A COMPARISON BETWEEN RADIAL AND NON-RADIAL DATA ENVELOPMENT ANALYSIS (DEA) MODELS: A CASE OF TRAWL VESSELS IN MALAYSIA COASTAL SEAS

(Perbandingan antara Model Analisis Penyampulan Data (APD) Jejari dan Bukan Jejari: Satu Kes Vesel Pukat Tunda di Laut Pantai Malaysia)

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ABSTRACT

In Malaysia, the consumption of fish-based protein is becoming increasingly popular in line with the growing population. However, the mismatch between fish production and the high demand for fish has led to the categorization of the fishing industry in Malaysia as inefficient and in a critical state. Among the factors contributing to this inefficiency are overfishing and the use of destructive vessels such as trawlers. In this study, the objective is to find the efficiency of trawlers for fishing was assessed in 12 coastal areas in Malaysia using two basic approaches with very different characteristics known as radial and non-radial Data Envelopment Analysis (DEA) models. The radial model is represented by the Charnes, Cooper, and Rhodes (CCR) model and the Banker, Charnes, and Cooper (BCC) model while the non-radial model is denoted by the Slack-Based Measure (SBM) model. Furthermore, a comparison of efficiency scores among the models was conducted to assess consistency between them. The Spearman's Rank Correlation test revealed that the CCR and SBM models were significantly highly correlated. This shows that there is no significant difference between the radial model and the non-radial model for this case. The study found that the most efficient Decision-Making Unit (DMU) was Pulau Pinang, while the least efficient DMU was Johor Timur.

Keywords: radial model; non-radial model; consistency; trawlers

ABSTRAK

Di Malaysia, pengambilan protein berasaskan ikan semakin popular seiring dengan pertambahan populasi. Bagaimanapun, ketidakpadanan antara pengeluaran ikan dengan permintaan yang tinggi terhadap ikan telah menyebabkan industri perikanan di Malaysia dikategorikan sebagai tidak cekap dan berada dalam keadaan kritikal. Antara faktor yang menyumbang kepada ketidakcekapan ini ialah penangkapan ikan yang berlebihan dan penggunaan kapal pemusnah seperti pukat tunda. Dalam kajian ini, objektif nya adalah untuk mengukur kecekapan pukat tunda untuk menangkap ikan telah dinilai di 12 kawasan pantai di Malaysia menggunakan dua pendekatan asas dengan ciri-ciri yang sangat berbeza dikenali sebagai model Analisis Penyampulan Data (DEA) jejari dan bukan jejari. Model jejari diwakili oleh model *Charnes, Cooper,* dan *Rhodes* (CCR) dan model *Banker, Charnes*, dan *Cooper* (BCC) manakala model bukan jejari dilambangkan dengan model *Slack-Based Measure* (SBM). Seterusnya, perbandingan skor kecekapan diantara model dikira untuk melihat keseragaman diantara model. Ujian Korelasi Pangkat Spearman mendedahkan bahawa model CCR dan SBM mempunyai korelasi tinggi yang signifikan. Ini menunjukkan bahawa tidak terdapat perbezaan yang signifikan antara model jejari dan model bukan jejari bagi kes ini. Kajian mendapati Unit Pembuat Keputusan (DMU) paling cekap ialah Pulau Pinang, manakala DMU paling kurang cekap ialah Johor Timur.

Kata kunci: model jejari; model bukan jejari; keseragaman; pukat tunda

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