ALBANIAN FINANCIAL SUPERVISORY AUTHORITY
THE BOARD

REGULATION

No. 8, date 08 February 2007

"On the basis, calculation approaches, and the manners of keeping mathematical provisions"

Adopted upon Board Decision No.8, date 08 February 2007

Pursuant to Point 10 of Article 101 of Law No. 9267, date 29 July 2004, "On the Insurance, Reinsurance and Intermediary Business", The Financial Supervisory Authority Board,

DECIDED:

Pursuant to Article 7 of Law No. 9267, date 29 July 2004 life insurances fall into the following classification:

- Class 19: Life – death
- Class 20: Marriage – birth
- Class 21: Insurances linked with investment funds
- Class 22: Collective funds administration
- Class 23: Insurance of payment funds

Definitions:

The concepts, which will be hereunder defined, have to do with Class 19. Life insurance policies that belong to Class 19 are divided into two large subclasses consisting of insurances and annuities.

<u>Insurance</u>: The profit is made up of the insurance amount, which is paid to the insurant, in case the policyholder passes away within a certain period of time, which has been subject to specification in the policy, or survives over the period specified in the policy.

<u>Annuities:</u> The benefit consists of a series of regular payments, which are made to the policy beneficiary over the written deadline and as long as the insurant, is alive.

1. Pure endowment with saving elements of n years[1)] term: A policyholder of age x will be, at the moment of purchasing the policy, entitled to receiving the payment of insurance amount S after n years, on condition that the policyholder will survive to that time. No payment will be made if the policyholder will not survive up to the $x + n$ age. The actuarial standard record in relation to the current expected benefit rate when $S = 1$, is: ${}_n\boldsymbol{E}_x$ **ose** $\boldsymbol{A}_{x:\overline{n}|}{}^{1}$

2. Temporary life insurance of n years[2)] term: A policyholder beneficiary of x age will be, at the moment of purchasing the policy, entitled to receiving the payment of insurance amount S only and solely if the policyholder dies within n – years term. The actuarial standard record in relation to the current expected benefit rate when $S = 1$, is: $\boldsymbol{A}^{1}{}_{x:\overline{n}|}$

3. Life term insurance with saving elements of n years[3)]: The policyholder beneficiary of x age will be, at the moment of purchasing the policy, entitled to receiving a payment of insurance amount S, by the end of his death year or, by the end of n – years term, depending on which of them is earlier. Hence, in this case it is insurance amount S, which is always paid. The actuarial standard record in relation to the current expected benefit rate when $S = 1$, is $\boldsymbol{A}_{x:\overline{n}|}$

It results that $\boldsymbol{A}_{x:\overline{n}|} = \boldsymbol{A}^{1}{}_{x:\overline{n}|} + \boldsymbol{A}_{x:\overline{n}|}{}^{1}$

4. Whole life insurance[)4]: This type of insurance constitutes a specific case of life temporary insurance, where $n \to \infty$. The actuarial standard record in relation to the current expected benefit rate when $S = 1$, is $\boldsymbol{A}_x$.

Insurance cases defined in points 1,2,3,4, make up the major ones in the set of discrete insurance cases.

5. Whole life Annuities[5)]: The benefit consists of a series of regular payments, which are made to the beneficiary for the time s/he is alive. In case the person, who purchases

[1]) In actuarial science literature it is recognized under the term "Pure Endowment"
[2]) In actuarial science literature it is recognized under the term "Term Assurance of n years"
[3]) In actuarial science literature it is recognized under the term " Endowment Assurance of n years"
[4]) In actuarial science literature it is recognized under the term " Whole Life Assurance"
[5]) In actuarial science literature it is recognized under the term " Whole Life Annuity"

annuities, is at age x at the moment of purchasing them and, the initial annuity installment gets paid after one year, the actuarial standard record in relation to the current expected benefit rate when each installment has the value of 1 unit is a_x. In case the person who purchases annuities is at age x at the moment of purchasing them and, the initial installment of annuity is paid at that moment, then the actuarial standard record in relation to the current expected benefit rate, when each installment has only 1 unit, is $\ddot{a}_x$. The result is that $a_x = \ddot{a}_x - 1$

6. Temporary annuities of n years[6] term: These are similar to temporary whole life annuities, except for the fact that payment of the number of installments to the beneficiary continues up to the termination of the n years term. The current excepted benefit amounts, when every installment consists of 1 unit, are respectively $a_{x:\overline{n}|}$ and $\ddot{a}_{x:\overline{n}|}$

These are the basic types of discrete insurances and annuities. There may be several other types based on the specifics of benefits allocation, premium payment approach, etc., but they have to be subject to receiving in advance the Financial Supervisory Authority. Moreover, every text belonging to Life Insurance (Life contingencies) or belonging to Actuarial Science may be applied in case of conducting a more elaborate research.

