# The role of the unexpired risk reserves and outstanding loss reserves in general insurance business[i]

*Rolul rezervelor pentru riscuri neexpirate şi a rezervelor de daune în activitatea de asigurări generale*

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**Abstract**

*The intent of this article is to introduce the topic of both Unexpired Risk Reserve and loss Reserving, especially of the Incurred but not reported reserves (IBNR). We will focus on the purpose, common definitions and basic principles. We will explore the common techniques used by practicing actuaries in estimating of Unexpired Risk Reserve and loss reserves. Unexpired Risk Reserve is the present value of loss and expense payments to be provided for by premiums covering the period from the valuation date to expiry on all contracts in force on the valuation date. A loss reserve is a provision for an insurer's liability for claims. Loss reserving is a major challenge to the casualty actuary because the estimation process involves not only complex technical tasks but considerable judgment as well. This are a critical point, as the actual financial reserves in the accounts has a direct impact on shareholder's equity, solvency, and also on underwriting profit.*

**Keywords:** *reserves for unexpired risks, equalization loss reserves, outstanding loss reserves, IBNR, claim rate, average cost per claim method, run-off triangle*

**Rezumat**

*Articolul este dedicat expunerii rolului şi importanţei Rezervelor pentru riscuri neexpirate şi a Rezervelor de daune, în special a celor de daune neavizate pentru sectorul*

*asigurărilor. Vom expune metodele cele mai adecvate pentru estimarea acestor rezerve utilizate în practica actuarială. Rezerva pentru riscuri neexpirate reprezintă valoarea actuală a daunelor şi cheltuielilor de subsriere viitoare, aferente contractele în vigoare la o anumită dată. Rezerva de daune este rezerva aferentă obligaţiilor viitoare ale asigurărtorului pentru cazurile asigurate apărute pînă la data calculării acestor rezerve. Această analiză are o importanţă semnificativă, deoarece valoarea acestor rezerve are o influenţă semnificativă asupra rezultatelor financiare ale asigurătorului.*

**Cuvinte-cheie:** *rezerva pentru riscuri neexpirate, rezerve de egalizare, rezerva de daune, rezerva daunelor apărute dar neraportate (RDANr), rata daunei, metoda costului mediu per daună, triunghiul run-off*

**JEL Classification:** L66, E22, D50

## Introduction

Generally speaking, the reserves are defined as those amounts of money or material goods which have been acquired, but which have been not yet consumed or spent.

*The insurance reserves in the case of the general insurances, as well as those concerning the life insurances, are set up and maintained by the insurer in order to cover the liabilities towards the insured entities as recorded by its accounting system.*

Thus, the insurance reserves in the case of the non-life insurances might be called also *technical reserves* or *insurances provisions*, as they are referring to liabilities arising out of the general insurances activity. They are referring to liabilities arising as a result of the general insurances activity and are calculated on the basis of statistical methods.

## Types of reserves in the general insurances

As comparatively to the moment of closing the accounting documents, the above liabilities are divided in two main categories:

- *Future liabilities:* they are referring to liabilities connected to insurances due to subsequent periods, being conditioned by policies for which the insurance premiums have been already received.
- *Past liabilities:* they are referring to liabilities arising as a result of events taking place before the closing date of the accounting documents.

Reserve for unexpired risks include (Figure 1):

- *The reserve of the un-cashed or unearned premium (RPN)* is explained by the fact that, in the case of the non-life insurance policies the exposure to risk is usually exceeding a financial year time. A percentage of the premiums subscribed within a financial year is meant to cover the liabilities due to the exposure to risk after the end of the financial year.
- *The additional reserve for unexpired risks (RARN)* - the reserve calculated on the basis of the estimation for the damages which will arise after the closing of the financial exercise, due to the insurance policies being contracted before that date, to the extent the estimated value of these policies exceeds the reserve for the un-cashed premium.

