



ΠΑΝΕΠΙΣΤΗΜΙΟ
ΠΑΤΡΩΝ
UNIVERSITY OF PATRAS

Stochastic Frontier Analysis

PhD Candidate: Nikos Rigas

nrigas@upnet.gr

School of Business Administration
Department of Economics
University of Patras

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Theory

Theoretically, a production function gives the maximum possible output with a given set of inputs.

The production function defines a boundary or "frontier", deviations from which can be interpreted as inefficiency. The econometrics of stochastic frontier analysis (SFA) provides techniques for modelling the frontier concept within a regression framework so that inefficiency can be estimated.

The general panel-data regression model for SFA analysis is:

$$y_{it} = \alpha_t + x_{it}\beta + v_{it} - u_{it}$$

v_{it} is a zero-mean symmetric error. u_{it} represents unobserved inefficiency. The symmetric error causes the frontier to be stochastic (aka a bit random). The one-sided inefficiency term u_{it} only reduces output and represents departure from the frontier.

① *What is SFA?*

SFA (introduced by Aigner et al. (1977)) is an econometric approach to efficiency measurement. The basic idea is the introduction of two error components, a random error term and an inefficiency error term. For both terms, a distributional assumption is made, which facilitates maximum likelihood estimation.

② *Same as DEA?*

No! DEA is characterized as nonparametric and deterministic. SFA is stochastic and parametric. Moreover, SFA because it is parametric, allows the coexistence of inefficiencies and random errors, while the DEA, being nonparametric, attributes the total deviation from the frontier to inefficiency.

③ We think of an output production y_i which deviates from the efficient output \hat{y} . We think of deviation u_i resulting from the fact that producer i uses his inputs in an efficient way. Additionally, we think of a random deviation v_i resulting from influences producer i can not control.

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