CHAPTER-4

SOLVENCY ANALYSIS

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SOLVENCY ANALYSIS

4.1 Introduction

Solvency is the capacity to meet all liabilities whenever demanded by the outsiders. In case of insurance companies, the word solvency means the ability to pay liabilities on liquidation and to pay liabilities whenever insurance policy matures or death occurs. The difference between total value of assets on a specified date and the amount of liabilities on that date, as per actuarial experts is known as solvency margin and in India as per the directives of IRDA, solvency ratio {available solvency margin(ASM)/required solvency margin(RSM)} should be 150% to all insurance companies **(IRDA Annual Report 2006-07)**[1]. In India, the calculation of both ASM and RSM are very difficult because specific business information calculated by actuarial experts relating to insurance business are not available from Annual Reports of IRDA **(Darzi, 2011)**[2]. It is true that different countries use different solvency ratios as there are no internationally accepted standards for solvency margin and adequate capitalization. However, from the management point of view, there is other way of looking into solvency for which various leverage/capital structure ratios such as, debt/equity ratio, debt/asset ratio, equity /asset ratio and so on may be analyzed and compared with industry average for securing the continuation of the function and existence of the company. The important ratios worked out for General Insurance Companies by the Comptroller and Auditor General of India are current assets to total net assets, current assets to current liabilities, quick assets to current liabilities and total assets to total liabilities to review liquidity and solvency position. The ratio of total assets to total liabilities indirectly indicates the solvency margin of the company **(Murty and Gadre, 2001)**[3]. This ratio can also be presented as the ratio of total liabilities to total assets with same interpretation in another way **(Gupta and Sharma, 2008)**[4]. The ratio of total assets to total liabilities represents cover for liabilities. This ratio indicates whether the total assets of the companies are increasing or decreasing compared to total liabilities **(Modi, 2011)**[5]. Higher the ratio, more stable is the long term solvency position of a firm and lower the ratio, the, more unstable is the long term solvency position of a firm **(Gupta and Sharma, 2008)**[4]. The ratio of actual capital to the minimum capital required by the regulator can also provide an idea on

the level of capitalization of the life insurance company. Shareholders' fund may be taken as actual capital. The higher is the ratio, better is the solvency position of the company. For life business, the ratio of capital to technical reserve can be taken as the indicator of solvency as this ratio reflects the ultimate liabilities of life insurers **(Das et.al, 2003)**[6]. However, in India, the minimum capital for registration of a Life insurance company is 10000 lakhs of rupees **(IRDA Annual Report, 2000-2001)**[7]. **Charumati (2012)**[8] uses the ratio of mathematical reserve to capital and surplus as a measure of insurance leverage. Higher the ratio, the better is the ability for repaying the policyholders' liability.

The ratio of shareholders' fund to total assets is an important ratio for determining long term solvency of a firm. This ratio represents the relationship of owners' fund to total assets. Higher the ratio or the share of the shareholders in the total capital of the company better is the long term solvency position of the company. This ratio indicates the extent to which the assets of the company can be lost without affecting the interest of the creditors of the company **(Gupta and Sharma, 2008)**[4]. This ratio reflects percentage of total assets is financed from debt capital or percentage of total assets is financed from shareholders' fund of a life insurance company. Tangibility of assets in insurance studies is measured by the ratio of fixed assets to total assets **(Afza and Ahmed, 2010)**[9]. Tangibility of assets strengthens the borrowing decisions since they have greater value in case of bankruptcy or solvency. A firm with large portion of fixed assets can easily raise loan at nominal rate **(Ahmed et.al, 2010)**[10].

4.2 Analysis of Solvency

The researcher has selected five ratios from the review of literature. These are the ratio of total assets to total liabilities, ratio of shareholders' fund to minimum capital for registration, ratio of shareholders' fund to technical reserve, ratio of shareholders' fund to technical reserve and the ratio of fixed assets to total assets. These ratios have been analyzed to judge solvency position of life insurance companies under the study with the help of descriptive statistics, comparison of company average with industry average and year-wise trend of industry average. To test statistically whether the differences in profitability performance of selected life insurance companies are significant or not, ANOVA tool has been applied {**Ansari and Fola, 2014**[11], **Krishnamoorthi et al, 2012**[12] and **Sornaganesh and Maheshwari, 2014**[13]} and to

identify the companies for which significant difference has arisen post hoc ANOVA technique has been used.

4.2.1 RATIO OF TOTAL ASSETS TO TOTAL LIABILITIES (TA/TL)

In the ratio of total assets to total liabilities, the numerator is total assets and the denominator is total liabilities. Total assets include policyholders' investment, shareholders' investment, assets held to cover link liabilities, loans, fixed assets current assets etc. Total liabilities include shareholders' fund, borrowings, policyholders' fund, current liabilities etc. Higher ratio indicates better overall solvency level.

4.2.1.1 Descriptive Analysis of the Ratio of TA/TL

For the purpose of descriptive analysis of the ratio of TA/TL, the ratios for ten years of thirteen companies have been computed on the basis of IRDA Annual Reports (Concerned Issues) and shown in the following table:

Table-4.1

Descriptive Analysis of the Ratio of Total Assets to Total Liabilities

Name of the Company	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Average	SD	Kolmgorov-Smirnov Z	Sig.
AVIVA	2.92	1.48	1.17	1.20	1.14	1.12	1.08	1.10	1.09	1.09	1.34	0.54	1.25	0.09
BAJAJ ALLIANZ	2.14	1.18	1.11	1.09	1.09	1.07	1.05	1.07	1.10	1.14	1.20	0.31	1.35	0.05
BIRLA SUN LIFE	1.17	1.08	1.06	1.06	1.06	1.06	1.04	1.06	1.07	1.07	1.07	0.03	1.00	0.27
HDFC STANDARD	1.40	1.14	1.12	1.08	1.07	1.07	1.04	1.03	1.04	1.05	1.10	0.10	0.92	0.37
ICICI PRUDENTIAL	1.12	1.07	1.04	1.04	1.05	1.05	1.04	1.05	1.06	1.06	1.06	0.02	0.81	0.53
ING VYSYA	2.28	1.32	1.18	1.12	1.08	1.06	1.04	1.06	1.05	1.05	1.23	0.36	1.10	0.18
KOTAK MAHINDRA	1.54	1.19	1.14	1.07	1.08	1.09	1.08	1.07	1.08	1.09	1.14	0.14	1.09	0.19
PNB MET LIFE	3.74	2.26	1.40	1.22	1.11	1.09	1.04	1.04	1.05	1.07	1.50	0.83	1.10	0.18
LICI	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.56	0.92
SBI LIFE	1.49	1.37	1.21	1.10	1.00	1.07	1.05	1.04	1.05	1.05	1.14	0.15	0.95	0.33
TATA AIA	1.40	1.33	1.22	1.17	1.10	1.09	1.05	1.05	1.06	1.08	1.15	0.12	0.82	0.52
MAX N Y	1.49	1.30	1.20	1.16	1.13	1.15	1.11	1.10	1.14	1.13	1.19	0.11	0.93	0.35
RELIANCE	3.55	1.80	1.29	1.09	1.05	1.06	1.03	1.03	1.06	1.08	1.40	0.75	1.12	0.16
Average	1.94	1.35	1.17	1.11	1.07	1.07	1.05	1.05	1.07	1.07	1.20			

Note: 1) Computed by researcher from data obtained from Annual Report of IRDA (Various issues)

2) Kolmogorov- Smirnov test indicates that the data are normally distributed as the test fails to reject null hypothesis that distributions are normal since the significance level of group distributions exceeds 0.05.

The table 4.1 reveals that the average ratio of total assets to total liabilities of PNB MET LIFE is 1.50 and having highest solvency margin of 0.50 during the entire study period followed by RELIANCE as 1.40. While LICI has the lowest ratio of 1.000 which means that it has very negligible solvency margin .It also appears from the table-4.1 that BIRLA SUN LIFE, HDFC STANDARD, KOTAK MAHINDRA, SBI LIFE, TATA AIA and MAX N Y are immediately to do something for the betterment of this ratio because this ratio has a decreasing trend over the study period of those companies. This ratio is almost fixed throughout the study period for LICI. Highest variation of this ratio is observed in case of PNB MET LIFE, RELIANCE, AVIVA, ING VYSYA and BAJAJ ALLIANZ.

