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Measures of Efficiency in the Takaful Industry of 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 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.

1. INTRODUCTION

The primary function of insurance is to act as a risk transfer mechanism to provide peace of mind and protect against losses (Sabbir, 2002). Insurance schemes utilize the combination method by persuading a large number of individuals to pool their risks into a large group to minimize overall risk (Ali, 2000). In the developed world, insurance is part of society such that some forms of cover are required by law. In developing countries, the need for such a safety net is much greater, particularly at the poorest levels where vulnerability to risks is much greater and there are fewer opportunities available to recover from a large loss. Therefore, in the developing countries which are characterized as having low-income levels, and lacking access to social security systems, healthcare, and education, sanitation, and employment opportunities, the need for insurance as a risk transfer mechanism is even more imperative.

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 investment, better prices and services quality for consumers and greater safety in terms of improved capital buffer in absorbing risk (Berger *et al.,1993*). Furthermore, the Bangladeshi financial system has undergone major structural changes in the era of globalization with various liberalization measures being introduced during the last few decades. These factors are expected to have an impact on the efficiency of the life insurance companies and the *Takaful* operators. This study, therefore, focuses on to extend the established non-conventional insurance sector by investigating the efficiency of the Takaful companies/operators in Bangladesh for the period 2009-2011. For the *Takaful* operators, the information obtained on the evaluation of the institutions' performance may be used to improve the overall efficiency of their operations and in turn, may contribute towards achieving its competitive edge.

In this context, the objective of this study is to analyze the sources of efficiency and technical changes of all the Takaful companies in Bangladesh. By using the descriptive statistics and non-parametric approach of Data Envelopment Analysis (DEA) together with Malmquist Index, we isolate the contributions of technical change, efficiency change, the pure and scale changes to total factor productivity growth of different *Takaful* operators in

Bangladesh. Encouraged by the increase in the public awareness in Islamic finance, the *Takaful* industry in Bangladesh continues to enhance its competitiveness.

In recent years, Islamic finance has become one of the most rapidly growing segments of the global financial system. 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 Bangladesh economy. The world's first Takaful insurance company was established in Sudan in 1979, and since then Takaful insurance companies have spread around the world. In Bangladesh, Takaful operators have been started their business from the year 2000. However, in Bangladesh, the insurance companies of private sectors are growing in the last few years. During our study period, the growth rate of insurance industry is 27.75%, 16.56% and 19.27% in the years 2009, 2010 and 2011 respectively. On the other hand, in terms of premium, the growth rate of Takaful industries is only 0.45%, and 5.5% in the year 2011, and 2010 respectively. The researchers want to investigate why the growth rate of Takaful is lower than conventional insurance growth rate, though the 89% to 90% of the people of Bangladesh are Muslim. This is the main research question or motivation to measure the efficiency of the Takaful operation in Bangladesh. No study has been done yet to measure the efficiency of the Takaful industries of Bangladesh.

This study utilizes two inputs, namely, commission and management expenses and two outputs, i.e. premium and net investment income. The paper is organized as follows. Section 2 presents the literature review and in Section 3, we discuss the methodology of DEA and Malmquist Index. Section 4 presents the results and analysis and finally, Section 5 concludes.

2. LITERATURE REVIEW:

Efficiency comparisons at the international level have received significant attention in the insurance literature. In this study, we have detailed overview of 19 international studies, including their sample periods, lines of business covered, method used, types of efficiency analyzed, inputs and outputs used and summery of findings. However, all the 19 studies are analyzed by using Data Envelopment Analysis (Both VRS & CRS), Malmquist Index (both Technical and Efficiency), and Stochastic Frontier Model such as Cobb-Douglas frontier model for 19 different countries. The researchers studied to cover different countries from different continents. Growth in productivity is observed for most of the countries, which is attributed to improvements in technical progress.

