Input Efficiency of Financial Services Sector: A Non-parametric analysis of Banking and Insurance Sectors of Pakistan

[a]Syed Alamdar Ali Shah, [b]Prof.Dr. Omar Masood

[a]International Centre for Education in Islamic Finance(INCEIF), Malaysia; [b]Chair Quaid-e-Azam School of Management Sciences, Pakistan

Abstract—**In an attempt to enrich the literature of the efficiency of financial services sector with holistic perspective, this study aims to empirically investigate the input efficiency of banking and insurance sectors with further probe into Islamic segments of these sectors in Pakistan. This study measures the technical, allocative, cost, and scale efficiencies of banking and insurance firms in our sample using the non-parametric frontier method, data envelopment analysis (DEA). The findings show that, on average, the allocative efficiency of the overall Islamic financial services sector has increased during the period of study and has also remained well above their conventional counterparts. The study also revealed that, insurance sector is more technically efficient than banking sector. Finally, the study also found that overall efficiency of financial sector can also be improved by exchanging experts between two sectors. The results of this research study provide empirical findings as to how two segments of Financial Services Sectors had fared in the competitive environment from 2007 to 2015.**

Key Words: Input Efficiencies, Banking, Insurance, DEA, Financial Sector
JEL Classification: G21; G22; G32; L25

I. INTRODUCTION

Since global crisis 2008, introduction of new Basel based capital rules and increased Islamisation has made financial services sector face continuous challenges all over the world [18]. Regulatory authorities have introduced new regulations to improve their performance and resilience to guard against capital impairment. Among many measures taken to improve the resilience of financial services providing institutions the ability of the respective Financial Services providing institutions to utilize their input resources has always been a question.

There are two types of financial services sectors that are functioning around the globe at present namely Islamic and Conventional. With the rise of Islamic nature of financial services the competition for Conventional segment for market share has increased manifold which is leading both these financial services sectors to compete for better input and output efficiencies. The studies have shown that long term share and value addition is highly dependent upon various efficiencies [4].

Conventional financial services sector has long roots and therefore enjoys expertise to run their systems; however their Islamic counterparts are underprivileged somewhat in this regard. Besides this handicap many studies have shown that Islamic financial institutions have achieved better efficiencies in many segments [15,20]. Studies undertaken so far have been independently for various segments of financial services sectors, for instance, for banking sector alone and for insurance sector alone. Therefore it is quite necessary to fill in the gap of analyzing the performance of financial sector as a whole.

Following the same trend there is also a need to analyze the efficiency of financial services firms functioning in Pakistan because like other parts of the world efficiency analysis using DEA technique has been conducted in Pakistan accounting for only Banking and Insurance sectors individually, not taking them collectively as a single financial services sector. This is the gap that present study addresses by taking data of Pakistani Banking and Insurance companies from 2007-2015 with panel based comparative analysis further decomposing the financial services sectors further into Conventional and Islamic. Taking an account of financial services with holistic perspective is important because international investors, global financial institutions and policy makers all make efficiency based decisions.

The primary objective of our study is therefore to examine the input efficiency of Banking and Insurance sector by evaluating Technical, Allocative, Scale and Cost efficiencies using Data Envelopment Analysis (DEA) by taking data from the period 2007-2015 and also to find any difference of efficiency in Islamic and Conventional segments of these sectors. The remainder of the paper consists of following sections; section 2 consists of literature review; section 3 consists of methodology; section 4 consists of results and discussion and section 5 is the conclusion.

II. LITERATURE REVIEW

A. Literature Review for Insurance Sector Efficiency

Performing research on insurance the studies from the West including USA concentrate on conventional segment [12]. Studies in Europe about insurance efficiency include Austrian Insurance sector and elaborating impact of organizational structure on the efficiencies of firms [8]. Almost all of the studies conclude that product innovation and technology improvement has improved the performance of insurance firms in their respective research samples.

Due to the emergence and growth of Islamic Takaful over the last one decade we found the studies in this area very few. Studies conducted in this area e.g., [11,13,33] conclude that cost efficiency of Takaful firm is similar with their conventional counterparts.

From Asian countries researchers from East Asian region lead literature on Islamic segment of finance, consequently researchers like [11] in their study on Takaful and conventional insurance firms opine that Takaful firms are operating at lower efficiency than conventional insurance firms. He suggested that Takaful firms need to reduce their administration expenses and asset gains. Saad doing the similar analysis in Malaysia suggested that Takaful firms need to increase their size to reap benefits of economies of scale[21].

