Determinants of Cost Efficiency of Takaful and Conventional Insurance Firms of Pakistan

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ARTICLE DETAILS	ABSTRACT
History *Revised format: November 2018* *Available Online: December 2018* **Keywords** *Takaful, Insurance, Cost Efficiency, Tobit Regression, DEA* **JEL Classification:** G20, G22, G23, D61, C61, C24	This study investigates the Efficiency Performance of Takaful and Conventional Insurance Firms of Pakistan in terms of Cost, Allocative and Technical efficiencies for the period of 2010-2015. Six years panel data of Takaful and listed Conventional Insurance Firms of Pakistan is taken under consideration. The Methodology of Data Envelopment Analysis (DEA) is used in order to estimate efficiencies scores. Furthermore, Tobit Regression Analysis is carried out for determination of the real contributors of efficiencies in Insurance and takaful Industry of Pakistan. In Data Envelopment Analysis, Labor, Total Fixed Assets and Total Equity Capital are used as input variables. Simultaneously, the price variables are used along with input variables such as Price of Labor, Price of Total Fixed Assets and Price of Total Equity Capital. The output variables include Invested Assets, Investment Incomes and Net Premiums. In second Stage Analysis (i.e. Tobit regression), DEA efficiency scores are used as dependent variable, whereas Age, Size, and Leverage are used as independent variables along with the dummy for conventional and Takaful firms of Pakistan. This study found that Takaful and insurance firms have been operating on almost equal efficiency levels. Furthermore LEVERAGE is the main contributor for efficiency optimization, followed by the firm SIZE, whereas, firm's AGE has no contribution in efficiency scores.

1. Introduction

In current years there has been a noteworthy expansion in insurance sector of Pakistan all along with the opening of Takaful firms in business. This incredible information prompts us to embark on the efficiency and productivity examination of insurance and Takaful sectors. The intention of the study is to weigh up the efficiency of takaful and

conventional insurance companies of Pakistan by approximation the Allocative Efficiency, Technical Efficiency, and Cost Efficiency over the time of 2010 to 2015. This pragmatic examination is pedestal on both life and general insurance sub division of insurance sector in array to present as the whole picture of the competence in the insurance business of Pakistan.

In Pakistan, the Takaful rules are implemented in 2005 under the SECP. Before that, insurance sector was consisted of barely conservative insurance firms. Now 5 Takaful firms (2 family and 3 general Takaful firms) are operating with portfolio of Shariah compliant products in the market.Currently 5 life plus 27 general insurance companies are operating in Pakistan under private Conventional Insurance system. Total Premiums written by Conventional Insurance is 223 Billion whereas 10 Billion is the Total Premium written for Takaful Companies for 2015 year. (Insurance Association of Pakistan Year Book: 2015-16). Takaful is growing at a rapid pace, since it is a Shariah-compliant alternative to conventional insurance and its market share is potentially expected to improve up to 50 percent of overall sector share over the next five years. Total GDP share of the insurance industry is roughly 0.9 percent, while Islamic insurance build up 13 percent of the insurance business.

2. Literature Review

Early researches, about the efficiency of insurance industry using DEA as a analysis tool, provide information in order to interpret the performances of the insurance sector across the countries, such as in the case of **USA** conducted by Berger et al. (1997), Cummins et al. (1999), Meador et al. (2000), Gardner and Grace (2002), Cummins and Weiss (2002) and Cummins et al. (2010). The findings are reported in the form of Total Factor Productivity (TFP) growth and the Malmquist Index is used for TFP measurement.

The Japanese life insurance industry is analyzed by (Fukuyama, 1997) who concluded that there is an increased in TFP by 19% in Japanese insurance firms over the time span of 1988-1993. Whereas, Cummins et al. (1996) found that the TFP growth is 3.4% of Italian insurance industry from 1986 to 1993.In Spain, Cummins and Rubio-Misas (2001) reported that efficiency of Spanish insurance firms in terms of cost is recorded lower than to U.S. counterparts. In Germany, Rees and Kessner (2000) concluded that the mean levels of German insurance efficiency is 48% and lower than that of British companies which are at mean levels of 57%.

