**REPUBLIC OF ALBANIA**
**FINANCIAL SUPERVISORY AUTHORITY**
**BOARD**

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**REGULATION**

**ON THE BASES AND METHODS OF CALCULATING
MATHEMATICAL PROVISIONS,
METHODS ON THE MAINTENANCE OF MATHEMATICAL PROVISIONS
AND THE CRITERIA AND PROCEDURES FOR THEIR APPROVAL**

*Approved by Board Decision no. 187, dated 24.11.2016*

**CONTENTS**

# CHAPTER I

# GENERAL PROVISIONS

## Article 1

## Legal basis

This regulation is drafted on the basis and pursuant to Article 6, item 4, Article 89, items 5 and 12 of Law no. 52/2014, "On the activity of insurance and reinsurance".

## Article 2

## Object

The object of this regulation is:

1. Determination of principles, technical bases and methods for calculating mathematical provisions[1];
2. Determination of methods of keeping mathematical provisions;
3. Determination of the special criteria for calculating the mathematical provisions of insurance contracts where the investment risk is held by the insured;
4. Determination of the role and responsibilities of the authorized actuary of the company;
5. Establishment of the criteria and procedures for reporting and approving mathematical provisions.

## Article 3
## Definitions

In this Regulation, the following terms shall have these meanings:

1. "Authority" means the Financial Supervisory Authority;

2. "Authorized Actuary" is a person licensed by the Authority, according to the provisions of Law no. 52/2014, which, inter alia, has the main task of calculating premium fees,

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[1] Mathematical provisions are calculated for life insurance contracts as well as for other insurance contracts for which (i) savings funds or compensation funds are collected for future years and (ii) probability and actuarial calculations are applied in similar way to life insurance.

probability tables, provisions and dividends, based on scientific theories related to investments, statistics, mathematics, finance and demography;

3. "Annuity" means an insurance contract, where the benefit consists of a regular series of payments made to the policy beneficiary over the term specified in the contract, determined in a number of years or for a lifetime;

4. "Demographic bases" means any statistics on mortality/life expectancy or morbidity of insured persons used for calculating the premium and/or for calculating mathematical provisions;

5. "Financial Bases" means the technical interest rate used for calculating the premium and any other financial assumptions used for calculating the premium and/or for calculating mathematical provisions;

6. "Technical Bases" means all statistical, demographic, financial and any other hypotheses used for calculating the premium or for calculating mathematical provisions;

7. "Endowment" means a life insurance contract under which the benefit is paid as a fixed amount with the maturity of the contract or in case of death of the insured;

8. "Insurance Class" [2]: it is according to the definition of Article 4, item 6 of Law no. 52/2014;

9. "Profit-annuity contracts" are life-assurance contracts that enable insured persons to participate in expected gains that materialize through bonuses in the form of increase in contractual benefits or discounts on payable premiums;

10. "Mathematical Provision"[3]: it is according to the definition of Article 4, item 33 of Law no. 52/2014;

11. "Mortality rate" means the actuarial valuation drafted by the statistics of the selected population groups or the portfolio of insured persons showing the rate of deaths at a certain age within the estimated group;

12. "Morbidity rate" means the actuarial valuation drafted by statistics of the selected population groups or insured portfolios showing the rate of cases of disease by age or other factors considered in the valuation;

13. "Delivery value" means the amount payable to the insured who submits the life insurance policy by voluntarily terminating the coverage prior to the maturity of the contract or the

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[2] Classification of a similar risk or operation group that determines the activity that the insurance company may exercise under a license, according to Annex 1 of Law no. 52/2014.

[3] The amount calculated on the basis of actuarial valuations and methods for covering the outstanding liabilities from insurance contracts that are the object of this regulation.

death of the insured;

14. "Zillmerisation" (or Zilmer's method): is the actuarial process that implies increasing the amount of future net premiums for the effect of calculating mathematical provisions as a result of the inclusion in this amount of the insurance expenses, paid in the beginning of the contract;

15. "Option" means the right or the possibility of the insured to choose among some alternatives provided under the terms of the insurance contract;

16. "Prospective method" means the actuarial method of calculating mathematical provisions where the provision is equal to the difference between the present value of expected future insurer's obligations and the present value of future premiums payable under insurance contracts;

17. "Retrospective Method" means the method used to calculate mathematical provisions according to which the value of mathematical provisions represents the difference between the level of written premiums including accumulations and returns from investments, and the value of the paid claims, including expenses.


