

CONCENTRATION AND INDIAN INSURANCE

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Abstract

Concentration measures indicate how equal or unequal the output in an industry is distributed among firms. There are many measures of concentration and the choice of the measure depends on the properties that the measure satisfies. They provide a synthetic measure of market structure. Every concentration index possesses a specific inequality component. This paper calculates the available concentration measures for the insurance industry and following Bajo-salas decomposes the indices into contribution of inequality and number of companies.

Keywords: Insurance market, concentration measure, decomposition

JEL Classification: G22, L10

Insurance sector in India was opened up to private participation in 2000. Till such time, the life insurance business was the monopoly of the state owned Life Insurance Corporation of India and general insurance business was done by four government companies. While the life insurance business was operating in a deregulated environment, the general insurance business was under a tariff regime. The tariff rates were fixed by the Tariff Advisory Committee. In case of revision of tariffs, the methodology adopted is not publically known. As such, before 2000, the supplier of insurance was the Government. In the absence of competition, insurance potential in the country was not fully exploited. The suppliers of insurance were satisfied with the business and were not making any substantial efforts to expand the coverage of insurance. As a result, the insurance penetration (premium as per cent of gross domestic product) in India was very low at 2.71 per cent. With the passing of the IRDA Act, insurance market was opened up to private participation and many foreign insurers partnering with domestic companies, or Indian commercial banks with large branch network, entered the insurance market and started business in both life and non-life.

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As a result, the number of companies doing insurance business in India have moved up to 42 by 2008 from only five in 2000. In the life insurance segment, 21 companies including LIC of India are operating. Among the private life insurance companies, except for two, the remaining are joint ventures with a foreign partner. In non-life segment, there are four public sector companies, one national re-insurer, two specialized insurers (one for agriculture and another for export credit). Two stand-alone health insurance companies have recently started underwriting health insurance business. Among the private insurers, except for one all are joint ventures. While the domestic partners provide insights into the geographical area, demographic characteristics of that area and provide necessary network to reach the masses, the foreign partner complements the underwriting and product development skills.

This happy blend of knowledge sharing made in roads into a large geographical part of the country. As a result, the total premium (first year premium plus renewal premium of the life insurers and gross premium of general insurers) underwritten went up from Rs. 62479.70 crore in 2001-02 to Rs. 230157.01 crore in 2007-08. During this period, the total insurance penetration also increased from 2.71 to 4.60 per cent. While the non-life insurance penetration has increased marginally from 0.56 to 0.60 per cent, the life insurance penetration increased from 2.15 to 4 per cent during the same period.

Many factors have contributed to the increase in the premium collection as well as insurance penetration. The economic growth that was achieved during this period has increased the per-capita income of the people thereby increasing the capacity of the people for covering the risks that are associated with opening up of the economy. This was reflected in the insurance density (per capita premium paid) which moved from 11.5 US Dollars in 2001 to 47.4 US Dollars in 2008. Secondly, the institutional and regulatory environment created by IRDA has also helped in the vast growth of insurance in India. Despite this, there is still a large section of people who are uninsured and only a small section of the people have any sort of health insurance. In the case of health insurance, the Government has recently introduced many schemes to cover the people under below poverty line and many state governments in a similar way have their own schemes. Such Governments' schemes are akin to welfare schemes.

At the time of bringing competition into the insurance market, it was envisaged that prices would be determined by supply of and demand for insurance. While there are many varieties of products now available to meet the demands of various segments of the population, price differentiation is not felt in the market. It may be possible that a few or a monopoly company may be controlling the market to a larger extent. Though market share of the Life Insurance Corporation in India has come down to 74 per cent, it is still the largest company operating across the country. As such, the private companies, which are not as big as LIC, have to compete in more than one way. Though competition has brought in improvements in the customer services to some extent, the impact of competition needs to reflect in the prices. It may be interesting to know at this stage that two or three small companies among them have a substantial market share in the premium collection. A similar scenario is observed in the non-life insurance business. Though four large public sector companies are holding a large share two or three private companies are trying to catch them up in the premium collection. It is not the intention of this paper to find differences if any between the business models of the public companies vis-à-vis private companies.

As argued earlier, the vast insurance potential in India is attracting global players to enter into the insurance market. Policy makers therefore need to assess whether the new entrants would add to the insurance penetration or cut the share of presently operating insurers thereby not making any substantial contribution to the insurance business in India. That is to say, whether the insurance market is operating in a monopoly or controlled by a small number of large firms. It is also important to know that how many small companies constitute such a group and what is the disparity between major insurers vis-à-vis the new entrants. In the case of general insurance similar questions can arise to find out how the private insurers are pursuing the four public sector companies. Technically it means how the insurance market in India is concentrated and whether the concentration indices can be decomposed so as to find some of the answers posed to the above questions.

There may be many ways to tackle this issue. For example through demand studies. In the absence of demand studies, a simple measure like concentration ratio may be useful. The importance of concentration ratios arises from their ability to capture structural features of a market. Concentration ratios are often used in structural models for capturing competitiveness as a result of market structure. Concentration ratios are also able to decompose changes in concentration due to new entrants, exits or mergers. As such, these ratios are often used in industrial economics for explaining the market structure and also to measure competitiveness across firms in an industry [Waterson 1984].

