

EFFICIENCY ANALYSIS OF LIFE INSURANCE COMPANIES IN INDIA IN THE POST REFORMS PERIOD

Dr. Manjit Singh

Professor, University School of Applied Management, Punjabi University, Patiala. email: smanjitt@gmail.com

Lakhwinderjeet Kaur

Head, Department of Commerce and Management, Guru Hargobind Sahib Khalsa Girls' College, Karhali Sahib, Distt. Patiala.

ABSTRACT

Insurance sector reforms paved the way for private participation, fostering strong growth. Insurance companies are increasingly adopting a strategy of deploying multiple distribution networks to increase market penetration and reach the masses that are not currently served. However, the insurance sector still remains mostly under-penetrated. Efficiency refers to an insurer's ability to produce a given set of outputs with the use of inputs. An insurer is called technically efficient if in a given state of production technology in the industry, it cannot reduce its inputs used without some corresponding reduction in the resources produced. Efficiency in general describes the extent to which time, effort or cost is well used for the intended task or purpose. The present paper attempts to study the efficiency analysis of Life Insurance Companies in India in the post reform period using the Data Envelopment Analysis. The study is confined to the period from the year 2001-02 to 2010-11. The study found that the public sector life insurance company LIC was more efficient than the private sector life insurance companies. However, the efficiency of private life insurers showed an improvement with the passage of time. The study suggested that the private life insurance companies should increase their business size to compete in the market.

Keywords: *Efficiency, Life Insurance, Technical Efficiency, Scale Efficiency.*

1. Introduction

The reforms in the Indian insurance sector in the year 2000 have led to liberalization, privatization and globalization of insurance industry in India. The reforms have opened new opportunities in the insurance industry and has generated intensely competitive environment. However, the insurance sector still remains mostly under-penetrated. Life insurance is largely used as a means to improve finances, whereas non-life coverage is not considered a necessity. Since the ranks of the middle class are growing, and per capita income is rising, the insurance market could grow to a very large extent in size in the coming years. Insurance companies are increasingly adopting a strategy of deploying multiple distribution networks to increase market penetration, and reach the masses that are not currently served. Increased competition compels less efficient firms to either raise their level of efficiency or to exit the sector completely. It also increases the efficiency at industry level which can improve if inefficient firms either catch up with their efficient rivals or the most efficient firm

through technological improvement. Thus life insurance companies in India now compete in the insurance market. Despite recent growth, there is still tremendous untapped potential in the Indian insurance sector. The reforms in insurance sector have put heavy pressure on firms to increase efficiency of operations in order to survive the expected competition. Efficiency refers to an insurer's ability to produce a given set of outputs with the use of inputs. An insurer is called technically efficient if in a given state of production technology in the industry, it cannot reduce its inputs used without some corresponding reduction in the resources produced.

2. Objectives of the Study

The main objectives of the study are:

- (i) To evaluate the technical efficiency of Life Insurance Companies in India.
- (ii) To evaluate the scale efficiency of Life Insurance Companies in India.
- (iii) To conclude on the basis of the study and provide suggestions thereof.

3. Research Methodology

The study is based on the secondary data that has been collected through annual reports of the selected companies, viz. LIC, HDFC Standard Life Insurance Company Ltd., ICICI Prudential Life Insurance Company Ltd., Max New York Life Insurance Company Ltd., SBI Life Insurance Company Ltd., ING Vysya Life Insurance Company Ltd., Kotak Mahindra Old Mutual Life Insurance Company Ltd., MetLife India Insurance Company Pvt. Ltd., Reliance Life Insurance Company Ltd., various reports of IRDA, handbook on Indian

insurance statistics 1998, articles published in reputed journals and newspapers, magazines, pamphlets of the institutions and various websites relating to life insurance. The data pertains to the period from the year 2001-02 to 2010-11. The study attempts to measure the efficiency of life insurance companies using DEA Analysis. The sample consists of one public life insurer i.e. Life Insurance Corporation of India and 8 companies from the private sector. Two models of output have been used to examine the efficiency of life insurance companies in India. In the first model, net written premium has been taken as the output and in the second net premium written and investment income has been taken as output. The inputs include the operating expenses including commission and capital. The efficiency analysis has been done in three parts. The first part evaluates the technical efficiency (Constant Returns to Scale) using the two output models. The second part analyses the technical efficiency (Variable Returns to Scale) using the two output models. The third part examines the scale efficiency of life insurance companies under both the output models.