In Pakistan researchers opine that Pakistani Insurance firms irrespective of Islamic or Conventional have better technical efficiency and need to improve their input pricing strategies to improve their allocative and therefore cost efficiencies[3]. Furthermore Khan & Noreen conducting DEA analysis on the comparison of efficiency of Pakistani Insurance and Takaful firms found that insurance firms achieve more technical efficiency as compared with takaful firms[15]. Furthermore, Takaful firms achieve more allocative and cost efficiency as compared with their conventional counterparts. They also opine that Takaful firms are also attaining higher efficiency when it comes to Scale efficiency.

B. Review of Literature for Banking Sector Efficiency

Conducting comparative analysis of Islamic and conventional banks also using ratio analysis [19] indicated that conventional banks perform better when it comes to analyzing efficiency and liquidity however, the Islamic Banks perform better when to comes to analyzing solvency. Following the methodology of ratio analysis augmented by t-test found that during the period 2000-2009 Islamic Banks were more liquid and lower on risk than their conventional counterparts. However, they opined that the performance of both banking system was the same[16].

Cengiz doing the comparative analysis of Turkish banking sector using logistic regression and CAMELS approach found that Islamic Banks in Turkey perform better in terms of profitability and asset management however their market risk management performance is inferior[7]. In another study while analyzing the efficiency comparison of Turkish Banks using DEA and other measures between the period 1990 and 2000 found that Islamic Banks achieve better revenue and cost efficiency as compared with their conventional counterparts [14].

Sufian & Noor in their work on Islamic Banks of Asian and MENA region using DEA analysis found that Islamic Banks of MENA region have higher level of technical efficiency as compared with Asian Islamic Banks[27]. He also found that technical efficiency greatly contributes to profitability of Islamic Banks. Lower level of allocative efficiency suggests the Islamic Banks need to work on their management skills and input price mechanism.

Usman using DEA analysis on the data of Conventional Banks of Pakistan from 2001 to 2008 found that Foreign Banks are more technically efficient as compared with their domestic Counterparts. They also found that state owned and domestic owned banks are least efficient[29].

Akhtar used data from 2001-2006 used DEA analysis to calculate the efficiency of Pakistani Banks. His findings also suggest that the efficiency of Foreign Banks operating in Pakistan is better than the efficiency of domestic banks whether they are public or privately owned. He also found in his study that Foreign Banks have been taken advantage in the utilization of domestic benefits and opportunities. He also suggested improving the internal performance and managerial skills[2].

Nazir and Alam in their study on 28 commercial banks from 2003-2007 to check the impact of privatization over operating income using DAE technique found that privatization was not helpful for the banks to improve their operating income[17]. The reason for these contradictory findings they suggested included Law & Order situation, bad debts and increased competition. Overall the study favored state owned commercial banks as distinct from all previous studies.

Still in another study a researcher using DEA analysis to calculate the scale efficiency of five full fledged Pakistani Islamic Banks found only Dawood Islamic Bank efficient in terms of scale efficiency, while the most efficient year turned out to be 2007[6]. Shah with his co-researchers in his study on banking sector using data on conventional and Islamic Banks found that Islamic Banks are performing better in terms of technical and scale efficiency however, conventional banks performed better in terms of allocative efficiency[23]. Saeed also in their study on the comparison of Islamic and Conventional Banking took data for the period 2007 to 2011 using DEA analysis concluded that conventional banks are performing better than Islamic banks which differs from previous studies on the ground that in earlier studies Islamic

Banks performed better in terms of allocative efficiency[22]. Various researchers from Pakistan in their study using data and on Pakistani Islamic and Conventional Banks for the period 2003-2008 and employing DEA analysis also found that Islamic Banks are more cost efficient and less revenue efficient than their conventional counterparts[10,20].

Taking an account of the studies as narrated hereinabove we find that so far studies undertake efficiencies of banking and insurance sectors independently. Also we find that in the period before 2010 conventional banks had more technical and allocative efficiency, however after the in the studies undertaken after 2010 Islamic Banks are found to have more allocative efficiency. Furthermore, from various economic reports undertaken to gauge performance of financial sector we understand that both the sectors contribute to development of financial sector collectively. Therefore there is a dire need to take a collective efficiency analysis of Banking and Insurance sector. To accomplish our purpose we form following primary research question:

- Which Sector out of Banking and Insurance is better employing inputs the in the financial sector?

