ACTUARIAL ESTIMATION OF TECHNICAL RESERVES IN INSURANCE COMPANIES. BASIC CHAIN LADDER METHOD

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Abstract: *A major concern for insurance companies is to keep achieving financial stability of the insurance business which it carries. They must work in order to fully cover the expense of premiums collected, assumed obligations to policyholders. Otherwise, get in position to not fulfil these obligations due to insufficient insurance reserves established. Unfavourable balance emerged between the compensation, due first, to be covered from other resources. If this state of balance is maintained and becomes an alarming extent, the insurer may get unable to pay. To avoid such a situation there is required the insurer to accurately determine the level of insurance premiums to collect from insurers, and technical reserves required to fulfil. But is this is the case in reality? To estimate the total reserves to be made for the entire portfolio of damage unsettled can be used several methods including The Chain Ladder Method. This paper, is about the results of applying The Chain Ladder Method in insurance companies and also about the limits of it. The validation process applies to both the quantitative and the qualitative is not limited to the comparison between estimates and results. It should include qualitative aspects such as evaluation mechanisms control, documentation, interpretation and communication of results. This method is used by insurers to predict the amount of reserves to be established to cover future damage. This actuarial method is one of the most used for grounding reserves. The method is based on the assumption that existing patterns of claims in the past will continue in the future. As this assumption to be valid the data should be accurate in the past. But several factors can affect the accuracy of data, including changes in insurance products offered, changes in legislation, many times with claims for compensation, or changes in the approval process of compensation for damages. Insurance companies must maintain a share premium of the insurance premiums to pay claims that may arise in the future.*

Keywords: *claims; chain-ladder method; damages; premium rates.*

JEL Classification: *G22.*

1. Introduction

Actuarial analysis helps decision-making in an insurance company as the basis to determine the size and value risk (risk premium), which is considered an essential element of both life insurance and general insurance. Professionalism in determining the risk depends mostly financial result of the insurer.

To meet obligations, past and future insurance company must establish and maintain technical reserves. Past obligations refer to those arising from the insured risk that may occur in the future.

The estimation of technical reserves has a particular importance for insurers as related funds are invested and the earnings are an important source of income. The

calculation is performed by means of technical statistical and mathematical undervalued and distort or over-activity of insurers. Such reserves overstatement leads to reduced solvency margin and the company may be unable to meet its obligations at a time and undervaluation affect profits and taxes paid can be higher. Insurers should consider whether deterministic or stochastic method is suitable to model uncertainty biometric risk factors.
For it must take into account the duration obligations when assessing whether a method that omits the estimated future changes of risk factors is biometric appropriate, especially in the evaluation of the result of the error introduced by the method.
It should also ensure that the method is on the assumption that the biometric risk factors are independent of any other variable is adequate and that the special risk factors are taken into account.
To this end, assessing the level of correlation should be based on historical data and reasoning qualified.

2. Using Chain Ladder Method for estimating reserves for unsettled claims

In the case of general insurance damage reserve is estimated based on actuarial techniques such as the method Chain Ladder (Harnek, 1966), the method Bornhuetter Ferguson (Bornhuetter and Ferguson, 1972) and the method of Taylor separation (Taylor, 1977).
The best known and used method is the Chain Ladder model. The principle of the method is that the available information about compensation paid in the past for such damages is viewed in a table called triangle of evolution - run off, the line is the year of origin (accident damage), and the column is the year of evolution, developmental delay. Chain -Ladder method uses the data in a two - dimensional array representing the emergence and evolution of compensation (Benţe and Gavriletea, 2015).
To exemplify the application of this method step by step, we present the claims paid and accumulating during 2012 - 2017 the insurance company Groupama.
Typically, claims losses settled for each claims occurrence year are not paid on one date but rather over a number of years (or time periods). The insurer's data for the claims loss settlement amounts might be expanded to show the years in which the amounts were settled as in Table 1.
The data in Table 1 can be presented as cumulative claims losses settled. For each claims occurrence year the incremental claims loss settled for a particular development year is the amount settled in that development year. The cumulative claims losses settled is the total amount settled up to that development year, i.e. it is the sum of the incremental claims losses settled up to that date. The cumulative claims losses settled for the worked example are presented in table 2. This table is obtained by adding up all claims paid out so far, including those relating to the calculation year.

