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Economics 392M
Statistics and Scientific Computation 395
Computational Economics
Spring 2014

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<http://www.utexas.edu/cola/depts/economics/faculty/dak2>

Office Hours
MWF 11-12

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This course provides an introduction to computational economics for graduate students. It will cover the application of computational methods to economic models in fields such as sectoral economics, environmental economics, macroeconomics, financial economics, growth theory and others. The computational methods will include both simulation and optimization approaches as well as databases. A variety of computer languages will be used including MATLAB, GAMS and Mathematica.

Previous knowledge in economics, mathematics and computational methods is useful though strength in one or two of these areas can more than accommodate for little or no background in one or two of the others.

There are weekly computer exercises as well as two short papers, one due at mid-term and the other due near the end of the term.

The textbook for this course is

Kendrick, David A., P. Ruben Mercado and Hans M. Amman, *Computational Economics*, Princeton University Press, Princeton, New Jersey, 2006.

The web site associated with the book is

<http://www.laits.utexas.edu/compeco/>

This site has pointers to input files for most of the models that we will be using in the course, to the software packages, etc.

Also, there are two packets of materials for this course at Central Duplicating in GSB 3.136. The first is a collection of articles and the second is some chapters from the *User's Guide* for the Duali software.

You should buy the first packet. The second packet is optional. There is a version of it available on the Web and you can find it by going to

<http://www.utexas.edu/cola/files/405607>

Also you may want to access the first seven chapters from my *Stochastic Control for Economic Models (2nd Ed)* book. They are available on my web site for reading online or downloading at

<http://www.utexas.edu/cola/depts/economics/faculty/dak2>

Also some of the materials for the course can be found at the web site for the course which is

<http://www.laits.utexas.edu/compeco/Courses/index392.html>

Due to health problems Yumin will be delayed slightly in returning to Austin at the start of the spring semester. However, the web site above will serve well until he has time to return and update it. The dates will be off a little but the order of topics we will cover this year is the same as last year.

Optional Texts

See DK about gaining access to these.

1. Kendrick, David A. (1990), *Models for Analyzing Comparative Advantage*, Kluwer Academic Publishers, Dordrecht, The Netherlands.
2. Judd, Kenneth L. (1998), *Numerical Methods in Economics*, M.I.T. Press, Cambridge, MA.
3. Amman, Hans M., David A. Kendrick and John Rust (Eds) (1996), *Handbook of Computational Economics*, North-Holland Publishing Co., Amsterdam.
4. Brooke, Anthony, David Kendrick, Alexander Meeraus and Ramesh Raman (1998), *GAMS: A Users Guide*, available from the GAMS Development Corporation at

<http://www.gams.com>

Outline

I. First Pass

Growth

1. Chakravarty in Excel
2. Chakravarty in GAMS

Transportation and Industrial Modeling

1. Transportation Model in GAMS
2. Small Mexican Steel

Databases

1. U.S. Data in Access

Financial Modeling

1. Portfolio Model in MATLAB

Agent Based

1. Agent-Based Models in MATLAB

Game Theory

1. Genetic Algorithms and Evolutionary Games in MATLAB

II. Second Pass

Financial Modeling

1. Genetic Algorithms and Portfolio Models in MATLAB

Dynamic Optimization

1. Dynamic Optimization in MATLAB

Personal Financial Planning

1. Thrift Model in GAMS

Macroeconomics

1. Hall and Taylor in GAMS
2. Taylor Multicountry Model in GAMS

Environmental

1. Global Warming in GAMS

Partial Equilibrium Models

1. Partial Equilibrium in Mathematica

Computable General Equilibrium

1. CGE Models in GAMS

Control Theory

1. Deterministic Control in Duali
2. Stochastic Control in Duali

Neural Nets

1. Neural Nets in Excel

Big Data

1. Using Python is Scrape Data from the Web

Reading List

I. First Pass

Growth

1. Chakravarty in Excel
KMA Ch. 1 “Growth Model in Excel”
2. Chakravarty in GAMS
Notes in Packet #1
Chakravarty, S. (1962), "Optimal Savings with a Finite Planning Horizon," *International Economic Review*, September, Vol. 3, pp. 338-355.

Transportation and Industrial Investment

1. Transportation Model in GAMS
KMA Ch. 4 “Transportation in GAMS”
2. Small Mexican Steel
Kendrick, Meeraus and Alatorre, The Planning of Investment Programs in the Steel Industry, Johns Hopkins University Press, Baltimore.