# CHAPTER II
## SPECIAL PROVISIONS

## PART ONE

## BASES AND METHODS OF CALCULATING MATHEMATICAL PROVISIONS


### Article 4

#### Basic principles and methods of calculating mathematical provisions

1. The insurance company shall calculate mathematical provisions for insurance contracts that are the object of this regulation.

2. Mathematical provisions are calculated according to the appropriate prospective actuarial valuation methods as the difference between the present value of future liabilities and the present value of future premiums payments, based on the terms and conditions of each insurance contract including:

    a. All guaranteed benefits, and delivery values;

    b. the bonuses for which the insured have the right to benefit collectively or individually;

c. All options available to the insured under the terms of the contract;

d. Expenditures, including commissions on insurance.

3. The insurance company may use retrospective actuarial methods for certain contracts in the event that (a) the mathematical provisions calculated by the retrospective method for such contracts are not lower than the respective amounts calculated using appropriate prospective methods, or (b) the prospective methods cannot be used to calculate the mathematical provisions of these contracts. Annex II, attached and part of this regulation, provides a description of prospective and retrospective methods of calculating mathematical provisions.

4. When selecting actuarial valuation methods, the insurance company takes into account, on a case-by-case basis, the method applied to the valuation of assets in covering mathematical provisions.

5. The insurance company calculates the mathematical provisions for each insurance contract. Approximations or generalizations can only be applied if it is deemed that their implementation results in an approximate equivalent to the one calculated on their own. The principle of calculating the provisions for each contract should not prevent the provision of additional provisions for general risks that can not be individualized.

6. Mathematical provisions for group insurance contracts should be calculated based on age, gender and other necessary data of individuals within the group, taking into account the rights guaranteed to all insured individuals and beneficiaries. For group insurance contracts, the use of appropriate group approximations or generalizations is permitted only in special cases, based on the judgment of the authorized actuary.

7. In any case of approximations and generalizations, the actuary must include in the actuarial report all the hypotheses and the reasons supporting the application of approximate and generalizing methods.

8. The mathematical provision of any insurance contract should not be negative. If the value obtained from actuarial calculations is negative, the mathematical provision of the contract will be kept zero. Mathematical provision of a contract with a guaranteed delivery value at any time may not be below the delivery value for this time.

9. The mathematical provision of a contract on the date of calculation is obtained by the linear interpolation of the mathematical provisions calculated at the beginning and at the end of the current contractual insurance period.

10. The method of calculating mathematical provisions should not be subject to year to year changes and should be in this way in order to recognize the distribution of benefits appropriately throughout the duration of each policy. For contracts with profit sharings, all future bonuses will be included in the aggregate calculations or will be calculated separately, taking into account the assumptions about expected developments and recognized profit sharing criteria in relation to the rights of policyholders, insured and

beneficiaries in profit sharing.

11. Insurance companies determine the technical bases for assessing mathematical provisions based on the most probable considered hypotheses and a reasonable margin for adverse change of the considered elements.

12. The reinsurer's share of mathematical provisions shall be calculated in compliance with the terms of the reinsurance contract.

## Article 5

### The share of expenses in mathematical provisions

1. The estimate of the share of expenses in mathematical provisions is made on the basis of stable and realistic assumptions and using appropriate methods of estimating the share of expenses in the premium fee. The expected expense share should not be lower than the amount resulting from diligent estimation of future expenses.

2. The share of expenses in mathematical provisions can be specifically calculated as the difference between the present value of expected expenses with the share of expenses calculated at the present value of future premiums including the present value of future income from the investment of premiums that does not cover benefits under the contract.

3. The share of mathematical provision expenses may also be included in mathematical provisions that are calculated as the difference between the present value of future liabilities to the beneficiaries at the present value of future premiums, as the latter are cleared from the component of expenses anticipated for the future.

