

EFFICIENCY APPRAISAL OF LIFE INSURANCE INDUSTRY IN INDIA - PUBLIC VERSUS PRIVATE PLAYERS

APARNA BHATIA AND MEGHA MAHENDRU

ABSTRACT. The article computes cost, revenue and profit efficiency scores of Indian Life Insurance companies during the period 2013-14 to 2020-21 by employing a Non-Parametric Approach, namely, Data Envelopment Analysis (DEA). The paper also examines the efficiency of Life Insurers across ownership by comparing Public and Private Insurance Sector. The concrete findings suggest that the overall performance of Life insurance companies in terms of economic efficiencies is not satisfactory. The average cost, revenue and profit efficiency is .527, .402 and .589 respectively which is far less than the yardstick of 1. The highest level of inefficiency subsists on the revenue side, which is in turn reflected in the average of profit inefficiency. Significantly inferior efficiency scores in the Private Sector seem to have marred the average efficiency scores of Insurance sector in India.

1. INTRODUCTION

The Indian Insurance market is positioned at \$131 billion in the financial year 2022 (Invest India, 2022). In fact, it is one of the fastest growing sectors in India which grew at a compounded annual growth rate (CAGR) of 17% over the last two decades (Invest India, 2022). Life insurance segment of the sector contributes significantly to its growth. Swiss Re, one of the world's leading providers of insurance and reinsurance anticipates that the Indian life insurance market would grow at an exceptionally high annual rate of 7.1% in 2023 (Hindustan Times, 2022). Prior to liberalisation and Privatisation, Life Insurance Corporation (LIC) was the only life insurance provider in the Indian insurance sector. Subsequently, in 2000, many new players entered the insurance market with a large number of advanced innovative insurance products and sophisticated distribution channels. On the positive spin, post privatisation, the insurance industry in India recorded a steady growth. Overall, insurance penetration in India almost doubled from 2.7% in 2001 to 4.2% in 2021 with life and non-life insurance penetration at 3.2% and 1.0% respectively. But on the vexatious side, a tight competition emerged within the industry. The same share of wallet over which LIC had a monopoly since years was now being shared amongst many new entrants. The market share of LIC reduced from 71.8% in 2011-12 to 68.24% in 2022-23 (IRDA, 2020). But strikingly Life Insurance Corporation (LIC) still continues to surge ahead of its rivals. Data from IRDA suggests that in 2021-22, LIC showed a growth of 3.54% in the number of new policies issued while the private sector insurance companies lagged at 3.38%. Even LIC's composite market share in terms of number of individual policies, number of group policies issued, new business premium and premium collection stood at 74.6%, 81.1%, 66.2% and 64.1% respectively as compared to the private sector. The figures reinforce the fact

Received by the editors January 12, 2023. Accepted by the editors May 15, 2023.

Keywords: Behavioural biases; Irrational decisions, Personality traits, investment decision-making (IDM), Public officials, Kerala.

JEL Classification: G2, C24.

Aparna Bhatia, Ph.D., Associate Professor, University School of Financial Studies, Guru Nanak Dev University, Amritsar, India. E-mail: aparnamohindru@yahoo.co.in.

Megha Mahendru (Corresponding Author), Ph.D., Assistant Professor, Department of Commerce and Business Administration, Khalsa College, Amritsar, India. E-mail: mahendru.megha30@gmail.com.

This paper is in final form and no version of it will be submitted for publication elsewhere.

that private life insurance companies lag far behind LIC and are still battling for survival in the market.

The ultimate objective of privatisation is to increase insurance density and insurance penetration through the inception of private players who adopt different strategies of market penetration. But anxiously even after more than 20 years of privatisation Indian Insurance coverage is quite low at 4.2%; life insurance reach being even low at 3.2% (Indian Brand Equity Foundation, 2022). The figures evidently depict a huge underserved market. Hence, it is quite overdue and imperative to gauge the efficiency of players in the insurance sector in recent times operating both in the Public as well as Private sector.

'Efficiency' computes a company's performance in relation to the best operating company's performance at a particular point of time (Ram Mohan and Ray, 2004; Bhatia and Mahendru 2019). A company is efficient when it is able to minimise its cost and maximise its revenue concurrently at its existing production capacity and hence achieve greater profits. Literature on measurement of "efficiency performance" of Insurance Sector is inexhaustible. The review of related studies suggests that voluminous research papers are based on evaluating various efficiency measures of insurance companies. Several researchers have measured the cost efficiency of insurance companies over decades (Praetz, 1980; Fecher et al., 1991; Gardner and Grace, 1993; Yuengert, 1993; Cummins and Weiss, 1993; Rai, 1996; Berger et al., 1997; Cummins et al., 1999; Berger et al., 2000; Cummins and Nini, 2002; Greene and Segal, 2004; Choi and Weiss, 2005; Hao and Chou, 2005; Tone and Sahoo, 2005; Hao, 2007; Hussels and Ward, 2007; Bikker and Leuvensteijn, 2008; Weiss and Choi, 2008; Fenn et al., 2008; Sinha and Chatterjee, 2009; Afza and Asghar, 2010, Shinde, 2012; Sinha, 2012; Noronh and Shinde, 2012; Ansah-Adu et al., 2012; Kader et al., 2014; Dash and Muthyala, 2018; Sen, 2019). Evaluating Cost efficiency is worthwhile as this measure helps to investigate efficiency corresponding to the current output quantity by minimising the cost at that point of production. But, measurement of cost efficiency alone is not adequate because the goal of revenue and profit maximisation supersedes the cost aspect (Bhatia and Mahendru, 2018; 2018a; 2018b). Hence, researchers evaluated revenue efficiency along cost efficiency of insurance industry (Cummins, 1999; Cummins et al., 1999; Ward, 2002; Choi and Weiss, 2005; Weiss and Choi, 2008; Cummins and Xie, 2008). Some studies considered cost efficiency along with profit efficiency (Berger et al. 1997; Klumpes, 2004; Zanghieri, 2009 and Trigo-Gamarra & Growitsch, 2010). But if a company wishes to be wholly efficient it needs to focus on cost efficiency and revenue efficiency together in order to attain profit efficiency. Berger et al. (2000) assessed cost, revenue and profit efficiency of 684 US insurance companies including 111 joint producers, 293 life specialists, and 280 P-L specialists for the years 1988-1992. But still there is a dearth of studies, especially in India, evaluating all the three efficiency measures simultaneously. This is the strongest motivation to undertake the current work. The prolific literature on insurance also suggests that authors have not distinguished between life and non- life insurance business while evaluating efficiency of the insurance sector. The results of non-life insurance business cannot be generalised for life insurance business (Barros et al., 2005). The scope, objectives, statutes and guidelines differ widely across life and non- life insurance businesses. This gap in the current literature also provides a stimulus to take up this study.

So, the paper specifically focuses on life insurance sector with the following specific objectives:

- (I) Assessment of cost, revenue and profit efficiency of Indian Life Insurance Industry.
- (II) Company- wise assessment of efficiency of Life Insurers operating in India.
- (III) Ownership-wise assessment of efficiency of Life Insurers operating in India.
- (IV) Assessment of differences in efficiency scores of Public Sector and Private Sector insurers.

To achieve the pre-mentioned objectives, the current study employs Data Envelopment Analysis (DEA) approach for the computation of cost, revenue and profit efficiency scores of 24 life insurance companies classified into Public and Private Sector. The results show that the overall performance of Life insurance companies in terms of economic efficiencies i.e. Cost,

revenue and profit efficiency is not satisfactory. Both cost and revenue side shows a large amount of inefficiency. The highest level of inefficiency subsists on the revenue side, which is in turn reflected in the average of profit inefficiency. Company wise analysis shows that SBI Life insurance is the most cost efficient company while Edelweiss Tokio has the lowest Cost Efficiency. LIC is found to be both revenue and profit efficient with an efficiency score of 1. Sahara India has the lowest revenue efficiency score while Edelweiss Tokio has the lowest profit efficiency score. Significantly inferior efficiency scores in the Private Sector seem to have marred the average efficiency scores of Insurance sector in India.

The study with its novel objectives is significantly useful for several stakeholders. First, the authorities of insurance business shall be able monitor the performance of individual companies as well as public and private sectors in terms of measures of efficiency. It shall also help the authorities in identifying the laggards in the insurance business marring the overall performance of the industry. Secondly, the managers of insurance companies shall be able to spot the weaknesses and also their source emerging from cost/revenue/profit inefficiencies. Thirdly, the investors too shall be acquainted with the conduct and performance of the life insurance sector of India. They shall be able to separately judge the efficiency of the public and private sector. This shall facilitate their decision making and lead them to rational judgment.

