Chapter III

Operating Efficiency Analysis

3.1 Introduction

Operation of life insurance business is a very unique and dynamic process, here operating cycle is reversed, and payment is received before a service is provided. The received payment is known as gross premium which is the major source of income for the life insurance companies. Out of gross premium, companies pay commission and operating expenses of the business, make provisions for the future, and invest as per IRDA guidelines. In the event of loss of life, companies pay benefits to the policyholders in terms of claims.

It implies that for better financial management practices, understanding and analysis of operating efficiency is very essential. However, before measuring operating efficiency, it becomes very pertinent to study various factors or parameters related to business operation of a life insurance company. With this consideration, the present chapter is divided into two parts, the first part mainly emphasises on growth of major parameters of business operation and second part focuses on operating efficiency.

Part I

It has covered a detailed analysis of various aspects of operations such as Individual Business in force (Number of policies issued), New Business Premium (Including Single Premium), Renewal Premium, Commission Paid, Operating Expenses, Benefits Paid (Net), Income from Investment and surplus (Rajput & Upadhyay, 2015).

3.2 Individual Business in force (Number of policies issued)

Number of policies issued indicates business of insurance also known as business in force. Insurers are continuously putting efforts in increasing their business. Business in force includes policies added during the year (i.e. new policies issued, old policies reinstated/revived) as well as adjustment of deleted policies (i.e. policy terminations by death, maturity, lapse, surrenders or cancellation) and opening business in force. Below table 3.1 shows individual business in force of non-linked and linked business.

Table 3.1 Growth of Individual Business in force (Policies in '000)

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	2098	1711	5355	571	1401	1809	6184	1454
	(-6.71)	(-19.37)	(21.48)	(15.59)	(12.17)	(9.17)	(69.29)	(81.07)
2008-09	2744	2575	6449	951	2423	2642	7542	3313
	(30.79)	(50.50)	(20.43)	(66.55)	(72.95)	(46.05)	(21.96)	(127.85)
2009-10	3244	2977	6321	1081	3312	3879	8277	4633
	(18.22)	(15.61)	(-1.98)	(13.67)	(36.69)	(46.82)	(9.75)	(39.84)

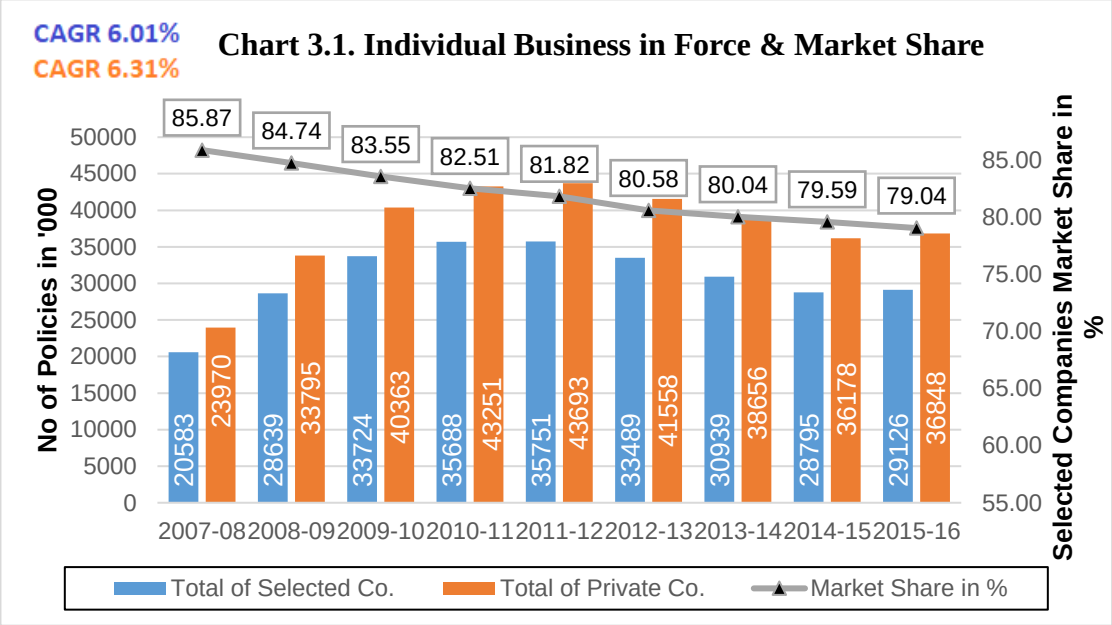
Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2010-11	3588 (10.60)	3359 (12.83)	6251 (-1.11)	1150 (6.38)	2997 (-9.51)	4477 (15.42)	8587 (3.75)	5279 (13.94)
2011-12	3833 (6.83)	3511 (4.53)	6068 (-2.93)	1173 (2.00)	2943 (-1.80)	4758 (6.28)	8307 (-3.26)	5158 (-2.29)
2012-13	4040 (5.40)	3550 (1.11)	5577 (-8.09)	1123 (-4.26)	2506 (-14.85)	4606 (-3.19)	7222 (-13.06)	4865 (-5.68)
2013-14	4218 (4.41)	3625 (2.11)	5121 (-8.18)	1074 (-4.36)	2232 (-10.93)	4798 (4.17)	5853 (-18.96)	4018 (-17.41)
2014-15	4193 (-0.59)	3668 (1.19)	4696 (-8.30)	1085 (1.02)	2008 (-10.04)	5187 (8.11)	4774 (-18.43)	3184 (-20.76)
2015-16	4617 (10.11)	3755 (2.37)	4630 (-1.41)	1219 (12.35)	1895 (-5.63)	5634 (8.62)	4402 (-7.79)	2974 (-6.60)
2016-17	4997 (8.24)	3908 (4.07)	4699 (1.50)	1381 (13.29)	1870 (-1.31)	6032 (7.06)	4080 (-7.31)	2851 (-4.15)
Average	**3757**	**3264**	**5517**	**1081**	**2359**	**4382**	**6523**	**3773**
CV %	**23.20**	**20.60**	**13.06**	**19.53**	**25.25**	**29.67**	**26.12**	**32.59**
CAGR %	**8.31**	**6.30**	**0.64**	**10.83**	**4.12**	**13.79**	**1.11**	**13.51**

Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: The percentage growth over the previous year is shown in brackets.

HDFC has reported increased number of policies throughout the study period but it has been observed that the growth rate was not constant. In the year 2007-08 and 2014-15 company has reported slightly negative growth rate. Though, CAGR for the study period (ten years) has been reported 8.31% which is the indicator of increased policies throughout the study period.

MAX has also reported increase in number of policies issued. Throughout the study period it has recorded positive growth rate except first year 2007-08. Thereafter, in the year 2008-09 maximum growth rate has been observed at 50.50% but by the end of the year 2016-17 it has stabilised at 4.07%. Its CAGR has been noted at 6.30%. On the other hand, CAGR of the ICICI has been noted only 0.64%, but its average policy issued was 5,517 thousand during study period with only 13.06% of variance, it represents comparatively good customer retention practices in terms of quantity and consistency. Kotak has recorded good growth rate in the initial two years of the study. Later, it has decreased and in the year 2012-13 & 2013-14 it has been noted negative. Although, its CAGR has noted 10.83%. Birla has maintained positive growth rate in the first three years & subsequently it has tumbled and undergone negative growth rate in the last six years of the study period. Its CAGR was 4.12%. SBI has reported a positive growth rate during the study period except for the year 2012-13. Its CAGR has been noted comparatively highest 13.79% which indicates significant growth in policies issued. Bajaj has reported a downward fall after 2007-08, which continuously

decreased significantly and in the last six years it has posted negative growth rate. Its CAGR was only 1.11%. Reliance has reported higher CAGR of 13.51% but after 2011-12 it has reported significant down fall.



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded

Above chart 3.1 shows comparative view of individual business in force for selected companies viz a viz that of all private companies. Although, market share of selected companies has decreased from 85.87% to 79.04% during the period of study, the majority portion of individual business in force has been captured by selected companies which is an indicator of market leadership of selected companies. In other words, selected eight companies have acquired an average 80% of market share in terms of individual business in force.

General Observation of Individual Business in Force

Due to the new regulations of IRDA in the year 2006-07, most of the companies have introduced a revised version of group as well as individual unit link plans during the year 2007-08 to 2009-10. Afterwards, the growth rate in the private sector has significantly declined over the years and customers have adopted a cautious attitude. Insurance companies have started offering different products in the name of riders instead of different policies. Thus, during the study period growth in number of policies was adversely affected due to the regulatory action of IRDA. However, the growth of the life insurance business depends on the volume of the policy and premium not on the basis of number of policies issued.

3.3 Premium Income

Premium income is the primary source of income for the life insurance companies, from which expenses are incurred, benefits are paid ad investments are made. Premium income is divided into two parts.

1. New Business Premium (Including Single Premium),

2. Renewal Premium.

Below Table 3.2 depicts growth in New Business Premium & Table 3.3 depicts growth in Renewal Premium from 2007-08 to 2016-17.

3.3.1 New Business Premium

Table 3.2 Growth in New Business Premium **Rs. In Lakh**

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	268537 (62.86)	159783 (75.18)	803475 (55.65)	110662 (79.96)	196501 (122.61)	479282 (86.94)	667448 (55.12)	275105 (195.14)
2008-09	265111 (-1.28)	184291 (15.34)	681183 (-15.22)	134303 (21.36)	282085 (43.55)	538664 (12.39)	449143 (-32.71)	351398 (27.73)
2009-10	325751 (22.87)	184908 (0.33)	633392 (-7.02)	133398 (-0.67)	296001 (4.93)	704074 (30.71)	445110 (-0.90)	392078 (11.58)
2010-11	405933 (24.61)	206139 (11.48)	786214 (24.13)	125314 (-6.06)	208030 (-29.72)	758958 (7.80)	346582 (-22.14)	303494 (-22.59)
2011-12	385747 (-4.97)	190172 (-7.75)	444109 (-43.51)	116427 (-7.09)	192617 (-7.41)	653132 (-13.94)	271731 (-21.60)	180929 (-40.38)
2012-13	443607 (15.00)	189934 (-0.13)	480862 (8.28)	118810 (2.05)	183651 (-4.65)	518288 (-20.65)	298790 (9.96)	137657 (-23.92)
2013-14	403893 (-8.95)	226160 (19.07)	375959 (-21.82)	127181 (7.05)	169749 (-7.57)	506548 (-2.27)	259203 (-13.25)	193399 (40.49)
2014-15	549210 (35.98)	257260 (13.75)	533213 (41.83)	154018 (21.10)	193794 (14.17)	552916 (9.15)	270210 (4.25)	206969 (7.02)
2015-16	648722 (18.12)	288171 (12.02)	676575 (26.89)	220966 (43.47)	222031 (14.57)	710658 (28.53)	288452 (6.75)	155833 (-24.71)
2016-17	869636 (34.05)	366635 (27.23)	786330 (16.22)	284974 (28.97)	253426 (14.14)	1014386 (42.74)	329026 (14.07)	105158 (-32.52)
Average	**456615**	**225345**	**620131**	**152605**	**219789**	**643691**	**362570**	**230202**
CV %	**41.02**	**27.83**	**24.83**	**36.88**	**19.62**	**25.36**	**35.09**	**41.55**
CAGR%	**18.09**	**14.93**	**4.30**	**16.57**	**11.12**	**14.74**	**-2.65**	**1.21**

Source: Computed from Handbook on Indian Insurance Statistics of different years

Note: The percentage growth over the previous year is shown in brackets
First year Life Insurance Premium includes single premium

HDFC has recorded highest growth rate in initial year 2007-08 with 62.86%. In the subsequent year it has declined & in the year 2008-09, 2011-12 & 2013-14 company has recorded negative growth rate. Although, in the last three years of the study shows good growth in new business premium. Its CAGR for the ten years has been noted comparatively highest 18.09%. MAX has recorded high growth rate of 75.18% in the

year 2007-08. Except for the year 2011-12 & 2012-13, company has positively forced in new business premium and CAGR for the ten years has been noted 14.93%.

ICICI has recorded highest growth rate 55.65% in the year 2007-08. During the study period it has posted negative growth rate in the year 2008-09, 2009-10, 2011-12 & 2013-14. However, company's CAGR has been noted 4.03% and average new business premium has been noted at Rs. 6,20,131 lakh which indicates good earning capacity of the company.

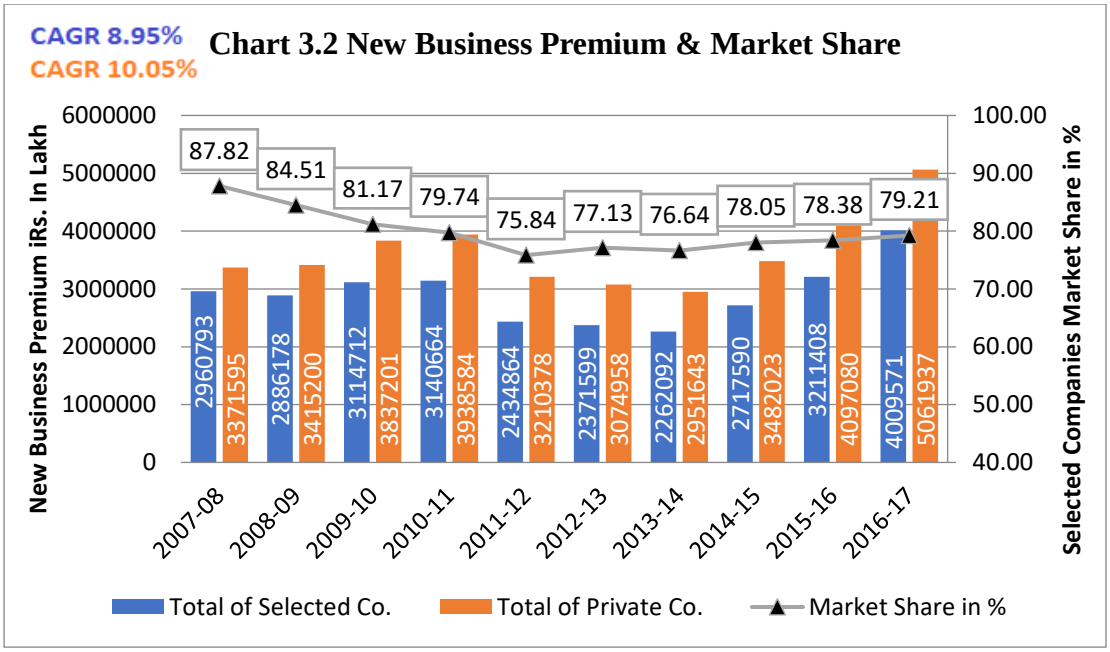
Kotak has reported high growth rate in the year 2007-08 with 79.96%. Since then, growth rate has significantly declined and in some of the years it has been reported negative also. During the last two years it has picked up momentum in terms of premium collection. CAGR of the Kotak has been noted 16.57% for the ten years.

Birla has reported highest growth rate 122.61% in the year 2007-08, thereafter it has declined significantly. It has been observed that company has faced a tough situation from the year 2010-11 to 2013-14 where in growth rate has decimated to negative. Its CAGR has been noted 11.12%.

SBI has reported a robust growth 86.94% in the year 2007-08. Except for the period 2011-12 to 2013-14, the company has registered a positive growth rate. In the year 2007-08 new business premium was Rs.4,79,282 lakhs which in the year 2016-17 were raised to Rs.10,14,386 lakhs. Its CAGR has been noted high 14.74%.

Bajaj has reported 55.12% growth rate in the year 2007-08, thereafter it has declined significantly. It has been observed that company has faced trouble in generation of new business premium for the year 2008-09 to 2011-12. Its CAGR was considerably low at -2.65% for the ten years.

Reliance has reported 195.14% growth rate in the year 2007-08 which was highest growth rate among all the selected companies. From the year 2007-08 to 2016-17, it has declined significantly and the year 2010-11, 2011-12, 2012-13, 2015-16 and 2016-17 reported negative growth rate. CAGR has been noted 1.21% but contrary with the variance of 41.55%, which indicated that growth in the new business premium was not consistent during the study period.



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded.

Above chart 3.2 shows comparative view of new business premium for selected companies viz a viz that of all private companies. CAGR of selected companies has been observed 8.95% whereas private companies as a whole was 10.05%. Although, the market share of selected companies has decreased from 87.82% to 79.21%, the major portion of new business premium has been captured by selected companies which is an indicator of market leadership of selected companies.

