Quest Journals
Journal of Research in Humanities and Social Science
Volume 3 ~ Issue 10 (2015) pp:42-44
ISSN(Online) : 2321-9467
www.questjournals.org

Research Paper

Assessing the Solvency of the Nigerian Health Insurance Scheme

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Received 11 November, 2014; **A**ccepted 26 October, 2015 © The author(s) 2015. Published with open access at **www.questjournals.org**

ABSTRACT:- *Insurance business is based on expectations of receipt contributions or premiums accumulated to meet expected liabilities. Liabilities are paid as when due. At any point in time assets accumulated must exceed liabilities so that the insurance business is solvent. Solvency occurs when liabilities exceed assets accumulated. The Nigerian Insurance contributions are a fixed percentage of 15% of annual salary for all members. Liabilities are based on the incidence of sickness and medical bills incurred. The premiums are not based on the actuarial factors of the liabilities. In this paper we derive the expected liabilities for the public sector of 32, 000 employees with a staff distribution that is assumed to be normal and compared with the accumulated contributions. It is found that the Nigeria insurance package is solvent since accumulated assets exceed liabilities yearly for all the years. Expected Liabilities amount to ₦33, 319, 000 while contributions amount to ₦661, 047, 998. Liabilities are 4.58% of contributions. In economics it is a rip off.*

Keywords:- *Contributions, incidence of sickness, staff distribution, salary distribution, medical expenses expected liabilities and accumulated assets.*

I. INTRODUCTION

The expected liabilities are one type, medical bills. Medical bills arise because of sickness and the bills are incurred after treatment. The occurrence of sickness is probabilistic for each age and category of ailment. The incidence of sickness is assumed to follow a normal distribution for each age and k insurance package that reflects the ailments.

The contributions are a fixed percentage of 15% of salaries irrespective of the class of ailment, for all members. At the package includes a family with four children under the age of 18.

The expected liabilities is obtained by multiplying the probability of an incidence of sickness with the expected medical bill for that category of ailment and summed for all members who enjoy the same package after making allowance for operating and overhead expenses and loading for reserves. The expected liabilities are compared with the expected contribution to ascertain solvency.

The standard derivations of incidence of sickness and medical bills are introduced at various probabilities of ruin to ascertain solvency.

II. LITERATURE REVIEW

The 1970's is deemed the origin of insurance rules in Europe, as this is when the European Union (EU) commission decided on an approach involving two steps i.e. Solvency I and
Solvency II (Doff, 2008, Linder et al, 2004, and Eling et al 2008).

In EU 1973 and 1979 solvency regulation, set out two directives requiring insurers to establish a capital buffer (common minimum standard) to cope with the uncertainty of insurance business, the aim was to detect threats early in insurance firms so as to allow supervisor authorities ensure measure to secure policy holders, Eling and Holz muller (2008) noted that four systems ground the world today can be identified as good examples of different approaches to securing insurance funds as other system can be likened to them; these are the United States (U.S), European Union (E.U), New Zealand and Switzerland. They argued that the U.S. insurance market which as at 2006 held approximately 31% of the world's premium income ($1, 170 billion) has solvency regulation varied between its states. Prior to 1994 they relied on fixed minimum capital standards,

however since then their National Aggregation of Insurance Commission (NAIC) developed RBC to ensure a more accurate reflection of size and risk exposure.

III. METHODOLOGY

Let l_x be the number of peope of age x in the population and P_x the incidence of sickness at age x is assumed to follow a normal distribution with mean μ_{xn} and variance δ^2_x N (μ_{1x}, δ^2_{2x}) and the medical bills M_x at age x is also assumed to follow a normal distribution with mean μ_{2x} and variance δ^2_{2x}, N (μ_{2x}, δ^2_{2x}).
For each age x, the expected medical bill is $l_x\mu_{1x}\mu_{2x}$.
Since $E(P_x) = \mu_{1x}$ and $E(M_x) = \mu_{2x}$.
Total expected liability based on sickness = $\sum l_x\mu_{1x}\mu_{2x}$
We load the liabilities with 10% to cover operating and over heed expenses.
Hence expected Total liabilities = $1.1\sum l_x\mu_{1x}\mu_{2x}$