## Article 6
### Insurance Commissions and Zillmerisation

1. If the insurance commissions are paid before the corresponding premiums are collected, the future premiums for the calculation of mathematical provisions will be cleared from the part of the commissions paid in advance.

2. Notwithstanding paragraph 1 of this Article, the company may use Zilmer's method for adjusting mathematical provisions with the effect of deferred commissions, if the effect from the use of this method does not exceed 3.5 percent of the capital amount[4].

3. If the expected commissions of existing contracts are higher than the corresponding amounts resulting from the calculation as the difference between the premium that

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[4] For the effect of this Regulation, the capital amount means (a) the amount of insurance in the case of life insurance, (b) the amount payable at maturity in the case of 'endowment' insurance and (c) the capitalized amount of annuity on the starting date of the benefits.

includes the commissions and the premium cleared from the commissions used to calculate the matured mathematical provisions), the insurance company creates additional provisions to cover commissions.

4. If the commissions provided in item 2 are paid over periods of one year, the zillmerised mathematical provisions shall not be lower than the amount guaranteeing the payment of the benefit under the contract.

5. If implemented, Zillmerisation should be used continuously throughout the duration of the policy. The insurance companies that use Zillmerisation for the calculation of mathematical provisions should present details in the actuarial report according to the insurance products:

   (a) the amount of provisions calculated using the Zilmer's method,
   (b) the amount of mathematical provisions calculated using the net method (without Zillmerisation) and
   (c) the difference between the amounts calculated according to both methods.

6. If the commissions for a given contract are paid over a period longer than one year, the zilmerised mathematical provision must not be less than the amount that guarantees the payment of the benefit under the contract.

## Article 7
### Technical Basis of Calculating Mathematical Provisions

1. Insurance companies should identify the technical bases for diligent assessment of mathematical provisions based on appropriate hypotheses that are deemed with high probability of occurrence, as well as by using reasonable limits for unfavorable tendencies of parameters used in calculations.

2. The technical bases used for calculating mathematical provisions shall be consistent with those established by the authorized actuary for the calculation of premiums, unless the circumstances have changed and dictate the need to use more conservative technical bases and increase of the provisions. The general criteria for calculating the premium fees are set out in Annex 1 attached and an integral part of this Regulation.

## Article 8
### Demographic Bases of Calculating Mathematical Provisions

1. The insurance company, based on the insurance product, selects, as appropriate, the statistical elements on mortality and morbidity according to diligent criteria and sufficiently supported on the company's experience as well as other data.

2. In the case of contracts where the reduction of the mortality rate leads to the increase of

mathematical provisions, the insurance company should carefully assess the hypotheses that support the reduction of mortality rates in future periods.

3. In the case of contracts covering the risk of mortality and health insurance, determining mortality and morbidity rates, the insurance company shall take into account and assess the expected impact of known diseases, the effects of which are not reflected in existing demographic tables.

## Article 9
## Financial Bases of Calculating Mathematical Provisions

The interest rates used in calculating mathematical provisions should be carefully selected, meeting the following principles and criteria:

1. The interest rates used in the calculation of mathematical provisions may not be higher than the estimated return rates from the investment of assets in covering mathematical provisions, including return rates for future investments expected to be made.

2. In selecting the interest rate, the insurance company shall take into account the currency specified in the insurance contract and the currency of the corresponding assets.

3. If the current or expected rate of return from the investment of assets to cover mathematical provisions is not sufficient to cover liabilities arising from insurance contracts, the company must retain an additional provision.

4. In calculating mathematical provisions for guaranteed benefit contracts:

   1. The interest rate according to a particular currency may not be higher than the average rate of return from the investment of mathematical provisions covering the last three years in this currency;

   2. The maximum interest rate for a given currency may not be greater than 60 percent of the average rate of return on long-term securities of the Government of the Republic of Albania[5] or the government of a country of the origin of currency provided that this country has no lower rating than BBB by Standard & Poors. The Authority publishes the maximum interest rates by currency at least once a year after technical consultations with life insurance companies.

   3. The maximum interest rate shall not apply to contracts with a maturity of less than eight years and having a single premium payment as well as for annuities that do not have a premium return clause.

