



MEASURING TECHNICAL EFFICIENCY OF INSURANCE COMPANIES USING DYNAMIC NETWORK DEA: AN INTERMEDIATION APPROACH

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Abstract. This study measures technical efficiency of the Malaysian insurance companies using a new framework for performance efficiency, built on the intermediation approach, by decomposing the complex service processes of insurance companies into two functional divisions, premium accumulation and investment capability. The study employs a dynamic network data envelopment analysis for performance evaluation of insurer (life, general and composite insurers) and ownership (local and foreign) types, spanning the period 2007–2014. The findings reveal a lack of efficiency in the investment capability function among local insurers as compared to their foreign counterparts. While the composite or non-specialized segment performs better in the investment capability function, the general segment achieves better efficiency in the premium accumulation function. The results suggest the high usage of input quantities and lack of total investment as key reasons for low efficiency, particularly among the local insurers. Implications for business excellence for insurance companies are further discussed.

Keywords: performance evaluation, data envelopment analysis, intermediation approach, dynamic network slacks-based measure, insurance companies.

JEL Classification: G22, L25.

Introduction

In the context of performance efficiency using the data envelopment analysis (DEA) approach, the important question on the true measure of production mechanism for insurance companies remains vague (Brockett *et al.* 2005). There are two theoretical streams to evaluate the efficiency of an insurance company, namely the production approach and the financial intermediary approach (Brockett *et al.* 2004). Under the production approach, the role of financial institutions is confined to that of service providers to account hold-

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ers, while in the intermediation approach, financial institutions act to channel the funds between savers and investors. Berger and Humphrey (1997) differentiate between the two approaches in identifying how to measure the performance of financial services. The production approach is found to be suitable for evaluating financial branches or subsidiaries, while the intermediation approach is more appropriate for evaluating the entire financial industry (Berger, Humphrey 1997; Brockett *et al.* 2004).

The current insurance literature has given more emphasis on the use of the production approach, which is more appropriate for evaluating the performance of manufacturing companies (Chen *et al.* 2011; Cummins, Rubio-Misas 2006; Cummins *et al.* 2010; Cummins, Xie 2008; Eling, Luhnen 2010b; Kuo *et al.* 2017; Lu *et al.* 2014; Nourani *et al.* 2017), while the application of the intermediation approach has not received much attention in insurance-related studies. Additionally, although recent research has increasingly focused on the empirical evaluation of insurance efficiency, recent studies have largely adopted traditional measures of efficiency evaluation (Biener, Eling 2012; Cummins *et al.* 2010; Huang *et al.* 2012; Huang, Eling 2013; Xie 2010); therefore, a consistent conclusion remains elusive. The traditional DEA assumes a service process as a single black box that transforms inputs to outputs. However, more than one stage may be involved in completing a service process. Therefore, by using the traditional DEA approach, we are in fact neglecting the internal linking of activities between different stages or divisions, and thereby neglecting the decomposed inefficiencies of each stage. As such, the multi-stage DEA approach, introduced to open up black boxes, is needed to address the issue of efficiency (Färe *et al.* 2007) as it identifies the source(s) of inefficiency in the whole service process. In this respect, one may overestimate or underestimate the efficiency scores if a proper technique is not applied. In fact, an accurate measure of performance measurement is a preliminary step to achieve business excellence within any financial or non-financial entity.

This study builds on the use of the financial intermediation approach in line with Brockett *et al.* (2005) and proposes a new framework for insurance companies to assess their performance, which is supported by an extant theory on insurance literature. Following which, the results of this study provide useful input on resource allocation and strategic decision-making for insurance companies. The remainder of this study unfolds as follows: Section 1 details the proposed new framework for measuring insurance efficiency. Section 2 describes the research design. Section 3 discusses the research findings, and the final section concludes the study.

1. Proposed insurance efficiency framework

1.1. The service process for insurance

The traditional performance assessment framework for insurance companies is rooted in the production process of manufacturing systems. Unlike manufacturing, insurance reflects a special type of service process (Müller 1981). Pfeffer and Klock (1974: 3) define insurance as follows: Insurance is a device for the reduction of uncertainty of one party, called the insured, through the transfer of particular risks to another party, called the insurer, who