# *Pension Provision and Annuity Rates*

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Over many past generations persons have been retiring from their active work relating to earning of livelihood at or around certain ages depending on the type of work and the country etc. In many countries and particularly in India, since the joint family system was the norm, a person did not have much financial worry as he would expect to be looked after by the other members of the joint family. The values have been and are changing and joint family system is currently disappearing fast. The life expectancy is increasing and a person is expected to live longer than the past generations. It is now becoming necessary for a person to have some independent financial arrangement for meeting the needs during his long retired life. Many countries have started making provision of minimum level of social security benefit at least for the economically weaker sections of the society for its senior citizens.

It is accepted that there are three pillars which support the pension provision in a country. The three pillars are -

- Government
- Employer
- Individual

The government can contribute directly as also facilitate the contributions of the other two pillars by providing tax concessions and helping in creating an awareness about the need for providing for the retirement. The provision of a minimum pension amount for at least economically weaker sections of the society is a necessity in every civilized society as it ensures certain minimum standard of living for all its senior citizens.

The government may have one of the two types of retirement benefit schemes for its employees broadly classified as under :-

**Defined benefit scheme**: Under this system, benefits are payable as per predetermined rate which may depend on current earnings at the time of retirement or average earnings over a period of time before retirement and the number of years of service etc. The provision could be partially or fully funded or not funded at all. In case the provision is not funded and the pension amounts are paid by the government from their current revenue the arrangement is called pay-as-you-go (payg).

**Defined contribution scheme** – Under this system, contributions are specified in advance and the contributions are accumulated in the account of an individual member. Under this scheme, the pension provision is considered in two parts being accumulation stage and pension pay out stage. In the accumulation stage the defined contributions are accumulated in the individual accounts of the concerned members.

The employer may create a trust for the establishment of a benefit scheme in the form of Defined Benefit Scheme or Defined Contribution Scheme for its employees where the

employer will contribute and may also facilitate the individual employees also to contribute. The fund can be managed by the trustees of the fund or can be insured with a life insurance company. However as per the current regulations while the fund can be managed by the trustees on its own or through a life insurance company the payment of annuity can be made through a life insurance company only.

In the case of persons who are not employees, the individual may save the money in various schemes and purchase an annuity at the time of retirement etc. However an individual may purchase a deferred annuity from a life assurance company by payment of a single premium or regular premiums over a period of time where the annuity amount may be fixed in advance. However pension policies are also available which may cover death benefits also but the amount available on maturity of the policy will be used to purchase an annuity at the current available rate at that time subject to provision of receiving part of maturity benefit in cash.

Generally in the pension provision arrangement there are two stages being accumulation of contribution / premium and payment of pension / annuity. After the accumulation stage has come to an end the accumulated amount is available for the purchase / provision of pension / annuity. In this connection annuity rates and terms offered by various life insurance companies would be relevant. In this paper we propose to consider the elements which contribute to the rating of a life annuity and study their impact on the annuity rates. The following elements are considered:

i) Mortality
ii) Interest
iii) Expenses
iv) Commission and Profit Margin.
v) Reserving and Solvency Margin as per IRDA regulations

The effect of individual elements is now considered in detail:

i) **Mortality**

For considering the effect of mortality we would treat that there is only one element i.e. mortality and we would ignore all other elements being rate of interest, expense level with and without inflation, commission and profit margin and reserving and solvency margin requirement as per IRDA. In fact we assume that purchase price is used for payment of annuity till the annuitant survives without putting the balance available with the company to any productive use and obtaining a rate of return and there is no expense involved in procuring and servicing the annuity, there is no commission and profit margin and there is no reserving and solvency requirement by IRDA. The table used for the purpose is mortality for annuitants LIC (a) 1996–1998 ultimate. The assumptions made are as under:

a) 100% of LIC (a)1996-1998 ultimate
b) 90% of LIC (a)1996-1998 ultimate

c) 80% of LIC (a)1996-1998 ultimate

In conjunction with the above, further assumptions is made for the improvement in mortality over future i.e. no improvement, 0.5% improvement in mortality per annum and 1% improvement in mortality per annum.

