Reinsurance – an efficient solution
of catastrophe risk transfer
for the housing stock of Romania

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Abstract. *As economic losses caused by natural disasters substantially increase in volume, impacting national economies, post-disaster reconstruction financing becomes crucial, especially for countries with fragile economies. The growing gap between economic and insured losses calls for a pragmatic approach related to financial protection solutions. Romania is one of the few countries that adopted a solution to cut down this deficit of protection in the case of the residential system. This system considers reinsurance as a sustainable risk transfer method, meant to quickly and efficiently attract the funds required to rebuild the housing stock in the event of a disaster.*

Keywords: reinsurance, risk transfer, mandatory insurance, natural catastrophe.

JEL Classification: G22.

1. Introduction

Reinsurance is the purchase of protection by the cedent insurer against risks, especially risks underwritten under policies issued by the insurer, in return for a reinsurance premium. Often, risk transfer goes beyond the jurisdictional boundaries of the cedent, geographically spreading risks related to exposures, especially in the case of natural catastrophes (Nat Cat), thus contributing to the financial stability of the jurisdiction.

Risk mitigation techniques are those techniques used by insurance companies to transfer part of the risk to financially sound companies. Reinsurance is one such technique, through which large exposures can be covered, which provides protection, security and liquidity to the insurance company in case of major events. "Reinsurance plays a pivotal role in supporting the solvency and capital efficiency of insurance risk transfer". (Chester et al., 2017)

World-wide, in comparison with insurance markets, the reinsurance markets are significantly lower in volume. However, "reinsurance being a form of insurance, many of the principles and practices applying to the conduct of insurance business equally apply". (Carter, 2013)

Simultaneously, reinsurance faces the same competitive pressures as insurance. As such, "there are many opportunities for the industry to maintain and increase its relevance, as new risks grow in importance and global macroeconomic conditions become more complex – and therefore riskier." (Chester et al., 2017).

Consequently, since the insurers could significantly reduce the underwriting risk, "reinsurance is a key instrument for insurers and supervisors to conduct risk management". (Gurenko et al., 2012)

According to Mayers and Smith (1990), "a broader interpretation of modern financial theory provides an important role for reinsurance as a mechanism for reducing unsystematic risk".

Prior to any other risk, reinsurance mitigate the risk of insolvency. However, reinsurance is a higher cost for any insurer due to the impredictibility of the losses. According to Froot (2001) "the pattern of hedging against catastrophe event risk deviates from the predicted by theory, in the sense that protection against the largest events is often not purchased or unavailable and the prices deviate substantially from fair value".

2. Reinsurance – an efficient risk transfer solution in the case of risks of catastrophe

Nat Cat are low-frequency and high-impact events characterized by a big and unforeseen volume of losses. As such, the major post-event risk of any insurer is to became suddenly insolvent if they do not have enough reimbursement capacity for claims. "Fortunately, resultant risk transfer mechanisms can be set in place to increase the risk capacity of insurers to withstand extreme risk events". (James, 2017)

Risk transfer through insurance/reinsurance aims to compensate direct and indirect losses, avoid long-term negative effects, ensure social and economic benefits, maintain welfare, stimulate/maintain economic activities, innovative investments, and maintain/increase productivity.

The main goals of reinsurance for an insurance company are:
- to provide the funds required to compensate loss in the case of catastrophic events;
- to protect company equity;
- to contribute to decreasing the capital requirement to ensure company solvability;
- to create financial stability through transferring and spreading risks to reinsurance companies from the entire world;
- to provide underwriting capacity for the company.