Table 1. Incremental claims loss settlement data presented as a run-off triangle during 2012 - 2017 (thousand euros)

Claims occurrence year	Development period					
	0	1	2	3	4	5
2012	8.234	6.432	4.987	3.621	2.577	2.110
2013	7.481	4.301	3.789	3.123	2.3694	
2014	8.515	4.989	3.601	2.853		
2015	7.139	4.785	3.315			
2016	7.799	4.468				
2017	8.104					

Source: Processed by author

Table 2. Cumulative development table (thousand euros)

Claims occurrence year	Development period					
	0	1	2	3	4	5
2012	8.234	14.666	19.653	23.274	25.851	27.960
2013	7.481	11.782	15.571	18.694	21.088	$C_{13,5}$
2014	8.515	13.504	17.105	19.958	$C_{14,4}$	$C_{14,5}$
2015	7.139	11.934	15.249	$C_{15,3}$	$C_{15,4}$	$C_{15,5}$
2016	7.799	12.267	$C_{16,2}$	$C_{16,3}$	$C_{16,4}$	$C_{16,5}$
2017	8.104	$C_{17,1}$	$C_{17,2}$	$C_{17,3}$	$C_{17,4}$	$C_{17,5}$

Source: Processed by author

Table 3. Determining the estimated cumulative claims loss settlements in future periods

Claims occurrence year	Development period					
	0	1	2	3	4	5
2012	8.234	14.666	19.653	23.274	25.851	27.960
2013	7.481	11.782	15.571	18.694	21.088	22.796,128
2014	8.515	13.504	17.105	19.958	22.313,044	24.120,4005
2015	7.139	11.934	15.249	18.039,567	20.168,2359	21.801,8630
2016	7.799	12.267	15.506,7147	18.344,434	20.509,0878	22.170,3239
2017	8.104	13.272,7314	16.778,0595	19.848,4444	22.190,5608	22.796,128

Source: Processed by author

The recorded value of unsettled claims reserve was calculated without taking into account inflation.

The underlying assumption for the CLM is that the cumulative claims loss settlement factor for a specific development year is assumed to be the same for all claims occurrence years. The CLM estimator for each of the factors is based on the cumulative settlement data for as many claims occurrence years as possible. This is demonstrated in Table 3 for the factors for development.

The final step in the use of run-off triangles is to group the estimated incremental claims loss settlement amounts by the years in which they will be settled. These predicted cash flows can then be discounted to determine the technical provisions.

RDN2017 = (22.796,128 - 8.140) + (22.170,3239 - 12.267) + (21.801,8630 - 15.249) + (24.120,4005 - 19.958) + (22.796,128 - 21.088) = 36.991,4468

3. Conclusions and recommendations

Actuarial techniques in insurance helps to reinforce prudentially insurance supervision, quality improvement and financial responsibilities of insurers and other professional participants of the financial market, increasing the role of risk management in insurance, strengthening the capacity of interdependence between auditors and actuaries in insurance, increase customer confidence, market development and compliance with European standards.

Actuarial analysis helps decision-making in an insurance company as the basis to determine the size and value risk (risk premium), which is considered an essential element of both life insurance and general insurance.

In terms of determining methodologies applied, insurance and reinsurance companies should ensure that the actuarial function considers the relationship

