

Comprehensive and Technical Efficiency of Insurance and Takaful Companies in Pakistan

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Abstract

Insurance and *Takaful* companies, both, are business organizations existing for the motive of profit. Large capital is required by the shareholders to establish a company; therefore, the company is expected to earn sufficient profit to meet the expectations of the shareholders. Moreover, a company also has its responsibilities towards its customers in terms of quality service. Shareholders are more concerned with their profit and customers regarding the services. Companies pay claims when the covered persons suffer a loss which can be the death of the family's only bread earner, factory on fire, theft of business goods etc. Therefore, efficient financial performance of insurance and *Takaful* companies is important to fulfil the requirements of both: shareholders and clients. This study investigates financial efficiency of insurance and *Takaful* companies via Data Envelopment Analysis during the period 2011 to 2015. We have taken six general (non - life) insurance & *Takaful* companies operating in Pakistan with input factors labor cost, assets and output factors premium / contribution received and percentage of claims paid. Results show that insurance and takaful companies are more than 80% efficient in their operations. For further increasing their efficiencies, they need to reduce their input by less than 20% to have same level of output. Comparing efficiencies of insurance and *takaful* companies, insurance companies are more efficient in terms of pure technical & super efficiency while takaful companies have higher scale efficiency than insurance companies, though the difference in most of the cases is less than 2%. Both types of companies need to improve their efficiencies by decreasing their assets input and labor cost while retaining the same output level of premiums and claims.

Keywords: General insurance, Data Envelopment Analysis (DEA); Malmquist index, Takaful, Scale and technical efficiency

1. Introduction

Use of efficiency measurement is increasing in the financial sector especially in

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the growing insurance and takaful industry. Cummins (2000) studied efficiency of 08 insurance companies. Antonio & Akbar (2000) conducted a study on cost efficiency of insurance and takaful companies of Malaysia. Eling & Luhnen (2010) studied 6462 life and general insurance companies based in 36 countries. Efficiency comparison of companies operating in different countries gives useful insights though these comparisons are confined to certain countries. Mostly, the studies focused on US, Japan, OECD and Switzerland (Weiss, 1991, 2000; Donni & Fecher, 1997; Diacon et al, 2002).

Insurance companies are established with huge capital. Shareholders of a company make this investment for a good return and it is always a strategic investment which generates the benefit in long term. Big cash inflows of the company are premium earned and investment income when the collected premium is invested. Outflows include claim payments and administrative expenses. A company can be efficient only if it earns more profit when it receives more premium and investment income and pays less claims and incurs less administrative expenses.

Insurance and *Takaful* companies serve the society by compensating a customer if any of the defined losses occurs. The defined loss can be a theft of car, death of a client, destruction of factory due to earthquake. Such compensation enables a business to keep it continue ensuring no loss of jobs, goods and services. Therefore, it is important to check whether insurance or *Takaful* companies are efficient in terms of honoring their promises in the form of paying claims on timely basis.

In Pakistan, insurance growth in 2016 was recorded as 13 % and premium collection was around Rs. 265 billion (Milliman, 2016). In year 2018, insurance and takaful companies of Pakistan received Rs. 308 billion which is around 0.89% of GDP (Insurance Association of Pakistan, 2019). Insurance sector paid tax of Rs. 5 billion in year 2015 (Hanif & Iqbal, 2017).

In Pakistan, first *Takaful* company was established in 2006 under *Takaful* rules 2005. Presently, five full-fledged *Takaful* companies and more than 15 insurance companies providing takaful services are working in Pakistan (SECP, 2018). More than ten years have passed since the establishment of takaful companies in Pakistan; therefore, it is pertinent to compare the efficiency of takaful and insurance companies. Since lesser studies are conducted on comparing efficiencies of general insurance and takaful having similar size and nearby year of establishments; therefore, this study aims to compare efficiencies of 05 general insurance and takaful companies. Moreover, this study also contributes in the literature on the use of data envelopment analysis in insurance and

takaful companies. For better and meaningful findings, comparison is made between general insurance and takaful companies having almost similar sizes and dates of incorporations.

Moreover, the present study aims to analyse the competitiveness of insurance and takaful companies, the most important elements of financial industry, and aims to suggest ways for improving their efficiencies. It will provide a comparison to the shareholders of the companies about the profit they earn on their investment with respect to earning of their competitors. They may take corrective measures if they are less efficient than their competitors. Regulators may constitute such laws which promote efficiency of the companies.

Introduction section will be followed by section 2 giving an over view of previous studies. Framework, variables, methodology and results are mentioned in section 03. Section 04 discusses the results with respect to the financial rating of the companies for that period. Section 05 discusses the Malmquist index (mi) of insurance and *takaful* companies. Section 06 has a discussion on results, methodological contribution in 6 and conclusion in section 8.

2. Literature review

2.1 Insurance

‘Insurance is a mechanism in which a client transfers a financial risk to an entity that provides compensation, if an insured event occurs’ (Malik & Ullah, p.16, 2016). ‘Insurance involves transfer of potential losses to an insurance pool’ (Dorfman, 1998, p. 3)

Oxford dictionary defines insurance as ‘An arrangement by which a company or the state undertakes to provide a guarantee of compensation for specified loss, damage, illness, or death in return for payment of a specified premium’. Insurance can be divided into two broad classes: Life insurance and non - life (General insurance). Life insurance coverage provides compensation when the customer dies while non -life coverage includes insurance of vehicles, goods, buildings etc. History of life insurance is very old and has different claims about its commencement. Some claim that general insurance started in 11th century while the life insurance started from Italy in sixteenth century (Borscheid & Haueter, 2012; Mace, 2016). In Pakistan, insurance/Takaful sector is comprised of around 30 general (Non - Life) insurance and 03 general Takaful (Islamic insurance) companies while life insurance companies are seven and family (Life) takaful companies are two (Insurance Association of Pakistan, 2019).