The main forms of the reinsurance categories are:
- *Proportionate of the Quota Share Treaty type* through which the reinsurer agrees to take on for reinsurance a certain share of "every risk accepted by the cedent company in the initial insurance company, proportionally supporting all claims in exchange for the same share of all the direct premiums, less the reinsurance commission, which is a win-win contract for both parties and is easily managed". (Badea and Nagy, 2012)
- *Proportionate of the Surplus Treaty type* through which the reinsurer agrees to take on part of a risk above a certain limit called "plus/line". The cedent reinsures only those amounts they do not wish to retain on their behalf. "The premium related to every risk is assigned to reinsurers in the same share as the insured sum of the respective risk is assigned for reinsurance, whereas claims are recovered from the reinsurer based on the same percentage calculation." (Badea and Nagy, 2012). Pursuant to this type of contract, the cedent reinsures only part of any risk that goes beyond the level of its own retention.
- *Not proportionate of the Excess of Loss/Xol or X/L type* – through which the cedent sets "its own share, a value up to which the limit of assigning the liability of the cedent shall be set, respectively". (Badea and Nagy, 2012) Reinsurance will only work, in case of damage, for the amount exceeding own retention. Pursuant to this contract, the insurer assigns a relatively small number of premiums and is able to build up substantial protection. This type of contract, divided into "layers" is recommended in the case of reinsurance for natural catastrophe.
- *Not proportionate of the Stop Loss type* through which the cedent commits to withstand loss caused during the time frame set in exchange for the equivalent of a certain share of the volume of premiums collected, whereas the reinsurer commits to cover everything that goes beyond this level.

Reinsurance may be viewed both as a risk transfer tool, and a corporate financing tool. According to Garven and Lamm-Tennant (2003), reinsurance is characterized as "both a leverage management and risk management mechanism".

"Under the additional assumption that both the insurer and the reinsurer are obligated to pay more for larger loss, we have shown that the layer reinsurance is quite robust in the sense that it is always optimal over our assumed risk measures and our prescribed class of premium principles". (Yichun and Tan, 2013)

Risk transfer pursuant to reinsurance agreement is a topic of interest for the insurance industry. As there are no detailed provisions regarding risk transfer implementation, the reasoning of the entities involved plays a significant role, as both knowledge and understanding of all agreements with reinsurers are a must.

By its nature, the reinsurance contract is a business agreement between two or several entities with expertise in managing risk and capital. To assess whether reinsurance is efficient, the supervisory authorities should understand the following aspects regarding the cedent insurer: the reinsurance strategy and program, the risk management system, the impact of reinsurance in managing liquidity, the risk transfer and its economic impact.

"A reinsurance contract could be called 'most efficient' if it, for a given net premium, maximized the reduction of the variance in the claim distribution of the ceding company." (Borch, 1969)

An analysis of the international reinsurance market over the last 30 years shows that the price of catastrophe reinsurance has risen due to the increased frequency of events. "Cedents cut back on their limits and/or increase their retentions in periods of high prices... There is negative compromise between the amount of protection of insurance purchased and the expected loss. That is, prices are high when quantity is low and cedents respond by adapting their purchasing behavior" (Froot, 2008).

In 2015, one of the largest strategic partners in the area of reinsurance set up "Capital Partners", meant to identify and use Munich Re reinsurance solutions as an integrated tool to manage risks and capital.

An alternative to traditional reinsurance is the issuing of Nat Cat type of catastrophe bonds. "An initial important point of difference in that reinsurance is provided in the insurance market, whereas cat bonds are issued in the much larger and more diverse financial market – a market that has a far greater capacity than the international insurance market to absorb losses due to natural disasters" (Zietsch and Harpke, 2014). According to Zietsch and Harpke (2014), in comparison to reinsurance, in the case of Nat Cat bonds, investors may diversify risk. As such the risk transfer tends to be a cheaper financing protection.

As a general rule, "policymakers should seek to increase regulatory resources, with further investments in people, systems, and training, so as to better enable supervisors to evaluate and monitor the risk management models that increasingly will be required of insurers". (Groome et al., 2004)

3. Catastrophe risk reinsurance financing for residential insurance in Romania

In Romania there is a dual insurance scheme for residential buildings, which is made up of two complementary categories of products, namely a compulsory component and an optional component. Taking out voluntary insurance is conditional on the existence of compulsory insurance.

