Industrial Engineering Department
Friday Seminar Series

Andrew L Johnson

Associate Professor

Department of Industrial & Systems Engineering at

Texas A&M University

Friday, November 18, 2016 at 10am

L2D2

Regulating Local Monopolies in Electricity Transmission: An Application of Shape Constrained Regression

The Finnish electricity market has a competitive energy generation market and a monopolistic transmission system. To regulate the local monopoly power of network operators, the government regulator uses frontier estimation methods to identify excessive transmission costs, taking into account outputs and the operating environment. We describe the new regulatory system developed for the Finnish regulator, which is based on shape constrained nonparametric functional estimation and utilizes panel data to detect the excessive costs from random noise.

The literature of productive efficiency analysis is divided into two main branches: the parametric SFA and nonparametric DEA. A new method is proposed, Stochastic Nonparametric Envelopment of Data, StoNED, that combines the virtues of both DEA and SFA in a unified approach to frontier analysis. StoNED follows the SFA approach by including a stochastic component. In contrast to SFA, however, the proposed method does not make any prior assumptions about the functional form of the production function. In that respect, StoNED is similar to DEA, and only imposes free disposability, convexity, and some returns to scale specification.

The main advantage of the StoNED approach to the parametric SFA approach is the independence of the ad hoc parametric assumptions about the functional form of the production function (or cost/distance functions). In contrast to the flexible functional forms, one can impose monotonicity, concavity and homogeneity constraints without sacrificing the flexibility of the regression function. Additionally, the main advantage of StoNED to the nonparametric DEA approach is robustness to outliers, data errors, and other stochastic noise in the data. In DEA the frontier is spanned by a relatively small number of efficient firms, however, in our method all observations influence the shape and level of the frontier. Also many standard tools from parametric regression such as goodness of fit statistics and statistical tests are directly applicable in our approach. This is collaborate work with Timo Kuosmanen of Aalto University in Finland.

Biography: Andrew L Johnson is an Associate Professor in the Department of Industrial and Systems Engineering at Texas A&M University. He obtained his B.S. in Industrial and Systems Engineering from Virginia Tech and his M.S. and Ph.D. from the H. Milton Stewart School of Industrial and Systems Engineering from Georgia Tech. His research interests include productivity and efficiency measurement, warehouse design and operations, material handling and mechanism design. He is a member of the INFORMS, National Eagle Scout Association, and German Club of Virginia Tech.