Barros et al (2008) investigated the technical efficiencies of Nigerian insurance companies under the period from 1994 to 2005 and found that the efficiency levels declined as a result of inadequacies in technology, scale and management. Adu, et al (2011) assessed insurance companies efficiencies in Ghana from the period of 2006 to 2008 and reported as the average efficiency score of life insurance in Ghana was higher than that of non-life insurance firms.

Abidin and Cabanda (2011) examined 23 Non-Life Insurance companies of Indonesia in term of the relative efficiency for the period of 2005 to 2007. They reported that the size of the insurance company has significant impact on the operational efficiency, thus confirming the theory of economies of scale. Dutta and Sengupta (2010) conducted a study to inspect the blow of technological innovation on the Indian insurance industry efficiency. They evaluated the panel data of 12 life insurance companies for the period of 2006-2009 and found that an increase in investment on IT-infrastructure significantly enhance technical and scale efficiency. In Pakistan perspective, most of the studies found on the financial efficiencies focusingonly to the Banking financial sector of Pakistan, while the literature on insurance sector of Pakistan is scant.

Afza& Jam-e-Kausar (2010) examined technical, pure and scale efficiencies of general insurance firms of Pakistan. The sample size was consisted of 27 non life insurance firms of Pakistan. The study estimated the average scores of Technical efficiency (92.70%), Allocative efficiency (81.12%) and cost efficiency (75.44%). The results show that there is considerable need to improve the insurance company operations in term of overall efficiencies, so that inefficient insurance firms should struggle towards the efficient frontier of insurance industry. There are quite number of studies on conventional insurance efficiency but novisible studies is observed on the efficiency of takaful operators as compared to their counterpart. This Islamic Finance alternative bring the dual financial system within the same sector of economy and a new study area originated in order to evaluate comparative efficiencies of conventional insurance sector with Islamic insurance sector. i.e., Takaful sector. Furthermore, the results of these studies could be sources of guidelines for takaful and insurance operators, customers, investors, policy makers and regulatory bodies. In this connection some studies are givenbelow:

Saad, et.al, (2006)carry out a relative study of the efficiency of conventional life insurance and family takaful industry in Malaysia during the period 2002 to 2005. This study established that the competitiveness of the Malaysian Takaful industry has been significantly appreciated as a repercussion of increase in public awareness of Islamic finance. They found that Company Size has a significant impact on efficiency changes. *Kader et al (2011)* investigated the cost efficiency of Takaful firms operating in seventeen Islamic countries and concluded that average cost efficiency scores of Takaful firms are comparable with developed conventional insurers. *Ismail et al. (2011)also* found that efficiency score for Takaful firms' remains lower (i.e. 64 percent) than their conventional counterparts (i.e. 87 percent).

Ismail, Othman &Bacha (2011) investigated cost efficiency and investment performance of the takaful industry and the conventional insurance industry using DEA over the period of 2004- 2009 and found that takaful had a lower significant return as compared to its conventional insurance counterpart. On the other hand, Yusop, et al (2011) found that the efficiency level of life insurance and takaful operators in Malaysia in regard totherisk management over the period of 2003-2007 was relatively high. Saad et. al (2012)concluded that, the overall efficiency of the Takaful companies was found below than its conventional counterparts. Only one takaful company, namely, Prudential BSN Takaful Bhd recorded TFP performances above the industrial average. The remaining 5 takaful companies are ranked the lowest among the 28 companies in terms of Total Factor Productivity (TFP) performance.

Antonio et. al (2013)compared the cost efficiency between Takaful and conventional insurance in Malaysia over the period of 2009-2011. The input-output data were analyzed to measure and compare the level of takaful and conventional insurance efficiency using Data Envelop Analysis (DEA), which was measured by input approach (cost efficiency). This study found that the overall cost efficiency of conventional insurance companies in Malaysia was better than that of takaful companies in 2011 although takaful had better overall cost efficiency level in 2010 and 2009. Hidayat et. al (2015)carried out a study on the comparative analysis of financial performance of the takaful and conventional insurance companies in Bahrain for the period of 2006 to 2011. This study found that conventional insurance companies in Bahrain performed better than Takaful companies in terms of profitability and efficiency during 2006-2011. ring 2006-2011.