In order to develop an inclusive structure, the current article is set out in various sections. The first section discusses the growth and contribution of insurance business in India. It also brings out the gaps in the existing literature that motivate researchers to undertake this work. The second section presents the literature available on efficiency of insurance companies and confirms the research gap. The third section outlines the econometric framework and inputs-outputs used to compute the efficiency of insurance companies. Fourth section discusses the Database and Research Methodology. Fifth section presents the results and findings of the study. Sixth Section analyzes the results and gives discussion. Seventh section concludes the findings and the following section eighth presents theoretical implications of the study. The penultimate section ninth gives practical implications. The final section tenth gives limitations and future scope of research.

2. LITERATURE REVIEW AND RESEARCH GAP

The current paper endeavours to evaluate efficiency of life insurance companies in India. So this section presents a review of studies undertaken with respect to life insurance business with focus on India specifically. This would help to identify the research gap precisely. It is seen that much work has been undertaken in India to analyze the technical efficiency of insurance sector (Sinha (2006), Sinha (2007a), Garg & Deepthi (2008), Bawa & Ruchita (2011), Dutta & Sengupta (2011), Chakraborty et al. (2012), Mathur & Paul (2014), Nandi (2014), Sinha (2015), Bawa & Bhagat (2015), Sinha & Bandopadhyay (2017), Saha & Roy (2018) and Siddiqui (2020). Technical Efficiency reflects the ability of a firm to maximize output from a given set of inputs or minimize the cost given the output produced. It is calculated by taking the quantity of inputs and outputs only. Thus, measure of technical efficiency suffers from a serious limitation as it does not consider the prices of inputs and outputs taken to calculate efficiency. On account of the same, researchers used more contemporary measures of efficiency evaluation.

Tone & Sahoo (2005) assessed the cost efficiency of the only company in the Public sector, The Life Insurance Corporation of India (LIC), over a long period from 1982-2001. The results highlighted a decline in efficiency in initial years till 1994-95 while an increase in the latter year till 2000-01. The adoption of modernisation in operations or perhaps the pressure from new private players entering the market surged LIC to pull up its socks.

Sinha (2012) focussed on the cost efficiency of just the private life insurance companies operating in India. 15 companies were assessed over the years 2005-06 to 2009-10. The results revealed variations and inconsistency in the cost efficiency scores of private players.

Sinha & Chatterjee (2009) evaluated cost efficiency of Indian life insurance companies both in the public as well as the private sector. A sample of 14 companies was assessed from 2002-2003

to 2006-2007. LIC was reported as 100 percent cost efficient with a score of 1 in all the years under review. For Private insurers an upward trend in cost efficiency was noticed in initial years but a fall was witnessed in the efficiency scores in 2005-06 and 2006-07. Even Shinde (2012) and Noronh and Shinde (2012) found LIC to be fully efficient with a cost efficiency score of 100%. Variation in scores was reported for the remaining 22 life insurance companies in the private sector over the whole decade of 2000-2010. Dash & Muthyala (2018) too found Life Insurance Corporation as the most efficient company out of a sample of 15 firms over the period 2010-17, followed by SBI Life and ICICI Prudential Life.

Sen (2019) too assessed life insurance companies both in the public as well as the private sector. The sample varied from 14 to 24 companies over the period of 10 years from 2005-06 to 2015-16. Companies performed better in the initial years while stagnation was observed in the cost efficiency scores towards the last years under analysis. Even Life Insurance Corporation of India was found to be cost inefficient in the latter years.

Studies evaluating cost efficiency have been conducted across various other countries as well like European countries as Denmark, Austria, Belgium, Finland, France, Germany, Italy, Japan, Netherlands, Sweden, Switzerland, UK and Dutch (Rai, 1996; Hussels & Ward, 2007; Fenn et al., 2008; Bikker & Leuvensteijn, 2008; Luhn, 2009), Asian countries as Korea, Philippines, Taiwan, Thailand and Pakistan (Boonyasai et al., 2002; Karim, 2005; Huang et al., 2007; Afza & Asghar, 2010; Li, 2011), the U.S (Rai, 1996, Cummins & Zi, 1998; Choi & Weiss, 2005), Africa countries as Ghana and others (Ansah-Adu et al., 2012; Kwadjo et al., 2012; Barros & Wanke, 2016) and even the Islamic countries (Kader et al., 2010; Kader et al., 2014). But, measurement of cost efficiency alone is also inadequate (Bhatia and Mahendru, 2015; 2018c; Mahendru and Bhatia 2017). It is possible that a high cost incurring company i.e. a cost inefficient company might be able to generate higher revenues due to high spends on marketing and advertising of their policies than the cost efficient one. Thus, neglecting the revenue side of an insurance company presents a partial or possibly a misleading view of holistic performance of insurance companies. Also comparison between cost and revenue side has a cumulative effect on the profit efficiency of companies. Few studies evaluating cost and profit efficiency could be found in literature covering other countries as US (Berger et al., 1997), UK (Klumpes, 2004), Germany (Zanghieri, 2009) and other European countries (Trigo-Gamarra & Growitsch, 2010). However, not even a single study covering revenue efficiency could be found in the extant literature.

Hence, evaluation of all three financial efficiency measures simultaneously is much needed in order to have an insightful vision of efficiency of insurance business. Also though company wise analysis has been undertaken by researchers but clear comparison across ownership structure has not been highlighted in any of the studies available with respect to the Indian insurance industry. Thus, in the light of insufficiency of studies available in literature specifically with respect to India the current paper endeavours to fill a very prominent research gap and analyse cost, revenue and profit efficiencies of life insurance sector in India. A company wise assessment would be undertaken to pinpoint the leaders and laggards in the insurance business. Relative analysis across public and private ownership of insurance companies shall also be conducted to compare the performance of Life Insurance Corporation (LIC) with its remaining 23 counterparts in the private sector. It is believed that the current work would be exhaustive enough to evaluate the life insurance sector of India holistically and would definitely update the existing literature on insurance.

3. ECONOMETRIC FRAMEWORK

3.1. Data Envelopment Analysis (DEA). Several approaches have been developed over time for measuring companies' performance ranging from simple financial ratios to complex econometric models. Two approaches namely Parametric (Econometric Approach) and Non-Parametric (Linear Programming Approach) are available under complex econometric models. Numbers of studies have been conducted in the insurance sector which adopted both of these

approaches. Parametric Approach requires specific functional form, i.e. ‘The Tranlog Production Function’ or ‘Cobb Douglas Production Function’ which has close similarity to the actual production process (Coelli et al., 1998) whereas Non-Parametric Approach does not assume a particular functional form and can handle multiple inputs and multiple outputs to calculate the efficiency scores. Non-Parametric Approach follows Linear Programming Technique for calculating the efficiency scores (Ajibefun, 2008).

Among various Non-Parametric Approach techniques, Data Envelopment Analysis (DEA) is employed as it does not require any assumptions regarding the functional form of the production frontier. It also has the ability to accommodate multiple inputs and outputs. DEA forms the efficient frontier against which the relative performance of companies i.e., Decision Making Units (DMUs) is measured in relation to its peer group. DEA ensures to define how existing sources can be used effectively to create the outputs of decision making units (DMUs). DEA was originally developed for measuring Technical Efficiency, Pure Technical Efficiency and Scale Efficiency where prices of inputs and outputs are not required. Afterwards, DEA was modified to measure economic efficiency i.e. Cost Efficiency, Revenue Efficiency and Profit Efficiency which requires different input-output combinations as well as their prices (Fried, Lovell and Schmidt, 2008). The objective of this measure is to assess whether the firm has achieved the specified objective of cost minimization, revenue maximization and profit maximization or not. A cost efficiency model is an input oriented model, revenue efficiency model is an output oriented model and Profit efficiency model is maximizing profit model which considers cost and revenues simultaneously. The mathematical linear programming equations used to calculate cost, revenue and profit efficiency are given below in the Table 1:

