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Center for International Education
NONG LAM UNIVERSITY

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THEORY AND PRACTICE OF EFFICIENCY & PRODUCTIVITY MEASUREMENT: STATIC & DYNAMIC ANALYSIS

Subal Kumbhakar, Christopher F. Parmeter,
Spiro Stefanou, and Alfons Oude Lansink

9-13 and 16-20 January 2017

Course organized by the Center for International Education
NONG LAM UNIVERSITY, Ho Chi Minh City, Vietnam

In collaboration with
WAGENINGEN UNIVERSITY, the Netherlands

Introduction & objectives of the course

Productivity growth entails changes in scale, efficiency gains and technological change. Innovations are needed to keep pushing the competitive envelope, and efficiency gains are needed to ensure that implemented technologies achieve their potential. Conventional economic approaches assume that all firms operate rationally and efficiently. This course, however, challenges this assumption and presents concepts, models and tools needed to analyze and quantify the levels of inefficiency and productivity at a point in time and their movement over time.

The course is designed to bridge the gap between theory and practice. It is organized into distinct parts: "Parametric, Static Approaches" (Week 1) and "Dynamic Approaches (parametric and non-parametric)" (Week 2). Participants may enroll for either week 1 or 2, or both weeks. Although each week is independent, participants are encouraged to take both weeks.

Course activities

The course consists of theory and method sessions in the morning followed by an afternoon practicum session. The practicum will include applications of the theory, computer analyses with actual data sets, and interpretations in practice. Applications to various economic sectors will be considered such as agriculture, banking and finance, chain management, health, electrical power generation, and sports. Extensions of these models will be addressed that measure the efficiency of value chains, characterize the dynamic linkages in decision making, and introduce hybrid nonparametric-parametric approaches.

Week 1 (9 - 13 January 2017): Parametric Efficiency and Productivity Analysis

Instructors:

Professor Subal C. Kumbhakar, Binghamton University (SUNY, USA)

Professor Christopher F. Parmeter, University of Miami (USA)

Participants will be introduced to a set of parametric models for efficiency and productivity estimation with applications that illustrate the use of each of the models. The applications will include production, cost, distance functions, etc. Special emphasis will be given to modeling and estimating production/cost efficiency models using the stochastic frontier (SF) approach. Stata programs will be used in the computer LAB sessions. By the end of the class participants will be able to undertake research projects on the efficiency and productivity measurement. Many of the course materials are based on "A Practioner's Guide to Stochastic Frontier Analysis Using Stata" (Cambridge University Press, 2015).

Week 2 (16– 20 January 2017*)*: Dynamic Efficiency and Productivity Analysis

Instructors:

Professor Spiro Stefanou, University of Florida (USA)

Professor Alfons Oude Lansink, Wageningen University (Netherlands)

The dynamic efficiency course presents nonparametric approaches (e.g. Data Envelopment Analysis) to measuring efficiency and productivity. These concepts are extended to measuring dynamic efficiency and productivity both parametrically and non-parametrically. The sources of economic dynamics include: i) economic forces (e.g., adjustment costs and financial constraints), ii) technological characteristics (e.g., physical/biological nature of production, and vintage investment/stock non-convexities like we see with lumpy investment), and iii) cognitive capacity (e.g., learning to adapt to new asset levels).

Objectives

Participants will learn the theories concerning efficiency and productivity measurement and will develop proficiency with software to facilitate the initiation of their own research in efficiency and productivity measurement. The course deals with both conceptual and methodological issues.
In particular, participants will understand the following from either course:

- Sources of efficiency from the perspective of technical feasibility, allocating scarce resource among competing ends, and the firm scale of operations;
- The input and output perspectives of technical and allocative efficiency;
- Characterizations of efficiency and productivity growth from a primal, dual and distance function perspectives;
- Decomposition of productivity growth that explicitly accounts for the presence of inefficiency;
- Use DEA models to measure technical, allocative, and scale efficiency levels and productivity growth;
- Characterize definitions of variables of interest to be employed (goods and services; inputs, outputs, environmental, nonmarket goods/services);
- Assess the appropriate use of parametric and nonparametric approaches given the data and problem setting (understanding the advantages and disadvantages of both perspectives);
- Use these approaches to articulate the forces driving efficiency gains and productivity growth;
- Use these approaches for benchmarking, identifying best practice and role models to plan for performance enhancement/gains;

The Dynamic Analysis course will further cover:

- Delineation of variable and quasi-fixed factors and their treatment in efficiency and productivity (Dynamic Course);
- Use econometric approaches to address efficiency and productivity change measurement over time (Dynamic Course).