A study by Weiss (1991) applied Stochastic Frontier Approach (SFA) to compute the efficiency of 100 US property & liability insurance companies over the period 1980 to 1984. The estimated results indicated cost inefficiency of around 12 to 33 percent amongst the US insurers. Cummins et al (1996) investigated the general level of technical efficiency over time in the 94 life and non-life insurers of Italy over the period 1985-1993. This study used the DEA technique to compute the efficiency scores and found that the efficiency amongst the insurers remain around 70% to 78% over the study period. Fukuyama (1997) investigated productive efficiency and productivity changes of Japanese life insurance companies by focusing primarily on the ownership structures (mutual and stock) and economic conditions (expansion and recession) where he found that productive efficiency and productivity performances differ from time to time across the two ownership types under different economic conditions. Fukuyama (1997) found that stock and mutual life insurers in Japan have approximately equal technical efficiency scores. For the sample period 1989-1992, Fukuyama (1997) found the average technical efficiency in the Japanese life insurance industry to be about 0.91 and total factor productivity gains of about 19 percent. Cummins and Zi (1998) conducted their study by using DEA to measure the efficiency of US insurance companies over the periods 1988 to 1995. They examine effects of merger in firms' efficiency and found that acquired firms achieve greater efficiency gains than firms that have not been involved in mergers or acquisitions. They also found mergers and acquisitions in the life insurance industries have had a beneficial effect on efficiency. The general level of efficiency in both developed and developing countries has been examined by many researchers but the results are mixed in both types of insurance markets. Moreover, Cummins and Weiss (1999) applied DEA to compute the efficiency of 750 life insurers of U.S. for the period 1988 to 1995 and found lower efficiency scores amongst the insurance firms as compared to other financial institutions. Kessner and Polborn (1999) applied Data Envelopment Analysis (DEA) to measure the efficiency of 110 life insurers of Germany over the period 1990 to 1993 and found that the higher number of insurers in the insurance market of Germany were inefficient. Another study by Mansoor and Radam (2000) examined the general level of technical efficiency and productivity for 12 Malaysian life insurers using DEA approach over the period 1987-1997. Although the study reported an increase in the productivity of the insurers, yet the increase in productivity was less compared to the growth rate of the economy. In addition, Diacon Stephen (2001)

conducted his study to evaluate the general efficiency using Farrel Efficiency Scores for 431 of general insurance companies of UK over the period of 1998 and 1999 and found that UK companies inefficiency improvements in comparison with their European counterparts.
Another study by Noulas et al. (2001) investigated the efficiency of 16 non life insurance companies by using DEA-CCR model in Greek over the periods of 1991 to 1996 and found that Industry highly inefficient, with notable differences between different companies. In addition, another study showed that insurance companies were under pressure to upgrade their efficiency relative to their competitors in Austria (Mahlberg and Url, 2003). Barros et al (2005) found positive relation to the efficiency scores captured by the trends of 14 life insurance of Portugal over the period 1995 to 2003. For instance, Tone and Sahoo (2005) investigated the general level of efficiency over time in the Indian life insurers using DEA over the period 1982-2001. The estimated results indicated that the allocated inefficiencies amongst the life insurers of India increased after 1994 whereas the cost efficiency also increased after 2000. Barros, Barroso and Borges (2005) conducted their study to examine the efficiency of 27 insurance companies using DEA Malmquist index in Portugal over the period of 1995 to 2003 and found that public policy to encourage the adoption of disincentives to principal-agent relationships and the collective-action problem would yield increased efficiency
Overall, regarding the empirical studies discussed above, the differences in sample periods might be important in explaining inconsistent results. Moreover, comparability of the studies is limited by differences in the subject of investigation and the methodology employed. Thus, the major contribution of this paper is to extend existing literature as to the number of countries analyzed, and also with regard to the methodologies used, with the aim of shedding a brighter light on efficiency in international insurance markets.DEA is a model that combines all the inputs and outputs 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), Cummins and Weiss (2002) and 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.
In addition, considering the Malaysia like Bangladesh twofold local financial system environment where the Takaful operators are operating in parallel with their conventional counterparts, another recent study was undertaken by 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. Thus, the overall productivity growth of the insurance industry in Malaysia over the sample period was more or less contributed by both technical efficiency and technical progress. Wu et al., 2007 found that Canadian life and health insurance companies operated very efficiently. Another study on Nigeria that most of the companies there were VRS efficient (Barros/Obijiaku, 2007). Abidin & Cabanda (2009) has applied DEA in order to find out the general efficiency of 23 non-life insurance companies in Indonesia over the period of 2005 to 2007 and found that bigger insurance companies were more efficient than smaller firms. Afza & Ali Asghar (2010), applied non-parametric Data Envelopment Analysis (DEA) to estimate the efficiency of 38 life and non life insurance companies in Pakistan over the period 2003 to 2007 and found that the insurance companies were on average 92.7 percent technical efficient,

