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Efficiency Comparison between Life and Non-Lifetakafuloperators in Bangladesh-A Non Parametric Approach

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Abstract: *This study aim is to examine the efficiency in the Takaful industry of Bangladesh. Data Envelopment Analysis (DEA) is used to explore the contributions of technical and efficiency changes to the growth of productivity in the Takaful industries of Bangladesh by using descriptive statistics such as mean, median, standard deviation, minimum & maximum and efficiency (Constant Returns to Scale & Variable Returns to Scale) applying the generalized output-oriented Malmquist index for the years 2009-2011. The output-input data consists of a panel of all (06) Takaful companies (03 life and 03 non-life) in Bangladesh. This study utilizes two inputs and two outputs, namely, commission and management as well as premium and net investment income, respectively. In the DEA technique, efficiency is measured by the Malmquist index. The Malmquist efficiency measures have two components: the efficiency change and technical change index. Efficiency change is again combined by pure efficiency and scale efficiency. It is found that, on geometric mean, the TFP of the Takaful industry is mainly due to both efficiency and technical changes where the main source of the efficiency change is scale efficiency rather than pure efficiency. Our finding indicates that in the Takaful industry of Bangladesh, the smaller the size of the companies, the higher the probability for the companies to be more efficient in utilizing their inputs to generate more outputs. We believe our work is beneficial for researchers and practitioners to better understand the Bangladeshi Islamic insurance industry.*

Keywords: *Data Envelopment Analysis (DEA); Takaful; Malmquist Index; Efficiency; Technical Efficiency; Scale Eficiency; Pure Efficiency.*

I. Introduction

Islamic finance and Takaful insurance products are growing worldwide in a way that is encouraging their adoption by Islamic as well as non-Islamic countries to support economic growth. In recent years, Islamic finance has become one of the most rapidly growing segments of the global financial system. The Islamic banking industry today has assets worth over $900 billion, and Islamic finance has spread to 75 countries from East to West, extending from Muslim to non-Muslim countries. The introduction of an Islamic model of insurance has boosted the Islamic world economy, according to many reports. Insurance has become the biggest industry in Saudi Arabia's economy having overtaken the banking, real estate and manufacturing sectors.

Takaful is an Arabic(ل تكافالا)word meaning 'guaranteeing each other' for mutual **protection**. It is not a new concept – it has been practiced by the Muslim immigrants (Muhajrin) of Mecca and the Muslim residents (Ansar) of Medina in the Muslim society following the migration (Hijra) of the Prophet (PBUH) 1,400 years ago.Muslim rejection of conventional insurance originated in 1903, when an Islamic ruling made by prominent Muslim scholars declared that conventional insurance was un-Islamic. This prompted the search for an acceptable alternative, but it was not until the 1970s that the debate gathered momentum and **Takaful** was re-discovered as an accepted alternative. In 1985, the Council of the Islamic Jurisprudence Academy (Majma' al-Fiqh al-Islami) approved **Takaful** as a Shari'a compliant system of co-operation, risk sharing and **mutual** assistance.Takaful originated within the Arab tribes as a pooled liability that indebted those who committed offences against members of a different tribe to pay compensation to the victims of their heirs. The concept widened to several walks of life, including sea trade, in which participants made contributions to a fund for cover to any group member who went through mishap on sea voyages.

Nevertheless, it was not until 1979, in Sudan, that the pioneer takaful firm was established.The use of takaful as the Islamic alternative to conventional insurance began in 1985 when the Grand Council of Islamic Scholars of the Organisation of the Islamic Conference formally gave the required permission. Conventional insurance was considered to be unsuited to Islamic law (Shari'ah) and was to be shunned by Muslims, unless there was no substitute. The opposition to conventional insurance was on the premise that Islamic principles do not permit uncertainty or any interest-bearing assets, both of which are intrinsic factors in conventional insurance business.

On the contrary, the first Takaful insurance company was established in Bangladesh in January, 2000 and then no Takaful insurance company has been established after 2007. Why Takaful insurance doesn't grow up at the desire level though this is an enormous demanded industry in Bangladesh? Because of this, the researchers want to examine main reasons behind this stagnancy by measuring efficiency. The diversification of insurance models and types has encouraged customers to choose between them according to their needs, perceptions and beliefs. Identification of customers' reasons for acquiring particular forms of insurance helps to highlight the weaknesses and strengths of the different forms.

Efficiency of financial institutions is often described as one of their prime objectives since efficient firms can obtain higher performance with lesser utilization of inputs. Different types of efficiency concepts communicate different information about the performance of financial institutions. For instance, Technical efficiency estimates the ability of a firm to maximize its output from a given set of inputs, technical efficiency is also referred as the operating efficiency of the firm. Whereas, the allocative efficiency measures the right mix of inputs in the light of the relative prices of each input to produce maximum outputs. The combination of both technical efficiency and allocative efficiency estimates the cost efficiency of the firms which provides an accurate picture that how close a firm s costs are to a best performer s costs. In other words, cost efficiency measures the overall reduction in costs that can be achieved if the firm is efficient in respect of both technical and allocative efficiency.

The efficiency of financial institutions has been widely and extensively studied in the last few decades. For financial institutions, efficiency implies improved profitability, greater amount of funds channeled in, better prices and services quality for consumers and greater safety in terms of improved capital buffer in absorbing risk (Berger et al., 1993).

The study of efficiency of life insurance companies is important for the Bangladesh dual financial system where the Takafuloperators are operating alongside their conventional counterparts. Furthermore, the Bangladeshi financial system has undergone major structural changes in the era of globalization with various liberalization measures being introduced during the last decade. These factors are expected to have an impact on the efficiency of the life and non-lifeTakafuloperators. This study, therefore, focuses on two aspects of Takaful industry in Bangladesh. Firstly, it aims to extend the established an individual sector by investigating the efficiency of the whole Takaful operators for the period 2009-2011. Secondly, it seeks to compare the performance of life and non-lifeTakafuloperators in Bangladesh.

For the Takafuloperators, the information obtained on the evaluationof the institutions' performance may be used to improve the overallefficiency of their operations and in turn, may contribute towards achievingits competitive edge. In this context, the objective of this study is to analyzethe sources of efficiency and technical changes in both the life and non-life Takaful companies in Bangladesh. By using the non-parametric approach of DataEnvelopment Analysis (DEA) together with Malmquist Index, we isolatethe contributions of technical change, efficiency change, the pure andscale changes to total factor productivity growth of different life and non-lifeTakafuloperators in Bangladesh.Inorder to enhance the resilience of the Takafulindustry in facing challengingoperating environment, six key areas are highlighted. One of these isenhancing operational efficiency of Takafulsector (TakafulAnnual Report,2005). Having this in mind, this study hopes to identify the determinantsof efficiency of the Takafulindustry and thereby provide recommendations to further strengthen the resilience of Takafulsector within the Bangladeshi financial system.