3.3.2 Renewal Premium

Table 3.3 Growth in Renewal Premium **Rs. In Lakh**

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	217319 (80.05)	111677 (89.87)	552631 (100.89)	58452 (63.93)	130718 (46.22)	82932 (127.43)	305083 (192.65)	47439 (553.88)
2008-09	291358 (34.07)	201435 (80.37)	854439 (54.61)	100016 (71.11)	175095 (33.95)	182546 (120.12)	613309 (101.03)	141856 (199.03)
2009-10	374759 (28.62)	301146 (49.50)	1019483 (19.32)	153407 (53.38)	254565 (45.39)	306329 (67.81)	696861 (13.62)	268412 (89.21)
2010-11	494484 (31.95)	375124 (24.57)	1001849 (-1.73)	172237 (12.27)	359677 (41.29)	535571 (74.84)	614413 (-11.83)	353621 (31.75)
2011-12	634493 (28.31)	448881 (19.66)	958049 (-4.37)	177316 (2.95)	395919 (10.08)	660242 (23.28)	476649 (-22.42)	368833 (4.30)
2012-13	688661 (8.54)	473936 (5.58)	872962 (-8.88)	158968 (-10.35)	337979 (-14.63)	526715 (-20.22)	390480 (-18.08)	266882 (-27.64)
2013-14	802397 (16.52)	501694 (5.86)	866906 (-0.69)	142898 (-10.11)	313556 (-7.23)	567312 (7.71)	325111 (-16.74)	234941 (-11.97)
2014-15	933780 (16.37)	559902 (11.60)	997449 (15.06)	149787 (4.82)	329528 (5.09)	733795 (29.35)	331520 (1.97)	255139 (8.60)

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2015-16	982576 (5.23)	633445 (13.13)	1239864 (24.30)	176202 (17.64)	335940 (1.95)	871878 (18.82)	301279 (-9.12)	283979 (11.30)
2016-17	1074913 (9.40)	711405 (12.31)	1449070 (16.87)	228981 (29.95)	318970 (-5.05)	1087127 (24.69)	289306 (-3.97)	297524 (4.77)
Average	**649474**	**431865**	**981270**	**151826**	**295195**	**555445**	**434401**	**251863**
CV%	**46.47**	**44.77**	**27.49**	**33.27**	**35.62**	**51.19**	**42.00**	**47.93**
CAGR%	**24.44**	**28.31**	**18.08**	**20.44**	**13.56**	**40.42**	**10.75**	**44.97**

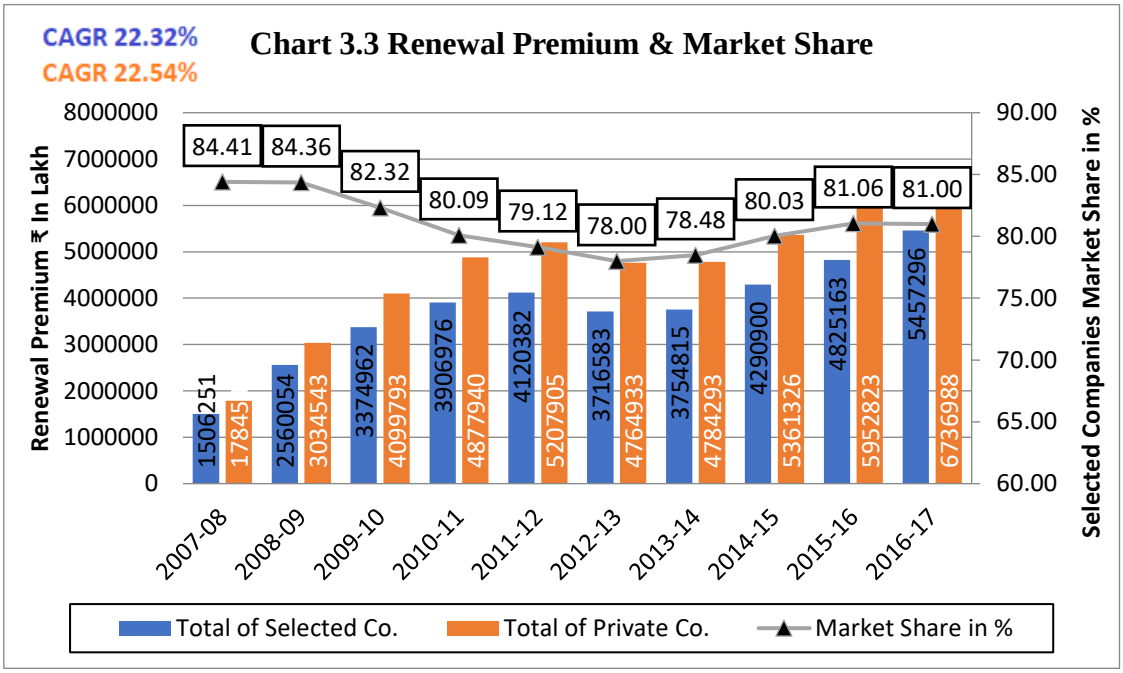
Source: Computed from Handbook on Indian Insurance Statistics of different years

Note: The percentage growth over the previous year is shown in brackets

HDFC has recorded highest growth rate of 80.05% in the year 2007-08, subsequently it has declined and in the year 2016-17 touched lowest at 9.40% growth rate. Although, its CAGR has been noted 24.44% and its average renewal premium was relatively highest among the selected companies at Rs.6,49,474 lakhs with variance of 46.47%.

MAX has reported decent growth in first three years study from 2007-08 to 2009-10. Thereafter, it has been declined and reached at lowest rate 5.58% in the year 2012-13. Subsequently, it has accelerated momentum of growth in last two years of the study. Its CAGR has been noted 28.31%. ICICI has reported exceptionally highest growth rate 100.89% in the year 2007-08, but throughout the study period the growth rate has been observed fluctuating. CAGR has been recorded 18.08% with low variance 27.49%. Kotak has reported positive growth rate with highest 71.11% in the year 2008-09 & lowest 2.95% in the year 2011-12. Later, negative growth rate has been observed in the year 2012-13 & 2013-14. CAGR for the study period has been noted 20.44% with the variance 33.27%. Birla has reported 46.22% growth rate in the year 2007-08, subsequently it has declined and reported negative growth rate also in the year 2012-13 to 2013-14. CAGR has been noted at 13.56% for the study period.

SBI has reported striking growth rate in the year 2007-08 & 2008-09. Throughout the study period company has posted positive growth rate except for the year 2012-13 and its CAGR has been noted comparatively highest at 40.42%. Bajaj has reported healthy growth in the years 2007-08 to 2009-10. Subsequently, it has recorded negative growth rate. CAGR for the study period has been noted at 10.75%. Reliance has reported comparatively highest growth rate 553.88% in the year 2007-08. Later on, it has decreased and posted negative growth also. Its CAGR has been noted 44.97% with the variance of 44.93%, which indicates high fluctuations in renewal premium.



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded.

Above chart 3.3 depicts comparative view of renewal premium for selected companies viz a viz that of all private companies. CAGR of selected companies has been observed almost equal to that of all private companies' growth rate. However, market share of selected companies in terms of renewal premium has been almost around 80.00%. It can be noted that the selected companies have constantly captured the market in terms of renewal premium.

General observation of Premium Income

During the period 2005-07 IRDA has issued guidelines on group insurance and unit linked life insurance products. Accordingly, in the initial period of the study it has been found that all private companies introduced a new and revised version of the group as well as individual unit linked plans to conform to the new guidelines issued by the IRDA. They offered both conventional and Unit Linked plans to customers leading to a huge increase in new business premium in the initial study period and thereby renewal premium has also increased. After 2008-09, the growth rate in the new business premium has declined over the year due to the cautious attitude adopted by customers. IRDA has introduced new guidelines regarding ULIP products with effect from 1 September 2010. These guidelines made the industry to review and revamp existing products, distribution channels and cost models. Immediately, after the introduction of new guidelines on Group ULIP no group product being available for customers for the period of 3 months. Later, an entire range of new individual

ULIP products were launched which positively impacted the growth momentum of the life insurance industry.

From the year 2011-12, due to heavy reliance on ULIP products, interest rate issues, rising inflation, choppy stock markets along with debt crisis had a downward spiral effect on the industry. In the year 2012-13 & 2013-14 the business environment continued to be challenging for life insurance companies, on account of a combination of factors including slowdown in GDP growth rate, inflation, high interest rates and uncertainty on other macro-economic and regulatory parameters. In the year 2014-15, inflation private insurers witnessed positive growth in new business premium as well as renewal premium due to decline in inflation and other positive factors. Thereafter, healthy growth rate in new business premium has been observed in the year 2015-16 & 2016-17.

3.4 Expenses of Management

As regards management expenses, a life insurance company has to comply with the limit prescribed under Rule 17D of the Insurance Rules, 1939. Section 40B of the Insurance Act, 1938 provides that no insurer shall in respect of life insurance business transacted in India, spend as expenses of management more than the prescribed limits. Expense of management refers to all charges incurred either directly or indirectly related with all type of commission payments, operating expenses which are charged to Revenue Account.

Thus, expenses of management include:

1. All Commission Payments
2. Operating Expenses.

On 9th May 2016, IRDA has notified IRDA (Expenses of management of insurers transacting life insurance business) regulations, 2016 which prescribed available limits of expenses of management considering type and nature of product, premium paying term and duration of insurance business. Further, for the financial year 2015-16, Insurers have the option either to comply with these Regulations or with the earlier provisions under Rule 17D of the Insurance Rules, 1939.

3.4.1 Commission Paid

The commission is based on the type of product and size of policy that is being sold by the agent. Below Table 3.4 shows growth in total commission paid that included

first year commission, renewal commission & single commission for the period under consideration.

Table 3.4 Growth in Commission paid **Rs. In Lakh**

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	35126 (67.32)	38446 (68.24)	81097 (54.32)	15511 (93.40)	33555 (66.63)	40538 (106.86)	149686 (58.12)	27578 (179.21)
2008-09	42489 (20.96)	39158 (1.85)	69999 (-13.68)	22543 (45.34)	48179 (43.58)	46788 (15.42)	105155 (-29.75)	59691 (116.44)
2009-10	52549 (23.68)	42121 (7.57)	60297 (-13.86)	16792 (-25.51)	51620 (7.14)	66617 (42.38)	96257 (-8.46)	62785 (5.18)
2010-11	47681 (-9.26)	53990 (28.18)	56068 (-7.01)	13017 (-22.48)	38058 (-26.27)	67105 (0.73)	61647 (-35.96)	51480 (-18.01)
2011-12	57764 (21.15)	59457 (10.13)	60547 (7.99)	11212 (-13.87)	32540 (-14.50)	51836 (-22.75)	38827 (-37.02)	39803 (-22.68)
2012-13	63940 (10.69)	61403 (3.27)	76542 (26.42)	11741 (4.72)	30048 (-7.66)	51141 (-1.34)	28042 (-27.78)	32616 (-18.06)
2013-14	51410 (-19.60)	68281 (11.20)	62749 (-18.02)	13438 (14.45)	23471 (-21.89)	55618 (8.75)	14896 (-46.88)	32982 (1.12)
2014-15	62347 (21.27)	74863 (9.64)	55317 (-11.84)	18161 (35.14)	23337 (-0.57)	60371 (8.55)	20622 (38.44)	28070 (-14.89)
2015-16	70184 (12.57)	82101 (9.67)	61998 (12.08)	25811 (42.13)	21806 (-6.56)	71426 (18.31)	15741 (-23.67)	24588 (-12.41)
2016-17	79202 (12.85)	93643 (14.06)	75892 (22.41)	32481 (25.84)	25506 (16.97)	78334 (9.67)	14644 (-6.97)	19541 (-20.53)
Average	**56269**	**61346**	**66051**	**18071**	**32812**	**58977**	**54552**	**37913**
CV%	**23.44**	**30.49**	**13.86**	**38.25**	**31.76**	**20.13**	**86.79**	**39.82**
CAGR%	**14.20**	**15.15**	**3.74**	**15.01**	**2.39**	**14.86**	**-17.03**	**7.06**

Source: Computed from Handbook on Indian Insurance Statistics of different years

Note: The percentage growth over the previous year is shown in brackets

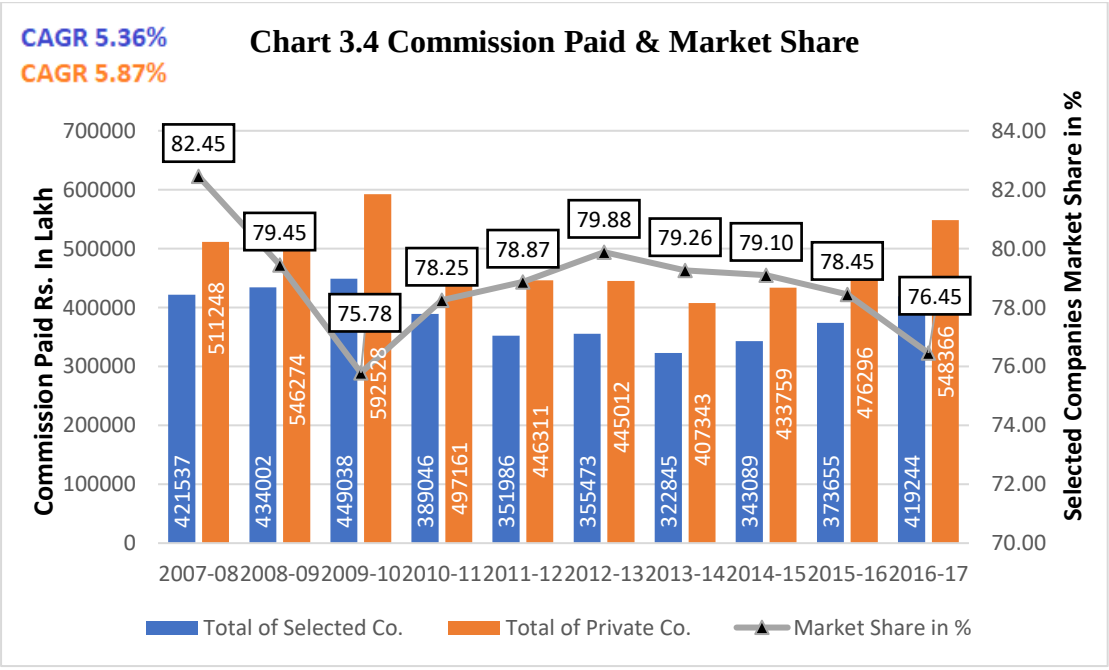
HDFC has reported the highest growth rate in the year 2007-08. Thereafter, the growth in commission expenses was observed but at a decreasing rate. In the year 2010-11 & 2013-14 company has reported reduction in their commission expenses. Its CAGR has been noted 14.20% during the study period. Max has reported highest growth rate in the year 2007-08. Afterwards, the growth rate has significantly reduced. Its CAGR has been noted 15.15% during the study period. ICICI has exercised effective control over its commission expense which shows its effective way of doing business. Since 2008-09 company has tried to reduce expenses gradually and as a result the CAGR has been reported at 3.74%.

Kotak has reported highest growth rate 93.40% in the year 2007-08 due to large collection of new business premium. During the year 2009-10 to 2011-12 company has controlled their commission expenses. Thereafter due to gradual decrease in the

business, lower growth rate is observed in expenses. Its CAGR has been recorded 15.01% for the study period. Due to good premium collection, Birla initially paid high commissions to its agents but afterwards, company has not been able to maintain its premium income and has reported a significant decline in its expenses. Its CAGR has been noted only 2.39% with high variance 31.76%. SBI has recorded the highest growth rate in 2007-08. It has been observed that SBI's average annual growth rate seems to be high due to the large number of policies offered and the high premium collection. The growth rate was 106.86% in 2007-08 and has significantly reduced over the period of the study and reached at 9.67% in the year 2016-17.

Except for the first year, Bajaj has recorded a negative growth rate in the total commission paid. The continuous negative growth rate in Bajaj indicates that the company has failed to earn business in terms of policy, first year premium as well as renewal premium. Its CAGR has been recorded at -17.03% with a very high variant 86.79%.

Initially, in the year 2007-08 Reliance has sold out more policies and collected more premium, therefore, commission has also been paid in large amount by the company. It has reported comparatively highest growth rate 179.21% in the year 2007-08 & then recorded continuous reduction and reached -20.53% in the year 2016-17. Its CAGR has been noted 7.06% with high variance 39.82 %.



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded

The above chart 3.4 depicts a comparative view of commission paid for selected companies viz a viz that of all private companies. large fluctuations have been observed during the first five years. The CAGR of selected companies as well as that of all private companies have been found to be almost equal. Selected eight companies have acquired average 78.79% market share in growth of commission, which is an indicator of market leadership of selected companies.

3.4.2 Operating Expenses Paid

For the efficient and effective management operating expenses play a major role in the growth of the company. Operating expenses includes the expenses related to the operation of insurance business such as employees' remuneration, travel & conveyance, training expenses, rent-rates & taxes, repairs, printing & stationary, medical fees, audit fees, advertisement, depreciation, service tax and other. Below table 3.5 shows the growth of operating expenses for the period under consideration.