81.12 percent allocated efficient and 75.44 percent cost efficient. Moreover, the study had also found that allocated and cost efficiencies are improved from 2003 to 2005 but significantly decreased in 2006 whereas; technical efficiency is increased over the study period. Saeidy & Kazentipour (2011) conducted their study to examine the efficiency of all public and private insurance companies in Iran by using DEA over the period of 2005-2009 (1383-1387 in Persian calendars) and found that the performance of State owned insurance was better than private insurance companies. Saad(2012) conducted his study to examines the efficiency of 28 general or non-life Takaful and insurance industry by using DEA in Malaysia during the period 2007 to 2009 and found that the efficiency of the Takaful companies below the level of their conventional counterparts.

Against this background, the motivation of our paper is to investigate the efficiency of the both life and non-life Takaful and insurance industry in Bangladesh using the nonparametric approach. We also hope to shed some light on the performance of the Takaful operators.

3. DATA SOURCES AND METHODOLOGY

In order to measure the efficiency 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 was 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 all (06) Islamic insurance firms in Bangladesh, namely Fareast Islami Life Insurance Company (FILIC), Islami Commercial Insurance Company (ICIC), Islami Insurance Bangladesh Limited (IIBL), Padma Islami Life insurance Limited (PDILIL), Prime Islami Life Insurance Limited (PILIL) and Takaful Islami Insurance Limited.(TIIL) Inputs and outputs data are collected from period of 2009 to 2011. The data are gathered from the respective Takaful annual reports, websites and chief finance officer (for ICIC because of unavailable audited annual report).

To examine the contributions of technical and efficiency change to the growth of productivity in the Takaful 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.

4. FINDINGS AND ITS ANALYSIS:

4.1 Measures of some Descriptive Statistics

We want 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 period of study. In case of total inputs and outputs during the period of analysis, FILIC and ICIC have occupied the highest and lowest rank respectively. The average premium and net investment income are Tk. 1689.66 and Tk. 267.34 million BDT, respectively. Meanwhile, the average commission and management expenses are Tk. 484.42 and Tk.261.23 millions BDT, respectively during study period 2009-2011.

Table 1: Descriptive Statistics, 2009-2011

Statistics	**Inputs (In million BDT)**		**Outputs (In million BDT)**	
	Commission	**Management Expenses**	**Premium**	**Investment Income**
Mean	484.42	261.23	1689.66	267.34
Median	189.87	160.76	670.41	106.64
Standard Deviation	687.58	256.62	2372.83	316.40
Minimum	28.74	33.29	13.96	16.99
Maximum	2213.71	849.04	6908.76	1131.33

Source: Annual Reports of respective Takaful Companies

4.2. Production Frontier and Efficiency

The primary purpose of this section 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 the Takaful 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. For the years reported in tables 2 and 3, all the Takaful companies are consistently efficient, both under constant returns to scale (CRS) and variable returns to scale (VRS) except ICIC and PDILIL. Meanwhile, ICIC is consistently efficient under VRS but not under CRS. Moreover, the PDILIL is the least efficient firm for both CRS and VRS versions respectively.

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

SL. No.	Name of the Takaful Company	2009	2010	2011
1	Fareast Islami Life Insurance Company	1.000	1.000	1.000
2	Islami Commercial Insurance Company	0.519	0.542	0.325
3	Islami Insurance Bangladesh Limited	1.000	1.000	1.000
4	Padma Islami Life insurance Limited	0.746	0.756	0.991
5	Prime Islami Life Insurance Limited	1.000	1.000	1.000
6	Takaful Islami Insurance Limited	1.000	1.000	1.000
	Mean	0.877	0.883	0.886