Table 1 Efficiency Evaluation Models of DEA		
Cost Efficiency	Revenue Efficiency	Profit Efficiency
$Min \sum_{r=1}^m p_i^o \bar{x}_{io}$	$Max \sum_{r=1}^s q_r^o \bar{y}_{ro}$	$Max \sum_{r=1}^s q_r^o \bar{y}_{ro} - \sum_{r=1}^m p_i^o \bar{x}_{io}$
Subject to:	Subject to:	Subject to:
$\sum_{j=1}^n \lambda_j \bar{x}_{io} \leq \bar{x}_{io}$	$\sum_{j=1}^n \lambda_j \bar{x}_{io} \leq \bar{x}_{io}$	$\sum_{j=1}^n \lambda_j \bar{x}_{io} \leq \bar{x}_{io}$
$i = 1, 2, \dots, m$	$i = 1, 2, \dots, m$	$i = 1, 2, \dots, m$
$\sum_{i=1}^n \lambda_j \bar{y}_{rj} \geq \bar{y}_{ro}$	$\sum_{i=1}^n \lambda_j \bar{y}_{rj} \geq \bar{y}_{ro}$	$\sum_{i=1}^n \lambda_j \bar{y}_{rj} \geq \bar{y}_{ro}$
$r = 1, 2, \dots, s$	$r = 1, 2, \dots, s$	$r = 1, 2, \dots, s$
$\lambda_j, \bar{x}_{io} \geq 0$	$\lambda_j, \bar{y}_{ro} \geq 0$	$\bar{x}_{io} \leq \bar{x}_{io}, \bar{y}_{ro} \geq \bar{y}_{ro}$
$\sum_{i=1}^n \lambda_j = 1$	$\sum_{i=1}^n \lambda_j = 1$	$\sum_{i=1}^n \lambda_j = 1$
Where:	$\bar{y}_{ro} = r^{th}$ output that maximizes revenue for DMUO	
$n =$ Number of DMUs	$\bar{x}_{io} = i^{th}$ input that minimise cost for DMUO	
$j =$ nth DMU	$\bar{y}_{ro} = r^{th}$ output for DMUO	
$s =$ output observation	$\bar{x}_{io} = i^{th}$ input for DMUO	
$m =$ input observation	$\bar{y}_{rj} = s^{th}$ output for nth DMU	
$r = s^{th}$ output	$\bar{x}_{ij} = m^{th}$ input for nth DMU	
$i = m^{th}$ input	$\lambda_j =$ non-negative scalars	
$q_r^o =$ unit price of the output r of DMUO	$p_i^o =$ unit price of the input i of DMU	
*DMU: Decision making units		

3.2. Input-Output Selection. The choice of inputs and outputs for calculating efficiency in case of financial institutions is a subjective process (Ariff and Can, 2008 and Berger and Humphrey, 1997). Different approaches namely, Intermediate Approach, User Cost Approach and Value Added Approach are used for selecting inputs and outputs. Insurance company is a

financial intermediary that borrows funds from shareholders (Capital) and policyholders (annuities and insurance policies). It then invests this money in the capital market for transforming it into assets basically for paying out insurance claims. For such an intermediary financial institution, intermediation approach is most appropriate (Sinha, 2015; Shinde, 2012; Noronh and Shinde, 2012 and Nandi 2014). This study also follows the intermediation approach by using two inputs (Number of Agents and Shareholder Fund) and two outputs (Investments and Net Premium received) along with their prices. Shareholders fund is considered a prominent input as these are the basis of capital adequacy, investment and premium generation in an insurance company (Rai, 1996; Sinha, 2006; Hussels and Ward, 2007; Kader et al., 2009; Asghar and Afza, 2010; Bawa and Ruchita, 2011; Ansah-Adu et al., 2012; Kwadjo et al., 2014; Saha and Roy, 2018). Similarly, in order to penetrate into the market and reach till the masses, huge manpower is required. Especially in a country like India where a major proportion of population is spread in rural areas, there is a greater role of employees who interact with such a widespread and less educated population. Thus, agents who represents an insurance company and sells insurance policies to policyholders are taken as another input in the current study (Sinha, 2006; Hussels and Ward, 2007; Kader et al., 2010; Afza and Asghar, 2010; Bawa and Bhagat, 2015). Simultaneously, since inputs facilitate investments, these are considered as the important output in insurance sector (Asghar and Afza, 2010; Saad and Idris, 2011; Ansah-Adu et al., 2012; Kwadjo et al., 2012; Rahman, 2013 and 2015; Saha and Roy, 2018). Insurance company works for earning premium which determines its ultimate gain, hence premium is taken as the second output in the current work (Rai, 1996; Sinha, 2006; Hussels and Ward, 2007; Huang et al., 2007; Kader et al., 2009; Asghar and Afza, 2010; Saad and Idris, 2011; Bawa and Ruchita, 2011; Ansah-Adu et al., 2012; Kwadjo et al., 2014; Nandi, 2014; Rahman, 2013 and 2015; Bawa and Bhagat, 2015; Saha and Roy, 2018).

The description of inputs, outputs and prices of inputs and outputs is described in the Table 2 below:

Table 2: Description of input and output variables	
Variables	Description
Input Variables	
1. Number of Agents	Number of Agents both Individual and Company in the Insurance Company
2. Shareholder Fund	Share Capital + Advance against Share capital + Share Application Money pending Allotment + Reserves & Surplus + Fair Value Change Account
Input Prices	
1. Agent Cost	Fees paid to agents/ number of agents
2. Shareholder Fund Charge	Operating Expenses related to Insurance Business + Expenses other than those directly related to insurance business/ Shareholder Fund
Output Variables	
1. Investments	Investments in Approved Securities + Government Securities + other approved securities + shares + debentures
2. Net Premium Received	Premium - Reinsurance ceded + Reinsurance accepted
Output Prices	
1. Prices of Investments	Interest, Dividends & Rent + Profit on sale/redemption of investments + (Loss on sale/ redemption of investments) + Transfer/gain on revaluation/Change in Fair value + Amortization of Premium/Discount on Investments/ Total Investments
2. Prices of Premium Received	Price of Premium Received as unity throughout the years for all companies
Source: Authors' Calculations	

4. DATABASE AND RESEARCH METHODOLOGY

The study is based on all 24 Life insurance companies operating in the Indian Insurance Sector. Indian Life Insurers include both Public and Private sector companies. Both are controlled and regulated by Insurance Regulatory Development Authority of India (IRDA). Life Insurance Corporation (LIC) is the only Public Sector Company, other companies being in the Private sector. The list of Indian Life Insurers is shown in Table 3 as below:

S. No.	Insurers	Year of Commencement of Operations
1	Life Insurance Corporation of India	1956-57
2	Aditya Birla Sunlife Insurance Company Ltd.	2000-01
3	HDFC Standard Life Insurance Company Ltd.	2000-01
4	ICICI Prudential Life Insurance Company Ltd.	2000-01
5	MaxLife Insurance Company Ltd.	2000-01
6	Bajaj Allianz Life Insurance Company Ltd.	2001-02
7	Exide Life Insurance Company Ltd.	2001-02
8	Kotak Mahindra Life Insurance Ltd.	2001-02
9	PNB Metlife India Insurance Company Ltd.	2001-02
10	Reliance Nippon Life Insurance Company Ltd.	2001-02
11	SBI Life Insurance Company Ltd.	2001-02
12	TATA AIA Life Insurance Company Ltd.	2001-02
13	Aviva Life Insurance Company India Ltd.	2002-03
14	Sahara India Life Insurance Company Ltd.	2004-05
15	Shriram Life Insurance Company Ltd.	2005-06
16	Bharti AXA Life Insurance Company Ltd.	2006-07
17	Future Generali India Life Insurance Company Ltd.	2007-08
18	Ageas Federal Life Insurance Company Ltd.	2007-08
19	Aegon Life Insurance Company Ltd.	2008-09
20	Canara HSBC OBC Life Insurance Company Ltd.	2008-09
21	Pramerica Life Insurance Company Ltd.	2008-09
22	Star Union Dai-ichi Life Insurance Company Ltd.	2008-09
23	IndiaFirst Life Insurance Company Ltd.	2009-10
24	Edelweiss Tokio Life Insurance Company Ltd.	2011-12

Source: IRDA Website, 2019

Efficiency evaluation of the Life Insurance industry is done over the most recent time period of 8 years from 2013-14 to 2020-21. The primary source of data of insurance companies is the website of Insurance Regulatory Development Authority (IRDA) which provides company-wise Policyholder accounts, Shareholder Accounts and Balance Sheets. The data regarding all the inputs and outputs have been extracted from these accounts and the Balance Sheet.

