" on the left menu

Then under "Simulation Modeling in Microeconomics", click on "GAMS Chapter 1 2012 (Jensen)"

7. Maximizing utility subject to a budget constraint
 - formulated as an nlp
 - formulated as an mcp using the KKT (first-order) conditions
 - interpreting marginals as shadow values and Lagrangean multipliers
 - deriving Marshallian demand functions
 - deriving Hicksian demand functions, expenditure function

8. Introduction to general equilibrium modeled as a complementarity problem: Notes2
Intro2.pdf, Part B
 - conditions for equilibrium: zero profits, market clearing, income balance
 - micro consistency

9. A basic two-good, two-factor general-equilibrium model: Notes3
model M21.gms
 - assessing and interpreting counter-factuals

10. Variations on the basic model
 - specific factors of production, income distribution
 - slack activities; e.g., solar and wind power unprofitable at market prices
 - labor-leisure choice
 - two households with different preferences, income distribution

11. Industrial organization, games, operations research, econometrics: Notes4
 - simple monopoly
 - free entry and exit
 - Cournot and Bertrand duopoly
 - games with discrete strategies
 - classic operations-research problem: logistics supply optimization
 - classic econometrics problem: constrained non-linear least squares as an NLP

11. Taxes, distortions, public goods and bads: Notes6
 - benchmarking with taxes
 - labor supply and distortionary income taxes
 - equal-yield tax reform with endogenous labor-leisure choice
 - modeling a public good
 - endogenous, optimal provision of the public good
 - modeling public infrastructure goods
 - pollution externality

12. Open (trading) economy models: Notes8
modeling a small open economy
tariffs versus real trade costs
small economy with a benchmark tariff
quantitative restriction such as a quota
modeled as an endogenous tax equivalent
modeled as a license: an artificial commodity

Policies, Etiquette

E-mail policy: you may email me with small questions, but I tend not to answer questions that have been answered twice in class. *You are responsible for what is presented in class, including revisions to the syllabus and changes in mid-term dates.* Much of my communication with you will be via class email.

Class attendance policy: Since there is no textbook and we are making things up as we go along, class attendance is mandatory.

Athletics, clubs events, religion, weddings, etc. policy: all these things are known well ahead of time. If you have a conflict with an exam, tell me this week or forever hold your peace. I really have to insist that all absences including minor illnesses count as missed classes. That's the nature of this course.

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and www.Colorado.EDU/disabilityservices Disability Services' letters for students with disabilities indicate legally mandated reasonable accommodations. The syllabus statements and answers to Frequently Asked Questions can be found at www.colorado.edu/disabilityservices

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, { {insert your procedures here} } See full details at http://www.colorado.edu/policies/fac_relig.html

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See policies at <http://www.colorado.edu/policies/classbehavior.html> and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

The University of Colorado at Boulder policy on Discrimination and Harassment, the University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships apply to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH, the