

# STUDY OF EUROPEAN AIRPORTS' EFFICIENCY ON THE BASIS OF SPATIAL STOCHASTIC FRONTIER ANALYSIS

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## ABSTRACT

The thesis of Dmitry Pavlyuk “Study of European airports’ efficiency on the basis of spatial stochastic frontier analysis”. Scientific consultant Dr.sc.ing., professor Alexander Andronov.

This research is devoted to incorporation of spatial effects into an efficiency estimation methodology and its empirical application to the European airport industry.

The thesis contains a critical review of existing airport benchmarking researches. Modern methodologies of efficiency analysis are discussed and classified, and a wide range of their applications to the airport industry are reviewed. The review is focused on revealing spatial effects in the airport industry, notably spatial heterogeneity and spatial dependence.

The spatial stochastic frontier (SSF) model, incorporating spatial effects, is proposed by the author. The SSF model is stated in a reasonably general form and a number of practically effective private cases of the SSF model are also discussed.

The thesis contains a detailed description of a derived maximum likelihood estimator for the SSF model parameters. The author obtains a distribution law of a composed error term of the SSF model as a private case of the closed multivariate skew normal distribution. A likelihood function for the SSF model’s error term is specified and a related estimator is constructed. Also formulas for estimation of individual inefficiency values are provided in the thesis.

The estimator for the SSF model parameters is implemented as a package for CRAN R software and called *spfrontier*. The package is accepted and published in the official CRAN archive. The derived estimator and the developed package are validated using designed statistical simulation studies and real-world examples.

Empirical analysis of spatial effects in four data sets of European airports is executed. The data sets consist of jointed European airports, and separately Spanish, UK, and Greek airports. The analysis consists of testing of spatial autocorrelation between airports’ partial factor productivity indicators and estimating of alternative specifications of the SSF model. Detailed conclusions on every data set are presented in the thesis.

Main results of the thesis are presented at 8 international scientific and research conferences and reflected in 15 scientific publications.

The thesis consists of introduction, 4 chapters and conclusions. It includes 156 pages, 23 figures, 27 tables in the main body, 18 appendixes and 271 publication titles in the bibliography.