

OREGON STATE UNIVERSITY
Department of Economics
Spring 2009

ECON 463/563: EFFICIENCY AND PRODUCTIVITY ANALYSIS (4 HRS)
TR 10:00-11:50, CORD 3121

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TR 2-3:30 or by appt. or email

- How can we include changes in environmental quality when we measure productivity?
- Who is the best running back of all time?
- How do we measure productivity in the public sector? In the services?
- Does unionization help or hurt productivity?

This course provides methods to answer the questions raised above as part of our overview of how to think about and measure performance, with special focus on efficiency and productivity. This is designed to be a hands on course, in which students will learn how to use recently developed, very user friendly software to compute efficiency and productivity, and what is popularly known as Data Envelopment Analysis (DEA). This allows us to measure efficiency and productivity, benchmark, identify peers, and simulate alternative strategic plans. Students will get to design their own empirical projects (or may replicate/update a previously published paper).

The course is designed for advanced undergraduate or masters students in economics, forestry, finance, business, environmental studies, management, industrial engineering, health and any other discipline where performance measurement is important. It is also a designated WIC course.

1 Measurable Student Learning Outcomes: Econ 463

- Students propose a research question which is related to performance and performance measurement.
- Students use library/computer skills to find and collect appropriate data to address their research question.
- Students employ library skills to identify related literature.
- Students demonstrate their writing and comprehension skills through a review of the literature related to their research question.
- Students demonstrate their ability to apply efficiency and productivity models through a midterm exam.

- Students specify an appropriate model to address their research question.
- Students analyze data using their proposed model using software designed for that purpose.
- Students write a research paper which summarizes their work.
- Students present their papers before their peers.

2 Measurable Student Learning Outcomes: Econ 563

- Students propose a research question which is related to performance and performance measurement.
- Students use library/computer skills to find and collect appropriate data to address their research question.
- Students employ library skills to identify related literature.
- Students demonstrate their writing and comprehension skills through a review of the literature related to their research question.
- Students demonstrate their ability to apply efficiency and productivity models through a midterm exam.
- Students demonstrate their mastery of classical related literature through a take home exam.
- Students specify an appropriate model to address their research question.
- Students analyze data using their proposed model using software designed for that purpose.
- Students write a research paper which summarizes their work.
- Students present their papers before their peers.

WIC requirements If you are taking this as a WIC (writing intensive course) course, note that this means that your final project is required to be at least 2500 words. In addition, all of your written assignments combined must be at least 5000 words.

Graduate students (those taking the course as 563) will have additional readings (see the attached detailed assignments) and will have a different midterm exam than the 463 students.

3 Prerequisites

For those taking the course as ECON 463, ECON 201 and 202 are required. Although intermediate microeconomics (ECON/AREC 311) is recommended for those taking the course for undergraduate credit, it is not required. Students who have not had this course should get permission from the instructor to take the course.

Graduate students (those taking the course as 563) are required to have Economics 512.

4 Text

- OnFront, Reference Manual. (may be downloaded from my Web Page)
- T.J. Coelli, D.S.P. Rao, C.J. O'Donnell and G.E. Battese, *An Introduction to Efficiency and Productivity Analysis*, second Edition, Springer 2005.
- Wayne C. Booth, Gregory G. Colomb and Joseph M. Williams, *The Craft of Research*, 2nd edition, The University of Chicago Press, 2003.

Other references:

- M. Farrell, 'The Measurement of Productive Efficiency,' *Journal of the Royal Statistical Society, Series A*, 1957, 120(3):253-290.
- A. Charnes, C. Cooper, and E. Rhodes, 'Measuring the Efficiency of Decision Making Units,' *European Journal of Operational Research* 1978, 2:429-444.
- Tim Anderson at Portland State University has helped set up a DEA home page:
<http://www.emp.pdx.edu/dea/homedea.html>
Download the Introduction to DEA.
- *Data Envelopment Analysis: A Technique for Measuring the Efficiency of Government Service Delivery*, Australian government productivity commission, 1997. Can be downloaded from:
<http://www.pc.gov.au/>
search under publications for Productivity, then for the Data Envelopment Analysis title. Sections 1-3 are a nice overview.
- See also links on my Home Page.
- A. Charnes, C. Cooper, A. Lewin and L. Seiford, eds., *Data Envelopment Analysis: Theory, Methodology and Applications*, Kluwer-Nijhoff, 1994.
- R. Färe and S. Grosskopf, *New Directions: Efficiency and Productivity*, Kluwer Academic Publishers, 2004.
- R. Färe and S. Grosskopf, *Intertemporal Production Frontiers: with dynamic DEA*, Kluwer Academic Publishers, 1997.
- H. Fried, C.A.K. Lovell, and S. Schmidt, *The Measurement of Productive Efficiency: Techniques and Applications*, Oxford University Press, Oxford, 1993, 160-194.

