Efficiency of Domestic and Indo-foreign Life Insurance Companies during Post-Global Recession Period: A DEA Approach

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Abstract

The present study assesses the efficiencies of 22 life insurance companies in India in the post-global recession by segmenting them as Domestic companies and Indo-foreign companies. The period of study is 2008-09 to 2016-17 and all 22 companies had operations throughout the study period. Based on two inputs and two outputs, an input oriented Data Envelopment Analysis (DEA) is applied with Charnes, Cooper and Rhodes (CCR) model and Constant Returns to Scale (CRS) to estimate Overall Technical Efficiency (OTE) of the participating companies in each year during the study period. Average performances of the Domestic and Indo-foreign companies are also evaluated. It is observed that the LICI is the only efficient unit among the Domestic companies, while ICICI Prudential, Bajaj Allianz are top efficient companies among the Indo-foreign companies. Significant difference of efficiencies among Domestic companies and among Indo-foreign companies is analysed using Kruskal Wallis test. It is observed that Domestic companies as well as Indo-foreign companies are significantly different in terms of their efficiency. On the other hand, significant difference of efficiency between Domestic and Indo-foreign companies is analysed using independent sample t test. The result proves that efficiencies of Domestic and Indo-foreign companies are not significantly different.

Key-words: Life Insurance Company; Domestic Company; Indo-foreign Company; Post-Global Recession; Data Envelopment Analysis; Kruskal Wallis test; Independent Sample t test.

1. Introduction

Life insurance business first started in India during the British rule in 1818 with Oriental Life Insurance Company. In 1956, when Life Insurance Corporation of India (LICI) Ltd. was nationalised, more than 200 small institutions were issuing life insurance policies on their own (Kumar, 1996). The state-owned LICI enjoyed a natural monopoly in the life insurance market for nearly 44 years until economic reforms in 1991. Based on the Malhotra Committee report (1994), liberalisation was introduced in the insurance sector to foster growth. Life and non-life business

were separated and prudential solvency-based regulation was introduced. Enactment of the Insurance Regulatory and Development Authority (IRDA) Act in 1999 and setting up of the IRDA the following year made this sector a regulated one. This allowed the private players to enter the insurance market (Saha, 2013). The journey of the private players started with setting up of four companies, ICICI Prudential Life Insurance Company, Birla Sun Life Insurance Company, HDFC Standard Life Insurance Company and Max New York Life Insurance Company in 2000-01 (Sinha, 2012). In the last 16 years, another 19 private insurers joined the league. Currently, India's life insurance market is characterised by the presence of 24 life insurance companies comprising 23 private companies and one public company, the LICI. Over the years, businesses of the private life insurance companies have grown significantly reducing the market share of the LICI (Kulkarni & Sagar, 2011). However, their cumulative growth in terms of net premium collection or Asset under Management (AUM) positively influenced economic growth. Hence, the life insurance companies were expected to utilise their resources efficiently.

A majority of private players who started their operation in the last decade have allowed foreign participation in their ownership subject to the cap set by the regulators. Hence, private companies can be classified under two heads – Domestic companies (companies with no foreign participation in their ownership structure) and Indo-foreign companies (companies with foreign participation in their ownership structure). Thus entire industry may be classified as Domestic companies (that includes Domestic private companies and the LICI) and Indo-foreign companies. During the operation of private life insurers in India since 2000-01, a major debacle in the economy came out due to global financial crisis generated from sub-prime mortgage crisis in the United States of America (USA). The crisis, in fact severely influenced global financial sector, including life insurance businesses as well. American Insurance Group (AIG) was badly affected and insurance companies in India endured the pain of global economic recession (Marcovic, et al., 2010). It was the general belief that as the Indo-foreign life insurance companies were more exposed to the abroad market, their hardships in the aftermath of global financial crisis were more as compared to the Domestic companies. Against this backdrop, an attempt has been made in this paper to analyse the performance of Domestic and Indo-foreign companies in the aftermath of global financial crisis and to investigate as to whether there is any significant difference in their performance.

2. Past Studies and Research Gap

A review of select studies on efficiency of life insurance companies or insurance sector in general is made in this segment covering a period of 2000 to 2012. Mansoor & Radam (2000) in their study focussed on the productivity of life insurance companies in Malaysia during the period of 1975 to 1997 using Malmquist Productivity Index (MPI). Average technical efficiency of the industry was 72%. On an average it had grown by 48% during the study period. Productivity growth and growth of technical change was 48% and 30% respectively. Top efficient companies were Malaysia National Insurance Company, Malaysia Co-operative Insurance Society and Overseas Assurance Corporation Ltd. The growth in technical efficiency was highest for Asia Life and Great Eastern, while growth in technical change was highest for United Malaysian Insurance Company and Malaysian Assurance Alliance. MAA and UMI are best performers in terms of productivity growth. However, MCIS, Safety and AIA showed negative growth during the period. Kumar (2005) in his study reviewed the development of insurance sector in Indian economic environment. Circumstances behind nationalisation of the LICI, economic reforms in 1991, product and technological development in Indian insurance market and the role of insurance companies in economic growth were discussed in his study. He advocated removal of inefficiency for overall growth of this sector. In one of the recent studies, Huang (2007) predicted cost and profit efficiency

