

ECON 463/563: Efficiency and Productivity

Coelli, Rao, Battese,
An Introduction to Efficiency and Productivity Analysis, Kluwer, 1998

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1 Measuring Performance

- Performance of what?

economic activities/decision making units, egs:

- firms
- teams
- schools
- countries
- athletes
- breweries
- recycling programs

- What do we mean by performance?

financial measures, egs:

- profit
- stock price, PE ratio
- cost, revenue (sales)

OR/MGT measures: egs:

- benchmarking
- TQM
- *productivity
- *efficiency
- sustainability
- outcomes
- wins/runs/speed

How do we measure it?

Generally look for a summary measure or 'index'

- nonfrontier methods, egs:
 - traditional index numbers like productivity
 - regression based measures

- frontier methods, egs:
 - *data envelopment analysis (nonparametric)
 - stochastic frontiers (econometric)

Illustration

2 Course Overview

- Review of production theory
- DEA/efficiency
- DEA/productivity
- traditional index numbers

3 Performance Measures: Informal Definitions

- Productivity

total factor productivity (TFP) = all outputs/all inputs

‘bang for the buck’

standard of living

average product

Issue: aggregation

partial factor productivity = single output/single input (eg labor productivity) = y/x

- Relative Technical Efficiency

output technical efficiency = maximum feasible output/observed output (given x)

input technical efficiency = minimum feasible input/observed input (given y)

4 Determining maximum feasible output, minimum feasible input

Feasible production set: All feasible input output combinations given the state of technology.

Formally:

$$S = \{(x, y) : x \text{ can produce } y\} \quad (1)$$

Boundary of S is frontier or best practice which determines maximum output/minimum input. Sometimes called total product curve or production function (for case of single output).

5 Illustrations

- technical efficiency
- productivity
 - technical change

6 Example for DEA: Baseball

	At Bats	Singles	Homeruns
	input	output 1	output 2
Tim	100	40	0
Rolf	100	20	5
Trent	100	10	20

How do we compare performance?
construct best practice frontier
output tech effic= max outputs/observed outputs

7 Modeling Performance: production theory approach

Static Approach		
x	→	y
inputs	technology	outputs
or	or	or
resources	transformation	outcomes
or	or	or
costs	process	revenues

Practice Examples:

1. hospitals
2. universities

What type of inputs or resources would you include?
 What type of outputs or outcomes would you include?