Databases in Access

1. U.S. Data
KMA Ch. 5 "Databases in Access"

Financial Modeling

1. Portfolio Model in MATLAB
KMA Ch. 7 “Portfolio Model in MATLAB”

Agent Based

1. Agent-Based Models in MATLAB

Game Theory

1. Genetic Algorithms and Evolutionary Games in MATLAB
KMA Ch. 11 “Genetic Algorithms and Evolutionary Games in MATLAB”

II. Second Pass

Financial Modeling

1. Genetic Algorithms and Portfolio Models in MATLAB
KMA Ch. 12 “Genetic Algorithms and Portfolio Models in MATLAB”
KMA Ch. 14 “Agent-based Models in MATLAB”

Dynamic Optimization

1. Dynamic Optimization in MATLAB
KMA Ch. 16 “Dynamic Optimization in MATLAB”

Personal Financial Planning

1. Thrift Model in GAMS
KMA Ch. 6 “Thrift in GAMS”

Macroeconomics

1. Hall and Taylor in GAMS
2. Taylor Multicountry Model in GAMS
Mercado and Kendrick (1997), "TAYGAMS: John Taylor's Two-Country Model in GAMS" - in Packet #1

Environmental

1. Global Warming in GAMS
KMA Ch. 15 “Global Warming in GAMS”
Anantha Duraiappah (1993), *Global Warming and Economic Development*, Kluwer Academic Publishers, Dordrecht, The Netherlands.

Partial Equilibrium Models

1. Partial Equilibrium – Ch. 3 in KMA

Computable General Equilibrium

1. CGE Models in GAMS
KMA Ch. 8 “General Equilibrium Models in GAMS”
use Orani and also Seung Rae Kim’s model

Control Theory

1. Deterministic Control in Duali
Use this software to learn some Windows programming.
Amman, Hans M. and David A. Kendrick, "The Duali/Dualpc Software for Optimal Control Models: User's Guide" Center for Applied Research in Economics, TP 92-03, revised Dec. 1999 - in Packet #2

Ch. 4 model from Kendrick (2002), *Stochastic Control for Economic Models*, 2nd Ed., available

at <http://www.eco.utexas.edu/faculty/Kendrick>
Also in Packet #3.

2. Stochastic Control in Duali

KMA Ch. 17 “Stochastic Control in Duali” Sections 3 thru 6

OLF from Ch. 6 of *Stochastic Control* book

MacRae model from Ch. 7 of *Stochastic Control* book

CE vs OLF – paper by Amman & Kendrick in packet

or find it at the Computational Economics journal

web site beginning from the Springer web site at

<http://www.springerlink.com>

Mitigation of the Lucas critique – paper by Amman and

Kendrick in the packet or find it at the Elsevier web

site for the JEDC journal beginning from

<http://www.sciencedirect.com>

Neural Nets

1. Neural Nets in Excel

KMA Ch. 2 "Neural Nets in Excel"

Schedule

Jan	15	<p>Lecture</p> <p>KMA Ch. 1 “Growth Model in Excel”</p> <p>Chakravarty model in GAMS – notes in packet</p> <p>Mercado, Lin and Kendrick – multi-sectoral growth model</p> <p>KMA Ch. 4 “Transportation in GAMS”</p> <p>Small static Mexican steel model.</p>
Jan	22	<p>Lab Preparation</p> <p>Chakravarty growth model in Excel</p> <p>Chakravarty growth model in GAMS</p> <p>Multi-sectoral growth model in GAMS</p> <p>Transport model in GAMS</p> <p>Small Mexican steel model in GAMS</p> <p>Lab</p> <p>modify and solve either (1) the Chakravarty growth model in Excel or GAMS, (2) the multi-sectoral growth model in GAMS or (3) the transport model or the small static Mexican steel model in GAMS</p>
Jan	27	<p>Lecture</p> <p>KMA Ch. 5 "Databases in Access"</p> <p>KMA Ch. 7 “Portfolio Model in MATLAB”</p> <p>Also we will use as an alternative the portfolio model in GAMS in App. 7C.</p> <p>Lab</p> <p>Database in Access</p> <p>Portfolio model in MATLAB and in GAMS</p> <p>Due</p> <p>Exercise on (1) the Chakravarty growth model in Excel or GAMS, (2) the multi-sectoral growth model, (3) the transport model or (4) the small static Mexican steel model.</p>
Feb	3	<p>Lecture</p> <p>Agent-based Models</p> <p>KMA Ch. 14 “Agent-based Models in MATLAB”</p> <p>Lab</p> <p>Agent-based Model in MATLAB</p> <p>Due</p> <p>Exercise on database systems or portfolio model.</p>