Table 3.5 Growth in Operating Expense **Rs. In Lakh**

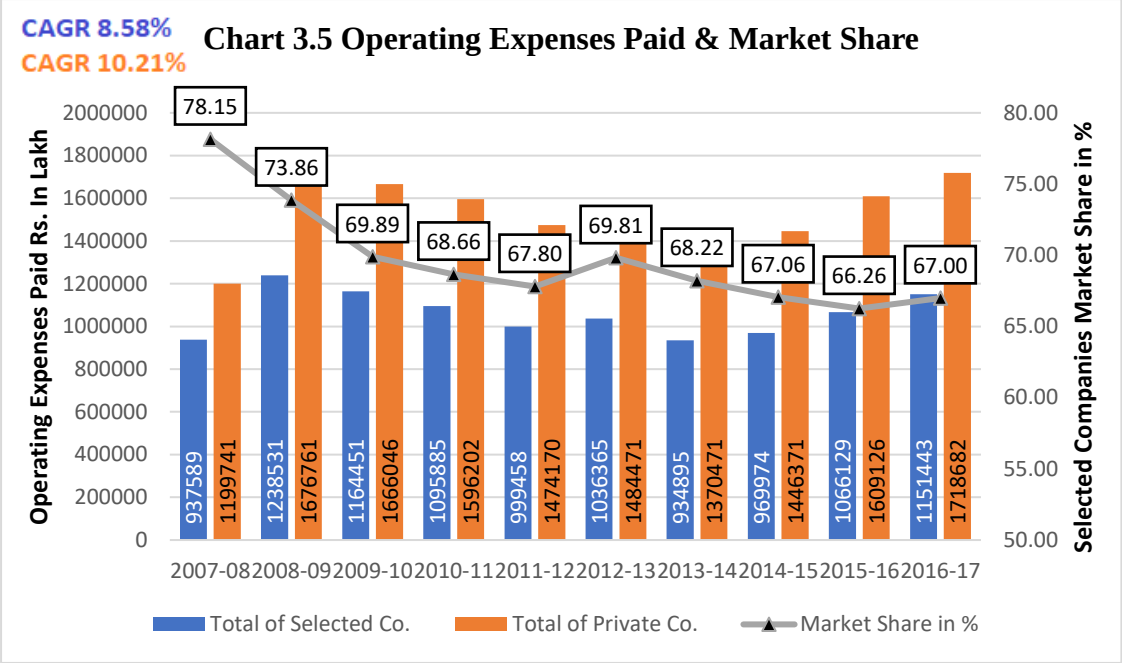
Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	101298 (75.64)	86533 (68.45)	291994 (91.73)	42487 (76.80)	67073 (78.45)	44694 (38.64)	200434 (86.79)	103076 (140.25)
2008-09	176007 (73.75)	160896 (85.94)	274059 (-6.14)	60767 (43.02)	124876 (86.18)	62050 (38.83)	187579 (-6.41)	192297 (86.56)
2009-10	150904 (-14.26)	150439 (-6.50)	256915 (-6.26)	57384 (-5.57)	132675 (6.25)	75298 (21.35)	177163 (-5.55)	163673 (-14.89)
2010-11	149521 (-0.92)	144044 (-4.25)	218739 (-14.86)	58006 (1.08)	120348 (-9.29)	88299 (17.27)	160658 (-9.32)	156270 (-4.52)
2011-12	126988 (-15.07)	124005 (-13.91)	200347 (-8.41)	55460 (-4.39)	121512 (0.97)	102393 (15.96)	140628 (-12.47)	128125 (-18.01)
2012-13	134420 (5.85)	122884 (-0.90)	203122 (1.39)	57328 (3.37)	115970 (-4.56)	115105 (12.41)	160030 (13.80)	127506 (-0.48)
2013-14	128077 (-4.72)	120384 (-2.03)	161686 (-20.40)	55279 (-3.57)	91802 (-20.84)	110343 (-4.14)	134610 (-15.88)	132714 (4.08)
2014-15	148879 (16.24)	124188 (3.16)	165202 (2.17)	66906 (21.03)	87071 (-5.15)	117559 (6.54)	112174 (-16.67)	147995 (11.51)
2015-16	187183 (25.73)	124958 (0.62)	188835 (14.31)	79413 (18.69)	90429 (3.86)	145813 (24.03)	110863 (-1.17)	138636 (-6.32)
2016-17	238528 (27.43)	159121 (27.34)	235720 (24.83)	92818 (16.88)	76993 (-14.86)	164649 (12.92)	105630 (-4.72)	77984 (-43.75)
Average	**154180**	**131745**	**219662**	**62585**	**102875**	**102620**	**148977**	**136828**
CV%	**24.98**	**17.00**	**20.22**	**22.62**	**22.15**	**35.74**	**22.55**	**23.22**
CAGR%	**15.25**	**11.97**	**4.46**	**14.47**	**7.43**	**17.71**	**-0.16**	**6.16**

Source: Computed from Handbook on Indian Insurance Statistics of different years

Note: The percentage growth over the previous year is shown in brackets

HDFC has reported high growth rate around 73% in the initial two years of study. Thereafter, the expenses were kept under control and during the last three years the growth rate of 25% has been observed. Its CAGR has been noted at 15.25% with a very high variance 24.98%. The company continuous to invest in development of new distribution channels, technology & products which resulted in an increase in the operating expenses. Max has also reported a higher growth rate in the initial two years of study period with a significant increase in growth rate by 85.94% in the year 2008-09 and afterwards company has reported significantly downfall in their operating expenses. Its compounded growth rate has been noted 11.97%. ICICI has incurred large amount of operating expenses in the year 2007-08 with the highest growth rate of 91.73%. Subsequently company has started reducing the operating expenses and reported low and negative growth rate. Its CAGR has been reported 4.46%. Kotak has recorded higher growth rate in initial two years of the study. For the period 2009-10 to 2013-14 negative growth rate was recorded. In the last three years 2014-15, 2015-16, & 2016-17 it has been increased by 21.03%, 18.69%, & 16.88% respectively. Its CAGR has been reported at 14.47%. Birla recorded a growth rate of 78.45% and 86.18% respectively during the first two years. From the year 2009-10 onwards, company reported very low or negative growth rate till the end of the study period. Its CAGR has been noted 7.43% with a high variance 22.15%.

SBI has observed a gradual decrease in operating expenses throughout the study period. The company continues to focus on cost containment activities to reduce operating expenses. Its CAGR has been noted 17.71%. In the year 2007-08 growth rate recorded in Bajaj was very high at 86.79%. Subsequently, it has significantly decreased and touched negative growth rate too. It is the only company to report negative CAGR i.e. -0.16%. CAGR of Reliance has been observed comparatively higher 6.16% but when it has been observed in detail, it was found that the growth was very high in the first two years and after this a drastic decline has been noted.



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded.

Chart 3.5 depicts a comparative view of operating expenses paid by selected companies viz a viz that of all private companies. The market share of operating expenses dropped from 78.15% in 2007-08 to 67% in 2016-17, indicating that selected companies have successfully controlled their operating expenses. CAGR of selected companies was 8.58% whereas, that of all private companies was 10.21%.

General observation of Expenses of Management

In the year 2007-08 all private companies have reported high growth rate in expense of management because of high premium collection in this year. However, during the study period, the growth rate of expenses of management have registered at a decreasing rate. Ultimately, the expense of management depends on a way of doing business of company and the regulations of IRDA. However, The IRDA, on the recommendations of the Life Insurance Council constituted under section 64F may enhance the limits in any year.

3.5 Benefits Paid (Net)

Benefits paid means insurance claims which include claims by death, maturity, annuity/pension payment and other benefits. Settlement of claim is one of the major operating activities of the life insurance business. Below table 3.6 indicates a growth rate in benefits paid for the ten years from 2007-08 to 2016-17.

Table 3.6 Growth in Benefit Paid **Rs. In Lakh**

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	50146 (187.30)	13601 (63.14)	201487 (176.96)	26255 (51.61)	42968 (244.18)	35085 (150.50)	85140 (21.88)	16242 (105.83)
2008-09	68127 (35.86)	22082 (62.36)	220656 (9.51)	24304 (-7.43)	64644 (50.45)	39675 (13.08)	75651 (-11.15)	15553 (-4.24)
2009-10	133789 (96.38)	58917 (166.81)	720999 (226.75)	49668 (104.36)	113878 (76.16)	85138 (114.59)	263020 (247.68)	69342 (345.84)
2010-11	283091 (111.60)	123679 (109.92)	1059117 (46.90)	103615 (108.62)	193437 (69.86)	292577 (243.65)	498467 (89.52)	201159 (190.10)
2011-12	295317 (4.32)	172400 (39.39)	845438 (-20.18)	143494 (38.49)	270462 (39.82)	472611 (61.53)	549460 (10.23)	275597 (37.00)
2012-13	389764 (31.98)	249817 (44.91)	1328786 (57.17)	178213 (24.20)	365864 (35.27)	779101 (64.85)	930377 (69.33)	553620 (100.88)
2013-14	466191 (19.61)	293120 (17.33)	1207396 (-9.14)	185422 (4.05)	366543 (0.19)	878020 (12.70)	847725 (-8.88)	527212 (-4.77)
2014-15	816239 (75.09)	350291 (19.50)	1224572 (1.42)	178522 (-3.72)	377161 (2.90)	819768 (-6.63)	823049 (-2.91)	620716 (17.74)
2015-16	817691 (0.18)	314606 (-10.19)	1240868 (1.33)	182403 (2.17)	424709 (12.61)	795955 (-2.90)	499826 (-39.27)	424468 (-31.62)
2016-17	984217 (20.37)	377681 (20.05)	1496441 (20.60)	228717 (25.39)	465234 (9.54)	952614 (19.68)	617006 (23.44)	312711 (-26.33)
Average	**430457**	**197619**	**954576**	**130061**	**268490**	**515054**	**518972**	**301662**
CV%	**77.91**	**69.81**	**47.31**	**57.03**	**57.70**	**72.56**	**58.56**	**74.90**
CAGR%	**49.66**	**46.42**	**35.31**	**29.44**	**43.59**	**52.50**	**24.34**	**44.48**

Source: Computed from Handbook on Indian Insurance Statistics of different years

Note: The percentage growth over the previous year is shown in brackets

HDFC has recorded the highest growth rate 187.30% in the year 2007-08. Throughout the study period it has been highly fluctuating and in the year 2016-17 it was 20.37%. Its CAGR has been noted 49.66% which shows that HDFC has settled a greater number of claims.

Max has shown gradual increase in benefits paid throughout the study period in terms of Rupees. However, the growth rate has reported upward trend in the initial years and downward trend in the later years of the study. Its CAGR was 46.42% with a high variance 69.81%. ICICI has recorded highest growth rate 226.75% in the year 2009-10. Throughout the study period high fluctuation has been observed in the growth rate and its CAGR has been noted 35.31%. Kotak has recorded high growth rate 104.36% & 108.62% in the year 2009-10, 2010-11 respectively. Its CAGR has been noted 29.44% with a high variance 57.03%.

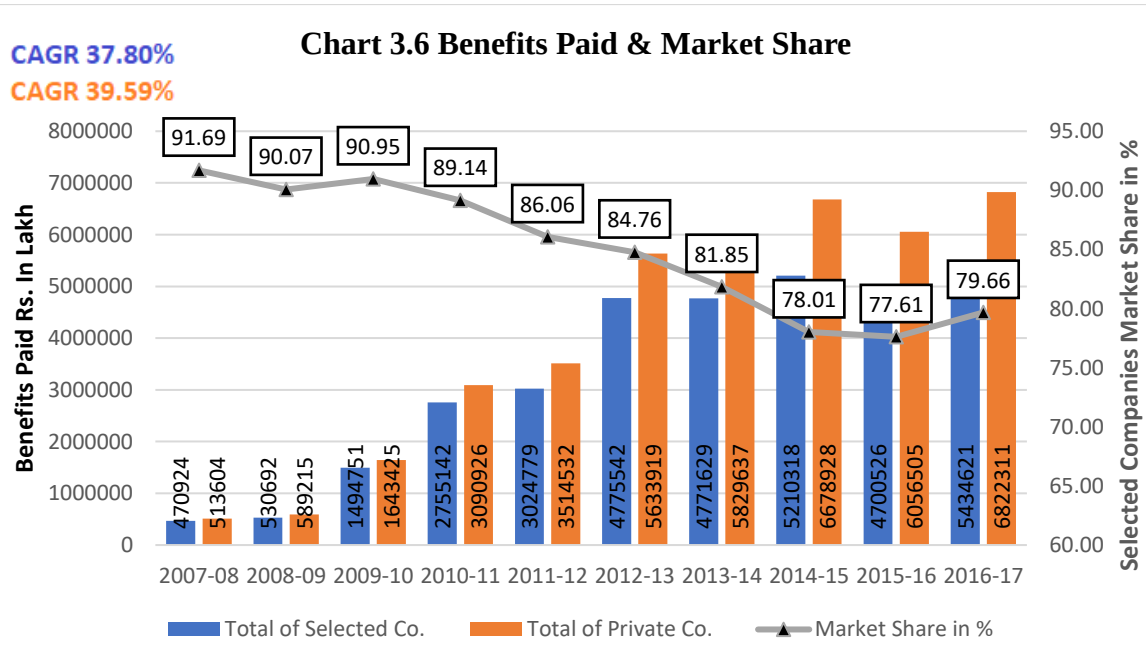
Birla has reported highest growth rate 244.18% in the year 2007-08 and throughout the period it has demonstrated fluctuating trend. Its CAGR has been noted 43.59%

with a high variance 57.70%. SBI has recorded robust growth rate in initial study periods which has decreased during the later part of the study period. Its CAGR has been reported 52.50% with 72.56% variance. Bajaj has recorded highest growth 247.68% in the year 2009-10 and in the rest of the period the growth rate has remained very low and in last few years it has touched negative also. Its CAGR has been noted 24.34% with a variance 58.56%.

CAGR of Reliance has been recorded 44.48% with a very high variance 74.90% which indicates large fluctuations. In the year 2007-08 growth rate was 105.83% and in the year 2016-17 it was -26.33%.

The chart 3.6 shows a comparative view of the benefits paid for selected companies viz a viz that of all private companies. The market share of selected companies has gradually declined from 91.69% in 2007-08 to 79.66% in 2016-17. CAGR of selected companies was 37.80%, which is marginally lower than that of all the private companies.

Chart 3.6 Benefits Paid & Market Share



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded.

General observation of Benefits Paid

Generally, benefits paid by the life insurance company based on the size of its business. However, it may be affected by the mortality rate, life expectancy rate, natural calamity etc. In the initial year of the study large benefits may have been paid due to the high volume of business earned by the companies. It has been observed

that gradually, with the increase in volume of business, there has been an increase in payment of claims whereas large amount of benefits paid in certain years may have been due to surrenders and pre-matured withdrawals during the study period.

3.6 Income from Investment

Income from investment comprises of income accrued on investment from interest, dividends & rent. It also includes profit on sale/redemption of investments, and adjustment of loss on sale/ redemption of investments. Below table 3.7 indicates a growth rate in income from investment for the ten years from 2007-08 to 2016-17.

