ARE INDIAN LIFE INSURANCE COMPANIES COST EFFICIENT?

DR.RAM PRATAP SINHA
ASSISTANT PROFESSOR OF ECONOMICS
A.B.N. SEAL (GOVT) COLLEGE,
COOCHBEHAR-736101
E Mail:rp1153@rediffmail.com

BISWAJIT CHATTERJEE
PROFESSOR OF ECONOMICS AND DEAN(FACULTY OF ARTS)
JADAVPUR UNIVERSITY
E Mail:chatterjeeb@vsnl.net

Paper Abstract

The present paper estimated cost efficiency of the Life insurance companies operating in India for the period 2002-03 to 2006-07 using the new cost efficiency approach suggested by Tone (2002). The results suggest an upward trend in cost efficiency of the observed life insurers between 2002-03 and 2004-05. However, the trend was reversed for the next two years i.e. 2005-06 and 2006-07.This has been so because of the fact that during the initial years of observation. mean cost efficiency of the private life insurers was rising but the trend was reversed in 2005-06 and 2006-07.

Introduction:

Following the deregulation of the life insurance sector in India in end-1999,life insurance companies have made steady progress in terms of business growth. Quite a number of research studies have attempted to compare the relative performance of the LIC vis a vis the new private sector companies during the reform era. However, no research study has attempted to compare them in terms of cost efficiency. The present paper seeks to fill this gap.

Organisation of the Paper:

The paper proceeds as follows. Section 1 provides a brief overview of the growth in life insurance business during the reform period. Section 2 discusses the methodological issues relating to the measurement of efficiency. Section 3 describes the received literature on the efficiency studies relating to the life insurance sector. Section 4 discusses the approach of the paper and states the results available from the present study. Finally, section 5 analyses the results.

Section 1:The Life Insurance Sector in India:

Modern form of life insurance in India can be traced back to 1818 when the British insurer Oriental Life Insurance Company commenced business in India. When life insurance business was nationalised in 1956 under the wholly state-owned Life Insurance Company of India (LIC), there were over 200 institutions underwriting life insurance policies.

Economic reforms in India initiated in the early 1990s saw the liberalisation of insurance business move up the government's policy agenda. The Malhotra Report submitted in 1994 urged the gradual liberalisation of insurance business, the separation of non-life and life business and the introduction of capital adequacy and solvency based regulation of the insurance sector. An Insurance Regulatory Authority Bill was eventually passed in 1999 to put these recommendations into effect. The new regulator, Insurance Regulatory and Development Authority (IRDA) took office at the same time to oversee and regulate the market. Following the opening up of the life insurance sector, 15 new life insurance companies entered the market by 2006-07.

Of late, the Indian life insurance market is drawing intense attention, fuelled in part by the fast expansion of its insurance markets and the fact that this growth potential is now available to all (subject to the regulatory restriction on foreign equity holding).India is the second most populous country of the world with more than one billion population. The economic growth record is strong (more than 6% during the past one decade).

In spite of these positive developments, the life insurance market in India is extremely under-penetrated.Tables 1 and 2 provide a comparison of Indian insurance penetration and density levels with the Asian and global standards for 2003, 2004 and 2005 and 2006.Note that insurance penetration is defined as a ratio (in per cent) of premium to G.D.P. and insurance density is defined as a ratio(in per cent) of premium to population.

Table1: Insurance Penetration: International Comparison

Country/Region	2003	2004	2005	2006
India	2.26	2.53	2.53	4.10
Asia	5.74	5.58	5.16	5.00
World	4.59	4.55	4.34	4.50

Source: I.R.D.A. Annual Report,2006-07.

Table 2: Insurance Density: International Comparison

Country/Region	2003	2004	2005	2006
India	12.9	15.7	18.3	33.2
Asia	140.1	147.2	149.6	154.6
World	267.1	291.5	299.5	330.6

Source: I.R.D.A. Annual Report,2006-07.

Section 2: The Methodological Issues

Concept of Cost Efficiency:

Cost efficiency of a productive enterprise is an important indicator of its performance. The cost efficiency of a firm is defined by the ratio of minimum costs to actual costs for a given output vector is computed by measuring the distance of its observed (cost)point from an idealised cost frontier.

The Data Envelopment Approach:

Data Envelopment Analysis (DEA) is a non-parametric linear programming tool generally used for performance evaluation of economic units through the construction of such an economic frontier. The advantage of DEA is that it requires very few prior assumption on input-output relationship. The DEA method enables extension of the single input-single output technical efficiency measure to the multiple output- multiple input case. In its constant returns to scale form,the DEA methodology was developed by Charnes, Cooper and Rhodes (1978). Banker, Charnes and Cooper (1984) extended the approach to the case of variable returns to scale. The DEA approach constructs the production frontier from piecewise linear stretches resulting in a convex production possibility set.