4.2.1.2 Average Position of Select Life Insurance Companies Relating to the Ratio of TA/TL Compared to Industry Average

Table-4.2 and diagram-4.1 have been prepared on the basis of data collected from IRDA Annual Reports (Respective Issues) which are as follows:

Table-4.2

Company-wise Average Ratio of Total Assets to Total Liabilities
(2003-04 to 2012-13)

Name of the Company	Average(2003-04 to 2013-14)	Ten Years' Average Rank
PNB MET LIFE	1.501	1
RELIANCE	1.403	2
AVIVA	1.340	3
ING VYSYA	1.225	4
BAJAJ ALLIANZ	1.204	5
Industry Average	1.195	
MAX N Y	1.191	6
TATA AIA	1.154	7
KOTAK MAHINDRA	1.143	8
SBI LIFE	1.143	9
HDFC STANDARD	1.104	10
BIRLA SUN LIFE	1.072	11
ICICI PRUDENTIAL	1.059	12
LICI	1.000	13

Diagram-4.1

Company-wise Average Ratio of Total Assets to Total Liabilities

(2003-04 to 2012-13)

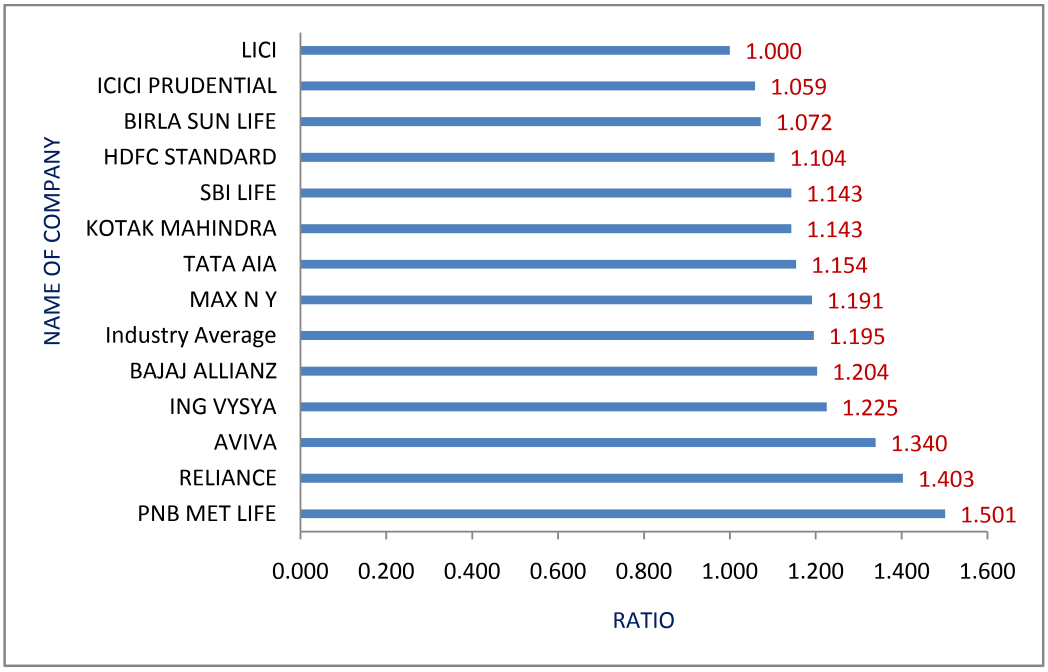


Table-4.2 and diagram-4.1 indicate that the average ratio of total assets to total liabilities from 2003-04 to 2012-13 of PNB MET LIFE is 1.501 which is in a very strong solvency position compared to all other companies under the study except RELIANCE and AVIVA which are moderately good so far as the solvency position is concerned. The table and diagram also reveal that the solvency positions of ING VYSYA, AVIVA, RELIANCE, PNB MET LIFE and BAJAJ ALLIANZ are above industry average while in case of rest of the companies under the study, it is below industry average.

4.2.1.3 Year-wise Average Position of the Ratio of TA/TL of Life Insurance Industry

Year-wise industry average ratios have been calculated by adding all the ratios of TA/TL of thirteen companies in a particular year divided by total number of companies under the study as shown in the table-4.3 and diagram-4.2 (Based on IRDA Annual Reports, Various Issues).

Table-4.3

Year-wise Industry Average Ratio of Total Assets to Total Liabilities (2003-04 to 2012-13)

Name of the Company	Industry Average
2003-04	1.9419
2004-05	1.3473
2005-06	1.1650
2006-07	1.1084
2007-08	1.0737
2008-09	1.0749
2009-10	1.0500
2010-11	1.0540
2011-12	1.0658
2012-13	1.0738

Diagram-4.2

Year-wise Industry Average Ratio of Total Assets to Total Liabilities (2003-04 to 2012-13)

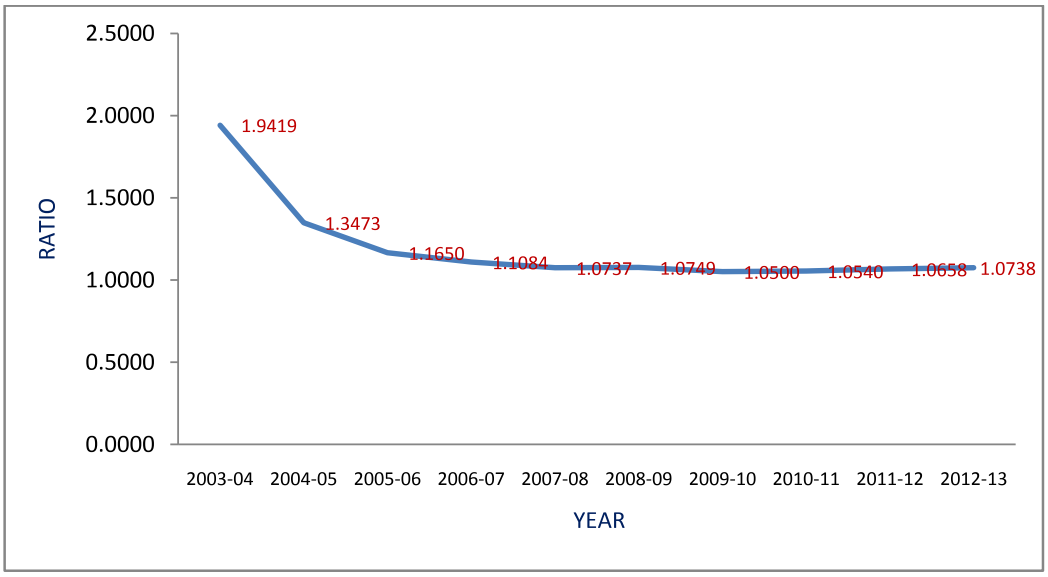


Table-4.3 and diagram-4.2 show that the industry average ratios of total assets to total liabilities have decreased from 2003-04 as 1.9419 to 2009-10 as 1.0500 and very

slight improvement thereafter which indicates an alarming situation so far as the solvency of Indian life insurance industry is concerned.

4.2.1.4 Analysis of Variance for Testing Null Hypothesis H_0S_1

In order to test null hypothesis H_0 S_1, the researcher has calculated table-4.4 with the help of SPSS-17(Based on Data obtained from Annual Reports of IRDA, Various Issues).

Table-4.4

One Way ANOVA of the Ratio of Total Assets to Total Liabilities

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.458	12	.205	1.298	.229
Within Groups	18.472	117	.158		
Total	20.930	129			

The table-4.4 indicates that the differences in the ratio of total assets to total liabilities across the select companies are not significant as the p-value is 0.229. Since the value is more than 0.05, so it is concluded that there is no significant difference in the ratio of total assets to total liabilities across the select life insurance companies under the study at 5% significance level. Hence, Null hypothesis is accepted.

4.2.2 RATIO OF SHAREHOLDERS' FUND TO MINIMUM CAPITAL FOR REGISTRATION (SF/MCFR)

The ratio of shareholders' fund to minimum capital for registration consists of shareholders' fund in the numerator and minimum capital for registration in the denominator. Shareholders' fund includes share capital, reserves and surplus etc. The minimum capital for registration of life insurance companies in India is rupees 10,000 lakhs fixed by IRDA. A high ratio indicates better capital adequacy level.