of Chinese insurance companies that constituted 90% of total business in Chinese insurance market during the period 1999 to 2004 using Stochastic Frontier Analysis (SFA). The results showed that the cost efficiency of foreign and non-state owned companies were better than that of Domestic and state-owned companies. However, an opposite result was observed in case of profit efficiency. In a similar study, Ibiwoye (2010) developed a model for analysing technical efficiency and cost efficiency of 10 Nigerian insurance companies under constant and variable returns to scale using frontier analysis. It was observed that the companies were scale inefficient and followed decreasing returns to scale. Size of the firms influenced their efficiencies. In India, Kulkarni & Sagar (2011) focussed on the competitive strategies adopted by the LICI to retain their market share. While the LICI was the market leader by the end of 2008-09 with 70.92% market shares, private insurers were not lagging behind with a net premium growth of 800% from 2000-01. ICICI Prudential, Bajaj Allianz, and SBI Life were the frontrunners. In order to retain its existing market share, the LICI was diversifying in other forms of insurance, such as health insurance, bancasssurance, micro-insurance, etc. and opening up its branches abroad. Latif (2011) determined the impact of ownership structure on efficiencies of Iranian insurance companies in 2008-09 and 2009-10. It was observed that in both the years, the technical, pure technical and scale efficiencies of private life insurance companies are more as compared to public life insurance companies. Jain & Goyal (2012) conducted a study on insurance market in general. They studied the impact of demographic factors, such as gender, age and income on policyholders' rights. While income fully influenced policyholders' rights, age had partial influence on it. However, gender had no significant influence on policyholders' rights. Sinha (2012) in his recent study compared the performances of major life insurance companies operating in India during the period of 2005-06 to 2008-09 using envelopment models developed by Charnes, Cooper & Rhodes (CCR), and Banker, Charnes & Cooper (BCC) and slack based measure developed by Tone. The LICI was found to be a better performer as compared to other insurance companies. Finally, Saha & Roy (2018) used Data Envelopment Analysis (DEA) to measure efficiencies of 24 life insurance companies operating in India in the year 2015-16. They used input oriented CCR and BCC models to evaluate overall technical efficiency, pure technical efficiency and scale efficiency of the Decision Making Units (DMUs) to find out the effect of managerial performance and scale of operation on performance of the companies.

Existing literature based on efficiency of life insurance companies cover a wide range of studies contributed by Indian and foreign scholars. While most of the studies mainly cater to calculation of technical efficiency, pure technical efficiency, scale efficiency, cost efficiency and profit efficiency of a select group of insurance companies of a country during a particular period, there are some studies involving with productivity, technical and technological changes of the life insurance companies. Impact of ownership structure and other demographic factors on performance of life insurance companies are also studied in some of the papers. In India, growth of private life insurers as compared to the LICI has been studied thoroughly.

While a number of issues have been covered in the existing literature, performance of Domestic and Indo-foreign life insurance companies in the backdrop of economic global recession is not analysed in studies reviewed, so far. The existing studies have not also investigated the difference in the performance of Domestic and Indo-foreign companies in Indian insurance market. However, the following research objectives are formulated keeping in view the research gap.

3. Objectives

The objectives of the study are:

(i) To study the efficiencies of Domestic as well as Indo-foreign life insurance companies in each year during the post-global recession era;
(ii) To analyse the average performance of Domestic as well as Indo-foreign life insurance companies in the post-global recession era;
(iii) To examine significant difference of efficiencies among Domestic life insurance companies;
(iv) To explore significant difference of efficiencies among Indo-foreign life insurance companies; and
(v) To study the significant difference in the efficiency between two groups (Domestic and Indo-foreign) of life insurance companies.

4. Methodology

As of 2016-17, there were 24 life insurance companies in Indian life insurance sector comprising 23 private life insurers and one public life insurer – the LICI. However, 22 out of 24 companies worked in each year during the study period (2008-2009 to 20016-2017). Truly speaking, two private life insurers like, IndiaFirst Life Insurance Company and Edelweiss Tokio were incorporated in 2009-10 and 2011-12 respectively. Hence, IndiaFirst and Edelweiss Tokio have not been considered under the current study.

Now, among those 22 life insurance companies, ownership of three companies, such as the LICI, Exide Life and Sahara India are controlled by Domestic entities termed as Domestic companies. However, rest 19 companies are operating with foreign collaboration called Indo-foreign companies. These 22 Domestic and Indo-foreign companies working side by side in Indian insurance market are depicted here.