5. In special circumstances, the Authority may allow insurance companies, for a period of

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[5] Long-term securities imply investments with a maturity of not less than five years.

no more than two years, to use higher interest rates than those set out above only (a) if the interest rate increase of government securities results in significant capital losses of financial assets and

(b) provided that the reduction in mathematical provisions from the increase of the interest rate does not exceed the capital loss of the assets that cover these provisions during the year.

## Article 10
## Currency Conformity

1. If mathematical provisions under a particular currency are not covered by assets or are not readily returned without exchange risk in the currency of liabilities, the company should diligently calculate an additional provision to cover the effects of exchange rate changes regarding the appropriateness of assets.

2. Mathematical provisions for contracts with foreign currency benefits are calculated in this currency and are also presented in ALL using the Bank of Albania's average exchange rate on the date of the valuation.

## Article 11
## Special rules for policies directly linked to the investment value

1. The insurance company shall calculate special provisions for insurance contracts where the benefits are directly related to the investment value.

2. If the benefits under the insurance contract are directly linked to the quota (unit) value of an investment fund or the value of the assets within that fund, the special provisions for such benefits should be accounted in the nearest amount with the value of quotas (units), or with the value of the relevant assets of the fund in the event that the allocation in quotas is not determined.

3. When benefits under an insurance contract are directly linked to participation indexes or other values in a reference other than those specified in paragraph 2 of this Article, the special provisions for such benefits shall be calculated for as closely as possible with the value of the quotas (units) representing the reference value or, if no quotes are determined, with the value of the assets with a comparable risk profile and easily tradable as close to the assets on which the reference value is based.

4. Zilmer's method is not permitted for the calculation of special provisions under paragraph 1 of this Article.

## Article 12
## Transparency of methods and database

The insurance company makes available to interested parties, according to the law, data on the methods and technical bases used for calculating mathematical provisions.

## PART TWO

## METHODS ON THE MAINTENANCE OF MATHEMATICAL PROVISIONS

### Article 13

### Provisions on keeping separate accounts

The insurance company must maintain and submit separate accounts that are the object of this regulation for life insurance, and other long-term insurances that are similar to them for calculation purposes. Special company accounts for these types of insurance should include at least:

1. Insurance premiums, including returned premiums;
2. Insurance commissions;
3. Reinsurance premiums and commissions;
4. Paid claims (benefits) and estimates for liabilities payable to insured persons;
5. The reinsurer's share of the paid claims (benefits) and estimates of the liabilities payable to insured persons;
6. Mathematical provisions, claims provisions and other provisions held with these insurances;
7. Expenses related to these insurances.

## PART THREE

## CRITERIA AND PROCEDURES OF APPROVING MATHEMATICAL PROVISIONS

### Article 14
### Criteria and procedures for approving mathematical provisions by the Authority

1. The insurance company submits to the Authority until the last day of the following month of each quarter for interim periods and the financial year end, the calculations of mathematical provisions, and the database taken into consideration for the calculation of these provisions.

2. The actuary's report drawn up in compliance with Annex II of this Regulation related

tothe methods of calculating mathematical provisions and the consederation on their sufficiency as well as their opinion shall be submitted at the Authority in compliance with the provisions of Article 112 of Law 52/2014 "On the activity of insurance and reinsurance".

3. The Authority shall approve the adequacy of mathematical provisions of the financial year by 31 March of the following year.

4. If the Authority deems that mathematical provisions, according to item 3 of this Article, and for interim periods, are not sufficient to cover the liabilities arising from insurance contracts, it orders the insurance company to retain and reflect mathematical provisions in the value approved by the Authority. The increase of mathematical provisions can also be carried out with the implementation of the most conservative technical bases suggested by the Authority based on consistent technical arguments.

## CHAPTER III
## FINAL PROVISIONS

### Article 15
### Annexes

The annexes attached to this regulation are part of it and mandatory for implementation.

### Article 16
### Entry into force

This Regulation shall enter into force immediately.