IV. CASE STUDY

Table 1: AGE GROUP

L_x	2, 000	5, 000	9, 000	9, 000	5, 000	2, 000
Proportion sick per month μ_{1x}	.08	0.1	0.2	0.2	0.15	0.1
Standard deviation of proportion sick δ_{1x}	0.02	0.024	0.055	0.55	0.035	0.025
Medical bill per month μ_{2x}	4, 000	5, 000	6, 000	6, 000	5, 000	6, 000
Standard deviation of medical bill	1, 000	1, 375	1, 500	1, 500	1, 375	1, 000

From table 1 above we see that for the first age group……., we expect 8 out of 100 to be sick in a month and in the next group age……. We expect 10 out of 100 to be sick in a month until we reach the last group where we expect 10 out of 100 staff to be sick in the month, similarly 4, 000 is incurred when one is sick in the first group etc.

Total contribution is obtained by summing 15% of salaries in each group for all age groups

Age	**l_x**	**Incidence of sickness per month, μ_{1x}**	**Medical bill, per month, μ_{2x}**	**Expected Medical bill**
	2, 000	0.08	4, 000	640, 000
	5, 000	0.10	5, 000	2, 500, 000
	9, 000	0.20	6, 000	10, 800, 000
	9, 000	0.20	6, 000	10, 800, 000
	5, 000	0.15	5, 000	3, 750, 000
	2, 000	0.15	6, 000	1, 800, 000
				30, 290, 000

Total expected medical bill per month is ₦30, 290, 000. When loaded with the necessary loading of 10% for expenses and contingencies.
Total expected medical bill per month =₦33, 319, 000

Contribution

Age	l_x	Salary per annum	Contribution of 15% of salary per month
	2, 000	300, 00	7, 500, 000
	5, 000	537, 254	33, 578, 374
	9, 000	945, 237	106, 339, 150
	9, 000	1, 692, 775	190, 437, 180
	5, 000	3, 031, 502	189, 468, 870
	2, 000	5, 428, 975	135, 724, 370
Total	32, 000		661, 047, 998

Giving an average contribution of 20, 658 per month, per person.
Total Expected liability = 33, 319, 000
Total Expected Contribution = 661, 047, 998
Contribution exceed liability = 630, 757, 998
In fact liability is only 4.58% of contributions. In economic language the insurance package is a rip off.
If the incidence of sickness is doubled for each age group to .06, 0.2, 0.4, 0.4, 0.3, and 0.3 for each group respectively, the expected medical bill is ₦66, 638, 000 which is still a small fraction of the monthly contributions, amount to 9. 16% of total contributions. Following the method of contribution or percentage of contributions the National Health Insurance Scheme is solvent perpetually.

The contribution rate has to reduce to 0.76% of salaries to leave a margin of 30% for contingencies over the expected liabilities.

Next we introduce a case study where the incidence of sickness is doubled and medical bills are double.

Age	l_x	Incidence of sickness per month μ_{1x}	Medical bills per month μ_{2x}	Expected Medical bill
	2, 000	0.16	8, 000	2, 560, 000
	5, 000	0.12	10, 000	10, 000, 000
	9, 000	0.40	12, 000	43, 200, 000
	9, 000	0.40	12, 000	43, 200, 000
	5, 000	0.30	10, 000	15, 000, 000
	2, 000	0.30	12, 000	7, 200
				121, 160, 000

Total expected medical bill per month is ₦ 121, 160, 000 when loaded with the necessary loading of 10% for expenses and contingencies.

Total expected medical bill per month ₦133, 276, 000 which is 18.32% of the contributions.
Solvency is guaranteed perpetually with the present percentage rate of contributions.

V. CONCLUSION

The percentage rate of 15% contribution amounts to ₦661, 047, 998 per month while the expected medical bills liabilities amount to 4.58% of the total contributions. Even when the incidence of sickness and medical bills are doubles, the total liabilities amount to 9.16% of the total contributions.

The present percentage rate of contribution of 15% of salaries compared to the uncured medical liabilities is a rip off. The appropriate rate of contributions still maintaining a good margin for contingencies and reserves is about 1.5% of salaries.

There will be need for the National Health Insurance provision to keep records for years for a correct determination of the appropriate that will be commensurate with liabilities and still maintain solvency.