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Multi-criteria Comparison of Hospital Efficiencies Using Nested Radial Data Envelopment Analysis Model

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Abstract: This research proposes a nested radial data envelopment analysis (DEA) model for the comparison of hospitals with multiple criteria. By hybridizing principal component analysis (PCA), DEA, and efficiency contribution measure (ECM) models, the nested radial DEA model can evaluate the hospitals regarding service efficiency and resource utilization with multiple criteria without their weights explicitly specified. In addition, the proposed model can overcome the challenge by the conventional DEA model that fails to distinguish hospitals when the number of criteria is high compared to the number of hospitals to be compared. The proposed model is applied on the New York State hospital comparison problem by providing efficiency scores for each hospital regarding the overall operational efficiency and particular efficiencies including patients' experiences, timely and effective care, complications, readmissions and mortality, and revenue and patient volume. The efficiency scores are compared and analyzed among the hospitals, which illustrate how the hospitals are faring individually with respect to resource utilization vis a vis services delivered. The comparative analysis using the nested radial DEA model provides references for both hospital administrators and policy makers to improve the hospital efficiencies by identifying and improving important and relevant factors.

Keywords: DEA, PCA, Hospital Efficiency