For the purpose of convenience we have assumed that the annuity is payable annually in arrear. The annuity figure at ages 50 , 60 , 70 , 80 and 90 with purchase price of 1 lacs , 3 lacs and 5 lacs and mortality assumptions as above are calculated with the use of Excel and are given in Annexure **A**.

From the annual annuity amount figure given in Annexure **A**, we observe that annuity rate at age 60 is 4836 for 100% mortality, 4624 for 90% mortality and 4403 for 80% mortality (without taking into account improvement in mortality in the future). The effect of mortality on rates of annuity is that there is reduction of about 9.56% if there is overall uniform improvement in mortality at all ages from 100% to 90% of LIC (a) 96-98 ult. Table and about 9.52% if there is overall uniform improvement in mortality at all ages from 90% to 80% of LIC (a) 96-98 ult. table. Incidentally it may be mentioned that on average full amount of purchase price is paid to the surviving annuitants over period of time and accordingly if more annuitants are expected to survive there is reduction in the annuity amount. Similarly if we take into account the improvement in the mortality of 0.5% over the future, the annuity rate at age 60 is 4665 for 100% mortality and thus there is reduction of about 3.5 % as compared to annuity without assumption of improvement in mortality over the future. It there is improvement in mortality of 1% pa the annuity rate becomes 4490 at 100% rate of mortality there is further reduction of about 3.5% in the annuity rate.

## ii) Interest

Taking various levels of mortality separately, we would now consider the effect of rate of interest. As would be obvious, the introduction of rate of interest would tend to enhance the annuity amount as the unused purchase price would be available for investment and would earn some rate of return depending upon the assumption regarding the performance of the fund. However we would be ignoring the other elements being expense level with and without inflation, commission to agents and profit margin for the company and reserving and solvency margin as per IRDA regulations.

We propose to consider the following assumptions with regard to rate of interest:

(a) Uniform rate of interest of  5%, 6%, 7%, 8% and 9%.
(b) Rate of interest of  7% for first 10 years and 5% thereafter.
(c) Rate of interest of 8% for first 10 years and 5% thereafter.

With uniform rate of interest of 5%, the annuity rate at age 60 increases from Rs.4836 to Rs.8424  (100% of LIC (a) 1996-98 ultimate mortality) i.e. by about 74%.

We attach annexure from B-1 to B-5 giving the values of annuity amount per annum in arrears for purchase price of Rs1 lac assuming rates of interest of 5%, 6%, 7%, 8% and 9% respectively. Annexure **B-6** and **B-7** are also enclosed giving corresponding annuity values with combination of rate of interest of 7% for first 10 years and 5% thereafter and 8% for first 10 years and 5% thereafter respectively. Further Annexure **B-8** is enclosed giving the ratio of the value in tables from Annexure **B-1** to **B-7** with the corresponding value in Annexure **A** (1 lac sum assured and no improvement of mortality in future).

It may be observed from Annexure **B-8** that the enhancement in annual annuity ranges from about 22% to 111% with uniform 5% rate of interest and from about 40% to 219% with uniform 9% rate of interest depending upon age & mortality level with rate of return of 7% for first 10 years & 5 % thereafter, the enhancement in annual amount ranges from about 31% to 140% & with rate of return of 8% for first 10 years & 5 % thereafter, the enhancement varies from 36% to 159% .

### iii) Expense

After the annuity is purchased it is required that the monthly payments are received by the annuitants on time. It could be done by periodic issuance of cheques say for a year and the cheques could be made payable at par at the specified or all branches of the bank involved or the amount could be electronically transferred every month to the individual accounts of the annuitants. The charges of the bank or the agency involved in such transactions would depend on the volume of business being transacted by the bank / agency.