Concentration indices measure how equal or unequal the output in an industry is distributed among the firms. Many such indices are available like, Rosenbluth-index (1961), entropy index (Theil 1967), Herfindahl-index [Hirschman(1945), Herfindahl (1950)], E-index (Marfels (1972)) and concentration ratios. Hannah-Kay(1977)] proposed a one parameter family of measures of concentration which includes Herfindahl and E-index as special cases. Researchers however differed on the choice of the index. The choice of the index was based on the desirable properties which the index needs to satisfy. Marfels favoured E-index, Hall-Tideman (1967) preferred Herfindahl and Rosenbluth-index. Good (1987) compromised between Herfindahl, E-index, the Hannah-Kay index with parameter $\alpha = 1.5$, and suggested the mean of the parameters of the above three indices.

The use of concentration indices was mostly in the manufacturing sector to study the market structure. Of late, these indices have been used to study the concentration in the financial services also. For example, Cummins et. al. (1972) studied the concentration in the US life insurance industry. Stich (1993) investigated the concentration in the Swedish and Finnish insurance market. He further explored the oligopolistic structure by means of dominance measures and defined the oligopolistic group. Similarly Bikker and Haaf (2002) provided an overview of the tools at hand to assess competitive conditions and for calculating the degree of concentration in the banking markets. In fact, Journal of Money Credit and Banking [June 2004] brought out a special issue for understanding the impact of bank concentration and competition of performance. Bajos and Salas [2002] provided consistent relationships between concentration and inequality indices.

Concentration measures are used when firms produce a homogeneous product across the industry. Insurance is a complex business and insurers supply more than one service to their customers. The products and services rendered by the insurers may not be homogeneous

across companies. However, as insurers collect premium and render services later, premium can be viewed as a bundle resulting from sale of various products (services), thereby making it homogeneous. In that way concentration and competition can be measured and used to assess the market structure.

The present paper measures various concentration and inequality measures suggested by the earlier authors. The paper adopts the methodology suggested by Bajos and Salas for decomposing the concentration measure. For this purpose, data is drawn from the Handbook on insurance statistics 2007-08 brought out by IRDA. The paper is organized into three sections. The first section gives about the theoretical background regarding concentration ratios, and their decomposition. The second section deals with the concentration ratios in the Indian insurance industry and the third section deals with calculations.

Theoretical Background

Concentration indices in a general form can be written as

$$CI = \sum_{i=1}^N s_i w_i$$

Where s_i is the market share of the i^{th} firm, and w_i is the weight attached to the i^{th} firm and N is the number of firms in an industry. Marfels (1972) and Dickson (1981) discussed different weighting schemes and derived a number of concentration ratios. The weighting scheme of an index determines its sensitivity towards changes at the tail-end of the distribution. If the companies are arranged according to their size, say sales, in a decreasing order, and assign weights $w_i = 1, \forall i \leq k$ and $w_i = 0, \forall i > k$, one gets the most commonly used concentration ratio CR_k .

$$CR_k = \sum_{i=1}^k s_i$$

If each firm is assigned its own market share as weight i.e. $w_i = s_i, \forall i$, then the concentration index is well known Herfindahl – Hirschman index.

$$HHI = \sum_{i=1}^N s_i^2$$

If the weights are assigned as the negative of the logarithm of the respective market share, that is, $w_i = -\log s_i, \forall i$, one obtains the Entropy measure.

Following Waterson (1984) industry concentration indices can be expressed as a function of number of firms in an industry (N) and inequality index I i.e.

$$C = f(N, I)$$

Changes in the concentration index can therefore be explained through changes in the inequality index and changes in the number of firms in an industry.

Bajo and Salas [2002] argued that “a new entrant into an industry would lead to an ambiguous effect on concentration. Concentration directly falls due to increased number of firms. Also the degree of inequality within the industry is affected so that concentration could actually rise in case the entrant is big enough”. Bajo and Salas [2002] derived a relationship between

concentration indices and classical inequality indices so as to know the effects of number of firms and changes in inequality on changes in the concentration.

Hannah and Kay [1977] defined a set of concentration indices as follows.

$$C_{HK}(\alpha) = \begin{cases} \sum_{i=1}^N S_i^\alpha \left[\sum_{i=1}^N S_i^\alpha \right]^{1/\alpha-1} & \text{if } \alpha > 0, \alpha \neq 1, \\ \exp = \left[\sum_{i=1}^N S_i \ln S_i \right] & \text{if } \alpha = 1, \end{cases}$$