7. $P_{x:\overline{n}|}{}^{1}$: Annual net premium for pure insurance with saving elements of n years term (refer to 1); this premium is paid as component part annually incorporated in the gross premium for n years as long as the insurant is alive.

This premium meets the requirement of the following equation $P_{x:\overline{n}|}{}^{1} * \ddot{a}_{x:\overline{n}|} = {}_nE_x$

8. $P^1{}_{x:\overline{n}|}$: The annual net premium for temporary life insurance of n years term (refer to 2). This premium meets the requirement of the subsequent equation $P^1{}_{x:\overline{n}|} * \ddot{a}^1{}_{x:\overline{n}|} = A^1{}_{x:\overline{n}|}$

[6]) In actuarial science literature it is recognized under the term "Temporary Annuity of n years"

9. $P_{x:\overline{n}|}$: The annual Premium for life insurance with saving elements of n year term (refer to 3). This premium is paid as annually included in the gross premium for n years as long as the insurant continues to live. This premium meets the requirement of the subsequent equation $P_{x:\overline{n}|} * \ddot{a}_{x:\overline{n}|} = A_{x:\overline{n}|}$

10. P_x: Annual premium for whole life insurance (refer to 4), which is paid for the entire life (refer to 4) and, which is paid as annually included in the gross premium as long as the insurant continues to live. This premium meets the requirement of the following equation $P_x * \ddot{a}_x = A_x$

11. ${}_tP_x$: Annual net premium for the whole life[7)] (refer to 4), which is paid as annually included in the gross premium for three years as long as the insurant continues to live. This premium meets the requirement of the following equation ${}_tP_x * \ddot{a}_{x:\overline{t}|} = A_x$

12. ${}_tP^{(m)}_{x:\overline{n}|}$: Annual net premium, which is paid in m installments every year with the subsequent value $\left({}_tP^{(m)}_{x:\overline{n}|}\right)/m$ each, over a period of t years as long as the insurant continues to live, for life insurance with saving elements of n years term (refer to 3). This premium meets the requirement of the following equation ${}_tP^{(m)}_{x:\overline{n}|} * \ddot{a}^{(m)}_{x:\overline{t}|} = A_{x:\overline{n}|}$

In order to be in a position to provide the provisions formula of some of the major life insurance policies, it is indispensable to hereby mention also some other concepts.

Expenditures

Essential types of expenditures, which are connected with an insurance policy, are hereunder listed:

- Expenditures for each individual policy (for example, documentation cost);
- Expenditures proportional to the premium (for example, intermediary's commission);
- Expenditures proportional to the benefit (for example, taxes, insuring cost, etc.).

[7)] Definitions 11 and 12 are provided so as to demonstrate that premium payment approaches can be of different kinds.

Value equation

The equation value to find the net Premium for a life insurance policy has the general patter hereunder described:

(Expected value of net premiums at the time $t = 0$) = (expected value of benefits)[8] at the time $t = 0$).

Time $t = 0$ stands for the moment when the policy is purchased when the policyholder has the age x. Equations provided in definitions 7, 8, 9, 10, 11, 12 are value equations.

Value equation, which would incorporate the gross premium in it, has the following general pattern:

(The expected value of gross premiums at the time $t = 0$)=

(Expected value of benefits[9)] at the time $t = 0$) +

(Expected value of expenditures at the time $t = 0$) +

(Expected value of insurant's benefit at the time $t = 0$)

The value equation, which includes gross premium, with general pattern:

(Gross expected value at the time $t = 0$)=

(Expected value of benefits at the time $t = 0$) +

(Expected value of expenditures at the time $t = 0$);

This is an expression of equivalency principle. According to this principle, premiums, which are paid by the insurant, are used solely to the benefit of the beneficiary and of its beneficiaries and to cover policy design, purchase and administration. According to this principle, the insurer does not make any profit out of insurances business.

PROVISIONS

In case of a common type of life insurance policy:

Loss at time t = (value at time t of future expenditures

– Value at time t of future incomes[10)])

[8]) The term benefit implies the insurance amount, that is, the policyholder's benefit.
[9]) Same record as in 8)
[10]) In literature: loss at time t=present value at t of future outgo – present value at t of future income.

