



Course: Linear Programming and Data Envelopment Analysis applied to Public Policy Evaluation

Status: Complementary

Hours: 30 Hours

Credits: 2

Main Objectives:

The purpose of this course is to present to students to the theoretical tools of linear programming tools and Data Envelopment Analysis and its applications in several areas of public policy, notably transportation and education.

Prerequisite: None

Content:

1. Linear Programming

- 1.1. Modeling: Introduction.
- 1.2. Introduction to Linear Programming.
- 1.3. Simplex Method.
- 1.4. Graphic Method.
- 1.5. Problems with inequality restrictions.
- 1.6. Duality: Examples and Applications.
- 1.7. Case Studies. Real applications to problems of planning, programming and operation of logistics and transport systems.
- 1.8. Optimization of computational tools: Solver and R.

2. Data Envelopment Analysis

- 2.1. Production Economics Review.
- 2.2. Introduction to DEA.
- 2.3. DEA with Constant Returns of Scale (CCR).
- 2.4. DEA with Variable Returns of Scale (BCC).
- 2.5. Input and Output Orientation.



- 2.6. Price information and Allocative Efficiency.
- 2.7. Non-Discretionary Variables.
- 2.8. Adjusting for the Environment.
- 2.9. Input Congestion and Treatment of Slacks.
- 2.10. Additional Methods .
- 2.11. Applications in R for efficiency measurement.

3. Method

Lectures, reading of the bibliography with problems lists done by the students and through the use of specific software. Elaboration of final work in the format of scientific article.

Yes, we will use R a Lot!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

4. Objectives

The objective of this course is provide to the graduate students of the Applied Economics Program an understanding of the main concepts and techniques associated to Operational Research and Data Envelopment Analysis also tools to support the elaboration and evaluation of public policies. It emphasizes mathematical modeling, the main algorithms of solution and the use of tools for the resolution of real problems found in practice. It is hoped that students will be able to master the concepts and methods presented, identifying opportunities for research development and application of the concepts of Operational Research and Data Envelopment Analysis in solving countless real problems that arise in logistics, transportation planning and operation, education and other relevant areas of the public sector.



5. Evaluation

A paper in a scientific format to be wrote by the students considering a relevant practical/theoretical problem in LP or DEA.

6. References

6.1. Obligatory:

COELLI, T. J.; RAO, D. S. P.; O'DONNELL, C. J.; BATTESE, G. E. **An Introduction to Efficiency and Productivity Analysis**. 2nd Edition. Springer. 2005.

HILLIER, F.; LIEBERMAN, G. H. **Introduction to Operations Research**. 9th edition. Mc Graw Hill. Stephen P. 2009.

6.2. Complementary:

BOUERI, R.; ROCHA, F.; RODOPOULOS, FABIANA. (ORG). **Avaliação da qualidade do gasto público e mensuração da eficiência**. Brasília: Tesouro Nacional, 2015.

BRADLEY, A. C. H.; MAGNANTI, T. L. **Applied Mathematical Programming**. Reading, Mass.: Addison-Wesley Pub. Co. New York. 1977 (esgotado em versão impressa, disponível online para download em <http://web.mit.edu/15.053/www/>).

FERREIRA, C. M. C.; GOMES, A. P. **Introdução à Análise Envoltória de Dados**. Editora UFV, Viçosa. 2009.

LOESCH, C; HEIN, C. **Pesquisa Operacional: fundamentos e modelos**. Editora da FURB, Blumenau, 1999.

<http://www.r-bloggers.com/linear-programming-in-r-an-lpsolveapi-example/>

ORTÚZAR, J.D.; WILLUMSEN, L.G. **Modeling Transport**. 4th Edition Chichester, John Willey, 2011.



SALLAN, J,M; LORDAN, O; FERNANDEZ, V. **Modeling and solving linear programming with R**. Omnia Science, 2015. Disponível em <http://www.r-bloggers.com/modeling-and-solving-linear-programming-with-r-free-book>

7. Schedule (Note: dates on dd/mm format)

	03/05	10/05	17/05	24/05	31/05	07/06	14/06
Introduction to Modeling and LP	X						
Simplex Method and Graphic Method	X	X					
Problems with inequality restriction		X					
Duality: examples and applications			X				
Case Studies and Optimization: Solver and R			X	X			
Production Economy and Intro to DEA					X		
DEA (CCR) and (BCC)					X		
Input and Output Orientation					X		
Price Information and Efic. Allocative						X	
Adjusting to the environment (Slacks)						X	
Additional methods of measuring efficiency							X
Applications in R					X	X	X