Table 3.7 Growth in Income from Investment **Rs. In Lakh**

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	50616 (127.90)	20644 (141.68)	227728 (190.37)	36407 (165.45)	77971 (135.51)	65635 (234.24)	94069 (146.71)	21830 (272.84)
2008-09	10134 (-79.98)	-7999 (-138.75)	-57050 (-125.0)	-26667 (-173.2)	-39978 (-151.3)	-106846 (-262.8)	-130192 (-238.4)	-61191 (-380.3)
2009-10	140275 (1284.2)	94811 (1285.28)	465878 (916.61)	53170 (299.39)	259339 (748.70)	289812 (371.24)	349547 (368.49)	73835 (220.66)
2010-11	265411 (89.21)	102527 (8.14)	832719 (78.74)	68119 (28.12)	198172 (-23.59)	313515 (8.18)	405290 (15.95)	105499 (42.88)
2011-12	196131 (-26.10)	68770 (-32.92)	397685 (-52.24)	40875 (-39.99)	19310 (-90.26)	198031 (-36.84)	205342 (-49.33)	106248 (0.71)
2012-13	271928 (38.65)	110940 (61.32)	467477 (17.55)	97018 (137.35)	173152 (796.70)	377525 (90.64)	372631 (81.47)	113558 (6.88)
2013-14	276963 (1.85)	133631 (20.45)	598464 (28.02)	71936 (-25.85)	147500 (-14.81)	426894 (13.08)	334291 (-10.29)	136365 (20.08)
2014-15	607604 (119.38)	349565 (161.59)	1100391 (83.87)	196220 (172.77)	426723 (189.30)	815423 (91.01)	597469 (78.73)	278371 (104.14)
2015-16	624283 (2.75)	229079 (-34.47)	783785 (-28.77)	115667 (-41.05)	247770 (-41.94)	598133 (-26.65)	285356 (-52.24)	132534 (-52.39)
2016-17	757166 (21.29)	317434 (38.57)	1034549 (31.99)	158754 (37.25)	283081 (14.25)	759035 (26.90)	402241 (40.96)	146688 (10.68)
Average	**320051**	**141940**	**585163**	**81150**	**179304**	**373716**	**291604**	**105374**
CV%	**79.98**	**84.30**	**61.66**	**79.00**	**76.30**	**77.97**	**68.10**	**83.17**
CAGR%	**42.32**	**43.55**	**29.43**	**27.75**	**23.94**	**44.12**	**26.57**	**38.00**

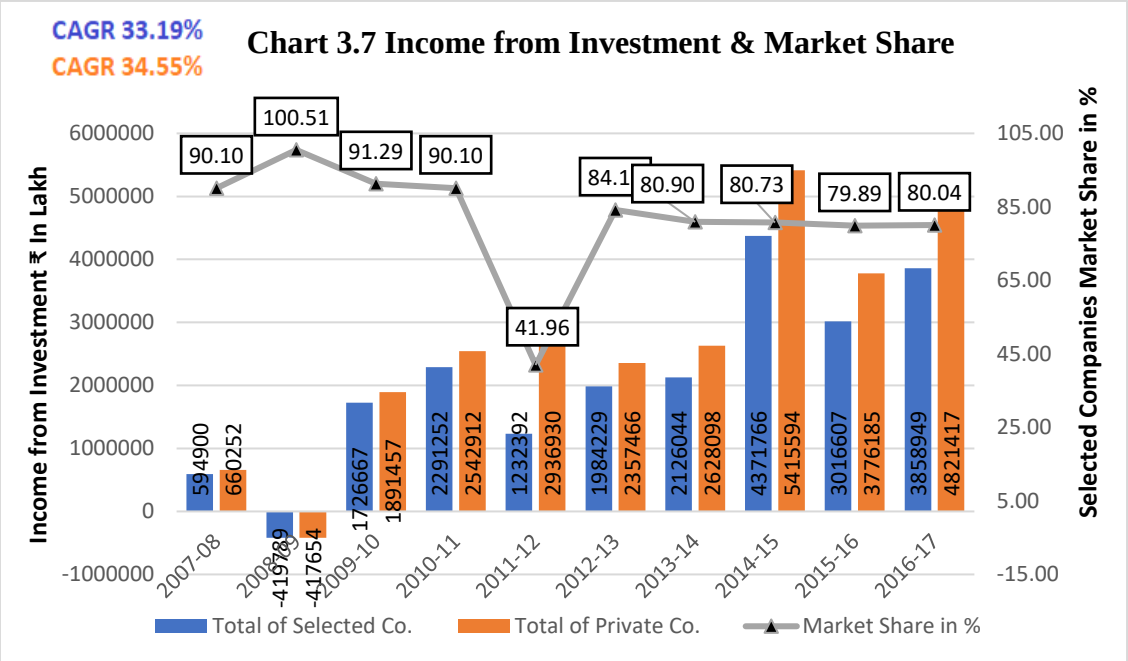
Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: The percentage growth over the previous year is shown in brackets

HDFC has earned highest income from investment with 1284.20% growth rate in the year 2009-10. Except for the years 2008-09 & 2011-12, company has recorded positive growth rate throughout the study period. Its CAGR has been noted 43.32% with the variance 79.98%. Max has suffered heavy loss (7999) lakh in the year 2008-09 that has been covered in the next year by highest growth rate 1285.28%. Its CAGR has been noted 43.55% with the high variance 84.30%. ICICI has recorded positive growth rate in income from investment throughout the study period except for the

years 2008-09, 2011-12, & 2015-16. Its CAGR has been noted at 29.43% with comparatively low variance 61.66%. Kotak has incurred the losses in the year 2008-09 and reported negative growth rate in the years 2011-12, 2013-14, & 2015-16. Its CAGR has been noted 27.75% with very high variance 79.00%.

Birla has recovered losses of 2008-09 in the year 2009-10 by 748.70% growth rate. In the year 2010-11 & 2011-12 growth rate has been noted negative but in the year 2012-13, it recovered with good growth rate 796.70%. with similar volatility Birla has posted 23.94% CAGR. Based on the average income from investment, SBI has recorded highest average income from investments Rs. 3,73,716 lakhs. Throughout the study period company has recorded robust growth rate except the year 2008-09, 2011-12 & 2015-16. Its CAGR has been noted 44.12% with high variance 77.97%.

Bajaj has recorded 26.57% CAGR. During the year 2008-09, 2011-12, 2013-14 & 2015-16, company could not generate worthy income from investment. Reliance reported large fluctuations in income from investments throughout the study period and the variance 83.17% has given a proof for the same. Its CAGR has been noted 38.00%.



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded.

The above chart 3.7 shows a comparative view of income from investment for selected companies viz a viz that of all private companies. CAGR of selected companies has been noted 33.19% which is near to that of all private companies. Market share in terms of income from investment in the year 2007-08 was 90.10%

that increased to 100.51% in the year 2008-09 which indicates that selected private companies have suffered huge loss to the extent of 100%, out of total loss suffered by all private sector companies. Thereafter all selected companies have reported a significant downfall in the year 2011-12. From the year 2012-13, selected companies have regained their share in the total income from investments of all private sector companies i.e., an average 80%

General observation of Income from Investment

Income from the investment of insurance is partially based on the returns from the stock market which are unpredictable. Upward movement in stock market leads to increased income and downward movement in stock market leads to deterioration in income from investment in insurance. Insurance companies generate income in relation to volume of investment and type of investment. Due to the global financial crises during 2008-09, insurance industry suffered from the losses on their investments. However, during the remaining years of the study companies were in position to generate positive income from investment.

3.7 Surplus/Deficits from Operation

Surplus/ Deficit is the operational result obtained after deducting expenses from the revenue of the life insurance business. In the life insurance company, premium is the major source of the revenue from which companies may settle their claims, manage expense & bonus to policyholders' and the residual amount will be invest in the market. Return from the investment is also a part of the surplus/ deficit of the business. Below Table 3.8 shows the operational result of selected companies with a growth rate from the year 2007-08 to 2016-17.

Table 3.8 Growth in Surplus/ Deficits from Operation **Rs. In Lakh**

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	7038	4431	32512	5963	5192	8156	19803	---
	(1976.1)	(2796.1)	(139.0)	(-8.28)	---	---	(43.62)	---
2008-09	16664	-1539	21293	7572	13169	10845	11550	1587
	(136.8)	(-134.73)	(-34.51)	(26.98)	(153.64)	(32.97)	(-41.68)	---
2009-10	19094	14869	129770	16896	18438	19426	40961	8677
	(14.58)	(1066.15)	(509.45)	(123.14)	(40.01)	(79.12)	(254.64)	(446.75)
2010-11	6698	41892	60760	8669	48762	35112	84095	9621
	(-64.92)	(181.74)	(-53.18)	(-48.69)	(164.46)	(80.75)	(105.31)	(10.88)
2011-12	37292	68422	133196	11959	64968	58545	100530	37845
	(456.76)	(63.33)	(119.22)	(37.95)	(33.23)	(66.74)	(19.54)	(293.36)
2012-13	64211	68643	144968	10744	44028	73151	86247	44428
	(72.18)	(0.32)	(8.84)	(-10.16)	(-32.23)	(24.95)	(-14.21)	(17.39)

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2013-14	42978 (-33.07)	61497 (-10.41)	125997 (-13.09)	21184 (97.17)	38403 (-12.78)	82521 (12.81)	64900 (-24.75)	23377 (-47.38)
2014-15	82206 (91.27)	61359 (-0.22)	116205 (-7.77)	21613 (2.03)	44174 (15.03)	69846 (-15.4)	42835 (-34.00)	13506 (-42.23)
2015-16	95958 (16.73)	46325 (-24.50)	134207 (15.49)	17644 (-18.36)	34559 (-21.77)	66435 (-4.88)	39441 (-7.92)	8022 (-40.60)
2016-17	94765 (-1.24)	65532 (41.46)	107382 (-19.99)	22394 (26.92)	32867 (-4.90)	65436 (-1.50)	48311 (22.49)	13937 (73.73)
Average	**46690**	**43143**	**100629**	**14464**	**34456**	**48947**	**53867**	**16100**
CV%	**75.70**	**63.55**	**45.00**	**43.03**	**52.15**	**56.97**	**54.44**	**91.94**
CAGR%	**75.65**	**83.31**	**22.95**	**13.17**	**22.76**	**26.03**	**13.36**	**31.20**

Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: The percentage growth over the previous year is shown in brackets

HDFC has managed to generate average surplus of Rs. 46690 lakhs with a variance of 75.70% and CAGR of 75.65% during the period of study. However, it is observed that the rate of growth during 2007-08 was as high as 1976% and as low as -64.92% during 2010-11. Max has managed to generate average surplus Rs. 43143 lakhs with a variance of 63.55% and comparatively highest CAGR of 83.31% during the period of study. However, it is observed that the rate of growth during 2007-08 was as high as 2796.08% and low as -134.73% during immediate year 2008-09.

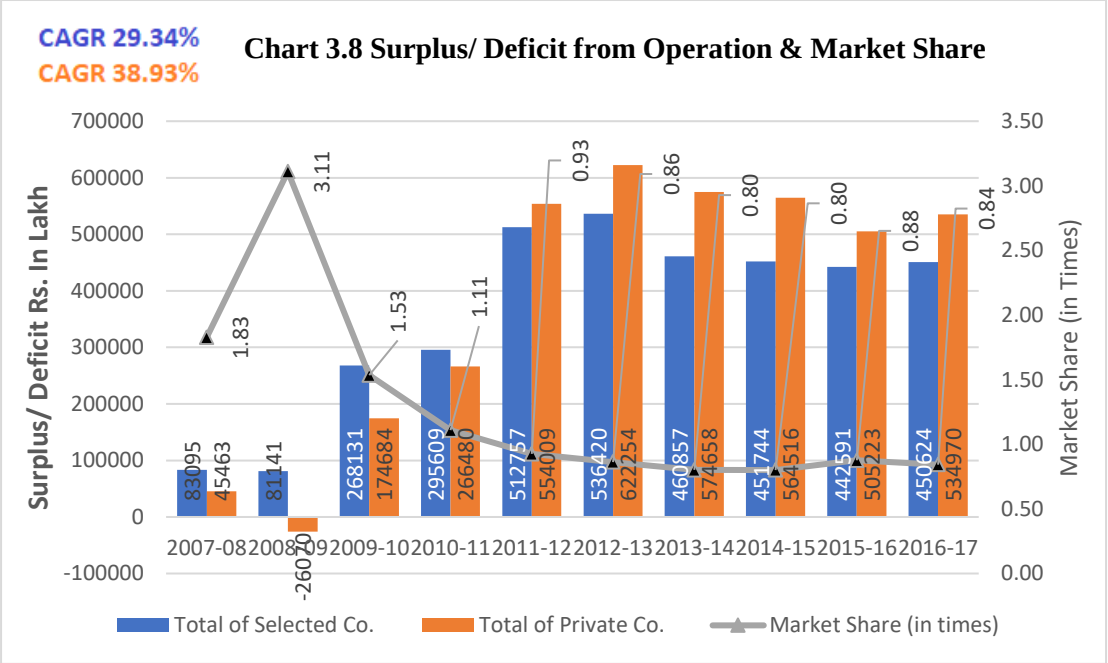
ICICI has managed to generate average surplus of Rs. 1,00,629 lakhs with a low variance of 45.00% and CAGR of 22.95% during the period of study. However, it is observed that the rate of growth during 2009-10 was as high as 509.45% and as low as -53.18% during 2010-11. Company has created large amount of surplus during the study period. Kotak has managed to generate average surplus of Rs. 14464 lakhs with a variance of 43.03% and CAGR of 13.17% during the period of study. However, it is observed that the rate of growth during 2009-10 was as high as 123.14% and as low as -48.69% during 2010-11.

Birla has managed to generate average surplus of Rs. 34456 lakhs with a variance of 52.15% and CAGR of 22.76% during the period of study. However, it is observed that the rate of growth during 2010-11 was as high as 164.46% and as low as -32.23% during 2012-13. There was no surplus created by company in the year 2006-07.

Like Birla, SBI did not have any surplus in the year 2006-07. SBI has managed to generate average surplus of Rs. 48947 lakhs with a variance of 56.97 % and CAGR of 26.03% during the period of study. However, it is observed that the rate of growth during 2010-11 was as high as 80.75% and as low as -15.36% during 2014-15.

Bajaj has managed to generate average surplus of Rs. 53867 lakhs with a variance of 54.44 % and CAGR of 13.36% during the period of study. However, it is observed that the rate of growth during 2009-10 was as high as 254.64% and as low as -41.68% during 2008-09.

Reliance has managed to generate average surplus of Rs. 16100 lakhs with a variance of 91.94 % and CAGR of 31.20% during the period of study. However, it is observed that the rate of growth during 2009-10 was as high as 446.75% and as low as -47.38% during 2013-14. Company was not able to create surplus in the year 2007-08 to 2008-09.



Source: Computed from Handbook on Indian Insurance Statistics of different years
Note: In the calculation of Market share LIC has been excluded

The above chart 3.8 shows a comparative view of surplus generation from the operations for selected companies viz a viz that of total private companies. CAGR of selected companies has been noted 29.34% which is lower than all private companies. Upon careful observation, it is evident that selected private companies' have higher surplus generation capacity than all private life insurance companies in India. In the year 2008-09, against negative surplus generated by all private companies, the selected companies were showing positive surplus generation.

General observation of Surplus/Deficits from Operation

All private life insurance companies have been established after 2001 and have faced several financial problems and challenges in business operations. During the initial

years of their operation the companies have not been able to generate any surplus, rather they were into deficits. Gradually, with effective utilisations of technologies, financial expertise, product innovations and professional delivery, they attained surplus generating capacity over a period of time. However, fluctuations in their surplus growth rate have been noted during the study period.

3.8 Testing of Hypothesis

Objective: To analyse and evaluate overall growth of the business.

In the present study, overall growth of life insurers has been measured based on certain parameters such as premium income, surplus generation, income from investment, benefits paid and management of expenses. In the earlier part of this chapter year by year growth was analysed using annual growth rate, CAGR and market share for each parameter. To evaluate whether working pattern of selected companies with respect to these parameters are same or not. In accordance with these parameters following hypothesis have been framed.

Null Hypothesis:

1. Ho: There is no significant difference in new business premium collected among different selected companies.
2. Ho: There is no significant difference in renewal premium collected among different selected companies.
3. Ho: There is no significant difference in management of expenses (which include commission and operating expenses) paid among different selected companies.
4. Ho: There is no significant difference in benefits paid among different selected companies.
5. Ho: There is no significant difference in income from investment among different selected companies.
6. Ho: There is no significant difference in surplus generated among different selected companies.

Alternative Hypothesis:

1. H1: There is a significant difference in new business premiums collected among different selected companies.
2. H1: There is a significant difference in renewal premiums collected among different selected companies.

3. H1: There is a significant difference in management expenses (which include commission and operating expenses) paid among different selected companies.
4. H1: There is a significant difference in benefits paid among different selected companies.
5. H1: There is a significant difference in income from investment among different selected companies.
6. H1: There is a significant difference in the surplus generated among different selected companies.

The hypothetical statements quantified above are required to analyse using appropriate statistical test. However, the selection of appropriate statistical test is based on the sample characteristics of collected data.

Sample Characteristics:

Normality is one of the important aspects to decide which statistical method needs to be used for data analysis. If data is normally distributed, Parametric Test is used and if it is not, Non-parametric test is used. There are different numerical and visual methods which can be used to check the normality of data. In the present study both approaches have been used to check the presence of normality in the data.

As a part of normality test, Kolmogorov-Smirnova is more appropriate in larger sample size ($\geq$ 50), whereas Shapiro-Wilk is appropriate in smaller as well as in larger sample sizes (Mishra et al., 2019). In accordance with the result of Kolmogorov-Smirnov and Shapiro-Wilk, significant value of Surplus, First Year Premium, Renewal premium, Benefits paid, and Income from Investment performed less than 0.05. It denotes that normality is not present in the data of all these five parameters (Massey, 1951), (Shapiro & Wilk, 1965). Along with it, the visual inspection of their histograms, normal Q-Q plots and box plots demonstrate that these five variables were approximately not normally distributed. Hence, non-parametric test is to be performed on data related to five variables.

However, significant value of MOE variable is greater than 0.05 and the same was reflected in the visual inspection of their histograms, normal Q-Q plots and box plots. Altogether it demonstrates that normality is present in the data of MOE variable. (Histograms, Q-Q plots and box plots are attached in Appendix I)

Table: 3.9 Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**Df**	**Sig.**
Surplus	.144	80	.000	.902	80	.000
First Year Premium	.161	80	.000	.899	80	.000
Renewal premium	.168	80	.000	.911	80	.000
MOE	.069	80	.200*	.972	80	.071
Benefits paid	.145	80	.000	.886	80	.000
Income from Investment	.129	80	.002	.901	80	.000

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction
Source: Computed

According to fundamentals of statistical analysis before performing parametric test certain assumptions related to sample size and normality of data should be checked. In the present study, basic assumption of normality for performing the parametric test does not meet and sample size is small. Hence, non-parametric test serves as an alternative to parametric test. In accordance with the present study, to compare eight selected companies for six variables, Independent Sample Kruskal Wallis (non-parametric) test have been performed.