The principal advantage of the DEA approach stems from the fact that the assumption of a specific functional form of the underlying technology is not necessary. This makes DEA particularly useful when dealing with service industries, since we have very limited knowledge about the underlying production technology in such cases. Instead of using any functional form, DEA uses linear programming approaches to envelope the observed data as tightly as possible. It only requires that the production possibility set is convex and the inputs and outputs are disposable.

Estimation of Cost Efficiency Using DEA-The Standard Approach:

Suppose we have data on r inputs and s outputs for each of the n firms. The ith firm(i=1,2,…,n) uses a r x 1 input vector $x_i = (x_1, x_2, \ldots, x_r)$ to produce a s x 1 output vector $y = (y_1, y_2, .., y_s)$ where X is a r x n input matrix and Y a s x n output matrix that represent data for all n sample firms. In the first stage, the following linear programming problem (LP) is solved:

$$\text{Min } \omega'_i x_i^*$$

$$\text{Subject to } x_i \geq X\lambda,\ y \leq Y\lambda,\ \lambda \geq 0, \sum\lambda = 1 \text{(under variable returns to scale)}$$

Whether, w_i is a r x 1 input price vector for the i-th firm which corresponds to the input vector xi, and xi* is the cost-minimizing input vector for the i-th firm which is obtained by the LP .

In the second stage, the cost efficiency of the i-th firm is calculated as the ratio of minimum cost to observed cost:

$$CE = \omega'_i x_i^* / \omega'_i x_i$$

The measure of cost efficiency is bounded between 0 and 1. A cost efficiency of 1 represents a fully cost efficient firm; 1-CE represents the amount by which the firm could reduce its costs and still produce at least the same amount of output.

Estimation of Cost Efficiency: The New Approach

In the life insurance sector, input and output quantities are expressed in monetary terms. Further, the definition and calculation of input and output prices is rather difficult. We therefore follow Tone (2002) and calculate cost efficiency by replacing the input vector x_i expressed in physical terms by

z_i where z_i is the vector of inputs expressed in monetary terms. . This approach further allows us to model input prices w_i being equal to unity for all selected inputs. The new LP is, therefore:

$$\text{Min } C=\Sigma z_i$$
$$\text{Subject to } z_i \geq Z\lambda,\ y \leq Y\lambda,\ \lambda \geq 0, \sum\lambda=1 \text{(under variable returns to scale)}$$

Section 3 : Studies on Life Insurer Efficiency: A Review of Literature

The initial studies on the efficiency of U.S. life insurers, mostly focused on scale economies (e.g., Grace and Timme, 1992, Yuengert, 1993 and Gardner and Grace, 1993).These studies tend to find evidence of significant scale economies in the industry, although larger firms generally are found to exhibit decreasing returns to scale.

Cummins and Zi(1998) made comparative analysis of frontier cost efficiency methodologies by the application of a wide range of econometric and mathematical programming techniques to a data set consisting of 445 life insurers over the period 1988-1992. The alternative methodologies gave significantly divergent estimates of efficiency for the in-sample insurers. The efficiency rankings were quite well-preserved among the econometric methodologies; but the rank correlations were found to be lower between the econometric and mathematical programming categories and between alternative mathematical programming methodologies. Thus, the choice of methodology had a significant effect on the results. Most of the insurers in the sample display either increasing or decreasing returns to scale, and stock and mutual insurers were found to be equally efficient after controlling for firm size.

During the eighties and nineties, the U.S. life insurance industry has experienced an unprecedented wave of mergers and acquisitions. Traditionally, the industry was characterized by high-cost distribution system and non-price competition, However, the insurers increasingly faced with more intensive competition from non-traditional sources such as banks, mutual funds, and investment advisory firms which captured a major share of the market for asset accumulation products such as annuities and cash value life insurance. The increased competition has narrowed profit margins and motivated insurers to seek ways to reduce costs. The more stringent solvency standards implemented under the risk based capital system adopted in 1993 also have put pressure on insurers to strengthen their financial statements. Technological advances in sales, pricing, underwriting, and policyholder services have forced insurers to become more innovative; and the relatively high fixed costs of the new systems may have affected the minimum efficient scale in the industry.In this context, Cummins,Tennyson and Weiss(1998) examined the relationship between mergers and acquisitions, efficiency, and scale economies in the US life insurance industry. They estimated cost and revenue efficiency over the period 1988-1995 using data envelopment analysis (DEA). The Malmquist methodology is used to measure changes in efficiency over time. They found that acquired firms achieve greater efficiency gains than firms that have not been involved in mergers or acquisitions. Firms operating with non-decreasing returns to scale and financially vulnerable firms were found to be acquisition targets. Overall,

mergers and acquisitions in the life insurance industry was found to have a beneficial effect on efficiency.