Taking various combinations of rates of mortality & rates of interest, we would now consider the effect of expense level with & without inflation assumption. However we would ignore the effect of other elements being commission payable to agents & profit margin for the company & reserving & solvency margin requirement as per IRDA regulations. As would be obvious, the introduction of expense provision would tend to reduce the annual annuity amount payable to the annuitant. It may be pertinent to add that the expense provision would depend upon the expected size of the portfolio, computer support & the arrangement for the payment of the annuity. However, we propose to consider the following assumptions with regard to expense level & expense inflation:

(a) First year expense of Rs.1000 & renewal expense of Rs.400 with inflation of 4.5 %.
(b) First year expense of Rs.750 & renewal expense of Rs.250 with inflation of 4.5 %.
(c) First year expense of Rs.500 & renewal expense of Rs.200 with inflation of 4.5 %.
(d) First year expense of Rs.250 & renewal expense of Rs.100 with inflation of 4.5 %.

We attach Annexure **C-1** to **C-6** giving the values of annual annuity amount payable in arrears for average purchase price of 1 lac, 3 lacs and 5 lacs over different rates of interest (5%,6%,7%,8% and 9%) and different mortality assumption with expenses assumed as above.

It may be observed from annexure **C-2** that with uniform rate of interest of 5 %, the annuity rate age of 60 years reduces by about 8.6% from Rs.8424 (100% of LIC (a) 1996-98 Ult. Mortality) to Rs.7701 in case of purchase price of Rs.1 Lac. & expenses for the first year being Rs.1000 & subsequent years being Rs.400 subject to inflation of 4.5 % per annum.

Where expenses assumed are per policy, the average size of the policy is also relevant. In this case, we have assumed average size of purchase price of Rs.1 Lac, 3 Lacs & 5 Lacs. In case average purchase price is assumed as 3 Lac. , the annuity rate becomes Rs.24549 i.e. Rs.8183 per 1 lac purchase price & the same is higher to the extent of 6.3% as compared to annuity per annum for average purchase price Rs.1 lac. However if average purchase price is Rs.5 lac , the annuity rate become Rs.41397 i.e. Rs.8279.4 per 1 lac purchase price which is about 7.5% higher than the annuity rate applicable for 1 lac purchase price (assuming mortality rate of 100% LIC(a) 1996-98 Ult. Table).

Similar there is increase in annuity rate if the level of expense is reduced. If the level of expense is reduced to Rs. 250 for the first year & Rs.100 for the subsequent years with expense inflation of 4.5%, there is an increase in the annual annuity for 1 lac. purchase price from Rs. 7701 to Rs. 8243 (assuming mortality rate of 100% LIC(a) 1996-98 Ult. Table) which is to the extent of 7%.

## iv) Commission & profit margin

Commission & profit margin provision would obviously reduce the annual annuity rate for a fixed purchase price. However we are ignoring the effect of reserving & solvency margin as per IRDA requirements. If we take commission as 2% of purchase price and gross profit margin as 8%, the annuity rate would be 90% of the annual annuity rate available otherwise ( reduction of 2% for the commission & 8 % for the profit).

## v) Reserving and Solvency Margin as per IRDA requirements

Reserving and solvency margin provision would obviously reduce the annual annuity rate for a fixed purchase price. The reserving and solvency margin requirement introduces the necessity of capital from the shareholders. If capital is provided by the shareholders they would desire a return which may be called as Risk Discount Rate (RDR) as the profit would be emerging in future. RDR is generally substantially higher than the rate of interest due to risk inherent in such investment .The cost of capital is also included in this element. For reserving we have kept the following margins (MAD) in the various elements:

a)  10% lower mortality with no change in rate of improvement of mortality
b)  1% reduction in rate of interest
c)  10% excess expenses with no change in rate of inflation

Solvency margin is 6% of the value of reserve only as there is no payment on death. We have kept profit margin as zero and rate of return on capital employed for the purpose of

reserving and solvency margin as per IRDA requirements at 12% per annum. The rate of tax on capital is assumed at 14.025% (12.5% plus 10% plus 2%).

It may be observed from annexure D-2 that the annual annuity rate for average purchase price of Rs.1 lac assuming uniform rate of interest of 5% and expenses (Rs.1000 for first year and Rs.400 for subsequent years with inflation at 4.5% per annum) at age 60 years would reduce from Rs.7701 (100% of LIC (a) 1996- 98 Ult. Mortality) to Rs.7047 which is about 9.2%.