4.2.2.1 Descriptive Analysis of the Ratio of SF/MCFR

For the purpose of descriptive analysis of the ratio of SF/MCFR, 130 ratios have been computed on the basis of IRDA Annual Reports (Various Issues) and shown in the following table-4.5:

Table-4.5

Descriptive Analysis of the Ratio of Shareholders' Fund to Minimum Capital for Registration

Name of the Company	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Avarage	SD	Kolmgorov-Smirnov Z	Sig.
AVIVA	1.44	1.30	1.25	2.93	3.37	3.29	3.82	5.26	6.00	6.32	3.50	1.79	0.51	0.95
BAJAJ ALLIANZ	1.79	1.62	2.96	4.25	7.21	6.50	11.92	22.49	35.61	48.44	14.28	15.33	0.85	0.46
BIRLA SUNLIFE	1.07	1.06	1.55	2.27	3.85	4.08	4.22	7.27	10.73	12.48	4.86	3.83	0.83	0.50
HDFC STANDARD	1.57	1.32	3.17	3.94	6.38	6.52	5.75	4.81	8.55	13.61	5.56	3.44	0.62	0.84
ICICI PRUDENTIAL	2.01	2.39	2.55	5.01	7.79	10.05	12.68	20.85	30.05	39.65	13.30	12.26	0.69	0.72
ING VYSYA	1.13	1.64	1.40	1.63	1.67	1.72	1.53	3.48	3.15	3.39	2.07	0.85	1.13	0.16
KOTAK MAHINDRA	0.88	1.03	1.41	1.16	1.94	2.38	3.07	4.10	6.13	8.03	3.01	2.28	0.64	0.80
PNB MET LIFE	1.06	1.20	0.95	1.55	1.58	2.40	1.91	2.60	3.50	5.22	2.20	1.25	0.59	0.88
LICI	1.25	1.37	1.77	2.93	3.08	3.36	3.66	4.04	5.31	5.15	3.19	1.36	0.44	0.99
SBI LIFE	1.52	3.16	3.99	4.61	10.07	9.78	12.65	16.30	21.56	27.10	11.07	8.03	0.56	0.91
TATA AIA	1.03	1.47	2.14	2.41	2.25	3.10	3.11	3.95	6.55	9.88	3.59	2.56	0.86	0.45
MAX N Y	1.14	1.41	1.71	2.91	4.39	7.88	10.32	12.32	17.65	18.82	7.85	6.35	0.62	0.83
RELIANCE	0.90	0.94	1.11	1.27	2.07	3.46	3.03	2.93	9.06	12.31	3.71	3.67	1.03	0.24
Average	1.29	1.53	2.00	2.84	4.28	4.96	5.97	8.49	12.60	16.18	6.02			

Note: 1) Computed by researcher from data obtained from Annual Report of IRDA (Various issues)

2) Kolmogorov- Smirnov test indicates that the data are normally distributed as the test fails to reject null hypothesis that distributions are normal since the significance level of group distributions exceeds 0.05.

Table 4.5 indicates that so far as the capital adequacy over and above minimum capital is concerned, the position of BAJAJ ALLIANZ, ICICI PRUDENTIAL and SBI LIFE is better compared to all other companies under the study. Most of the companies have not injected more and more capital during the study period. Highest variation in this ratio is observed in case of BAJAJ ALLIANZ, ICICI PRUDENTIAL and SBI LIFE.

4.2.2.2 Average Position of the Ratio of SF/MCFR of Select Companies Compared to Industry Average

Table-4.6 and diagram-4.3 have been prepared from the data collected from IRDA Annual Reports (Concerned Issues) which are as follows:

Table-4.6

Company-wise Average Ratio of Shareholders' Fund to Minimum Capital for Registration (2003-04 to 2012-13)

Name of the Company	Average(2003-04 to 2013-14)	Ten Years' Average Rank
BAJAJ ALLIANZ	14.2781	1
ICICI PRUDENTIAL	13.3029	2
SBI LIFE	11.0732	3
MAX N Y	7.8545	4
Industry Average	6.0153	
HDFC STANDARD	5.5611	5
BIRLA SUNLIFE	4.8573	6
RELIANCE	3.7077	7
TATA AIA	3.5899	8
AVIVA	3.4996	9
LICI	3.1920	10
KOTAK MAHINDRA	3.0112	11
PNB MET LIFE	2.1971	12
ING VYSYA	2.0748	13

Diagram-4.3

Company-wise Average Ratio of Shareholders' Fund to Minimum Capital for Registration (2003-04 to 2012-13)

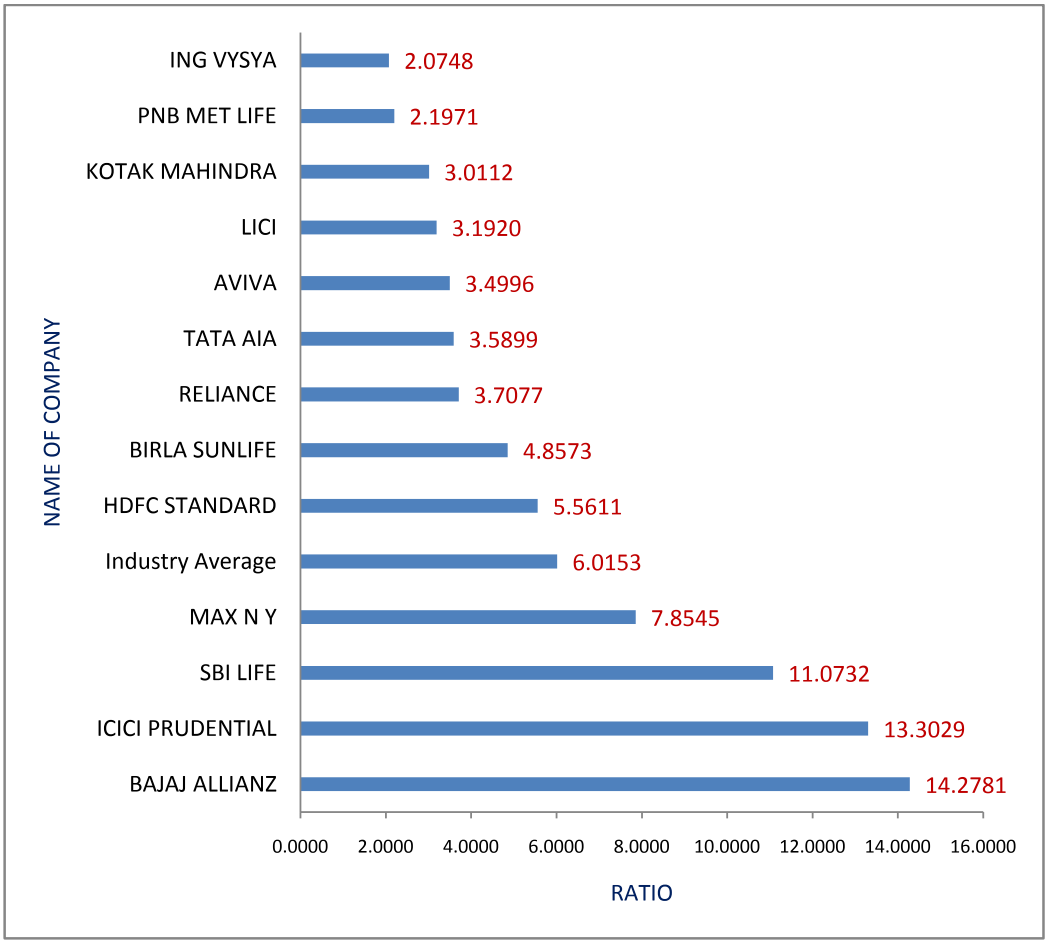


Table-4.6 and diagram-4.3 indicate the fact that the average ratios of shareholders' fund to minimum capital for registration of Indian life insurance companies are not satisfactory and are low except BAJAJ ALLIANZ, ICICI PRUDENTIAL and SBI LIFE. Only four companies i.e. BAJAJ ALLIANZ, ICICI PRUDENTIAL, SBI LIFE and MAX N Y have maintained ratios above industry average.

4.2.2.3 Year-wise Average Position of the Ratio of SF/MCFR of the Life Insurance Industry

Year-wise industry average ratios for ten years have been calculated as shown in the table-4.7 and diagram-4.4 (Based on IRDA Annual Reports, Various Issues).

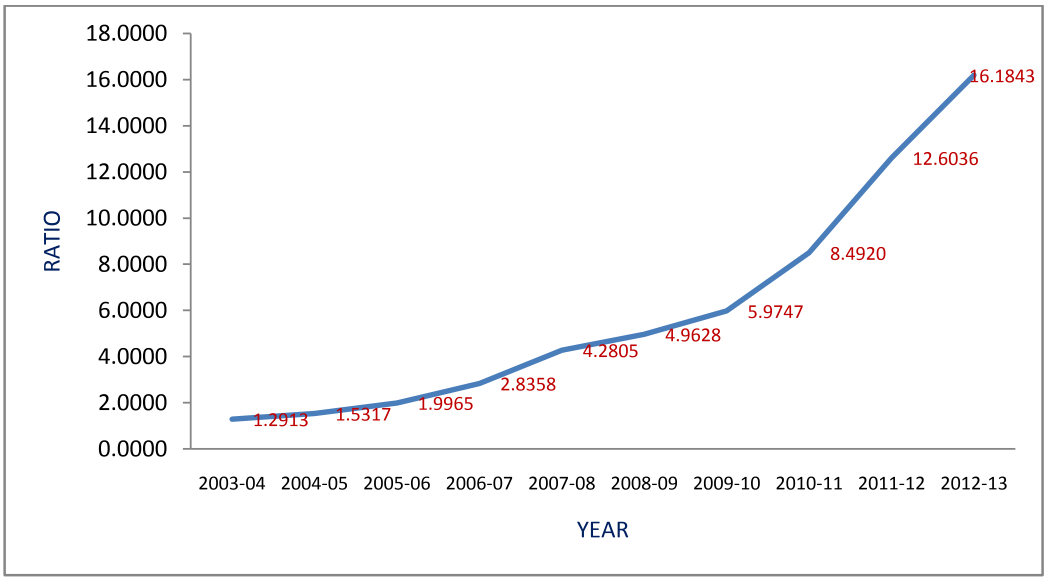
Table-4.7

Year-wise Industry Average Ratio of Shareholders' Fund to Minimum Capital for Registration (2003-04 to 2012-13)

Name of the Company	Industry Average
2003-04	1.2913
2004-05	1.5317
2005-06	1.9965
2006-07	2.8358
2007-08	4.2805
2008-09	4.9628
2009-10	5.9747
2010-11	8.4920
2011-12	12.6036
2012-13	16.1843

Diagram-4.4

Year-wise Industry Average Ratio of Shareholders' Fund to Minimum Capital for Registration (2003-04 to 2012-13)



The table-4.7 and diagram-4.4 reveal that the industry average of the ratios of shareholders' fund to minimum capital for registration has increased at a decreasing rate from 2006-07 to 2008-09 and thereafter increased at an increasing rate up to

2012-13 due to the performance of BAJAJ ALLIANZ, ICICI PRUDENTIAL and SBI LIFE. This shows that less capital has been raised by the rest of the companies under the study and thus having no effort to increase the solvency position.