3.1 Efficiency Analysis of the Life Insurance Companies

In the first part, the technical efficiency (Constant Returns to Scale) has been evaluated by using the two output models. The first model uses premium as the output and operating expenses including commission and capital as the inputs.

Table 1 depicts the results of insurer-wise technical efficiency (CRS) from the year 2001-02 to 2010-11. The table shows that average technical efficiency of both the public and private sector life insurance companies from 2001-02 to 2010-11 is 100 per cent and 17 per cent respectively. Thus, the technical efficiency of the public sector life insurance companies is higher by 83 per cent than that of the private sector. All the

Table 1: Technical Efficiency (Constant Return to Scale) of Life Insurance Companies in the Post-reform Period (Output: Premium)

Name of Company	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	MEAN
HDFC LIFE	0.027	0.082	0.128	0.176	0.197	0.226	0.218	0.168	0.228	0.336	0.178
SBI LIFE	0.019	0.085	0.168	0.196	0.598	0.365	0.362	0.419	0.546	0.743	0.350
ICICI PRU	0.082	0.115	0.162	0.246	0.281	0.299	0.315	0.383	0.469	0.635	0.298
MET LIFE	0.001	0.010	0.023	0.038	0.068	0.072	0.094	0.094	0.119	0.144	0.066
MAX NEW YORK LIFE	0.020	0.044	0.067	0.086	0.110	0.128	0.140	0.123	0.167	0.224	0.110
ING VYASYA	0.006	0.016	0.042	0.107	0.080	0.082	0.106	0.109	0.134	0.122	0.080
RELIANCE	0.000	0.007	0.024	0.057	0.070	0.107	0.156	0.162	0.252	0.301	0.113
KOTAK MAHINDRA	0.009	0.035	0.098	0.207	0.202	0.186	0.187	0.209	0.298	0.359	0.179
MEAN	0.020	0.049	0.089	0.139	0.200	0.183	0.197	0.208	0.276	0.358	0.172
LIC	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Source: Compiled and calculated from the annual reports of Life Insurance Companies for the period from 2001-02 to 2010-11.

private sector insurance companies show an increasing trend throughout the study period. The average efficiency of private sector life insurance companies increased from 2 per cent in the year 2001-02 to 35.8 per cent in 2010-11. SBI Life Insurance Company consistently occupied the top slot for all the years, i.e., achieving 35 per cent average efficiency. On the other hand, the public sector life insurance company LIC appeared as the most efficient company during the whole period under study by achieving 100 per cent efficiency. Year-wise results show that in all the years under study, only public sector company LIC displayed maximum efficiency level. The comparison shows that the efficiency of LIC was the highest efficiency and of the private sector life insurance companies improved during the post-liberalization period.

Table 2 depicts the results of insurer-wise technical efficiency (CRS) from the year 2001-02 to 2010-11. The table shows that average technical efficiency of both the public and private sector life insurance companies from 2001-02 to 2010-11 is 100 per cent and 14 per cent respectively. Thus, the technical efficiency of the public sector life insurance companies is higher by 86 per cent than that of the private sector. All the private sector insurance companies show an increasing trend throughout the study period. The average efficiency of private sector life insurance companies increased from 1 per cent in the year 2001-02 to 30.4 per cent in 2010-11. SBI Life Insurance Company consistently occupied the top slot for all the years, i.e., achieving 62.2 per cent average efficiency. On the other hand, the public sector life insurance company LIC appeared as the most efficient company during the whole period under study by achieving 100 per cent efficiency. Year-wise results show that in all the years under study, only public sector company LIC displayed maximum efficiency level. The comparison shows that the efficiency of LIC was the highest

efficiency and of the private sector life insurance companies improved during the post-liberalization period.

3.2 Technical Efficiency (Variable Returns to Scale) of Life Insurance Companies:

In the second part, the technical efficiency of life insurance companies has been studied relating to variable returns to scale. Table 3 exhibits the technical efficiency (Variable Returns to Scale) of Life insurance companies using the premium as output and the operating expenses including commission and capital as the inputs.