We attach annexure D-1 to D-6, annexure D-1 assumes rate of interest of 0%. The average purchase price is taken as Rs.1 lac, 3 lac and 5 lacs. Further assumptions for mortality are taken as 100%, 90% and 80% of LIC (a) 1996-98 ult. with 0%, 0.5% and 1% rate of improvement per annum in mortality. The expense rates are taken as Rs.1000 and Rs 400 for subsequent years, Rs.750 for 1st year and Rs.250 thereafter, Rs.500 for first year and Rs.200 thereafter, Rs.250 for first year and Rs.100 thereafter and no expenses. Annexure D-2 to D-6 assume rate of interest of 5%, 6%, 7%, 8% and 9%.

**Effect of Risk Discount Rate**

We may like to observe the effect of increase in risk discount rate from 12% to 18%. In this connectivity annual annuity rate payable in arear using risk discount rate of 18% as a percentage of the annual annuity rates payable in arrear using risk discount rate of 12% are given in the chart below (the assumptions include average purchase price of Rs.1lac,interest being 7% for first 10 years and 5% thereafter , expenses being Rs.1000 for first year and Rs.400 for subsequent years, tax rate being 14.025%, inflation rate for the subsequent year expenses being 4.5% and mortality rate for annuitants is assumed at 90% of LIC (a) 1996-98 ult. with improvements in mortality)

| Purchase Price | 100000 | 100000 | 100000 | 100000 | 100000 |
|---|---|---|---|---|---|
| Interest | 7% and 5% | 7% and 5% | 7% and 5% | 7% and 5% | 7% and 5% |
| Expenses | 1000 & 400 | 1000 & 400 | 1000 & 400 | 1000 & 400 | 1000 & 400 |
| RDR | 18% / 12% | 18% / 12% | 18% / 12% | 18% / 12% | 18% / 12% |
| Tax Rate | 14.025% | 14.025% | 14.025% | 14.025% | 14.025% |
| Inflation Rate | 4.5% | 4.5% | 4.5% | 4.5% | 4.5% |
| Mortality Rate | 90% | 90% | 90% | 90% | 90% |
| Age | **50** | **60** | **70** | **80** | **90** |
| Imp Factor 0% | 97% | 96% | 96% | 94% | 93% |
| Imp Factor 0.5% | 97% | 96% | 95% | 94% | 93% |
| Imp Factor 1 % | 96% | 96% | 95% | 94% | 93% |

|  |  |  |  |  |  |
|---|---|---|---|---|---|
|  |  |  |  |  |  |

Thus it may be observed that reduction in annuity rate at age of 60 years is 4% if rate of discount is increased from 12% to 18%.

## Revision of Annuity Rates

The annuity rate may be revised by insurance companies from time to time depending on the current experience as well as the expected experience in the future with regard to various factors affecting the calculation of annuity rates. It needs hardly to be emphasized that the level of annuity rates has impact on the provision of pension. The direct impact of annuity rate is that the higher annuity rate would provide a higher annuity amount for a given purchase price and a lower annuity rate would provide a lower annuity amount for the same purchase price. The indirect impact of level of annuity rates may be that it may affect the market sentiment towards the pension business.

## Setting of Assumptions

We may now consider as to what are the problems in assuming the various parameters for the calculation of annuities. In this connection the main constraint at the younger ages is the experience of various factors over a very long period of time. If the age of the annuitant is 60 years, we have to consider the expected future experience for at least 40 years. For non-participating annuities, a life insurance company would have to fix the parameters in a prudent way as the entire loss, if any, would fall on the shareholders and the annuity rates may be lower. In case of participating business as per the current IRDA regulations the profit could be shared in the proportion of 90:10 between the annuitants and the shareholders. However the problem would arise about the form in which annuitants get 90% of the profit. In the case of life insurance the bonus could be provided in the form of cash or reversionary system. However in the case of annuities, it could probably be in the form of cash only. In the case of with profit annuities the base rate of annuity would generally be lower than without profit annuities but in the long run return to the annuitants may be higher.