Gamarra(2007) estimated cost and profit efficiency of three groups of German life insurance companies: multichannel insurers, direct insurers, and independent agent insurers. Non-parametric DEA is used to estimate efficiencies for a sample of German life insurers for the years 1997-2005. Testing a set of hypothesis, she found economic evidence for the coexistence of the different distribution systems which is the absence of comparative performance advantages of specialised insurers. Further, she found evidence for scale economies in the German life insurance industry.

In the Indian context, Tone and Sahoo(2005) were the first to study efficiency of the life insurance sector as they applied new cost efficiency model to examine the performance of Life Insurance Corporation (LIC) of India. The findings show a significant heterogeneity in the cost efficiency scores over the course of 19 years. A decline in performance after 1994–1995 can be taken as evidence of increasing allocative inefficiencies arising from the huge initial fixed cost undertaken by LIC in modernizing its operations. A significant increase in cost efficiency in 2000–2001 is, however, cause for optimism that LIC may now be realizing a benefit from such modernization. This will stand them in good stead in terms of future competition. Results from a sensitivity analysis are in broad agreement with the main findings of this study.

Sinha (2007) assessed total factor productivity growth in the life insurance industry for the period 2003-05 using Malmquist Total Factor Productivity Index. Comparison of technical efficiency scores of the life insurance companies show that the private insurance companies are still way behind the Life Insurance Corporation. Since under the assumption of constant returns to scale the inefficient firms are penalised more in terms of distance from the best practice frontier the mean technical efficiency score of the life insurers under CRS is much lower than under VRS. For all the observed years, LIC and SBI Life have a technical efficiency score of 1. All other life insurance firms are technically inefficient (technical efficiency score of less than 1). For 2002-03 and 2003-04 , excepting LIC all other insures exhibited increasing returns to scale.For 2004-05, ING Vysya and Max New York Life exhibited decreasing returns to scale. All the life insurers exhibited positive total factor productivity growth. Obviously, the total factor productivity growth rate of the private life insurers is much higher than LIC. Among the private life insurers, OM Kotak Life exhibited highest total factor productivity growth rate followed by Aviva Life insurance.

Sinha(2007) compared thirteen life insurance companies in respect of technical efficiency for the period 2002-03 to 2005-06 using the assurance region approach. In his paper,year to year comparison of mean technical efficiency scores revealed that mean technical efficiency has improved in 2003-04 relative to 2002-03, remained on the same level in 2004-05 and declined in 2005-06.This is likely because of divergence in the performance across the life insurers. In the last two years, most of the life insurers have exhibited increasing returns to scale.

Section 4:Approach of the Present Paper

Specification of Input and Outputs:

In order to use DEA for estimating cost efficiency, it is essential to identify the relevant inputs and outputs of the life insurance firms. Selection of input/output variables, however, is rather difficult for insurance firms since input prices are often implicit, and many outputs are intangible.

Measurement of Output:

The outputs of financial service firms are measured according to three main approaches: the asset (intermediation) approach, the user-cost approach, and the value-added approach (refer Berger and Humphrey, 1992).

The asset approach treats financial service firms as pure financial intermediaries which borrow funds from their customers which are invested, and thus transformed into assets. Interest payments are paid out to cover the time value of the funds used. Applying the asset approach would mean that only the intermediation services provided by life insurance firms are taken into account with out any regard to the risk-pooling and risk-bearing services rendered by them.

The user-cost approach was developed by Hancock (1985). It determines whether a financial product is an input or an output by analyzing if its net contribution to the revenues of an insurance firm is positive or negative. According to that, a product is considered an output, if its financial return exceeds the opportunity costs of funds or if the financial costs of a liability are lower than the opportunity costs. Otherwise, the financial product would be classified as an input. This method would require precise information on product revenues and opportunity costs which can not be obtained for the Indian life insurance firms.

The value-added approach differs from the asset approach and the user-cost approach as it considers all asset and liability categories to have some output characteristics. Those categories which have substantial value added, are then used as the important outputs. The remaining categories are treated as rather unimportant outputs, intermediate products, or inputs. An important advantage compared to the user-cost approach consists in the fact that the value-added approach uses operating cost data rather than determining the costs implicitly or using opportunity costs. The value added approach is considered to be the most appropriate method to measuring output of financial firms and is widely used in recent insurance studies.

In the present study we follow the value added approach and consider two output proxies: benefits paid to the customers and net premium mobilized by the insurance companies.

Measurement of Input:

The life insurers have two important cost components: operating expenses and commission expenses. We have included both of them in our study as inputs expressed in monetary terms.

Descriptive Statistics on Inputs/Outputs:

Tables 3-7 present the descriptive statistics of input/output variables

Table 3: Descriptive Statistics of Input/Output variables (2002-03)

Statistical Measure	Operating Expenses	Commission Expenses	Premium	Benefit
Max	462109	499861	54628	2053039
Min	2330	167	6	6
Average	41932	39636.54	4288.154	158040.1
SD	121353.9	132859.8	14532.24	547039.1

Source: Calculated.