2.2 Takaful

Takaful is defined as a system in which a common fund is created for compensating the fund members when they face a defined loss. It is based on principles of brotherhood, solidarity and mutual assistance with each other (Gonulal, 2012; Zainuddin & Noh, 2013). First Takaful company was established in 1979 in Sudan (Billah, 2007). In Malaysia, first Takaful company was established in 1985 and today Malaysia leads the global Takaful market (Redzuan & Aidid, 2009). In Pakistan, first general Takaful company was established in 2006 and life (family) Takaful company in 2008. Presently, two general and two-family Takaful companies are operating in Pakistan. One of the general Takaful companies' operations stands closed leaving only two general Takaful companies in Pakistan.

Studies have been carried out for measuring efficiency of insurance companies by using parametric and non-parametric approaches. These studies are conducted in developed and developing countries but very few researchers have tried to measure efficiency of *Takaful* companies. Some of these studies were conducted by Diacon (2002), Cummins and Misas (2001) however, Fukuyama (1997) studied the efficiency of Japanese insurance industry. Barros et al (2008) studied the Nigerian insurance industry using DEA from 1994 to 2005 and the findings revealed that technical efficiency of these firms is decreasing.

Khan and Noreen (2014) studied 12 conventional insurance companies including ten general and two life insurance companies and five Islamic insurance companies (three general and two-family *Takaful*) of Pakistan using data from 2006-2010. Input variables namely Labor, Capital and business services and output variable premium income were taken to measure the efficiency. They used data envelopment approach. The empirical results of cost efficiency indicate that *Takaful* companies are more efficient than conventional counterparts due to high allocative efficiency leading to the conclusion that their choice of inputs is optimal. Ismail and Bacha (2011) conducted a study on eighteen companies including four life insurers, seven composite and seven *Takaful*. Input variables taken are management expenses, labor costs and Invested assets as input variables and gross income and investment income are output variables using Data Envelopment Analysis. Findings revealed that insurance companies have a higher technical efficiency than their *Takaful* counterparts.

2.3 Previous work

Study	Input Variables	Output Variables	Tool	Result
Efficiency Measure of Insurance v/s <i>Takaful</i> by Khan & Noreen (2014)	Labor cost, Total fixed assets, Business Services and equity capital	Premium income	DEA model	Insurance companies are less efficient than <i>Takaful</i> counterparts due to high allocative efficiency leads to the conclusion that their choice of inputs is not optimal.
Organizational Form And Efficiency: The Coexistence Of Family <i>Takaful</i> and Life Insurance In Malaysia (Ismail, Alhabshi & Bacha, 2011).	Management expenses, labor costs and Invested assets	gross income and Investment income	DEA Excel Solver	Insurance companies have higher technical efficiency and scale efficiency as compared to <i>Takaful</i> companies.
An Analysis On The Efficiency Of <i>Takaful</i> And Insurance Companies In Malaysia: A Non-Parametric Approach (Saad, 2012).	management and commission expenses	premium and net investment income	DEA Coelli's Version	Overall, efficiency of the <i>Takaful</i> companies is found to be below than their conventional counterparts.

Source: Developed by authors

Insurance and *Takaful* companies can be considered as units of production because they have proper inputs, processes and outputs. Their inputs include premium income, invested assets, employees like marketers and underwriters. The technology and procedures process these inputs and generate profit or loss for the shareholders and claim amounts for their covered customers. Cummins

and Weiss (1999) considered insurance companies as production units while comparing the efficiency of US stock and mutual insurance companies.

In the study by Khan and Noreen (2014), the list of companies taken as sample shows that most of the insurance companies were established before 1980's while *Takaful* companies are established after 2006 which may have an impact on results. Moreover, the sample contains a mix of general and life insurance and *Takaful* companies. As mentioned earlier, general insurance and *Takaful* companies provide financial compensation when defined loss occurs to covered vehicles, buildings, physical stock, and machinery etc while life insurance and *Takaful* companies provide compensation when death or disability of the customer occurs. They both have different structures and varying break -even points. Life insurance Company's break - even point is around six to ten years while general insurance companies have around five years (Business today, 2017). Same is the case with general and family *Takaful* companies. Year of establishment also has an impact on the performance of the companies, as the older companies normally have a large size in terms of number of customers, premium and geographical spread which also affects their premium income and claims figures.

Therefore, in this study, the sample consists of three general insurance and three general *Takaful* companies with year of establishments close to each other so that the results may remain more relevant and comparable.

Following are the details of insurance and takaful companies considered in Khan and Noreen (2014)'s study showing years of establishment and their type; either being a general (non - life) company or life.

S.No	Insurance Company	Year of Establishment (Taken from company's websites)	General/ Life
1	Adamjee Insurance	Adamjee General: 1960 Adamjee Life: 2008	Not mentioned whether they are considering Adamjee general or life. Not mentioned in appendix B
2	Askari General	1995	General

3	Atlas General Insurance Company	1934	
4	Premier Insurance	1952	General
5	Shaheen Insurance	1996	General
6	EFU – General	1932	
7	EFU Life	1992	
8	State life Insurance Corporation of Pakistan	1972	
9	National Insurance Company Limited	2000	General
10	New Jubilee insurance	Jubilee Life 1995 Jubilee General 1953	Study doesn't mention whether they are taking Jubilee general or life in their data
11	Habib Insurance	1942	General

Takaful Companies

S.No	Takaful Company	Year of Establishment	General/ Life
1	Pak Kuwait Takaful Company	2006	General
2	Takaful Pakistan Limited	2007	General
3	Pak Qatar General Takaful	2008	General
4	Pak Qatar Family Takaful Company	2008	Life
5	Dawood Family Takaful Company	2007	Life

Among insurance companies, only two are life insurance while remaining 09 are general insurance companies. Among takaful, one company is life while 04 are general takaful companies. Regarding year of establishment, 06 insurance companies are established in or before 1960, one company in 1972 while the rest are in or before 2000 while all takaful companies are established after 2005. Older companies normally have a large set up resulting in economies of scale, thus improving their efficiencies. Comparing them with new companies may not be appropriate. Therefore, in this study, only general insurance and takaful companies are taken and insurance companies are selected with due care with year of establishment close to 2000. Following details can be checked:

Companies Selected in the Current Study:

S.No	Insurance Company	Year of Establishment	General/ Life
1	Al Falah Insurance	2006	General
2	PICIC Insurance	2004	General
3	Asia Insurance	2008	General

Takaful Companies

S.No	Takaful Companies	Year of Establishment	General/ Life
1	Pak Kuwait Takaful	2006	General
2	Takaful Pakistan	2007	General
3	Pak Qatar General	2008	General

Based on close year of establishment of insurance and takaful companies and being all general companies, results are comparable.