5. RESULTS AND EMPIRICAL FINDINGS

5.1. Efficiency of Indian Life Insurers. Cost Efficiency (CE), Revenue Efficiency (RE) and Profit Efficiency (PE) are calculated for each Indian Life Insurance Company relatively for the years 2013-14 to 2020-21 by employing DEA. Then the efficiency scores are combined to check and analyse the performance of overall life insurance companies. The results are presented in Table 4:

Year	Cost Efficiency (CE)	Revenue Efficiency (RE)	Profit Efficiency (PE)
2013-14	0.571	0.324	0.495
2014-15	0.531	0.345	0.459
2015-16	0.633	0.741	0.650
2016-17	0.508	0.343	0.588
2017-18	0.509	0.355	0.639
2018-19	0.497	0.358	0.632
2019-20	0.486	0.369	0.619
2020-21	0.477	0.376	0.633
Average	0.527	0.402	0.589
Source: Authors' Calculations			

As depicted in Table 4, the overall average cost, revenue and profit efficiency (inefficiency) of the Indian Life Insurers is .527 (.473), .402 (.598) and .589 (.411) respectively during the time period of study. The results highlight that on the whole life insurance industry is not efficient in using its inputs and producing the outputs as its efficiency score is far below the full efficiency score of 1 in terms of all efficiencies. To elaborate, the results of cost efficiency indicate that on average Indian Life Insurers have utilized only 52.7% of the inputs to produce the given level of outputs and have rather wasted 47.3% of its inputs. Life Insurers could generate just 40.2% of the revenues which is to a large extent lesser than what they are expected to generate. Similarly, Indian Life Insurers earn merely 58.9% of available profits but lose the opportunity to make 41.1% more profits. Year-wise analysis of cost, revenue and profit efficiency of Indian Life Insurers highlights that all three efficiencies follow quite an erratic pattern, grossly remaining at 50% of full efficiency scores. A noticeable observation of Table 4 suggests that no doubt both cost and revenue side shows a massive amount of inefficiency, however the highest level of inefficiency subsists on the revenue side, which is in succession reflected in the poor average of profit efficiency. In a nutshell, overall the performance of insurance companies in terms of economic efficiency seems to be dissatisfactory.

5.2. Company-wise Cost, Revenue and Profit Efficiency of Indian Life Insurers. The above results on an average indicate inefficiency among life insurers in India. This has generated inquisitiveness to measure the company wise performance and scrutinize the efficiency scores of Indian Life Insurers individually. This would help to segregate relatively bad performers from the good ones. The results are calculated in Table 5.

From Table 5, it is seen that not even a single life insurance company is cost efficient on the basis of average cost efficiency scores of individual life insurers as none has an efficiency score of 1. An optimistic visualization depicts that almost 50% Indian Life Insurers i.e. 12 out of 24 Life Insurance Companies have efficiency scores of more than 0.500. SBI Life Insurer ranks as number 1 and has the highest cost efficiency score of 0.966. It is followed by LIC with an efficiency score of 0.937, succeeded by ICICI Prudential (0.913), Indiafirst (0.779) and HDFC life insurance Company (0.720) as the top 5 rankers. On the pessimistic side, the remaining 12 companies have wasted more than 50% of their inputs and are highly cost inefficient. Edelweiss Tokio has lowest Cost Efficiency score of 0.167 standing at 24 ranking positions preceded by Future Generali India (0.245), Bharti Axa (0.245), Aegon (0.266) and Pramerica (0.285). The overall combined average cost efficiency score no doubt drops to a low of 0.527 only (Refer Table 4).

Table 5, also highlights that only 8 companies out of 24 (33.33%) companies have more than or equal to 0.500 score in revenue efficiency. However, 2 out of these namely, LIC and Canara HSBC OBC are fully revenue efficient with an efficiency score of 1 thus ranking at first position. These are followed by Indiafirst (0.946), Star Union (0.653) and HDFC (0.650) at third, fourth and fifth rank respectively. Sahara India has the lowest revenue efficiency score of 0.080 which suggests that the company has generated only 8% of revenues than it is expected to generate.

It is preceded by Edelweiss Tokio (0.097), Aegon (0.142), Future Generali India (0.168) and Bajaj Allianz (0.182) at last 5 ranks.

Table 5 Company-wise Cost, Revenue and Profit Efficiency Score

S. No.	Insurers	Cost	Rank	Revenue	Rank	Profit	Rank
		Efficiency		Efficiency		Efficiency	
1	Aditya Birla Sunlife	0.581	8	0.256	14	0.577	12
2	Aegon	0.266	21	0.142	22	0.723	8
3	Ageas Federal	0.565	9	0.323	11	0.620	11
4	Aviva	0.497	13	0.204	17	0.745	7
5	Bajaj Allianz	0.629	7	0.182	20	0.765	6
6	Bharti AXA	0.254	22	0.193	19	0.306	22
7	Canara HSBC OBC	0.692	6	1.000	1	0.713	9
8	Edelweiss Tokio	0.167	24	0.097	23	0.084	24
9	Exide	0.385	18	0.197	18	0.392	19
10	Future Generali India	0.245	23	0.168	21	0.283	23
11	HDFC	0.720	5	0.650	5	0.783	5
12	ICICI Prudential	0.913	3	0.390	10	0.820	4
13	IndiaFirst	0.779	4	0.946	3	0.896	3
14	Kotak Mahindra	0.518	12	0.251	15	0.540	14
15	MaxLife	0.530	11	0.586	6	0.530	15
16	PNB Metlife India	0.449	16	0.500	8	0.472	16
17	Pramerica	0.285	20	0.277	13	0.453	17
18	Reliance Nippon	0.421	17	0.246	16	0.549	13
19	Sahara India	0.540	10	0.080	24	0.702	10
20	SBI Life Insurance	0.975	1	0.504	7	0.991	2
21	Shriram Life Insurance	0.325	19	0.481	9	0.373	21
22	Star Union Dai-ichi	0.467	15	0.653	4	0.448	18
23	TATA AIA	0.496	14	0.311	12	0.381	20
24	LIC	0.937	2	1.000	1	1.000	1

Source: Authors' Calculations

As seen from Table: 5 again, 15 companies out of 24 (62.5%) have more than 0.500 score in profit efficiency. However, LIC is the only life insurance company which is fully efficient in terms of profit efficiency with a score of 1. This depicts that it is considering both the cost as well as the revenue side of the company's business simultaneously. It is followed by SBI Life (0.991), Indiafirst (0.896), ICICI Prudential (0.820) and HDFC (0.783) as subsequent rankings. On the other hand, Edelweiss Tokio has the lowest profit efficiency score of 0.084 preceded by Future Generali India (0.283), Bharti Axa(0.306), Shriram Life (0.373) and TATA AIA (0.381) stands as the last 5 rankers.

5.3. Ownership-wise Cost, Revenue and Profit Efficiency of Indian Life Insurers.

This section assesses the efficiency of insurance business across ownership which is classified as the Public and the private insurance sector. Consequently the company-wise scores are aggregated to calculate ownership-wise average scores. Table 6 show the ownership-wise efficiency scores of Life Insurance companies and results of Independent sample t test.

The results presented lead to much contemplation when LIC being the only company representing Public Sector has higher average efficiency scores in all the three measures of efficiency as cost efficiency (0.937), revenue efficiency (0.100) and profit efficiency (0.100) against 23 other companies representing the private sector with relatively low average efficiency scores of 0.508 (Cost efficiency), 0.375 (Revenue efficiency) and 0.572 (Profit efficiency). The absolute differences alone put a question mark on the extent of large numbers of companies in the private

sector. Still to confirm that these differences in the Public and Private Sector are statistically significant or not Independent Sample t test is applied.

Table 6 Ownership-wise Cost, Revenue, Profit Efficiency Score and Independent t test results					
Year	Efficiency	Sector	Mean Values of Efficiency	T- test Score	Significance
Overall Average	Cost Efficiency	Public Sector	.937	1.988	.059
		Private Sector	.508		
	Revenue Efficiency	Public Sector	1	2.412	.025
		Private Sector	.375		
	Profit Efficiency	Public Sector	1	1.911	.069
		Private Sector	.572		
Source: Authors' Calculations					

The results of t-test show that the mean difference between the Public-Private sector in case of cost efficiency is significant with t value 1.988 and $p=0.059$ which is less than 0.100. The mean difference for Revenue efficiency is statistically significant for the Public-Private sector is 2.412, $p=0.025$ which is less than 0.05. Profit Efficiency is statistically significant ($p=0.069$) for the Public-Private sector as the mean difference between Public-Private is 1.911. Overall, the results reveal that the mean difference is statistically significant between Public-Private sectors for revenue and profit efficiency measures.