Table 1: Domestic and Indo-foreign Life Insurance Companies in India as on 2016-17

No.	Domestic Companies	No.	Indo-foreign Companies
1	Life Insurance Corporation of India Ltd. (LICI)	1	Aegon Life Insurance (Aegon)
2	Exide Life Insurance (Exide Life)	2	Aviva Life Insurance (Aviva)
3	Sahara India Life Insurance Corporation Ltd. (Sahara India)	3	Bajaj Allianz Life Insurance (Bajaj Allianz)
		4	Bharti AXA Life Insurance (Bharti AXA)
		5	Aditya Birla Sunlife Insurance (Birla Sunlife)
		6	Canara HSBC OBC Life Insurance (Canara HSBC)
		7	DHFL Pramerica
		8	Future Generali India LIC Ltd. (Future Generali)
		9	HDFC Life Insurance (HDFC Standard)
		10	ICICI Prudential Life Insurance (ICICI Prudential)
		11	IDBI Life Insurance Company Ltd. (IDBI Federal)
		12	Kotak Life Insurance (Kotak Mahindra)
		13	Max Life Insurance (Max Life)
		14	PNB Metlife
		15	Reliance Nippon Life (Reliance Nippon)
		16	SBI Life Insurance Company (SBI Life)
		17	Shriram Life (Shriram)
		18	Star Union Dai-ichi Life Insurance (Star Union Dai-ichi)
		19	Tata AIA Life Insurance Company (TATA AIA)

Source: Life Insurance Companies Operating India (IRDA, 2017)

As per our study objective, efficiencies of those Domestic and Indo-foreign life insurance companies are to be studied. As we know that efficiency is typically a function of input and output.

$\Rightarrow$ *Efficiency = Output ÷ Input*

With a view to estimating the efficiency of the competing units, appropriate financial or non-financial variables pertaining to insurance companies are to be identified. Prior researches have shown that commission expenses (Diacon, Starkey & O'Brien, 2002) paid to the agents and operating expenses (Ennsfellner et al., 2004) are two most important inputs for estimating efficiency. However, net premium collected from policyholders (Abidin & Cabanda, 2011) and benefits paid to the policyholders (Cummins et al., 1999) may be selected as outputs of insurance businesses. According to Cooper, et al. (2007), number of units should be greater than or equal to the product of number of inputs and number of outputs.

- $n \geq (p \times q)$ *where, n = number of units [i.e. decision making units (DMUs)], p = number of inputs, q = number of outputs.*

As (p×q) for the current study is four, though total DMUs for the current study is 22 fulfilling the condition and two input-two output combinations may be considered here. The data on the input and output variables for all 22 insurance companies (DMUs) during the period 2008-09 to 2016-17 are collected from Handbook of Indian Insurance Statistics 2016-17 published by the IRDA (IRDA, 2017a). With a view to assess the efficiency of competing life insurance companies each year, Data Envelopment Analysis (DEA) is applied (Berger & Humphrey 1997). An input-oriented DEA with the assumption of Constant Returns to Scale (CRS) (Charnes, Cooper & Rhodes, 1978) would aim for equi-proportionate reduction of inputs to produce a standard output of the efficient units by solving the following Linear Programming (LP) problem. :

$Min\ \theta = Min\ X\lambda/X_0$
Subject to the following constraints
$\theta x_o - X\lambda \geq 0,$
$Y\lambda \geq y_o,$
$\lambda \geq 0.$

Where,

- $X\lambda$ = optimum minimum input
- X_0 = actual input
- $Y\lambda$ = optimum standard output
- Y_o = actual output.

The efficiency estimated based on the above LP is known as Overall Technical Efficiency (OTE). Here, the measure of θ is actually OTE. It is the reciprocal of radial contraction of input to produce a standard output. Thus the objective function (*Min θ)* would ensure maximum radial contraction in such a way, so that the contracted input (θx_o) is always greater than or equal to the standard input $(X\lambda)$. Hence, the measure of efficiency in input oriented model can be represented as follows:

$\Rightarrow$ *Efficiency (θ) = Standard input ÷ Actual input*

If the actual input of a unit is equal to the standard input, then θ = 1 and the unit is an efficient unit. However, if actual input is greater than the standard input, then θ<1 and the unit is an inefficient unit. Finally, it may be said that if OTE of a company is equal to 1 in a particular year, the company is an efficient company. On the other hand, if OTE is less than 1, the company is an inefficient one.