$C_{HK}(1)$ is defined as the limit of $C_{HK}(\alpha)$ when $\alpha \rightarrow 1$ which coincides with the antilogarithm of (minus) the first order entropy concentration index (Waterson 1984). When $\alpha = 2$, recognize that $C_{HK}(\alpha)$ is the well known Herfindhal index. Interpreting X_i as the income of the i^{th} household, Cowell [1977] defined the general entropy inequality indices as

$$I_{GE(c)} = \begin{cases} \frac{1}{N} \frac{1}{c(c-1)} \sum_{i=1}^N [(X_i/\bar{X})^c - 1] & \forall c \neq 0, 1 \\ \frac{1}{N} \sum_{i=1}^N \ln(\bar{X}/X_i) & \text{if } c = 0 \\ \frac{1}{N} \sum_{i=1}^N [(X_i/\bar{X}) \ln(X_i/\bar{X})] & \text{if } c = 1 \end{cases} \quad \dots (1)$$

Where \bar{X} is the mean income of the households and N is the number of households. Realising that concentration indices implicitly possess an inequality component, Bajo and Salas [2002] provided a consistent relationship between the concentration and inequality indices. They have shown that

$$C_{HK}(\alpha) = \begin{cases} \frac{1}{N} [1 + \alpha(\alpha-1)I_{GE(\alpha)}]^{1/\alpha-1} & \text{if } \alpha = c > 0, \alpha \neq 1 \\ \frac{1}{N} [\exp(I_{GE(\alpha)})] & \text{if } \alpha = c = 1 \end{cases}$$

Of particular interest are when $\alpha = 1$ and $\alpha = 2$

$$C_{HK}(1) = \frac{1}{N} [\exp(I_{GE(1)})]$$

and when $\alpha = 2$

$$C_{HK}(2) = \frac{1}{N} [1 + 2I_{GE(2)}]$$

in general

$$C_{HK}(\alpha) = \frac{\varphi(I_{GE(\alpha)})}{N} \quad \text{if } \alpha > 1$$

Where $\varphi(I_{GE(\alpha)})$ is the component of inequality in $C_{HK(\alpha)}$ which is an increasing function. This can be used to derive

$$\frac{\Delta C_{HK}(\alpha)}{C_{HK}(\alpha)} \approx \frac{\Delta \phi_{GE}(\alpha)}{\phi_{GE}(\alpha)} - \frac{\Delta N}{N} \quad \text{if } \alpha > 0$$

For any given α , concentration would increase or decrease according as $\frac{\Delta \phi(l)}{\phi(T)}$ is greater than (or lower than) $\frac{\Delta N}{N}$.

Insurance industry in India

Before the insurance sector reforms were undertaken, as mentioned earlier, the life insurance business was the monopoly of LIC and the four public insurers were controlling non-life business. That CR_1 in the case of life and CR_4 in the case of non-life were 1 in 2000. By 2007-08, CR_1 in the case of life insurance total premium collection was 0.74, whereas CR_4 in the case of non-life was 0.47. This indicates the presence of competition in the insurance business in India. What is interesting is that the company following the LIC has a share of 0.07 (7 per cent) suggesting the large gap between them. Therefore it will be interesting to see how these ratios have changed over the study period.

In the case of non-life business, two companies following the four public general insurers, between them have a market share of 21 per cent which clearly indicates change in market dynamics. Thus, four public insurers and four private insurers together control the 92 per cent of the market.

For the purpose of the study, the benchmark year is taken as 2003-04. The following table gives the CR_1 , CR_4 and CR_8 for comparison purposes. In the case of life insurance, the concentration ratios are calculated separately for first year premium including single premium and for total premium (first year premium plus renewal premium) so that, the differential market structures in these segments may be clearly noticed.

Concentration Ratios

Life	First Year	CR ₁	CR ₄	CR ₈
	2003-04	0.8767	0.9479	0.9836
	2007-08	0.6402	0.8483	0.9444
Total	2003-04	0.9532	0.9806	0.9943
	2007-08	0.7439	0.8875	0.9574
Non-Life	2003-04	0.2975	0.8635	0.9620
	2007-08	0.1875	0.6007	0.9182

It may be observed from the table that while the difference between CR_1 and CR_4 in the case of first year premium was 21 per cent in 2007-08, it was only 15 per cent in the case of total premium. This clearly indicates, while three companies have increased their share in first year premium they are not able to retain that increase in total premium which includes renewal

premium. The concentration ratios calculated for different k's and years are presented at Annex 1. Concentration curves which pass through points (K, CR_k) for $k = 1, 2, 3, \dots$ is a handy graphical tool to visualize how the ratios are changing. Such curves are presented in Figures 1 and 2.