Target group
The course is oriented toward faculty members, government agencies, researchers, postgraduate students, practitioners, and others with background in any field of economics.

Assumed prior knowledge
Microeconomic theory at the graduate level such as the treatment in H. Varian, Microeconomic Analysis, W.W. Norton. Completion of a course in dynamic optimization is strongly recommended. Econometric theory and applications at the graduate level to include topics in Maximum Likelihood Estimation and System Estimation are required and some exposure to panel data econometrics is desirable.

For the participants who wants to review some basic concepts about the productivity and efficiency as well as the software used for the courses, the organizer will probably set a half-day tutorial, one day before the summer course.

Course Materials

1. Subal C. Kumbhakar and C. A. Knox Lovell, “Stochastic Frontier Analysis”, Cambridge University Press, 2000. (Parametric and Dynamic Course) Reading materials on dynamic production analysis prepared by the authors will be sent to participants in advance of course.
2. Subal C. Kumbhakar, Hung-Jen Wang, and Alan Horncastle, “A Practitioner's Guide to Stochastic Frontier Analysis Using Stata”, Cambridge University Press, 2015. http://www.cambridge.org/zw/academic/subjects/economics/econometrics-statistics-and-mathematical-economics/practitioners-guide-stochastic-frontier-analysis-using-stata
3. Christopher F. Parmeter and Subal C. Kumbhakar (2014), "Efficiency Analysis: A Primer on Recent Advances", Foundations and Trends® in Econometrics: Vol. 7: No. 3–4, pp 191-385. http://www.nowpublishers.com/articles/foundations-and-trends-in-econometrics/ECO-023

Participants should make sure they have these books before the course starts (books are not included in participation fee). Articles and other accompanying materials will be distributed during the course.

Language
The course will be taught in English.

Software
Software in the computer lab will be used to solve empirical data sets. (R and/or Stata will be used)

Duration
Two full weeks comprising 2 distinct parts each of which can be taken separately. Each course will involve daily sessions, with a 3-hour theory session in the morning and a 3-hour practicum session in the afternoon.

Course fees

The course fee for each week is USD 500 (VND 11 million for Vietnamese citizen). For those registering for both weeks the course fees are USD 900 (VND 18 million for Vietnamese citizen). The course fee does not include books. It includes additional training material, coffee/tea break, lunches and an informal dinner.

Outline of the Course in Hours (Only for Postgraduate Students)

For each week of the summer course, participants who needs credits (ECTS) will have to make a take home exam, which in turn makes them eligible to obtain the amount of 3 credits (according to ECTS). That means a work load of 84 hours for each part of the summer course and in total 168 hours of preparation, attendance and exam.

Schedule

Week1: Parametric Efficiency & Productivity Analysis Course Schedule and Plan, January 9 – 13, 2017

Day	Lecture	Practicum
1	Objective: Notions of efficiency from a primal perspective will be introduced and the use of both the primal and distance function perspectives will be discussed. The emphasis will be on technical efficiency in a single output framework. (a) Introduction (b) Cross-Sectional Methods i. Distribution Free Methods ii. Maximum Likelihood Methods (d) Estimating Firm-Specific Inefficiency i. Confidence Intervals ii. Tests of Correct Distributional Form	Basics of Stata. Estimation/Inference of Cross-Sectional SF models.
2	Objective: Introduce determinants of inefficiency and model testing. (a) Determinants of Inefficiency i. The Scaling Property ii. Mean versus Variance Effects (b) Skewness i. Tests of Skewness ii. The Wrong Skew Problem (c) Model specification tests (d) Measurement of Technical Change	Estimation of SF models with inefficiency determinants. Model Testings.