In the current study, data on input and output variables of all Domestic and Indo-foreign companies are taken together and OTE scores are calculated based on above model in each year under the study. This addresses the first objective of the study. Summarised performance of the Domestic and Indo-foreign life insurance companies are analysed in addressing objective-2 of the study by calculating average OTE scores of different years. The next two objectives of the study are to explore significant difference of efficiencies of the Domestic and Indo-foreign companies. Here, non-parametric Kruskal Wallis (K-W) test has been conducted fulfilling the required assumption. The final objective of testing significant difference in the efficiency of Domestic and Indo-foreign companies has been addressed by applying independent sample t test fulfilling the assumptions of normality and Homoscedasticity.

5. Analysis and Interpretation

Objective 1: Studying the efficiencies of Domestic as well as Indo-foreign life insurance companies in each year during the post-global recession era

Based on input-oriented CCR model and using two inputs and two outputs under the study, efficiency scores of 22 life insurance companies during the period of 2008-09 to 2016-17 are calculated in order to address the first objective of the study (Table 2).

Table 2: OTE Scores of Life Insurance Companies during the Period 2008-09 to 2016-17

DMUs	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Domestic Companies									
LICI	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	0.984 (IE)	1.000 (E)	0.947 (IE)
Exide Life	0.594 (IE)	0.524 (IE)	0.418 (IE)	0.498 (IE)	0.577 (IE)	0.491 (IE)	0.528 (IE)	0.401 (IE)	0.470 (IE)
Sahara India	0.497 (IE)	0.608 (IE)	0.549 (IE)	0.452 (IE)	0.691 (IE)	0.835 (IE)	0.734 (IE)	0.553 (IE)	0.806 (IE)
Indo-foreign Companies									
Aegon	0.574 (IE)	0.488 (IE)	0.553 (IE)	0.666 (IE)	0.770 (IE)	0.449 (IE)	0.456 (IE)	0.664 (IE)	1.000 (E)
Aviva	0.593 (IE)	0.546 (IE)	0.725 (IE)	1.000 (E)	0.781 (IE)	0.784 (IE)	0.727 (IE)	1.000 (E)	1.000 (E)
Bajaj Allianz	0.577 (IE)	0.643 (IE)	0.635 (IE)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	0.992 (IE)	1.000 (E)
Bharti AXA	0.416 (IE)	0.386 (IE)	0.628 (IE)	1.000 (E)	0.675 (IE)	0.378 (IE)	0.443 (IE)	0.382 (IE)	0.355 (IE)
Birla Sunlife	0.489 (IE)	0.498 (IE)	0.522 (IE)	0.700 (IE)	0.679 (IE)	0.721 (IE)	0.741 (IE)	0.729 (IE)	0.952 (IE)
Canara HSBC	0.168 (IE)	0.288 (IE)	0.476 (IE)	0.877 (IE)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	0.979 (IE)
DHFL Pramerica	1.000 (E)	0.328 (IE)	0.307 (IE)	0.343 (IE)	0.223 (IE)	0.326 (IE)	0.803 (IE)	0.966 (IE)	0.782 (IE)
Future Generali	0.302 (IE)	0.179 (IE)	0.235 (IE)	0.341 (IE)	0.366 (IE)	0.395 (IE)	0.562 (IE)	0.577 (IE)	0.445 (IE)
HDFC Standard	0.593 (IE)	0.596 (IE)	0.670 (IE)	0.695 (IE)	0.884 (IE)	1.000 (E)	0.994 (IE)	0.841 (IE)	0.830 (IE)
ICICI Prudential	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)
IDBI Federal	0.936 (IE)	0.536 (IE)	0.430 (IE)	0.450 (IE)	0.444 (IE)	0.469 (IE)	0.554 (IE)	0.525 (IE)	0.557 (IE)
Kotak Mahindra	0.529 (IE)	0.701 (IE)	0.711 (IE)	1.000 (E)	0.824 (IE)	0.673 (IE)	0.562 (IE)	0.493 (IE)	0.540 (IE)
Max Life	0.446	0.460	0.412	0.421	0.554	0.614	0.600	0.630	0.530

	(IE)	(IE)	(IE)	(IE)	(IE)	(IE)	(IE)	(IE)	(IE)
PNB Metlife	0.323 (IE)	0.424 (IE)	0.889 (IE)	0.861 (IE)	0.690 (IE)	0.580 (IE)	0.552 (IE)	0.467 (IE)	0.534 (IE)
Reliance Nippon	0.403 (IE)	0.494 (IE)	0.461 (IE)	0.566 (IE)	0.711 (IE)	0.577 (IE)	0.571 (IE)	0.511 (IE)	0.652 (IE)
SBI Life	0.931 (IE)	0.958 (IE)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	1.000 (E)	0.993 (IE)	1.000 (E)
Shriram	0.477 (IE)	0.496 (IE)	0.703 (IE)	0.699 (IE)	0.595 (IE)	0.515 (IE)	0.536 (IE)	0.451 (IE)	0.462 (IE)
Star Union Dai-ichi	0.350 (IE)	0.756 (IE)	0.908 (IE)	0.973 (IE)	0.736 (IE)	0.511 (IE)	0.526 (IE)	0.504 (IE)	0.666 (IE)
TATA AIA	0.521 (IE)	0.494 (IE)	0.515 (IE)	0.990 (IE)	0.931 (IE)	0.931 (IE)	0.921 (IE)	0.920 (IE)	0.538 (IE)
Note: E denotes Efficient and IE denotes Inefficient mentioned in the parenthesis									