Table 3 shows the technical efficiency (VRS) of life insurance companies for the period from 2001-02 to 2010-11. The average efficiency of both the public and private sector is 100 per cent and 38.4 per cent respectively registering a difference of 61.6 per cent. SBI Life Insurance company displays a top slot consisting of 76.1 per cent throughout the study period followed by Kotak Mahindra (67.6 per cent). However, the average efficiency of Max New York was the least consisting of 15 per cent throughout the study period followed by ING Vyasya (17.5 per cent). Year wise results present that in the year 2001-02, one out of eight private sector life insurers and the public company LIC showed maximum efficiency. Also, 2 out of private sector companies along with public company LIC showed maximum efficiency in the years from 2002-03 to 2003-04. Among the private sector, Kotak Mahindra improved its efficiency and recorded an efficiency of 100 per cent from the years 2006-07 to 2010-11. Reliance achieved the maximum level of efficiency in the year 2004-05 but could not maintain it. The technical efficiency of Met Life remained constant at 100 per cent for the period 2001-02 to 2003-04 and thereafter it showed a decreasing trend by recording an efficiency of 8 per cent in 2005-06 and a slight increase in the period from 2008-09

Table 2: Technical Efficiency (Constant Return to Scale) of Life Insurance Companies in the Post-reform Period (Output: Premium and Investment Income)

Name of Company	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	MEAN
HDFCLIFE	0.019	0.058	0.095	0.123	0.169	0.180	0.178	0.091	0.259	0.281	0.145
SBI LIFE	0.013	0.061	0.120	0.141	0.466	0.289	0.288	0.252	0.542	0.622	0.279
ICICI PRU	0.057	0.082	0.115	0.179	0.260	0.302	0.247	0.180	0.605	0.583	0.261
MET LIFE	0.000	0.007	0.016	0.026	0.049	0.055	0.072	0.060	0.115	0.121	0.052
MAX NEW YORK LIFE	0.014	0.031	0.048	0.061	0.082	0.100	0.110	0.091	0.148	0.179	0.086
ING VYASYA	0.004	0.011	0.030	0.073	0.061	0.072	0.082	0.067	0.135	0.101	0.063
RELIANCE	0.000	0.005	0.017	0.039	0.058	0.081	0.112	0.102	0.239	0.251	0.090
KOTAK MAHINDRA	0.006	0.024	0.069	0.145	0.170	0.154	0.158	0.140	0.255	0.298	0.141
MEAN	0.014	0.034	0.063	0.098	0.164	0.154	0.155	0.122	0.287	0.304	0.140
LIC	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Source: Compiled and calculated from the annual reports of Life Insurance Companies for the period from 2001-02 to 2010-11

to 2010-11. Thus, the technical efficiency of private life insurance companies fluctuated throughout the study period. On the other hand, the public sector company LIC registered 100 per cent technical efficiency throughout the study period.

Table 4 shows the results of insurer-wise technical efficiency (VRS) from the year 2001-02 to 2010-11. The table shows that average technical efficiency of both the public and private sector life insurance companies from 2001-02 to 2010-11 is 100 per cent and 34.6 per cent respectively. Thus, the technical efficiency of the public sector life insurance companies is higher by 65.4 per cent than that of the private sector. Among the private sector life insurers the average technical efficiency of SBI Life was at the top slot consisting of 68.6 per cent followed by Kotak Mahindra (64 per cent). Max New York has the least average technical efficiency consisting of 11.9 per cent followed by ING Vyasa (14.7 per cent). Year wise results depict that in the year 2001-02, only one private life insurer Met Life achieved the maximum level of efficiency and in the years 2002-03 and 2003-04, Met Life and SBI Life achieved the 100 per cent efficiency level. Reliance achieved the highest efficiency level in the year 2004-05 but could not maintain it. SBI Life also reached maximum efficiency level in the year 2005-06 but it decreased in the following years. Kotak Mahindra achieved the maximum efficiency level of 100 per cent in the year 2006-07 and maintained this level throughout the further study period.

3.3 Scale Efficiency of Life Insurance Companies:

The third part examines the scale efficiency of life insurance companies. Table 5 depicts the technical efficiency (Variable Returns to Scale) of Life insurance companies using the premium as output and the operating expenses including commission and capital as the inputs.

Table 5 presents the company-wise scale efficiency scores and return to scale for the years 2001-02 to 2010-11. Scale efficiency score of 1.00 attained by the only public player LIC for the whole period indicates that the company enjoys the constant return to scale, i.e., the proportion of increase of output is equal to proportion of input increase. The scale efficiency scores of all the private sector life insurance companies are less than 1.00. The study indicates that all the private sector companies enjoy increasing returns to scale. Among the private sector, Max New York has the highest average scale efficiency scores consisting of 72.3 per cent followed by HDFC (68.2 per cent). However, the average scale efficiency scores of Kotak Mahindra is the least consisting of 29.6 per cent followed by Met Life (38.6 per cent). The study also reported that the public insurer is enjoying constant returns to scale and the private insurers enjoy increasing return to scale. So, the study suggests that the private sector companies should increase their business size to get the benefit of a large scale economy and also in the long run, to achieve the target of constant return to scale.