Moreover, the current study also makes a methodological contribution by using following financial ratings of the companies for the period under consideration

while analysing the results. The use of financial ratings is not found in the previous studies in the analysis.

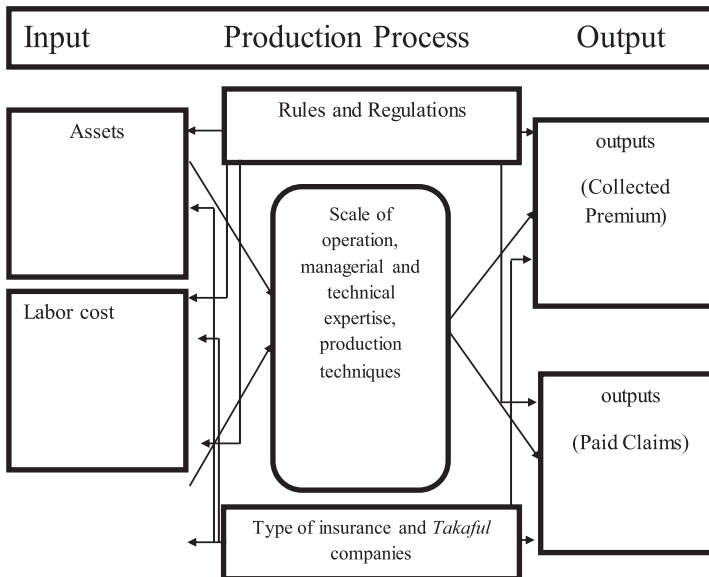
Table 2.1 Financial rating of insurance and *Takaful* companies carried out by JCR-VIZ and PACRA rating agencies operating in Pakistan for the period under consideration.

Company	2011	2012	2013	2014	2015
Al Falah Insurance (AF)	A-	A	A	A+	AA-
PICIC Insurance (PICIC)	A-	BBB+	BBB+	BBB+	BBB+
Asia care Insurance(AS)	BBB+	A-	A-	A-	A-
<i>Takaful</i> Pakistan (TP)	BBB+	BBB+	BBB+	BBB+	BBB+
Pak Qatar General <i>Takaful</i> (PQ)	BBB+	BBB+	A-	A-	A-
Pak Kuwait <i>Takaful</i>	A-	A-	A-		BBB

3. Theoretical Framework, Methodology and Data

3.1 Theoretical Framework of the study

Figure 3.1 Theoretical Framework



Source: (Khan & Sulaiman, 2016).

We shall consider labor cost and assets as input variables while premium and paid claims as out-put variables.

Input

Input factors are those which produce/generate a product or service. Quality of output greatly depends on the input factors. In this study, input variables are labor cost and assets.

Processes

It's the system, technology, procedures, rules and regulations which converts the input elements into output. For a manufacturing concern, it's the machinery and procedures that convert the raw material into output. For insurance and takaful companies, the procedures of underwriting, customer service etc. can be considered as their processes. Underwriting is the process in which a company decides about the request of a client asking for insurance either to give the coverage or to reject and if it decides to give the coverage, then what should be the rate of premium or contribution.

Output

It may be in the form of a physical product or service. Its quality greatly depends on the quality of input factors and the processes. In this study, out - put variables are premium and net paid claims. Premium is the price of insurance coverage provided by the company. The coverage commences when the client pays the premium. A specific amount is claimed by the client if the covered loss occurs and is paid by the company to the client or legal heirs.

Insurance and takaful companies invest their assets and employ staff for ensuring profit for their shareholders and quality service to their clients. With these assets and staff, companies generate premium and pay claims to their customers. In this study, we try to check how efficiently companies are using their assets and staff for generating premium and paying claims.

3.2 Methodology

Merriam-Webster Dictionary defines efficiency as “effective operation as measured by a comparison of production with cost (as in energy, time, and money)”. It is linked with one of the utility concepts of economics. Being commercial financial institutions, both insurance and *Takaful* companies are concerned with earning more profit with less resource, thus remaining more and more efficient. Previously, ratio analysis has remained in use for measuring efficiency while in the last few decades; use of frontier methodologies has started. This method gives very meaningful and relevant results. Frontier

methodology has parametric and non - parametric approaches namely Stochastic Frontier Analysis, Thick Frontier Analysis and non-parametric techniques like Data Envelopment Analysis (Khan & Noreen, 2014). Researchers mainly use DEA method for measuring efficiency of insurance companies, as it can handle several input and output variables (Saad, 2012).

Comparison of general insurance with general *Takaful* is selected because both of them focus coverage of an asset against the risk of loss due to a covered physical threat while life insurance and (family) *Takaful* companies focus on risk of loss due to death and disability of the covered clients. Due to the differences in services of general and life, their financial statements and data reporting also differ (Cummins & Xie, 2013). Several studies have focused on measuring efficiency in insurance companies while few studies carried out in Malaysia have also measured it in *Takaful* companies. However, very little work has been carried out on *Takaful* companies operating in Pakistan therefore, we take five insurance and *Takaful* companies established nearly in same periods using non-parametric approach taking data from 2011 – 2015 by applying DEA. Efficiency scores are calculated using Efficiency Measurement System (EMS) 1.3. We take labor cost and assets as input variables and premium and paid claims as output variables.