3	Objective: Introduce panel SF models and system methods on SF modeling. (a) Panel Data Methods i. Distribution Free Methods ii. Maximum Likelihood Estimation iii. Time Constant Variables (b) System Methods: Introduction	System Estimation/Inference of panel SF models.
4	Objective: Introduce SF cost system models and some alternative models. (a) Cost System Issues i. Input/Output Oriented Inefficiency ii. Fixed Inputs iii. Greene Problem (b) Alternative SF models (mixture models/Zero Inefficiency SF)	Estimation of SF cost system models.
5	Objectives: Multiple outputs, Distance functions, TFP and profitability decomposition, and applications of the stochastic frontier models in other fields. (a)Multiple output technology i. Transformation function models ii. Distance function models (input and output distance functions) (b)TFP and profitability decomposition i.Decomposition using production function ii. Decomposition using cost function iii.Decomposition using input and output distance functions	TFP decomposition two-tier frontier estimation

Week2: Dynamic Efficiency & Productivity Analysis Schedule and Plan, January 16-20, 2017

Day	Lecture	Practicum
1	Establishing Production Technologies • Nonparametric representation of technology (SES) o Axioms o Constructing cost and profit maximization as LP problem • Radial Distance Functions (SES) o Input distance functions o Output distance functions o Duality between input distance functions and Cost function o Duality between output distance functions and Revenue function • Directional Distance Functions (AOL) o Definition and properties o Translation o Duality between Directional Distance function and Cost and Profit functions	Introduction to R for nonparametric analysis Computational approaches to DEA o Constructing nonparametric benchmark technologies o Generating cost and profit maximization problems for actual data using nonparametric technology framework o Generating the nonparametric distance functions for actual cases

2	Characterizing Dynamic Production and Efficiency • Overview (SES) • Defining Dynamic Production Possibility Sets (SES) • Congestion & Weak Disposability (SES) • Dynamic Optimization (SES) • Technical Efficiency measures (AOL) o Graphically piece-wise linear technology o Radial & Directional Distance measures Representing Dynamic Production Possibilities • Input Requirement Set (SES) • Measuring the boundaries with DEA (SES)	Starting Dynamic DEA Application: NY Dairy Farm panel; US electric utility firms panel
3	Representing Dynamic Production Possibilities • Cost Efficiency (AOL) • Dynamic Duality with the directional input distance function (AOL) • Decomposition of cost efficiency (allocative & technical) (AOL) • Efficiency of variable and quasi-fixed factors of production (AOL) Dynamic Econometric Approaches • Stochastic Frontier Estimation (SES) • Dynamic Directional Distance (SES) • Dynamic Dual Approaches (SES)	Operationalizing efficiency concept measurement with Dynamic DEA Application: Variety of panel data sets. Parametric estimation of dynamic stochastic frontiers, dynamic shadow cost function system Application: Using panel of dairy farms; electric utility panel
4	Productivity Growth (SES) • Defining TFP Growth under dynamic adjustment (SES) • TFP growth decompositions (SES) • Nonparametric Approaches (AOL) • Parametric Approaches to: (SES) o Dynamic duality o Dynamic directional distance function	TFP Growth estimates using econometric estimation of o Dynamic Dual system with efficiency o Dynamic Directional Distance Function with efficiency Application: EU country-level panel of food manufacturing

Location

The sessions will be held at Nong Lam University, Quarter 6, Linh Trung Ward, Thu Duc District, Ho Chi Minh City, Vietnam. The exact rooms will be announced later.