6. ANALYSIS AND DISCUSSION

The company-wise analysis highlights SBI Life Insurance Co. Ltd. at rank 1 in terms of cost efficiency. SBI uses an expansive Bancassurance channel which helps it to reduce its operating and management expenses and exploit its resources to the best extent (Adhikari, 2015: Business Today). The same holds good for ICICI Prudential, Indiafirst and HDFC too that follows the Bancassurance Model which helps them to use the existing customer base of their promoter banks and take advantage of operating at lowest cost without spending much on setting up branches and offices and recruitment of additional employees (Dasgupta, 2022: Financial express). Similarly, LIC with more than 90% cost efficiency score occupies rank 2. LIC has the largest agency force in the insurance sector as more than 70 percent of its business collection is through the agency channels which are paid only when they sell insurance policies (Economic Times, 2022). This assists LIC to manage its cost at minimum while maintaining an equilibrium generating outputs i.e. selling of policy. Also being a pioneer company, LIC has a long and old existence and has a large number of branches extended all over rural and urban regions of the country (Batra, 2022: The Print). It has cavernous penetration till the masses which helps it to exploit economies of scale and reduce its working cost. On the other hand, the least cost efficient company, Edelweiss Tokio, has a network of 121 branches across 91 cities consisting of sub-brokers and authorised people across India (Edelweiss Tokio, 2023) which makes it difficult for it to reduce its operational cost. Even Future Generali India, Bharti Axa, Aegon and Pramerica falling in the bracket of most cost inefficient companies operate in the market without relying on any bank support and resultantly incur large amount on advertising and agent's recruitment to attract more customers which increases their cost and obviously makes them inefficient in terms of cost.

The results of Revenue efficiency suggest LIC and Canara HSBC OBC to be the most efficient company with 100% efficiency score. No doubt LIC is the most trusted company enjoying more than 60 years of trust, faith and confidence of the customers (Economic Times, 2004). A business like insurance is a game of 'trust' and 'belief'. This faith of people in LIC helps it to sell more policies and attract more customers without incurring much expenditure on marketing of its products. Similarly, Canara HSBC OBC Life Insurance Company uses the trust and market knowledge of two big public sector banks in India i.e. Canara Bank and Punjab National

Bank combined with the global insurance expertise of HSBC (Canara HSBC Oriental bank of Commerce, 2023). It provides services to more than 115 million bank customers through a well-diversified network of over 11000 branches of bank partners in India (Kumar, 2017: The Economic Times). This all helps it to generate more revenues. On the other hand, Sahara India Life Insurance Company is found to be the most revenue inefficient company. As per India's 1st IRDAI Approved Insurance Web Aggregator namely "My Insurance Club", Sahara India has a market share of just 0.1 in 2013-14 which further declined in later years to 0.03 (2016-17) and still dropped to 0.02 in 2017-18 and became 0.00 in 2018-19. There have been serious concerns regarding the management of Sahara India Life Insurance. So much so that in June 2017, IRDA offered other insurers to take over the business of Sahara Life's insurance (Sinha, 2017: Economics Times). With this reputation it became arduous for Sahara India Life Insurance to sell its policies in the market, thus leading to poorer revenues. Even its counterparts namely, Edelweiss Tokio, Aegon, Future Generali India and Bajaj Allianz together have less than 5% market share thus making it self-evident that these companies are not able to attract customers and sell their policies to them. This all leads to lower revenue efficiency scores.

With respect to profit efficiency, LIC's large participating funds and low expense ratios serve as its biggest strengths to make it 100% profit efficient in the whole clan (Sinha, 2018). LIC dominates the annuity business with a 95% market share (Sinha, 2019). Thus, LIC earns better profits by generating more revenues at minimum cost. Similarly, Private companies namely SBI Life, Indiafirst, ICICI Prudential and HDFC have a vast portfolio of insurance products and solutions, tailored to the specific needs of various customers (González et al., 2021). The management of these companies focuses on newer areas of product diversification as Life and Health Insurance Plans, Online Term Plans, Retirement Solutions, Credit Life and Employee Benefit Plans (González et al., 2021). They use the existing customer base of their promoter bank and follow virtual online modes. The use of contemporary modes augurs well for growth in profit efficiency of these companies. Edelweiss Tokio, Future Generali India, Bharti Axa, Shriram Life and TATA AIA are the insurance companies which are operating individually with negligible market share. To add fuel to the fire these are both cost as well as revenue inefficient which leads to higher profit inefficiency of these companies.

It is seen that across ownership, the Public sector (LIC) has overall shown a full revenue and profit efficiency score of 1 which is significantly different from the life insurance companies in the Private sector. It seems that LIC dominates all the other 23 companies in the sector. LIC has a way back existence of more than six decades. It endeavours to make insurance products available to every person in any corner of the country with a network of 2048 branch offices, 113 divisional offices, 8 zonal offices and 1381 satellite offices (LIC, 2022). LIC being the dominant insurance player has a huge customer base of over 29 crore policyholders (IRDA, 2019). Moreover the premium charges on different products offered by LIC are less costly than that of private players (Economic Times, 2022). These all plus points help LIC to significantly earn better revenues and profits as differentiated from rivals in the private sector.

Private sector focuses just on the 'creamy layer' of society represented by rich and wealthy people. It ignores more than 3/4th population that belong to rural and semi-urban areas (Rao & Periyasamy, 2014). Consequently, the major proportion of market share is captured by the Public sector leading to high revenue efficiency. Also, Private sector adds frills to its business in its endeavour to bring innovation and uniqueness. The premium added to the cost makes its products quite expensive for the larger population. Private sector also undertakes extensive marketing and advertising for launching and sale of its products. It makes infrastructural investments in order to adopt tech-savvy channels of distribution. All these discretionary expenses reduce its cost efficiency as against the Public sector insurance companies; consequently significantly affecting its revenue and profit efficiency scores.

Our results corroborate with the latest study undertaken by Sen (2019) that suggests LIC to be cost inefficient. With progression in years perhaps LIC is not able to balance the economies

generated from massive turnover with the diseconomies of mismanagement of its wide paraphernalia. Rather in our results private players as SBI and ICICI Prudential succeed LIC in terms of cost efficiency, thus contradicting the finding of previous research by Dash and Muthyala (2018) where both the insurance companies lagged behind LIC. Also our results do not support some earlier studies that evaluated cost efficiency of insurance companies and found LIC to be 100 percent cost efficient (Sinha & Chatterjee, 2009; Shinde, 2012; Noronh and Shinde, 2012). However, the results of these studies (Sinha & Chatterjee, 2009; Shinde, 2012; Noronh and Shinde, 2012) commensurate with our finding with respect to Private Life Insurance companies endorsing variations in cost efficiency scores of these companies over different years under review. Also since Sinha & Chatterjee (2009), Shinde, (2012) and Noronh and Shinde (2012) found LIC to be fully efficient, their results correspond with our sector-wise analysis that suggest Public Sector insurance companies outperform those in the private insurance sector. Anxiously, none of the studies is available in literature that can equate and support our finding with respect to revenue and profit efficiency of insurance business.

7. CONCLUSION

The presented article bridges a very major research gap existing in the available literature by making a relative analysis of cost, revenue and profit efficiency of Life Insurance companies in India and undertaking a comparison between the Private and Public Sector of Insurance business. The results lead to anxious outcomes where 23 private players seem incapable of competing with a single gigantic participant in the Public sector i.e. LIC. Overall, Indian Life Insurers are not fully efficient as their average cost, revenue and profit efficiency taken as a whole is .527, .402 and .589 respectively which is far less than the yardstick of 1 efficiency. The company-wise cost efficiency scores rank SBI Life Insurance Co. Ltd. at 1st position followed by LIC and ICICI Prudential while revenue efficiency scores rank LIC and Canara HSBC OBC as fully revenue efficient. LIC is the only life insurance company which is profit efficient. LIC is chased by SBI Life, Indiafirst, ICICI Prudential and HDFC in case of Profit Efficiency. The ownership-wise results provide statistically evidence that the Public sector (LIC) has significantly more efficiency scores than life insurance companies in the Private sector.

8. THEORETICAL IMPLICATIONS

There are some theoretical implications that the current study advocates with respect to insurance business. First, insurance shields the masses in case of casualties like early death of bread earners, medical emergencies etc. It is also a major channel of savings for the people in case of survival. In fact, life insurance gives an assurance of paying benefits both in case of death as well as survival. These savings help people to meet their trailing responsibilities in terms of education of children, their marriage, and medical treatment of elderly people at home etc. In the end, it is obligatory for insurance companies to pay back to the policyholders. With such a demanding responsibility in its profile and involvement of hard-earned money of people, maintenance of efficiency of the insurance sector is very vital. Secondly, competition brings the spirit to perform better. So perhaps inclusion of private sector players in the insurance sector has been a healthy step undertaken by the authorities of the country. But simultaneously new participants need to justify their existence by proving their efficiency. Inefficient businesses cannot sustain in the long run. The business of insurance rests on public money and hence it must prove its worth. Thirdly, Indian Insurance market is still largely untapped for insurance products. To be specific, insurance penetration is just at 3.69% (IRDA Report, 2018). Hence, it is desirable that more number of insurance companies be opened in the country to cover the vast population of 1.3 billion. But low performers need to be gauged and eliminated otherwise the average efficiency of the whole sector becomes low and disappointing. Last but not the least, public sector insurance companies are deriving benefits of economies of scale by penetrating into even the rural and semi-urban areas while the private sector seems to take advantage of

innovation and modernisation with focus on the creamy layer. A novel revenue business model for both the sectors in which the players in the public and private sector are able to earn more than their cost, should be framed by the authorities so that benefit from both the approaches can be derived by all the companies across their varied ownerships.