Table 4: Descriptive Statistics of Input/Output variables (2003-04)

Statistical Measure	Operating Expenses	Commission Expenses	Premium	Benefit
Max	518650	573384	63533	2392375
Min	4465	547	29	50
Average	50606.31	47296.54	5127.385	184528.8
SD	135254.9	151888.1	16862.06	637350.5

Source: Calculated.

Table 5: Descriptive Statistics of Input/Output variables (2004-05)

Statistical Measure	Operating Expenses	Commission Expenses	Premium	Benefit
Max	598718	624517	75127	2844045
Min	7680	787	82	260
Average	63183.31	54599.69	6373.308	221680.5
SD	154882.5	164597.7	19855.46	757018.2

Source: Calculated.

Table 6: Descriptive Statistics of Input/Output variables (2005-06)

Statistical Measure	Operating Expenses	Commission Expenses	Premium	Benefit
Max	604156	709492	90792	3392711
Min	1121	379	28	22
Average	70839.71	62259.57	7561.786	251507.4
SD	148875.1	179722.9	23111.93	871363.6

Source: Calculated.

Table 7: Descriptive Statistics of Input/Output variables (2006-07)

Statistical Measure	Operating Expenses	Commission Expenses	Premium	Benefit
Max	708086	916907	127823	5328646
Min	1542	668	51	157
Average	96358.71	87420.5	10975.64	397951.8
SD	173548.6	231188.9	32461.69	1367708

Source: Calculated.

Results From the Present Study:

Table 8 provides the insurer wise cost efficiency figures for the period of observation (2002-03 to 2006-07).Table 9 provides the insurer wise ranks determined on the basis of cost efficiency scores.

Table 8: Insurer wise Cost Efficiency Scores

Life Insurance Company	2002-03	2003-04	2004-05	2005-06	2006-07
Aviva	0.4983	0.3457	0.5455	0.2728	0.2660
Bajaj Allianz	0.3180	0.1912	0.5912	0.5600	0.2048
Birla SunLife	0.3190	0.4895	0.6485	0.4785	0.3995
HDFC Bank	0.4325	0.4180	0.5328	0.4586	0.4810
ICICIPru	0.4065	0.8905	0.6784	0.6217	0.4982
ING Vysya	0.3921	0.3433	0.6099	0.2586	0.2638
Kotak	0.3648	0.4208	0.8697	0.5221	0.4339
LIC	1	1	1	1	1
Max New York Life	0.2267	0.2332	0.3976	0.2636	0.2777
MetLife	0.7839	0.83532	0.77063	0.201578	0.228374
Reliance	0.706024	1	1	0.0821	0.27143
Sahara	-	-	-	1	1
SBI Life	1	1	1	0.640715	0.747543
Tata AIG	0.341582	0.293796	0.487887	0.322581	0.345165

Source: Calculated.

Table 9: Insurer Wise Ranks (on the basis of cost efficiency scores)

Company	2002-03	2003-04	2004-05	2005-06	2006-07
Aviva	5	9	10	10	11
Bajaj Allianz	12	13	9	5	14
Birla SunLife	11	6	7	7	7
HDFC Bank	6	8	11	8	5
ICICIPru	7	4	6	4	4
ING Vysya	8	10	8	12	12
Kotak	9	7	4	6	6
LIC	1	1	1	1	1
Max New York Life	13	12	13	11	9
MetLife	3	5	5	13	13
Reliance	4	1	1	14	10
Sahara	-	-	-	1	1
SBI Life	1	1	1	3	3
Tata AIG	10	11	12	9	8

Source: Calculated.

Table 10: Descriptive Statistics of Cost Efficiency Scores of Life Insurers

Particulars	2002-03	2003-04	2004-05	2005-06	2006-07
No of Life Insurers	13	13	13	14	14
Mean Cost Efficiency	0.5223	0.5740	0.7025	0.4773	0.4584
Mean Cost Efficiency of Private Insurers	0.4825	0.5384	0.6777	0.4371	0.4167
Standard Deviation	0.2520	0.3056	0.1990	0.2666	0.2604

Source: Calculated.

Section 5: Analysis of the Results

In the present paper we have estimated cost efficiency of the Life insurance companies operating in India using the new cost efficiency approach suggested by Tone (2002). The results suggest an upward trend in cost efficiency of the observed life insurers between 2002-03 and 2004-05. However, the trend was reversed for the next two years i.e. 2005-06 and 2006-07.This has been so because of the fact that during the initial years of observation, mean cost efficiency of the private life insurers was rising but the trend was reversed in 2005-06 and 2006-07.

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