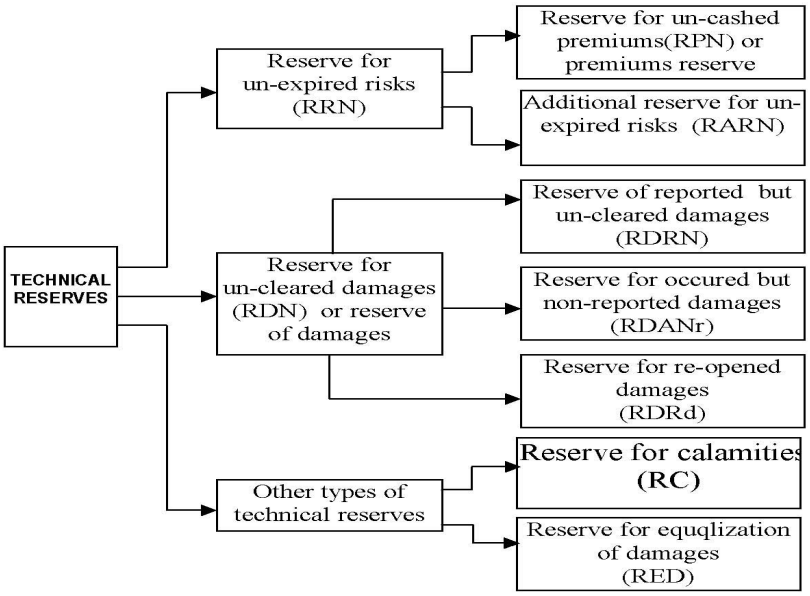


**Figure 1. Classification of technical reserves**

There are two important categories of delay between the occurrence and the clearance of the damages (damages closing):

- *Delays connected to the clearance of the damages* - the period between the reporting moment to the insurer and the moment of the compensation payment. This situation is basically due to the internal administrative procedures, to the process of ascertaining whether the insurer is liable for the damages payment, of fixing the compensation size;
- *Delays connected to the damages reporting* - the period between the event occurrence and the moment the event is reported (notified) to the insurer. This period of time arises because of the fact that some of the insured are delaying the notification of the event to the insurer.

According to these delimitations of the delays connected to the damages, the *reserve for un-cleared damages (RDN) or the damages reserve* is set up, which may be established and maintained under this name as a total value. Alternatively, it may be divided in three separate components:

- *The reserve for the reported but un-cleared damages (RDRN)* is the estimated value which is set up as a reserve meant to clear the damages on which the insurer is notified by the end of the financial period;
- *The reserve for the occurred but not reported damages (RDANr or IBNR).* This reserve is required in order to cover the compensation payments for the events which, although occurred keep on being still un-reported to the;
- *The reserve for the re-opened damages (RDRd)* is an additional reserve which

must be explicitly emphasized for the damages which the insurer considers as being cleared up but which might ask in the future for additional payments. This reserve is used only if there are significant differences between the insurers as regards the conditions to have in mind when judging whether the damage may be considered as a cleared (closed) damage.

### The estimation of the reserve for unexpired risks

Setting-up the *reserves for unexpired risks* means the estimation of the insurer's liabilities as against the existing policies of un-expired exposure (policies in force) by the time the accounting documents are closed.

The estimation of the reserve for un-cashed premiums (RPN) is based on a *retrospective approach*. The main method for setting-up the RPN of the policies in force by the time of calculation consists of keeping a part of the subscribed premiums as against the un-expired exposure of the policies. To this purpose, it is necessary to establish precisely what is the insurance policy actually "covering" and when the premium may be considered as being cashed. Thus, the insurance premium "covers" the payment of compensations and the expenses connected to the setting-up of damages which occur to the extent of the risk incidence; the insurer's profit, which normally is cashed to the extent of the risk incidence; the initial expenses (the commission for agents and brokers, wages etc.), which occur at the very beginning of the insurance.

If the policy is exposed to the risk at a ratio of *x%* of the risk by the end of the financial period and *(100-x)%* after this financial period, then *(100-x)%* of the basic subscribed premium is un-cashed and represents the RPN.

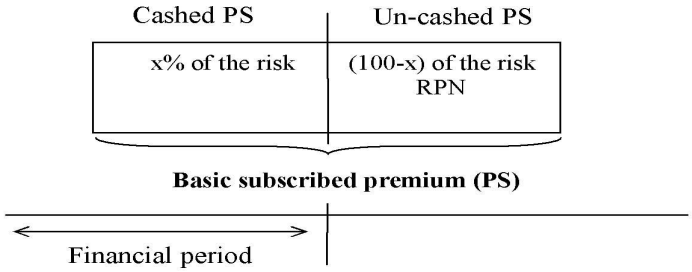


**Figure 2. Cashed and un-cashed premium**

Consequently, the RPN for this policy by the end of the financial period is:

$$RPN = PS \cdot \frac{(100 - x)\%}{100}$$

Hence, *RPN represents that part of the premiums, which have been subscribed by the insurer without being yet cashed, respectively exposed to the risk.*

The basis for the calculation of RPN is given by the subscribed premiums after deducting the premiums given-up to re-insurances and the supplement to the net premium. This is why the subscribed premiums used for estimating this reserve are known also as basic *subscribed premiums.*

The calculation of RPN may be done directly for a policies cohort, namely for an *insurance portfolio* or *individually for each policy*. The use of these methods should be selected depending on the portfolio profile, the way the policies are subscribed all over the period and the way the basic data are grouped (half-a-year, quarterly, monthly, daily).