This study is organized by the combination of multi-sections such as Section 2reviews the relevant literature; Section 3discusses the methodology of DEA and Malmquist Index; Section 4presents the results and analysis, and finally Section 5 presents some conclusions.

II. Literature Review

The vibrant Takaful industry has continued to display strong growth in recent years with many of the key markets still exhibiting double digit growth often with Takaful outstripping the growth of conventional insurance. This increase though is coming under pressure due to the fallout from the poor performing financial markets and the changing political landscape of the Middle East region. Despite these challenges there still remain fantastic opportunities for increasing market penetration in the core markets of Malaysia and the Middle East as well as harvesting the undoubted potential in South East Asia, Africa and some non Muslim countries with significant Muslim populations. ITS 'New Frontiers' will investigate the obstacles faced by the industry and seek to provide constructive solutions to nurture the continued development of the global industry.

Takafulis based on the concept of social solidarity, cooperation and mutual indemnification. It is a pact amongst a group that agrees to donate contributions to a fund that is used to jointly indemnify covered losses incurred by the members. While the concept of Takaful revolves around mutuality and is founded on non-commercial basis, the operations and the fund are commonly managed by a Takaful operator on commercial basis (World Takaful Report, 2012).

The global Takaful industry continued to demonstrate a strong growth rate in 2010 at rate of 22.9% ($13.7bn) as compared to previous year 'in year 2009 growth rate stands at 17.7% with total contribution value of $11.1bn' according to the World Islamic Insurance Directory 2012. The Gulf Cooperation Council countries 'GCC' market contributed $5.7bn, Middle East 'Non-Arab' at $5.3bn and South East Asia 'SEA' contributions stood at $1.9bn. According to WTR, the highest 102% growth has been occurred in the Levant Takaful market with US$79.00m as compared to preceding year in 2009 with US$39.00m. On other hand, the growth rate of Takaful industries has been decreased both in the Indian Sub-continent and Africa by 5% and 10% respectively during the adjacent year 2009-2010. Furthermore, the positive growth rate of Takaful industries has not seen during last few years in Bangladesh. The researchers want to examine the reasons why Takaful industries hasn't grown in Bangladesh where about 90% of the population are Muslim and so called conventional insurance are prohibited for them.

The Takaful industry is facing strategic challenges as the market establishes itself. Significant investments are required to establish the Shariah board, develop technical expertise on Shari'ah compliance, train staff, create brand awareness among customers, as well as implementing the appropriate technology. To ensure the success and sustainability of the Takaful and re-Takaful industry, the companies will need to work with their respective national regulator to address impediments facing the industry. Despite all the challenges, Takaful is a viable alternative to conventional insurance and is expected record gross Takaful contribution of $17.2bn by end of 2012.There are several factors that supportedthe Takafulgrowth such as 1)Growing demand for Shari'ah-compliant products, ii) Abundant liquidity iii) Increasing levels of foreign direct investment, iv) Growth of re-Takaful capacity, v) Growth of high quality sukuk papers for Takaful companies to invest in, vi) Increased awareness amongst consumers, vii) A more efficient distribution channel of Takaful products, viii) Growth in other financing products such as housing financing which leads to increase in housing Takaful.

The question of the efficiency of the firms in insurance industry is very important in order to determine how the insurance industry will respond to various challenges and which firms are likely to survive (Berger et. al, 1993). The findings from the expanding body of literature on efficiency in insurance for both developed and emerging economies, have important implications for both insurance operators in improving their competitive edge and the policymakers as well as the regulators of insurance companies in order to improve the stability of the financial institutions and to enhance further the effectiveness of the monetary system as a whole.

While there have been numerous international studies on the performance of other financial services industries, especially deposit-taking institutions, only a handful have been concerned with the insurance industry. A study on the performance of the insurance industry is crucial since the said industry is currently facing many challenges, including increased competition, consolidation, solvency risks, and a changing regulatory environment. The question of the efficiency of the firms in this industry is clearly important in order to determine how the industry will respond to these challenges and which firms are likely to survive (Berger et. al, 1993).

Due to the increased competition, consolidation and a changing regulatory environment that have characterized the insurance industry in recent years, it is imperative for the insurance operators to always seek for ways and methods to improve their operating performance. The findings from the expanding body of literature on efficiency in insurance for both developed and emerging economies, have important implications for both insurance operators in improving their competitive edge and the policymakers as well as the regulators of insurance companies in order to improve the stability of the financial institutions and to enhance further the effectiveness of the monetary system as a whole.

The measurement of insurance efficiency is mostly focused on the efficient frontier approach. This has been used widely to assess the efficiency levels as both approaches allow the use of multiple inputs and outputs from a sample of institutions to develop an efficiency frontier and evaluate the efficiency of a decision-making unit (DMU) relative to other DMUs in the sample. According to a survey conducted by Berger and Humphrey (1997) on 130 past studies that apply frontier efficiency analysis to financial institutions in 21 countries, there are various methods used to measure efficiency. These methods are divided into two approaches namely parametric and non-parametric. The most commonly used parametric approaches are the Stochastic Frontier Approach (composed error), Distribution Free Approach (different composed error) and the Thick Frontier Approach. For non-parametric approaches, the most commonly used are the Data Envelopment Analysis and the Free Disposable Hull [Cummins et al. (1999); Cummins and Zi (1998)].

Among the methods, the two main ones that have been widely used in the literature to measure the efficiency of the insurance industry are Stochastic Frontier Analysis (SFA) and Data Envelopment Analysis (DEA). The SFA which is also known as the Econometric Frontier Approach was developed by Aigner et al., (1977). This approach specifies a functional form for cost, profit or production relationship among inputs, outputs, and environmental factors and allows for random error (Berger and Humphrey, 1997). The functions are used to estimate the distance that a firm is from the optimizing envelope (Seale, 2000).

Data Envelopment Analysis (DEA) or the mathematical programming approach was introduced by Charnes et al. (1978) and draws upon the efficiency concept in Farrell (1957). According to Charnes et al. (1978), DEA estimates efficiency under the assumption of constant returns to scale, while Banker et al. (1984) assumed variable returns to scale. This approach constructs the frontier of the observed input-output ratios by linear programming. It assumes that linear substitution is possible between observed input combinations on an isoquant. In other words, DEA is a model that combines all the input and output information on the firm into a single measure of productive efficiency that lies between zero (i.e. a completely inefficient firm) and unity (i.e. a completely efficient firm). In addition, the DEA effectively estimates the frontier by finding a set of linear estimates that bound (envelop) the observed data (Leong et al., 2003). Thus, this technique is a benchmarking technique in the sense that the 'best practice' firms lie on the frontier and 'envelop' other inefficient firms (Neal, 2004).