Outcomes of the Kruskal Wallis Test:

It determines statistically significant differences between eight companies for six independent variables based on mean rank.

Table 3.10: Mean Rank

Company	Surplus	FYP	RP	MOE	BP	IFI	*Aggregate
HDFC	41.70	53.70	54.70	53.30	43.30	46.10	99.60
Max	42.00	25.50	41.90	48.50	27.10	30.30	64.10
ICICI	65.90	67.00	71.50	71.40	65.90	62.90	130.00
Kotak	20.40	11.10	10.40	6.90	20.20	21.30	36.10
Birla	37.00	25.70	30.70	23.90	34.80	36.10	70.80
SBI	46.70	68.30	48.50	34.20	46.30	51.70	134.70
Bajaj	49.70	46.50	43.10	46.30	50.80	49.00	91.20
Reliance	20.60	26.20	23.20	39.50	35.60	26.60	21.50

(*Aggregate Mean Rank = Surplus + FYP + RP – MOE – BP + IFI)
Source: Computed

In the present study, there are eight selected companies and number of years under consideration are ten. Accordingly, there are 80 observations in aggregate for each variable. These 80 observations have been arranged in lower to higher order and given a rank from 1 to 80. Based on the rank obtained, average rank for each company has been calculated for each variable, which can be identified as mean rank. In other words, mean rank is the average of the ranks for all observation within each company.

The company wise mean rank of each variable can be used to compare the growth of the business as presented in table 3.10. On the basis of the mean rank, aggregate mean rank has also been calculated in table 3.10.

Higher aggregate mean rank indicates higher growth of the business in all aspects of its operation. SBI and ICICI posted higher aggregate mean rank revolving around 130 among all selected companies, that indicates efficient use of resources. Bajaj and HDFC were close to aggregate mean rank of 100 which is an indicator of relatively satisfactory operating performance. Of the remaining companies, Max and Birla have reported aggregate mean rank around 70 whereas that of Kotak and Reliance below 50 being indication of subnormal operating efficiency.

Higher mean rank in case of surplus, first year premium (FYP), Renewal Premium (RP), and Income form Investment (IFI) indicate growth potential. Lower mean rank in case of Expense of Management (MOE) and Benefits Paid (BP) indicate good command or control on these variables.

Both ICICI and SBI have their aggregate mean rank near 130. Upon observation, it was found that ICICI has generated more income as compared to SBI but failed to control their expenses. On the other hand, SBI has earned income as well as controlled their expenses. Between HDFC and Bajaj, HDFC has expanded more business in terms of premium. Similarly, between Max and Birla, Max has expanded more business in terms of premium. Remaining two companies Kotak and Reliance have posted higher growth in expenses as compared to premium income, which is an indication of unfavourable operating result.

Table 3.11: Test Statistics

	Surplus	**First Year Premium**	**Renewal premium**	**MOE**	**Benefits paid**	**Income from Investment**
Chi-Square	29.337	59.226	46.976	49.287	26.683	26.223
Df	7	7	7	7	7	7
Asymp. Sig.	.000	.000	.000	.000	.000	.000

The table 3.11 presents the result of Kruskal-Wallis Test where in an assessment is made to calculate significant different values of all selected companies for each variable. It determines significant difference among the companies selected for each variable. In test statistics, Chi-square indicates chi-square statistic, Df indicates degree of freedom of the test and Asymp. Sig. indicates statistical significance of the test.

If statistically significant value of any variable is less than 0.05, null hypothesis is rejected. It indicates a significant difference among the selected companies. In present study significant value in case of Surplus, First Year Premium, Renewal Premium, Management of Expenses, Benefits Paid and Income from Investment is less than 0.05. Hence, Null hypothesis is rejected in all selected variables.

It denotes significant difference among the selected companies in each variable.

The table 3.12 below highlights the summary of hypothesis testing using Independent Sample Kruskal Wallis Test:

Table 3.12: Hypothesis Test Summary

No.	Null Hypothesis	Test	Sig.	Decision
1	No significant difference in new business premium collected among different selected companies.	Independent Samples Kruskal Wallis Test	.000	Reject the Null Hypothesis
2	No significant difference in renewal premium collected among different selected companies.	Independent Samples Kruskal Wallis Test	.000	Reject the Null Hypothesis
3	No significant difference in management of expenses (which include commission and operating expenses) paid among different selected companies.	Independent Samples Kruskal Wallis Test	.000	Reject the Null Hypothesis
4	No significant difference in benefits paid among different selected companies.	Independent Samples Kruskal Wallis Test	.000	Reject the Null Hypothesis
5	No significant difference in income from investment among different selected companies.	Independent Samples Kruskal Wallis Test	.000	Reject the Null Hypothesis
6	No significant difference in surplus generated among different selected companies.	Independent Samples Kruskal Wallis Test	.000	Reject the Null Hypothesis

In all the six parameters, null hypothesis is rejected that denotes significant difference among the selected companies. It is very pertinent to uncover specific significant difference among the selected companies in each parameter. The present study has

used post hoc analysis to locate the specific differences among the selected companies for each parameter. The table 3.13 below demonstrates effective size of variability which quantifies the size of difference among the selected companies for each variable. It is computed by dividing chi-square value with (N-1).

Table 3.13 Effect Size of Variability

	Surplus	**First Year Premium**	**Renewal premium**	**MOE**	**Benefits paid**	**Income from Investment**
Effect Size score	37.14	74.96	59.46	62.39	33.78	33.19

As regards the effect size of variability, first year premium, renewal premium and management of expenses witnessed the larger size of variability during the period of the study. Larger the effect size of variability, more the chances of significant differences among the selected companies. The present outcomes give a significant difference and size of variability, but it does not identify pairs of companies having significant difference. Hence it is essential to analyse pairwise comparison.

The table 3.14 below provides Company wise (pairwise) actual point of significant differences in respect of each variable during the study period.

Table 3.14: Summary of Pairwise Comparison

Sample 1 – Sample 2	**Adjusted Significance**					
	First Year Premium	**MOE**	**Renewal Premium**	**Surplus**	**Income from Investment**	**Benefits Paid**
Kotak – ICICI	0.000	0.000	0.000	0.000	0.002	0.000
Kotak – Bajaj	0.018	0.004	0.046			
Kotak – HDFC	0.001	0.000	0.001			
Kotak – SBI	0.000		0.007			
Kotak – Reliance		0.048				
Kotak – Max		0.002				
Reliance – SBI	0.001					
Reliance – ICICI	0.002		0.000	0.000	0.013	
Max – ICICI	0.002				0.048	0.005
Max – SBI	0.001					
Birla – ICICI	0.002	0.000	0.002			
Birla – SBI	0.001					
SBI – ICICI		0.010				

Pairwise comparison evaluates relationship between pairs of companies' mean. Table 3.14 highlights only those pairs of companies' that differed significantly. In each

variable, eight selected companies have been compared with each other and analysed 28 pairs of companies and collectively it has analysed 168 pairs. Overall, 13 pairs have been identified out of 168 pairs having significant difference.

While analysing First year premium, it was observed that 10 out of 28 pairs have reported significant difference. In case of Management of expenses, 7 pairs out of 28 pairs have shown significantly different whereas an analysis of Renewal premium projected that 6 out of 28 pairs have reported significant difference. However, only 3 out of 28 pairs have been found to have significant difference in respect of income from investment. On the other hand, only 2 out of 28 pairs have reported significant difference in respect of Surplus and benefits paid. Selected companies have witnessed large differences as regards to first year premium, renewal premium and MOE. It indicates large variation in earnings of first year premium, renewal premium and incidence of MOE. It can be concluded that different practices followed by the selected companies in case of first year premium followed by management of expenses and renewal premium which has significantly impacted to the operating performance. Contrary, the selected companies have followed almost similar practices in terms of income from investments, surplus and benefits paid with marginal impact on operating performance.

It has been observed that ICICI has managed to increase first year premium income relatively in higher proportion as compared to that of all selected companies. SBI has also managed to generate higher first year premium income but has managed to control their MOE in more effective manner as compared to all selected companies. Both these companies have managing their business operation efficiently in all six parameters. In comparison, HDFC and Bajaj have also reported effective contribution in above mentioned six parameters of business operation. On the other hand, Birla, Reliance, and Max have considerably lower business than ICICI and SBI, which makes up significant difference during the period of study. Kotak has witnessed the highest significant difference as compared to that of all selected companies indicating lower proportion of business in all major parameters of operation.

The diagrams 3.1 to 3.6 demonstrate the overall picture of significant difference based on mean rank. Where black line presents no significant difference and light-yellow line presents significant difference, among the selected companies. (Detailed Pairwise comparison has been attached in in Appendix I)

The result of part I revealed that ICICI and SBI are operating more efficiently than other selected companies during the period under consideration. A comparative study of relative operating efficiency of selected companies' vis a vis all private life insurance companies and an assessment of level of slack to be achieved in order to reach at efficient level has been carried out in Part II of present chapter.

Diagram 3.1 Surplus

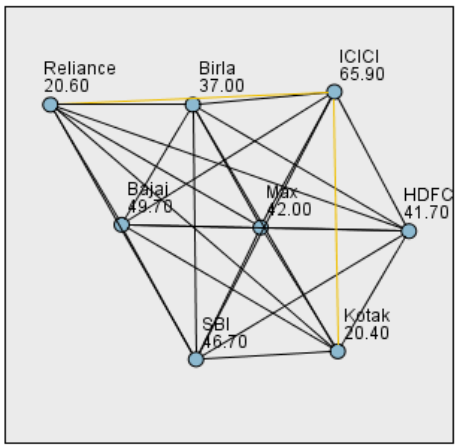


Diagram 3.2 First Year Premium

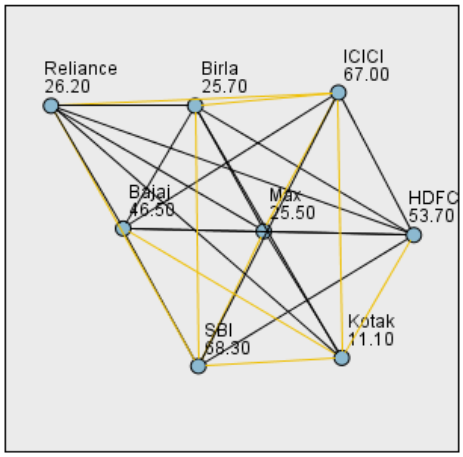


Diagram 3.3 Renewal Premium

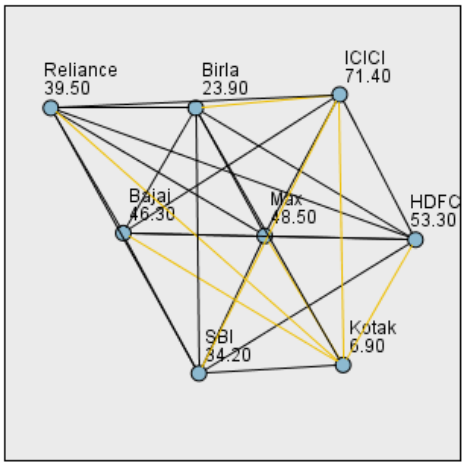


Diagram 3.4 Income from Investment

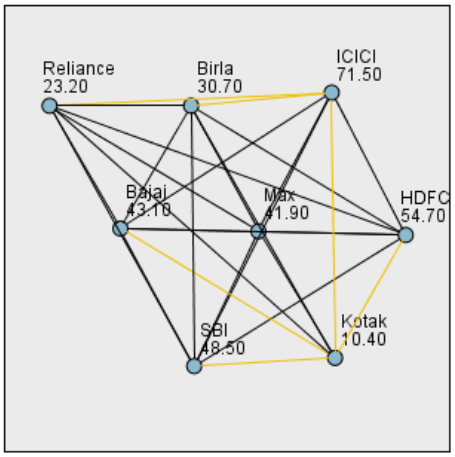


Diagram 3.5 Benefits Paid

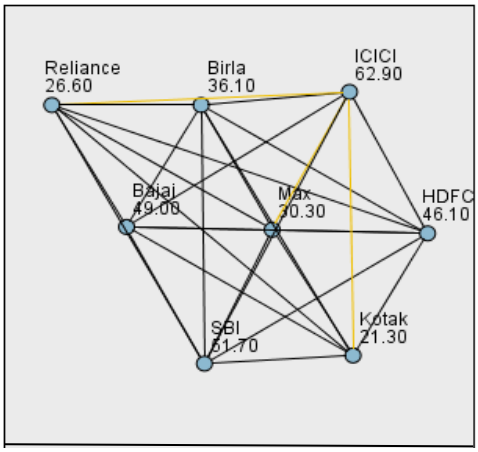
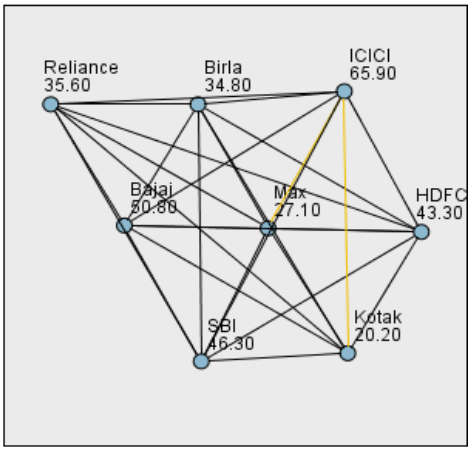


Diagram 3.6 MOE



Part II

3.9 Efficiency

Efficiency refers to the ability of firms to generate the maximum amount of output by using the minimum amount of inputs. It signifies a level of performance by determining the ratio of output to input. The basic idea of efficiency analysis is to estimate the best practice efficient frontiers consisting of the dominant firms in the industry. In the economics, efficiency of the firm consists of mainly two components such as Technical Efficiency & Allocative Efficiency. Technical efficiency replicates the ability of the firm to get maximum output from a given set of inputs. It is further decomposed into pure technical efficiency and scale efficiency (Fare, Grosskopf, & Lovel, 1984). Pure technical efficiency measures efficiency without scale efficiency. Although, scale efficiency refers to optimal size of operations, which is obtained by dividing the aggregate efficiency by technical efficiency (Coelli, Prasada Rao, O'Donnell, & Battese, 2005).

On the other hand, Allocative efficiency is known as price efficiency which replicates the ability of a firm to use the inputs in optimal proportions, given their respective prices. The combination of technical efficiency and allocative efficiency refers to economic efficiency (overall efficiency). However, Inefficiency only lies in factors such as productivity, resources allocation and management.

3.10 Operating Efficiency

Operating efficiency is about how efficiently a company is managing its resources in the course of its day-to-day activities. Operating performance is frequently measured using different accounting ratios such as net premium ratio, return on investment, expense to premium etc. These ratios give financial information by comparing past performance year wise and company wise in the same industry. Somewhere these financial ratios fail to consider the value of management actions. Thus, to measure efficiency one should focus on different techniques or methods. Some parametric and non-parametric methods are commonly used in efficiency measurement. Parametric method includes Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA), Thick Frontier Approach (TFA) and Multiple regression, whereas non-parametric method includes Data Envelopment Analysis (DEA), Free Disposable Hull (FDH) etc. Parametric (Econometric) methods are based on certain parameters and assumptions that data follows a normal distribution, whereas non-parametric

(mathematical programming) methods do not meet normal distribution assumption and specifically skewed data are analysed in non-parametric methods (Cummins & Zi, 1998).

Available literature indicates that DEA type estimators are maximum likelihood, and the results of these estimators affect the asymptotic properties (Grosskopf, 1996). DEA has been more consistent with multiple inputs & outputs (Kneip, Park, & Simar, 1998). "DEA provides a particularly convenient way to decompose overall efficiency and estimate scale economies" (Cummins & Xie, April 2013). DEA can ideally be able to handle small sample sizes (Kshetrimayum, 2011). Based on available literatures and characteristics of data, present study estimates efficiency using Data Envelopment Analysis (DEA), which evaluates and compares relative performance with minor prior assumptions.