## Review of Annuity Rates of Existing Annuitants

We propose that we may consider a system where the annuity rate may be reviewed every 10 years. For this purpose we have considered the initial assumption at the age of 60 years as under:

Purchase price     - 1 lac
Interest                  - 7% for first 10 years & 5% thereafter
Mortality              - 90% of LIC (a) 1996-98 ult. With improvement at 0%, 0.5% and 1%
Expenses              - 1000 for the first year & 400 thereafter with inflation of 4.5%
Risk discount rate - 12%
Tax rate                - 14.025%
Commission rate and Profit margin are taken as nil.

The annuity rate at the age of 60 years on the above assumption comes to Rs.8043 (0% improvement in mortality), Rs.7870 (0.5% improvement in mortality) and Rs.7692 (1% improvement in mortality).

If we consider the position after 10 years we would have reserve of 91118 under 0% improvement, 93210 under 0.5% improvement and 95372 under 1% improvement. However if at that time we find that still we could use the assumption being interest at 7% for the first year & 5% thereafter, mortality being 9% of LIC(a) 1996-98 ult. with improvements at 0%, 0.5% and 1%, expenses as 400 with inflation of 4.5%, risk discount rate of 12% and tax rate of 14.025%, the annuity amount available at age 70 years would be Rs.10089 against Rs.8043, Rs.10127 against Rs.7870 and Rs.10163 against Rs.7692 and the percentage increase are 25.4%, 28.7% and 32% respectively. Now we may like to find out approximately the contribution of various elements in the increase of annuity amount at age of 70 years (after 10 years from the purchase of the annuity) i.e. 25.4 % for 0 % improvement. For this purpose we may consider the item of interest without taking into account expenses and reserving etc. , the item of expense without taking into account reserving etc., and finally the balance may be attributed to Reserving  and Solvency Margin requirement etc. as under :-

a)  Using the rate of interest of 7% for the first 10 years & 5% thereafter in lieu of uniform rate of 5% as per initial assumption-  At the age of 70 years at 5% the annuity rate is 10297 (Annexure C-2) and the same becomes 11638 (as per Annexure F-1) and the increase is 13 %( Mortality rate 90% of LIC (a) 1996-98 ult. & 0% improvement).

b)  Using expenses of Rs.400 per annum with inflation of 4.5% against Rs.621 per annum (Rs.400 taken with inflation of 4.5% for 10 years) with inflation of 4.5% per annum there would be an increase of 2.9% (mortality rate 90% of LIC (a)1996-98 ult. & 0% improvement). There is no additional first year expense taken for the purpose.

c)  The balance percentage i.e. 8.5% (25.4-13.0-3.9) may be attributed to reserving and solvency margin for IRDA requirements etc.

If the scenario after 10 years is such that rate of interest can be assumed only below 5%, mortality can be assumed only lighter than what was assumed in the calculations and expenses can be assumed only higher than what was assumed in the calculations, the existing pension level could not be maintained and that the pension amount may have to be reduced. It may be relevant that if the amount of the annuity was required to be reduced, an option should be available to the annuitant to seek the better rates, if possible, from other life insurance companies. It would imply that the insurance companies would have to value the contracts assuming that the annuity amount was reviewable every 10 years.

However if on the review date it is found that it would not be possible to maintain the existing annuity rates then the action of intimating the annuitants and giving them the

option of taking the predetermined reserve amount for purchasing the annuity from some other insurance company, if desired, would have to be initiated.

If the concept of review of annuity rates after specified period is acceptable to the pension market, the reserving position may also be relooked into by IRDA. In this connection it may be submitted that as per current regulations, solvency margin for annuity/pension in payment business is 6% of reserves and would go on reducing as the period elapses. Due to the difference between risk discount rate desired by shareholders on the capital used and the rate of return actually earned on the capital used would add to the cost of the annuity and reduce the annuity rate.

## **Conclusions**

i)   Setting of the assumptions covering a very long period of time would require that the assumptions are made on prudent basis particularly when the business is non-participating.

ii)  The introduction of review of annuity rates periodically may help to give better rates to annuitants in the long run.

iii) The revision in reserving and solvency margin requirement may improve the annuity rates.