This main research question will be answered with the help of following sub questions:

- Which Sector out of Banking and Insurance has better technical efficiency?
- Which Sector out of Banking and Insurance has better allocative efficiency?
- Which Sector out of Banking and Insurance has better scale efficiency?
- The Islamisation of which sector has input efficiency in financial sector?

III. METHODOLOGY:

A. What is Data Envelopment Analysis

Contemporary DEA measures are based on linear programming and relevant efficiency measures are bench marked according to best available practices of the industry[5,25]. Various efficiency terms are used in DEA analysis. Firstly, by the term Technical efficiency we mean the ability of a firm to convert physical input into output according to best available practices. Accordingly a 100% technically efficient firm is the one that operates 100% at the level of industry practices [5,31]. Technical efficiency is affected by expertise, efficiency and systems available to run an organization more than prices of inputs that do not have direct affect on technical Efficiency.

Allocative efficiency is another measurement concept used in DEA analysis. The use of this concept stems from the fact that an organization that is 100% technically efficient may not be using best available prices for the acquisition of inputs for its production process [5,28].

A third efficiency measure deployed in DEA analysis is cost efficiency which is based on both technical and allocative efficiency. A firm can achieve cost efficiency only if it can achieve technical and allocative efficiency. It is measured by taking the product of technical and allocative efficiency [5,30]. The concepts have been explained in the **figure 1** hereunder.

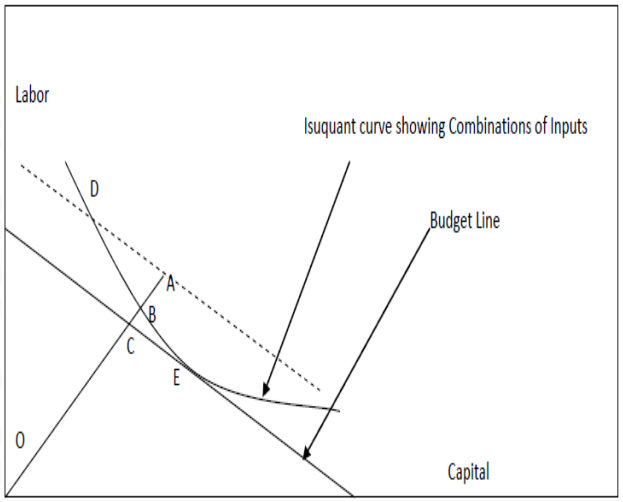

Figure 1. Isoquant curve representing efficiencies

The figure 1 above shows a curve which represents various combinations of inputs required to produce a unit of output. This curve is known as isoquant curve or efficiency frontier and represents expertise, efficiency and systems available to the enterprise for production. A firm can move along this curve for utilizing various combinations of input to produce given unit(s) of output. A firm is considered technically efficient only if it produces along this curve. In the figure 1 budget line is also drawn as a straight line drawn tangent to the isuquant curve. This shows combinations of inputs that have the same level of cost. The slope of the budget line is negative which shows the firm will have to reduce one input labor in our diagram to increase the quantity of other input capital in our case. Closer to the origin "O" budget line shows lower overall cost and vice versa. The point of tangency "E" shows the combination which entails all three efficiencies i.e., technical, allocative and cost.

The line OA in the diagram represents a technically inefficient point "A" because more inputs are required at this point to produce a unit of output as compared with point "B" which lies on the efficient Isoquant. The point "B" is technically efficient but not cost efficient because it lies above the budget line which is tangent to the isoquant curve at point "E". The point "E" therefore is a point of production that entails all technical, allocative and cost efficiency.

If an organization moves from point "A" and starts producing at point "E" it will increase its cost efficiency by (OA-OC/OA). This improvement consists of improved technical efficiency by (OA-OB/OA) and improvement in allocative efficiency by (OB-OC/OB).