## ANNEX I

### "GENERAL CRITERIA FOR CALCULATING PREMIUM FEES"

1. **General principles**

   a. Insurance companies develop appropriate actuarial hypotheses for the calculation of appropriate premiums to cover the liabilities arising from each insurance contract, including mathematical provisions and the costs associated with the insurance contract.

   b. Insurance companies evaluate and choose the technical bases for calculating premiums. Based on the type of insurance contract and benefits offered by it, companies set the technical interest rates, demographic bases, if any, and any other technical basis needed

to calculate the risk premium fee. In addition, the companies determine the rules for determining the charges over the pure premium in order to calculate the sale premium fee. In selecting the technical bases for the calculation of the premium, insurance companies take into account the guaranteed benefits or profit sharing schemes under the insurance contract, the guaranteed interest rate if applicable, and the costs that may be related to the investment income. The premium fees for new insurance contracts should be based on diligent actuarial assumptions so as to guarantee the fulfillment of obligations under the contracts.

## 2. The financial bases for calculating the premium fees

a. Insurance companies determine the technical interest rate used in the calculation of fees. For guaranteed-benefit contracts, the interest rate used in the calculation of the premium may not exceed the interest rate guaranteed through these contracts.

b. Notwithstanding item 1 above, the insurance company may use interest rates higher than contractually guaranteed interest rates only for the purpose of determining the amortization of insurance cover for contracts with periodic (annual or more frequent) premiums.

## 3. Demographic bases and other technical bases for calculating premium fees

a. For the calculation of tariffs, the insurance company diligently determines the demographic bases and other technical bases obtained from the market data and the company's experience. For insurance contracts based on the life of the insured, the insurance company should also take into account the overall mortality/lifespan trends of the population in general and the portfolio of insured persons in particular.

b. For annuity and annuity option contracts, the insurance company should adjust, as far as the data is concerned, the demographic bases obtained from historical data analysis, by also taking into consideration the potential effects of selecting a portfolio with a worse tendency compared to the historical data used.

c. **The insurance company must periodically monitor the demographic bases and other technical bases used to calculate the premium fees in order to verify their suitability at any time. If statistically significant problems are identified that may question the adequacy of the demographic and technical bases used, the company should update these bases and immediately review tariffs in order to guarantee technically good balanced tariffs for the business.**

d. Demographic bases and other technical bases used to calculate group insurance premiums should be appropriately selected in relation to the risk profile within the insured group.

## 4. Actuarial Report on Premium Fees

a. The authorized actuary designs and signs technical reports containing:

    i. The financial, demographic and other technical bases, and the methods used to calculate the premium fees, indicating the type and source of the data used;

    ii. Authorized actuary's opinion on the appropriateness of premium fees against contractual liabilities and associated costs.

b. Technical reports on premium fees associated with technical files of calculations must be deposited and saved by the insurance company.

## ANNEX II

### "ON THE FORM AND CONTENT OF THE ACTUARIAL REPORT"

**A. Scope**

This Annex defines the detailed content of the Authorized Actuary Report under Articles 89, items 12, 112 and 225 of Law No. 52/2014 "On the activity of insurance and reinsurance".

**B. Bases used to prepare the actuarial report**

The authorized actuary performs his investigation in compliance with the rules on the provisions and he gives the opinion whether premium fees and provisions held by the insurance company guarantee the fulfillment of liabilities arising from insurance contracts. The final monetary values of the actuarial report are expressed in Albanian currency ALL and Eur. Each other currency is converted into ALL and Eur by applying the average exchange rate received by the Bank of Albania for the valuation date.

**C. Detailed report content**

The Actuarial Report contains the following minimum information:

1. The date on which actuarial valuation was performed;

2. The summary table with the sum of mathematical provisions for each insurance product;

3. A full description of all liabilities and rights of each category of insurance contract concluded by the insurer, including:

    o Premium Fees;
    o Guarantees and options.

4. The authorized actuary at the end of each reporting period shall prepare a statement of all

rights and liabilities of each of the categories of insurance contracts, according to the content provided in item (3).

5. The information required by item (3) is mandatory for each new category of insurance contracts or existing categories that have undergone changes during the financial year for which the report is conducted. For existing categories of insurance contracts or categories that have not undergone any changes, only one reference of this information is sufficient in the previous statement.