Charnes et al., (1978) initially used data envelopment analysis in their study (Saad, 2012). Later on, Banker (1984) also utilized the same technique. This technique focuses on gauging the relative efficiency in firm with best practices. DEA has two parts: technical efficiency and allocative efficiency. Technical efficiency tells us the minimum inputs required for a specific output and maximum output for a specific input. Allocative efficiency tells us the proportion of optimal level of input for a given output. Technical efficiency can be further divided into pure technical efficiency and scale efficiency. Pure technical efficiency occurs when firm maximizes output with variable return to scale and scale efficiency occurs when firm operates at constant return to scale (Khan & Noreen, 2014).

The Mathematical form of the DEA model could be explained in the following. In the DEA, we calculate score for each DMU based on output-input ratio by giving specific weight.

$$Score = Output/Input(s) \dots\dots\dots (A)$$

We give specific weight to each input and the resulting output.

$$Score = \frac{Weighted Output}{Weighted Input(s)} \dots\dots\dots (B)$$

A DMU is said to be efficient if the total score is equal to one, while, by receiving a score having less than one, the DMU would be relative inefficient.

The DEA analysis is based on linear programming.

Let us consider that there are six numbers of DMUs varying from 1 up to 6 and the Vector of DMUs is denoted by D_i :

$$D_1, D_2, D_3, D_4, D_5, D_6, \dots \quad \text{(i)}$$

The vector of Inputs is given by IT ;

$$It_1, It_2, \dots \quad \text{(ii)}$$

The output vector denoted by OT ;

$$Ot_1, Ot_2, \dots \quad \text{(iii)}$$

The input-oriented efficiency for i^{th} DMU

In input-oriented efficiency, our objective is to achieve the fixed level of output by utilizing the possible minimum level of inputs.

$$\text{Min } \emptyset, \dots \quad \text{(iv)}$$

$$\text{Constrain Function } \begin{cases} \rho It_i \leq \emptyset IT \\ \rho Ot_i \geq OT \\ \sum_{i=1}^n \rho_i = 1 \\ \rho_i \geq 0 \end{cases} \emptyset, \dots \quad \text{(v)}$$

In equation (iv) and (v), \emptyset is the efficiency score measuring the technical efficiency of i -th DMU. The value of \emptyset is less than or equal to 1 ($\emptyset \leq 1$). A DMU is said to be inefficient and lies inside the frontier if the value of \emptyset is less than one. Alternatively, a DMU is said to be efficient if the value of \emptyset is equal to one and hence the DMU will lie on production frontier curve. ρ is the measure of weight given to i -th DMU and gives location to i -th DMU according to its efficiency.

This study also makes a methodological contribution by using financial ratings of the companies for the period under consideration while analysing the results. The use of financial ratings is not found in the previous studies. It helps in linking and justifying the results with the year wise financial performance of the companies.

3.3 Data and Variables

In the study, insurance and *Takaful* companies are considered decision making units (DMU's) which gives output including premium and net claims with inputs of assets and labor. Variables are displayed in the following table.

Table 3. 1: List of Inputs & Outputs

Input/output	Variable	Description	Unit
Input	Assets	Total assets of a company invested in Pak Rupees	Pak Rs. In millions
Input	Labor cost	Cost of labor employed in the company per annum.	Pak Rs. In millions
Output	Premium	Total premium collected by the company in a year	Pak Rs. In millions
Output	Net Claims	Total amount of claims paid by the company in a year	Pak Rs. In millions

Source: Developed by author

The data is collected from the declared financial statements of the companies displayed at their websites. The study uses panel data for six selected insurance and *Takaful* companies of Pakistan from the year 2011 to 2015. These companies include three insurance companies namely Al Falah, PICIC and Asia care. Three *Takaful* companies include *Takaful* Pakistan, Pak Qatar and Pak Kuwait. All of these companies are general companies i.e. all of them provide general (non - life) coverages like vehicles, buildings, machinery, physical stock etc. One of the reasons of their selection is their year of establishment is close to one another and all of these companies transact general insurance or *Takaful* business.

4. Results

Here, we will have a discussion on results of constant return to scale (CRS), variable return to scale (VRS), super efficiency with respect to CRS and VRS, scale efficiency, returns to scale worked out through using data envelopment analysis. Results are displayed in the Table – 4.1, 4.2

Table 4.1: Overall Technical Efficiency (Constant Return to Scale), Pure Technical Efficiency in % (VRS)

Efficiency in %	Overall Technical Efficiency (CRS)						Pure Technical Efficiency (VRS)					
	2011	2012	2013	2014	2015	Mean	2011	2012	2013	2014	2015	Mean
DMUs												
Alfalah	100	100	100	100	100		100	100	100	100	100	
PICIC	100	90	67	77	84		100	91	81	78	100	
Asia	45	54	68	100	100		100	100	100	100	100	

Mean	81	81	78	92	94	85	100	97	93	92	100	96
TPL	100	100	69	58	72		100	100	100	100	100	
PQ	51	100	100	100	100		51	100	100	100	100	
PK	80	100	71	24	75		94	100	88	25	25	
Mean	77	100	80	60	82	79	81	100	96	75	75	85

4.1. Overall Technical Efficiency (CRS)

Table 4.1 shows that in year 2011, Alfalah, PICIC and *Takaful* Pakistan Limited (TPL) overall efficiency (Constant return to scale – CRS) is 100% while that of Asia, Pak Qatar General *Takaful* (PQ) and Pak Kuwait *Takaful* (PK) is 45%, 51% & 81% respectively. Mean of overall efficiency of three insurance companies is 81% while mean of overall efficiency of *Takaful* companies in year 2011 is 77%.

In year 2012, overall efficiency (Constant return to scale – CRS) of Alfalah insurance is 100%, PICIC 90% and Asia is 54%. In the same year, TPL, PQ and PK have their CRS equal to 100%. Mean of overall efficiency of three insurance companies is 81% while mean of overall efficiency of *Takaful* companies is 100%.