Previous studies on the insurance industry's efficiency using DEA provided evidence to understand the performance of the insurance sector in certain countries, e.g. those studies which analyze insurance in national markets such as the case in the United States done by Berger et al. (1997), Cummins et al. (1999), Meador et al. (2000), Gardner and Grace (2002), and Cummins and Weiss (2002), Cummins et al. (2010) and the insurance industries in other countries like in Japan, Italy, United Kingdom, Australia, Spain, and Germany have been studied by Fukuyama (1997), Cummins et al. (1996), Diacon (2001), Worthington and Hurley (2002), Cummins and Rubio-Misas (2001), and Mahlberg and Url (2010) respectively. Besides that, there are also studies that conduct analyses of the insurance industry in multi-markets such as Rees and Kessner (2000) and Diacon et al. (2002) where they have conducted studies by internationally comparing the efficiency of insurance companies in Europe.

Another study on the effect of deregulation and consolidation on financial services markets by analyzing the Spanish insurance industry was done by Cummins and Rubio-Misas (2001). They analyzed a sample consisting of nearly all insurers reporting to the Spanish regulatory authority over the period 1989-1998 by estimating the "best practice" production and cost frontiers using the data envelopment analysis (DEA), while total factor productivity growth was analyzed using the Malmquist index methodology to draw inferences about the relationship between consolidation and productivity gains or losses in the industry. They found that cost efficiency was relatively low in the Spanish insurance market, averaging only 22.7 percent in 1998 which was primarily caused by allocative inefficiency, i.e. the failure to choose the optimal mix of inputs. Average allocative efficiency in 1998 was only 41.2 percent, whereas pure technical efficiency averaged 60 percent. Thus, Spanish firms on average are more successful in employing technology than in choosing optimal inputs. In addition, the Malmquist analysis showed that Spanish insurers experienced average total factor productivity growth over the sample period ranging from 0.6 to 2.6 percent per year, while the change in total factor productivity was attributable primarily to the technical efficiency growth rather than favorable technical change. Thus, the authors conclude that consolidation had improved efficiency in the Spanish insurance market, but on average, firms have not succeeded in achieving technical improvements.

Comparing the results of the three countries' insurance industries with their United States counterparts, in terms of total factor productivity growth which is measured by the Malmquist index, the Japanese life insurers (Fukuyama, 1997) and the Italian life and property-liability insurers (Cummins et al., 1996) indicate efficiency gains that are considerably higher than in the U.S. In the case of the Spanish insurance industry, Cummins and Rubio-Misas (2001) found that cost efficiencies for Spanish insurers are low compared to the U.S insurers.

A prior study on the efficiency of the Malaysian insurance industry by Abu Mansor and Radam (2000) was conducted by using the non-parametric Malmquist Index approach to measure the productivity of the life insurance industry in Malaysia. In measuring the efficiency performance, they evaluated the Malmquist Index of a sample of 12 Malaysian insurance companies over the 1987 to 1997 period. Abu Mansor and Radam found that the overall productivity growth of the insurance industry in Malaysia was contributed by both technical efficiency and technical progress. A more recent empirical study on the efficiency of Malaysian insurance companies as well as other insurance companies around the world was conducted by Eling and Luhnen (2010). In this study Eling and Luhnen (2010) examined the efficiency of 3,831 companies from 91 countries using DEA and SFA techniques. Their sample includes 28 firm-years of life insurance companies and 113 firm-years of non-life insurance companies from Malaysia.

In addition, considering the Malaysian dual financial system environment where the Takaful operators are operating in parallel with their conventional counterparts, another study was undertaken by Md. Saad et al. (2007) to analyze the sources of efficiency and technical changes of all the life insurance companies and compare the performance results with that of the Takaful operators in Malaysia. Using a sample of 13 Malaysian insurance companies over a period of 2002 to 2005, they used a non-parametric approach of DEA together with the Malmquist Index to isolate the contributions of technical change, efficiency change, the pure and scale changes to the total factor productivity growth of different life insurance companies and the Takaful operators.

On the basis of the findings, the authors found that on average, the total factor productivity growth of the insurance industry in Malaysia is mainly due to technical change while efficiency change contributed a negative change. While Takaful presents a below average in total factor productivity but slightly above average for technical change as well as an equal to industry average in scale efficiency. However, this result is still inconclusive on the Takaful industry as a whole since only one Takaful company is included in the study.

Against this backdrop, the motivation of our paper is to investigate the efficiency comparison among Life and non-life Takaful firmsin Bangladesh using the nonparametric approach. This study is organized by the combination of multi-sections such as Section 2reviews the relevant literature; Section 3discusses the methodology of DEA and Malmquist Index; Section 4presents the results and analysis, and finally Section 5 presents some conclusions.

III. Data Sources And Methodology

This study intends to measure the comparative efficiency between life and non-life Takaful operators of the Takaful industry of Bangladesh. There are 02 public insurance company, 43 privately owned general companies and 17 life insurers in Bangladesh. There are 09 Takaful operators are operated in Bangladesh, out of which the data of three foreign companies namely First Takaful Insurance Company, Noor Takaful insurance company limited and National Takaful Insurance Company operators were not accessible. The data of remaining 06 companies (03 Life Takaful Operators and 03 Non-life Takaful Operators) were available for efficiency analysis. We use two inputs and outputs in this study. The inputs are commission and management expenses and the outputs are premium and net investment income. These inputs and outputs are used to examine the efficiency of three (03)life Takaful operators in Bangladesh, namely Fareast Islami Life Insurance Company, Padma Life Islami Insurance Limited and Prime Life Islami Insurance Limited and three (03) Non-life Takaful Operatorsin Bangladesh , namely: Islami Commercial Insurance Company, Islami Insurance Bangladesh Limited, and TakafulIslami Insurance Limited. Inputs and outputs data are collected from period of 2009 to 2011. The data are gathered from the respective Takafulannual reports, websites and chief finance officer (for Islami Commercial Insurance Company because of unavailable audited annual report).

To examine the contributions of technical and efficiency change to the growth of productivity in the both life and non-lifeTakaful industries the generalized output-oriented Malmquist index, developed by Fare et al. (1989) is adopted in this study. The Malmquist indexes are constructed using the Data Envelopment Approach (DEA) and estimated using Coelli's (1996) DEAP version 2.1. Malmquist index was chosen as there are a number of desirable features for this particular study. The DEA does not only require input prices or output prices in their construction, which make the method particularly useful in situations in which prices are not available publicly or non-existent, but it also does not require a behavioral assumption such as cost minimization or profit maximization in the case where the producers" objectives differ, unknown or unachieved. This is first demonstrated by Fare et al. (1989) using the geometric mean formulation of the Malmquist index. Following this, Forsund (1991) derived the decomposition of the simple version of the Malmquist productivity index into technical change and efficiency change. Following Fare et al. (1989), the Malmquist index of total factor productivity growth is written as follows:

$$M_0(x^t, y^t, x^{t+1}, y^{t+1}) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \times \sqrt{\left[\left(\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1})}\right)\left(\frac{D_0^t(x^t, y^t)}{D_0^{t+1}(x^t, y^t)}\right)\right]} \qquad (1)$$

Where, $D_0^t(x^{t+1}, y^{t+1})$, denoted the distance from the period t+1 observation to the period t technology. The first part of the right hand side of equation (1) measures the change in firm's relative efficiency (i.e., distance between the observed productions from maximum potential production) between year t and t+1. On the other hand, second parts of this equation within the brackets (geometric mean of the two ratios) shows the firms' relative change in technology (i.e., movements of the frontier function itself) between the two periods evaluated at $x^t$and x^{t+1}. Basically, the change in relative efficiency measures how well the production process converts inputs into outputs (catching up to the frontier) and the later reflects enhancement in technology. According to Fare et al. (1994a), improvements in productivity yield Malmquist index values greater than unity. Deterioration in performance over time is associated with a Malmquist index less than unity. The same interpretation applies to the values taken by the components of the overall TFP index. The positive change in the efficiency component yielded index values greater than one and is considered to be evidence of catching up (to the frontier). Values of the technical change component greater than one are considered to be evidence of technological progress.