4.2.2.4 Analysis of Variance Testing the Null Hypothesis H_0S_2

For testing null hypothesis H_0 S_2, table-4.8 has been prepared with the help of SPSS-17(Based on Data obtained from Annual Reports of IRDA, Various Issues).

Table-4.8

One Way ANOVA of the Ratio of Shareholders' Fund to Minimum Capital for Registration

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2165.339	12	180.445	3.843	.000
Within Groups	5493.096	117	46.950		
Total	7658.435	129			

The table-4.8 indicates that the differences in the ratio of shareholders' fund to minimum capital for registration across the select companies are significant as the p-value is 0.000. Since the value is less than 0.05, so it is concluded that there is significant difference in the ratio of shareholders' fund to minimum capital for registration across the select life insurance companies under the study at 5% significance level. Hence, the null hypothesis has been rejected.

4.2.2.5 Post Hoc Test in Identifying the Life Insurance Companies Responsible for Significant Differences in the Performance of the Ratio of SF/MCFR

For identification of life insurance companies which are responsible for differences in performance of the ratio of SF/MCFR, the Post-hoc test has been conducted with the help of SPSS-17.

Table-4.9

Post Hoc Tests-The Ratio of Shareholders' Fund to Minimum Capital for Registration

Name of Co (I)	Name of Co (J)	Mean Difference(I)-(J)	Sig.
BAJAJ ALLIANZ	AVIVA	10.77852*	.034
BAJAJ ALLIANZ	ING VYSYA	12.20329*	.007
BAJAJ ALLIANZ	KOTAK MAHINDRA	11.26690*	.020
BAJAJ ALLIANZ	PNB MET LIFE	12.08106*	.009
BAJAJ ALLIANZ	LICI	11.08610*	.025
BAJAJ ALLIANZ	TATA AIA	10.68822*	.037
BAJAJ ALLIANZ	RELIANCE	10.57044*	.041
ICICI PRUDENTIAL	PNB MET LIFE	11.10583*	.024
ING VYSYA	ICICI PRUDENTIAL	11.22806*	.021
PNB MET LIFE	ICICI PRUDENTIAL	11.10583*	.024

Examination of the Tukey HSD post hoc analysis **(Field, 2005)**[14] reveals that there are ten mean comparisons in the table-4.9 those are significantly different. All these differences are statistically significant at 0.05 levels.

The ratio of AVIVA, KOTAK MAHINDRA, TATA AIA, RELIANCE, ING VYSYA and PNB MET LIFE may be improved by injecting more and more capital to the business so that the differences across the life insurance companies may be reduced to insignificant level.

4.2.3 RATIO OF SHAREHOLDERS' FUND TO TECHNICAL RESERVE (SF/TR)

In the ratio of shareholders' fund to technical reserve, the numerator is shareholders' fund and denominator is technical reserve. Shareholders' fund means share capital, reserves and surplus etc. Technical reserve means actuarial reserves in respect of policy liabilities. A higher ratio indicates safety level of policyholders' money.

4.2.3.1 Descriptive Analysis of the Ratio of SF/TR

To make descriptive analysis of the ratio of SF/TR, 130 ratios (13 companies for 10 years) have been computed on the basis of IRDA Annual Reports (Various Issues) and shown in the following table:

Table-4.10

Descriptive Analysis of the Ratio of Shareholders Fund to Technical Reserve

Name of the Company	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Average	SD	Kolmgorov-Smirnov Z	Sig.
AVIVA	2.78	0.60	0.19	0.22	0.13	0.10	0.06	0.08	0.09	0.09	0.43	0.80	1.27	0.08
BAJAJ ALLIANZ	1.70	0.21	0.10	0.07	0.06	0.04	0.04	0.06	0.10	0.15	0.25	0.48	1.37	0.05
BIRLA SUNLIFE	0.20	0.09	0.07	0.06	0.06	0.05	0.03	0.04	0.05	0.06	0.07	0.05	1.07	0.20
HDFC STANDARD	0.45	0.16	0.14	0.09	0.08	0.07	0.03	0.02	0.03	0.04	0.11	0.12	0.85	0.46
ICICI PRUDENTIAL	0.14	0.07	0.03	0.03	0.03	0.03	0.02	0.03	0.05	0.06	0.05	0.03	0.87	0.44
ING VYSYA	2.13	0.54	0.24	0.15	0.09	0.07	0.03	0.06	0.05	0.05	0.34	0.61	1.15	0.14
KOTAK MAHINDRA	0.72	0.21	0.14	0.07	0.07	0.07	0.05	0.05	0.07	0.08	0.15	0.20	1.06	0.21
PNB MET LIFE	5.33	2.11	0.50	0.26	0.10	0.09	0.03	0.03	0.04	0.06	0.86	1.61	1.21	0.11
LICI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.87
SBI LIFE	0.58	0.43	0.24	0.11	0.11	0.08	0.05	0.04	0.05	0.05	0.18	0.18	1.05	0.22
TATA AIA	0.51	0.36	0.22	0.13	0.07	0.07	0.03	0.03	0.05	0.07	0.15	0.15	0.95	0.33
MAX N Y	0.71	0.39	0.23	0.19	0.14	0.16	0.11	0.10	0.12	0.11	0.23	0.18	0.92	0.37
RELIANCE	4.99	1.01	0.37	0.12	0.06	0.06	0.02	0.02	0.05	0.08	0.68	1.46	1.20	0.11
Average	1.56	0.47	0.19	0.12	0.08	0.07	0.04	0.04	0.06	0.07	0.27			

Note: 1) Computed by researcher from data obtained from Annual Report of IRDA (Various issues)

2) Kolmogorov- Smirnov test indicates that the data are normally distributed as the test fails to reject null hypothesis that distributions are normal since the significance level of group distributions exceeds 0.05.

The table-4.10 shows that the ratio of shareholders' fund to technical reserve is decreasing over the study period except 2011-12 and 2012-13 in which years there is a little sign of improvement. As a result, it can be interpreted that in the event of liquidation of companies, all the policyholders will not get their full money returned. However, the ratio of SF/TR is fluctuating in companies namely, PNB MET LIFE, RELIANCE, AVIVA, ING VYSYA and BAJAJ ALLIANZ in between the study periods which is evident from standard deviations.

4.2.3.2 Average Position of the Ratio of SE/TR of Select Life Insurance Companies Compared to Industry Average

Table-4.11 and diagram-4.5 have been prepared to study the position of the ratio of SF/TR of select life insurance companies in comparison with industry average(computed from the data collected from IRDA Annual Reports ,Concerned Issues) as follows:

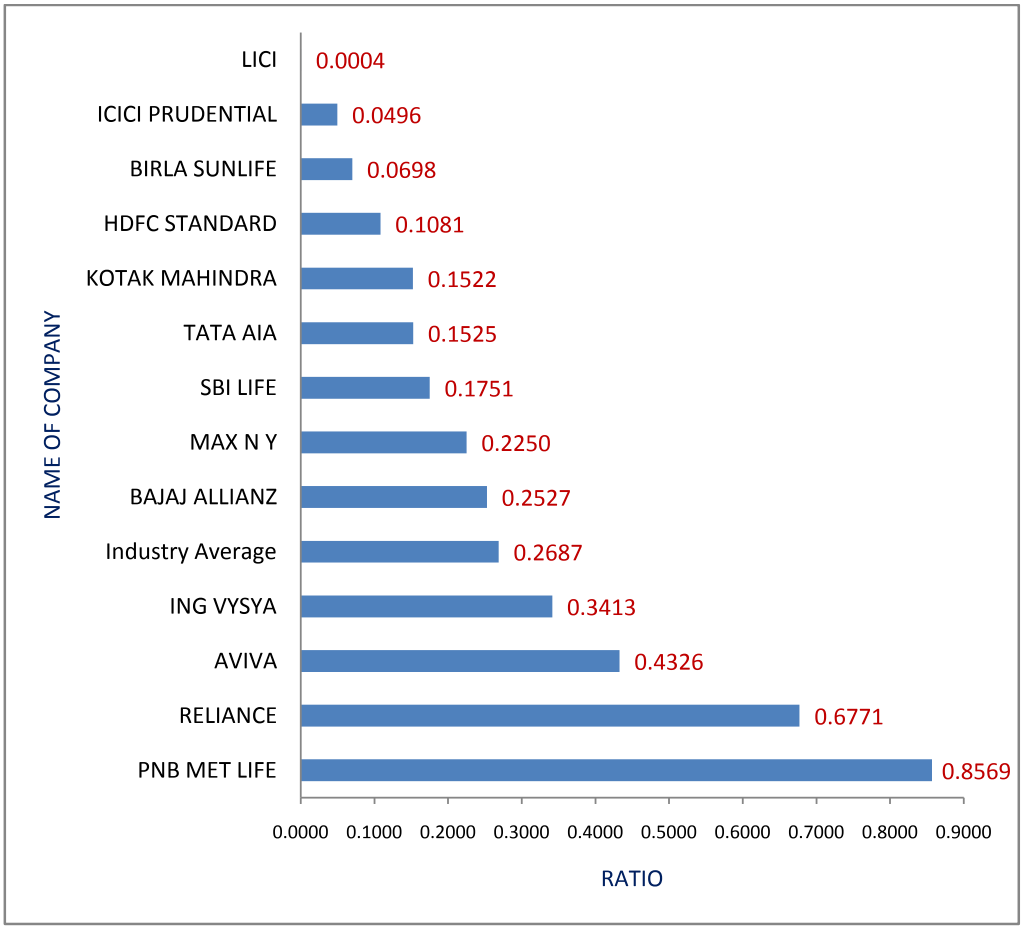
Table-4.11

Company-wise Average Ratio of Shareholders Fund to Technical Reserve (2003-04 to 2012-13)

Name of the Company	Average(2003-04 to 2013-14)	Ten Years' Average Rank
PNB MET LIFE	0.8569	1
RELIANCE	0.6771	2
AVIVA	0.4326	3
ING VYSYA	0.3413	4
Industry Average	0.2687	
BAJAJ ALLIANZ	0.2527	5
MAX N Y	0.2250	6
SBI LIFE	0.1751	7
TATA AIA	0.1525	8
KOTAK MAHINDRA	0.1522	9
HDFC STANDARD	0.1081	10
BIRLA SUNLIFE	0.0698	11
ICICI PRUDENTIAL	0.0496	12
LICI	0.0004	13

Diagram-4.5

Company-wise Average Ratio of Shareholders Fund to Technical Reserve (2003-04 to 2012-13)



The study of the table-4.11 and diagram-4.5 reveals that the average ratio of shareholders' fund to technical reserve of life insurance companies under the study are very poor except PNB MET LIFE , RELIANCE, AVIVA and ING VYSYA, the ratios of which companies are above industry average.

4.2.3.3 Year-wise Average Position of the Ratio of SF/TR of the Life Insurance Industry

Year-wise industry average ratios for ten years of 13 companies have been shown in the table-4.12 and diagram-4.6 (Based on IRDA Annual Reports, Various Issues).

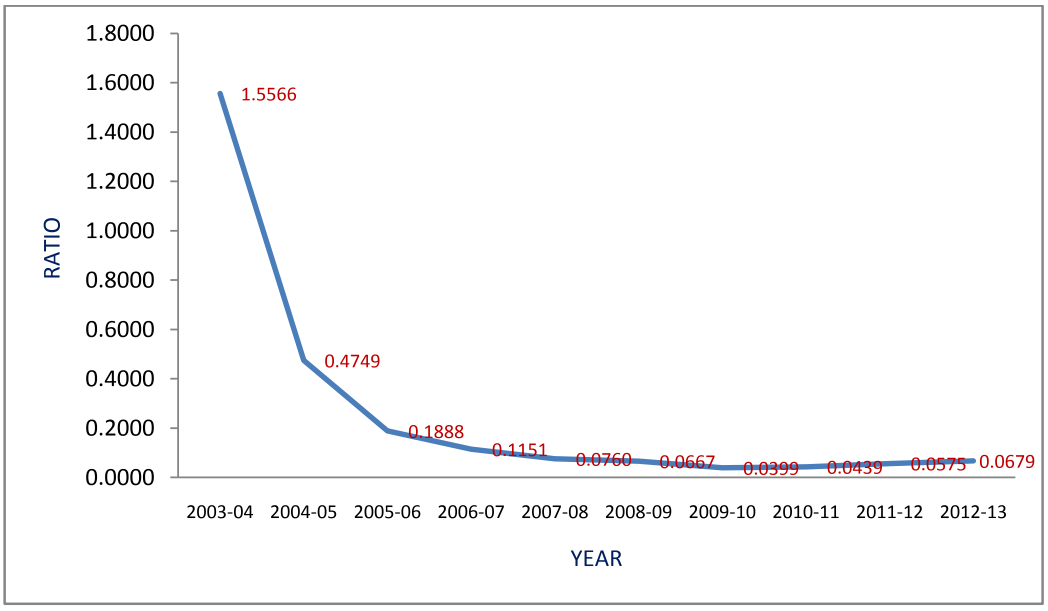
Table-4.12

Year-wise Industry Average Ratio of Shareholders Fund to Technical Reserve (2003-04 to 2012-13)

Name of the Company	Industry Average
2003-04	1.5566
2004-05	0.4749
2005-06	0.1888
2006-07	0.1151
2007-08	0.0760
2008-09	0.0667
2009-10	0.0399
2010-11	0.0439
2011-12	0.0575
2012-13	0.0679

Diagram-4.6

Year-wise Industry Average Ratio of Shareholders Fund to Technical Reserve (2003-04 to 2012-13)



From the study of table-4.12 and diagram-4.6 it is concluded that the industry average ratios of shareholders' fund to technical reserve have a decreasing trend over ten years' study period and it is not a good sign for the life insurance industry in India

since the life insurance companies in India are conducting their business at the risk of policyholders' money.

4.2.3.4 Analysis of Variance Testing the Null Hypothesis H_0S_3

To test null hypothesis $H_0 S_3$, the researcher has prepared ANOVA table-4.13 with the help of SPSS-17(Based on Data collected from Annual Reports of IRDA, Various Issues).

Table-4.13

One Way ANOVA of the Ratio of Shareholders' Fund to Technical Reserve

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.683	12	.640	1.222	.276
Within Groups	61.273	117	.524		
Total	68.955	129			

The table-4.13 indicates that the difference across the select companies in the ratio of shareholders' fund to technical reserve is not significant as the p-value is 0.276. Since the value is more than 0.05, so we conclude that there is no significant difference in the ratio of shareholders' fund to technical reserve across the select life insurance companies under the study at 5% significance level. Hence null hypothesis is accepted.

4.2.4 RATIO OF SHAREHOLDERS' FUND TO TOTAL ASSETS (SF/TA)

This ratio is calculated as shareholders' fund in the numerator and total assets in the denominator. A higher ratio indicates better solvency position. A lower ratio indicates that a large portion of the firm's assets is financed from debt capital and high degree of risk of insolvency due to stock market fluctuations.

4.2.4.1 Descriptive Analysis of the Ratio of SF/TA

In order to analyze the ratio of SF/TA with the help of descriptive statistics, the ratios for ten years of thirteen companies have been computed on the basis of concerned IRDA Annual Reports as shown in the following table-4.14:

Table-4.14

Descriptive Analysis of the Ratio of Shareholders Fund to Total Assets

Name of the Company	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Average	SD	Kolmgorov-Smirnov Z	Sig.
AVIVA	0.66	0.32	0.13	0.16	0.11	0.08	0.06	0.07	0.07	0.08	0.17	0.18	1.06	0.21
BAJAJ ALLIANZ	0.51	0.15	0.08	0.06	0.05	0.04	0.03	0.06	0.09	0.12	0.12	0.13	1.00	0.27
BIRLA SUNLIFE	0.14	0.07	0.06	0.05	0.05	0.04	0.02	0.04	0.05	0.05	0.06	0.03	0.97	0.30
HDFC STANDARD	0.28	0.12	0.11	0.07	0.07	0.06	0.03	0.02	0.03	0.03	0.08	0.08	0.76	0.61
ICICI PRUDENTIAL	0.11	0.06	0.03	0.03	0.03	0.03	0.02	0.03	0.04	0.05	0.04	0.03	0.89	0.40
ING VYSYA	0.56	0.24	0.15	0.11	0.07	0.06	0.03	0.06	0.05	0.05	0.14	0.15	0.86	0.45
KOTAK MAHINDRA	0.35	0.16	0.11	0.06	0.06	0.06	0.04	0.05	0.06	0.07	0.10	0.09	1.04	0.23
PNB MET LIFE	0.73	0.56	0.27	0.17	0.07	0.07	0.03	0.03	0.04	0.05	0.20	0.24	0.94	0.34
LICI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.81
SBI LIFE	0.33	0.27	0.17	0.09	0.10	0.07	0.04	0.04	0.04	0.05	0.12	0.10	0.93	0.36
TATA AIA	0.28	0.21	0.15	0.10	0.05	0.06	0.03	0.03	0.04	0.06	0.10	0.08	0.91	0.37
MAX N Y	0.33	0.23	0.16	0.14	0.11	0.12	0.09	0.08	0.10	0.09	0.14	0.07	0.76	0.61
RELIANCE	0.72	0.44	0.23	0.09	0.05	0.05	0.02	0.02	0.05	0.07	0.17	0.22	1.09	0.19
Average	0.39	0.22	0.13	0.09	0.06	0.06	0.04	0.04	0.05	0.06	0.11			