Apart from technical allocative and cost efficiencies many studies also analyze technical efficiency by taking another measure namely "scale efficiency (SE)" [16]. This is ascertained by dividing technical efficiency on "Constant Return to Scale (CRS)" on "Variable Return to Scale (VRS)" basis. If there arises difference in the technical efficiency at both the above two scales it proves that there exists scale inefficiency. SE exists when a production unit maximizes its output at a given return to scale and operating at constant return to scale it increases or decreases its output. The result will be either increased scale efficiency or decreased. An explanation of "Scale Efficiency" has been given using figure 2 hereunder:

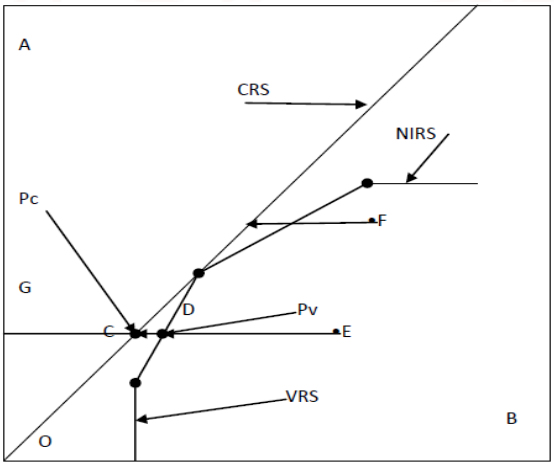

Figure 2. Constant and variable returns to scale

Figure 2 has been drawn with the help of one input variable "B" on horizontal axis and one output variable "A" on the vertical axis. Productivity under constant return to scale (CRS) is shown as a straight line emanating from point "O" touching the top of the box rising gradually, while productivity under variable return to scale (VRS) is a curve that takes various slopes touches CRS curve and moves further. Under Constant return to scale assumption the technical efficiency is between the point "E" and Pc and under Variable return to scale the technical efficiency is between the points "E" and "Pv". The distance between the two points which are also labeled as "C" and "D" in the figure 3, is due to "Scale efficiency". On the surface of figure 3 it is calculated as (GC/GD).

B. Operationalizing the Concepts

Historically, the economists have used several ways to estimate the curve in figure 1 the most common of which consists of "least square" which is not practiced now and "best practices estimation" using DEA and stochastic frontier estimation. For the purpose of our analysis we have focused on DEA analysis which is too based upon linear programming [5].

C. Using DEAP for calculating efficiencies

. The mathematical model applied in the program is hereunder:

$$Max\ h = \frac{\sum_r u_r y_{rj_0}}{\sum_i v_i x_{ij_0}} \quad \text{subject to} \tag{1}$$

$$\frac{\sum_r u_r y_{rj}}{\sum_i v_i x_{ij}} \leq 1, \quad j = 1, \Lambda, n(\text{ for all } j)$$

The *u's* and *v's* used in the problem along with the production variables *x's* and *y's* are constrained variables of the problem and are assumed to be greater than or equal to some small positive quantity for the purpose of ensuring the inclusion of all inputs and/or outputs for calculating all relevant efficiencies.

The result *h* of the model is efficient if it equals "1" for an organization. But if the results are less than "1" it means some other organizations are more efficient. This mathematical expression is solved by converting it into a linear programming problem as under:

$$Max\ h = \sum_r u_r y_{ry_0} \tag{2}$$

Subject to

$$\sum_i v_i x_{ij_0} = 100(\%)$$
$$\sum_r u_r y_{rj} - \sum_i v_i x_{ij} \leq 0, \ j = 1, \Lambda, n$$
$$-v_i \leq -\epsilon \ \ i = 1, 2, \Lambda, m$$
$$-u_r \leq -\epsilon \ r = 1, 2, \Lambda, t$$

The above formulation was first developed by CCR model and named as such in DEA computer program. We can also construct a dual model by incorporating a dual variable in the above model. This has been shown hereunder:

$$Min 100 Z_0 - \epsilon \sum_i s_i^+ - \epsilon \sum_r s_r^- \tag{3}$$

Subject to

$$\sum_j \lambda_j x_{ij} = x_{ij_0} Z_0 - s_i^+, \; i = 1, \Lambda, m$$

$$\sum_j \lambda_j y_{rj} = y_{rj_0} + s_r^-, \; r = 1, \Lambda, t$$

$$\lambda_j, s_i^+, s_r^- \geq 0$$

The λ's introduced as shadow prices in the model as dual variables limit the efficiency of each organization in sample of study to "1". It also implies that the corresponding organization also has an efficiency of "1" which will also contain positive price and dual variable. Accordingly, positive shadow price in the primary or positive value λ's in dual represents and points the peer group of inefficient organization in the study sample. So far we have constructed this model on the basis of Constant Return to Scale however, a similar model on the basis of Variable Returns to Scale can also be constructed as known as BCC model.