Following Fare et al. (1994), this study uses an enhanced decomposition of the Malmquist index by decomposing the efficiency change component calculated relative to the constant returns to scale technology into a pure efficiency component (calculated relative to the VRS technology) and a scale efficiency change

component which captures changes in the deviation between the VRS and CRS technology. The subset of pure efficiency change measures the relative ability of operators to converts inputs into outputs while scale efficiency measures to what extent the operators can take advantage of returns to scale by altering its size toward optimal scale.

IV. Findings And Its Analysis

4.1 Measures of some Descriptive Statistics

This study aspires to analyze some descriptive statistics such as mean, median, Standard Deviation, minimum and maximum before run data envelopment analysis. Table-1 reveals the descriptive statistics of the outputs and inputs of all the Takaful companies during the study period. In case of total inputs and outputs for life Takaful operators during the study period, Fareast Islami Life Insurance Company and Prime Islami Life Insurance Limited have occupied the highest and lowest rank respectively. On other hand, in terms of non-life Takaful Operators Islami Insurance Bangladesh Limited have been used highest inputs but TakafulIslami Insurance Limited have achieved highest outputs and Islami Commercial Insurance Company have achieved lowest total inputs and outputs during the study period 2009-2011.The average premium and net investment income for both life and non-life Takaful operators are Tk. 3298.26, Tk. 490.50 million BDT and Tk. 81.06, Tk.44.18 million BDT respectively. Meanwhile, the average commission and management expenses are Tk.931.44Tk. 458.95and Tk. 37.39, Tk. 63.50 millions BDT, respectively during study period 2009-2011.

Table 1: Descriptive Statistics, 2009-2011

Types OfTakaful	Statistics	Inputs(In million BDT)		Outputs(In million BDT)	
		Commission	Management Expenses	Premium	Investment Income
Life	Mean	931.44	458.95	3298.26	490.50
	Median	538.45	368.80	1791.83	356.07
	SD	744.94	227.06	2476.69	316.08
	Minimum	325.75	240.30	1111.90	116.07
	Maximum	2213.71	849.04	6908.76	1131.33
Non-life	Mean	37.39	63.50	81.06	44.18
	Median	35.36	73.09	26.86	33.07
	SD	9.05	20.45	91.14	27.87
	Minimum	28.74	33.29	13.96	16.99
	Maximum	53.99	81.21	228.91	97.21

Source: Annual Reports of respective Takaful Companies

4.2. Production Frontier and Efficiency

In this section, the study is to outline a number of commonly used efficiency measures and to discuss how they calculated relative to an efficient technology, which is generally represented by some form of frontier function. Tables 2 and 3, reports efficiency change for both life and non-lifeTakaful companies from 2009-2011 under constant returns to scale (CRS) and variable returns to scale (VRS) respectively, since the basic component of the Malmquist productivity index is related to measures of efficiency. For the values of unity, the firm is implied to be on the industry frontier in the related year, while the values that are less than unity imply that the firm is below the frontier or technically inefficient. Thus, the lower the values from unity, the firm is said to be more inefficient compared to the values closer to one. According to portrayed result in tables 2 and 3, all the Takaful companies are consistently efficient during the study periods 2009 to 2011 in two types of Takafuloperators, under constant returns to scale (CRS) except Padma Islami Life insurance Limited in life Takaful and Islami Commercial Insurance Company in terms of non-life Takaful.Meanwhile, the efficiency (CRS) ofPadma Islami life insurance Limited increased within the study periods butthe efficiency (CRS) position is going to worsen in terms of Islami Commercial Insurance Company. In contrary, all the Takaful operators are consistently efficient under VRS except Padma Islami Life insurance Limited in 2009 and Islami Insurance Bangladesh Limited in 2010.

Table 2: Efficiency of the Takaful Firms, 2009-2011 (Constant Returns to Scale)

Types Of Takaful	Name of the Takaful Company	2009	2010	2011
Life	Fareast Islami Life Insurance Company	1.000	1.000	1.000
	Padma Islami life insurance Limited	0.746	0.756	0.991
	Prime Islami life Insurance Limited	1.000	1.000	1.000
	Mean	**0.915**	**0.919**	**0.996**
Non-life	Islami Commercial Insurance Company	0.655	0.618	0.392
	Islami Insurance Bangladesh Limited	1.000	1.000	1.000
	TakafulIslami Insurance Limited	1.000	1.000	1.000
	Mean	**0.885**	**0.873**	**0.797**

Tables 2 and 3 depict the percentage of the realized output level compared to the maximum potential output level at the given input mix. As per example, in 2009, Islami Commercial Insurance Company produced 65.50 percent of its potential output level and Padma Islami insurance Limited produced 74.6 percent of its potential output under CRS. On the other hand, under VRS in the same year, the Padma Islami insurance Limited produced the potential output 84.4 percent whereas, Islami Commercial Insurance Company produced at their maximum potential output, which was at 100 percent. In 2010 Islami Commercial Insurance Company produced 61.80 percent of its potential output level and further extensive decrease in 2011 and Padma Islami insurance Limited produced 75.6 percent of its potential output under CRS. Under the VRS,Islami Insurance Bangladesh Limited produced 84.5 percent of its potential output level but increased in later year reached at maximum potential output, which was at 100% percent. Under VRS in the same year, the Padma Islami Life insurance Limited produced the potential output as same as 76.5 percent whereas, Islami Commercial Insurance Company produced at their maximum potential output, same as 2009. As indicated by the weighted geometric mean in Tables 2 and 3, the average efficiency for the life Takaful industries increases and decreased for non-life Takaful industries for the period 2009 to 2011 under CRS. Meanwhile, under VRS, the average efficiency for both theTakaful industries has seems to be value of unity reached at maximum potential output, which was at 100% percent in the year 2009 and 2011 but shows slightly lower (5.2%) mean efficiency than maximum efficiency in 2009 in case life Takaful and in 2010 in non-life Takaful. On average, efficiency performance of the Takaful industry is relatively higher based on VRS than CRS.

