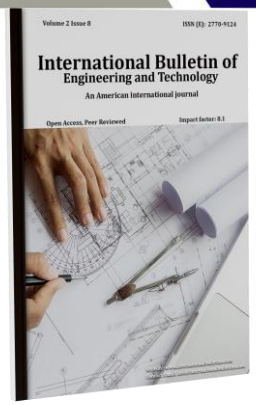

CALCULATION OF DEFINITION RATES FOR THE EVENT OF DEATH IN LIFE INSURANCE

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Annotation: In order to take out life insurance, it is necessary to calculate its price, that is, the rate of definition. Definition rates are calculated by different methods for each type of life insurance. If the object of life insurance is the property interests related to a person's life, the subject is a person's death, reaching a certain age, illness, accident, birth of a child, marriage and other situations. In this article, based on the demographic statistics about population death and age structure, which is the source of the calculation of the definition rates, the table of death developed using a special methodology for the last years on the scale of Uzbekistan is presented. With the help of this table, a switching table has been created that can be used to calculate the desired interest rate of life insurance in insurance companies. Also, for the sake of convenience, a copy of this table in Excel is provided for wide use in practical issues.

Keywords: Life insurance, death event, term, whole life and limited term life insurance.

The main condition for the payment of the insurance sum in this type of life insurance is living up to the age specified in the contract or living up to the annuity payment period. Along with these types of insurance, another type of life insurance that is common and affordable among them is life insurance for the death of the insured person. This type of insurance provides a large income for the heirs of the insured person in return for a relatively small insurance premium. Life insurance mainly comes in two forms:

1) life insurance for the death of the insured person;

2) term insurance for the event of death of the insured person, that is, the insurance amount is paid when the event of death of the insured person occurs before the period specified in the contract.

Calculation of definition rates in life insurance for the event of death is divided into 3 types:

1. Whole life insurance in the event of death
2. Term life insurance for the event of death
3. Term life insurance with limited payouts for the event of death

Life insurance in the event of death. In life insurance for the event of death, the insurance premium is paid to the beneficiary (heir) specified in the contract after the death of the insured person. The insurance payment is paid immediately after the death is confirmed. To simplify the statement, we will look at the type of insurance, in which the payment is made at the end of the year of death and the insurance premium is paid in one lump sum.

First, we find the actuarial value of the contract Ax (net rate).

Let's say that l_x people of x years have signed a life insurance contract. After one year, l_{x+1} people will be alive, $\boldsymbol{d_x = l_x - l_{x+n}}$people will die during the year. In that case, the cost of insurance sum S paid in the first year will be equal to $\boldsymbol{v \cdot d_x \cdot S}$, and in the second year $\boldsymbol{v^2 \cdot d_{x+1} \cdot S}$, in the third year $\boldsymbol{v^3 \cdot d_{x+2} \cdot S}$, and so on. The current value of payments for all contracts when insurance premiums are paid in one go is as follows:

$$A_x^{\omega-x} \cdot l_x \cdot S = \sum_{k=0} v^{k+1} \cdot d_{x+k} \cdot S$$

From this

$$\frac{d_{x+k}}{l_x} = q_{x+k} \cdot \ {}_kp_x$$

taking into account that, solving the equation with respect to A_x, we find the formula for calculating the actuarial value:

$$A_x = \sum_{k=0}^{\omega-x} v^{k+1} \cdot \frac{d_{x+k}}{l_x} = \sum_{k=0}^{\omega-x} v^{k+1} \cdot q_{x+k} \cdot \ {}_k\ p_x$$

Using commutation functions, we find a "simplified" formula for the lump sum rate:

$$A_x = \sum_{k=0}^{\omega-x} \frac{C_{x+k}}{D_x} = \frac{M_x}{D_x}$$

Term life insurance for the event of death. In this type of contract, the term n is fixed, and if the policyholder of age x dies before age x+n, the insurance amount is paid to him. In this case, as above, we believe that the insurance amount will be paid at the end of the year of the insured's death. We calculate the definition rate $\boldsymbol{A^1_{x:n}}$ for this type of insurance.

We find the definition rate using the following balance equation:

$$A^1_{x:n} l_x \cdot S = (v \cdot d_x + v^2 \cdot d_{x+1} + \cdots + v^n \cdot d_{x+n+1}) \cdot S = l_x(A_x - A_{x+n} \cdot \frac{D_{x+n}}{D_x})$$

So $A^1_{x:n}$ definition rate

$$A^1_{x:n} = \frac{M_x - M_{x+n}}{D_x}$$

as defined as.