*The „pro rata temporis method"* (timely proportional), which takes into consideration the individual calculation, policy by policy, of the RPN, depending on the validity duration of each insurance policy. According to this method, RPN by the end of the financial period is calculated by multiplying the subscribed premium by the weight of the number of days left till the end of the policy duration, after the end of the financial year, in the total number of days of the policy validity:

$$RPN = PS \cdot \frac{T - t}{T}$$

where: $T$ -insurance duration of the policy, in days;

$t$ -number of days as from the beginning of the insurance duration till the moment of the *RPN* calculation.

$$RPN = PS \cdot \frac{365 - t}{365} = \frac{PS}{365} \cdot (365 - t)$$

Excepting the case of a small insurance portfolio, this method requires that it technique is used due to the large volume of information and the calculation implied by every single policy.

Thus, the *„pro rata temporis method"* is the most precise method, which can be utilized for estimating the RPN.

## The outstanding loss reserves

An insurer is bound in any moment to un-cleared liabilities in connection with damages, which occurred without being yet sorted out. The estimation of the reserves meant to cover the un-cleared damages is therefore an activity of an utmost importance for each and every insurer. Meantime, it is an actuarial activity as it implies a present evaluation of future uncertain phenomena.

There are two separate methods, which can be used for this kind of estimations:

- *The individual estimation* of the liabilities for each un-cleared damage;
- *Statistical methods*, in order to estimate the total *value* of the payments to be made for the whole portfolio of un-cleared damages.

*The individual estimation* is based on the individual calculation, case after case, of all the files of un-cleared damages. Each file is successively analyzed by a person from the damages department. A person of adequate expertise will take into account all the necessary elements and will credit a specific value to any damage. The amounts required by the payment of the direct expenses, connected to the respective damage, are to be added to this specific value. Eventually, there is only an adjustment to be made, respectively the future inflation of the damages, which has to be considered, depending on the forecasted moment of the damages settlement.

In the case of applying the *statistical methods,* it is necessary that more detailed information is available in order to divide the data by homogenous groups. What is fundamental when utilizing the statistical methods is the experience of enough information meant to allow the division of the damages in any possible subgroups?

There are different statistical methods which can be used for the estimation of the reserve for the un-cleared damages, each of them leading to different outcomes in most of the cases. The statistical methods are implying the fact that in the past there has been a stable evolution of the procedure of clearing the damages and that this stability is going to last for the future as well.

Most of the statistical methods may be divided in the following main groups:

- The chain-ladder method;
- The average cost per damage method;
- The damage rate method;
- Combinations or variations of these methods. Basically, the variations are linked to the following:
  - Adjustments depending on the previous inflation;
  - Selection of the occurred damages or of the compensated damages;
  - Selection of the damages cohort;
  - Selection of different factors of development;

The majority of the statistical methods imply the presentation of the data in form of table of the kind: *development table; run-off triangle.* The statistical methods based on the run-off triangle are using in calculation a basic principle, which is presented by the Figure 3.

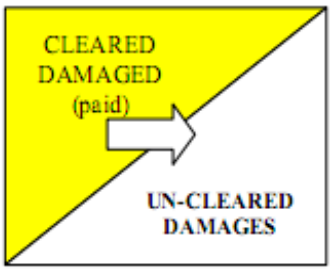


**Figure 3.The technique for IBNR calculation**

On the basis of the known information as to the cleared damages (the hatched area), it is possible to predict the un-cleared damages corresponding to the un-hatched area of the square. The un-cleared damages are estimated by the statistical methods described below.

*The Chain-Ladder method* is based on the computation of the development factors and their application to the cumulated damages, which served to their calculation. More accurately, the basic chain-ladder method is applying to the development of the *compensated damages,* but not adjusted to the inflation, using the damages cohort based on the origin year of the events.