Table 3: Efficiency of the Takaful Firms, 2009-2011 (Variable Returns to Scale)

Types	Name of the Takaful Company	2009	2010	2011
Life	Fareast Islami Life Insurance Company	1.000	1.000	1.000
	Padma Islami life insurance Limited	0.844	1.000	1.000
	Prime Islami life Insurance Limited	1.000	1.000	1.000
	Mean	**0.948**	**1.000**	**1.000**
Non-life	Islami Commercial Insurance Company	1.000	1.000	1.000
	Islami Insurance Bangladesh Limited	1.000	0.845	1.000
	TakafulIslami Insurance Limited	1.000	1.000	1.000
	Mean	**1.000**	**0.948**	**1.000**

4.3. Productivity Performance of the Individual TakafulCompany

As we know, Malmquist TFP index to measure productivity change and to decompose these productivity change into technical change and technical efficiency change. Tables 4 and 5 report the performance of the firms from 2009 to 2011 in terms of TFP change and its two subcomponents which are technical change and efficiency change respectively. Note that a value of the Malmquist TFP productivity index and its components of greater than one imply improvements of productivity in the relevant aspects, while values less than one indicate a decrease or deterioration in productivity. Subtracting 1 from the number reported in the table gives an average increase or decrease per annum for the relevant time period and relevant performance measure. These measures also capture the performance relative to the best practice in the relevant performance or relative to the best practice in the sample.

Table 4: Takaful Firms Relative Malmquist TFP Change between Time Period t and t + 1, 2009-2011

Types	Name of the Takaful Company	2009-2010	2010-2011	Mean
Life	Fareast Islami Life Insurance Company	0.868	0.837	0.853
	Padma Islami life insurance Limited	0.982	1.259	1.121
	Prime Islami life Insurance Limited	0.908	0.957	0.933
	Mean	**0.919**	**1.018**	**0.969**
Non-life	Islami Commercial Insurance Company	1.069	0.760	0.915
	Islami Insurance Bangladesh Limited	1.102	1.306	1.204
	TakafulIslami Insurance Limited	1.355	0.840	1.098
	Mean	**1.175**	**0.969**	**1.072**

Table 4 portrays calculated changes in the Malmquist-based Total Factor Productivity index. As shown in the results, Islami Insurance Bangladesh Limited has positive productivity changes during the adjacent years of 2009-2010, 2010-2011. Moreover, Padma Islami insurance Limited recorded minor deterioration in TFP for the year 2009-2010 where in the next year recorded marked improvement in TFP at 2010-2011.On the other hand, Islami Commercial Insurance Company and TakafulIslami Insurance Limited have positive productivity changes for the adjacent years of 2009-2010, but they faced deterioration in productivity in 2010-2011. Moreover, in case of life TakafulPrime Islami Insurance Limited have faced positive productivity changes but Fareast Islami Life Insurance Company have experienced deterioration changesduring the adjacent years of 2009-2010 and 2010-2011. In addition, Islami Insurance Bangladesh Limited has occupy the first rank with 20.40 percent average TFP annual growth rate, followed by TakafulIslami Insurance Limited with an annual rate

of 09.8 percent, andIslami Commercial Insurance Company with 8.50% deterioration. In contrary,in case of life Takaful, Padma Islami Life insurance Limitedoccupied first rank with an annual rate of 12.10 percent. In addition, in terms of LTO,the TFP change, on average, only showed significant deterioration of growths in the periods of 2009-2010, with 08.10 percent. However, it improved in 2010-2011, which is 01.8percent. On the other hand, in terms of NLTO, the TFP change, on average, only showed significant improvement in growths for the periods of 2009-2010, with 17.50 percent but it deterioration in 2010-2011, which is 03.1 percent.

The Malmquist TFP index is further decomposed into its two components, technical change and efficiency change. The results of technical change and efficiency change are displayed in Tables 5 and 6. Table 5 portrays the index values of technical progress or retreat as measured by average shifts in the best-practice frontier from period t to t+1. According to the results, bothtypes of Takaful operators experienced technical progress and retreat. However, all three NLTO have experienced technical progress for the periods of 2009 to 2011. In contrast, all three LTO are the firms that have experienced technical retreat for the periods of 2009 to 2011. During the study period TakafulIslami Insurance Limited has positive productivity changes for the years of 2009-2010, but they faced a notable reduction in productivity in 2010-2011. On the other hand, TakafulIslami Insurance Limited has been achieved the maximum change in technical progress (35.5 percent) in the period 2009-2010 and maximum retreat in 2010-2011 , while Islami Insurance Bangladesh Limited achieved the highest technical growth between the period 2010-2011 with 2o.40 percent.

During the study period, all three NLTO have achieved positive average technical progress but on the contrary all three LTO have experienced average technical retreats. By considering the mean, Islami Insurance Bangladesh Limited occupies first rank with 20.4%, followed by Islami Commercial Insurance Company with 16.0% and TakafulIslami Insurance Limited with 9.8%. In contrast, Fareast Islami Life Insurance Company was found as the most technical regressive firm (14.7 percent).

Table 5: Takaful Operators Relative Technical Change, 2009-2011

Types	Name of the Takaful Company	2009-2010	2010-2011	Mean
Life	Fareast Islami Life Insurance Company	0.868	0.837	0.853
	Padma Islami life insurance Limited	0.969	0.951	0.960
	Prime Islami life Insurance Limited	0.908	0.957	0.933
	Mean	**0.915**	**0.915**	**0.915**
Non-life	Islami Commercial Insurance Company	1.133	1.197	1.165
	Islami Insurance Bangladesh Limited	1.102	1.306	1.204
	TakafulIslami Insurance Limited	1.355	0.840	1.098
	Mean	**1.197**	**1.114**	**1.156**

As we see, table 6 reveals the changes in relative efficiency for each individual Takaful operator. The results indicate considerable variation across companies and time. It is very good to see that all the Takaful companies have been found to be consistently efficient, except Islami Commercial Insurance Company through the year 2009 to 2011. During the entire period of study, the results indicate that, on average, the only Takaful operator under study, i.e. Padma Islami insurance Limited experienced the highest efficiency change with 16.8 percent, while only Islami Commercial Insurance Company that experienced efficiency decline by (-21.00 %). Finally, in case of LTO, the result shows that improvements have seen in positive improvement relative efficiency with 5.1% and deterioration with 8.00% in terms of NLTO throughout the study period 2009-2011.