3.11 Estimation of Data Envelopment Analysis (DEA)

Data Envelopment Analysis (DEA) is a non-parametric method of measuring relative efficiency of the decision-making units (DMUs) such as firms or public-sector agencies etc. The non-parametric piece-wise surface (or frontier) over the data is constructed using the linear programming method in DEA. The surface is then used to calculate efficiency measures. First of all, the piece-wise linear convex hull approach to frontier estimation proposed is used (Farrell, 1957). Later on, mathematical programming methods have been suggested by (Boles, 1966); (Shephard, 1970); (Afriat, 1972) but the term DEA was first used by (Charnes, Cooper, & Rhodes, 1978). DEA segregates the best practice firms from the sample and the more efficient (best practice firm) firm attains a score of 1 and the relatively inefficient firms secure a score between 0 and 1 by their distance from the production frontier. DEA measures efficiency using two approaches i.e. input oriented and output oriented. Input oriented approach indicates decrease in input without changing output whereas output oriented approach indicates maximization in output without changing input. (Charnes, Cooper, & Rhodes, 1978) proposed a model that had an input orientation and assumed constant returns to scale (CRS) model. Subsequent papers have considered alternative sets of assumptions, such as (Fare, Grosskopf, & Logan, 1983), (Banker, Charnes, & Cooper, 1984) in which variable returns to scale (VRS) models are proposed. Subsequently number of research papers have extended and applied the DEA methodology.

Practically, in selection of input oriented or output oriented measures, input conservation or output augmentation is very important (Ray, 2004). In this study commission expenses and operating expenses have been considered as inputs. However, basis for selection of inputs have been discussed in the later part of this chapter. Commission expenses and operating expenses are known as the expense of management. As per 17D of Insurance Rule 1939, no life insurer can spend expenses of management more than the limits prescribed. But to compete in the market, all insurers must pay reasonable expenses. If there is a decrease in input below a certain level, it may result into loss of an efficient agent or employee to the company. In this way commission expenses and operating expenses are two such inputs where in a reduction below a given level is not advisable in the interest of the company. Therefore, output based formulation would be more appropriate. In this study efficiency is measured by maximizing outputs with given input. So, an output-oriented approach has been used. The choice of constant or variable returns to scale depends on specific application.

The CRS assumption is only appropriate when all DMU's are operating at an optimal scale. It means performances of DMU's are not normally expected to depend on scale of operation. For comparing performance of several large monopolies this model is more appropriate. If all DMU's are not operating at the optimal scale and want to use the CRS specification, it will result in technical efficiency, but scale efficiency distracts it. Technical Efficiency (TE) as per CRS assumption can be expressed in terms of ratio is as follows.

TE CRS = TE VRS × Scale Efficiency (SE)

Many studies have decomposed the TE score obtaining from CRS in to Two components, one is scale efficiency, and another is "pure" technical efficiency. Further this model is extended by variable returns to scale (VRS) which measures technical efficiency devoid of these scale efficiencies. (Coelli T. J., 1996), wherein scale efficiency may be expressed in terms of the following ratio.

SE = TE CRS/ TE VRS

Scale efficiency shows whether the companies are operating on CRS or not. If companies are not operating on CRS, it doesn't show whether the firm is sub optimally small or large indicating Increasing Returns to Scale (IRS) or Decreasing Returns to Scale (DRS). The extended VRS model states increasing or decreasing

returns to scale. Therefore, the present study has decomposed TE CRS into pure technical efficiency (i.e., TE VRS) and scale efficiency with applying above formula.

Mathematical Formulation

In case of one input one output production, simple diagrammatic approach is more appropriate. For multiple input-output production, it is advisable to use algebra approach.

In 1957, Farrel described the technique of frontier analysis. However, a mathematical framework to handle frontier analysis could be established after 20 years by Charnes et al. (1978).

The Mathematical program is:

$$\max E_m = \frac{\sum_{j=1}^{J} v_{jm} y_{jm}}{\sum_{i=1}^{I} u_{im} x_{im}}$$

subject to

$$0 \le \frac{\sum_{j=1}^{J} v_{jm} y_{jn}}{\sum_{i=1}^{I} u_{im} x_{in}} \le 1; \quad n = 1, 2, \mathrm{K}, N$$

$$v_{jm}, u_{im} \ge 0; \quad i = 1, 2, \mathrm{K}, I; \quad j = 1, 2, \mathrm{K}, J$$

Where

E_m is the efficiency of the mth DMU,

y_{jm} is jth output of the mth DMU

v_{jm} is the weight of that output

y_{im} is ith input of the mth DMU

u_{im} is the weight of that input, and

y_{jn} and x_{jn} are jth output and ith input, respectively, of the nth DMU, n = 1, 2, …, N.

This mathematical program is a frictional program. It is difficult to solve for large data set. Hence, it is pertinent to convert into liner programming format. Present study has used linear programming (LP) techniques to test efficiency with objective functions.

An algebraic formulation of DEA Optimization problem:

Let $x^j = (x^j_1, x^j_2, \ldots, x^j_n)$ be the bundle of n inputs used and $y^j = (y^j_1, y^j_2, \ldots, y^j_m)$ the bundle of m outputs produced by firm j (j=1, 2, …., N). suppose that k is one of the observed firms and wish to measure the technical efficiency of firm k. The observed input-output bundle of firm k is (x^k, y^k).

The relevant DEA LP Programme would be

Max ϕ

s.t.

Output Constraints	$\sum_{j=1}^{N} \lambda j Yrj \geq \phi y_{rk}$	(r = 1, 2, …, m);	
Input Constraints	$\sum_{j=1}^{N} \lambda j xij \leq x_{ik}$	(i = 1, 2, …, n);	(3.1)
Sum of weight	$\sum_{j=1}^{N} \lambda j = 1;$	(j = 1, 2, …, N)	
Weight	$\lambda j \geq 0;$	(j = 1, 2, …, N); ϕ Unrestricted	

The technical efficiency of firm k would be measured by

Technical Efficiency = Actual Output (Y0) / Maximum Output (ϕ*YO)

$$T_k = \frac{1}{\phi^*} \qquad (3.2)$$

where ϕ* is the optimal solution of DEA LP problem above.

3.12 Measurement of Input and Output

Selection of input and output is important aspect of DEA estimation. It is very difficult to estimate the same in-service sectors like insurance, banking etc. The criteria for the selection of input and output are quite subjective. There is no specific rule in determining the procedure for selection of inputs and outputs. However, it is purely based on the judgement of the researcher, by taking the support of technical expert in a field, using various guidelines, Methods (Approaches), literatures etc.

3.12.1 Output

Output means a generation of benefits from the operation of DMUs. There are mainly three approaches to determine outputs i.e. The Assets (Intermediation) Approach, The User Cost Approach and Value Added Approach (Berger & Humphrey, 1992); (Kshetrimayum, 2011); (Micajkova, 2015); (Bawa & Bhagat, 2015); (Chakraborty, 2016).

The Assets (Intermediation) Approach considers financial firms as pure financial intermediaries that borrow funds from customers, invest in the market and transform into assets. Customers have been paid interest for the time value of the funds used. Although, insurance companies are working as intermediaries but at the same time, they provide certain other services too. The main functions of life insurance companies are risk pooling and risk bearing. Thus, this approach is inappropriate for the present study.

The User Cost Approach determines financial input and output. If the financial returns on an asset exceeds the opportunity cost of funds or if the financial costs of a liability are less than the opportunity costs, then the product is a financial output. Otherwise, it is classified as financial input (Cummins & Weiss, 2013). Product revenue and opportunity costs are the base for estimation of financial input and output. Practically, it is difficult to estimate this approach in life insurance sector due to the bundle of policies and variety of services provided by the insurers.

The third approach is Value added approach. It determines output based on significant value addition. Insurer's outputs consist of intangible services. It is necessary to define suitable proxies that are highly correlated with the quantity of financial services provided (Levertya & Grace, 2008). In Insurance business, output proxies defined through three principal services i.e., Risk pooling & Risk bearing, Real financial services relating to insured losses, and Intermediation.

Life Insurers operate risk pooling function by collecting premium from policyholders and redistributing incurred losses. Furthermore, Insurers reduce their policyholders' risks by holding capital to absorb unexpected losses. Parallelly, insurers bear the risk at every stage of its operation.

As regards to real financial services, life insurers provide various services such as individual retirement account, tax sheltered annuities, estate planning, flexible premium annuities, mortgage banking, and portfolio management (Morton & McGuire, 1980). On the other hand, Intermediation function may be applied in life insurance annuity products, wherein policyholders invest in annuity plan and insurer invest the same funds in the market until benefits are paid. Interest credits are deposited directly to policyholders account as investment income. The net interest margin between actual rate of return earns and the rate of interest credited to policyholders account represents the value-added of the intermediation function.

In the life insurance business premium income is the outcome of risk pooling and risk bearing function. It adds the significant value in the operation of the business. Hence, based on the value-added approach premium income is considered as an output in the present study.

3.12.2 Input

Inputs are resources utilised by the DMUs to operate or to give certain outputs. In general parlance input is divided in three parts such as labour, business service & materials and capital (Cummins & Weiss, 2013); (Micajkova, 2015). Most of the studies follow this classification to select inputs for DMUs.

Labour consists of agents, employees, & brokers etc. Business service & material includes all operating and administrative inputs whereas, capital includes fixed capital & financial capital.

In the present study, operating expenses is selected as an input based on business service & materials approach input. Operating expenses include all travelling expenses, conveyance, repairs, communication expenses, legal & professional charges, audit fees etc. Furthermore, it includes capital expenditure like business development expenses, computers etc. However, some operating expenses related to employees are correlated with labour approach input for selecting an input. Commission paid is considered as a second input in the present study based on labour approach input. It includes commission paid to agents, brokers, corporate agencies & others. However, available literature played a vital role in selection procedure of inputs. Few summarised literatures, containing inputs & outputs are presented in Table 3.15 below.

Table 3.15 Summary of Inputs & Outputs used in different studies related with Efficiency Measurement.

Author	YOP	Output Variables	Input Variables	Area of Work	Country
J. David Cummins, Hongmin Zi	1998	Benefit Payments & Additions to Reserves	Labour, Financial Capital, Materials	Life Insurance	U. S
Ram Pratap Sinha	2007	Benefits Paid, Operating Income, Net Premium	Operating Expenses	Life Insurance	India

Dr. Sumninder Kaur Bawa and Miss Ruchita	2011	Net Premiums	Equity Capital, Labour	Health Insurance	India
Norma Md Saad, Nur Edzalina Haji Idris	2011	Net Premium, Net Income on Investment	Commission Paid, Management Expenses	Life Insurance	Malaysia
Mr. Sanjaykumar. R. Shinde	2011	Benefits Paid, Net Premium Mobilised	Operating Expense, Commission Expense	Life Insurance	India
Kshetrimayum Sobita Devi	2011	Premium Income & Benefits Paid	Operating Exp, Commission	Life Insurance	India
Kwadjo Ansah-Adu, Charles Andoh And Joshua Abor	2011	Profit or Loss, Net Premium and Investment Income	Total Capital, Total Operating Cost, Total Investments	Life & Non-Life Insurance	Ghana
Wu Song, Cao Zhengyong, Qin Kun, Lang Wei, Zhang Rong	2012	Premium Income, Deposit, Investment Income	Labour, Capital	Life & General Insurance	China
Noel Toya Mwangeti	2012	Net Earned Premium Income, General Market Share, Investment Income	Incurred Claim, Commission Expense, Management Expense, Admitted Assets	Life & Non-Life Insurance	Nairobi, Kenya
Mr. Abhijit Sinha	2013	Net Premium & Benefits Paid	Commission & Operating Expense	Life Insurance	India
Abdul Latif Alhassan, George Kojo Addisson, Michael Effah Asamoah	2014	Net Premium, Net Income After Tax	Business Service Input, Labour Cost, Equity Capital, Debt Capital	Life & Non-Life Insurance	Ghana
Jayanta Kumar Nandi	2014	Net Premium, Net Benefits Paid	Commission Paid, Operating Expenses	Life Insurance	India

Tanuj Mathur, Ujjwal Kanti Paul	2014	Net Premium, Income from Investments	Commission, Management Expenses, Shareholder Capital	Non-Life Insurance	India
Vesna Micajkova	2015	Gross Written Premium, Gross Claims Settled	Administrative Exp., Commission Exp., Total Capital.	Insurance Companies in General	European Country Macedonia
Khalid Al-Amri	2015	Losses Incurred, Investments	No of Employees, Equity & Debt Capital	General Insurance	Muscat, Oman
Dr Sumninder Kaur Bawa, Nidhi Bhagat	2015	Net Premiums, Number of Policies Sold	Number of Agents, Number of Offices	Life Insurance	India
Md. Omar Faruk, Arafatur Rahaman	2015	Premium & Investment Income	Commission, Management Exp	Life Insurance	Bangladesh
Joy Chakraborty	2016	Net Premiums, Benefits Paid (Net), Income from Investments	Operating Exp, Commission, Investments	Life Insurance	India
Tapas Kumar Parida, Debashis Acharya	2017	Benefits Paid, Liquid Assets to Liabilities	Individual Agent, Operating Exp., Total Commission, Equity Capital + Debt Capital.	Life Insurance	India

Source: Compiled from different studies

3.13 Decision Making Units (DMUs)

Decision-Making Units (DMUs) refers to the number of firms or companies used for the comparison under DEA. The selection of DMUs depends upon homogeneity and the number of DMUs. In private sector life insurance business, 23 companies are operating in India having similar tasks and objectives. Of the 23 companies, 8 have been selected for the present study. It is necessary to measure the relationship between input-output and DMUs. Relationship between input-output and DMUs signifies that higher the number of DMUs, higher the performance of efficient frontier

(Ramanathan, 2003). Certain rules of thumb are also specified for the same. The number of DMUs is expected to be at least 2 or 3 times larger than the number of inputs and outputs (Golany & Roll, 1989); (Bowlin, 1998). In order to make the efficiency result more reliable all the 23 private life insurance companies have been considered. However, the greater emphasis has been given to the selected 8 companies.

3.14 Analysis & Interpretation

Objective:

To analyse relative operational efficiency.

Present chapter has used descriptive statistics as well as DEA to achieve the objective of the study.

3.14.1 Descriptive Statistics

A summary of primary statistics is presented below comprising average, coefficient of variance, Minimum & Maximum for selected input(s)-output.

Table 3.16 Summary Statistics of Output and Inputs for the year 2007-08 to 2016-17

Output

Premium				
Companies	**Mean**	**CV**	**Min.**	**Max.**
HDFC	11,06,089	42.96	4,85,856	19,44,549
MAX	6,57,210	37.12	2,71,460	10,78,040
ICICI	16,01,401	19.05	12,42,865	22,35,400
Kotak	3,04,432	30.60	1,69,114	5,13,955
Birla	5,14,983	15.08	3,27,219	5,88,536
SBI	11,99,135	36.25	5,62,214	21,01,513
Bajaj	7,96,971	27.09	5,84,314	11,41,971
Reliance	4,82,065	22.94	3,22,544	6,60,490
Overall	**8,32,786**	**59.07**	**1,69,114**	**22,35,400**

Inputs

Commission					**Operating Expense**			
Companies	**Average**	**CV**	**Min**	**Max**	**Average**	**CV**	**Min**	**Max**
HDFC	56,269	23.44	35,126	79,202	1,54,180	24.98	1,01,298	2,38,528
MAX	61,346	30.49	38,446	93,643	1,31,745	17.00	86,533	1,60,896
ICICI	66,051	13.86	55,317	81,097	2,19,662	20.22	1,61,686	2,91,994
Kotak	18,071	38.25	11,212	32,481	62,585	22.62	42,487	92,818
Birla	32,812	31.76	21,806	51,620	1,02,875	22.15	67,073	1,32,675
SBI	58,977	20.13	40,538	78,334	1,02,620	35.74	44,694	1,64,649
Bajaj	54,552	86.79	14,644	1,49,686	1,48,977	22.55	1,05,630	2,00,434
Reliance	37,913	39.82	19,541	62,785	1,36,828	23.22	77,984	1,92,297
Overall	**48,249**	**52.14**	**11,212**	**1,49,686**	**1,32,434**	**40.17**	**42,487**	**2,91,994**

Source: Computed

(Min = Minimum Amount, Max = Maximum Amount)
(Average Amount Rs. in Lakh, CV= Coefficient of variance in %)

For the purpose of calculating premium earned by selected companies during the period under consideration i.e., 2007-08 to 2016-17, Mean of premium earned for each of the selected companies is computed and overall average of the same is determined at Rs 8,32,786 lakh. Max, Kotak, Birla, Bajaj and Reliance have earned the below overall average premium whereas ICICI, SBI and HDFC have earned the above overall average premium. ICICI has earned highest average total premium Rs. 16,01,401 lakhs with lowest coefficient of variance 19.05%. It indicates that ICICI is very consistent in generation of premium income. In the year 2016-17, ICICI has witnessed highest premium collection Rs. 22,35,400 lakhs in selected companies.