If the contract or insurance policy will be estimated according to the equivalency principle, which was mentioned above, then

E (loss at time $t = 0$) = 0

Following coming into effect of the insurance policy after a given period t, some expenditure has been incurred (for example, insuring expenditures, administrative expenditures, etc,) and the insurant has received some incomes (premiums installments until time t). As a consequence,

E (loss at time t) ≠ 0; Moreover,

E (loss at time t) = Prospective provisions at time t.

In case of a life policy, the prospective reserve at time t, without considering the expenditures) is:

The expected value at time t of future expenditures[11)] – the expected value at time t of future incomes[12)];

Prospective provisions formula without considering the expenditures of main life insurance policies.

1. Pure life insurance with saving elements of n years term:

$$ {}_tV_{x:\overline{n}|}^{\;1} = A_{x+t:\overline{n-t}|}^{\;1} - P_{x:\overline{n}|}^{\;1} * \ddot{a}_{x+t:\overline{n-t}|} \qquad 0 \le t \le n $$

2. Temporary life insurance with n years term:

$$ {}_tV^{1}{}_{x:\overline{n}|} = A^{1}{}_{x+t:\overline{n-t}|} - P^{1}{}_{x:\overline{n}|} * \ddot{a}_{x+t:\overline{n-t}|} \qquad 0 \le t \le n $$

3. Life insurance with saving elements of n years term:

$$ {}_tV_{x:\overline{n}|} = A_{x+t:\overline{n-t}|} - P_{x:\overline{n}|} * \ddot{a}_{x+t:\overline{n-t}|} \qquad 0 \le t \le n $$

4. Whole life insurance:

$$ \begin{aligned} {}_tV_x &= A_{x+t} - \mathrm{P}_x * \ddot{a}_{x+t} = \\ &= 1 - \mathrm{d} * \ddot{a}_{x+t} - \left(\mathrm{A}_x / \ddot{a}_x\right) * \ddot{a}_{x+t} = \\ &= 1 - \left(\ddot{a}_{x+t} / \ddot{a}_x\right) * \left(\mathrm{A}_x + d * \ddot{a}_x\right) = \\ &= 1 - \left(\ddot{a}_{x+t} / \ddot{a}_x\right) \qquad t \ge 0 \end{aligned} $$

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11) Future expenditures here imply the amount of insurance that the insurer is obliged to pay to the insurant.

12) Future incomes here imply net premiums, which the insurant is obliged to pay to the insurer starting from time t and beyond.

The observation here is that the aforementioned formulas stand for an insurance amount unit.

Retrospective provisions

Retrospective provision at time t for a life insurance policy is equal to premiums accumulated value[13)] received up to time t by the insurer minus the accumulated value of insurant's benefits and expenditures covered up to time t. The newly defined provision is a gross retrospective premium. The net retrospective premium would be defined in a similar manner by means of considering the net premiums and by means of excluding expenditures in the aforementioned definition.

The retrospective provision for a life insurance policy is equal to the prospective provision, if:

(a) Both types of provisions are calculated by means of applying the same rating base.

(b) The premium calculation base is similar to the rating base.

It is worth specifying that rating base implies assumptions made with regard to the following:

1. Expenditures
2. Mortality rate
3. Technical interest

that are applied to calculate provisions.

Premium calculation base again implies assumptions made in relation to expenditures, mortality rate and technical interest when calculating the premium.

If, in the case of calculation base, expenditures are taken as 0 and the net premium is incorporated in the provisions calculation formula, then it understood that a net reserve is being calculated; and, if expenditures are taken as 0 in the case of premium calculation base, then it is understood that a net premium is being calculated.

Provisions incorporating expenditures

[13]) This is an issue of gross premiums.

Provisions, which incorporate expenditures, are calculated in a way similar to that provided above. In the case of a life policy, the prospective provision including also the expenditures at time t is as follows:

(*) The expected value at time t of future outgoings[14)] – the expected value at time t of future incomes[15)]

For each and every life insurance policy the prospective provision, which includes expenditures is subject to the calculation approach according to the definition (*).

The subsequent section provides an example of the calculation of prospective provision, which incorporates expenditures for a whole life insurance policy.

In general, the structure of expenditures belonging to a life insurance policy is as follows: Initial expenditures $1 + c$ yearly expenditures (excluding the first year) c, and expenditures proportional to the premium $k * P$ whereby P represents the annual gross premium for each year.

