UNIVERSITI PUTRA MALAYSIA

DEVELOPMENT OF HYBRID MODEL FROM CCR-I AND SBM-I FOR MEASURING MIX EFFICIENCY LEVEL

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By

MUHAMMAD ASYRAF ASBULLAH

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

DEVELOPMENT OF HYBRID MODEL FROM CCR-I AND SBM-I FOR MEASURING MIX EFFICIENCY LEVEL

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September 2010

Chairman : Azmi Jaafar, PhD

Institute : Institute for Mathematical Research

In today's world, Data Envelopment Analysis (DEA) has been used widely in many areas of efficiency analysis study. Basically, the DEA method has two different types of measurement, which called as radial and non-radial measure. Both measures were represented by the input orientated model of Charnes-Cooper-Rhodes (CCR-I) and Slack-based Measure (SBM-I).

Problems that arise from CCR-I model are due to its excessive two phase's procedure, unreported of nonzero slacks along its efficiency score and the terminology of weak efficiency. The shortcomings of SBM-I are because the proportionality aspect was avoided and all inefficiencies are reported only in a single score. Furthermore, the requirement to solve two different models simultaneously in order to determine the mix level seems demanding. This study

aims to overcome the mentioned shortcomings by proposing a new single DEA model. We also wish to combine the characteristics of both CCR-I and SBM-I in this model. In addition, the proposed model is targeting to derive a new technique for mix efficiency evaluation. This model and technique was illustrated using existing data sets. We observed that the results from this new model reflecting the nonzero slacks in its optimal score and remove the weak efficiency terminology. We have discovered that the corresponding characteristics of CCR-I and SBM-I was delineated and the mix level of the new technique is comparable with the results obtained from the standard method.

As conclusion, the findings of this study contributes to reduce the computational efforts, provides a simple way to determine the mix efficiency levels and successfully combining the radial and non-radial characteristics in a single DEA model.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

PEMBANGUNAN MODEL KACUKAN DARIPADA CCR-I DAN SBM-I UNTUK MENGUKUR TAHAP KECEKAPAN CAMPURAN

Oleh

MUHAMMAD ASYRAF ASBULLAH

September 2010

Pengerusi : Azmi Jaafar, PhD

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Dimasa kini, Analisis Penyampulan Data (APD) digunakan secara meluas dalam pelbagai cabangan kajian analisis kecekapan. Pada asasnya, kaedah APD mempunyai dua jenis pengukuran yang berbeza, digelar sebagai pengukuran jejari dan bukan jejari. Kedua-dua jenis pengukuran tersebut diwakilkan oleh model berorientasikan input bagi Charnes-Cooper-Rhodes (CCR-I) dan Slack-based Measure (SBM-I).

Masalah-masalah yang timbul dari CCR-I berkaitan dengan bebanan prosedur dua fasanya, kemerosotan bukan sifar yang tidak dilaporkan bersama-sama penyelesaian optimumnya dan dari istilah kecekapan lemah. Kelemahan-kelemahan SBM-I disebabkan aspek kekadaran telah diabaikan dan semua ketidakcekapan dilaporkan hanya dalam satu nilai tunggal. Tambahan pula, keperluan untuk

menyelesaikan dua model berlainan secara serentak bagi menentukan tahap kecekapan campuran kelihatan agak mendesak. Matlamat kajian ini adalah untuk mengatasi kelemahan-kelemahan yang dinyatakan dengan mencadangkan satu model APD tunggal yang baru. Kami juga ingin menggabungkan ciri-ciri CCR-I dan SBM-I dalam model ini. Sebagai tambahan, model yang dicadangkan mensasarkan untuk menerbitkan satu teknik terbaru bagi pernilaian kecekapan campuran. Model dan teknik ini diilustrasikan menggunakan set-set data yang sedia ada. Kami perhatikan yang keputusan dari model baru ini mengambilkira kemerosotan bukan sifar dalam penyelesaian optimumnya dan menyingkirkan istilah kecekapan lemah. Kami mengenalpasti yang ciri-ciri sepadan bagi CCR-I dan SBM-I ditunjukkan dan teknik terbaru bagi tahap kecekapan campuran adalah setanding dengan keputusan yang diperoleh dari kaedah piawai.

Sebagai kesimpulan, hasil penemuan daripada kajian ini menyumbang kepada mengurangkan usaha pengiraan, menyediakan satu cara mudah untuk menentukan tahap kecekapan campuran dan dengan jayanya menggabungkan ciri-ciri pengukuran jejari dan bukan jejari dalam satu model APD tunggal.

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I certify that a Thesis Examination Committee has met on 3 September 2010 to conduct the final examination of Muhammad Asyraf Asbullah on his thesis entitled "Development of Hybrid Model From CCR-I and SBM-I for Measuring Mix Efficiency Level" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

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MUHAMMAD ASYRAF ASBULLAH

Date: 3 September 2010

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