Table 6: Changes in Operators Relative Efficiency, 2009-2011

Types	Name of the Takaful Company	2009-2010	2010-2011	Mean
Life	Fareast Islami Life Insurance Company	1.000	1.000	1.000
	Padma Islami life insurance Limited	1.013	1.323	1.168
	Prime Islami life Insurance Limited	1.000	1.000	1.000
	Mean	**1.004**	**1.098**	**1.051**
Non-life	Islami Commercial Insurance Company	0.944	0.635	0.790
	Islami Insurance Bangladesh Limited	1.000	1.000	1.000
	TakafulIslami Insurance Limited	1.000	1.000	1.000
	Mean	**0.981**	**0.859**	**0.920**

In order to examine a change in scale efficiency, the efficiency change is further decomposed into two subcomponents, namely pure efficiency change and scale efficiency change in which the results are reported in Table 7. The results indicate that the pure efficiency and scale efficiency appear to be an equally important source of growth to efficiency change. All the Takaful companies recorded no changes in annual growth for both the scale and pure efficiencies, except Islami Commercial Insurance Company in case of NLTO andPadma Islami insurance Limited in case of LTO during the period 2009 to 2011. Relative to other insurance firms, Islami Commercial Insurance Company have attained the highest deterioration of scale efficiency at (-36.5)

percent and Padma Islami life insurance Limited have opined the highest growth of scale efficiencyat 5.9 percent during the study period through 2009-2011.

Table 7: Changes in Efficiency Components by Firms between Time Period t and t + 1, 2009-2011

Types	Name of the Takaful Company	2009-2010		2010-2011	
		PECH	SECH	PECH	SECH
Life	Fareast Islami Life Insurance Company	1.000	1.000	1.000	1.000
	Padma Islami life insurance Limited	1.048	0.967	1.249	1.059
	Prime Islami life Insurance Limited	1.000	1.000	1.000	1.000
	Mean	**1.016**	**0.989**	**1.083**	**1.020**
Non-life	Islami Commercial Insurance Company	1.000	0.944	1.000	0.635
	Islami Insurance Bangladesh Limited	1.000	1.000	1.000	1.000
	TakafulIslami Insurance Limited	1.000	1.000	1.000	1.000
	Mean	**1.000**	**0.981**	**1.000**	**0.878**

Note: PECH = Pure Efficiency Change, and SECH = Scale Efficiency Change.

In terms of pure efficiency, Padma Islami insurance Limited have achieved the highest growth by 4.80 percent in 2009-2010 and 24.90 percent in 2010-2011. During the entire period of study, we have identified as the years of pure efficiency improvement, while deterioration are recorded to be the years of scale efficiency.

4.4. Productivity Performance of the Industry

Table 8 summarizes the performance of the Malmquist productivity index of the whole Takaful(both life and non-life) industry in Bangladesh during the year 2009 and 2011.

In case of LTO, on average, Padma Islami life insurance Limitedrecorded the highest growth in TFP and efficiency change with 11.20 % and 15.80% respectively and negative technical changes with (-4.oo%). In contrast Fareast Islami Life Insurance Company has shown result the lowest growth in TFP and same as technical change with (-14.80) percent and interesting see that no change in efficiency. In addition, Prime Islami life Insurance Limited have experienced 6.8% retreats growth in TFP because of same deterioration in technical changes.

In terms of NLTO, Islami Insurance Bangladesh Limited occupiedfirst rank having highest growth in both TFP and technical change with 20.00 percent, and no change in efficiency in the study period. Moreover, TakafulIslami Insurance Limitedhas occupied second rank with 6.70% improvement in both TFP and TECH but no change in efficiency.Furthermore, Islami Commercial Insurance Company has experienced with 9.90 percent deterioration in TFP though the company has a remarkable technical progress (16.50%) but has a notable deterioration in efficiency change with (-22.60%).

On average, the TFP of the LTO industry is just below the pure efficient level, mainly due to both efficiency and technical changes with 5.30 and (-08.50) percents, respectively. Additionally, the efficiency change is largely contributed by pure efficiency rather than scale efficiency. In comparison, the TFP of the NLTO industry is over the pure efficient level, mainly due to both efficiency and technical changes with (-7.50%) and 14.40 percents, respectively. Additionally, the efficiency change is largely contributed by pure efficiency rather than scale efficiency. This indicates that the size of the companies is not a factor in affecting efficiency changes. This study found that there were very few substantial growths in technical components and efficiency change which suggest that TFP in the Takaful industry is due to the innovation in technical components coupled with a considerable improvement in the efficiency aspect. In case of lifeTakaful industry of Bangladesh has faced more negative impact of technical changes than a positive efficiency, the overall TFP for these firms within the period of study is maintained at a value slightly lower than 1 (reflected by the mean 0.965 of TFP change). In contrary, in case of non-life Takaful Industry of Bangladesh has faced more positive impact of technical changes than a negative efficiency change, the overall TFP for these firms within the period of study is maintained at a value slightly higher than 1 (reflected by the mean 1.056 of TFP change).

Table 8: Summary of the Malmquist Productivity Index of Takaful Operators, 2009-2011

Types	Name of the Takaful Company	EFFCH	TECHCH	PECH	SECH	TFPCH
Life	Fareast Islami Life Insurance Company	1.000	0.852	1.000	1.000	0.852
	Padma Islami life insurance Limited	1.158	0.960	1.144	1.012	1.112
	Prime Islami life Insurance Limited	1.000	0.932	1.000	1.000	0.932
	Mean	**1.053**	**0.915**	**1.048**	**1.004**	**0.965**
Non-life	Islami Commercial Insurance Company	0.774	1.165	1.000	0.774	0.901
	Islami Insurance Bangladesh Limited	1.000	1.200	1.000	1.000	1.200
	TakafulIslami Insurance Limited	1.000	1.067	1.000	1.000	1.067
	Mean	**0.925**	**1.144**	**1.000**	**0.925**	**1.056**

Note: TFPCH = Total Productivity Change; EFFCH = Efficiency Change; TECHCH = Technical Change; PECH = Pure Efficiency Change; and SECH = Scale Efficiency Change.

Figure 1(a) reveals the mean evolution over time of TFP and its components for the LTO measured by the geometric mean of the Malmquist productivity index for each period. The figure displays that on average, TFP occupied the maximum growth in efficiency change during the 2009-2010 and decrease of TFP in the subsequently periods of 2010-2011 which was largely contributed by the improvement of efficiency change rather than technical changes.

Finally, Figure 1 (b) presents the visual synopsis of changes in the mean efficiency and its components which are scale and pure efficiencies for the entire study periods. For the study period of 2009-2011, the mean efficiency changes improve within the study period which has made a significant impact on the overall of TFP change. On the other hand, in case of pure and scale efficiency, pure efficiency and scale efficiency is experienced by a significant amount of improvement. According to the figure, it seems that the change in efficiency has superior by a positive changes in scale efficiency and pure efficiency.

