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Efficiency Analysis of the U.S. Publicly Held Insurance Industry:
A Two-Stage Efficiency Model

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ABSTRACT

This paper aims to measure and analyze the efficiency of the US publicly-held insurance industry from 2011 to 2013. The paper uses a two-stage efficiency model: (1) data envelopment analysis (DEA), a non-parametric model for measuring the efficiency of 141 panel data of US publicly-held insurance firms, and (2) stochastic Tobit regression model for determining associations between insurers' financial performance and efficiency. Three significant findings are obtained: (1) There is no evidence that US insurance firms consistently improve in efficiency over time using the input-output mix. (2) There is an overall positive significant association between insurers' financial performance and technical efficiency at a very high confidence level. (3) Type of insurance is found to have a negative and significant effect on efficiency. These new findings add empirical evidence to the efficiency analysis of the US insurance industry.

KEYWORDS

DEA, Efficiency, Financial Performance, Insurance Industry, Performance Measurement, Tobit Model

INTRODUCTION

Efficiency studies of the financial services and specifically the insurance industry continue to rise in the empirical literature. The past decade has seen an increasing interest in assessing the efficiency and productivity of firms in the financial services sector. Insurance companies, in particular, are seen as a financial services market segment that can benefit significantly from efficiency and productivity analysis. Frontier methodologies such as Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) are frequently used to assess the relative performance and efficiencies of individual entities, as compared with their peers.

Existing insurance studies focus more on cross-country comparisons of efficiency that offer valuable information about performance and competitiveness of insurance firms in different countries (Berger & Humphrey, 1997; Biener & Eling, 2012; Cummins & Weiss, 2000; Donni & Fecher, 1997; Eling & Luhnen, 2010; Rai, 1996). Other studies also focused on insurers in a particular country for a comparison of efficiency across industry: Cummins and Rubio-Misas (2006) in Spain; Luhnen (2009) in Germany; Ennsfellner, Lewis and Anderson (2004) in Austria; Fukuyama (1997) and Tone and Sahoo (2005) in Japan; Cabanda and Viverita (2012) and Viverita, Wulandari and Cabanda (2016) in

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Indonesia; Hwang and Kao (2006) and Chen and Chang (2010) in Taiwan; Ansah-Adu, Andoh and Abor (2012) in Ghana; Nektarios and Barros (2010) in Greece. For the US insurance studies, existing studies that exist, focus on: (a) a single type of insurance, such as life (Cummins & Zi, 1998; Greene & Segal, 2004), property-casualty (Brockett, Cooper, Golden, Rousseau & Wang, 2004; Ellis, 2010; Park, Lee & Bin Kang, 2009), and auto (Weiss & Choi, 2008); (b) an event such as insurance mergers and acquisitions (Cummins, Tennyson, & Weiss, 1999; Cummins & Xie, 2008) or (c) are part of a larger worldwide study where it is difficult to identify actionable recommendations that are relevant and applicable to the US insurance industry (Eling & Luhnen, 2010). To date, there is no empirical study in the US focusing on publicly held insurers using individual-company data sets consisting of four types of insurance. This research seeks to make new empirical contributions to the growing efficiency literature by focusing on efficiency analysis of US publicly held insurers that include property and casualty, life and health, multiline and reinsurance firms. This paper acknowledges a pressing limitation of the study when it comes to the data availability on the four types of publicly-held insurers that can be an avenue for further research when empirical data are more accessible and available for future analysis.

The objectives of this paper are twofold: (1) to measure and analyze the efficiency of the US publicly held insurance industry from 2011 to 2013 by utilizing efficient input-output mixes and identifying areas of improvement and (2) to determine if there are associations between insurers' financial performance and technical efficiency.

This paper includes the following: (a) literature review and discussion of relevant efficiency research, (b) data and study methodology, (c) presentation and discussion of the empirical results and (e) analysis and conclusions.

LITERATURE REVIEW

Hsiao and Su (2006) outlined that DEA has been widely used to measure performance in the financial services industry. In this sector, some examples include: (a) banking (Asmild, Paradi, Aggarwall & Schaffnit, 2004; Berger & Humphrey, 1997), (b) insurance (Biener & Eling, 2012; Cummins, Rubio-Misas & Zi, 2004; Cummins & Xie, 2008; Diacon, Starkey, & O'Brien, 2002; Donni & Fecher, 1997; Eling & Luhnen, 2010; Rai, 1996; Weiss, 1991), (c) investment companies (Chen & Zhu, 2004), and microfinance (Cabanda & Domingo, 2010).

DEA has been cited as a superior approach to evaluating the economic gains of companies in the insurance industry (Chen & Zhu, 2004; Cooper, Seiford & Tone, 1999; Cummins, Weiss, Xie & Zi, 2010; Cummins & Xie, 2008; Hsiao & Su, 2006). Traditionally, financial, accounting and economic theories argue that maximization of profits is the primary objective and measurement goal of a 'for profit' firm. Two issues arise for insurance companies. First, some insurance firms are mutual insurers, where the owners and stakeholders are the policyholders. In this case, running an efficient firm and having sufficient capital to cover the claims or risk associated with the policyholders' organizations is the primary objective, not necessarily short-term profit maximization. The second is the fact that insurance companies must look at long-term capital accumulation through profits and investment growth in order to ensure that they can pay claims and remain viable in the long run. These two factors combined, outline why insurance companies cannot be properly evaluated in the short or long term by merely assessing profitability. Assessing efficiency, through DEA has been shown to be a better predictor of long-term effective outcomes, as opposed to merely examining financial profitability and ratios for a given insurance entity (Cummins et al., 2010; Cummins & Xie, 2008).

In the insurance sector, studies have predominately focused on using DEA to measure business efficiency and performance. More recently however, the following studies have expanded the DEA analysis with: (a) Hsiao and Su (2006) using DEA to measure an insurance company's investment performance, and (b) Brockett et al. (2004) using the tool to assess the relationship between solvency and efficiency in insurance firms.