9. PRACTICAL IMPLICATIONS

The results help in deriving some practical implications as well. First, Private sector insurance companies need to improve their performance and efficiency. The total average efficiency scores of insurance businesses are marred more due to their inefficiency. Private Life Insurers should adopt a new business model. 'Profit Pyramid Business Model' which is capable of covering people from different income segments of the society may be implemented. This would help them to widen their coverage to include even the low and middle income population of the country. Also, discretionary expenditure especially on premium advertising needs to be restricted. Every drop fills the ocean and hence the revenues generated would provide for cost coverage and gradually lead to profit generation. Secondly, LIC, representing the public sector insurer, is efficient with respect to both revenue and profit efficiency but it needs to work on cost efficiency as well. They too need to follow present day voguish and virtual modes of business. Cost on excessive sales force must be curtailed. A combination of personal and automated structure is desirable. Automation may prove expensive in the short run, but it would lead to enhancement in revenues and profits in the long run. Thirdly, the results assert that LIC, the only company in the public sector of insurance, dominates its 23 counterparts in the public sector especially in terms of revenue and profit efficiency. If people are more in favour of the government owned companies, as against the private players, the government/regulators i.e. IRDA may think of adopting some advanced Public-Private Partnership (PPP) model in the insurance sector. This business approach might on one hand benefit the general public and on the other hand enhance the efficiency of the insurance sector. Fourthly, efficiency evaluation will help insured to choose the life policy from those companies which are offering best policy plans to them.

10. LIMITATIONS AND FUTURE SCOPE

The article gives deep insights into the performance of insurance business in India. But, the selection of different inputs and outputs may lead to varied results of efficiency in insurance business. Hence researcher's biasness creeps in, thus restricting generalisation of results. Still the current work is an elaborative study of all the three efficiency measures across both the sectors not found in the existing literature. For future contribution to research the work can definitely be replicated by changing the input-output variables in the DEA model. Also, the analysis can further be extended to identify various company specific, industry specific and economy specific factors affecting efficiency scores of insurance companies.

REFERENCES

- [1] Abd Karim, M. Z. 2005. "Cost efficiency and profitability in Thailand's life insurance industry: a stochastic cost frontier approach." *International Journal of Applied Econometrics and Quantitative Studies* 2: 19-36.
- [2] Adhikari, A. 2015. "How LIC compares with private insurers." *Business Today*, February 3, 2015. Available at: <https://www.businesstoday.in/opinion/bankers-eye/story/life-insurance-corp-lic-versus-private-insurers-analysis-144026-2015-01-20>.
- [3] Afsordeh, M., and H. Moridipour. 2014. "Performance Evaluation of Representatives of Insurance Companies in Iran Using Analytic Network Process (ANP) and Data Envelopment Analysis (DEA)." *Euro-Asian Journal of Economics and Finance* 2, no. 4: 316-323.
- [4] Afza, T., and M.J.E.K. Asghar. 2010. "Efficiency of the insurance industry in Pakistan: an application of non-parametric approach." *Interdisciplinary Journal of Contemporary Research in Business* 2, no. 8: 84-98.
- [5] Ajibefun, I. A. 2008. "An evaluation of parametric and non-parametric methods of technical efficiency measurement: application to small scale food crop production in Nigeria." *Journal of Agriculture and Social Sciences* 4, no. 3: 95-100.

- [6] Ansah-Adu, K., C. Andoh, and J. Abor. 2011. "Evaluating the cost efficiency of insurance companies in Ghana." *The Journal of Risk Finance* 13, no. 1: 61-76.
- [7] Ariff, M., and C. Luc. 2008. "Cost and profit efficiency of Chinese banks: A non-parametric analysis." *China Economic Review* 19, no. 2: 260-273.
- [8] Barros, C., and P. Wanke. 2016. "Cost efficiency of African insurance companies using a finite mixture model." *South African Journal of Economic and Management Sciences* 19, no. 1: 64-81.
- [9] Batra, S. 2022. "The LIC story — history, valuation & why its IPO, India's biggest, matters for Modi government." *The Print*, January 27, 2022. Available at: <https://theprint.in/theprint-essential/the-lic-story-history-valuation-why-its-ipo-indias-biggest-matters-for-modi-govt/813475/>.
- [10] Bawa, S.K., and N. Bhagat. 2015. "Efficiency of life insurance companies operating in Punjab." *Pacific Business Review International* 7, no. 9: 76-85.
- [11] Bawa, S., and R. Ruchita. 2011. "Efficiencies of health insurance business in India: An application of DEA." *American Journal of Social and Management Sciences* 2, no. 2: 237-247.
- [12] Berger, A.N., and D. Humphrey. 1997. "Efficiency of Financial Institutions: International survey and directions for future research." *European Journal of Operational Research* 98, no. 2: 175-212.
- [13] Berger, A.N., J.D. Cummins, and M.A. Weiss. 1997. "The coexistence of multiple distribution systems for financial services: the case of property-liability insurance." *The Journal of Business* 70, no. 4: 515-546.
- [14] Berger, A.N., J.D. Cummins, M.A. Weiss, and H. Zi. 2000. "Conglomeration versus strategic focus: Evidence from the insurance industry." *Journal of Financial Intermediation* 9, no. 4: 323-362.
- [15] Bhatia, A., and M. Mahendru. 2015. "Measurement and evaluation of cost, revenue and profit efficiency of public sector banks in India." *International Journal of Behavioural Accounting and Finance* 5 no. 3-4: 298-313.
- [16] Bhatia, A., and M. Mahendru. 2018. "Estimation of Profit, Revenue and Cost Efficiency of Indian Scheduled Commercial Banks." *Wealth: International Journal of Money, Banking & Finance* 7, no. 1: 44-50.
- [17] Bhatia, A., and M. Mahendru. 2018. "Cost efficiency analysis of scheduled commercial banks: empirical evidence from India." *Journal of Management Development* 37, no. 7: 586-602.
- [18] Bhatia, A., and M. Mahendru. 2018a. "Assessment of Revenue Efficiency and Return to Scale of Indian Scheduled Commercial Banks." *Management Today* 8, no. 4: 336-345.
- [19] Bhatia, A., and M. Mahendru. 2018b. "Assessment of revenue efficiency of Indian scheduled commercial banks." *International Journal of Law and Management* 60, no. 6: 1234-1254.
- [20] Bhatia, A., and M. Mahendru. 2019. "Financial efficiency evaluation of Indian scheduled commercial banks." *Jindal Journal of Business Research* 8, no. 1: 51-64.
- [21] Bikker, J.A., and M. Van Leuvensteijn. 2008. "Competition and efficiency in the Dutch life insurance industry." *Applied Economics* 40, no.16: 2063-2084.
- [22] Boonyasai, T., M. Grace, and H. Skipper. 2002. "The Effect of Liberalisation and Deregulation on Life Insurance Efficiency." *Centre for Risk Management and Insurance Research*, Georgia State University, GA Working Paper 6, no. 02-2, pp. 1-36.
- [23] Borges, M.R., M. Nektarios, and C.P. Barros. 2008. "Analysing the Efficiency of the Greek Life Insurance Industry." *European Research Studies* 11, no. 3: 35-52.
- [24] Canara HSBC Oriental Bank of Commerce. 2023. "Canara HSBC Oriental Bank of Commerce Life Insurance Company Limite." Available at <https://canarabank.com/insurance/about-us.html>.
- [25] Chakraborty, K., A. Dutta, and P.P. Sengupta. 2012. "Efficiency and productivity of Indian life insurance industry." *Asia-Pacific Journal of Risk and Insurance* 7, no. 1: 1-28.
- [26] Choi, B.P., and M.A. Weiss. 2005. "An empirical investigation of market structure, efficiency, and performance in property-liability insurance." *Journal of Risk and Insurance* 72, no. 4: 635-673.
- [27] Coelli, T., D. Rao, and G. Battese. 1998. *An Introduction to Efficiency and Productivity Analysis*. Kluwer Academic Publishers.
- [28] Colwell, R.J., and E.P. Davis. 1992. "Output and productivity in banking." *The Scandinavian Journal of Economics* 94 (Supplement. Proceedings of a Symposium on Productivity Concepts and Measurement Problems: Welfare, Quality and Productivity in the Service Industries): S111-S129.
- [29] Carr, R.M., J.D. Cummins, and L. Regan. 1999. "Efficiency in the US life insurance industry: Are insurers minimizing costs and maximizing revenues?" In J.D. Cummins and A.M. Santomer, eds., *Changes in the Life Insurance Industry: Efficiency, Technology and Risk Management*, pp. 75-115. New York, NY: Springer.
- [30] Cummins, J.D., M. Rubio-Misas, and H. Zi. 2004. "The effect of organizational structure on efficiency: Evidence from the Spanish insurance industry." *Journal of Banking & Finance* 28, no. 12: 3113-3150.
- [31] Cummins, J.D., and G. Turchetti. 1996. "Productivity and technical efficiency in the Italian insurance industry" Working Paper No. 96-10, *Wharton School Center for Financial Institutions*, University of Pennsylvania.
- [32] Cummins, J.D., and M. Rubio-Misas. 2006. "Deregulation, consolidation, and efficiency: evidence from the Spanish insurance industry." *Journal of Money, Credit and Banking* 38: 323-355.