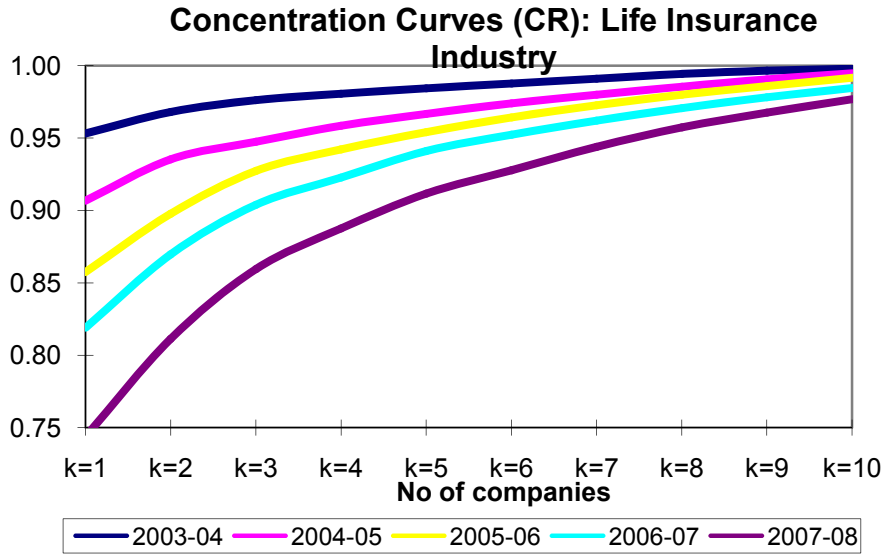


Figure 1.

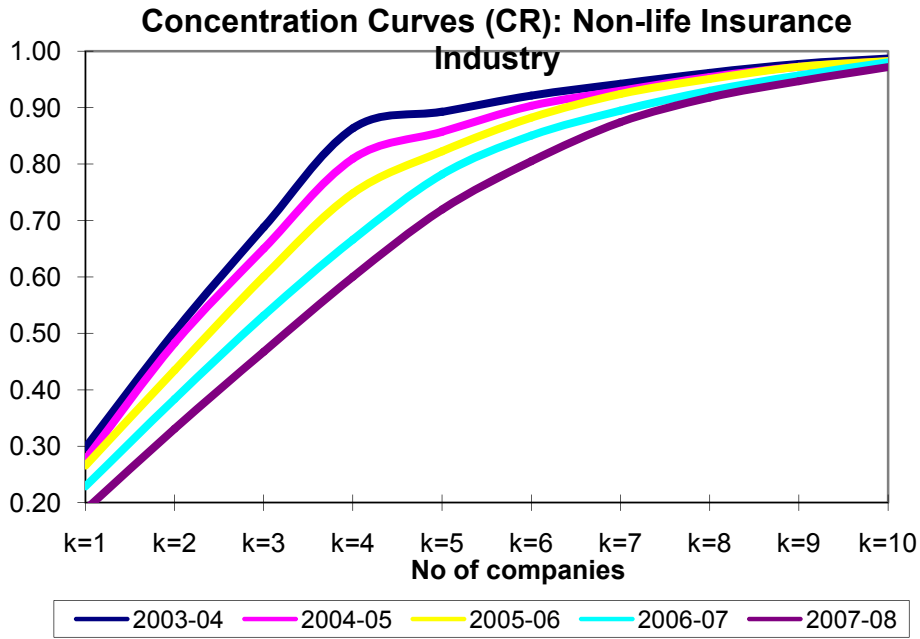


Figure 2.

In order to see the performance of the companies vis-à-vis the market, the following table gives the market growth of the largest 1,4, and 8 companies.

Increase in market volume (in per cent) 2003- to 2008

Segment	No. of companies			Total Market
	1	4	8	
Life				
First Year	246	324	355	374
Total Premium	136	173	191	202
Non-Life	25	25	67	74

It can be seen from the above table that in the case of life insurance, the largest company did not grow more than the total market, both in the case of first year premium as also in the total premium. In the case of non-life the four largest companies grew by 25 per cent as against 67 per cent for the 8 largest companies the market had grown by 75 per cent. This shows concentration has decreased in both life and non-life market. Stich [1995] derived a class of dynamic inequality measures and showed that for all inequality measures with maximum 1 and for $n \rightarrow \infty$, the infimum is zero, the dynamic index is simply the difference between the concentration indices in the two periods.

The following table gives changes in concentration indices during 2003-08.

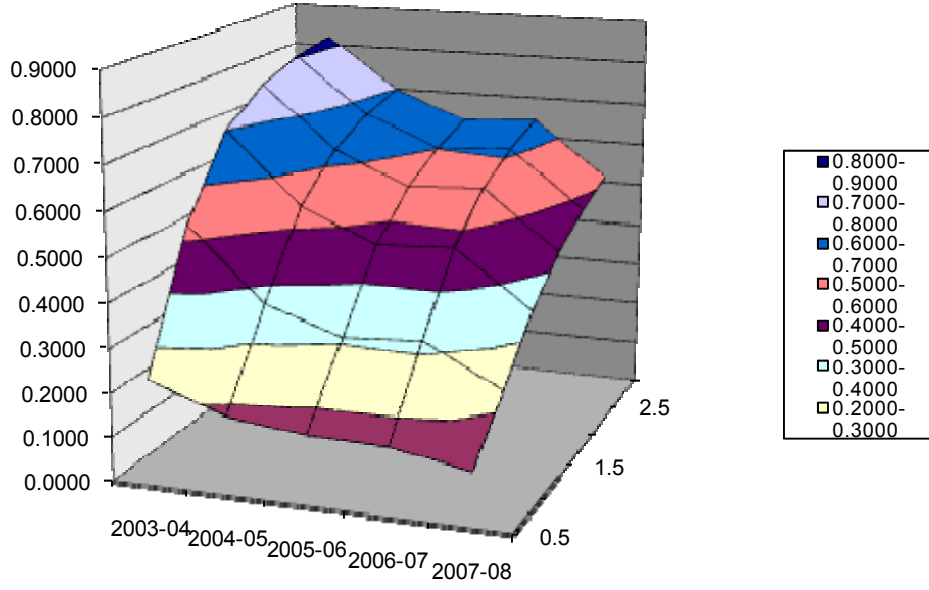
Change in Concentration – 2003-08

Measure	Total Life	First year Life	Non-Life
Herfindahl	-0.3462	-0.3431	-0.0765
Theil	-0.4361	-0.3008	-0.1684