The values in Tables 2 and 3 show the percentage of the realized output level compared to the maximum potential output level at the given input mix. As per example, in 2009, ICIC produced 51.9 percent of its potential output level and PDILIL produced 74.6 percent of its potential output under CRS. Under VRS in the same year, the PDILIL produced the potential output as same as 74.6 percent whereas, ICIC produced at their maximum potential output, which was at 100 percent. In 2010 ICIC produced 54.2 percent of its potential output level and also decrease in 2011

and PDILIL produced 75.6 percent of its potential output under CRS. Under VRS in the same year, the PDILIL produced the potential output as same as 76.5 percent whereas, ICIC 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 whole industry increases for the period 2009 to 2011 under CRS. Meanwhile, under VRS, the average efficiency for the whole industry is same between 2009 and 2010 but shows a slight increase in later years reached at maximum potential output, which was at 100% percent. On average, efficiency performance of the Takaful industry is relatively higher based on VRS than CRS.

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

SL. No.	Name of the Takaful Company	2009	2010	2011
1	Fareast Islami Life Insurance Company	1.000	1.000	1.000
2	Islami Commercial Insurance Company	1.000	1.000	1.000
3	Islami Insurance Bangladesh Limited	1.000	1.000	1.000
4	Padma Islami Life insurance Limited	0.764	0.765	1.000
5	Prime Islami Life Insurance Limited	1.000	1.000	1.000
6	Takaful Islami Insurance Limited	1.000	1.000	1.000
	Mean	0.961	0.961	1.000

4.3. Productivity Performance of the Individual Company

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 to 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 Companies Relative Malmquist TFP Change between Time Period t and t + 1, 2009-2011

SL. No.	Name of the Takaful Company	2009-2010	2010-2011	Mean
1	Fareast Islami Life Insurance Company	0.868	0.874	0.871
2	Islami Commercial Insurance Company	1.063	0.745	0.904
3	Islami Insurance Bangladesh Limited	1.113	1.281	1.197
4	Padma Islami Life insurance Limited	0.982	1.167	1.075
5	Prime Islami Life Insurance Limited	0.906	0.959	0.933
6	Takaful Islami Insurance Limited	1.355	0.816	1.086
	Mean	1.036	0.956	0.996

Table 4 portrays calculated changes in the Malmquist-based Total Factor Productivity index. As shown in the results, IIBL has positive productivity changes during the adjacent years of 2009-2010, 2010-2011. On the other hand, ICIC and PILIL have positive productivity changes for the adjacent years of 2009-2010, but they faced deterioration in productivity in 2009-2011. In contrast, PDILIL recorded deterioration in TFP for the year 2009-2010 where in the next year recorded marked improvement in TFP at 2010-2011. Moreover, FILIC and PILIL have faced positive productivity changes during the adjacent years of 2009-2010 and 2010-2011. In addition, IIBL has occupy the first rank with 19.7 percent average TFP annual growth rate, followed by TIIL with an annual rate of 08.6 percent, and then PDILIL ranked third with an annual rate of 07.5 percent. The TFP change, on average, only showed very few significant growths in the periods of 2009-2010, with 03.6 percent. However, it deteriorated in 2010-2011, which is 04.4 percents.

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, all the firms experienced both technical progress and retreat. Howover, ICIC and IIBL are the firms that experienced technical progress for the periods of 2009 to 2011. In contrast, Fareast Islami Life Insurance Company, PDILIL and PILIL are the firms that have experienced technical retreat for the periods of 2009 to 2011. During the study period TIIL has positive productivity changes for the years of 2009-2010, but they faced a

reduction in productivity in 2010-2011. On the other hand, TIIL has been achieved the maximum change in technical progress (35.5 percent) in the period 2009-2010 and maximum retreat in 2010-2011 , while IIBL achieved the highest technical growth between the period 2010-2011 with 28.1 percent. During the study period, 03 Takaful companies have achieved average technical progress. By considering the mean, IIBL occupies first rank with 19.7%, followed by ICIC with 13.0% and TIIL with 8.6%. In contrast, FILIC was found as the most technical regressive firm (12.9 percent).