D. Data and Variables for the Study

Asghar & Afza discussing efficiency of insurance and takaful sector in Pakistan indicated three approaches to identify output variables in financial sector, these consist of 1) the intermediation approach, 2) the user cost approach and 3) the value added approach[3]. Following the same various studies have been conducted taking different variables into account to measure the efficiencies of insurance sector both in conventional and Islamic financial services sector encompassing various variables based on different approaches for instance[8]. These studies indicate that for insurance industry capacity to bear risk and intermediation should form the basis of selecting outputs, following the same most of contemporary studies use "Gross Premium" in Insurance sector as their first measure of Output and Investment Income as second, that is used in our study as well.

Discussing variables selection in banking industry it was found that for analysis of banking industry generally two approaches are used to identify input and output variables namely the production approach and the mediation approach[1]. Production approach involves inclusion of labor and capital resources as input resources whereas under intermediation approach deposits and loanable funds are used as inputs. The intermediation approach focused using three inputs; (1) total deposits and short term funding, (2) total expenses, and (3) total staff costs and two output variables (1) total (non) interest-bearing loans and (2) total revenues[1]. Sufian following the same approach included Total Deposits and Loan Loss Provision as two inputs; and Total Loans and Investments as two variables as output[26]. Apart from the two approaches a few researchers used a variation of intermediation approach also called asset approach. This approach is adopted for choice of variables in selection of variables for analysis of Banks be it conventional or Islamic[9,24].

Following the asset approach this research has used two output variables, three input variables and the relevant prices of input variables. Input variables consist of Admin Costs, Deposit Accounts and Capital employed for all Banking institutions; and Admin Costs, Commission on Premium, and Capital Employed for all Insurance Institutions. The output variables for this study include Net Interest Income Margin, and Total Loans & Advances for Conventional Banking institutions; Net Spread Earned and Total Financing for Islamic Banking Institutions; and finally Gross Premium and Net Investment Income for both Islamic and Conventional Insurance institutions. The prices of input variables consist of average per employee admin costs for Admin costs, average deposit rate for deposit accounts and Weighted Cost of Capital (WACC) for capital employed for all Banking institutions; and average per employee admin costs for Admin costs, average per employee commission, and WACC for all Insurance Institutions. The prices have also been normalized as by dividing all the prices by the prices of physical inputs for instance $P_1^* = P_1/P_3$ and $P_2^* = P_2/P_3$ [31,32]. The data for this research has been obtained for the period 2007 to 2015 belonging to 20 Islamic and Conventional Insurance and Banking organizations each which represent about 80% market share in terms of deposit and 72% market share in terms of loans and advances in case of Banking and 80% in terms of "Gross Premium" in terms of insurance firms.

IV. RESULTS AND DISCUSSION

A. Data Analysis of Insurance Sector

TABLE I. EFFICIENCY OF INSURANCE FIRMS

YEAR	TE	SE	AE	CE
2007	0.82	0.71	0.43	0.36
2008	0.87	0.74	0.47	0.41
2009	0.88	0.51	0.39	0.34
2010	0.94	0.83	0.45	0.42
2011	0.87	0.87	0.56	0.49
2012	0.92	0.86	0.55	0.51
2013	0.91	0.84	0.63	0.57
2014	0.92	0.86	0.64	0.59
2015	0.94	0.87	0.65	0.61
Mean	0.887	0.766	0.498	0.443
SD	0.039881	0.128101	0.084424	0.08362

TABLE II. EFFICIENCY TAKAFUL FIRMS

YEAR	TE	SE	AE	CE
2007	0.88	0.42	0.72	0.63
2008	0.91	0.40	0.71	0.65
2009	0.89	0.44	0.69	0.61
2010	0.93	0.41	0.75	0.70
2011	0.92	0.45	0.70	0.64
2012	0.88	0.38	0.75	0.66
2013	0.95	0.45	0.71	0.67
2014	0.96	0.47	0.72	0.69
2015	0.96	0.48	0.72	0.69
Mean	0.909	0.421	0.719	0.653
SD	0.026726	0.026726	0.023401	0.027415

TABLE III. EFFICIENCY INSURANCE SECTOR

YEAR	TE	SE	AE	CE
2007	0.85	0.58	0.56	0.47
2008	0.89	0.59	0.58	0.51
2009	0.88	0.48	0.52	0.46
2010	0.94	0.65	0.58	0.54
2011	0.89	0.69	0.62	0.55
2012	0.90	0.65	0.64	0.58
2013	0.93	0.67	0.67	0.62
2014	0.94	0.68	0.67	0.63
2015	0.94	0.68	0.68	0.64
Mean	0.897	0.615	0.595	0.534
SD	0.02972	0.070887	0.049443	0.055702