6. The general principles and methods used in assessment including the detailed references for the items below:

   o The technical basis for the calculation of provisions describing any discrepancies in nature, terms and currency between liabilities and assets held for their coverage;
   o If during the calculations a net premium is used, the description of the modifications made to the method used;
   o Description of specific provisions for future bonuses including their amount;
   o For index-linked contracts, the technical basis used for guarantees related to the expected performance of the investment;
   o The technical basis for calculating the provisions associated with any guarantee or option, regardless of the guarantees related to the investment performance.

7. Interest rate tables, mortality and morbidity rate tables, and any other table used to calculate premium rates for long-term contracts (i.e. health insurance), and for calculating mathematical provisions. If the tables used are not published, the report contains full details of mortality and morbidity rates or other factors used in calculations.

8. For categories of insurance contracts other than those index linked contracts:

   o The rate of written premium retained for expenses and benefits for each insurance category;
   o The methodology used for provisioning related to expenses when premiums have ceased, no more future premiums are expected, or the valuation method has not taken into consideration future premiums.

- On types of index linked contracts

   o All assumptions made in assessing the responsibilities assumed by the insurance company;
   o Details of the technical basis used in the adequacy test of provisions if no explicit provision is made to cover the expenses that are likely to occur in the future in relation to the fulfillment of contractual liabilities.

9. Rate of mathematical provisions that do not match the currency of the assets, except for index-linked contracts.

10. For Reinsurance and Facultative Reinsurance Contracts:

- The names of the reinsurers with whom the company has a reinsurance contract;
- Information on the existence and the way of connecting the insurance company with the reinsurer;
- A description of the general and special terms and conditions of the reinsurance contract or optional contract;
- Reinsurance provisions under each reinsurance contract or agreement.

11. Details of the bonuses placed in each category of contracts, including:

- Circumstances and form when these bonuses are payable, the basis for the calculation and including the related fees or formulas;
- Details of the bonus distribution terms relating the number of years for the payment of premiums before a bonus is awarded, if any, for each category of contract.

12. Maximum risk-keeping tables according to insurance classes.

13. The required solvency margin of the insurance company.

**D. Certification of the actuarial report**

1. The certification of the actuarial report is noted in the last part of the report and expresses for each long-term (life) insurance class in the opinion of the authorized actuary if:
   - The insurance company has kept adequate data for the assessment of its responsibilities and its long-term activity;
   - Responsibilities are assessed in compliance with the regulatory framework;
   - The total amount of mathematical provisions held by the insurance company is appropriately assessed in compliance with the long-term liability of the insurance company deriving from all types of contracts including the obligations arising from the distribution of profits or bonuses;
   - Premiums for categories of insurance contracts issued during the financial year, earned income, based on reasonable actuarial hypotheses and other financial sources of the insurance company, enable the insurance company to cover the obligations of these contracts, including the provision of adequate and mathematical provisions related to these contracts.
2. The actuarial life assurance report shall clearly state the opinion of the authorized actuary, the opinion in favor of the authorized actuary who, whenever he deems it reasonable, adds to the certification referred to in paragraph (1) the required qualifications along with the additional measures to be taken to address them.

**THE CERTIFICATION SCHEME (OPINION) EXPRESSED**
**IN THE ACTUARIAL REPORT BY THE AUTHORIZED**
**ACTUARY FOR LONG-TERM (LIFE) INSURANCE**

I have conducted the actuarial investigation of the amount of provisions held by the "ABC" insurance company on December 31, 20XX. The actuarial investigation was conducted in compliance with the legal provisions in force.

The maintenance of appropriate mathematical provisions is the responsibility of the managing bodies of the insurance company. My duty is to verify whether the insurance company has kept

adequate data for the assessment of its long-term responsibilities, and to state whether the total of mathematical provisions held by the insurance company constitutes adequate provision for long-term liability of the company insurance policies that derive from all types of contracts including the increase in those liabilities arising from the distribution of profits or bonuses. My duty is also to calculate the insurance company's solvency margin.

The responsibilities are assessed in compliance with the applicable regulatory framework, and in my professional opinion, premiums for contracts issued during the financial year 20XX, earnings received, based on reasonable actuarial hypotheses, other financial sources of the insurance company, and the total mathematical technical provisions of the insurance company on December 31, 20XX are sufficient to cover timely liabilities and losses from risks arising from insurance contracts.