5 Evaluation of Student Performance

- Preliminary Reports and Proposal..... 25%
- Midterm Exam (April 24).....25%
- Programming Projects..... 10%
- Written Project (June 14)..... 30%
- Presentation10%

There will also be ungraded in-class written assignments.

6 Classroom Policies

Please see the OSU Student Conduct website: <http://oregonstate.edu/admin/stucon/achon.htm>

OSU Policy on Students with Disabilities:

'Accommodations are collaborative efforts between students, faculty and Services for Students with Disabilities (SSD). Students with accommodations approved through SSD are responsible for contacting the faculty member in charge of the course prior to or during the first week of the term to discuss accommodations. Students who believe they are eligible for accommodations but who have not yet obtained approval through SSD should contact SSD immediately at 737-4098.'

7 Project

Your project is the main focus of this course. Most of the assignments in the course are intended to focus on your project. This will require full participation on your part—you will be expected to write up a project proposal, write summaries of papers related to your project—which will be part of your literature review, write up a description of your method, data and results, and finally revise these and put all this together as a research paper. We will have you present your work as we proceed through the quarter. The programming projects will be in-class, hands-on exercises in which you compute efficiency/productivity for a data set which we will provide. You write up your results. We will teach you how to use OnFront, which is software for computing efficiency and productivity, and which will be available in the undergraduate computer lab.

Topics for your project should be related to your interests. You may undertake your own efficiency study—collect data, compute efficiency and write up and present your results along with related studies. Or you may survey applications in the area of your interest. You may also address computational or conceptual issues related to efficiency and productivity such as the effect of noisy data on DEA results. You may also replicate and extend an existing study you are interested in. Students taking the course for graduate credit should write up their projects as if they were to be submitted to a journal for publication.

FIRST ASSIGNMENT: LITERATURE SEARCH

For this assignment, you are required to do a literature search on a topic you are interested in for your project. This is best achieved online. You should try to find any literature that uses efficiency/productivity techniques, especially DEA (Data Envelopment Analysis). Your assignment is to hand in a list of the articles that you found related to your topic. This will be the basis for your literature review and reference list. See links on my home page. We will also meet with the librarian in charge of business and economics for guidance in how to conduct a literature and data search.

SECOND WRITTEN ASSIGNMENT: PROPOSAL

This assignment is meant to get you started and should be useful in writing your introduction for the final project. It should tell us what you propose to do in your project. You should include the following:

- a statement of your proposed research question
- motivation for your topic
- brief discussion of how you plan to address your research question including method and data.
- list of at least one related reference based on EconLit or DEA bibliography search

THIRD WRITTEN ASSIGNMENT: PAPER REPORT

Your paper report should be a summary/critique of efficiency or productivity studies in the area in which you are interested and should be on the order of three typed pages. This will eventually be (part of) your literature review. Please include a copy of the main paper(s) you are reviewing with your report. I hope to have everyone present at least one of the papers you are using in your project, so be prepared with hand-outs. The paper(s) you are reviewing should be from your literature search list or may be chosen from the Charnes et al book, the Fried, et al book, or from the list compiled by Tim Anderson at Portland State. You may, of course, include other related articles you may find. The Charnes et al book also has an extensive bibliography of DEA studies. I have a number of papers available as well which you are welcome to borrow. In terms of specifics, you should include in your paper summary the following

- full citation of the article, including authors, title, journal, issue, date, pages, etc. (this will ultimately be part of your bibliography for the project)
- statement of the research question
- summary of model, data and results

- relationship to your proposed study.
- copy of the paper being reviewed
- Do not plagiarize!