In year 2013, overall efficiency (Constant return to scale – CRS) of Alfalah insurance is 100%, PICIC 67% and Asia is 68%. In the same year, CRS of TPL is 69%, PQ 100% and PK is 71%. Mean of overall efficiency of three insurance companies is 78% while mean of overall efficiency of *Takaful* companies is 80%.

In year 2014, overall efficiency (Constant return to scale – CRS) of Alfalah insurance is 100%, PICIC 77% and Asia is 100%. In the same year, CRS of TPL is 58%, PQ 100% and PK is 24%. Mean of overall efficiency of three insurance companies is 92% while mean of overall efficiency of *Takaful* companies is 60%.

In year 2015, overall efficiency (Constant return to scale – CRS) of Alfalah insurance is 100%, PICIC 84% and Asia is 100%. In the same year, CRS of TPL is 72%, PQ 100% and PK is 75%. Mean of overall efficiency of three insurance companies is 94% while mean of overall efficiency of *Takaful* companies is 82%.

Mean of overall efficiency of three insurance companies for the period 2011 – 2015 is 85% while mean of overall efficiency of *Takaful* companies for the period 2011 – 2015 is 79%.

4.2. Pure Technical Efficiency (VRS)

Table 4.1 shows that in year 2011, Alfalah, PICIC, Asia and *Takaful* Pakistan Limited (TPL) have pure technical efficiencies (Variable return to scale – VRS) equal to 100% while that of Pak Qatar (PQ) and Pak Kuwait *Takaful* (PK) have 51% & 94% respectively. Mean of pure technical efficiencies of three insurance companies is 100% while mean of pure technical efficiency of *Takaful* companies in year 2011 is 81%.

In year 2012, all insurance and *Takaful* companies have pure technical efficiency equal to 100% with the exception of PICIC which has it equal to 91%. Mean of pure technical efficiency of three insurance companies is 97% while mean of pure technical efficiency of *Takaful* companies is 100%.

In year 2013, Alfalah, Asia, *Takaful* Pakistan and Pak Qatar have their pure technical efficiencies equal to 100% while PICIC and Pak Kuwait have it equal to 81% & 88% respectively. Mean of pure technical efficiency of three insurance companies is 97% while mean of pure technical efficiency of *Takaful* companies is 100%.

In year 2014, Alfalah, *Takaful* Pakistan and Pak Qatar have their pure technical efficiencies equal to 100% while PICIC, Asia & Pak Kuwait have it equal to 78% & 25% respectively. Mean of pure technical efficiency of three insurance companies is 92% while mean of pure technical efficiency of *Takaful* companies is 75%.

In year 2015, all insurance and *Takaful* companies have their pure technical efficiency equal to 100% with the exception of Pak Kuwait which has it equal to 25%. Mean of pure technical efficiency of three insurance companies is 100% while mean of pure technical efficiency of *Takaful* companies is 75%.

Mean of pure technical efficiency of three insurance companies for the period 2011 -2015 is 96% while mean of pure technical efficiency of *Takaful* companies for the period 2011 -2015 is 85%.

Table 4.2: Super Efficiency under CRS, Super Efficiency under VRS

Efficiency in %	Super Efficiency under CRS						Super Efficiency under VRS					
	2011	2012	2013	2014	2015	Mean	2011	2012	2013	2014	2015	Mean
DMUs												
Alfalah	253	200	203	107	137		big	big	big	big	big	
PICIC	119	90	67	77	84		121	91	81	78	139	
Asia	45	54	68	158	164		234	219	456	318	167	
Mean	139	114	112	114	128	121						
TPL	152	101	69	58	72		247	268	280	212	156	
PQ	51	107	286	199	203		51	107	big	big	203	
PK	80	108	71	24	75		94	big	88	24	99	
Mean	94	105	142	93	116	110						

4.3 Super Efficiency under CRS

Table 4.2 shows super efficiencies under constant return to scale, of insurance and *Takaful* companies for the period 2011 to 2015.

In year 2011, super efficiency under CRS of Alfalah insurance is 253%, PICIC 119%, Asia 45%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 152%, Pak Qatar (PQ) is 51% and Pak Kuwait *Takaful* (PK) is 94%. Mean of super efficiency under CRS of three insurance companies is 139% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 94%.

In year 2012, super efficiency under CRS of Alfalah insurance is 200%, PICIC 90%, Asia 54%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 101%, Pak Qatar (PQ) is 107% and Pak Kuwait *Takaful* (PK) is 108%. Mean of super efficiency under CRS of three insurance companies is 114% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 105%.

In year 2013, super efficiency under CRS of Alfalah insurance is 203%, PICIC 67%, Asia 68%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 69%, Pak Qatar (PQ) is 286% and Pak Kuwait *Takaful* (PK) is 71%. Mean of super efficiency under CRS of three insurance companies is 112% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 142%.

In year 2014, super efficiency under CRS of Alfalah insurance is 107%, PICIC 77%, Asia 158%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 58%, Pak Qatar (PQ) is 199% and Pak Kuwait *Takaful* (PK) is 24%. Mean of super efficiency under CRS of three insurance companies is 114% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 93%.

In year 2015, super efficiency under CRS of Alfalah insurance is 137%, PICIC, 84%, Asia 164%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 72%, Pak Qatar (PQ) is 203% and Pak Kuwait *Takaful* (PK) is 75%. Mean of super efficiency under CRS of three insurance companies is 128% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 116%.

Mean of super efficiency of three insurance companies for the period 2011 - 2015 is 121% while mean of pure technical efficiency of *Takaful* companies for the period 2011 -2015 is 110%.

4.4 Super Efficiency under VRS

Table 4.2 shows super efficiencies under constant return to scale, of insurance and *Takaful* companies for the period 2011 to 2015.

In year 2011, super efficiency under CRS of Alfalah insurance is 253%, PICIC 119% and Asia is 45%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 152%, Pak Qatar (PQ) is 51% and Pak Kuwait *Takaful* (PK) is 94%. Mean of super efficiency under CRS of three insurance companies is 139% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 94%.