Feb	10	<p>Lecture</p> <p>KMA Ch. 11 “Genetic Algorithms and Evolutionary Games in MATLAB”</p> <p>KMA Ch. 12 “Genetic Algorithms and Portfolio Models in MATLAB”</p> <p>Lab Preparation</p> <p>Genetic Algorithms in evolutionary games or in portfolio models</p> <p>Lab</p> <p>Genetic Algorithm in evolutionary games or in portfolio example in MATLAB</p> <p>Due</p> <p>Exercise on agent based models.</p>
Feb	17	<p>Lecture</p> <p>QLP from Ch. 2 of Kendrick <i>Stochastic Control for Economic Models</i> book</p> <p>KMA Ch. 16 “Dynamic Optimization in MATLAB”</p> <p>Lab Preparation</p> <p>MATLAB for QLP</p> <p>Lab</p> <p>MATLAB</p> <p>Due</p> <p>Exercise on genetic algorithms applied to either evolutionary games or to portfolio models.</p>
Feb	24	<p>Lecture</p> <p>Financial Modeling from Michael Evanchik and Genevieve Solomon</p> <p>KMA Ch. 6 “Thrift in GAMS”</p> <p>Hall and Taylor Model in GAMS – KMA Ch. 13 “Macroeconomic in GAMS”</p> <p>Lab</p> <p>Student Financial Model in GAMS</p> <p>HTGAMS</p> <p>Due</p> <p>Exercise on QLP in MATLAB</p>
Mar	3	<p>Lecture</p> <p>Environmental Models - Nordhaus and Duraiappah</p> <p>KMA Ch. 15 “Global Warming in GAMS”</p> <p>Lab</p> <p>Nordhaus DICE Model in GAMS</p> <p>Due</p> <p>Short Paper A</p>
Mar	10	Spring Break

Mar	17	<p>Lecture</p> <p>CGE Models –</p> <p>KMA Ch. 3 – Partial Equilibrium</p> <p>KMA Ch. 8 “General Equilibrium Models in GAMS”</p> <p>Lab</p> <p>Partial Equilibrium Models in Mathematica</p> <p>General Equilibrium Model in GAMS</p> <p>Due</p> <p>Exercise on the thrift model or on the Hall and Taylor Model in GAMS or the Global Warming Model</p>
Mar	24	<p>Lecture</p> <p>Deterministic Control in Duali</p> <p>KMA Ch. 17 “Stochastic Control in Duali” Sections 1 and 2</p> <p>Lab</p> <p>Abel in Duali</p> <p>Hall and Taylor in Duali</p> <p>Due</p> <p>Nothing</p>
Mar	31	<p>Lecture</p> <p>Stochastic Control in Duali</p> <p>OLF from Ch. 6 of <i>Stochastic Control</i> book</p> <p>MacRae model from Ch. 7 of <i>Stochastic Control</i> book</p> <p>Duali User’s Guide, Ch. 5 “Open Loop Feedback without Updating”</p> <p>KMA Ch. 17 “Stochastic Control in Duali” Sections 3 thru 6</p> <p>Lab</p> <p>MacRae in Duali or Taylor in Duali</p> <p>Due</p> <p>Exercise on the partial equilibrium or the general equil models. Abel or Hall and Taylor in Duali</p>
Apr	7	<p>Lecture</p> <p>Tom Roderick on retrieving big data from the Internet</p> <p>Lab</p> <p>Using Python code to automatically download pdf files from the Internet</p> <p>Due</p> <p>Exercise on MacRae or Hall and Taylor or other stochastic control model with parameter uncertainty in Duali.</p>

- Apr 14 Lecture
KMA Ch. 2 "Neural Nets in Excel"
Lab
Neural net example in Excel (turn in during lab)
Due
Exercise on downloading pdf files from the Internet
- Apr 21 Lecture
John Taylor's multicountry models
Intro to John Taylor's Rational Expectations Model
KMA Ch. 18 "Rational Expectations Macro in Duali"
Sections 1 and 2
Taylor Model in GAMS
Due
Short Paper B
- Apr 28 Lecture
Quarterly Fiscal Policy
Counterfactual Paper
Monte Carlo Results Paper

Standing on the Shoulders

In addition to the GAMS Library there are model files available for a number of other studies. These are available from David Kendrick. These files include

CHUNG	Korean Macroeconomics
DURA	Global Warming
HATHEWAY	U.S. Japan Macro Policy Coordination
LETSON	Water Pollution Control
LOFGREN	Egyptian Agriculture
PARASUK	U.S. Macro and Control Theory

Also, there are more than thirty example models available in the Duali software. These models and the GAMS models offer a good starting point for the development of your own model.

Since there are a considerable number of weekly exercises (experiments), you can claim a “skip” on one of them during the semester by turning in that week a sheet with only your name the experiment name and the word “skip” on it. If you do not use the skip then the last exercise will be entered as skipped on the grade spreadsheet.

The University has a relatively new policy which permits the assignment of plus and minus grades in graduate classes. I plan to make use of that option this spring.

Grades

1. Short Paper A	35
2. Exercises	30
3. Short Paper B	<u>35</u>
Total	100

I will make myself available to discuss appropriate academic accommodations that you may require as a student with a disability. Also students with disabilities may request appropriate academic accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities, 471-6259,

<http://www.utexas.edu/diversity/ddce/ssd/>

See the UT Honor Code at:

<http://registrar.utexas.edu/catalogs/gi09-10/ch01/index.html>

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.