The results in tables 1 to 3 above reveal that both Takaful and Insurance sector remain technically inefficient during the period 2007 to 2015 as the value of overall technically efficiency index is 0.897 which is below 1. However, the Conventional Insurance sector is lesser technically efficiency than Takaful sector because the value of technical efficiency index of Insurance sector is 0.887 as given in the first column of table 1 which is lower than the technical efficiency index of Takaful sector which is 0.909. It can also be witnessed that the standard deviation of technical efficiency index of Takaful sector is 0.0267 which is far lower than the standard deviation of Conventional Insurance sector which is 0.0399 showing Takaful sector is more consistent in terms of efficiency. The results also show that Takaful sector on the average requires approx 10% reduction in the input level to achieve better technical efficiency as compared with their Conventional counterparts which require approx 12% reduction in input level to achieve the same levels of output respectively.

Tables above also reveal the scale efficiency of Takaful and Conventional sectors. This scale efficiency shows the level of optimal efficiency at which the Insurance sector is operating. Its value of 1 indicates constant return to scale which means the sector or firm under analysis is operating at optimum level; the level below the value of one indicates increasing returns to scale and level above 1 indicates decreasing return to scale which are both the level of operations deviated from optimality. The overall value of Insurance sector presented in the table 3 above is approx 62% which indicates a significant expansion in Insurance sector. Following the value in tables 1 & 2 reveals that expansion in Takaful sector is higher than expansion in Conventional Insurance sector because the value of Takaful sector is approx 42% which is lower than the value of Conventional Insurance sector which is approx 76%. Also it means that the sectors with lower value need to expand their scale to enjoy economies of scale.

Furthermore the tables one to three above also reveal allocative efficiency measures. Table 3 reveals the value as approx 60% which shows the Insurance sector had 40% allocative inefficiency. However, this inefficiency is more contributed by Conventional Insurance sector which is approx 50% inefficient as compared with Takaful sector which is approximately 28% inefficient. Cost efficiency of the firm is also affected by allocative efficiency.

The overall cost efficiency of the Insurance sector during the period under analysis is approx., 53% as depicted in table 2. An analysis of contributing tables 1 and 2 reveals that Takaful sector is more efficient during this period as compared with Conventional Insurance sector as the average cost efficiency of Takaful sector is recorded at 65% as compared with 44% of Conventional Insurance sector over the same period. This shows that Takaful firms need to reduce their expenditures by about 35 percent as compared with 55% of Conventional Insurance sector to produce the same level of output. Taking the overall perspective the Insurance sector need to reduce expenditures by about 44% to produce same output level.

B. Data Analysis of Banking Sector

TABLE IV. EFFICIENCY OF CONVENTIONAL BANKS

YEAR	TE	SE	AE	CE
2007	0.67	0.77	0.52	0.35
2008	0.64	0.79	0.51	0.33
2009	0.66	0.81	0.54	0.36
2010	0.69	0.82	0.53	0.37
2011	0.71	0.80	0.57	0.40
2012	0.72	0.83	0.59	0.42
2013	0.72	0.84	0.58	0.42
2014	0.73	0.85	0.59	0.43
2015	0.74	0.86	0.61	0.45
Mean	0.698	0.819	0.560	0.378
SD	0.034561	0.029345	0.035707	0.037919

TABLE V. EFFICIENCY ISLAMIC BANKS

YEAR	TE	SE	AE	CE
2007	0.59	0.70	0.73	0.43
2008	0.63	0.70	0.75	0.47
2009	0.64	0.72	0.77	0.49
2010	0.67	0.74	0.76	0.51
2011	0.69	0.73	0.79	0.55
2012	0.70	0.75	0.80	0.56
2013	0.72	0.74	0.79	0.57
2014	0.73	0.75	0.81	0.59
2015	0.73	0.76	0.82	0.60
Mean	0.678	0.732	0.780	0.511
SD	0.049188	0.021667	0.02958	0.050281

TABLE VI. EFFICIENCY BANKING SECTOR

YEAR	TE	SE	AE	CE
2007	0.63	0.74	0.61	0.39
2008	0.64	0.75	0.62	0.39
2009	0.65	0.77	0.64	0.42
2010	0.68	0.78	0.63	0.43
2011	0.70	0.77	0.67	0.47
2012	0.71	0.79	0.68	0.49
2013	0.72	0.80	0.67	0.48
2014	0.73	0.81	0.69	0.50
2015	0.74	0.82	0.70	0.52
Mean	0.677	0.772	0.646	0.438
SD	0.035981	0.02166	0.02815	0.041473