In Pakistan, few studies have been conducted and very less literature is available particularly in the subject of Takaful and Conventional Insurance comparison. Khan et al.(2014)analyzed the Takaful and conventional insurance companies of Pakistan in terms of efficiency and productivity for the period 2006-2010. The results indicated that the insurance firms were more technically efficient exhibiting 89% efficiency for the given period. Similarly, results also pinpointing the scale efficiency of 74%, which means a significant expansion in insurance sector of Pakistan is observed during the period of 2006 to 2010. This study also analyzed the Takaful and conventional insurance sectors in terms of Economies of scales. It is concluded that the Takaful firms are fighting efficiently with conventional insurance firms regardless of new in the field. Results indicate that the Takaful firms are supplementary efficient in comparison to conventional counterparts. Malmquist productivity index reported significant enhancement in scale efficiency. It is recommended that Takaful firms should increase their efficiency and win the competition by improving their services, product quality and marketability of their products.

3. Methodology
There are two different approaches which are generally used to measure insurance efficiency, generally known as parametric and non-parametric approach. If the data is statistically normal, then we use parametric approach otherwise non-parametric approach will be used. The most frequently practiced approaches in parametric approaches are stochastic Frontier Approach (SFA), Distribution Free Approach (DFA) and Thick Frontier Approach (TFA). Whereas, in the non- parametric approaches encompasses Data Envelement Analysis (DEA) and Free Disposable Hull (FDH).

3.1   Data Envelop Analysis
The methodology of Data Envelement Analysis (DEA) which is based on the mathematical programming approach was introduced by Charnes et al. (1978). They drew this methodology upon the concept of efficiency which is reported in Farrell (1957). According to Charnes et al. (1978), Data Envelement Analysis (DEA) calculates the efficiency under the supposition of constant returns to scale, whereas Banker et al. (1984) introduced Data Envelement Analysis (DEA) approach under the concept of variable returns to scale. The Allocative Efficiency is traced back to M.J. Farrell (1957) and G. Debreu (1951) who originated many of the ideas underlying DEA. Fare, Grosskopf and Lovell (1985) developed linear programming formulations of these concepts.

The result would be in form of scores for each DMU, these scores represents percentages ratios and score '1' mean 100% efficient and scores less than '1' mean less than 100% and represents inefficiency of the given DMU with reference to the benchmark DMU which would be100% efficient and scored '1'. Results of each Model for the selected sample year wise is given in the form of tables. Tobit regression model, furthermore termed as a censored regression model, is intended to approximate linear associations among linking variables provided, there is either left- or right-censoring in the dependent variable (also recognized as censoring from under and above, respectively).

3.2   Sample Selection
This paper attempted to represent the whole sector of conventional and Islamic insurance operating in Pakistan. Therefore, the sample size included in this research could be said as the representative of almost 100% of the market share of Pakistan's insurance and takaful sector, such as listed firms of corporate sector, foreign firms and private firms.The Data Sample consist of 32 life and non-life conventional insurance firms of Pakistan's Corporate Sector and 5 general and family Islamic insurance firms known as Takaful firms working in Pakistan. The 6 years panel data from company's annual financial reports is gathered from the year of 2010 to 2015 obtained from their respective official websites as well as repository of IAP (Insurance Association of Pakistan).

3.3   Variables Descriptions of DEA
Different output variables are recognized by different studies to compute the efficiency and yield of insurance segment. Mostly, previous researches used "Premium Income" as a common gauge of risk pooling as policyholders in reality pay money for protection against risk by acquiring insurance policies. Since "Premium incomes" does not have direct impact on the income statement of the company, because "Claims" has to be deducted from these "Premium Incomes", remaining Premium incomes termed as "Net Premiums", which is more realized contribution in the company's annual incomes. So, this study used"Net Premiums" (Y1) as output variable instead of "Gross Premiums" or "Premium Incomes" in analysis. The measurement unit of this proxy is in the Pak Rupees (Rs).