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

SL. No.	Name of the Takaful Company	2009-2010	2010-2011	Mean
1	Fareast Islami Life Insurance Company	0.868	0.874	0.871
2	Islami Commercial Insurance Company	1.017	1.242	1.130
3	Islami Insurance Bangladesh Limited	1.113	1.281	1.197
4	Padma Islami Life insurance Limited	0.969	0.890	0.930
5	Prime Islami Life Insurance Limited	0.906	0.959	0.933
6	Takaful Islami Insurance Limited	1.355	0.816	1.086
	Mean	1.026	0.995	1.011

Table 6 reveals the changes in relative efficiency for each individual company. 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 ICIC through the year 2009 to 2011. During the entire period of study, the results indicate that, on average, the only Islamic insurance firm under study, i.e. PDILIL experienced the highest efficiency change with 16.3 percent, while only ICIC that experienced efficiency decline by (-17.8 %). finally, the result shows that an improvement have been seen in relative efficiency throughout these years with a slight deterioration during the period 2009-2011 at -1.5 percent.

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

SL. No.	Name of the Takaful Company	2009-2010	2010-2011	Mean
1	Fareast Islami Life Insurance Company	1.000	1.000	1.000
2	Islami Commercial Insurance Company	1.044	0.600	0.822
3	Islami Insurance Bangladesh Limited	1.000	1.000	1.000
4	Padma Islami Life insurance Limited	1.013	1.312	1.163
5	Prime Islami Life Insurance Limited	1.000	1.000	1.000
6	Takaful Islami Insurance Limited	1.000	1.000	1.000
	Mean	1.009	0.961	0.985

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 ICIC and PDILIL during the period 2009 to 2011. Relative to other insurance firms, ICIC have attained the highest deterioration and the highest growth of scale efficiency at (-40.0) percent and 4.4 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

SL. No.	Name of the Takaful Company	2009-2010		2010-2011	
		PECH	SECH	PECH	SECH
1	Fareast Islami Life Insurance Company	1.000	1.000	1.000	1.000
2	Islami Commercial Insurance Company	1.000	1.044	1.000	0.600
3	Islami Insurance Bangladesh Limited	1.000	1.000	1.000	1.000
4	Padma Islami Life insurance Limited	0.995	1.018	1.316	0.997
5	Prime Islami Life Insurance Limited	1.000	1.000	1.000	1.000
6	Takaful Islami Insurance Limited	1.000	1.000	1.000	1.000
	Mean	0.999	1.010	1.047	0.918

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

In terms of pure efficiency, PDILIL have achieved the highest deterioration by very significant -0.50 percent in 2009-2010. It is interesting to note that although PDILIL attained the highest deterioration in pure efficiency; it also experienced the highest growth in pure efficiency with 31.60 percent in the next period. 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 industry in Bangladesh during the year 2009 and 2011. On average, IIBL recorded the highest growth in TFP and technical changes with 19.4%, no efficiency change. In contrast FILIC has shown result the lowest growth in TFP and same as technical change with (-12.1) percent and interesting see that no change in efficiency. PDILIL took the second rank by having TFP of 7.0 percent, which is mainly contributed by efficiency progress (15.30 percent), but technical change are deteriorated with -7.1%. On average, the TFP of the Takaful industry is just below the pure efficient level, mainly due to both efficiency and technical changes with -1.5 and 0.01 percents, respectively. Furthermore, 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. On average, the insurance firms were found to be experiencing a technical progress. Even though there was no improvement in efficiency change, the subcomponent of this efficiency change, namely pure efficiency, shows a minor improvement (2.3 percent) and a negative change in scale change. Takaful industry of Bangladesh has faced more negative impact of efficiency than a positive technical changes, the overall TFP for these firms within the period of study is maintained at a value slightly lower than 1 (reflected by the mean 0.995 of TFP change).

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

SL. No.	Name of the Takaful Company	EFFCH	TECHCH	PECH	SECH	TFPCH
1	Fareast Islami Life Insurance Company	1.000	0.871	1.000	1.000	0.871
2	Islami Commercial Insurance Company	0.791	1.124	1.000	0.791	0.890
3	Islami Insurance Bangladesh Limited	1.000	1.194	1.000	1.000	1.194
4	Padma Islami Life insurance Limited	1.153	0.929	1.144	1.007	1.070
5	Prime Islami Life Insurance Limited	1.000	0.932	1.000	1.000	0.932
6	Takaful Islami Insurance Limited	1.000	1.051	1.000	1.000	1.051
	Mean	0.985	1.01	1.023	0.963	0.995