Therefore, according to the value equation:

$$\begin{aligned} P * \ddot{a}_x &= A_x + 1 + (c + k * P) * \ddot{a}_x \\ &= P_x * \ddot{a}_x + 1 + (c + k * P) * \ddot{a}_x \end{aligned}$$

Then $P * (1\text{-k})\text{-c} = \mathrm{P_x} + (1 / \ddot{a}_x)$

Prospective provision, which includes also expenditures at time t, according to the definition provided above, is as follows:

$$\begin{aligned} {}_tV_x^{\mathrm{mod}} &= A_{x+t} + (k * P + c) * \ddot{a}_{x+t} - \mathrm{P} * \ddot{\mathrm{a}}_{\mathrm{x+t}} \\ &= A_{x+t} - (P * (1 - \mathrm{k}) - c) * \ddot{a}_{x+t} \\ &= A_{x+t} - (P_x + (1 / \ddot{a}_x)) * \ddot{a}_{x+t} \\ &= A_{x+t} - P_x * \ddot{a}_{x+t} - 1 * (\ddot{a}_{x+t} / \ddot{a}_x) \\ &= {}_tV_x - 1 * (\ddot{a}_{x+t} / \ddot{a}_x) \end{aligned}$$

Thus[16] ${}_tV_x^{\mathrm{mod}} = {}_tV_x - 1 * (\ddot{a}_{x+t} / \ddot{a}_x)$

[14)] Future outgoings (expenditures) here imply insurer's expenditures, that is, the insurance amount that the insurer owes to the insurant, as well as, expenditures in relation to the policy at issue starting from time t and beyond.

[15)] Future incomes here imply the insurer's incomes, that is, gross premiums that the insurant owes to the insurer starting from time t and beyond.

Recursive ratios between provisions

Let's make the assumption here that the same rate of interest and same mortality rate will be applied everywhere: then for a whole life insurance policy with a payable insurance amount due by the end of the year of insurant's death, it can be proved that:

$\left({}_{t}V_{x} + P_{x}\right) * (1 + i) = q_{x+t} + p_{x+t} * {}_{t+1}V_{x}$ Where ${}_{t}V_{x}$ and ${}_{t+1}V_{x}$ are provisions without including expenditures.

Such recursive ratios may be set up for all life insurance policies.

The recursive ratio between provisions, which incorporate expenditures, is hereunder provided in its general form, which is applicable to all life insurance policies.

For each and every policy, with which as person of x age is issued, let ${}_{t}V$ be the provision including expenditures at time t.

- Let $P_{x,t}$ be the premium, which must be paid at the beginning of year $(t+1)$ of the insurance policy, so $P_{x,0}$ is the premium, which is paid at time $t=0$ that is, at the beginning of the second year of the policy and so on, (annual premiums do not have to necessarily be equal).
- Let expenditures E_{t} be the expenditures incurred at time t, that is, at the beginning of year $(t+1)$ of the policy. These expenditures must be commensurate with expenditures at the rating base.
- Let S_{t} be the insurance amount plus expenditures, which are associated with its payment, which becomes payable in case the insurant dies during year $(t+1)$ of the policy. The assumption here will be that the insurance amount will be paid by the end of the year of insurant's death.

In that context, the general pattern of the recursive ratio for the provisions of a life insurance policy has to be the following:

$$\left({}_{t}V + P_{x,t} - E_{t}\right) * (1 + i) = S_{t} * q_{x+t} + p_{x+t} * {}_{t+1}V$$

Where assumptions on expenditures, on technical interest and on the mortality rate are the same as those applied when calculating the premiums and provisions ${}_{t}V$ and ${}_{t+1}V$.

[16]) The provision calculated in this example is called Zillmer reserve after the name of the mathematician who has worked on it.

Recursive ratios between provisions, which include also the expenditures bear importance due to the fact that if the premium value at time t is calculated, then the value of the provision can be easily calculated for the forthcoming time in case the annual premiums values are recognized and by means of having the relevant assumptions on the expenditures, technical interest and on the mortality rate.

Additionally, for every policy belonging to classes 20, 21, 22, 23 of the Law appendix, the prospective provision including the expenditures is calculated according to the definition (*).

In this manner:

The prospective provision at time t including expenditures =

Expected value at time t of futures outgoings – Expected value at time t of the future incomes;

Therefore, future expenditures or outgoings, same way as above, imply the insurer's expenditures, that is, the insurance amount or other types of benefits, which the insurer owes to the insurant, as well as, all expenditures, which have to do with policy at issue starting from time t and beyond. Future incomes imply gross premiums, which the insurant owes to the insurer starting from time t and beyond.

The insurance companies will hereby be assigned with the enforcement of stipulations set forth in this regulation.

This regulation comes into effect upon the date of its adoption.

CHAIRPERSON

Elisabeta GJONI