Some researchers used the proxy of "Invested Assets" (Y2) such as Cummins et al. (1999), Worthington and Hurley (2002), Jeng and Lai (2005). Worthington and Hurley (2002), which believe that "Invested Assets" as a productivity variable with the reason that net profit of the insurance firms comes from the intermediation role of premiums from policyholders and investment incomes. The measurement unit of this proxy is in the Pak Rupees (Rs). Furthermore, "Investment Incomes" (Y3) is also considered as output variable for first stage DEA analysis. The fact behind selection of this output variable is that, "Investment Incomes" is the one out of many streams of company's annual revenues, which is earned from the different investments in market. Finally, considering the previous researches this study incorporates "Labor" (X1), "Total Fixed Assets" (X2) and "Equity Capital" (X3) as participatory input variables for the cost efficiency analysis. In order to estimate the cost efficiencies of selected insurance firms, unit Prices of all input variables also accounted in the data for analysis, these unit prices are known as Price variables. Keeping in view three input variables, there are simultaneously three price variables named as:

3.3.1   Price of Labor (P1)
It is measured as total wages paid for the year divided by total numbers of employees of the company. this data is collected on annual basis, of course employee turnover should also be kept in mind. This is calculated as average salary of each employee. The measurement of this proxy is in (Rs).

3.3.2   Price of Total Fixed Asset (P2)
It is measured as yearly accumulated depreciation divided by total asset worth, it will result average price of total assets year wise. The measurement of this proxy is in (Rs).

3.3.3   Price of Equity Capital (P3)
This proxy measurement is carried out by dividing the annual Dividend dispersed with the Total Equity Capital. The resultant is the average charge of the Equity Capital. The measurement is also in the form of (Rs).

3.4   Variables Descriptions of Tobit Regression:
The second stage analysis of this study is the Tobit Regression. The need for this two-step analysis is to make projection on the determinants of cost efficiency of research sample of this study. In this connection certain explanatory variables are used in order to estimate dependent variable. These independent variables are as under:

3.4.1   Age
This independent variable represents the company's years of operation within the Pakistan Insurance sector or

Takaful sector. This proxy addresses the phenomena of 'learning curve theory', in which individuals or organizations collectively repeat a particular process, as time passes, they gain better and better skills or efficiencies from their experience and resultantly improved technical, operational and cost efficiencies over time.

3.4.2 Size

This proxy can be measured on Total Sales of the company or Total Assets of the company. This research used company's Total Asset as proxy for firm size, measured in Rupees and denoted by "S" in the regression model. Hardwick (1997) argued that there is a constructive association among the performance and size of the firm due to operational cost efficiency which boost output and cut down the unit cost. Large company sizes also facilitate insurers to successfully branch out their understood risks and react more rapidly to alterations in market conditions.

Table 1: DEA Variables Description

Symbol	Variable	Type (V)	Measurement
Y1	Invested Assets	Output	Amount in (PKR)
Y2	Investment Incomes	Output	Amount in (PKR)
Y3	Net Premiums	Output	Amount in (PKR)
X1	Labor	Input	Wages in (PKR)
X2	Total Fixed Asset	Input	Amount in (PKR)
X3	Total Equity Capital	Input	Amount in (PKR)
P1	Price of Labor	Price	Wages/T . Employees
P2	Price of T F A	Price	Acc. Dep / Total Assets
P3	Price of Equity Capital	Price	Dividends / Total Equity

Table 2: DEA – Cost Efficiency Scores

(Input Variables)	(Price Variables)	(Output Variables)
Labor - X1	Price of Labor – P1	Invested Assets – Y1
Total Fixed Assets - X2	Price of TFA – P2	Investment Incomes – Y2
Equity Capital - X3	Price of Equity - P3	Net Premiums - Y3

3.4.3 Leverage

The third independent variable for cost efficiency determinant analysis is Leverage. Leverage is the sum of debt which is used to finance a firm's assets. A firm with considerably additional debt than equity in order to finance its assets is considered as highly leveraged. There are two types of leverages i.e., financial leverage (Debt/Equity or Debt/Asset) and operating leverage. This study used only financial leverage and the measurement of this proxy is carried out in term of Total Debt / Total Asset ratios instead of Total debt / Total Equity ratios of the company.