Note: 1) Computed by researcher from data obtained from Annual Report of IRDA (Various issues)

2) Kolmogorov- Smirnov test indicates that the data are normally distributed as the test fails to reject null hypothesis that distributions are normal since the significance level of group distributions exceeds 0.05.

The table-4.14 reveals more than 0.89 parts of the total assets of life insurance industry in India are financed from debt capital. However, the position is better for PNB MET LIFE, RELIANCE, AVIVA, ING VYSYA and MAX N Y compared to other companies under the study. The SDs of the ratio of SF/TA indicate that it is very much fluctuating in case of PNB MET LIFE, RELIANCE, AVIVA and ING VYSYA.

The indicator, shareholders' fund to total assets, clearly signals the degree of insurers falling to stock market risk and fluctuations of the economy as a result of too much dependence on outsiders' fund for which policyholders' money will be at stake.

4.2.4.2 Average position of the Ratio of SF/TA of Select Companies Compared to Industry Average

Table-4.15 and diagram-4.7 have been prepared (Based on data from IRDA Annual Reports, Various Issues) which are as follows:

Table-4.15

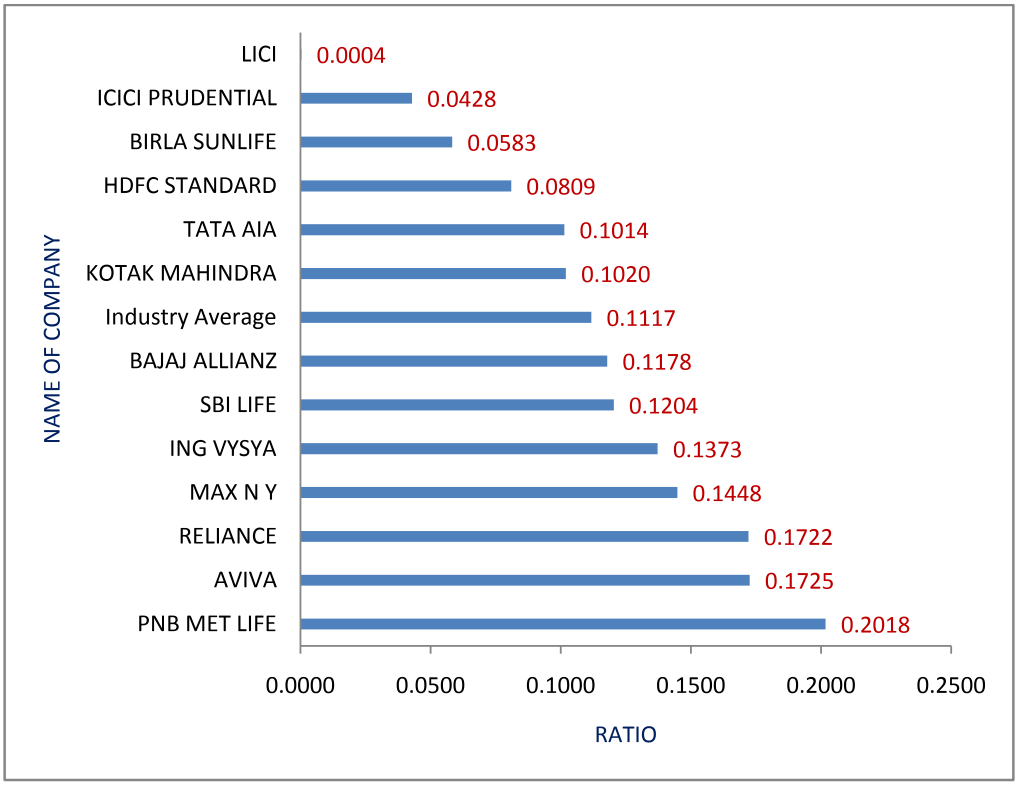
Company-wise Average Ratio of Shareholders Fund to Total Assets (2003-04 to 2012-13)

Name of the Company	Average(2003-04 to 2013-14)	Ten Years' Average Rank
PNB MET LIFE	0.2018	1
AVIVA	0.1725	2
RELIANCE	0.1722	3
MAX N Y	0.1448	4
ING VYSYA	0.1373	5
SBI LIFE	0.1204	6
BAJAJ ALLIANZ	0.1178	7
Industry Average	0.1117	
KOTAK MAHINDRA	0.1020	8
TATA AIA	0.1014	9
HDFC STANDARD	0.0809	10
BIRLA SUNLIFE	0.0583	11
ICICI PRUDENTIAL	0.0428	12
LICI	0.0004	13

Diagram-4.7

Company-wise Average Ratio of Shareholders' Fund to Total Assets

(2003-04 to 2012-13)



The table-4.15 and diagram-4.7 show that Indian life insurance companies are required to increase their ratios of shareholders' fund to total assets to more than 0.50 so that they can repay their full liabilities in case of liquidation. However, ratios of seven companies namely PNB MET LIFE, AVIVA, RELIANCE, MAX N Y, ING VYSYA, SBI LIFE and BAJAJ ALLIANZ are above industry average. As these ratios are very low and there is a need for early interference by the regulator to save the policyholders 'and creditors' money.

4.2.4.3 Year-wise Average Position of the Ratio of SF/TA of the Life Insurance Industry

Year-wise industry average ratios of thirteen life insurance companies for ten years have been calculated as shown in the table-4.16 and diagram-4.8 on the basis of data obtained from IRDA Annual Reports.

Table-4.16

Year-wise Industry Average Ratio of Shareholders Fund to Total Assets

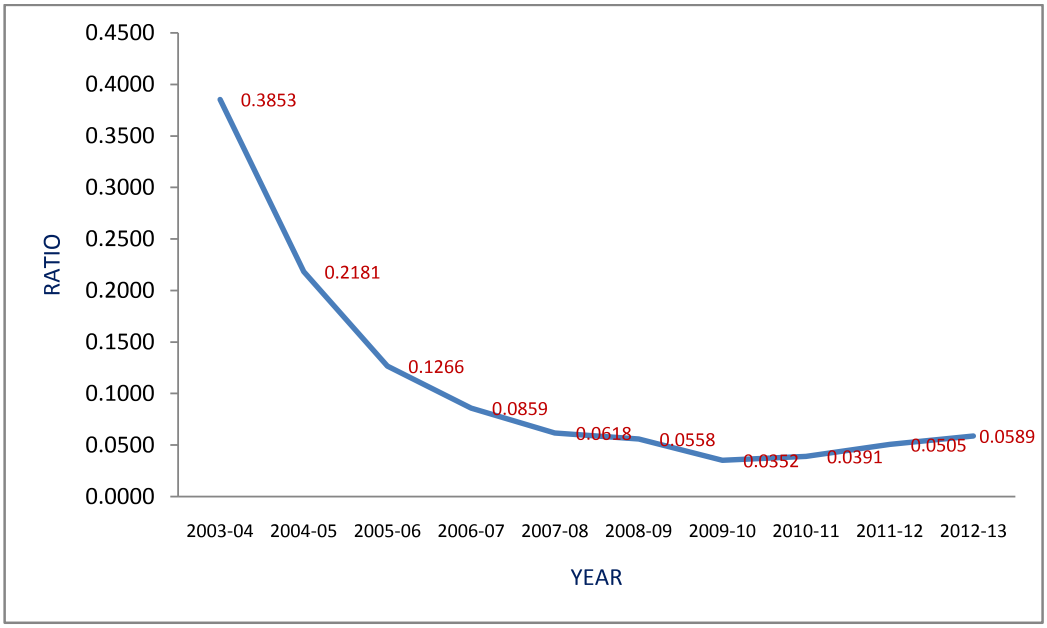
(2003-04 to 2012-13)

Name of the Company	Industry Average
2003-04	0.3853
2004-05	0.2181
2005-06	0.1266
2006-07	0.0859
2007-08	0.0618
2008-09	0.0558
2009-10	0.0352
2010-11	0.0391
2011-12	0.0505
2012-13	0.0589

Diagram-4.8

Year-wise Industry Average Ratio of Shareholders Fund to Total Assets

(2003-04 to 2012-13)



The industry average ratios of shareholders' fund to total assets as depicted in table-4.16 and diagram-4.8 indicate that this ratio is decreasing alarmingly over the study period and this may cause a series of life insurance failure in case the investment markets are behaving against the expectation of the management.