Source: Compilation of secondary data available from Handbook of Insurance Statistics 2016-17

Among Domestic companies, the LICI efficiently performed throughout the study period with a slight set back in 2014-15 and 2016-17. Other two Domestic companies, Exide Life and Sahara India are inefficient companies. Among the Indo-foreign companies, Birla Sunlife, Future Generali, IDBI Federal, Max Life, PNB Metlife, Reliance Nippon, Shriram, Star-Union Dai-Chi and TATA AIA have shown inefficiency in their operation throughout the study period. On the other hand, ICICI Prudential was efficient all through those years even surpassing the efficiency of the industry leader, the LICI. Bajaj Allianz, Canara HSBC and SBI Life have shown efficiency in most of the years during the study period. Barring those Indo-foreign companies, other companies, such as Aegon, Aviva, DHFL Pramerica, and HDFC Standard have projected efficiency once in a while, though they remained inefficient in most of the years.

Objective 2: Analysing the average performance of Domestic as well as Indo-foreign life insurance companies in the post-global recession era

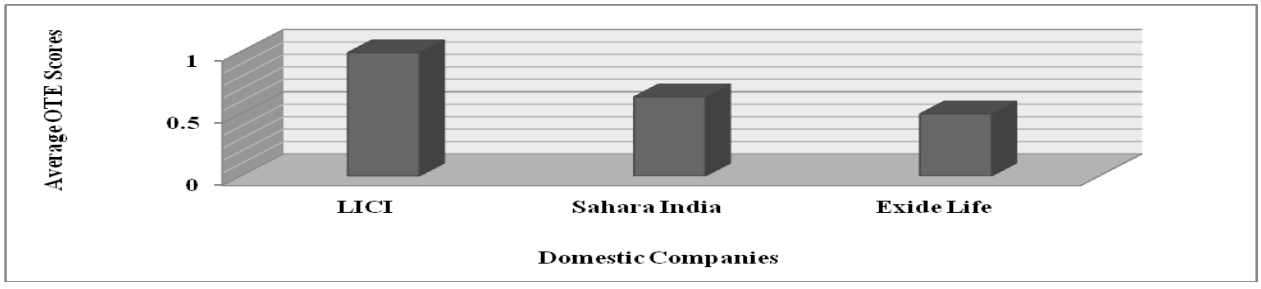
With a view to capture the summarised performance of Domestic as well as Indo-foreign companies in addressing the second objective of the study, average OTE scores of each life insurance company over the study period are calculated and the companies are ranked based on their average OTE scores. The LICI, being the market leader projected maximum efficiency with rank-1 followed by Sahara India (Table 3). Exide Life is the most inefficient Domestic Company (Chart 1).

Table 3: Average Performance of Domestic Life Insurance Companies

DMUs	Average OTE Score	Rank
LICI	0.992	1
Sahara India	0.636	2
Exide Life	0.500	3

Source: Based on Table 2

Chart 1: Average Performance of Domestic Life Insurance Companies



Source: Based on Table 3

As far as Indo-foreign insurance companies are concerned (Table 4), ICICI Prudential (Rank 1) was the most efficient company followed by SBI Life (Rank 2) and Bajaj Allianz (Rank 3).

Table 4: Average Performance of Indo-foreign Life Insurance Companies

DMUs	Average OTE Score	Rank
ICICI Prudential	1.000	1
SBI Life	0.987	2
Bajaj Allianz	0.872	3
Aviva	0.795	4
HDFC Standard	0.789	5
Canara HSBC	0.754	6
TATA AIA	0.751	7
Birla Sunlife	0.670	8
Kotak Mahindra	0.670	9
Star Union Dai-ichi	0.659	10
Aegon	0.624	11
PNB Metlife	0.591	12
DHFL Pramerica	0.564	13
Reliance Nippon	0.550	14
Shriram	0.548	15
IDBI Federal	0.545	16
Max Life	0.519	17
-Bharti AXA	0.518	18
Future Generali	0.378	19

Source: Based on Table 2

It is observed that Future Generali was the most inefficient company, while Shriram, IDBI Federal, Max Life and Bharti AXA were some of the companies with poor performance during the study period (Chart 2).