Date                                                        AUTHORIZED ACTUARY
                                                                    (signature)

## ANNEX III

## "BASIC ACTUARIAL CONCEPTS FOR LIFE INSURANCE"

### A.  Basic types and terms of life insurance

1. Pure insurance with term savings n years[6]: The insured of an x age at the time of the policy purchase is paid with the insurance amount S after n years if he lives up to that time. No payment is made if the insured person does not live up to the age of x + n. The standard actuarial note for the present expected benefit value when S = 1, is $nE_x$.

2. Provisional life insurance with a term of n year[7]: The beneficiary is paid with the insurance amount S if and only the insured dies within the n-year term. The standard actuarial note for the present expected benefit value when S = 1 is $A^1_{x:n}$

3.  Insurance with term savings in n years[8]: The beneficiaries of the policyholders with age x at the time of the purchase of the policy are paid the sum of the insurance S at the end of the year of his death or at the end of the n-year term, which is the fastest. Thus, in this case, always the insurance amount S is paid. The standard actuarial note for the present expected value when S = 1 is x:n|.

4.  Whole Life Assurance[9]: This type of insurance is a special case of Life's temporary insurance when n → ∞. The standard actuarial note for the present expected benefit value when S = 1, is $A_x$.

5.  Eternal annuities[10]: Benefit is a regular payroll that is made to the beneficiary while he lives. If the person purchasing annuities has the age of x at the time of purchase and the

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[6] In the literature of actuarial science is known by the term "Pure Endowment"

[7] In the literature of actuarial science is known by the term "Term Insurance of n years"

[8] In the literature of actuarial science is known by the term "Endowment Insurance of n years"

[9] In the literature of actuarial science is known by the term "Whole Life Insurance"

[10] In the literature of actuarial science is known by the term "Whole Life Annuity"

first installment of the annuity is paid after one year, the standard actuarial note on the present expected benefit value when each installment has only one unit is …... If the person purchasing annuities has the age x at the time of purchase and the first installment is paid at that moment, then the standard actuarial note for the present expected value of the benefit when each installment has only 1 unit is $\ddot{a}_x$

6. Temporary annuities with a term of n years[11]: These are similar to eternal annuities, except that the number of installments paid to the beneficiary continues until the expiration of the term of n years. The present expected benefit values when each installment is 1 unit are respectively:

$a_{x:\overline{n}|}$ and $\ddot{a}_{x:\overline{n}|}$.

These are the basic types of life insurance and discrete annuities. Complex products can be built based on the specifics of the benefits, the payment method of the premium, etc.

7. $P_{x:n}^{\ 1}$: annual net premium for the pure insurance with term savings over n year. This premium is paid by being included in the gross premium annually for n year until the insured person lives.

This premium satisfies the equation $P_{x:\overline{n}|}^{\ 1} \cdot \ddot{a}_{x:\overline{n}|} = nE_x$

$^-$ Annual net premium for provisional life insurance with a term of n years. This premium

8. $P_{x:\overline{n}|}^{1}$ satisfies the equation $P_{x:\overline{n}|}^{1} \cdot \ddot{a}_{x:\overline{n}|}^{1} = A_{x:\overline{n}|}^{1}$

9. $P_{x:\overline{n}|}$: Annual net premium for Life insurance with term savings over n years. This premium is paid gross in the gross premium annually for n years until the insured person lives. This premium satisfies the equation $P_{x:\overline{n}|} \cdot \ddot{a}_{x:\overline{n}|} = A_{x:\overline{n}|}$

10. $P_X$ :The annual net premium for life insurance; which is paid included in the gross premium every year until the insured person lives. This premium satisfies the equation
$P_x \cdot \ddot{a}_x = A_x$

11. $_t P_{x:\overline{n}|}^{(m)}$ The net annual premium payable in m installments annually with a value of (()): each, during a period of ten years until the insured person lives, for Life insurance with term savings over n years. This premium satisfies the equation $_t P_{x:\overline{n}|}^{(m)} \cdot \ddot{a}_{x:\overline{t}|} = A_{x:\overline{n}|}$

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[11] In the literature of actuarial science is known by the term "Temporary Annuity of n years"

## B. The value equation

The value equation for calculating the risk premium for a Life Insurance policy has this general form:

(The expected value of risk premiums at time t = 0) = (Expected value of benefit for the insured at time t = 0)[12].