In year 2012, super efficiency under CRS of Alfalah insurance is 200%, PICIC 90%, Asia 54%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 101%, Pak Qatar (PQ) is 107% and Pak Kuwait *Takaful* (PK) is 108%. Mean of

super efficiency under CRS of three insurance companies is 114% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 105%.

In year 2013, super efficiency under CRS of Alfalah insurance is 203%, PICIC 67%, Asia 68%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 69%, Pak Qatar (PQ) is 286% and Pak Kuwait *Takaful* (PK) is 71%. Mean of super efficiency under CRS of three insurance companies is 112% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 142%.

In year 2014, super efficiency under CRS of Alfalah insurance is 107%, PICIC 77%, Asia 158%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 58%, Pak Qatar (PQ) is 199% and Pak Kuwait *Takaful* (PK) is 24%. Mean of super efficiency under CRS of three insurance companies is 114% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 93%.

In year 2015, super efficiency under CRS of Alfalah insurance is 137%, PICIC 84%, Asia 164%. Super efficiency under CRS of *Takaful* Pakistan Limited (TPL) is 72%, Pak Qatar (PQ) is 203% and Pak Kuwait *Takaful* (PK) is 75%. Mean of super efficiency under CRS of three insurance companies is 128% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 116%.

Mean of super efficiency of three insurance companies for the period 2011 - 2015 is 121% while mean of pure technical efficiency of *Takaful* companies for the period 2011 -2015 is 110%.

Table 4.3: Scale Efficiency (CRS-VRS), Returns to Scale

Efficiency in %	Scale Efficiency						Returns to Scale					
	2011	2012	2013	2014	2015	Mean	2011	2012	2013	2014	2015	Mean
DMUs												
Alfalah	100	100	100	100	100		CO	CO	CO	CO	CO	
							N	N	N	N	N	
	100	98	82	98	84		CO	INC	CO	CO	CO	
PICIC							N		N	N	N	
	45	54	68	100	100		CO	CO	CO	CO	CO	
Asia							N	N	N	N	N	
Mean	82	84	83	93	94	87						
	100	100	69	58	72		CO	CO	CO	CO	CO	
TPL							N	N	N	N	N	
	99	100	100	100	100		CO	CO	CO	CO	CO	
PQ							N	N	N	N	N	
	85	100	80	95	82		INC	CO	CO	CO	CO	
PK								N	N	N	N	
Mean	93	100	83	84	84	88						

4.5 Scale Efficiency

Table 4.4 shows scale efficiencies of insurance and *Takaful* companies for the period 2011 to 2015.

In year 2011, scale efficiencies (CRS-VRS) of Alfalah insurance, PICIC and *Takaful* Pakistan is 100% while Asia is 45%, Pak Qatar (PQ) 99% and Pak Kuwait *Takaful* (PK) is 85%. Mean of scale efficiencies of three insurance companies is 139% while mean of super efficiency under CRS of *Takaful* companies in year 2011 is 94%.

In year 2012, scale efficiencies of Alfalah insurance, *Takaful* Pakistan Limited (TPL), Pak Qatar (PQ), and Pak Kuwait *Takaful* (PK) is 100% while PICIC & Asia have 98% & 54% respectively. Mean of scale efficiencies of three insurance companies is 84% while mean of scale efficiencies of *Takaful* companies in year 2012 is 100%.

In year 2013, scale efficiencies of Alfalah insurance & Pak Qatar (PQ) is 100% while PICIC has 82% & Asia has 68%. *Takaful* Pakistan Limited (TPL) and Pak Kuwait *Takaful* (PK) have 69% & 80% respectively. Mean of scale efficiencies of three insurance companies and three *Takaful* companies is same 83%.

In year 2014, scale efficiencies of Alfalah insurance, Asia & Pak Qatar (PQ) is 100% while PICIC has 98%, *Takaful* Pakistan Limited (TPL) 58% and Pak Kuwait *Takaful* (PK) is 95%. Mean of scale efficiencies of three insurance companies is 93% while mean of scale efficiencies of *Takaful* companies in year 2012 is 84%.

In year 2015, scale efficiencies of Alfalah insurance, Asia & Pak Qatar (PQ) is 100% while PICIC has 84%, *Takaful* Pakistan Limited (TPL) 72% and Pak Kuwait *Takaful* (PK) is 82%. Mean of scale efficiencies of three insurance companies is 94% while mean of scale efficiencies of *Takaful* companies in year 2012 is 84%. Mean of scale efficiencies of three insurance companies for the period 2011 - 2015 is 87% while mean of pure technical efficiency of *Takaful* companies for the period 2011 -2015 is 88%.

4.6. Financial rating of insurance and *Takaful* companies

Table 4.4 shows financial rating of insurance & *Takaful* companies for the period under consideration.

Table 4.5: Financial rating of insurance and *Takaful* companies carried out by JCR-VIZ and PACRA rating agencies operating in Pakistan for the period under consideration

Company	2011	2012	2013	2014	2015
Al Falah Insurance (AF)	A-	A	A	A+	AA-
PICIC Insurance (PICIC)	A-	BBB+	BBB+	BBB+	BBB+
Asia care Insurance (AS)	BBB+	A-	A-	A-	A-
<i>Takaful</i> Pakistan (TP)	BBB+	BBB+	BBB+	BBB+	BBB+
Pak Qatar General <i>Takaful</i> (PQ)	BBB+	BBB+	A-	A-	A-
Pak Kuwait <i>Takaful</i>	A-	A-	A-		BBB

The rating shows that Alfalah is constantly improving its rating which is in conformity with its efficiency scores. PICIC insurance's efficiency scores were high in 2011 but now lowering down with every increasing year and same is the case with its financial rating. Asia care starts with low efficiency scores and improves gradually and similar trend can be noted in its financial rating. *Takaful* Pakistan has average efficiency scores during the period and same is the case with its ratings. Efficiency scores of Pak Qatar improves year by year and similar progress can be noted in the improvement in its ratings. Pak Kuwait did well in the efficiency scores in 2011& 2012 but onwards, its score is dropping while similar trend can be noted in its financial ratings.