Chart 2: Average Performance of Indo-foreign Life Insurance Companies

Source: Based on Table 4

Objective 3: Examining significant difference of efficiencies among Domestic life insurance companies

While a difference is observed in the efficiencies of Domestic insurance companies, it is imperative to explore such difference statistically in addressing the third objective of the study. With a view to exploring the significant difference in the efficiencies of Domestic companies, the following hypothesis is taken.

Hypothesis-1

- *Null Hypothesis (H_0): No significant difference exists in the efficiencies of Domestic life insurance companies;*

- *Alternate Hypothesis (H_1): Significant difference exists in the efficiencies of Domestic life insurance companies.*

The type of data is pull data (efficiency of more than one company for more than one period). Parametric test for analysing mean difference of the competing companies can be applied subject to the fulfilment of the assumption of normality.

Assumption of Normality: Efficiencies of each life insurance company follow normal distribution. The assumption is tested based on following hypothesis:

Hypothesis-2

- *H_0: Efficiencies of each Domestic life insurance company follow normal distribution*
- *H_1: Efficiencies of each Domestic life insurance company do not follow normal distribution*

Hypothesis-2 is tested first applying Kolmogorov-Smirnov (K-S) test with 5% level of significance and 'n' degrees of freedom (df) where n is number of years = 9. If p-Value for a particular company is less than 0.05, then H_0 is rejected and vice versa. If H_0 is not met, the assumption is not fulfilled. In view of this, the results of K-S test (Table 5) are given below:

Table 5: Result of K-S test for Domestic Companies

Companies	Statistic	df	p-Value	Decision Rule	Decision	Remarks
LICI	0.444	9	0.000	p-Value<0.05	H_0 rejected	*It does not follow normal distribution*
Exide Life	0.120	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Sahara India	0.173	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*

Source: Compilation of secondary data from Table 2 using SPSS 20.0

The results of K-S test shows that H_0 is rejected for LICI (Table 5). If H_0 for all the companies are accepted, the assumption is met. As the situation is not so, the assumption is not met and parametric test cannot be conducted. Hence, in order to test Hypothesis-1, non-parametric Kruskal Wallis (K-W) test is conducted with 5% level of significance and (k-1) df where, k is the number of companies = 3. If p-Value is less than 0.05, then H_0 is rejected and vice versa. The result of the test (Table 6) shows that H_0 of Hypothesis-1 is not met.

Table 6: Result of K-W test for Domestic Companies

Chi-Square	*19.813*
Df	*2*
p-Value	*0.000*
Decision rule	*p-Value<0.05*
Decision	*H_0 is rejected*
Remarks	*Significant difference exists in the efficiencies of Domestic life insurance companies*

Source: Compilation of secondary data from Table 2 using SPSS 20.0

Finally, it is deduced that significant difference exists among the efficiencies of Domestic life insurance companies.

Objective 4: Exploring significant difference of efficiencies among Indo-foreign life insurance companies

Significant difference among the efficiencies of Indo-foreign companies has been studied based on the following hypothesis:

Hypothesis-3

- *H_0: No significant difference exists in the efficiencies of Indo-foreign life insurance companies;*
- *H_1: Significant difference exists in the efficiencies of Indo-foreign life insurance companies.*

Like the previous analysis for Domestic companies, here also the assumption of normality is to be checked based on the following hypothesis:

Hypothesis-4

- *H_0: Efficiencies of each Indo-foreign life insurance company follow normal distribution;*
- *H_1: Efficiencies of each Indo-foreign life insurance company do not follow normal distribution.*

Like before, K-S test is used to test Hypothesis-4. The result (Table 7) shows H_0 is rejected for Bajaj Allianz, Bharti AXA, Canara HSBC, DHFL Pramerica, ICICI Prudential, and Reliance Nippon. It means that their efficiencies are not normally distributed.

Table 7: Result of K-S test for Indo-foreign Companies

Companies	Statistic	Df	p-Values	Decision Rule	Decision	Remarks
Aegon	0.185	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Aviva	0.216	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Bajaj Allianz	0.402	9	0.000	p-Value<0.05	H_0 rejected	*It does not follow normal distribution*
Bharti AXA	0.304	9	0.016	p-Value<0.05	H_0 rejected	*It does not follow normal distribution*
Birla Sunlife	0.205	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Canara HSBC	0.306	9	0.015	p-Value<0.05	H_0 rejected	*It does not follow normal distribution*
DHFL Pramerica	0.313	9	0.011	p-Value<0.05	H_0 rejected	*It does not follow normal distribution*
Future Generali	0.136	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
HDFC Standard	0.170	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
ICICI Prudential	0.357	9	0.002	p-Value<0.05	H_0 rejected	*It does not follow normal distribution*
IDBI Federal	0.190	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Kotak Mahindra	0.197	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Max Life	0.190	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
PNB Metlife	0.164	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Reliance Nippon	0.374	9	0.001	p-Value<0.05	H_0 rejected	*It does not follow normal distribution*
SBI Life	0.217	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*

Shriram	0.186	9	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Star Union Dai-ichi	0.331	9	0.005	p-Value>0.05	H_0 accepted	*It follows normal distribution*

Source: Compilation of secondary data from Table 2 using SPSS 20.0

Hence, efficiencies of each Indo-foreign life insurance companies are not normally distributed. The assumption is not met. Hence, non-parametric Kruskal Wallis (K-W) test is applied to test Hypothesis-3. The result (Table 8) proves that H_0 is rejected and significant difference exists among efficiencies of Indo-foreign life insurance companies.