Figure 1(a): Changes in Mean TFP and Its Components for LTO, 2009-2011

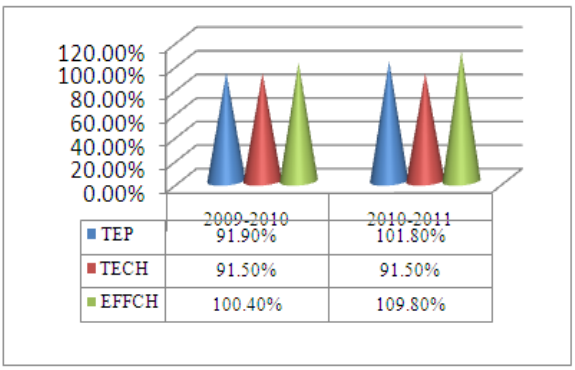


Figure 1(b): Changes in Mean Efficiency and Its Components for LTO, 2009-2011

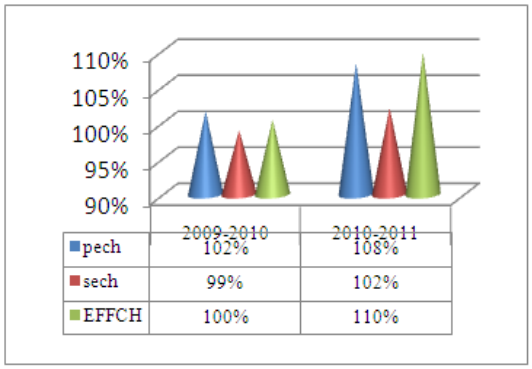


Figure 2(a)reveals the mean evolution over time of TFP and its components for the NLTO measured by the geometric mean of the Malmquist productivity index for each period. The figure displays that on average, TFP occupied the maximum growth in technical efficiency during the 2009-2010 and decrease of TFP in the subsequently periods of 2010-2011 which was largely contributed by the improvement of technical change rather than efficiency change.

Figure 2(a): Changes in Mean TFP and Its Components for NLTO, 2009-2011

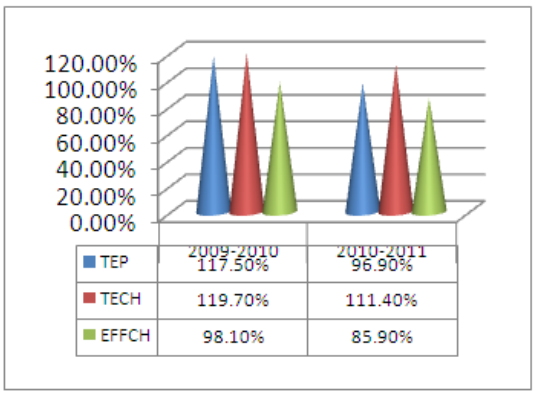
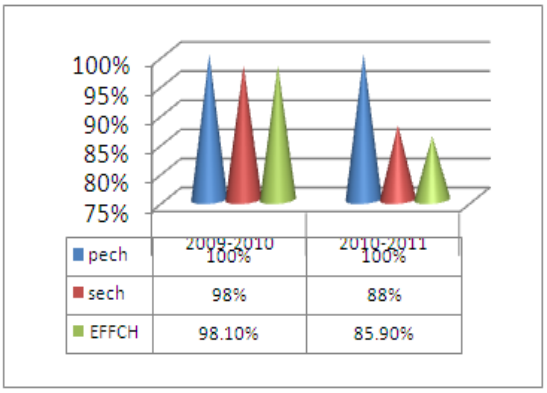


Figure 2(b): Changes in Mean Efficiency and Its Components for NLTO, 2009-2011



Finally, Figure 2 presents the visual summary of changes in the mean efficiency and its components which are scale and pure efficiencies for the entire study periods. For the study period of 2009-2011, the mean efficiency change decline within the study period which has made a significant impact on the overall of TFP change. On the other hand, in case of pure and scale efficiency, scale efficiency is experienced by a significant amount of deterioration but the situation unchanged in case of scale efficiency. According to the figure, it seems that the change in efficiency has declined by a change in scale efficiency rather than a change in pure efficiency.

V. Conclusions

The researchers used DEA to explore the contributions of technical and efficiency change to the growth of productivity in the Takaful Industries in Bangladesh by applying the generalized output-oriented Malmquist index for the years 2009-2011. The efficiency measures of Takaful operators are comparatively measured where

it is found on the point of efficiency, the TFP of the Islamic insurance industry in Bangladesh is near about efficient due to improvement in technical changes rather deterioration in efficiency change with 0.01and (-01.5) percents respectively. Furthermore, the efficiency change is contributed by the pure efficiency rather than scale efficiency.

This indicates that the size of the companies have a very limited influence in affecting efficiency changes. However, this study also found that there were diminutive significant growths in technical components and no improvement in efficiency change which suggest that TFP in the Islamic insurance industry is due to the less innovation in technical components coupled with a insignificant improvement on the aspect of efficiency. On average, the insurance firms are found to be experiencing a technical progress. In contrast there was a slight decline in efficiency change, the subcomponent of this efficiency change, namely pure efficiency, did show a slight improvement (2.3 percent). However, deterioration in the scale efficiency (-3.7 percent) can't offsets the scale efficiency deterioration effect thus giving a small decrease efficiency change. Hence, this finding indicates in the Takaful industry of Bangladesh that the smaller the size of the companies, the higher the probability for the companies to be more efficient in utilizing their inputs to generate more outputs. Due to the negative impact of the efficiency, the overall TFP for these firms within the period of study is maintained at a value just lower than 1 (reflected by the mean 0.995 of TFP change). Overall, Islami Insurance Bangladesh Limited has recorded the highest growth in TFP with 19.4 percent and efficiency change (just 1) and technical changes with 19.4 percent. Fareast Islami Life Insurance Company, on the other hand, recorded the lowest growth in TFP with (-12.9) percent, which is mainly due to technical regress (-12.9 percent). The findings of this study give significant benefits to the Takaful operators in assisting them to take strategies in terms of the operations and management in order to improve the efficiency of both industries in utilizing their inputs to generate more outputs, thus, improving their competitive edge and strengthening their positions in the industry further. This result indicates that Takaful industries have a great potential to further increase their TFP through improvements in both efficiency and technical component such as enhancing the use of information and communication technology in order to provide good services to customers.

Referances

[1]. Abidin Z. &Cabanda E.,(2011), EFFICIENCY OF NON-LIFE INSURANCE IN INDONESIA, Journal of Economics, Business and Accountancy Ventura,14(3), 197 – 202.

[2]. AFZA T. &Jam-e-Kausar, (2010), Efficiency of the Insurance Industry in Pakistan: An Application of Non-parametric Approach, INTERDISCIPLINARY JOURNAL OF CONTEMPORARY RESEARCH IN BUSINESS, 2 (8), 84-98.

[3]. Afza T. & Jam-e-Kausar, (2010), Firm size and efficiency in the non-life insurers of Pakistan, Journal of Quality and Technology Management.

[4]. Ali, M. M. K.,(2000), Provision of micro-insurance for microfinance clients. Microfinance Newsletter, 7, 2-5.