The results in tables 4 to 6 above reveal that both Conventional and Islamic Banking sector remain technically inefficient during the period 2007 to 2013 as the value of overall technically efficiency index is 0.677. However, the Conventional Banking sector is more technically efficiency than Islamic Banking sector because the value of technical efficiency index of Conventional Banking sector is 0.687 as given in the first column of table 4 which is higher than the technical efficiency index of Islamic Banking which is 0.663. It can also be witnessed that the standard deviation of technical efficiency index of Islamic Banking sector is 0.045 which is far higher than the standard deviation of Conventional Banking sector which is 0.0314 showing that Conventional Banking sector is more consistent. The results also show that both Islamic and Conventional Banking sectors on the average require approx 33% reduction in the input level to achieve better technical efficiency.

Tables above also reveal the scale efficiency of Islamic and Conventional Banking. This scale shows the level of optimal efficiency at which the Banking sector is operating. The overall value of banking sector presented in the table 6 above is approx 68% which indicates a significant expansion in banking sector. Following the value in tables 4 & 5 reveals that expansion in Conventional Banking sector is higher than expansion in Islamic Banking sector because the value of Islamic Banking sector is approx 73% which is lower than the value of Conventional Insurance sector which is approx 81%. Also it means that the sectors with lower value need to expand their scale to enjoy economies of scale.

Furthermore, tables 4 to 6 above also reveal allocative efficiency measures. Table 6 reveals the value as approx 65% which shows the Banking sector has 35% allocative inefficiency. However, this inefficiency is more contributed by Conventional Banking sector which is approx 45% inefficient as compared with Islamic Banking sector which is approximately 23% inefficient.

The overall cost efficiency of the Banking sector during the period under analysis is approx., 44% as depicted in table 6. An analysis of contributing tables 4 and 5 reveal that Islamic Banks are more cost efficient as compared with Conventional banks sector as the average cost efficiency of Islamic Banks has been observed at 51% as compared with 38% of Conventional Banking sector over the same period. This shows that Islamic Banks need to reduce their expenditures by about 49% as compared with 62% of Conventional banks to produce the same level of output. Taking the overall perspective, banking sector needs to reduce expenditures by about 56% to produce same output level with major contribution from Conventional Banking.

C. Data Analysis for Financial Sector comprising Banking & Insurance

TABLE VII. EFFICIENCY OF CONV FINANCIAL SERVICES SECTOR

YEAR	TE	SE	AE	CE
2007	0.73	0.75	0.49	0.35
2008	0.73	0.77	0.49	0.36
2009	0.75	0.69	0.48	0.36
2010	0.79	0.82	0.50	0.39
2011	0.77	0.83	0.57	0.44
2012	0.80	0.84	0.57	0.46
2013	0.79	0.84	0.60	0.48
2014	0.80	0.85	0.61	0.49
2015	0.82	0.86	0.63	0.51
Mean	0.764	0.792	0.529	0.405
SD	0.030	0.056	0.049	0.051

TABLE VIII. EFFICIENCY OF ISLAMIC FINANCIAL SERVICES SECTOR

YEAR	TE	SE	AE	CE
2007	0.70	0.59	0.73	0.51
2008	0.74	0.58	0.73	0.54
2009	0.74	0.61	0.74	0.54
2010	0.77	0.61	0.76	0.58
2011	0.78	0.62	0.76	0.59
2012	0.77	0.61	0.78	0.60
2013	0.81	0.63	0.76	0.61
2014	0.82	0.64	0.78	0.63
2015	0.82	0.65	0.78	0.64
Mean	0.7578	0.6081	0.7501	0.5689
SD	0.0349	0.0156	0.0183	0.0374

TABLE IX. EFFICIENCY OF FINANCIAL SERVICES SECTOR

YEAR	TE	SE	AE	CE
2007	0.72	0.68	0.59	0.42
2008	0.73	0.69	0.60	0.44
2009	0.74	0.66	0.59	0.44
2010	0.78	0.73	0.61	0.48
2011	0.77	0.74	0.65	0.50
2012	0.79	0.74	0.66	0.52
2013	0.80	0.75	0.67	0.54
2014	0.81	0.76	0.68	0.55
2015	0.81	0.76	0.69	0.56
Mean	0.762	0.711	0.626	0.477
SD	0.031	0.035	0.034	0.044