Time t = 0 is the moment of signing the policy. The equations given in the above definitions are value equations.

## C. Provisions

For a life insurance policy we have:

Loss at time t = (Value at time t of future liabilities - Value at time t of future income).

If the insurance policy is evaluated according to the principle of equivalence then we have E (loss at time t = 0) = 0.

After a life policy has come into force for a period of time and some expenses have been incurred and the insurer has received some revenues from premiums, as a consequence, we have:

$V_t^{(p)}$ = (the expected value at time t of future liabilities[13] – the expected value at time t of future

income) where the term $V_t^{(p)}$ is called prospective provision at time   .

**Prospective provision formulas without considering the costs for the main life insurance policies.**

1. Pure insurance with term savings over n years

$$V_t^{(p)} = {}_{n-t}E_{x+t} - P^1_{x:\overline{n}|}\ddot{a}_{x+t:\overline{n-t}|}$$

2. Provisional Life Insurance with a term of n years

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[12] For a life insurance policy with a term of n years, based on the principle of equity (value equation) we have: Liabilities [0, $\overline{n}$] = Premiums[0, $\overline{n}$ ].

[13] Future liabilities herein means the amount of insurance that the insurer owes to the insured for the period from t to n

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

### 3. Life insurance with term savings over n years

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

### 4. Whole Life insurance

$$V_t^{(p)} = A_{x+t} - P_x\ddot{a}_{x+t}$$

We note that the above formulas are for an amount insurance unit.

## Retrospective Provisions

The retrospective provision at time t for a life insurance policy is equal to the cumulative amount of premiums received by the insurer up to the time t, minus the accumulated value of the insured's benefits and the expenses paid up to the time t. The newly-defined provision is a gross retrospective provision. The retrospective net provision would be similarly defined, considering net premiums and excluding expenses in the above definition.

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

a.  Both types of provisions are calculated using the same technical basis;

b.  The basis for calculating the premium is the same as the technical basis used for calculating mathematical provisions.

We clarify that technical basis means the hypotheses made for all statistical, demographic, financial and any other hypotheses used for calculating the premium or for calculating technical provisions.

The basis of the premium calculation means the hypotheses made for the expenditures, the mortality table and the technical interest in the calculation of the premium.

If, in the technical basis, the expenses are taken 0 and the net premium included in the provisions formula, it means that a net provision is calculated and if, in the basis of calculating the premium, expenses are taken 0, it means that a net premium is calculated.

## Provisions involving expenses

Provisions involving expenses are calculated in a similar way as presented above.
For a life insurance policy, prospective provisions including expenses at time t is:

$$V_t^{(p)}$$

= ( expected value at time t of future liabilities[14] – expected value at time t of future income)(*)

## Recursive Relationships

We assume that the same degree of interest and the same mortality table will be used with both methods: then for a life-long life insurance policy with an amount of insurance payable at the end of the year of death, it can be proven that

$$( {}_tV_x + P_x ) * (1 + i) = q_{x+t} + P_{x+t} * {}_{t+1}V_x$$

Where ${}_tV_x$ and ${}_{t+1}V_x$ are provisions without including expenses.

Such recursive relationships can be built for all life insurance policies.

Recursive relationships among provisions including expenses are important for the fact that if the value of the provision at time t is calculated, the value of the provision at the next time may be easily calculated if the annual premium values are known and having the appropriate assumptions on expenses, the technical interest and the mortality table.

In addition, for each policy of classes 20, 21, 22, of Annex 1 of Law No. 52/2014, the prospective provision, including the expenses, is calculated according to the definition (*).

Prospective provision at time t including expenses = expected value at time t of future liabilities - Expected value at Time t of future income. Future obligations, the same as the above, imply the expenses of the insurer, i.e. the amount of insurance or other types of benefits that the insurer owes to the insured, and all the expenses that are related to the policy in question from time t onwards. Future income means the gross premiums that the insurer owes to the insurer from time t onwards.

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[14] Future obligations herein imply liabilities to the insured and various expenses undertaken by the insurer belonging to the contract in question