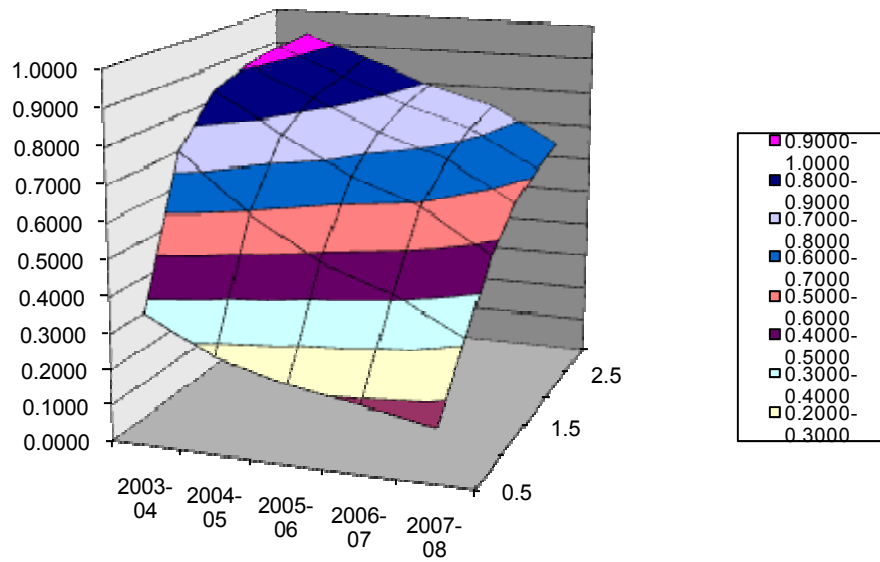
From the table it can be seen that the concentration indices as measured by Theil's entropy measure or HH index, declined over the period more in the life industry than in the non-life industry. In the case of total life premium, Theil's measure declined more than the HH index, whereas for first year premium, it was otherwise. In the case of non-life, the HH has declined only by 0.0765. Detailed tables on dynamic inequality measures for each year are at Annex 2.

The H-K indices and inequality indices for life insurance separately for total premium and first year premium and for non-life insurance are presented at Annex 3. Both the measures are showing declining trend over the years and with increasing α the measures are showing an increasing trend except for $\alpha = 1$ (Theil index) in the case of life business. The following 3-D graphs clearly show the above observation.

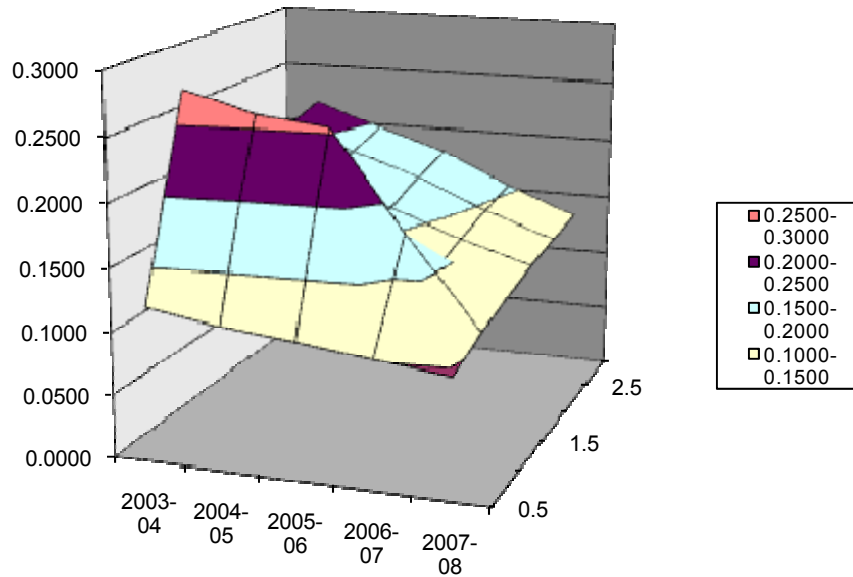
Life -First Year



Total Life



Non-Life



A similar observation was also seen in the case of non-life insurance. Hall and Tideman (1967) put forward a number of properties to be satisfied by a concentration measure and argued that HH index satisfy those properties. They also suggested an index HTI as

$$HTI = \frac{1}{2 \sum_{i=1}^n i \cdot s_i - 1}$$

Where the market share of the i^{th} company is given a weight which is its rank when the market shares are arranged in descending order with the largest company getting a rank 1. It can be show that $0 \leq HTI \leq 1$. In case of monopoly, it takes a value 1 and move downwards with increase in competition and close to zero in case there are infinite number of equi-sized small companies.