- [33] Cummins, J.D., and X. Xie. 2008. "Mergers and acquisitions in the US property-liability insurance industry: Productivity and efficiency effects." *Journal of Banking & Finance* 32, no. 1: 30-55.
- [34] Cummins, J.D., and H. Zi. 1998. "Comparison of frontier efficiency methods: An application to the US life insurance industry." *Journal of Productivity Analysis* 10: 131-152.
- [35] Cummins, J.D., M.A. Weiss, X. Xie, and H. Zi. 2010. "Economies of scope in financial services: A DEA efficiency analysis of the US insurance industry." *Journal of Banking & Finance* 34, no. 7: 1525-1539.
- [36] Cummins, J. D., M. A. Weiss, and H. Zi. 1999. "Organizational form and efficiency: The coexistence of stock and mutual property-liability insurers." *Management Science* 45, no. 9: 1254-1269.
- [37] Dalkılıç, N., and A. A. Ada. 2014. "Efficiencies of life/pension insurance industry in Turkey: an application of data envelopment analysis." *Journal of Applied Finance and Banking* 4, no. 1: 181-191.
- [38] Dasgupta, Mithun. 2022. "Bancassurance contributes 40% to ICICI Pru retail business in H1." *Financial Express*, November 3, 2022. Available at <https://www.financialexpress.com/money/insurance/bancassurance-contributes-40-to-icici-pru-retail-business-in-h1/2771436/>.
- [39] Dash, M., and A. Muthyala. 2018. "Cost efficiency of Indian life insurance service providers using data envelopment analysis." *Asian Journal of Finance & Accounting* 10, no. 1: 59-80.
- [40] Diacon, S. R. 2001. "The efficiency of UK general insurance companies." CRIS Discussion Paper Series No. 2001III, *Center for Risk & Insurance Studies*, Nottingham University Business School, Nottingham.
- [41] Diacon, S. R., K. Starkey, and C. O'Brien. 2002. "Size and efficiency in European long-term insurance companies: an international comparison." *The Geneva Papers on Risk and Insurance. Issues and Practice* 27, no. 3: 444-466.
- [42] Donni, O., and F. Fecher. 1997. "Efficiency and Productivity of the Insurance Industry in the OECD Countries." *The Geneva Papers on Risk and Insurance. Issues and Practice* 22, no. 4: 523-535.
- [43] Dutta, A., and P.P. Sengupta. 2014. "Analysis of Revenue Efficiency: Empirical Study of Indian Non-Life Insurance Companies." In Ambar Nath Ghosh and Asim K. Karmakar, eds., *Analytical Issues in Trade, Development and Finance: Essays in Honour of Biswajit Chatterjee*, pp. 449-456. New Delhi: Springer India.
- [44] Dutta, A., And P.P. Sengupta. 2011. "Efficiency measurement of Indian life insurance industry in post-reforms era." *Global Business Review* 1, no. 3: 415-430.
- [45] Economic Times. 2004. *LIC's the most trusted services brand*. Available at <https://economictimes.indiatimes.com/brand-equity/brands-news/lics-the-most-trusted-services-brand/articleshow/958829.cms?from=mdr>.
- [46] Economic Times. 2022. *LIC vs private insurers: How LIC fares in premiums, expenses from its peers*. Available at: <https://bfsi.economictimes.indiatimes.com/news/insurance/lic-vs-private-insurers-how-lic-fares-in-premiums-expenses-from-its-peers/89614151>.
- [47] Economic Times. 2022. *LIC's business drivers in place, execution remains key: Report*. Available at: <https://bfsi.economictimes.indiatimes.com/news/insurance/lics-business-drivers-in-place-execution-remains-key-report/92678157>.
- [48] Economic Times. 2012. *LIC is the most trusted brand in banking and finance space: Trust Research Advisory*. Available at: https://economictimes.indiatimes.com/news/company/corporate-trends/lic-is-the-most-trusted-brand-in-banking-and-finance-space-trust-research-advisory/articleshow/11604639.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst.
- [49] Edelweiss Tokio. 2023. "Edelweiss Tokio Life looks at expanding distribution capabilities in Gujarat." Available at: <https://www.edelweisstokio.in/press-releases/edelweiss-tokio-life-looks-at-expanding-distribution-capabilitie0>.
- [50] Eling, M., and M. Luhnen. 2010. "Efficiency in the International Insurance Industry: A Cross-Country Comparison." *Journal of Banking & Finance* 34, no. 7: 1497-1509.
- [51] Fecher, F., D. Kessler, S. Perelman, and P. Pestieau. 1993. "Productive Performance of the French Insurance Industry." *Journal of Productivity Analysis* 4, no. 1/2: 77-93.
- [52] Fenn, P., D. Vencappa, S. Diacon, P. Klumpes, and C. O'Brien. 2008. "Market structure and the efficiency of European insurance companies: A stochastic frontier analysis." *Journal of Banking & Finance* 32, no. 1: 86-100.
- [53] Fried, H.O., C.K. Lovell, and S.S. Schmid, Eds. 2008. *The measurement of productive efficiency and productivity growth*. Oxford University Press.
- [54] Fukuyama, H. 1997. "Investigating productive efficiency and productivity changes of Japanese life insurance companies." *Pacific-Basin Finance Journal* 5, no. 4: 481-509.
- [55] Garg, C., and M. Deepti. 2008. "Efficiency of General Insurance in India in the post-liberalization era: a data envelopment approach." *The IUP Journal of Risk & Insurance* 2, no. 4: 24-38.
- [56] González, J., A. Buelow, and J. Abril-Martorell. 2021. "Growth in Insurance Market Requires Business Diversification." Available at: <https://www.adlittle.com/en/insights/viewpoints/growth-insurance-market-requires-business-diversification>.