Morning sessions:

9.00-12.00 Lecture room {to be determined}

Afternoon sessions:

13.30-17.00 Computer room {to be determined}

Registration

Registration is possible electronically via email. Please email to ngocpham@hcmuaf.edu.vn for registration. In the email, please clearly indicate:

1. Your full name (as appears in your passport)
2. Your institution name/country
3. Course module(s) selected: please indicate only one among of “1. Week 1 only”, “2. Week 2 only”, or “3. Both Sessions)

The maximum number of participants is set at 30, the minimum at 25.
Please make sure that you provide the most recent contact details so that in case of any changes you will be notified promptly. After your internet registration you will receive a short notification that your name has been registered. At least two weeks before the course you will receive a confirmation about the location and the schedule. You will also be sent an invoice to the e-mail address indicated in the registration form.
Please e-mail to ngocpham@hcmuaf.edu.vn in case you have not received the second confirmation two weeks before the course.

Payment for the course fee
Please make your course registration fee paid via bank account transfer to the following bank accounts corresponding to the currencies used. Please choose the correct bank account for your money transfer.

Bank Details:

- Name account**: Nong Lam University**
- Account holder: Nguyen Hay
- Address: Linh Trung ward, Thu Duc District, Ho Chi Minh City
- Bank account number: 31410370001536 ***(for USD)***
- Bank account number: 31410000002377 ***(for VND)***
- Name of bank: Bank for Investment and Development of VietNam - East Sai Gon Branch. (BIDV)
- Address of Bank: 33 Nguyen Van Ba, Thu Duc District, Ho Chi Minh City
- Swift code: BIDVVNVX

Please indicate the purpose of the money transfer is: “Registration fee for EMA 2017 NLU HCMC”

Cancellations
Cancellations may be made free of charge until December 1, 2016. A cancellation fee of 100 % applies if participants cancel the course after December, 2016. The organizers have the right to cancel the course not later than 1 month before the course starts. The participants will be notified of any changes at their e-mail addresses.

Further information
If you require further information about the course content, study materials then please contact the course assistant
Ms. Pham Thi Anh Ngoc
Email: ngocpham@hcmuaf.edu.vn

For details about the logistics, accommodation, registration, fees, etc. please contact

Le Thi Xuan Hoang
Phone: +84 8 3724 6042
Email: xuanhoang@hcmuaf.edu.vn

Or
Nguyen Thi Tra My
Phone: +84 8 3724 6042
Email: nttramy@hcmuaf.edu.vn

Contact addresses:
Center for International Education
Nong Lam University
Quarter 6, Linh Trung Ward, Ho Chi Minh City
Vietnam
Phone: +84 8 3724 6042
Email: cie-nlu@hcmuaf.edu.vn

Useful information on accommodation for participants from outside Ho Chi Minh City

Hotels in Thu Duc District

Viet Thang Hotel – 18 USD for a room (including breakfast)
http://hotelvietthang.com/
39 Star Hotel - 25 USD for a room (including breakfast)
http://www.hotelstar39.com

Hotels in Center of HCMC

Luxury Hotel – 24 USD for a room (including breakfast)
http://luxuryhotel-saigon.com/
Roseland Hotel – 30 USD for a room (including breakfast)
http://www.roselandhotels.com/vi/roseland-inn-hotel.html
Lan Lan 1 Hotel – from 50 – 63 USD for a room (including breakfast, service charge and VAT)
http://www.siverlandhotels.com
Hoang Hai Long Hotel – 53 USD for a room (including breakfast, service charge and VAT)
http://hoanghailonghotel.com
Victory Hotel – 62 USD for a single room; 75 USD for a double room (including breakfast, service and VAT)
http://www.victoryhotel.com.vn/
Continental Hotel – 90 USD for a room (including breakfast, service charge and VAT)
http://continentalsaigon.com/
Majestic Hotel – 122 USD for a single room, 130 for a double room (including breakfast, service charge and VAT)
http://www.majesticsaigon.com/

From Tan Son Nhat (SGN) Airport to Nong Lam University

The easiest way to get to Nong Lam University or HCMC central from Tan Son Nhat International Airport is taking a taxi. It costs about 5-10 USD for taxi to get to the city central depend on which Hotel you will stay. However, to get to Thu Duc District, where Nong Lam University locates (North-Eastern suburban area of HCMC), the taxi will cost about 20-25 USD (one way). The most common taxi brands at Tan Son Nhat Airport/HCMC is Vinasun taxi, Mai Linh taxi, and Airport taxi….