The development factors are reports on the value of damages during successive years of development (or other successive periods of development: month, quarter, half-year).

The Chain-Ladder method modified to inflation is similar to the basic method excepting the fact that there are more calculations being needed.

- The initial data concerning the damages, presented in the form of a run-off table depending on the origin year/year of development, are converted into constant monetary terms, most probably those of the last origin year (the damages are multiplied by the inflation index). For this operation, it is necessary that the best estimations for the previous inflation of the damages are available;
- After cumulating the damages for each origin year, the basic chain-ladder method is used on the basis of the table modified by the inflation index, in order to estimate the cumulated damages to be paid during every subsequent origin years/years of development. These amounts will be expressed inconstant monetary terms;
- The amounts estimated for being paid during every subsequent year (but not the cumulated one) are then calculated. The predicted future inflation is than added to these amounts in order to convert the sums of every cell corresponding to the subsequent origin year/year of development into the monetary values corresponding to the respective year (the product between the future inflation index and the estimated amounts to be paid).

Using the Chain-Ladder method modified to inflation requires information about the previous rate of inflation of the damages or about the inflation rate of the previous years, in case there is not information concerning the damages inflation. The inflation over the following years can be set up depending on the previous inflation or can be predicted. Since there is the assumption that the damages are uniformly distributed over the year duration, the calculation takes into consideration a monthly average rate of inflation.

*The method of the average cost per damage*. This method takes into consideration two separate key-elements of the damages, respectively: *the number of damages (n) and the average damage (D).* This method requires a development table for both the damages value and the number of damages. Using these tables of development, there is another table being built up, namely the table of the average values of the damages, which is obtained by dividing the values of the corresponding cells of the first two tables. The next step consists of getting estimations for both the average values of the damages and the number of damages by multiplying, for each origin year, the estimated value for the average damage by the number of damages.

The reserve for the un-cleared damages is calculated as the difference between the final estimated damages (cumulated) and the compensated (paid) damages by the time of the evaluation.

Synthetically, the above discussion may be presented as in the following figure:

The method of the average cost per damage is not defined in an unique manner. The method applies to damages cohorts based on the origin year, the damages being either paid damages (DP) or occurred damages (DA), or to a cohort based on the reporting year. Consequently, it is very important to keep the relationship between the types of damages, paid or reported, and the number of damages either cleared or reported. Consequently:

- The paid damages are connected to the number of cleared damages;
- The occurred damages are connected to the number of reported damages.

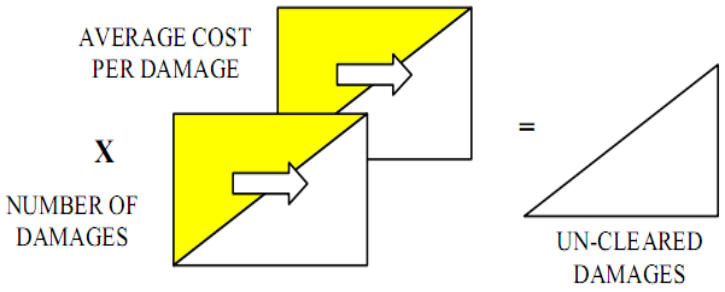


**Figure 4. The method of the average cost per damage for INBR calculation**

The situation gets somehow more complicated due to the spread out payments (partial payments) or to the damages which, although cleared up, are not backed by any payment. Changes the treatment of these damages may lead to disturbances as far as the application of this method is concerned.

The table of the number of damages can contain various information regarding the damages. This information may refer to:

- The number of the cleared damages;
- The number of the reported damages.

The method, as described above, is ignoring any adjustment to inflation. Such an adjustment may be done in a similar way with the one applied to the basic chain-ladder method. In practice there is an adjustment which is applied in order to take into account the inflation, both the previous and the predicted one.

When establishing the methodology of calculating the reserves, it is necessary to consider the characteristics of the insurances classes (the damage type, the tendency of the insurance class, the quantity and the quality of the statistics being available), for which the reserves are calculated and set up. Consequently, it is to assume that different methodologies are applied to different insurances classes subscribed by an insurer. Meantime, it is possible that various methods are applied to different parts of the same insurances class. For instance, the reserve of premiums for polices of short or long duration would be separately set up as well as the reserve for damages of short tendency or long tendency.

The outcomes of any method of setting up the technical reserves must be analyzed and verified in comparison with the reserves set up through a different method.

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