Table 6 reveals the scale efficiency and return to scale of the one public sector and eight private sector life insurance companies under study. The analysis provides that only the public sector life insurer LIC exhibited 100 per cent scale efficiency during the whole period of the study, i.e., 2001-02 to 2010-11.

The average scale efficiency of the public sector is higher than that of the private sector. Among the private life insurers, ICICI Pru achieved average scale efficiency score of 0.812 followed by Max New York (0.707). Among the private insurers, Kotak Mahindra was found to have the least efficiency score of 25.8 per cent followed by Met Life which scored 36 per

Table 3: Technical Efficiency (Variable Return to Scale) of Life Insurance Companies in the Post-reform Period (Output: Premium)

Name of Company	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	MEAN
HDFCLIFE	0.059	0.146	0.248	0.317	0.215	0.330	0.310	0.218	0.282	0.400	0.252
SBILIFE	0.128	1.000	1.000	0.448	1.000	0.742	0.650	0.818	0.833	1.000	0.761
ICICIPRU	0.152	0.145	0.194	0.294	0.293	0.344	0.361	0.464	0.561	0.747	0.355
METLIFE	1.000	1.000	1.000	0.211	0.088	0.180	0.224	0.153	0.170	0.193	0.421
MAXNEWYORKLIFE	0.029	0.067	0.102	0.132	0.121	0.194	0.214	0.162	0.211	0.269	0.150
INGVYASYA	0.043	0.038	0.088	0.236	0.091	0.156	0.306	0.320	0.289	0.184	0.175
RELIANCE	0.003	0.049	0.350	1.000	0.090	0.187	0.231	0.216	0.328	0.376	0.283
KOTAKMAHINDRA	0.057	0.110	0.376	0.956	0.264	1.000	1.000	1.000	1.000	1.000	0.676
MEAN	0.183	0.310	0.419	0.449	0.270	0.391	0.412	0.418	0.459	0.521	0.384
LIC	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Source: Compiled and calculated from the annual reports of Life Insurance Companies for the period from 2001-02 to 2010-11

cent. The least average efficiency score (28.2 per cent) and the highest average efficiency score (76 per cent) were exhibited by the private sector insurers during the year 2001-02 and 2005-06 respectively. It shows that the efficiency of private insurers improved up to the year 2005-06 and it decreased in the year 2006-07 and further improved in the forthcoming years. The analysis further indicates that among the public insurers, LIC enjoyed constant returns to scale during the period under study and all the private insurers depicted increasing returns to scale. So, it can be said that to improve scale efficiency and to achieve constant return to scale in the long run, the private insurers must increase their business to get the advantage of large scale economies.

4. Conclusion

The results obtained after using the two different models of output reveal that during the post-reform period the efficiency of both the public and private sector life insurance companies was different. It was found that technical efficiency under CRS and technical efficiency under VRS of the public sector life insurers is higher than that of the private sector life insurers. The comparison also depicts that the private sector life insurance companies showed some improvements in the efficiency. The average pure technical efficiency results show that the private insurers lagged behind the public insurers,

but they are trying to catch up and the efficiency scores of the private sector seem to improve. The study clearly depicts that all the private sector life insurance companies enjoyed increasing returns to scale, while the public sector company LIC enjoyed constant returns to scale using premium output model. The scale efficiency of private sector life insurance companies, using the premium and investment income as output, increased from 28.2 per cent in the year 2001-02 to 68.1 per cent in 2010-11. Thus, the only public sector life insurer

LIC appeared fully efficient life insurance company in terms of technical efficiency CRS and VRS throughout the study period. So, the study suggested the private sector companies to expand their business size in order to avail the benefit of large scale economy that may help them in improving their efficiency and compete with the public sector life insurance company.

5. Limitations of the study

During the course of the research study, some constraints came in the way. Some of these limitations are:

- (i) The study collected the data from the secondary sources, so it carries all the limitations inherent with the secondary data.
- (ii) The study measured the technical efficiency only.
- (iii) The study is based on the analysis of the ten years data only.

