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Editorial *Open Access*

EDITORIAL ON THE INTERNAL RATE OF RETURN MODEL FOR LIFE INSURANCE POLICIES

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The rate of return of a life insurance policy is an important factor from both the investors' and for the life insurance providers' point of view. The primary risk addressed by a life insurance policy is that of mortality, among other contingencies and risks. The effect of incorporating mortality in the rates of return of life insurance policies is thus of great interest (Schwarzschild, 1967; Myers & Cohn, 1987; Feldblum, 1992; Teufel et al., 2001).

In his recent publication, Dash (2016) examined two concepts of rates of return associated with life insurance policies.

The first concept of rate of return is the unadjusted rate of return, computed assuming that the individual survives until the maturity of the policy. The net present value (NPV) in this case is given by:

$$NPV = -\sum_{j=1}^{n} \frac{P}{r}.\left[1 - \frac{1}{(1+r)^j}\right] + \frac{MV}{(1+r)^n}$$

Where P denotes the premium, MV the maturity value, r the rate of return, and n the maturity period. The unadjusted rate of return is calculated by equating the NPV to zero (Brealey & Myers, 1996).

The second concept of rate of return is the mortality-adjusted rate of return, computed taking the probabilities of mortality into account. The expected NPV in this case is given by:

$$E(NPV) = -\sum_{j=1}^{n} \frac{P}{(1+r)^j}.p_j^{(k)} + \frac{MV}{(1+r)^n}.p_n^{(k)} + \sum_{j=1}^{n} \frac{MV_j}{(1+r)^j}.q_j^{(k)}$$

Where P denotes the premium, MV the maturity value, MV_j the maturity value in year j, $p_j^{(k)} = p_k \times p_{k+1} \times p_{k+2} \times \ldots\ldots \times p_{k+j-1} = \prod_{i=0}^{j-1} p_{k+i}$ is the probability that a person aged k will survive for another *j* years, $q_j^{(k)} = p_k \times p_{k+1}.......p_{k+j-2} \times (1 - p_{k+j-1}) = \left(\prod_{i=0}^{j-2} p_{k+i} \right) (1 - p_{k+j-1})$ is the probability that a person aged *k* will survive *j-1* years but not *j* years, and where p_i is the probability that a person aged *i* will survive for age *i+1*, *r* the rate of return, and *n* the maturity period. The mortality-adjusted rate of return is the calculated by equating the ENPV to zero.

The study analysed the rates of return of three types of life insurance policies, viz. the Capital Multiplier Plan, the Money Back Plan, and the Flexi-Plan. Some of the preliminary findings were as follows. For each type of policy, it was found that higher levels of sum assured tend to give higher levels of rates of return. It was found that higher maturity periods tend to give higher rates of return in the case of Capital Multiplier Plan and the Flexi-Plan, but the reverse is true in the case of the Money Back Plan. It was also found that for the Capital Multiplier Plan and Money Back Plan, the unadjusted and mortality-adjusted rates of return follow similar patterns at different levels of sum assured, while for the Flexi-Plan they do not follow similar patterns. Further, it was found that the mortality-adjusted rates of return were higher than the unadjusted rates of return in the case of Capital Multiplier Plan and Money Back Plan, but, in the case of Flexi-Plan, the unadjusted rates of return were higher.

A more significant finding of the study was that the unadjusted and mortality-adjusted rates of return follow a linear relationship taking into consideration the probability of an individual not surviving until the end of the contact. This relationship can be expressed as follows:

$$MARR_{k,n} = UARR_{k,n} + \beta . x_n^{(k)}$$

Where $MARR_{k,n}$ is the mortality adjusted rate of return, $UARR_{k.n}$ is the unadjusted rate of return, $x_n^{(k)} = (1 - p_n^{(k)})$ is the probability of a person aged *k* not surviving until maturity *n*. The coefficient β is the degree of responsiveness or sensitivity, i.e. the increase in the discrepancy between unadjusted and mortality-adjusted rates of return with 1% increase in probability of not surviving until maturity. This relationship is analogous to a capital asset pricing model, with the unadjusted rate of return representing a "risk-free" rate of return, as individuals are assumed to survive until the end of the maturity period, and with mortality representing a *"systematic risk"* which cannot be avoided.

The linear relationship was further extended to include the effects of the level of sum assured and the maturity period on the sensitivity, specific to a (type of) policy, as follows:

$$MARR_{k,n} = UARR_{k,n} + (\beta_0 + \beta_1 .SA + \beta_2 .n) x_n^{(k)}$$

Where $MARR_{k,n}$ is the mortality adjusted rate of return, $UARR_{k.n}$ is the unadjusted rate of return, $x_n^{(k)} = (1 - p_n^{(k)})$ is the probability of a person aged *k* not surviving until maturity *n*, and SA is the level of sum assured.

There are many possible extensions for the study, including other relevant risk factors, and for different types of policies. In particular, factors such as gender, occupation, medical history, and lifestyle can be incorporated into the model by considering specific mortality rates for different categories of individuals.

The concepts of rates of return associated with life insurance policies proposed by the study can have many applications. Investors should know the rates of return of when selecting a life insurance policy, so it should be mandatory that life insurance providers declare the same. On the other hand, life insurance providers should also know and track the risk profiles of life insurance policies that they issue.

The β coefficients proposed by the study can also be used to compare life insurance policies. In the study, the Capital Multiplier Plan and Money Back Plan had positive β coefficients, whereas the Flexi-Plan had negative β coefficients. In particular, the Money Back Plan had the highest β coefficients, especially for lower maturities and higher sum assured. The study should be extended to find the β coefficients of other types of life insurance policies in order to compare with a broader base of policies.

REFERENCES

Brealey, R.A., & Myers, S.C. (1996). *Principles of corporate finance. 5th Edition,* McGraw-Hill

Dash, M. (2016). The internal rate of return model for life insurance policies. *Asian Journal of Finance and Accounting, 8*(2), 70-94.

Feldblum, S. (1992). Pricing insurance policies: The internal rate of return model. In *Casualty Actuarial Society Part 10A Examination Study Note*.

Myers, S.C., & Cohn, R.A. (1987). A discounted cash flow approach to property-liability insurance rate regulation. In *Fair Rate of Return in Property-Liability Insurance* (pp. 55-78). Springer, Dordrecht.

Schwarzschild, S. (1967). A Model for Determining the Rate of Return on Investment in Life Insurance Policies. *Journal of Risk and Insurance*, 435-444.

Teufel, P., Tongson, T.J., & Rech, J.E. (2001). *Insurance risk 101*. Technical Report, American Academy of Actuaries, Washington, DC.