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

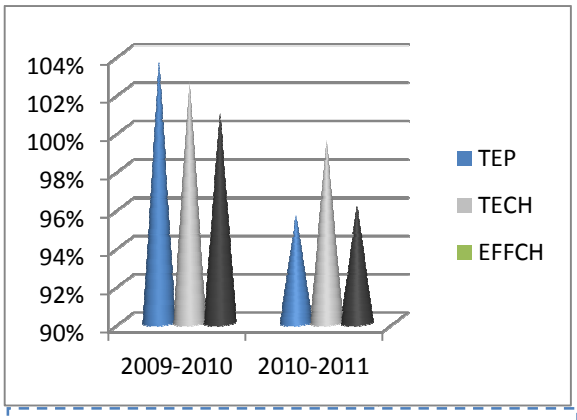

Figure 1: Changes in Mean TFP and Its Components

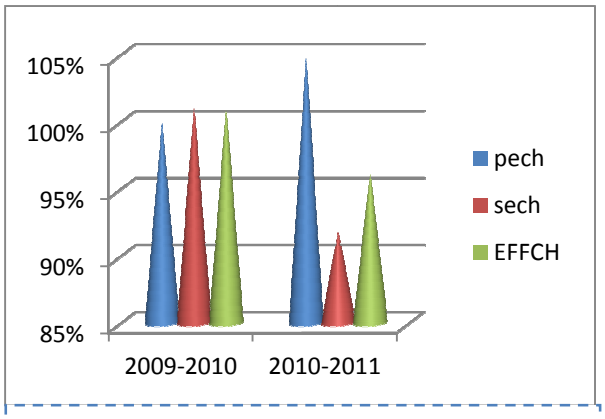

Figure 2: Changes in Mean Efficiency and Its components

Figure 1 reveals the mean evolution over time of TFP and its components for the Takaful industries 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. 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, pure efficiency is experienced by a significant amount of deterioration but the situation reverses 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.

5. 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 limitd 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, IIBL has recorded the highest growth in TFP with 19.4 percent and efficiency change (just 1) and technical changes with 19.4 percent. FILIC, 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.

REFERENCE:

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

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.

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

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

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.

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.

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.

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.

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.

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.

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.

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.

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.

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

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

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

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.

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.

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

Kessner, K., Polborn, M., (1999). Eine Effizienzanalyse der deutschen Lebensversicherer—die Best Practice Methode. Zeitschrift für die gesamte Versicherungswissenschaft 88, 469–488.

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.

Mahlberg, B., Url, T., (2003). Effects of the Single Market on the Austrian Insurance Industry. Empirical Economics 28, 813–838.

Mahlberg, B and Url, T., (2010). Single Market effects on productivity in the German insurance industry, *Journal of Banking & Finance* Vol. 34, No. 7, 1540–1548.

Mansor, S. A., Radam, A., (2000). Productivity and Efficiency Performance of the Malaysian Life Insurance Industry. Jurnal Ekonomi Malaysia 34, 93–105.

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.

Neal, P., (2004),. X-efficiency and productivity change in Australian banking. *Australian Economic Papers*, 13(2), 174-191.

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.

Rees, R., & Kessner, E., (2000), Regulation and efficiency in European insurance markets. *Economic Policy*, 29, Centre for Economic Policy Research, London.

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.

Saad M., (2012), AN ANALYSIS ON THE EFFICIENCY OF TAKAFUL AND INSURANCE COMPANIES IN MALAYSIA: A NON-PARAMETRIC APPROACH, Review of Interdisciplinary Business Research, 1 (1), 33-56.

Sabbir, P. (2002). *Takaful and poverty alleviation*, www.icmif.org/takaful

Saeidy & Kazentipour, (2011), Compare the Performance Public and Private Insurance Companies in Using Data Envelopment Analysis, World Applied Sciences Journal, 13(3), 988-992.

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-Economics Planning Sciences 39 (4), 261–285.

Weiss, M. A., (1991a). Efficiency in the Property-Liability Insurance Industry. Journal of Risk and Insurance 58 (3), 452–479.

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.

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.