between the findings of the analysis and selection of data quality methodologies to be used in the valuation of technical provisions.
They should ensure that the actuarial function examines whether the data used are adequate to support the assumptions underlying methodologies used in the valuation of technical provisions. If data is not appropriate methodologies, then the company should select an alternative methodology.
When assessing completeness of data, companies should ensure that the actuarial function determines whether the number of observations and the granularity of data available is sufficient and appropriate to meet the requirement of input information for the methodology.
Insurance and reinsurance companies should require actuarial function to consider the source and intended use of the data in the data validation.
They should ensure that the use of judgment qualified assessment of the accuracy, adequacy and completeness of the data used in their calculation does not replace the collection, processing and analysis of appropriate data, but complement them where necessary.
Insurers should ensure that the actuarial function, within the mandate to coordinate the calculation of technical, also coordinates evaluation and validation of relevant data used in the evaluation process.
The task of coordination should include at least:
a) selecting data used in the evaluation, considering the criteria of accuracy, adequacy and completeness of the data and determine the most appropriate methodology to be applied to the calculation. To this end, the relevant instruments should be used to verify the significant differences that may occur in the data for one year and within other relevant analysis;
b) reporting on the implementation of recommendations to optimize internal procedures, which are considered relevant to improve compliance with the criteria referred to above;
c) identifying where additional external data is required;
d) assessing the quality of external data, conducted similar evaluation of internal data, highlighting the need for market data or situations when they should be used to optimize the quality of internal data and whether and how to apply optimizations question on data available;
e) evaluating the need to adjust the data available within the actuarial best practices to optimize adaptation and reliability of estimates derived from actuarial and statistical methodologies establishing reserves based on these data;
f) registration of the relevant prospects acquired in the evaluation and validation, which may become relevant for other stage of calculating technical reserves which refers to understanding the underlying risks and also to determine the quality and limitations of the available data.
Insurance and reinsurance companies should ensure that the actuarial function evaluate the accuracy, completeness and appropriateness of the data to identify significant data limitations. If the identified significant limitations should also identified sources of limitations.
To identify and assess the impact of possible deficiencies that could affect compliance with data quality assurance and reinsurance companies should ensure that the actuarial function examines relevant documents available on the processes and procedures for collecting, storing and validating the data used to assess

technical and, if necessary, should seek specific information by contacting personnel involved in these processes.
In addition, companies should ensure that the actuarial function coordinates the relevant duties may be performed to assess the impact of the deficiencies identified from the available data used to calculate technical provisions, in order to ascertain whether the data available should be used purpose or whether data should be sought alternatives.
If deficiencies are identified data, insurance and reinsurance undertakings should ensure that the actuarial function, given its purpose, assess whether the adjustment or supplement data quality can be optimized.
Insurance and reinsurance companies should ensure that they put in appropriate measures to overcome data limitations resulting from exchange of information with business partners.
Companies should decide whether it is possible to adjust the data to overcome weaknesses in data quality and, where appropriate, the specific adjustments should be introduced.
Companies should ensure that adjustments are limited to what is strictly necessary to improve the criteria set out in recommendation past and does not distort identify trends and other characteristics with reflected the risks inherent in the data.
Insurance and reinsurance companies should ensure that the function actuarial formulate and submit recommendations to the governing body with on procedures that could be followed to improve the quality and the amount of data available. To fulfil this task, function actuary should identify sources of significant limitations and propose possible solutions, taking into account their effectiveness and time needed to implement them.
If there are significant limitations of the data, which cannot be remedied with highly complex measures, insurance and reinsurance should ensure that qualified reasoning used to overcome these limitations in order to ensure that technical reserves are calculated accordingly. Calculation of technical provisions should not be affected by inaccurate or incomplete data.
Insurance and reinsurance companies should ensure that the function actuarial document data limitations, including at least:
(A) Description of shortcomings, including their causes and references to other documents that have been identified;
(B) Concise explanation of the impact of the deficiencies in the coverage of calculation of technical provisions, regarding the significance of it and how it affects the process;
(C) A description of actions taken by the actuarial function to detect shortcomings, complementary or other sources and documents;
(D) A description of how such situations can be remedied in a term short for purpose and relevant recommendations to be applied to optimize data quality in the future.
If the calculation of technical provisions require entering data external sources of insurance and reinsurance companies should be able to demonstrate that external data are more appropriate than data domestic purpose. Companies should sport must ensure that data provided by third parties or external market data complements internal data available.
Without prejudice to the level of dependence obligations conditions market or the level of quality on the data available domestic companies it should take into account

relevant external benchmarks as appropriate. External data should be subject to analysis to evaluate compliance general requirements for data quality.
To carry out the assessment level of accuracy, adequacy and completeness of external data, insurance and reinsurance undertakings should ensure that the actuarial function know and consider when analyzing the reliability of information sources, ensuring consistency and stability of data collection and disclosure time.
Moreover, companies should ensure that the actuarial function realistic assumptions and analyses relevant methodologies applied to get data, including adjustments and simplifications applied to the raw data.
Actuarial function should be informed about the changes that were applied while external data and to consider whether these changes refer to the assumptions and methodologies associated or other procedures for external data collection. Moreover, whenever it is available and appropriate, companies should to ensure that the actuarial function determines the quality of available data context of technical analysis in relation to data available field or in the market that are considered comparable.
The actuarial function should identify and understand all violations significant. This analysis might refer to the specific groups specific homogeneous risks are assessed.

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