4.2.4.4 Analysis of Variance Testing the Null Hypothesis H_0S_4

To test null hypothesis $H_0 S_4$, the researcher has prepared ANOVA table-4.17 with the help of SPSS-17on the basis of data from IRDA Annual Reports.

Table-4.17

One Way ANOVA of the Ratio of Shareholders' Fund to Total Assets

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.385	12	.032	1.746	.066
Within Groups	2.148	117	.018		
Total	2.533	129			

The table-4.17 indicates that the difference across the select companies in the ratio of shareholders' fund to total assets is not significant as the p-value is 0.066. Since the value is more than 0.05, it is concluded that there is no significant difference in the ratio of shareholders' fund to total assets across the select life insurance companies under the study at 5% significance level. Hence, null hypothesis has been accepted.

4.2.5 RATIO OF FIXED ASSETS TO TOTAL ASSETS (FA/TA)

Fixed asset is placed in the numerator and total asset is placed in the denominator in calculating the ratio of fixed assets to total assets. Fixed assets include goodwill, intangibles (related to software), freehold land, leasehold property, building, furniture and fittings, information technology equipment, vehicles, Office equipment etc. Higher the ratio better is the borrowing power in case of pre-bankruptcy position.

4.2.5.1 Descriptive Analysis of the Ratio of FA/TA

For the purpose of descriptive analysis of the ratio of FA/TA, the researcher has ascertained all the ratios of thirteen companies for ten years (From IRDA Annual Reports) which is presented in the table-4.18 as follows.

Table-4.18

Descriptive Analysis of the Ratio of Fixed Assets to Total Assets

Name of the Company	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Average	SD	Kolmgorov-Smirnov Z	Sig.
AVIVA	0.047	0.029	0.013	0.013	0.017	0.013	0.007	0.004	0.003	0.003	0.015	0.013	0.815	0.520
BAJAJ ALLIANZ	0.088	0.028	0.010	0.007	0.008	0.009	0.005	0.004	0.006	0.006	0.017	0.025	1.303	0.067
BIRLA SUNLIFE	0.042	0.021	0.015	0.013	0.009	0.009	0.004	0.002	0.002	0.001	0.012	0.012	0.677	0.750
HDFC STANDARD	0.091	0.067	0.020	0.014	0.014	0.013	0.005	0.009	0.008	0.007	0.025	0.028	1.134	0.152
ICICI PRUDENTIAL	0.030	0.015	0.007	0.013	0.011	0.010	0.005	0.003	0.003	0.002	0.010	0.008	0.599	0.866
ING VYSYA	0.150	0.058	0.051	0.027	0.013	0.008	0.003	0.002	0.001	0.001	0.031	0.044	0.814	0.521
KOTAK MAHINDRA	0.092	0.036	0.015	0.012	0.013	0.013	0.008	0.005	0.004	0.003	0.020	0.026	1.188	0.119
PNB MET LIFE	0.068	0.104	0.059	0.018	0.025	0.035	0.017	0.009	0.004	0.002	0.034	0.031	0.646	0.799
LICI	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.002	0.002	0.003	0.000	0.585	0.883
SBI LIFE	0.015	0.014	0.013	0.008	0.004	0.005	0.008	0.007	0.005	0.005	0.008	0.004	0.772	0.591
TATA AIA	0.046	0.055	0.029	0.014	0.023	0.028	0.011	0.004	0.002	0.004	0.022	0.017	0.487	0.972
MAX N Y	0.161	0.093	0.064	0.042	0.038	0.051	0.025	0.010	0.007	0.006	0.050	0.045	0.592	0.875
RELIANCE	0.064	0.059	0.030	0.039	0.016	0.006	0.001	0.000	0.000	0.001	0.022	0.024	0.726	0.668
Average	0.069	0.045	0.025	0.017	0.015	0.016	0.008	0.005	0.004	0.003	0.021			

Note: 1) Computed by researcher from data obtained from Annual Report of IRDA (Various issues)

2) Kolmogorov- Smirnov test indicates that the data are normally distributed as the test fails to reject null hypothesis that distributions are normal since the significance level of group distributions exceeds 0.05.

The table-4.18 reveals that the average ratio of fixed assets to total assets is highest in case of MAX N Y i.e., 0.050 and lowest in case of LICI which is 0.003. The position of PNB MET LIFE, ING VYSYA and HDFC STANDARD is moderately good compared to other companies. The researcher also finds highest variations in the ratio in between the study periods in ING VYSYA, MAX N Y, PNB MET LIFE, HDFC STANDARD and BAJAJ ALLIANZ.

The analysis reveals that Indian life insurance companies are not interested in fixed assets formation. Rather, they are interested to invest in intangible assets.

4.2.5.2 Average position of the Ratio of FA/TA of Select Life Insurance Companies Compared to Industry Average

Table-4.19 and diagram-4.9 have been presented below (Based on data from IRDA Annual Reports, Various Issues) for analysis of average position.

Table-4.19

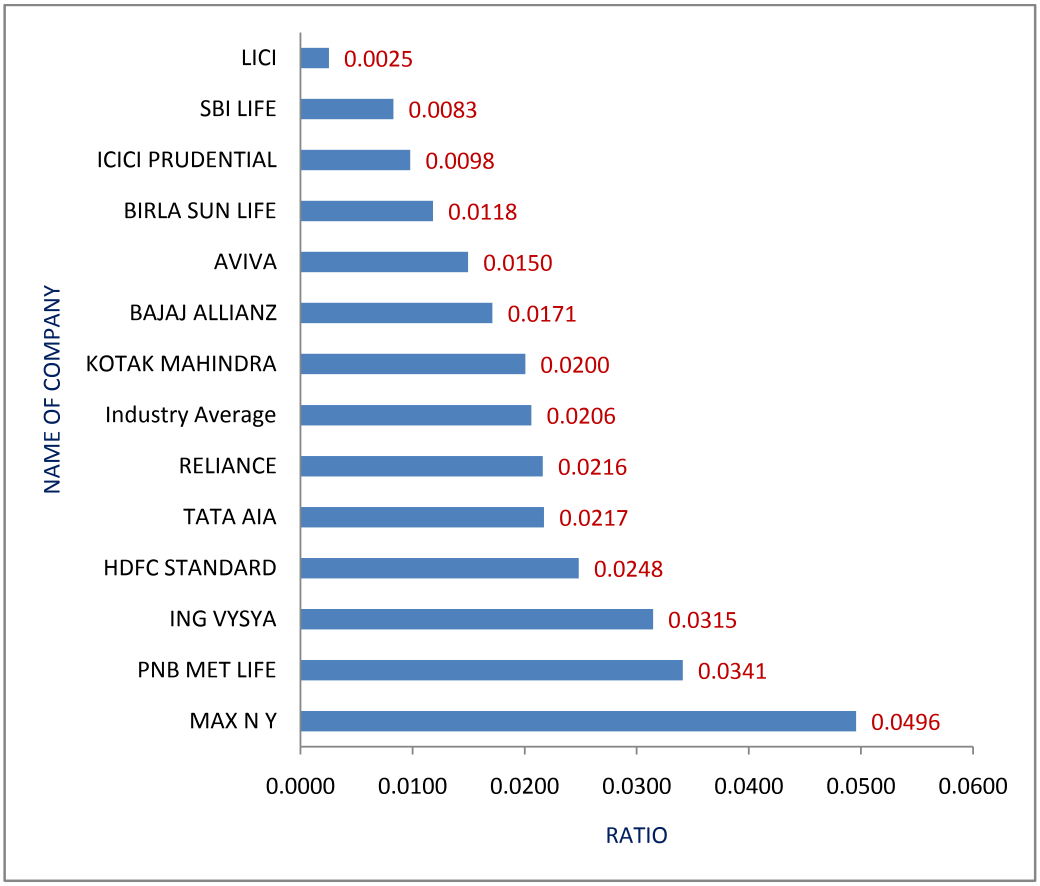
Company-wise Average Ratio of Fixed Assets to Total Assets
(2003-04 to 2012-13)

Name of the Company	Average(2003-04 to 2013-14)	Ten Years' Average Rank
MAX N Y	0.0496	1
PNB MET LIFE	0.0341	2
ING VYSYA	0.0315	3
HDFC STANDARD	0.0248	4
TATA AIA	0.0217	5
RELIANCE	0.0216	6
Industry Average	0.0206	
KOTAK MAHINDRA	0.0200	7
BAJAJ ALLIANZ	0.0171	8
AVIVA	0.0150	9
BIRLA SUNLIFE	0.0118	10
ICICI PRUDENTIAL	0.0098	11
SBI LIFE	0.0083	12
LICI	0.0025	13

Diagram-4.9

Company-wise Average Ratio of Fixed Assets to Total Assets

(2003-04 to 2012-13)



The table-4.19 and diagram-4.9 indicate that only MAX N Y's tangibility ratio is higher compared to rest of the companies under the study and all other companies are not interested in investing in fixed assets. It appears from the above table and diagram that six companies namely MAX N Y, PNB MET LIFE, HDFC STANDARD, ING VYSYA, TATA AIA and RELIANCE maintain the tangibility ratios above industry average.