5. Malmquist Index (MI) of insurance and *Takaful* companies

Input Oriented CRS Malmquist index (MI) gives us a comparison of two periods and shows us whether the productivity of the DMU has improved, deteriorated or remained static. MI over 01 means improvement, 1 means static and less than 01 means deterioration in performance in a later period compared with the earlier. Efficiency Change over 01 show that the firm has retained its performance but due to outward shift in frontier results in MI less than 01 which means that the industry production has improved while production of the specific DMU has not improved.

Table 5.1: Comparing Malmquist Index (MI) of insurance and *Takaful* companies in periods from 2011 to 2013

Inputs	Outputs	First period	Second period
Labor Cost	Premium collected	2011	2013
Assets	Total claims paid	—	—

DMU No.	DMUs in Period2	Input-Oriented CRS Malmquist Index	Efficiency Change	Frontier Shift
1	Al Falah Insurance	0.95302	1.00000	0.95302
2	PICIC Insurance	1.02386	1.24313	0.82362
3	Asia Insurance	1.46890	1.46364	1.00359
4	<i>Takaful</i> Pakistan	1.39014	1.04976	1.32425
5	Pak Qatar General <i>Takaful</i>	0.99610	1.00000	0.99610
6	Pak Kuwait <i>Takaful</i>	1.09139	1.04527	1.04412

Table 5.2: Comparing Malmquist Index (MI) of insurance and *Takaful* companies in periods from 2013 to 2015

Inputs	Outputs	First period	Second period
Labor Cost	Premium collected	2013	2015
Assets	Total claims paid	—	—

DMU No.	DMUs in Period2	Input-Oriented CRS Malmquist Index	Efficiency Change	Frontier Shift
1	Alfalah Insurance	1.04930	1.00000	1.04930
2	PICIC Insurance	0.97669	0.80442	1.21415
3	Asia Insurance	0.68078	0.68323	0.99642
4	<i>Takaful</i> Pakistan	0.71935	0.95260	0.75515
5	Pak Qatar General <i>Takaful</i>	1.00391	1.00000	1.00391
6	Pak Kuwait	0.91626	0.95669	0.95774
	<i>Takaful</i>			

Table 5.3: Comparing Malmquist Index (MI) of the two periods from 2011 -2013 & 2013 -15

DMU No.	DMUs	2011 – 2013 Malmquist index	2013 – 2015 Malmquist index
1	Alfalah Insurance	0.95302	1.04930
2	PICIC Insurance	1.02386	0.97669
3	Asia Insurance	1.46890	0.68078
	Mean	1.148	0.91
4	<i>Takaful</i> Pakistan	1.39014	0.71935
5	Pak Qatar General <i>Takaful</i>	0.99610	1.00391
6	Pak Kuwait <i>Takaful</i>	1.09139	0.91626
	Mean	1.159	0.88

In table 5.1, MI of Alfalah is less than 01 while Efficiency Change is 01. The score shows that Alfalah has retained its performance from 2011 to 2013 while the industry production has increased and the DMU production is 05% less than the industry. Production of PICIC has been improved in 2013 as its Malmquist index is more than 01. Performance of Asia care has also been increased as its MI is over 01. *Takaful* Pakistan and Pak Kuwait also have MI more than 01 showing increase in their production in the mentioned period. Pak Qatar has retained its performance but due to an outward shift in the frontier, its MI is less than 01 showing that its increase in production is less than the remaining industry. Mean of MI of insurance companies is 1.148 while *Takaful* companies have it equal to 1.159. The means show more increase in production of *Takaful* companies as compared to their insurance counterpart in the period.

In table 5.2, MI of Alfalah is more than 01 showing increase in productivity from 2013 to 2015. Rating of Alfalah insurance has also been improved from 2013 onwards. Due to better performance and also being part of a big financial group, it scored well in efficiency. Productivity of PICIC and Asia insurance has decreased as their MI is less than 01. *Takaful* Pakistan and Pak Kuwait also have MI less than 01 showing decrease in their productivity in the mentioned period. Rating of Pak Kuwait *Takaful* has also been decreased in 2014 onwards. Pak Kuwait investment company owns Pak Kuwait *Takaful* as well as Meezan bank in Pakistan. Meezan bank provided good support to its sister concern from 2006 but afterwards, new general *Takaful* companies also came in while performance of Pak Kuwait got deteriorated. Resultantly, Meezan bank also started giving its availing services of other *Takaful* companies instead of its sister concern. *Takaful* Pakistan had around 12 branches which were reduced to 03 branches later on. Decrease in MI of *Takaful* Pakistan may be due to reduction in its size. As mentioned earlier, Pak Kuwait was having solvency reporting issues in 2015 with the regulator and it was fined during this period, which may have resulted in low MI.

Pak Qatar has improved its productivity as its malmquist index is more than 01. Rating of Pak Qatar General has also been improved from 2013 onwards. Pak Qatar *Takaful* group has two companies namely Pak Qatar Family *Takaful* company and Pak Qatar general *Takaful* company. Pak Qatar family *Takaful* is the largest family *Takaful* company of Pakistan in terms of number of customers and premium collection. Pak Qatar has a vital role in diffusion of *Takaful* knowledge in the market. People have become aware about *Takaful* by the workers of Pak Qatar. They have managed to change the attitude of the people about *Takaful* resulting in opting for *Takaful* instead of insurance. Therefore, presently, Pak Qatar is the pioneer and the biggest provider of

family *Takaful* services in Pakistan. Due to large size of Pak Qatar Family *Takaful*, its general company also takes its advantage. Mostly, they have joined offices. Some staff provides services to both companies. Clients also trust it more due to its brand name and size. Mean of MI of insurance companies is 0.91 while *Takaful* companies have it equal to 0.88. The means show that productivity of insurance and *Takaful* companies has reduced but insurance companies are still better than their *Takaful* counterpart in the period.