The Dependent Variable used in this study is the CCR-I, BCC-I & COST-C efficiency score of Data Envelop Analysis. Furthermore, independent variables are used to explain further determinants of the cost efficiency of different firms of sample population. The past 10 years relationship between the variables is analyzed to predict future behavior of the cost efficiency determinants. It is represented as "CE" in the regression model. The Dummy or indicator variables used in this study are "Takaful Firms" and "Conventional Insurance Firms". Dummy variable with code "0" value is considered absent while dummy variable with code "1"is considered present in the regression.

4.5 Regression Equation

$$\text{DEA Scores CCR-I (it)} = \alpha + \beta1\, A\,(it) + \beta2\, S\,(it) + \beta3\, L\,(it) + \beta)\, \text{tkf\_d} + \varepsilon\,(it)$$

$$\text{DEA Scores BCC-I (it)} = \alpha + \beta1\, A\,(it) + \beta2\, S\,(it) + \beta3\, L\,(it) + \beta)\, \text{tkf\_d} + \varepsilon\,(it)$$

$$\text{DEA Scores COST-C (it)} = \alpha + \beta1\, A\,(it) + \beta2\, S\,(it) + \beta3\, L\,(it) + \beta)\, \text{tkf\_d} + \varepsilon\,(it)$$

5. Results

5.1   DEA Efficiency Scores

The 1st stage analysis of this study is based on the evaluation of efficiency scores with the help of Data Envelop Analysis software. For this purpose, different approaches of DEA are used such as CCR-I, BCC-I and COST-C models. The results indicate efficiency scores of Takaful and Insurance firms along with the ranking of whole sample for that period. These statistical results show the top ranked firms as 100% efficient firms and remaining firms are ranked with their respective scores. These scores are further analyzed for the determination of which sector (either Takaful or Insurance) is performing more efficiently over competitor sector. In simple words we are interested in the determination of leading and lagging sectors in takaful and insurance industry.

5.2   Independent Sample T-Test Analysis

The Independent Samples T-test evaluates the mean values of two independent set of samples, such as Takaful firms (TKF) and conventional Insurance firms (CIF), with the aim to establish statistical proof concerning the sample means, whether significantly dissimilar or not. From Year 2010 to 2015, the probabilities of Levene's Test are greater than desired significant level i.e., $p \leq 0.05$, so that it gives us path to consider the values of 'Equal Variance Assumed' in results and accept the null hypothesis (H_0) for *homogeneity of variance.* While on the other side, the probabilities of T-test results are also higher than significance level, i.e., $p \leq 0.05$, so that accept the (H_0) hypothesis, and achieved that the average differences of CCR-I efficiency scores for conventional Insurance Firms and Takaful firms are insignificant. Based on the results, we can conclude that, during the year 2010 to 2015, there is no significant mean difference between the CIF and TKF firms found and both groups are operating at almost equal levels in CCR-I, BCC-I and in COST-C Scores.

Table 3: Efficiency Scores Comparison of Takaful and Insurance Sectors under CCR-I

CCR – I		2010	2011	2012	2013	2014	2015
No. of firms	CIF	32	32	32	32	32	32
	TKF	5	5	5	5	5	5
Mean	CIF	0.451	0.523	0.397	0.462	0.370	0.310
	TKF	0.355	0.325	0.30	0.338	0.332	0.202
St. Dev	CIF	0.320	0.348	0.375	0.376	0.335	0.330
	TKF	0.317	0.257	0.327	0.382	0.306	0.148
Levene's Test	Prob.	0.964	0.09	0.369	0.337	0.513	0.076
T-test	Prob.	0.540	0.231	0.598	0.500	0.815	0.481
	MD	0.095	0.198	0.094	0.123	0.0376	0.108

Table 4: Efficiency Scores Comparison of Takaful and Insurance Sectors under BCC-I

BCC – I		2010	2011	2012	2013	2014	2015
No. of firms	CIF	32	32	32	32	32	32
	TKF	5	5	5	5	5	5
Mean	CIF	0.726	0.731	0.626	0.697	0.640	0.590
	TKF	0.720	0.650	0.715	0.662	0.689	0.626
St. Dev	CIF	0.238	0.267	0.310	0.303	0.326	0.347
	TKF	0.297	0.279	0.323	0.342	0.295	0.346
Levene's Test	Prob.	0.665	0.718	0.895	0.834	0.287	0.739
T-test	Prob.	0.960	0.533	0.554	0.816	0.754	0.833
	MD	0.006	0.081	-0.089	0.034	-0.049	-0.035