4.2.5.3 Year-wise Average Position of the Ratio of FA/TA of Life Insurance Industry

Year-wise industry average ratios have been calculated and shown in the table-4.20 and diagram-4.10 for analysis (Based on IRDA Annual Reports, Various Issues).

Table-4.20

Year-wise Industry Average Ratio of Fixed Assets to Total Assets

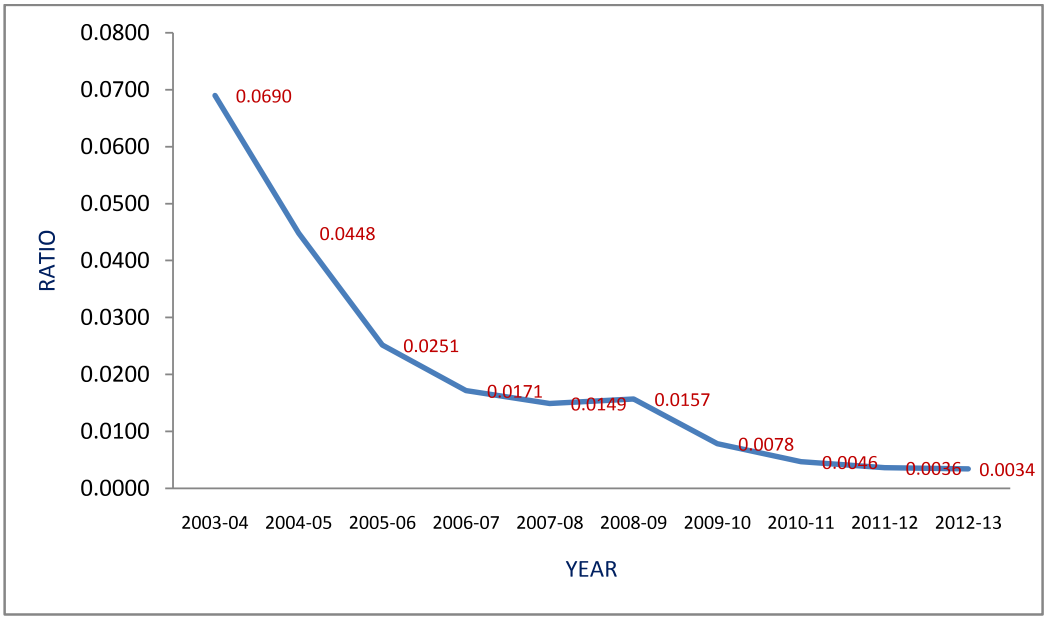
(2003-04 to 2012-13)

Name of the Company	Industry Average
2003-04	0.0690
2004-05	0.0448
2005-06	0.0251
2006-07	0.0171
2007-08	0.0149
2008-09	0.0157
2009-10	0.0078
2010-11	0.0046
2011-12	0.0036
2012-13	0.0034

Diagram-4.10

Year-wise Industry Average Ratio of Fixed Assets to Total Assets

(2003-04 to 2012-13)



A study of table-4.20 and diagram-4.10 makes it clear that the average tangibility ratio of the industry over the study period is decreasing in an increasing rate which means Indian life insurance industry is interested in fixed assets investment.

4.2.5.4 Analysis of Variance for Testing Null Hypothesis H_0S_5

For testing null hypothesis H_0 S_5, the researcher has calculated table-4.21 with the help of SPSS-17(Based on Data obtained from Annual Reports of IRDA, Various Issues).

Table-4.21

One Way ANOVA of the Ratio of Fixed Assets to Total Assets

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.019	12	.002	2.208	.015
Within Groups	.083	117	.001		
Total	.102	129			

The above table indicates that the differences across the select companies in the ratio of fixed assets to total assets are significant as the p-value is 0.015. Since the value is less than 0.05, so it is found that there are significant differences in the ratio of fixed assets to total assets across the select life insurance companies under the study at 5% significance level. Hence, null hypothesis has been rejected.

4.2.5.5 Post Hoc Test in Identifying the Life Insurance Companies Responsible for Significant Differences in the Performance of the Ratio of FA/TA

To identify life insurance companies which are responsible for differences in performance of the ratio of FA/TA, the Post-hoc test has been conducted with the help of SPSS-17 on the basis of data from which ANOVA has been calculated as shown in the table-4.22.

Table-4.22

Post Hoc Tests-The Ratio of Fixed Assets to Total Assets

Tukey HSD

Name of Co (I)	Name of Co (J)	Mean Difference(I)-(J)	Sig.
MAX N Y	LICI	.04702*	.008
MAX N Y	SBI LIFE	.04128*	.039

Examination of the Tukey HSD post hoc analysis reveals that there are two mean comparisons as above that are significantly different. First, we find that there is an average difference of 0.04702 in the ratio of fixed assets to total assets of MAX N Y and LICI. Second, there is average difference of 0.04128 in the ratio of fixed assets to total assets of SBI LIFE and MAX N Y.

However, the ratio of fixed assets to total assets of SBI LIFE and LICI may be improved by investing more funds to profitable fixed assets instead of intangible assets so that the differences across the select companies may be brought into insignificant level.

4.3 Comprehensive Ranking Analysis

In evaluating the overall solvency position, selected solvency ratios are assigned ranks in a way that largest ratio gets first rank and smallest ratio as last rank. Finally, all the rank scores are combined to form a single score and ultimate rank of overall solvency of companies are found out for each study period as lowest score being the first and the higher score being the last. Kruskal-Wallis statistical test **(Cunningham and Aldrich, 2012)**[15] has also been applied to find out significant differences across the select life insurance companies in respect of rank scores of overall solvency position. The following null hypothesis H_0S_6 has been tested:-

"There is no significant difference in overall solvency performance across the life insurance companies in India''.

Table-4.23

Rank Scores of Overall Solvency Performance

Name of the Company	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	Total Scores	Ranks
AVIVA	22	26	41	20	15	21	19	18	26	25	233	2
BAJAJ ALLIANZ	22	39	44	42	30	44	26	20	10	6	283	3
BIRLA SUNLIFE	52	54	49	49	38	42	44	36	31	40	435	12
HDFC STANDARD	37	41	35	35	28	29	39	43	44	41	372	9
ICICI PRUDENTIAL	48	49	52	45	39	42	39	38	38	34	424	11
ING VYSYA	22	23	28	26	37	44	51	34	46	59	370	8
KOTAK MAHINDRA	34	44	40	52	39	36	23	26	27	28	349	7
PNB MET LIFE	19	14	18	18	30	20	38	41	49	47	294	4
LICI	58	59	58	58	55	60	59	58	59	60	584	13
SBI LIFE	40	26	21	32	39	36	21	28	35	36	314	5
TATA AIA	47	30	25	26	35	30	28	44	41	31	337	6
MAX N Y	29	27	22	18	21	11	8	8	9	13	166	1
RELIANCE	25	23	22	34	49	40	60	61	40	35	389	10

Source: *Computed from Annual Reports of IRDA, Various Issues*

The table-4.23 reveals that overall solvency performance ranks of the selected life insurance companies under the study period of ten years. The table shows that MAX N Y, AVIVA, BAJAJ ALLIANZ, PNB MET LIFE and SBI LIFE have secured Ist, 2nd, 3rd, 4th and 5th position respectively for overall solvency performance during the study period of ten years taken together. The table also shows that ICICI PRUDENTIAL, BIRLA SUN LIFE and LICI have been ranked 11th, 12th and 13th position respectively for ten years' overall solvency performance. The other companies are ranked in between the two groups discussed above for overall solvency performance as categorized in the table-4.23.

Kruskal-Wallis statistical test results to find out significant differences across the select life insurance companies in respect of rank scores of overall solvency position have been shown in the following table:

Table-4.24

Kruskal-Wallis Test of Rank Scores of Overall Solvency Performance

Test Statistics	
Chi-Square	63.888
df	12
Asymp. Sig.	.000

In the table-4.24, the Kruskal –Wallis test shows that the significance value is .000 and this value is less than .05. So the conclusion is that there is significant difference in overall solvency performance across the life insurance companies in India. So, the null hypothesis is rejected.

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