6. Discussion

Table 5.3 shows that Alfalah insurance is consistently efficient company with scale efficiency score 1 during 2011 – 2015 while its super efficiency is more than 1 in the given period. Alfalah insurance, part of Abu Dhabi business group, was established in 2006. Abu Dhabi group also owns Alfalah bank and several other businesses in Pakistan. Normally, a general insurance company gets a solid support from its sister concern bank as the bank takes insurance coverage of the mortgaged and pledged assets of its borrowers from its sister concern insurance company. Thus, a regular and considerable premium income starts from its inception. Otherwise, it is difficult for a new company to remain highly efficient in its initial years.

Established in 2005, PICIC insurance company scale efficiency was 1.0 in 2011 but its efficiency declined in the onward years, however; it improved in year 2015. It was also owned by a bank called Pakistan industrial credit and investment corporation (PICIC). PICIC bank was acquired by NIB bank in 2007 while the amalgamation of NIB in MCB bank is in process. Change of ownership of PICIC group may be one of the reasons in declining efficiency of PICIC insurance.

Asia care insurance company was established in 2009 with low scores in initial years but improved gradually. Established in 2007, *Takaful* Pakistan Limited score was better in 2011 and 2012 which got reduced in onward years but got recovered in year 2015. Pak Qatar General *Takaful* was established in 2008 with low scores in year 2011 and got increased in onward years. Pak Qatar *Takaful* group owns Pak Qatar family *Takaful* limited (PQFTL) and Pak Qatar general *Takaful* limited (PQGTL). PQFTL is the largest family *Takaful* company in Pakistan and its better performance may also be due to the support of its sister general company. It may be one of the reasons of high efficiency of PQGTL.

Established in 2006, part of Pak Kuwait investment company, Pak Kuwait *Takaful* has better efficiency scores in 2011 & 2012 reducing in year 2013 and 2014 and recovering in year 2015. Pak Kuwait Investment Company owns Pak Kuwait *Takaful* company limited (PKGTL), the first *Takaful* company in Pakistan and Meezan bank limited, the largest Islamic bank and 7th largest bank

in Pakistan. In the initial years of establishment of PKGTL, Meezan bank used to take *Takaful* coverages of all of its clients from its sister concern company resulting in more contributions (Price of insurance is called premium while the amount paid by the client to takaful company is called contribution) and thus efficiency level was better in those years. Later on, other general *Takaful* companies were also established. Meezan bank might have used its services as well. One of the reasons in declining efficiency can be reduction in contribution (premium) receipt. Moreover, management of PKGTL has remained under close surveillance of the regular due to some irregularities and misreporting covering in the period of 2014. After investigations by the regulator, PKGTL was fined for Rs. 01 million after confirmation of the irregularities in figures of premium earned and claims (SECP & Dawn News, 2016). The declining efficiency of PKGTL can be better understood with these investigations and penalties.

While looking at the means of Overall Technical Efficiency under CRS, Pure Technical Efficiency under VRS and Super Efficiency under CRS, insurance companies are more efficient than *Takaful* companies established in almost same years with same size offering similar coverages to their clients. Only in scale efficiency, mean of the scores of *Takaful* companies is better than insurance companies.

Among *Takaful* companies, efficiency scores of Pak Qatar General *Takaful* remain very consistent; though it was the last general *Takaful* Company established in Pakistan. It may be due to effective presence of its sister concern family *Takaful* company. Normally, family *Takaful* companies have more clients in number and volume as compared to a general *Takaful* company. Every living member of the society can become a client of life insurance or family *Takaful* company while for becoming a client of general insurance or *Takaful* company, one should own some property like vehicle, machinery, stock or building etc. Comparatively, marketing staff of a family *Takaful* company is also more in number. They interact with more people, thus playing a vital role in the knowledge sharing of *Takaful* in the society. People become more aware about *Takaful* through these marketing people. So, taking life coverage from a family *Takaful* company, they may also prefer to take general *Takaful* coverage from their sister concern company resulting in more contribution (premium) for the company which positively affects the efficiency scores.

7. Methodological Contribution

This study also makes a methodological contribution by using financial ratings of the companies for the period under consideration while analysing the results.

The use of financial ratings is not found in the previous studies. It helps in linking and justifying the results with the year wise financial performance of the companies.

8. Conclusion

There are various studies on measuring efficiencies of insurance companies while lesser studies focus efficiencies of *Takaful* companies. In this study, we have made a comparison of efficiencies of insurance and *Takaful* of almost same size, establishment period close to each other and all providing general insurance or *Takaful* services. The findings show that insurance companies are more efficient than *Takaful* companies, though the difference between their efficiencies is not very high. Financial rating of insurance and *Takaful* companies also supports the efficiency scores. *Takaful* companies can improve their efficiencies with increasing their branch network as it will bring down per unit cost and will increase per share earnings for the shareholders. Minimum paid up capital requirement for general *takaful* and insurance company is same with Rs. 450 Million (SECP, 2020) while *takaful* companies are not allowed to offer several products due to Shariah objections which also give an edge to insurance companies. The regulator may consider a lesser paid capital requirement for *takaful* companies which will improve their efficiency. It may attract more foreign investment in *takaful* companies which will have a positive impact on economy. *Takaful* companies should also develop more innovative products and better services through further research in Shariah as presently *Takaful* companies cannot offer several products being offered by insurance companies namely bonds (surety and performance bonds for the contractors) etc. As mentioned earlier, in Pakistan, *Takaful* was introduced in 2006 and in 2015, market share of *Takaful* reached to only 2% (Hanif & Iqbal, 2017) while insurance companies were not allowed to offer *takaful* products. Therefore, in 2014, regulator allowed conventional insurance companies to offer *Takaful* products through window operations. After this allowance, more than 15 general insurance companies have started their window *takaful* operations which will increase *takaful* branch network and market share. With this study, we expect that more of such work may be carried out in future in comparison of process of claims, underwriting and product development of insurance and *Takaful* companies. This study will also give an insight to the regulator for making laws that enable companies to remain efficient.

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