The results in tables 6 to 9 above reveal that financial services sector consisting of firms from Conventional and Islamic Banking and Insurance sector remain technically inefficient during the period 2007 to 2015 as the value of their combined technically efficiency index is 0.762 . The level of productivity in both the sectors is also similar as the values of technical efficiencies are 0.764 and 0.757 respectively. However, it can also be witnessed that the standard deviation of technical efficiency index of Islamic Financial Services Sector is 0.0349 which is far higher than the standard deviation of Conventional Financial sector which is 0.030 showing that Conventional Financial Services Sector is more consistent. The results also show that both Islamic and Conventional Financial Services sectors on the average require approx 24% reduction in the input level to achieve better technical efficiency.

Tables above also reveal the scale efficiency of Financial Services sector. This scale shows the level of optimal efficiency at which Financial Services Sector is operating. The overall value of banking sector presented in the table 9 above is approx 71% which indicates a significant expansion in Financial Services Sector. Following the value in tables 7 & 8 reveals that expansion in Conventional Financial Services sector is higher than expansion in Islamic Financial Services sector because the value of Islamic Financial Services sector is approx 61% which is lower than the value of Conventional Financial Services sector which is approx 81%. Also it means that the sectors with lower value need to expand their scale to enjoy economies of scale.

Furthermore the tables 7 to 9 above also reveal allocative efficiency measures. Table 9 reveals the value as approx 63% which shows that the Financial Services Sector has 37% allocative inefficiency. However, this inefficiency is more contributed by Conventional Financial sector which is approx 47% inefficient as compared with Islamic Financial Services Sector which is approximately 25% inefficient. Cost efficiency of any organization or sector is also affected by allocative efficiency.

Overall cost efficiency of the Financial Services Sector during the period under analysis is approx., 48% as depicted in table 9. An analysis of contributing tables 7 and 8 reveal that Islamic Financial Services sector is more cost efficient as compared with Conventional Financial Services sector as the average cost efficiency of Islamic Banks has been observed at 57% as compared with 40% of Conventional Financial Services sector over the same period. This shows that Islamic Financial Sector need to reduce their expenditures by about 43% as compared with 60% of Conventional Financial Sector to produce the same level of output. Taking the overall perspective the financial sector need to reduce expenditures by about 52% to produce same output level.

V. CONCLUSION

The findings of our study suggest that Insurance sector is far much superior when it comes to input productivity as the results of technical efficiency for them are higher than that of banking sector. This phenomenon exists in both Islamic and Conventional financial services sectors. However, the results are other way round when it comes to input price efficiency i.e., the allocative efficiency as the allocative efficiency of Banking Sector is better as compared with Insurance sector. The Cost efficiency of Insurance sector again is better than that of banking sector. The results obtained from this study sufficiently support results from previous studies that were undertaken independently for measuring input efficiency of Islamic and conventional financial Insurance and Banking Organizations that Islamic segment financial services organizations perform better in terms of allocative efficiency, for instance [15,20]. Furthermore, in terms of scale efficiency although both the sectors individually and as a whole as well are operating at increasing returns to scale yet the results of Banking Sector are superior than that of Banking sector. In terms of overall results both the sectors are conventional financial services is heavily underperforming in terms of their allocative efficiency.

A. Limitations

This study has several limitations that require more research. For instance, we have calculated only input efficiencies of financial services sector whereas in order to complete the picture for overall efficiency we need to calculate output efficiencies as well. Furthermore, choice of inputs for the study is another limitation because changing various inputs can make us calculate which inputs actually affect efficiency more than the others. The size of the sample for our research is another limitation as we can get more generalized results if we gather data across countries and longer period of time.

B. Policy Implications

Our study has more macroeconomic implications because as the regulators in almost all of the Islamic countries are pursuing Islamic finance. Our studies suggest that pursuing Islamic finance should not be at the cost of penalizing the customers of conventional financial services because higher allocative efficiency means higher input costs and lower profitability which might ultimately affect the ability of the conventional financial services firms in terms of return to their shareholders. Also this study has shown very healthy results for Takaful firms as they depict the highest technical and second highest allocative efficiency which means that Islamisation of financial institutions needs to be geared up to reap benefits of input efficiencies. Our study has implications for improving performance during the era of financial crisis as well because in case of lower revenues, efficiency in input resources utilization takes priority and Islamisation helps achieve it.

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