

Fuzzy Total Factor Productivity by Credibility Theory

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Abstract : This paper proposes the method to measure the total factor productivity (TFP) change by credibility theory for fuzzy input and output variables. Total factor productivity change has been widely studied with crisp input and output variables, however, in some cases, input and output data of decision-making units (DMUs) can be measured with uncertainty. These data can be represented as linguistic variable characterized by fuzzy numbers. Malmquist productivity index (MPI) is widely used to estimate the TFP change by calculating the total factor productivity of a DMU for different time periods using data envelopment analysis (DEA). The fuzzy DEA (FDEA) model is solved using the credibility theory. The results of FDEA is used to measure the TFP change for fuzzy input and output variables. Finally, numerical examples are presented to illustrate the proposed method to measure the TFP change input and output variables. The suggested methodology can be utilized for performance evaluation of DMUs and help to assess the level of integration. The methodology can also apply to rank the DMUs and can find out the DMUs that are lagging behind and make recommendations as to how they can improve their performance to bring them at par with other DMUs.

Keywords : chance-constrained programming, credibility theory, data envelopment analysis, fuzzy data, Malmquist productivity index

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