Table 8: Result of K-W test for Indo-foreign Companies

Chi-Square	*79.790*
Df	*18*
Asymp. Sig.	*0.000*
Decision rule	*p-Value<0.05*
Decision	*H_0 is rejected*
Remarks	*Significant difference exists in the efficiencies of Indo-foreign life insurance companies*

Source: Compilation of secondary data from Table 2 using SPSS 20.0

It has been observed that significant difference exists in the efficiencies of companies operating as Indo-foreign life insurance companies.

Objective 5: Studying the significant difference in the efficiency between two groups (Domestic and Indo-foreign) of life insurance companies

It is significant to note that there is a need for exploring significant difference of efficiencies between Domestic and Indo-foreign life insurance companies in terms of their average performance that can be analysed in addressing the last objective of the study based on the following hypothesis:

Hypothesis-5

- *H_0: No significant difference exists in the performance of Domestic and Indo-foreign life insurance companies;*
- *H_1: Significant difference exists in the performance of Domestic and Indo-foreign life insurance companies.*

As the data is cross-sectional in nature (average OTE scores of Domestic and Indo-foreign life insurance companies), parametric test of mean difference may be applied subject to fulfilment of the following assumptions.

Assumption 1 (Assumption of Normality): Average OTE scores of Domestic companies and Indo-foreign companies are normally distributed.

The aforesaid assumption is tested based on following hypothesis:

Hypothesis-6

- *H_0: Average efficiencies of each group follow normal distribution;*
- *H_1: Average efficiencies of each group do not follow normal distribution.*

K-S test is applied to test the above hypothesis at 5% level of significance and 'n' degrees of freedom. Degree of freedom (n) for a group is the number of companies in that group. Hence, in case of Domestic companies, df = 3 and in case of Indo-foreign companies, df = 19. The result (Table 9) of K-S test projects that H_0 is accepted for both the groups.

Table 9: Result of K-S test for the Groups

Groups	Statistic	df	p-Value	Decision rule	Decision	Remarks
Domestic	0.280	3	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*
Indo-foreign	0.138	19	0.200	p-Value>0.05	H_0 accepted	*It follows normal distribution*

Source: Compilation of secondary data from Table 3 and Table 4 using SPSS 20.0

Average efficiency of each group follow normal distribution and Assumption-1 is met.

Assumption-2 (Assumption of Homoscedasticity): Variances of each group are homogenous.
In order to test the above assumption, the following hypothesis is taken:

Hypothesis-7

- *H_0: The variances of the groups are homogenous*
- *H_1: The variances of the groups are not homogenous*

If H_0 is accepted, the assumption is met. Levene's test at 5% level of significance is conducted to test Hypothesis-7. If p-Value for the test is less than 0.05, H_0 is not accepted and vice versa. The result of that test (Table 10) shows that H_0 is accepted. Hence, the assumption is met.

Table 10: Result of Levene's test

F	p-Value	Decision rule	Decision	Remarks
0.928	0.347	p-value>0.05	H_0 accepted	*Variances of the groups are homogenous*

Source: Compilation of secondary data from Table 3 and Table 4 using SPSS 20.0

Subject to fulfilment of these two crucial assumptions, parametric independent sample t test may be conducted to test Hypothesis-5 based on 5% level of significance and $(N_1 + N_2 – K)$ df, where N_1 is number of Domestic companies (3); N_2 is number of Indo-foreign companies (19) and K is the number of the groups (2). Hence, the df for the test is 20. The result of independent sample t test (Table 11) shows that H_0 is accepted.

Table 11: Result of t test

t	df	p-Value	Decision rule	Decision	Remarks
0.336	20	0.741	p-Value>0.05	H_0 is accepted	*Efficiencies of Domestic and Indo-foreign companies are not significantly different*

Source: Compilation of secondary data from Table 3 and Table 4 using SPSS 20.0

It is finally deduced from the result that despite a huge difference in the number of Domestic companies and Indo-foreign companies, their efficiencies are not significantly different.