FOURTH WRITTEN ASSIGNMENT: MODEL Again, this is designed to be part of your final project. You should include a discussion of the method you will use (eg., DEA), and your model specification (inputs and outputs). You should include the particular efficiency/productivity model you are using (eg, the definition of F_o if that is what you are using, along with an explanation of that definition. A Figure may be helpful here. Also include (i.e., write out) the linear programming problem you will be solving. If you have trouble doing this with your word processor, you may write out formulas by hand.

FIFTH WRITTEN ASSIGNMENT; DATA DESCRIPTION Tell us about your data. Include the data source, and a table (or figure if that works better) with descriptive statistics of your variables. For a single period, a table with means, st. dev and min and max should be fine. For those of you doing productivity studies, it would be helpful to have a table with the average annual growth rates of each variable over time. Or include a figure like the one we use for reporting productivity results. If you have your results at this point, you may also include these, along with a discussion of the results, especially in terms of how they relate to your research question.

FINAL WRITTEN ASSIGNMENT: FINAL PROJECT

I would expect your project to be something on the order of 15-20 typed, double-spaced pages including tables and bibliography. The WIC requirement is that the paper should be at least 2500 words. You should be able to use your earlier written assignments to put your final project together:

- Introduction (based on your first two assignments: include research question, motivation and how you plan to address your question.) 10 pts
- Review of the literature (based on your first and third assignments. Include full citations in your bibliography, and tell us how the paper(s) relate to your research question.) 15 pts
- Method (based on your fourth assignment) Explain what technique you will use to address your research question. 20 pts
- Data and Model (based on your fourth and fifth assignments) Include the model specification and descriptive statistics and data source. 20 pts
- Results: Include tables/graphics summarizing your results and discuss them, in particular with respect to your research question. 25 pts
- Summary/Conclusions In this section you can go back and restate your research question and conclusion based on your results. This is also a good place to think back on the whole project and what you might do differently or do in the future to extend your work. 5 pts
- Bibliography: This should follow standard style book guidelines: complete citations of all the references used in writing your project: authors, title, journal (or other source), date, pages. 5 pts.

In order to satisfy the WIC requirement, your project and the other formal writing assignments should be at least 5000 words. Your project should be at least 2500 words. You should also include copies of all the papers that you cite. Be careful in your report not to plagiarize—use your own words or directly cite your source using quotations.

If you wish to have another chance to revise your final draft, it should be handed in Tuesday, May 26. I will give you a provisional grade by Thursday, June 5. If you wish to revise your paper (and possibly improve your project grade), the final version of your project is due during our final exam period, Thursday, June 12.

DATE	TOPIC	ASSIGNMENT
Week 1	Introduction	Introduction to DEA
	Review of Producer Theory	OnFront, Ch. 2 (download from my homepage) Ch 1 and sec 3.1-3.3 in Ch 3 of Coelli et al skim Ch 1-5, <i>The Craft of Research</i> 563: Ch 2 in Coelli et al
Week 2	4/7 Library Visit, Autzen Review of Producer Theory	OnFront, Ch. 2 Ch 1 and sec 3.1-3.3 in Ch 3 of Coelli et al
	4/9 Results of literature search due	
Week 3	Efficiency and DEA	M. Farrell (1957) (463 and 563 students) Charnes, Cooper and Rhodes (1978) (563 students) sec 3.4, skim Ch 5 of Coelli et al skim Part IV of <i>The Craft of Research</i> 563: Ch 6 Coelli et al
	4/16 Project Proposal Due	
Week 4	Efficiency and DEA 4/23 ***MIDTERM EXAM***	In Class Computer Demo Thurs, April 23
Week 5	More DEA	OnFront
	Productivity and DEA 4/28 Paper Report Due	grad students: Ch 7 Coelli et al OnFront and Coelli et al, Ch. 3, 67-82 presentations (Review of Literature)
Week 6	Productivity and DEA	OnFront and Ch 11.1-11.3, Coelli et al
Week 7	5/12 Model Description Due	In class productivity prog. problem
Week 8	5/19 Data Description Due	presentations
Week 9	Computational and Modeling Issues	
week 10	Present Results/draft	
	Present Results/draft	
Thurs, June 11	***Final Version of Projects Due**	