The HTI for Indian insurance are calculated and given below:

Hall-Tideman Index

	<i>Life (Total)</i>	<i>Life (First Year)</i>	<i>Non-Life</i>
2002-03	0.8836	0.5406	0.2060
2003-04	0.7445	0.5223	0.2025
2004-05	0.5788	0.3749	0.1860
2005-06	0.4836	0.3385	0.1712
2006-07	0.4128	0.3371	0.1515
2007-08	0.3247	0.2558	0.1359

The decreasing trend in the index clearly shows how the monopoly is getting reduced in the insurance industry.

Since the opening up of the insurance sector, new entrants have entered the market though in small numbers in each year. As such the rate of change in number of companies is positive. However, in the case of non-life industry, till 2007-08, there were no new companies added to the existing number of companies of 2003-04. As such ΔN is zero.

Following Bajo-Salas, change in concentration indices for $\alpha = 1$ and 2 are explained in terms of changes in corresponding inequality indices and change in number of companies. The following tables give such decomposition for total premium.

Total Life Insurance

$\alpha = 1.0$

	<i>Rate of Change in Concentration Index</i>	<i>Rate of Change in inequality component</i>	<i>Rate of Change in number of companies</i>	<i>Explained rate of change (4) = 2-3</i>	<i>Percentage explanation (4)/(1) *100</i>
	(1)	(2)	(3)	(4)	(5)
2004-05	-0.2093	-0.1257	0.0769	-0.2026	96.8194
2005-06	-0.1907	-0.1276	0.0714	-0.1990	104.3513
2006-07	-0.1384	-0.0866	0.0667	-0.1533	110.7710
2007-08	-0.2402	-0.3085	0.0000	-0.3085	128.4496

$\alpha = 2.0$

	<i>Rate of Change in Concentration Index</i>	<i>Rate of Change in inequality component</i>	<i>Rate of Change in number of companies</i>	<i>Explained rate of change (4) = 2-3</i>	<i>Percentage explanation (4)/(1) *100</i>
	(1)	(2)	(3)	(4)	(5)
2004-05	-0.0940	-0.0243	0.0769	-0.1012	107.6596
2005-06	-0.1032	-0.0391	0.0714	-0.1105	107.0736
2006-07	-0.0852	-0.0242	0.0667	-0.0909	106.6901
2007-08	-0.1672	-0.1672	0.0000	-0.1672	100.0000

It may be seen from the table that the decomposition is fairly explaining the changes for $\alpha = 1$ and $\alpha = 2$.

In the case of first year premium, the decomposition explained more than the change and failed to explain for 2006-07. It may be mentioned that in that year, ULIPs have been aggressively marketed by the companies which accounts mostly for the total premium.

Life insurance - First Year **$\alpha = 1.0$**

	<i>Rate of Change in Concentration Index</i>	<i>Rate of Change in inequality component</i>	<i>Rate of Change in number of companies</i>	<i>Explained rate of change (4) = 2-3</i>	<i>Percentage explanation (4)/(1) *100</i>
	(1)	(2)	(3)	(4)	(5)
2004-05	-0.3095	-0.3173	0.0769	-0.3942	127.3667
2005-06	-0.1520	-0.1504	0.0714	-0.2218	145.9079
2006-07	0.0342	0.1813	0.0667	0.1146	335.0263
2007-08	-0.2827	-0.5194	0.0000	-0.5194	183.7343

 $\alpha = 2.0$

	<i>Rate of Change in Concentration Index</i>	<i>Rate of Change in inequality component</i>	<i>Rate of Change in number of companies</i>	<i>Explained rate of change (4) = 2-3</i>	<i>Percentage explanation (4)/(1) *100</i>
	(1)	(2)	(3)	(4)	(5)
2004-05	-0.1866	-0.1378	0.0769	-0.2147	115.0589
2005-06	-0.1197	-0.0642	0.0714	-0.1356	113.2832
2006-07	0.0191	0.0991	0.0667	0.0324	169.6335
2007-08	-0.2395	-0.2695	0.0000	-0.2695	112.5261

In the case of non-life insurance for $\alpha = 0.5$, the inequality indices were negative for all the years. One obvious conclusion is the nominal change in the concentration measure over the years is negative accompanied by negative changes in inequality indices. The decomposition was not good mainly because between 2002-03 and 2007-08, no new company has started business. Therefore, the rate of change in number of companies is zero thus distorting the decomposition.