5.3   Tobit Regression Analysis

This results section deals with the estimates of Tobit regression equation, as the final purpose of this research is to estimate the determinants of different DEA Efficiency scores. In this connection, dependent variable is considered as CCR-I, BCC-I and COST-C scores and simultaneously three Tobit regression equations have been estimated. The results of these regression results are as under:

5.4   CCR-I Model Interpretation

This regression results used CCR-I balanced pooled Data file for the estimates. So that all the coefficients are positive in nature except Dummy variable which tells that Takaful Firms (D=1) compare to conventional Insurance

firms (D=0) have a lower CCR-I scores with the magnitude of 0.196.Leverage and Takaful dummy variable is significant at level 1, while SIZE variable is significant at level 2. Whereas, AGE variable is insignificant (p value = 0.9056). So out of three independent variables, two variables (SIZE & LEVERAGE) is significantly affecting the dependent variable i.e., DEA CCR-I scores and the impact of AGE variable on CCR-I scores is statistically insignificant.

Table 5: Efficiency Scores Comparison of Takaful and Insurance under COST-C

COST - C		2010	2011	2012	2013	2014	2015
No. of firms	CIF	32	32	32	32	32	32
	TKF	5	5	5	5	5	5
Mean	CIF	0.285	0.311	0.184	0.277	0.262	0.213
	TKF	0.267	0.176	0.171	0.210	0.294	0.271
St. Dev	CIF	0.277	0.290	0.204	0.282	0.284	0.242
	TKF	0.285	0.173	0.165	0.176	0.255	0.235
Levene's Test	Prob.	0.928	0.205	0.833	0.57	0.919	0.988
T-test	Prob.	0.892	0.323	0.938	0.612	0.813	0.621
	MD	0.018	0.134	0.007	0.067	-0.032	-0.058

5.5 BCC-I Model Interpretation

AGE and SIZE variables are negatively correlated with dependent BCC-I scores variable which means as AGE and SIZE of the firm increased it will affect BCC-I scores of the firm negatively. While on the other side LEVEARGE variable has positive impact on BCC-I scores, as Leverage of the firm increased it will affect BCC-I score of the Firms. Takaful Firms (D=1) compare to conventional Insurance firms (D=0) have a lower BCC-I scores with the magnitude of 0.0992.Only LEVERAGE is highly significant with Level-1, rests of the variables are insignificant, which means only Leverage has confirmed significant effect on the scores of BCC-I of firms.

Table 6

Dependent Variable	CCR-I		BCC-I		COST-C	
Independent Variables	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept C	0.253717	0.0000	0.577840	0.0000	0.115376	0.0008
AGE	0.000116	0.9056	-0.000626	0.4798	-0.000208	0.7584
SIZE	2.01E-06	0.0295**	-5.41E-07	0.5163	1.76E-06	0.0052***
LEVERAGE	0.534984	0.0000***	0.441212	0.0000***	0.535680	0.0000***
TKF_D	-0.195923	0.0025***	-0.099279	0.0906*	-0.132064	0.0034***

*: Statistically Significant at 10%, **: Statistically Significant at 0.05 %, ***: Statistically significant at 1%

Table 7: Descriptive Statistics of DEA efficiency scores

	CCR-I	BCC-I	COST-C
Mean	0.403838	0.669504	0.252047
Median	0.262810	0.650231	0.151126
Maximum	1.000000	1.000000	1.000000
Minimum	0.040642	0.077928	0.001651
Std. Dev.	0.342953	0.299143	0.257344
Observations	222	222	222

Table 8: Descriptive Statistics of Tobit Regression

	AGE	SIZE	LEVERAGE
Mean	32.53153	7770.544	0.293879
Median	22.50000	1613.555	0.167210
Maximum	83.00000	292227.0	1.023844
Minimum	2.000000	17.34000	0.002586
Std. Dev.	24.14261	22630.18	0.292226
Observations	222	222	222