For the purpose of calculating commission paid by selected companies during the period under consideration i.e., 2007-08 to 2016-17, Mean of commission paid for each of the selected companies is computed and overall average of the same is determined at Rs 48,249 lakh. Kotak, Birla and Reliance have incurred below the overall average commission whereas ICICI, SBI, HDFC, Bajaj and Max have incurred above the overall average commission. For the purpose of calculating operating expenses paid by selected companies during the period under consideration i.e., 2007-08 to 2016-17, Mean of operating expenses paid for each of the selected companies is computed and overall average of the same is determined at Rs 1,32,434 lakh. Max, Kotak, Birla and SBI have incurred below the overall average operating expenses whereas ICICI, HDFC, Bajaj and Reliance have incurred above the overall average operating expenses. As it has been observed that ICICI and HDFC have witnessed higher operating expenses and commission with increased amount of premium income. However, SBI is the only company that maximize premium income with lower commission and operating expenses. On the other hand, remaining companies failed to enhance business in terms of premium by managing management of expenses.

3.14.2 Efficiency Analysis

Table 3.17 below highlights the overall technical efficiency under CRS from the year 2007-08 to 2016-17. Technical efficiency reflects technological change and adoption of new technology. It has converted into an efficiency score from 0 to 1, the company which has achieved a score 1 is technically efficient and the rest are relatively inefficient or less efficient.

Table 3.17 Technical Efficiency under Constant Return to Scale (TE-CRS)

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	0.870	0.465	1.000	0.693	0.655	1.000	0.460	0.696
2008-09	0.597	0.449	1.000	0.551	0.510	1.000	0.610	0.409
2009-10	0.607	0.467	1.000	0.708	0.513	1.000	0.661	0.502
2010-11	0.671	0.416	1.000	0.717	0.527	1.000	0.609	0.461
2011-12	0.671	0.416	0.740	0.679	0.545	1.000	0.590	0.447
2012-13	0.928	0.595	0.754	0.588	0.534	1.000	0.529	0.377
2013-14	0.978	0.621	0.799	0.515	0.555	1.000	0.504	0.340
2014-15	0.920	0.601	0.864	0.427	0.565	1.000	0.524	0.296
2015-16	0.820	0.680	0.963	0.475	0.595	1.000	0.758	0.362
2016-17	0.785	0.531	0.928	0.518	0.717	1.000	1.000	0.599
Average	**0.784**	**0.524**	**0.905**	**0.587**	**0.571**	**1.000**	**0.625**	**0.449**
Rank	**3**	**7**	**2**	**5**	**6**	**1**	**4**	**8**

Source: Computed

As regards technical efficiency, SBI demonstrated the consistent efficiency score 1 throughout the study period. In contrast, ICICI showed good performance for the first four years and then posed suboptimal performance for the remaining study period. However, in terms of average efficiency score ICICI is near to efficiency score.

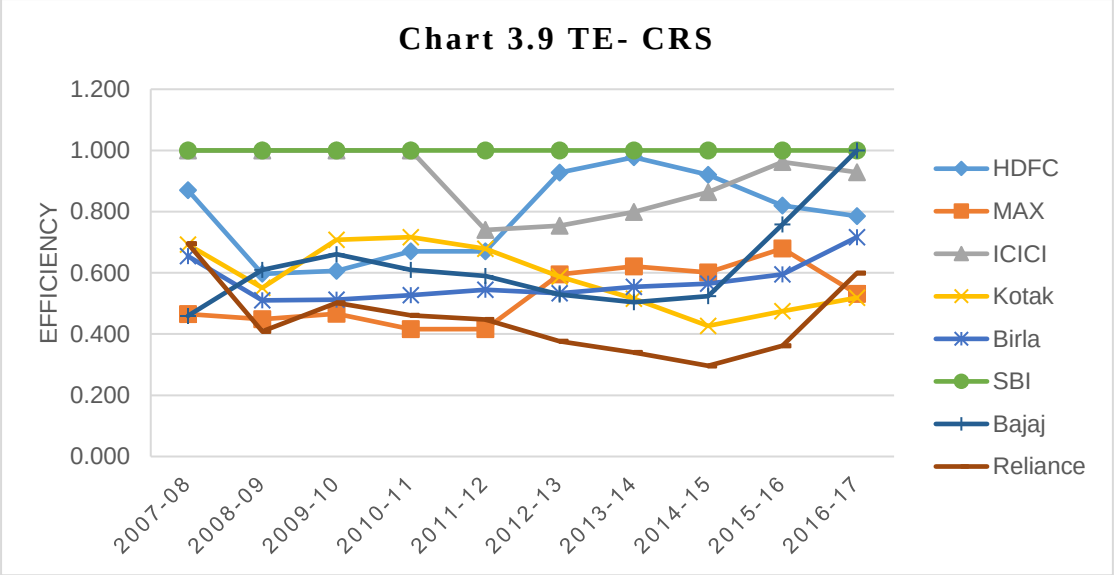
HDFC has reported efficiency score between 0.60 to 0.97 and has not reached a level of efficiency during the study period. Although, based on average efficiency score company stood at 3rd position.

On the other hand, Bajaj shows upward trend in the efficiency score during the study period. Company has achieved efficiency level in the year 2016-17. The company has ranked 4th in terms of average technical efficiency.

Kotak, Birla and Max have reported average efficiency score between 50 to 60% (i.e., 0.500 to 0.600) and ranked fifth, sixth and seventh respectively.

Reliance has reported average efficiency score less than 50% and stood last among the selected companies. Looking at the table in more detail, it is found that company has observed below 50% efficiency score during seven out of ten years period. Company is lagging in terms of adoption of new technology as compared to other selected companies.

However, this presentation shows overall technical efficiency only. Detailed bifurcation of overall technical efficiency into pure technical efficiency and scale efficiency have been presented in table 3.18 & 3.19.



Source: Computed

Chart 3.9 presented above demonstrates comparative view of overall technical efficiency of selected private life insurance companies in India for the year 2007-08 to 2016-17.

During the study period, SBI position itself at the top indicating green line and Reliance stood at bottom indicating brown line. The rest of the companies have experienced ups and downs during the period of the study.

Table: 3.18 Technical Efficiency under Variable Returns to Scale (TE-VRS)

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	0.870	0.465	1.000	0.694	0.655	1.000	0.916	0.699
2008-09	0.597	0.449	1.000	0.558	0.511	1.000	0.883	0.409
2009-10	0.608	0.469	1.000	0.729	0.514	1.000	0.833	0.502
2010-11	0.672	0.416	1.000	0.725	0.529	1.000	0.613	0.462
2011-12	0.764	0.479	1.000	0.879	0.694	1.000	0.749	0.537
2012-13	1.000	0.615	1.000	0.814	0.755	1.000	1.000	0.545
2013-14	1.000	0.634	1.000	0.606	0.720	1.000	1.000	0.480
2014-15	1.000	0.615	1.000	0.527	0.738	1.000	0.941	0.556
2015-16	0.857	0.680	1.000	0.488	0.754	1.000	1.000	0.521
2016-17	0.870	0.531	1.000	0.540	0.750	1.000	1.000	0.627
Average	**0.824**	**0.535**	**1.000**	**0.656**	**0.662**	**1.000**	**0.893**	**0.534**
Rank	**3**	**6**	**1**	**5**	**4**	**1**	**2**	**7**

Source: Computed

Table 3.18 above illustrates technical efficiency using variable return to scale assumption, which is known as Pure Technical Efficiency.

Overall, it can be seen that two out of the eight selected companies have been found efficient throughout the study period. All selected companies have reported their

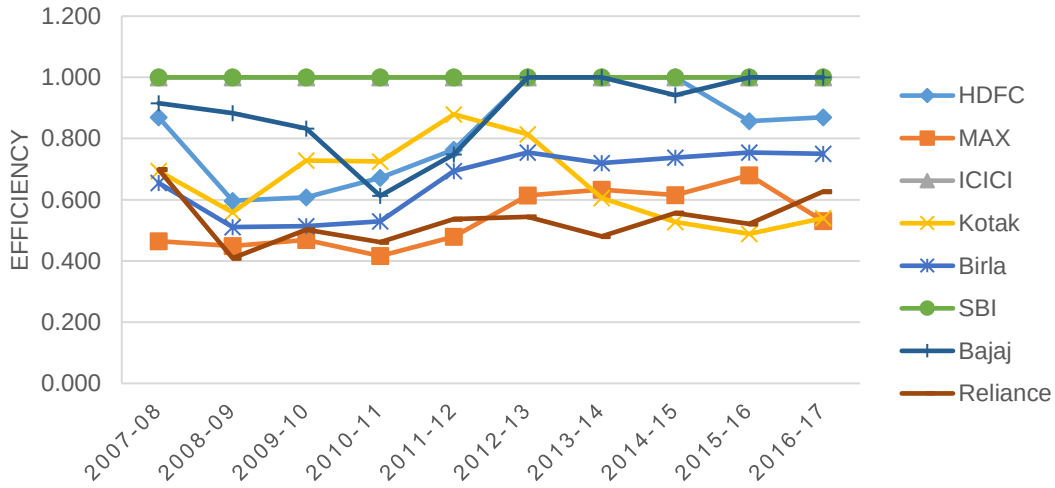
average technical efficiency score more than 50% i.e., 0.500, for the reason that the data is expected to be enveloped slightly more tightly under VRS model.

SBI and ICICI scored 1 in technical efficiency throughout the study period. Both the companies were technically efficient during the study period. As regards average technical efficiency both these companies ranked first.

However, Bajaj has obtained second position in terms of average technical efficiency with 0.893 score during the period of the study. Company witnessed good efficiency score during last five years of the study period which is almost equal to one. HDFC scored 0.824 average technical efficiency during the study period and obtained rank third. Nearly 65% (0.650) of average technical efficiency has been reported by Kotak and Birla.

By contrast Max and Reliance have reported nearly 53% (0.530) average technical efficiency. As regards pure technical efficiency, both these companies were in bottom line among selected companies.

Chart 3.10 TE- VRS



Source: Computed

Chart 3.10 above illustrates the comparative view of pure technical efficiency of selected private life insurance companies in India for the year 2007-08 to 2016-17. SBI and ICICI have maintained their efficiency level at score 1. However, other selected companies have observed variations during the period of study.

Table 3.19 Scale Efficiency (SE)

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	1.000	1.000	1.000	0.999	1.000	1.000	0.502	0.995
2008-09	1.000	1.000	1.000	0.987	0.999	1.000	0.691	1.000
2009-10	0.998	0.995	1.000	0.972	0.997	1.000	0.794	1.000
2010-11	0.999	0.999	1.000	0.988	0.997	1.000	0.995	0.999
2011-12	0.878	0.868	0.740	0.772	0.786	1.000	0.788	0.832
2012-13	0.928	0.968	0.754	0.722	0.707	1.000	0.529	0.692
2013-14	0.978	0.981	0.799	0.850	0.770	1.000	0.504	0.709
2014-15	0.920	0.977	0.864	0.809	0.766	1.000	0.557	0.533
2015-16	0.956	0.999	0.963	0.972	0.789	1.000	0.758	0.694
2016-17	0.903	1.000	0.928	0.960	0.955	1.000	1.000	0.955
Average	**0.956**	**0.979**	**0.905**	**0.903**	**0.876**	**1.000**	**0.712**	**0.841**
Rank	**3**	**2**	**4**	**5**	**6**	**1**	**8**	**7**

Source: Computed

Table 3.19 above depicts Scale efficiency of selected companies for the period under consideration. Scale efficiency is the ratio of CRS technical efficiency score to VRS technical efficiency score. It reflects whether the firm is operating at constant returns to scale or not.

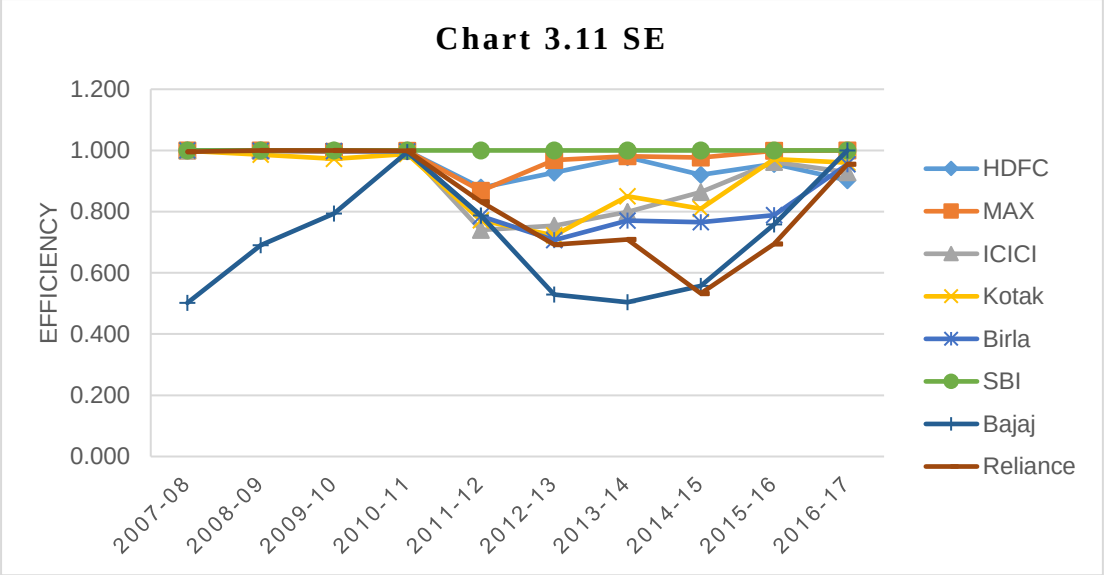
Overall, it is evident that majority of the companies scored 1 in scale efficiency during the beginning years of the study period.

As regards scale efficiency, SBI witnessed scale efficient by scoring 1 throughout the study period and lies on an efficient frontier curve. On the basis of average scale efficiency, SBI ranked first among the selected companies.

In respect of average scale efficiency, four out of remaining seven companies scored more than 90% (0.9000). Max and HDFC have reported average efficiency score more than 95% (0.950) whereas ICICI and Kotak have reported average efficiency score near to 90% (0.9000).

Birla and Reliance secured sixth and seventh rank respectively with average efficiency score near to 85% (0.850). On the other hand, Bajaj has reported lower average efficiency score 71% (0.712) and positioned last.

The operating efficiency of selected companies has a scope for improvement in both technical efficiency as well as in scale efficiency.



Source: Computed

Chart 3.11 above reflects scale efficiency of selected companies for the year 2007-08 to 2016-17. Almost all the selected companies experienced scale efficiency in the initial four years of the study period. Later, fluctuations have been observed in the selected companies.

Average Efficiency

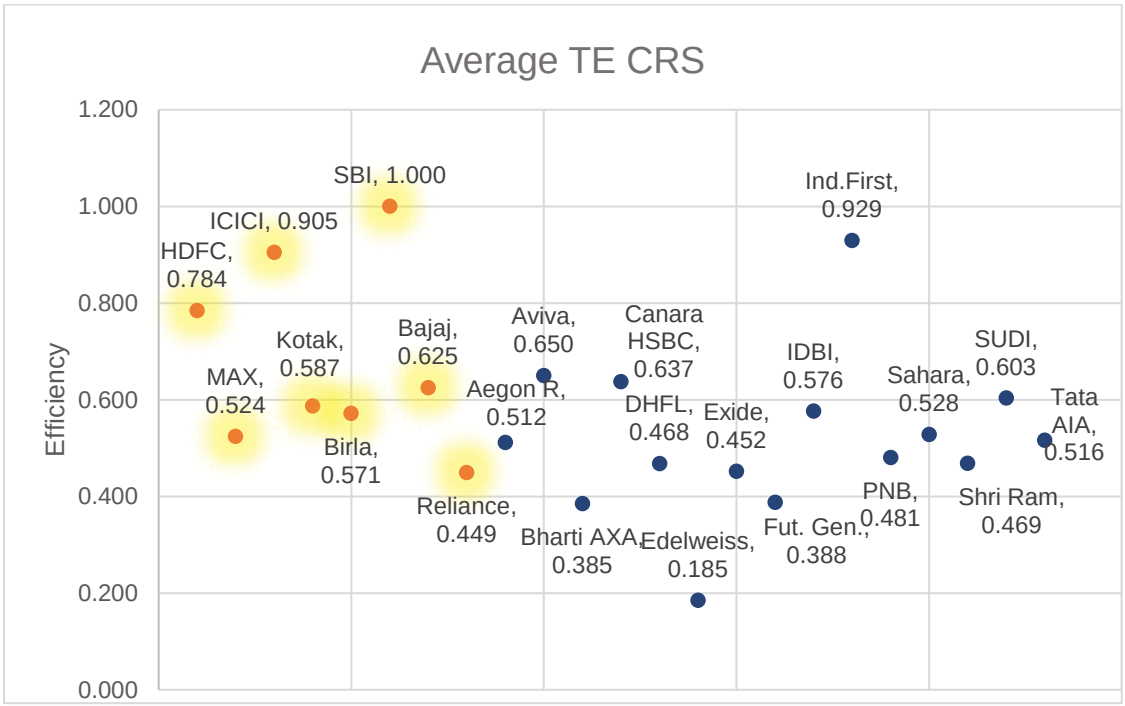
Chart 3.12 to 3.14 below highlights average technical efficiency using CRS and VRS assumption for the period under consideration. It exemplifies the picture of private life insurance sector in accordance with operating efficiency. According to their efficiency score companies have been plotted in scatter charts below. It exhibits frontier line at efficiency score one.