6. Overall Interpretations

The overall interpretations in addressing different objectives of the study are as follows:

Objective 1: Studying the efficiencies of Domestic as well as Indo-foreign life insurance companies in each year during the post-global recession era

Interpretation: Out of three Domestic companies, the LICI was efficient in their operation in most of the years during the study period (with exceptions in 2014-15 and 2016-17). However, ICICI

Prudential which is actually an Indo-foreign company remained efficient throughout the entire study period even surpassing the efficiency records of the LICI. Other Indo-foreign companies, such as Bajaj Allianz, Canara HSBC and SBI Life were also not far behind in the race. The result shows that perhaps the performance of a few Indo-foreign companies is not influenced by global recession issue as such.

Objective 2: Analysing the average performance of Domestic as well as Indo-foreign life insurance companies in the post-global recession era
Interpretation: It is observed that none of the Domestic companies attains the score of 1 based on average performance of all insurance companies considered during the study period, signifying inefficient companies. The remarkable observation is that as far as Indo-foreign companies are concerned, ICICI Prudential projects an average OTE score of 1 indicating efficient company out of other Indo-foreign insurance companies during the study period.

Objective 3: Examining significant difference of efficiencies among Domestic life insurance companies
Interpretation: The study shows that the significant difference exists in the efficiencies of Domestic life insurance companies, like the LICI, Exide Life and Sahara India. Truly speaking, the LICI, market leader, is performing in the insurance market for the long period and is holding excellent market share as well. On the other side, other two Domestic life insurance companies, like Exide Life and Sahara India are operating in the insurance market since post-reforms era and they are comparatively newer in the market. Hence, it is evident that because of the uneven size and market presence of the participating companies, difference in the level of their efficiency exists.

Objective 4: Exploring significant difference of efficiencies among Indo-foreign life insurance companies
Interpretation: While the difference in the average OTE scores of the competing companies in this group during the study period is comparatively less, significant difference exists among their efficiency. Some companies, such as ICICI Prudential, SBI Life and Bajaj Allianz with their market experience and innovative product ideas have conquered the market while some other companies, such as Bharti AXA, Future Generali could not gain the ground yet. Hence, the difference occurs in their performance.

Objective 5: Studying the significant difference in the efficiency between two groups (Domestic and Indo-foreign) of life insurance companies
Interpretation: Efficiencies of Domestic companies are not significantly different from that of Indo-foreign companies. Though there is huge difference in the number of Domestic and Indo-foreign companies, global recession has hit both of those segments equally resulting in homogenous efficiencies of those two groups.

7. Areas for Further Research

Some areas associated with the present study that requires further research have been identified as follows:

(i) Here, the study period is 2008-09 to 2016-17. Performances of life insurance companies prior to 2008-09 may be evaluated;

(ii) Impact of economic global recession on efficiency of the life insurers may be estimated by applying Mann-Whitney (MW) test by segmenting the entire study period into pre-global recession period and post-global recession period;

(iii) In the study, overall efficiency of the DMUs has been evaluated. However, efficiency due to managerial performance (pure technical efficiency) and scale efficiency are not estimated here. These issues may be taken up for analysis in future researches;

(iv) In the study, all efficient life insurers received equal rank of 1. However, the relative efficiency among those efficient units may be evaluated by calculating super-efficiency scores or from the frequency of efficient units in the reference set of inefficient companies.

(v) Significant difference between efficiency of different categories of life insurers (e.g. public and private) may be taken up for study;

(vi) Impact of underlying factors on efficiency of the firms may also be evaluated by applying logit and tobit truncated regression analysis.

8. Conclusion

The present study analyses the efficiencies of life insurance companies in the aftermath of global economic crisis by segmenting them as Domestic companies and Indo-foreign companies. There were only three Domestic companies whose ownership was completely controlled by domestic entities. The LICI, being the only public player of the industry was the only efficient company of this segment. On the other end, there were 19 Indo-foreign companies working in India in collaboration with foreign undertakings. ICICI Prudential had an OTE score of 1 in each year under study making it the most efficient company among the Indo-foreign companies. However, SBI Life, Bajaj Allianz, Canara HSBC were also not far behind. However, IDBI Federal, Max Life, Bharti AXA and Future Generali projected a really poor performance throughout the study period. It is observed in the study that efficiencies of individual companies under these two groups (Domestic and Indo-foreign) were significantly different. However, no significant difference exists in the average performance of Domestic and Indo-foreign companies. It was a common belief that companies with foreign exposures were more vulnerable to the global recession as compared to those who did not have such exposure in the post-global recession era. However, based on the current data, it is observed that even in the post-global recession era, one Domestic company, the LICI and a few Indo-foreign companies (e.g. ICICI Prudential, SBI Life, Bajaj Allianz) with their large clientele and innovative products performed quite well and the efficiency of Domestic and Indo-foreign companies in the aftermath of global recession was not significantly different.

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