Table 4: Technical Efficiency (Variable Return to Scale) of Life Insurance Companies in the Post-reform Period (Output: Premium and Investment Income)

Name of Company	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	MEAN
HDFCLIFE	0.041	0.105	0.195	0.225	0.191	0.267	0.257	0.121	0.325	0.349	0.207
SBILIFE	0.088	1.000	1.000	0.329	1.000	0.613	0.532	0.537	0.855	0.909	0.686
ICICIPRU	0.106	0.104	0.140	0.215	0.275	0.349	0.284	0.223	0.731	0.714	0.314
METLIFE	1.000	1.000	1.000	0.160	0.071	0.147	0.181	0.104	0.168	0.175	0.400
MAXNEWYORKLIFE	0.020	0.048	0.075	0.095	0.094	0.155	0.173	0.123	0.189	0.225	0.119
INGVYASYA	0.031	0.028	0.067	0.165	0.074	0.142	0.253	0.235	0.315	0.168	0.147
RELIANCE	0.002	0.040	0.341	1.000	0.083	0.147	0.168	0.141	0.317	0.333	0.257
KOTAKMAHINDRA	0.039	0.079	0.320	0.717	0.247	1.000	1.000	1.000	1.000	1.000	0.640
MEAN	0.165	0.300	0.392	0.363	0.254	0.352	0.356	0.310	0.487	0.484	0.346
LIC	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Source: Compiled and calculated from the annual reports of Life Insurance Companies for the period from 2001-02 to 2010-11

Table 5: Scale Efficiency of Life Insurance Companies in the Post-reform Period (Output: Premium)

Name of Company	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	MEAN	2001-11
HDFCLIFE	0.461	0.550	0.487	0.547	0.886	0.674	0.693	0.753	0.795	0.804	0.665	Irs
SBI LIFE	0.147	0.061	0.120	0.427	0.466	0.472	0.541	0.470	0.634	0.685	0.402	Irs
ICICILIFE	0.539	0.790	0.822	0.834	0.946	0.865	0.868	0.810	0.827	0.816	0.812	Irs
METLIFE	0.000	0.007	0.016	0.162	0.687	0.374	0.400	0.580	0.683	0.689	0.360	Irs
MAX NEW YORK LIFE	0.672	0.643	0.639	0.642	0.873	0.646	0.640	0.736	0.779	0.796	0.707	Irs
ING VYASYA	0.129	0.402	0.444	0.444	0.827	0.508	0.323	0.285	0.428	0.602	0.439	Irs
RELIANCE	0.142	0.120	0.049	0.039	0.704	0.554	0.666	0.727	0.753	0.754	0.451	Irs
KOTAK MAHINDRA	0.165	0.300	0.217	0.202	0.687	0.154	0.158	0.140	0.255	0.298	0.258	Irs
MEAN	0.282	0.359	0.349	0.412	0.760	0.531	0.536	0.563	0.644	0.681	0.512	
LIC	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	Crs

Table 6: Scale Efficiency of Life Insurance Companies in the Post-reform Period (Output: Premium and Investment Income)

Name of Company	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	MEAN	2001-11
HDFCLIFE	0.461	0.561	0.515	0.555	0.915	0.686	0.704	0.773	0.807	0.841	0.682	irs
SBI LIFE	0.147	0.085	0.168	0.438	0.598	0.492	0.557	0.512	0.655	0.743	0.440	irs
ICICILIFE	0.539	0.795	0.831	0.837	0.960	0.870	0.873	0.825	0.837	0.850	0.822	irs
METLIFE	0.001	0.010	0.023	0.178	0.764	0.397	0.421	0.614	0.701	0.747	0.386	irs
MAX NEW YORK LIFE	0.672	0.652	0.658	0.649	0.905	0.660	0.653	0.758	0.792	0.834	0.723	irs
ING VYASYA	0.129	0.417	0.475	0.454	0.870	0.527	0.346	0.342	0.462	0.661	0.468	irs
RELIANCE	0.142	0.142	0.070	0.057	0.777	0.571	0.678	0.749	0.768	0.800	0.475	irs
KOTAK MAHINDRA	0.166	0.317	0.259	0.217	0.765	0.186	0.187	0.209	0.298	0.359	0.296	irs
MEAN	0.282	0.372	0.375	0.423	0.819	0.549	0.552	0.598	0.665	0.729	0.536	
LIC	1.000	1.000	1.000	1.000	1.0001	1.000	1.000	1.000	1.000	1.000	1.000	crs

References

Annual Reports of IRDA for the period from 2003-04 to 2009-10.