[5]. Barros,C.P.; Barroso, N. and Borges, M.R., (2005). Evaluating the Efficiency and Productivity of Insurance Companies with a Malmquist Index: A Case Study for Portugal. Geneva Papers on Insurance, 30, 244-267.

[6]. Barros, P., Obijiaku, E. L., (2007). Technical Efficiency of Nigerian Insurance Companies. Department of Economics,Institute for Economics and Business Administration (ISEG), Technical University of Lisbon. Working Papers No. 18.

[7]. Berger, A.N, Hunter, W.C., &Timme, S.G., (1993). The efficiency of financial institutions: A review and preview of research past, present and future. Journal of Banking and Finance, 17(2&3), 221-250.

[8]. Berger, A. N., Humphrey, D. B., (1997). Efficiency of Financial Institutions: International Survey and Directions for Future Research. European Journal of Operational Research 98 (2), 175–212.

[9]. Coelli, T. J., (1996a). A Guide to Deap Version 2.1: A Data Envelopment Analysis (Computer) Program, Working Paper No. 8/96, Department of Econometrics, University of New England.

[10]. Cummins, J. D., Turchetti, G., Weiss, M. A., (1996). Productivity and Technical Efficiency Italian Insurance Industry. Working Paper, Wharton Financial Institutions Center, University of Pennsylvania, PA.

[11]. Cummins, J. D., Zi, H., (1998). Comparison of Frontier Efficiency Methods: An Application to the U.S. Life Insurance Industry. Journal of Productivity Analysis 10 (2), 131–152.

[12]. Cummins, J. D., Weiss, M. A., Zi, H., (1999). Organizational Form and Efficiency: The Coexistence of Stock and Mutual Property-Liability Insurers. Management Science 45 (9), 1254–1269.

[13]. Cummins, J. D. and Rubio-Misas, M. (2001). Deregulation, consolidation, and efficiency: evidence from the spanish industry, Working Paper Series, The Wharton School, University of Pennsylvania.

[14]. Cummins, J.D. and Weiss, M.A., (2002). "Analysing Firm Performance in the Insurance Industry, using Frontier efficiency Methods". In Dionne, G. (ed), Handbook of Insurance Economics. Kluwer, Boston, 767-829

[15]. Diacon, S. R., (2001). The Efficiency of UK General Insurance Companies. Working Paper, Centre for Risk & Insurance Studies, University of Nottingham.

[16]. Fare, R., Shawna, G., Bjorn, L., & Ross, P.(1989). Productivity development in Swedish hospitals: A Malmquist output index approach. Mimeo.

[17]. Fare, R., Shawna, G., Mary, N., &Zhongyang, Z.,(1994), Productivity growth, technical progress and efficiency change in industrialized countries. American Economic Review, 84, 66-83.

[18]. Forsund, F. 1991. The Malmquist productivity index. Paper presented at the 2nd European Workshop on Efficiency and Productivity Measurement. Berlgium: Centre of Operations Research & Econometrics, University Catholique de Louvain, Lauvain-la-Neuve.

[19]. Fukuyama, H., (1997). Investigating Productive Efficiency and Productivity Changes of Japanese Life Insurance Companies. Pacific-Basin Finance Journal 5 (4), 481– 509.

[20]. Kessner, K., Polborn, M., (1999). EineEffizienzanalyse der deutschenLebensversicherer—die Best Practice Methode. Zeitschriftfür die gesamteVersicherungswissenschaft 88, 469–488.

[21]. Leong, W.H., Dollery, B., &Coelli, T.,(2003), Measuring technical efficiency of banks in Singapore for the period 1993-1999: An application and extension of the Bauer et al.,1997 technique. ASEAN Economic Bulletin, 20(3), 195-210.
[22]. Jesmin, I. ,R. Md. Azizur, ,Jahid, B, (2013). Measures of Efficiency in the Takaful Industry of Bangladesh-A Non-Parametric Approach, ISSN 2222-1719(paper), ISSN 2222-2863(online) ,volX,no X,2013, www.iiste.org.
[23]. Mahlberg, B., Url, T., (2003). Effects of the Single Market on the Austrian Insurance Industry. Empirical Economics 28, 813–838.
[24]. Mahlberg, B and Url, T., (2010). Single Market effects on productivity in the German insurance industry, Journal of Banking & FinanceVol. 34, No. 7, 1540–1548.
[25]. Mansor, S. A., Radam, A., (2000). Productivity and Efficiency Performance of the Malaysian Life Insurance Industry. JurnalEkonomi Malaysia 34, 93–105.
[26]. Meador, J. W., Ryan, Jr., H. E., Schellhorn, C. D., (2000). Product Focus Versus Diversification: Estimates of X-Efficiency for the US Life Insurance Industry. Working Paper, Wharton Financial Institutions Center University of Pennsylvania.
[27]. Neal, P., (2004),. X-efficiency and productivity change in Australian banking. Australian Economic Papers, 13(2), 174-191.
[28]. Noulas, A. G., Hatzigayios, T., Lazaridis, J., Lyroudi, K., (2001), Non-Parametric Production Frontier Approach to the Study of Efficiency of Non-Life Insurance Companies in Greece. Journal of Financial Management and Analysis 14 (1), 19–26.
[29]. Rees, R., &Kessner, E., (2000), Regulation and efficiency in European insurance markets. Economic Policy, 29, Centre for Economic Policy Research, London.
[30]. Saad M., N., Abd. Majid, M.S., Mohd. Yusof, R., Duasa, J., & Abdul Rahman, A.R., (2007). Measuring efficiency of insurance and takaful companies in Malaysia using data envelopment analysis (DEA). Review of Islamic Economics, 11(1), 5-26.
[31]. Saad M., (2012), An Analysis on the efficiency of TAKAFUL and insurances companies in MALAYSIA: A Non-Parametricc Approach, Review of Interdisciplinary Business Research, 1 (1), 33-56.
[32]. Sabbir, P. (2002). Takaful and poverty alleviation, www.icmif.org/takaful
[33]. Saeidy&Kazentipour, (2011), Compare the Performance Public and Private Insurance Companies in Using Data Envelopment Analysis, World Applied Sciences Journal, 13(3), 988-992.
[34]. Tone, K., Sahoo, B. K., (2005). Evaluating Cost Efficiency and Returns to Scale in the Life Insurance Corporation of India Using Data Envelopment Analysis. Socio-Economic Planning Sciences 39 (4), 261–285.
[35]. Weiss, M. A., (1991a). Efficiency in the Property-Liability Insurance Industry. Journal of Risk and Insurance 58 (3), 452–479.
[36]. Worthington, A. C., Hurley, E. V., (2002). Cost Efficiency in Australian General Insurers:A Non-Parametric Approach. The British Accounting Review 34 (2), 89–108.
[37]. Wu, D., Yang, Z., Vela, S., Liang, L.,(2007). Simultaneous Analysis of Production and Investment Performance of Canadian Life and Health Insurance Companies Using Data Envelopment Analysis. Computers & Operations Research 34 (1), 180–198.