Non-Life **$\alpha = 1.0$**

	<i>Rate of Change in Concentration Index</i>	<i>Rate of Change in inequality component</i>	<i>Rate of Change in number of companies</i>	<i>Explained rate of change (4) = 2-3</i>	<i>Percentage explanation (4)/(1) *100</i>
	(1)	(2)	(3)	(4)	(5)
2004-05	-0.0545	-0.2845	0.0000	-0.2845	522.0606
2005-06	-0.0247	-0.1776	0.0000	-0.1776	719.1255
2006-07	-0.2979	-3.0519	0.0000	-3.0519	1024.4599
2007-08	-0.3986	1.4900	0.1667	1.3233	-331.9772

 $\alpha = 2.0$

	<i>Rate of Change in Concentration Index</i>	<i>Rate of Change in inequality component</i>	<i>Rate of Change in number of companies</i>	<i>Explained rate of change (4) = 2-3</i>	<i>Percentage explanation (4)/(1) *100</i>
	(1)	(2)	(3)	(4)	(5)
2004-05	-0.1000	-0.1722	0.0000	-0.1722	172.2000
2005-06	-0.1002	-0.1875	0.0000	-0.1875	187.1257
2006-07	-0.1352	-0.2805	0.0000	-0.2805	207.4704
2007-08	-0.1219	0.0611	0.1667	-0.1056	86.6284

As Bajo-Salas printed out, for any α , concentration would decrease if rate of change in inequality is less than rate of the change in the number of companies. One may need to know that the decomposition does not lead to useful conclusions if $\Delta N = 0$

Decline in concentration points towards competition which is observed more in life insurance rather than in non-life. This may be due to the fact that not many companies have entered into this segment. Considering the potential in the segment, there is a scope for increasing competition. Otherwise, there could be two segments competing with each other rather than each one competing with the rest. In the later case, there is a possibility of reducing prices (premium charges).

Conclusions

At this stage of development in the insurance sector both at regulatory as well as at institutional level, it is difficult to conclude whether the prices are determined through market forces. However, one may draw a broad conclusion that concentration is slowly declining and competition is emerging. The monopolistic nature of the market which was observed at the time of opening up of the sector is slowly giving way to competition. The pursuer group is making inroads in to the market. The results of the study need to be interpreted with caution as there are a small number of companies operating with differences in their composition and business models. It is necessary to prove how competition observed above is contributing to the prices of insurance services in India.

References

- Bajo, O and R. Salas (2002), "Inequality foundations of Concentration measures: An application to the Hannah-Kay indices", *Spanish Economic Review*, 4, pp 311-316
- Bajo, O and R. Salas (2004), "Decomposing change in industry concentration", *The Empirical Economics Letters*, 3(6) pp 311-319.
- Cowell, F. (1977), *Measuring inequality*, Phillip Allan, Oxford.
- Cummins, J.D, Herbert S. Denenberg and William C. Scheel (1972), "Concentration in the US Life insurance industry", *Journal of Risk and insurance*, Vol 39, pp 177-199.
- Good, I.J. (1987), "Indices of economic concentration", *Journal of statistical computing and simulation*, 28, pp 71.
- Hall, M; and Tideman, N (1967), "Measures of Concentration", *Journal of American Statistical Association*, 62, p 162-168.
- Hannah, L and Kay, J.A. (1977), *Concentration in modern industry. Theory, measurement and the U.K. experience*, Macmillan, London.
- Herfindahl, O.C. (1950), "Concentration in the U.S. steel industry", Ph.D. Dissertation, New York, Columbia University.
- Hirschman, A.O. (1945), *National Power and the structure of foreign trade*, Berkely: University of California Press.

IRDA (2007-08), "Handbook on Indian Insurance Statistics".

Marfels, C. (1971), "Absolute and relative measures of concentration reconsidered", *Kyklos*, 24, 753-766.

Stich, Andreas (1995), "Insurance and concentration: The change of concentration in the Swedish and Finnish insurance market 1989 – 1993", Discussion paper in statistics and econometrics. Seminar of economic and social statistics, University of Cologne.

Theil, H (1967), *Economics and information theory*, North Holland Publishing Company, Amsterdam.

Waterson, M (1984), *Economic theory of the industry*, Cambridge University Press, Cambridge.