A company that operates at the frontier line is the most efficient company having capacity to produce more with minimum resources.

It is worthwhile to note that seven out of eight selected companies have operated with more than 50% (0.5000) overall technical efficiency. As regards pure technical efficiency, all selected companies have operated with more than 50% (0.5000). However, scale efficiency is concerned, all selected companies have operated more than 71% (0.710).

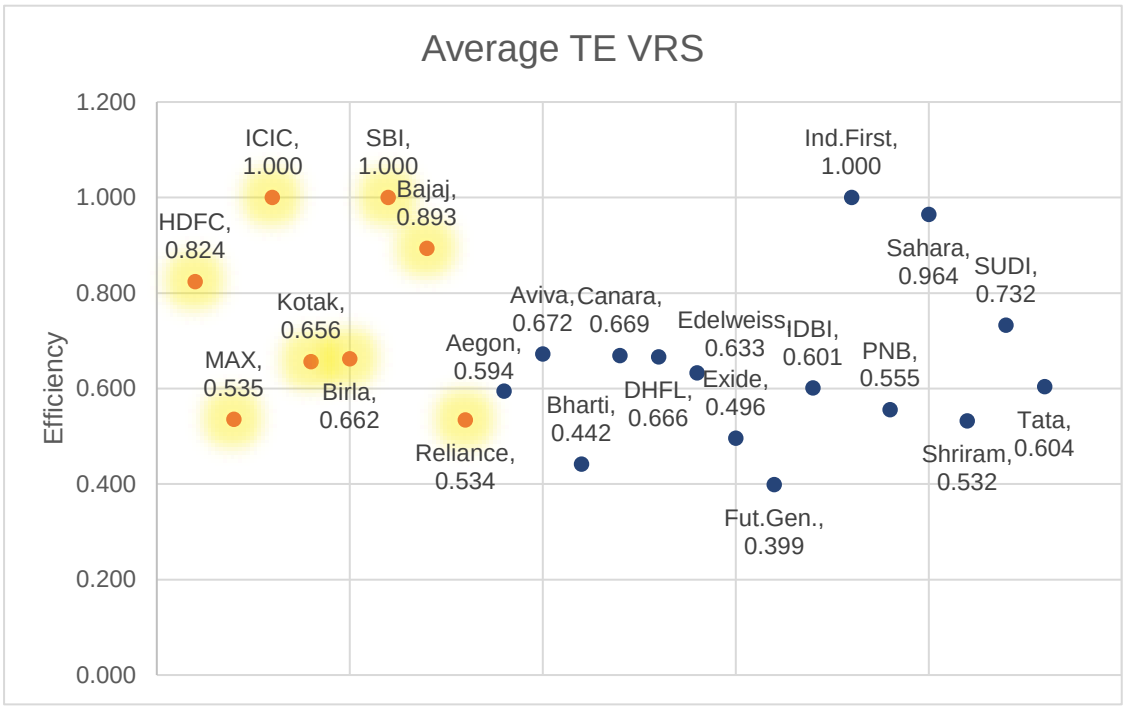
Summary statistics are presented in table 3.20 below on the basis of charts 3.12 to 3.14.

Chart 3.12 Comparative Average Technical Efficiency under Constant Returns to Scale (Overall Technical Efficiency)



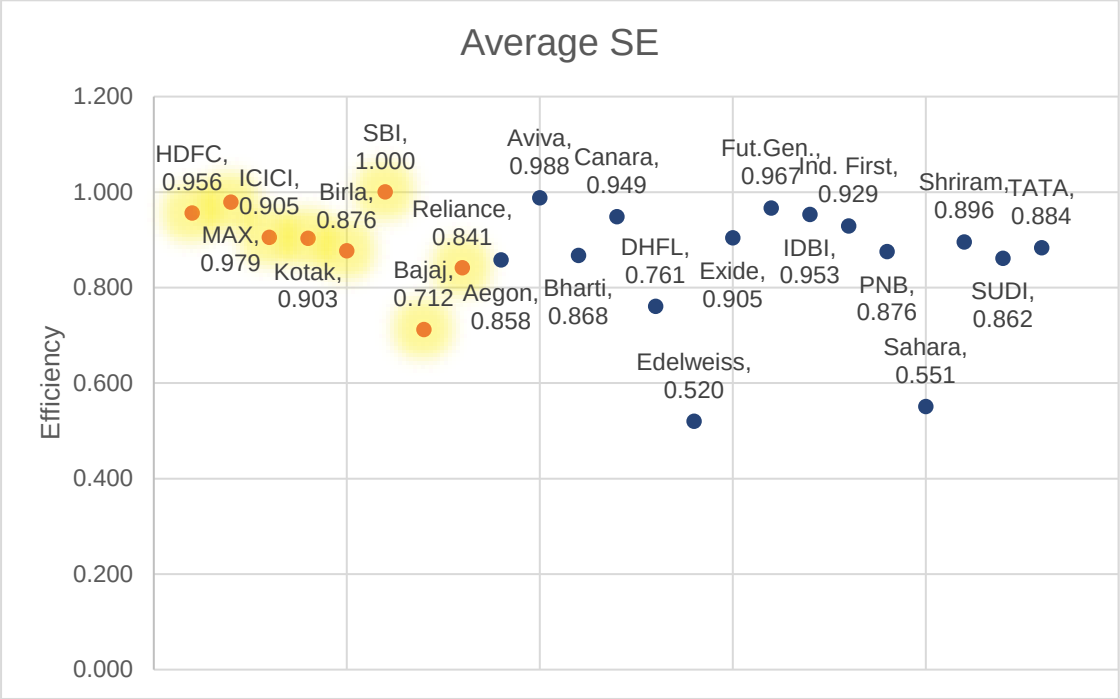
Source: Computed

Chart 3.13 Average Technical Efficiency under Variable Returns to Scale (Pure Technical Efficiency)



Source: Computed

Chart 3.14 Average Scale Efficiency



Source: Computed

Table 3.20 Summary statistics of average efficiency score

Efficiency Score	**Selected Companies**						**Overall**					
	TE- CRS		**TE- VRS**		**SE**		**TE- CRS**		**TE- VRS**		**SE**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
More than or equal to 0.90	2	25	2	25	5	63	3	13	4	17	12	52
0.76 to 0.89	1	13	2	25	2	25	1	4	2	9	8	35
0.61 to 0.75	1	13	2	25	1	13	3	13	7	30	1	4
0.46 to 0.60	3	38	2	25	0	0	11	48	8	35	2	9
Less than or equal to 0.45	1	13	0	0	0	0	5	22	2	9	0	0
Total	**8**	**100**	**8**	**100**	**8**	**100**	**23**	**100**	**23**	**100**	**23**	**100**

Source: Computed

With respect to overall technical efficiency, of the selected companies 25% achieved 90% (0.9000) or more technical efficiency score. However, only 13% of companies from all private companies acquired 90% (0.900) or more technical efficiency score.

As regards pure technical efficiency, of the selected companies 25% achieved 90% (0.9000) or more technical efficiency score. However, only 17% of companies from all private companies acquired 90% (0.900) or more technical efficiency score.

As regards scale efficiency, 63% of companies from selected acquired 90% (0.9000) or more efficiency score. However, only 52% of companies from all private companies acquired 90% (0.900) or more scale efficiency score.

From the discussion above, it has been revealed that performance of selected companies is more effective in terms of operating efficiency. Selected companies have gradually increased use of technology in business operation.

It is very important to understand the behaviour of output with the increase in scale of operation after measuring efficiency. In the later part of the present chapter, an attempt has been made to analyse returns to scale efficiency for each company.

3.14.3 Returns to Scale

Returns to scale describes the effect of increased production in long run. It explains the increased rate behaviour in output relative to the associated increase in input in the long run. Although, in the long run all factors in the production are variable and subject to change due to a given increase in size (Tone & Sahoo, 2005).

There are three types of returns to scale: Constant Returns to Scale (CRS), Increasing Returns to Scale (IRS), and Decreasing Returns to Scale (DRS). When output increases by the same proportional change in input, it is referred to as Constant Returns to Scale. In case of IRS, output increases by more than the proportional change in input. While in case of DRS, output increases by less than the proportional change in input.

According to mainstream microeconomics, the returns to scale faced by a firm are purely technologically imposed and are not influenced by economic decisions or by market conditions (Gelles & Mitchell, 1996). Therefore, returns to scale depends on technological change adopted by the companies.

Table 3.21 below highlights returns to scale company-wise. Table 3.22 below highlights the summary of returns to scale for all selected companies.

Table 3.21 Returns to Scale

Years	HDFC	MAX	ICICI	Kotak	Birla	SBI	Bajaj	Reliance
2007-08	CRS	CRS	CRS	IRS	CRS	CRS	DRS	DRS
2008-09	CRS	CRS	CRS	IRS	IRS	CRS	DRS	CRS
2009-10	IRS	IRS	CRS	IRS	IRS	CRS	DRS	CRS
2010-11	IRS	CRS	CRS	IRS	IRS	CRS	DRS	CRS
2011-12	DRS	DRS	DRS	DRS	DRS	CRS	DRS	DRS
2012-13	DRS	DRS	DRS	DRS	DRS	CRS	DRS	DRS
2013-14	DRS	DRS	DRS	DRS	DRS	CRS	DRS	DRS
2014-15	DRS	DRS	DRS	DRS	DRS	CRS	DRS	DRS
2015-16	DRS	IRS	DRS	DRS	DRS	CRS	DRS	DRS
2016-17	DRS	CRS	DRS	DRS	DRS	CRS	CRS	DRS

Source: Computed

Table 3.22 Summary of Returns to Scale

Years	CRS		IRS		DRS		Total	
	No. of Co.	%	No. of Co.	%	No. of Co.	%	No. of Co.	%
2007-08	5	62.5	1	12.5	2	25	8	100
2008-09	5	62.5	2	25	1	12.5	8	100
2009-10	3	37.5	4	50	1	12.5	8	100
2010-11	4	50	3	37.5	1	12.5	8	100
2011-12	1	12.5	0	0	7	87.5	8	100
2012-13	1	12.5	0	0	7	87.5	8	100
2013-14	1	12.5	0	0	7	87.5	8	100
2014-15	1	12.5	0	0	7	87.5	8	100
2015-16	1	12.5	1	12.5	6	75	8	100
2016-17	3	37.5	0	0	5	62.5	8	100

Source: Computed

During the first four years of the study, majority of selected companies have operated at CRS. By contrast, in remainder of the years, majority of selected companies have operated at DRS.

SBI is the only company that has operated at CRS throughout the study period. However, Kotak is the only company that has not operated at CRS throughout the study period.

HDFC, ICICI, Birla and Reliance have operated at DRS in last six years of the study. Bajaj has operated at DRS for nine consecutive years of the study and operated at CRS in the last year. On the other hand, Max has operated at fluctuating returns to scale.

It has been observed that some of the companies having high technical efficiency score being operated at DRS. The reason may be their size of the business, they may be sub-optimally large companies.

3.14.4 Output Slack

The result of data envelopment analysis demonstrates that the companies having score one is considered efficient, whereas the rest are considered relatively inefficient. The actual output of inefficient companies is less than the output target. Difference between output target and actual output is called output slack.

The output target can be determined using following formula.

Formulas:

$$\text{Output Target} = \frac{\text{Actual Output}}{\text{Relative Efficiency} / 100}$$

$$\text{Output slack} = \text{Output Target} - \text{Actual Output}$$

$$\text{Output Slack in \%} = \frac{\text{Output Slack}}{\text{Actual Output}} \times 100$$

The present study has used output-oriented model. Based on output-oriented model relatively inefficient companies need to increase their output with maintaining same level of inputs to reach at efficiency level. With the help of concept of output slack, an inefficient company can calculate the extent of increase in their actual output.

Using the above formulas table 3.23 below computed output slack in percentage using CRS model. It shows how far away inefficient companies to achieve the overall technical efficiency level as compared to efficient company(s).

Table 3.24 below computed output slack in percentage using VRS model. It shows how far away inefficient companies to achieve the pure technical efficiency level as compared to efficient company(s).

Table 3.23 Output (Premium) Slack in % from the year 2007-08 to 2016-17 using CRS Model (Overall Technical Efficiency)

No.	Companies	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	Average %
1	HDFC	14.98	67.57	64.87	49.12	49.09	7.78	2.28	8.68	22.01	27.37	31.38
2	MAX	114.99	122.79	114.19	140.39	140.31	68.05	60.96	66.34	47.15	88.39	96.36
3	ICICI	0.00	0.00	0.00	0.00	35.10	32.67	25.15	15.69	3.89	7.73	12.02
4	Kotak	44.35	81.49	41.18	39.51	47.30	70.05	94.04	134.31	110.69	92.88	75.58
5	Birla	52.72	96.05	95.01	89.65	83.47	87.42	80.31	76.95	68.16	39.50	76.92
6	SBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Bajaj	117.62	63.98	51.26	64.09	69.56	88.90	98.33	90.73	31.89	0.00	67.64
8	Reliance	43.74	144.33	99.08	116.79	123.61	165.34	193.90	237.43	176.25	67.00	136.75

Source: Computed

Table 3.24 Output (Premium) Slack in % from the year 2007-08 to 2016-17 using VRS Model (Pure Technical Efficiency)

No.	Companies	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	Average %
1	HDFC	14.94	67.52	64.51	48.90	30.92	0.00	0.00	0.00	16.69	14.96	25.84
2	MAX	114.95	122.73	113.19	140.19	108.58	62.70	57.84	62.54	46.97	88.34	91.80
3	ICICI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Kotak	44.16	79.08	37.26	37.89	13.74	22.82	64.93	89.62	104.72	85.13	57.93
5	Birla	52.68	95.77	94.49	88.99	44.12	32.50	38.89	35.49	32.62	33.26	54.88
6	SBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Bajaj	9.22	13.27	20.03	63.20	33.59	0.00	0.00	6.24	0.00	0.00	14.56
8	Reliance	43.09	144.26	99.05	116.58	86.14	83.58	108.34	79.75	91.78	59.47	91.20

Source: Computed

As regards overall technical efficiency, SBI is the only efficient company that has generated higher amount of output with consumption of lower amount of input. Therefore, SBI has been placed on frontier line. As compared to the efficiency level of SBI the rest of the companies have generated slack in output. ICICI has generated about 12% of average output slack for the period under consideration which can be considered at lower side.

During the study period, HDFC has reported 30%, Bajaj has reported 67.64%, Kotak and Birla have reported about 75% average output slack.

At higher side, Max has reported about 96% of average output slack whereas Reliance has reported highest 136.75% average output slack during the study period.

As regards pure technical efficiency, SBI and ICICI are efficient companies that have consumed lower amount of inputs to generate higher amount of output. Therefore, SBI and ICICI have been placed on frontier line. As compared to the efficiency level of SBI and ICICI the rest of the companies have generated slack in output. Bajaj has generated about 14% of average output slack for the period under consideration which can be considered at lower side.

During the study period, HDFC has reported 25.84%, Birla has reported 54.88%, Kotak has reported 57.93% average output slack.

At higher side, Max and Reliance have reported about 91% average output slack during the study period.

Companies having slacks in output need to increase their premium output with maintaining same level of inputs i.e., management of expenses.

There are various factors such as types of policies, pricing, coverage, duration, riders etc. that affect the premium of life insurance companies. The companies should develop appropriate strategies towards maximizing premium with maintaining their management expenses.

3.15 Summing up

In part I of the present chapter, an attempt has been made to analyse and evaluate overall growth of the business in terms of number of policies issued, new business premium, renewal premium, commission paid, operating expenses, benefits paid, income from investment and surplus/deficits. All these components have been analysed using year on year growth, average and CAGR. Further, a comparison has been made in respect of each component for each of the year under consideration with

that of private life insurance industry wherein market share as an indicator has also been computed. Later, significant differences have been calculated among the selected companies for each component using Kruskal Wallis (Non-Parametric) Test followed by post hoc test.

Business operations often lead to failure due to lack of technological advancement and innovation. Therefore, technology is a great ally in achieving operational efficiency of business and it has been analysed in part II of the present chapter using Data Envelopment Analysis (DEA) estimating two inputs i.e., operating expenses and commission paid and one output i.e., total premium. It has been analysed using descriptive statistics as well as DEA output-oriented CRS & VRS model. DEA for all 23 private life insurance companies have been calculated. However, the in-depth study has been carried out for selected 8 companies. It can be concluded that companies have managed to use their output including technology in optimal manner so as to achieve technical efficiency. Later, percentage slack in premium output in comparison with efficient company(s) have been calculated assuming same level of inputs. Although, practical suggestions of maximizing premium income have been discussed in chapter VII.

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