- [57] Hsu, W.Y., and P. Petchsakulwong. 2010. "The impact of corporate governance on the efficiency performance of the Thai non-life insurance industry." *The Geneva Papers on Risk and Insurance. Issues and Practice* 35, no. 1: S28-S49.
- [58] Huang, L.Y., .Y. Hsiao, and G.C. Lai. 2007. "Does corporate governance and ownership structure influence performance? Evidence from Taiwan life insurance companies." *Journal of Insurance Issues* 30, no. 2: 123-151.
- [59] Hussels, S., and D.R. Ward. 2007. The Impact of deregulation on the German and UK life insurance markets: an analysis of efficiency and productivity between 1991-2002. *Cranfield University School of Management*.
- [60] IBEF (India Brand Equity Foundation). 2022. Data available at: <https://www.ibef.org/>.
- [61] Ilyas, A.M. and S. Rajasekaran. 2019. "An empirical investigation of efficiency and productivity in the Indian non-life insurance market." *Benchmarking: An International Journal* 26, no. 7: 2343-2371.
- [62] Indian Brand Equity Foundation. 2022. *Insurance Industry Report*. Available at: <https://www.ibef.org/industry/insurance-sector-india>.
- [63] Invest India. 2022. "BFSI- Insurance, Insurance market in India is expected reach \$ 222 bn by 2026." Available at: <https://www.investindia.gov.in/sector/bfsi-insurance>.
- [64] IRDAI. 2022. Annual Report 2021-22. Available at: <https://new.irdai.gov.in/annual-reports>.
- [65] Jarraya, B., and A. Bouri. 2014. "Optimal production plan and profit efficiency in European non-life insurance companies." *Procedia Economics and Finance* 13: 69-81.
- [66] Kader, H.A., M. Adams, P. Hardwick, and W.J. Kwon. 2014. "Cost efficiency and board composition under different takaful insurance business models." *International Review of Financial Analysis* 32: 60-70.
- [67] Kader, Halem, Mike Adams, and Philip Hardwick. 2010. "The Cost Efficiency of Takaful Insurance Companies." *The Geneva Papers on Risk and Insurance. Issues and Practice* 35, no. 1: 161-181.
- [68] Klumpes, P. J. 2004. "Performance benchmarking in financial services: Evidence from the UK life insurance industry." *The Journal of Business* 77, no. 2: 257-273.
- [69] Kumar, K. 2017. "Canara HSBC Oriental Bank of Commerce Life Insurance ties up with Dhanlaxmi Bank." *The Economic Times*, July 6, 2017. Available at: https://m.economictimes.com/banking/canara-hsbc-oriental-bank-of-commerce-life-insurance-ties-up-with-dhanlaxmi-bank/amp_articleshow/59473611.cms.
- [70] Kwadjo, Ansah, Andoh Charles, and Abor Joshua. 2012. "Evaluating the cost efficiency of insurance companies in Ghana." *Journal of Risk Finance* 1, no. 3: 61-76.
- [71] Li, L. 2011. "Efficiency Analysis of Life Insurance Companies in Thailand." *University of the Thai Chamber of Commerce*. Available at: <https://scholar.utcc.ac.th/entities/publication/e552a416-e192-4460-9062-d0368ff0f3ac>.
- [72] LIC. 2022. *History of LIC*. Available at: <https://licindia.in/Top-Links/about-us/History>.
- [73] Mahendru, M., and A. Bhatia. 2017. "Cost, revenue and profit efficiency analysis of Indian scheduled commercial banks: Empirical evidence across ownership." *International Journal of Law and Management* 59, no. 3: 442-462.
- [74] Mahlberg, B., and T. Url. 2003. "Effects of the single market on the Austrian insurance industry." *Empirical Economics* 28, no. 4: 813-838.
- [75] Mahlberg, B., and T. Url. 2010. "Single Market effects on productivity in the German insurance industry." *Journal of Banking & Finance* 34, no. 7: 1540-1548.
- [76] Mathur, T., and U.K. Paul. 2014. "Performance appraisal of Indian non-life insurance companies: A DEA approach." *Universal Journal of Management* 2, no. 5: 173-185.
- [77] Micajkova, V. 2015. "Efficiency of Macedonian insurance companies: A DEA approach." *Journal of Investment and Management* 4, no. 2: 61-67.
- [78] My insurance club .com India's 1st IRDAI Approved Insurance Web Aggregator <https://www.myinsuranceclub.com/life-insurance/companies/sahara-life>.
- [79] Nandi, J.K. 2014. "Relative efficiency analysis of selected life insurers in India using data envelopment analysis." *Pacific Business Review International* 6, no. 8: 69-76.
- [80] Noronh, M.R., and S.R. Shinde. 2012. "A Comparative Study of Cost Efficiency of Life Insurance Companies in India." *Ganpat University (Kherva, India) Faculty of Management Studies Journal of Management and Research (GFJMR)* 4: 1-14.
- [81] Noulas, A.G., J. Lazaridis, T. Hatzigayios, and K. Lyroudi. 2001. "Non-parametric production frontier approach to the study of efficiency of non-life insurance companies in Greece." *Journal of Financial Management & Analysis* 14 no. 1: 19-26.
- [82] Rahman, M.A. 2013. "Comparative Study on the Efficiency of Bangladeshi Conventional and Islamic Life Insurance Industry: A Non-parametric Approach." *Asian Business Review* 3, no. 2: 80-91.
- [83] Rahman, Md. 2015. "Comparative Study on the Efficiency of Bangladeshi Conventional and Islamic Life Insurance Industry: A Non-Parametric Approach." *Asian Business Review* 3, no. 2: 80-91.
- [84] Rai, A. 1996. "Cost efficiency of international insurance firms." *Journal of Financial Services Research* 10, no. 3: 213-233.

- [85] Ram Mohan, T.T., and S.C. Ray. 2004. "Comparing performance of public and private sector banks: A revenue maximisation efficiency approach." *Economic and Political Weekly* 39, no. 12: 1271-1276.
- [86] Rao, N., and S. Periyasamy. 2014. "Life insurance penetration in rural Areas-Indian perspective." *International Journal of Banking, Risk and Insurance* 2, no. 2: 21-29.
- [87] Saad, N.M., N.E.H. Idris, and N. Edzalina. 2011. "Efficiency of life insurance companies in Malaysia and Brunei: a comparative analysis." *International Journal of Humanities and Social Science* 1, no. 3: 111-122.
- [88] Sabet, R., and A. Fadavi. 2013. "Performance measurement of insurance firms using a two-stage DEA method." *Management Science Letters* 3, no. 1: 303-308.
- [89] Saeidy, P. and S. Kazemipour. 2011. "Compare the performance of private and public insurance companies in using data envelopment analysis." *World Applied Sciences Journal* 13, no. 5: 988-992.
- [90] Saha, S.S., and M.N. Roy. 2018. "Evaluating Efficiency of Indian Life Insurance Companies using Data Envelopment Analysis." *Research Bulletin* 43, no. 4: 45-66.
- [91] Sen, S. 2019. "Analysis of cost efficiency of Indian life insurers: a comparison of quantity vs value based DEA approach." *Asia-Pacific Journal of Risk and Insurance* 14, no. 1: 2018- 0027.
- [92] Shinde, S.R. 2012. "A comparative study of cost efficiency of life insurance companies in India." *International Journal of Commerce and Business Management* 5 no. 2: 210-215.
- [93] Siddiqui, S. 2020. "Evaluating the Efficiency of the Indian Life Insurance Sector." *Indian Journal of Applied Economics* 16, no. 1: 72-80.
- [94] Sinha, A., and K. Bandopadhyay. 2015. "An Analysis of Efficiency of General Insurance Industry in India." *Malaysian Management Journal* 19: 53-66
- [95] Sinha, R.P. 2006. "Operating Efficiency of Life Insurance Companies: A Data Envelopment Approach." *The ICAI Journal of Risk and Insurance* 3, no. 4: 29-37.
- [96] Sinha, R.P. 2007a. "Operating efficiency of life insurance companies: An assurance region model." *ArthaVijnana* 49, no. 3-4: 305-320.
- [97] Sinha, R.P. 2010. "Revenue maximizing efficiency of life insurance companies: some Indian evidence." *IUP Journal of Risk & Insurance* 7, no. 3: 19-38.
- [98] Sinha, R.P. 2012. "Are Indian Life Insurance Companies Cost Efficient? Some Recent Empirical Evidence." *Prajnan* 41, no. 3: 181-202.
- [99] Sinha, R.P. 2015. "A dynamic DEA model for Indian life insurance companies." *Global Business Review* 16, no. 2: 258-269.
- [100] Sinha, R.P., and B. Chatterjee. 2009. "Are Indian life Insurance companies cost efficient?" *SSRN Electronic Journal*. Available at: <http://ssrn.com/abstract=1391904>.
- [101] Sinha, S. 2017. "IRDA directs ICICI Prudential Life to takeover Sahara Life." *The Economic Times, India Times*, English Edition, Jul 28, 2017. Available at <https://economictimes.indiatimes.com/industry/banking/finance/insure/irda-directs-icici-prudential-life-to-takeover-sahara-life/articleshow/59812258.cms?from=mdr>.
- [102] Tone, K., and B.K. Sahoo. 2005. "Evaluating cost efficiency and returns to scale in the Life Insurance Corporation of India using data envelopment analysis." *Socio-Economic Planning Sciences* 39, no. 4: 261-285.
- [103] TRA's Brand Trust Report. 2019. Available at: <http://www.trustadvisory.info/tra/fullReportPdf/BTR2019.pdf>.
- [104] Trigo-Gamarra, L., and C. Growitsch. 2010. "Comparing single-and multichannel distribution strategies in the German life insurance market: an analysis of cost and profit efficiency." *Schmalenbach Business Review* 62: 401-417.
- [105] Wise, W. 2017. "A survey of life insurance efficiency papers: Methods, pros & cons, trends." *Accounting* 3, no. 3: 137-170.
- [106] Wu, D., Z. Yang, S. Vela, and L. Liang. 2007. "Simultaneous analysis of production and investment performance of Canadian life and health insurance companies using data envelopment analysis." *Computers & Operations Research* 3, no. 1: 180-198.
- [107] Yang, Z. 2006. "A two-stage DEA model to evaluate the overall performance of Canadian life and health insurance companies." *Mathematical and Computer Modelling* 43, no. 7-8: 910-919.
- [108] Zanghieri, P. 2009. "Efficiency of European insurance companies: Do local factors matter?" *SSRN Electronic Journal*. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1354108.