Term life insurance with limited death benefits. If life insurance premiums are paid periodically, the term of payments can be lifelong (we have considered this case above) or limited. In this case, the payment term "t" is indicated. Contributions must be paid in full during this period. The annual premium paid from the beginning of the insurance year for age x is defined as t Px. The average sum of total contributions is equal to $a_{x:t!} \cdot \ddot{t}\, {}^tP_x$. Since the actuarial value of the contract is Ax, the equality $A_x = a_{x:t!} \cdot t\, {}^tP_x$ is appropriate. Accordingly, by switching functions, t P_x can be determined as follows

$$t\, {}^tP_x = \frac{A_x}{a_{x:t!}} = \frac{M_x}{D_x} : \frac{N_x - N_{x+t}}{D_x} = \frac{M_x}{N_x - N_{x+t}} \qquad {}_tP_x = \frac{M_x}{N_x - N_{x+t}}$$

Calculation of premium rates in mixed life insurance. There are also mixed contracts between life and death insurance. This type of life insurance is called compound life insurance. As with the previous types of insurance, certain contracts differ depending on the insurance premium and insurance payment scheme. Since the full cost of life insurance for a large amount is also high, a lump sum scheme is rarely considered. As a rule, contributions are paid throughout life or during the period specified in the contract. It is a combination of instant life and term

insurance of the same term, i.e. a hybrid type of insurance. More precisely, in this type of contracts n terms are specified, the insurance amount is paid in the following two cases:

1. If the insured of age x dies before the age of x+n, the insurance amount is paid to the beneficiary;

   It is paid to the insured if he reaches the age of x+n. It is known that the actuarial rate of life insurance for n years:

2. $A^1_{x:n} = \frac{M_x - M_{x+n}}{D_x}$

Accordingly, the actuarial rate of life insurance during this period:

$$A^1_{x:n} = {}_nE_x = \frac{D_{x+n}}{D_x}$$

Clearly, the rate of the mixed contract $A_{x:n}$ is equal to the sum of the above two rates, i.e.

$$A_{x:n} = A^1_{x:n} + {}_nE_x$$

Using switching functions, we create the following formula for the defined rate of mixed insurance:

$$A_{x:n} = \frac{M_x - M_{x+n} + D_{x+n}}{D_x}$$

Example 1. Contract amount - $50,000, 40-year-old insured man, contract premiums until 65 years old, annual interest rate - 4.5%. Find the value of the annual premium in the combined insurance. according to the schedule

Solution:

$$\boldsymbol{P = 50000 \cdot P_{40:25!} = 50000 \cdot \frac{M_{40} - M_{65} + D_{65}}{N_{40} - N_{65}}}$$

$$\boldsymbol{= 50000 \cdot \frac{4133,4 - 2386,9 + 4252,5}{284113,4 - 43269,7} = 50000 \cdot \frac{5999}{240843,7} = 1245,41\$}$$

If insurance premiums are paid periodically, then its value is calculated as follows:

$$\boldsymbol{P_{x:n!} = \frac{A_{x:n!}}{\ddot{a}_{x:n!}}}$$

In the above-mentioned mixed insurance, the insurance sum was assumed to be of equal value. Sometimes, in mixed insurance, there are cases where the sum assured of life and death life insurance policies are different. In this case, when calculating the definition rates, the life sum is taken as the basis, and the death rate is calculated by multiplying the death sum insured by the ratio of the life sum, i.e.

$$A_{x:n!} = \gamma A^1_{x:n!} + {}_nE_x \ , \qquad \gamma = S_{o'}/S_y$$

If insurance premiums are paid periodically, then its value is calculated as follows: Mixed insurance can be understood as insurance for death and survival for a certain period of time. Mixed insurance provides the policyholder with the most complete protection by simultaneously covering two opposite insurance risks. Awards are periodic and one-time. Mixed insurance contracts are the most profitable for savings purposes, but have lower guarantees in the event of death than other contracts. Payment of the sum insured should be in the form of lump sum or annuity.

Summary

In life insurance, the definition in calculating the rates is net life insurance until the main fixed term, life insurance for the event of the death of the insured person, term insurance, that is,

the event of the death of the insured person information on how the insurance amount is paid in the event of the term specified in the contract, the methods of calculating the defined rates in mixed life insurance are explained in detail and shown with the help of practical problems.

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