5.6   COST-C Model Interpretation

Third column of the table shows the results of Tobit regression analysis with dependent variable COST-C score, in which independent AGE variable is negatively correlated with the COST-C scores of the firm, means as older the firm it will be less cost efficient as compared to new incorporated insurance firms. This is just because of the reason that as insurance firm get older its claim side become bigger and simultaneously expenses also increases which results negative impact on COST-C scores of the firm. Whereas, SIZE and LEVERAGE variables are positively correlated with the COST-C scores of the firms. It means, as volume of total assets of the firm increases, and then firm would be more efficient in COST-C score. SIZE, LEVERAGE and Dummy Takaful variable are significant at level 1, while as AGE variable is not significant with the COST-C dependent variable. Dummy Variable coefficient is also negative in direction which tells us that Takaful Firms (D=1) compare to conventional Insurance firms (D=0) have a lower BCC-I scores with the magnitude of 0.132, controlling for the other independent variables.

6. Conclusions

We found that among the top ranked list (100% efficient), conventional insurance firms are higher in numbers compared to takaful firms, but no statistical significant efficiency mean difference is found among the takaful and conventional insurance firms. That mean on average both sectors are operating on equal performance basis in either (CCR-I, BCC-I, COST-C) case of efficiency measure. In input oriented scale efficiency (CCR-I) regression results, we found that SIZE and LEVEARGE is significant at level 2 and level 1 respectively and coefficients are positive in nature, so concluded that volume of Total Assets and firm's financial leverage is highly correlated has positive relations with firm's CCR-I efficiency scores. Whereas dummy variable states that the marginal contributions of Takaful firms are less than conventional insurance firms and reported as highly significant at 100%. Only AGE variable is insignificant in estimates which means firm's no of operational year have no impact on the firm's CCR-I scores.

In input oriented Technical efficiency (BCC-I) regression results, we found that only LEVEARGE is significant at level 1 and coefficient is also positive in nature, where as AGE and SIZE variables are insignificant, so concluded that volume of Total Assets and firm's age are not correlated with firm's BCC-I efficiency scores. Whereas dummy variable states that the marginal contributions of Takaful firms are less than conventional insurance firms and reported as insignificant Only LEVERAGE variable is significant in estimates which mean firm's financial leverage has impact on the firm's BCC-I scores. In Cost efficiency (COST –C) regression results, we found that SIZE and LEVEARGE is significant at level 1 and coefficients are positive in nature, so concluded that volume of Total Assets and firm's financial leverage is highly correlated has positive relations with firm's COST-C efficiency scores. Whereas dummy variable states that the marginal contributions of Takaful firms are less than conventional insurance firms and reported as highly significant at 99%. Only AGE variable is insignificant in estimates which means firm's no of operational year have no impact on the firm's COST-C scores.

The firm's AGE is the only independent variable which found insignificant in every estimate of regression, so for this finding, we can conclude that firm's age has no impact on the efficiency scores of the firm. Although this is contradictory with the theory of Learning curve, but in case of insurance sector, as firm age is increasing, its claims and other liabilities also increases which means that Age is not one of the determinants for efficiency measurement. This phenomenon is also evident from the year wise efficiency scores of CCR-I, BCC-I and COST-C, as different firms emerged as top ranked firms in different years, only some firms are consistently emerged as bench mark firms. So, AGE factor is not significant as determinant of efficiency score.

In order to achieve benchmarked frontier, Takaful firms should emphasis on total assets of the firm, as Total Asset is positively significant with the firm's efficiency scores.Since the financial leverage is also the significant contributor in cost efficiencies, so that firms should emphasis on increasing Assets with the fuel of external funds. It is further suggested that Takaful firms should reduce their operating cost and management expenses and should improve their investment assets and incomes by investing in healthy projects.Furthermore, takaful firms on average competing with the conventional counterparts in overall efficiencies so that there is quite good opportunity for takaful firms to pull the existing customers which are currently on conventional insurance platform, and bring them under the Shariah compliant takaful system.Finally, there is quite good opportunity for new entrants in the insurance sector as age doesn't matter in the performance of the firms Mean while firms should construct their total asset volume at higher levels as size of the firm does matter in efficiency scores.

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