Annual Reports of LIC for the period from 2001-02 to 2010-11.

Annual Reports of HDFC Standard Life Insurance company for the period from 2001-02 to 2010-11.

Annual Reports of Max New York Life Insurance company for the period from 2001-02 to 2010-11.

Annual Reports of Reliance Life Insurance company for the period from 2001-02 to 2010-11.

Annual Reports of ING Vyasya Life Insurance company for the period from 2001-02 to 2010-11.

Annual Reports of Met Life Insurance company for the period from 2001-02 to 2010-11.

Annual Reports of SBI Life Insurance company for the period from 2001-02 to 2010-11.

Annual Reports of Kotak Mahindra Old Mutual Fund Life Insurance company for the period from 2001-02 to 2010-11.

Annual Reports of ICICI Prudential Life Insurance company for the period from 2001-02 to 2010-11.

Adams, Mike (1996), "Investment Earnings and the Characteristics of Life Insurance Firms: New Zealand Evidence", *Australian Journal of Management*, Vol. 21, No. 1, June 1996, © The University of New South Wales, downloaded from jstor.org

Ahuja, Rajeev (2004), "Insurance Over the Transition", *Economic and Political Weekly*, Vol. 39, No. 32, Aug. 7-13, 2004, pp. 3569-3571-

- Ahuja, R. & Ranade, A. (2000). Issues in Regulation of Insurance. *Economic and Political Weekly*, 35(5), 331-338.
- Barros, Carlos Pestana, Barroso, N., & Borges, M. R. (2004). Measuring Efficiency in the Life Insurance Industry with a Stochastic Frontier Model. Retrieved from www.jstor.org
- Bhaumik, S. K. (1999). Liberalisation of the Insurance Industry: Some Lessons from the US experience. *Money and Finance*, April-June 1999, 74-88.
- Bikker, J.A., & Gorter, J. (2008). *Performance of the Dutch Non-life Insurance Industry Competition, Efficiency and Focus*. Discussion Paper Series No.08-01, 1-26. Retrieved from: www.koopmansinstitute.uu.nl, on Aug. 7, 2009.
- Brown, Z.M. (2000). An Investigation of the Relative Efficiency of UK General Insurer. Paper Presented at the 22nd UK Insurance Economists Conference University of Nottingham, March, 1-17 downloaded from <http://www.nottingham.ac.uk/business/cris/UKec/2000>
- Cummins, J.D., Giusepp.e, T., & Weiss, M.A. (1996). Productivity and Technical Efficiency in Italian Insurance Industry. The Wharton School, University of Pennsylvania, Working Paper Series -10, Presented at Georgia Productivity Seminar, Nov. 1-3, 1-41 downloaded from <http://fic.wharton.upenn.edu/fic/papers/96/9610.pdf>
- Cummins, J.D., & Weiss, M.A. (1998). Analyzing Firm Performance in the Insurance Industry Using Frontier Efficiency Methods. The Wharton School, University of Pennsylvania, 1-45 Retrieved from: <http://fic.wharton.upenn.edu/fic/papers/98/9822.pdf>
- Cummins, J. David, & Zi, H. (1996). Measuring Cost Efficiency in the U.S. Life Insurance Industry: Econometric and Mathematical Programming Approaches. Retrieved from: <http://www.jstor.org>
- Chaffai, M. E., & Ouertani, M.N. (2004). Technical efficiency in the Tunisian insurance industry: a comparison of parametric and non-parametric time variant models. Retrieved from <http://www.fineprint.com>.
- Chugh, L. C., & Meador, J. W. (2006). Demutualization in the Life Insurance Industry: A study of Effectiveness. *Review of Business*, November 2006, 27(1), 10-17. Retrieved from <http://www.jstor.org>.
- Chen, B., Powers, M. R., & Qiu, J. (n.d.) *Development of Chinese Life insurance Industry: An Efficiency Analysis*. The Capco Institute Journal of Financial Transformation. Retrieved from <http://www.ssrn.com>
- Dutta, A. (n.d.) *An Empirical Study of Indian Life Insurance Industry*. International Conference on Education and Management technology, 2010.
- Diacon, S. (2001). *The Efficiency of U.K. General Insurance Companies*. University of Nottingham, Centre for Risk and Insurance Studies, CRIS Discussion Paper Series-2001.111. Retrieved from www.nottingham.ac.uk/business/ohic.com/index/del/in.cris/papers/2001-3.pdf