ANNEX 1**Concentration Ratios**

Total Life Insurance

No. of Companies	2003-04	2004-05	2005-06	2006-07	2007-08
k=1	0.9532	0.9067	0.8575	0.8190	0.7439
k=2	0.9680	0.9353	0.8978	0.8697	0.8113
k=3	0.9761	0.9474	0.9274	0.9039	0.8596
k=4	0.9806	0.9584	0.9422	0.9227	0.8875
k=5	0.9844	0.9667	0.9541	0.9410	0.9116
k=6	0.9877	0.9739	0.9643	0.9524	0.9279
k=7	0.9911	0.9799	0.9726	0.9620	0.9439
k=8	0.9943	0.9856	0.9800	0.9707	0.9574
k=9	0.9966	0.9906	0.9859	0.9781	0.9675
k=10	0.9979	0.9947	0.9916	0.9845	0.9769
Life Insurance - First Year					
No. of Companies	2003-04	2004-05	2005-06	2006-07	2007-08
k=1	0.8767	0.7878	0.7352	0.7432	0.6402
k=2	0.9146	0.8482	0.8053	0.8115	0.7260
k=3	0.9373	0.8809	0.8724	0.8683	0.7972
k=4	0.9479	0.9046	0.8992	0.9022	0.8483
k=5	0.9584	0.9231	0.9206	0.9240	0.8777
k=6	0.9676	0.9416	0.9381	0.9363	0.9063
k=7	0.9766	0.9559	0.9502	0.9484	0.9273
k=8	0.9836	0.9672	0.9622	0.9601	0.9444
k=9	0.9899	0.9780	0.9727	0.9696	0.9562
k=10	0.9938	0.9869	0.9829	0.9781	0.9674
Non-Life Insurance					
No. of Companies	2003-04	2004-05	2005-06	2006-07	2007-08
k=1	0.2975	0.2765	0.2660	0.2290	0.1875
k=2	0.5030	0.4830	0.4351	0.3840	0.3308
k=3	0.6882	0.6504	0.6009	0.5316	0.4678
k=4	0.8635	0.8100	0.7487	0.6665	0.6007
k=5	0.8929	0.8573	0.8229	0.7818	0.7196
k=6	0.9217	0.9034	0.8825	0.8507	0.8051
k=7	0.9425	0.9303	0.9243	0.8948	0.8743
k=8	0.9620	0.9546	0.9512	0.9300	0.9182
k=9	0.9776	0.9726	0.9727	0.9574	0.9472
k=10	0.9873	0.9821	0.9830	0.9805	0.9719

ANNEX 2

Total Life Premium
Dynamic Inequality Indices

α	2004-05/ 2003-04	2005-06/ 2004-05	2006-07/ 2005-06	2007-08/ 2006-07	2007-08/ 2003-04
0.5	-0.2287	-0.1498	-0.1042	-0.2551	-0.7378
1.0	-0.1607	-0.1426	-0.0844	-0.2747	-0.6624
1.5	-0.1328	-0.1554	-0.1023	-0.4352	-0.8257
2.0	-0.1436	-0.2253	-0.1341	-0.9035	-1.4065
2.5	-0.1491	-0.3806	-0.1829	-2.1941	-2.9067
3.0	-0.0398	-0.7022	-0.2060	-5.8593	-6.8073
First Year Life Premium Dynamic Inequality Indices					
α	2004-05/ 2003-04	2005-06/ 2004-05	2006-07/ 2005-06	2007-08/ 2006-07	2007-08/ 2003-04
0.5	-0.2696	-0.0619	0.0582	-0.2960	-0.5693
1.0	-0.2963	-0.0958	0.0981	-0.3322	-0.6262
1.5	-0.3606	-0.1413	0.1514	-0.5362	-0.8867
2.0	-0.6216	-0.2496	0.3606	-1.0781	-1.5887
2.5	-1.2869	-0.4894	0.9441	-2.4924	-3.3246
3.0	-3.0006	-1.0494	2.6106	-6.2924	-7.7318
Non-Life Premium Dynamic Inequality Indices					
α	2004-05/ 2003-04	2005-06/ 2004-05	2006-07/ 2005-06	2007-08/ 2006-07	2007-08/ 2003-04
0.5	0.1229	0.0855	0.1167	-0.1626	0.1625
1.0	-0.0561	-0.0250	-0.3537	-0.3544	-0.7892
1.5	-0.0358	-0.0313	-0.0378	0.0117	-0.0932
2.0	-0.0596	-0.0537	-0.0653	0.0102	-0.1684
2.5	-0.0869	-0.0776	-0.0967	0.0062	-0.2550
3.0	-0.1260	-0.1085	-0.1398	0.0003	-0.3740

ANNEX 3

**Total Life Premium
Hannah - Kay Indices**

α	2003-04	2004-05	2005-06	2006-07	2007-08
0.5	0.3672	0.2694	0.2185	0.1868	0.1516
1.0	0.7506	0.5935	0.4804	0.4139	0.3145
1.5	0.8732	0.7636	0.6628	0.5915	0.4727
2.0	0.9089	0.8235	0.7385	0.6756	0.5627
2.5	0.9232	0.8496	0.7744	0.7176	0.6125
3.0	0.9306	0.8634	0.7942	0.7413	0.6420
First Year Life Premium Hannah - Kay Indices					
α	2003-04	2004-05	2005-06	2006-07	2007-08
0.5	0.2414	0.1789	0.1591	0.1561	0.1251
1.0	0.5318	0.3672	0.3114	0.3221	0.2310
1.5	0.7009	0.5394	0.4654	0.4746	0.3462
2.0	0.7710	0.6271	0.5520	0.5626	0.4279
2.5	0.8033	0.6730	0.6013	0.6118	0.4799
3.0	0.8209	0.6994	0.6310	0.6412	0.5134
Non-Life Premium Hannah - Kay Indices					
α	2003-04	2004-05	2005-06	2006-07	2007-08
0.5	0.1226	0.1140	0.1085	0.1016	0.0955
1.0	0.2758	0.2608	0.2544	0.1786	0.1074
1.5	0.1833	0.1639	0.1479	0.1296	0.1158
2.0	0.1987	0.1788	0.1609	0.1392	0.1222
2.5	0.2089	0.1894	0.1711	0.1468	0.1272
3.0	0.2164	0.1973	0.1793	0.1531	0.1312