Since Romania is a country which is significantly exposed to natural disasters, especially earthquakes and floods, in the framework of the Project implemented with World Bank support, "Natural Hazard Risk Mitigation and Emergency Preparedness", the ground was laid for the setting up of a compulsory home insurance scheme against natural disasters. The compulsory home insurance system against earthquakes, landslides and floods is regulated by the Law No. 260/2008. Since July 2010, a compulsory insurance program

against catastrophe risks has been implemented in order to reduce the financial efforts of the Romanian Government to mitigate the effects of a natural disaster and to use budgetary resources to rebuild infrastructure, while increasing public confidence in the insurance industry and the authorities.

The Insurance Pool against Natural Disasters (PAID) was set up having the main purpose of managing the compulsory home insurance system in Romania. PAID is an insurance pool, established through the association based on the expression of the consent of twelve insurance companies of Romania, which are licensed to underwrite natural disaster risks. The distributors of the compulsory home insurance are all the insurance companies that underwrite natural disaster risks. The insurance product managed by PAID is the compulsory home insurance policy, called PAD. It was created to provide simple and affordable coverage for all residential properties. The PAD insurance is a unique (product, with a compulsory nature, and should it not be issued, the other voluntary home insurance policies of Romania cannot be concluded. Voluntary home insurance policies are sold with a deductible excess equal to the PAD limits for earthquake, flood and landslide risks.

The main aspects which distinguish between the two coverage categories are shown in the table below:

Table 1. *Compulsory vs. voluntary system in Romania*

	Compulsory system	Voluntary system
Insurance contract	- the main insurance contract elements are provided in Law No. 260/2008	- the contract obligations are set by each company, as these also have the freedom of matching the premium with the insured risk
Insured object	- all residential buildings are insured, regardless of construction quality - the outbuildings and the contents are excluded	- residential buildings, their outbuildings and contents are insured. - the construction quality is high
Insured risks	- the 3 natural impact risks specific to Romania: earthquake, floods and landslides	- all risks are included: natural risks (earthquake, landslide, floods, thunderstorm, hail etc.), as well as other risks, such as fire, vandalism, explosion, theft, etc. - in the case of risks of earthquake, floods and landslides, the difference between the value of the residence and the sum covered through the mandatory policy is covered only for the building
Insurance Premium	- lump sum, 10/20 EUR, set through law, it may be changed through order of the President of the Financial Supervisory Authority - it operates based on the principle of solidarity, meaning the same level of insurance premium is applied for any residence, regardless of its vulnerability level	- it is actuarially set and varies based on the residence risk profile, insured sum, history of damages, insured object, area vulnerability, year of construction
Sum Insured	- standard 20.000/10.000 EUR, depending on the building materials used	- at the reconstruction or market value;
Deductible	- not applicable	- different deductibles may be applied, depending on risk, year of construction, vulnerable areas, etc.
Risk selection	- lack of risk selection and risk inspection - non-uniform risk spread - buildings technically assessed and classified in seismic risk class 1 are excluded	- it is possible to select risk based on the risk level - risk inspections are carried out - possibility of risk spread

Source: Information processed by the author based on Law No. 260/2008 and Financial Supervisory Authority of Romania regulations.

It is currently mandatory that all residential properties have a PAD policy. Voluntary home insurance policies are sold with a deductible excess equal to the PAD limits for earthquake,

flood and landslide risks and no voluntary policy may be issued unless the validity of the PAD policy is confirmed.

Since most of the risk for home insurance in case of natural catastrophes is taken by the compulsory system, it follows that the sustainability of the home insurance system in Romania depends to a large extent on the sustainability of the compulsory system.

The figures below (Figure 1, Figure 2, and Figure 3) show the relationship between the two categories of insurance in terms of the gross underwritten premiums and the gross claims paid, respectively. "This relationship reflects the specific nature of the two types of insurance in terms of determining the insurance premiums and how damaging the insured risks may be". (Radu and Alexandru, 2022)
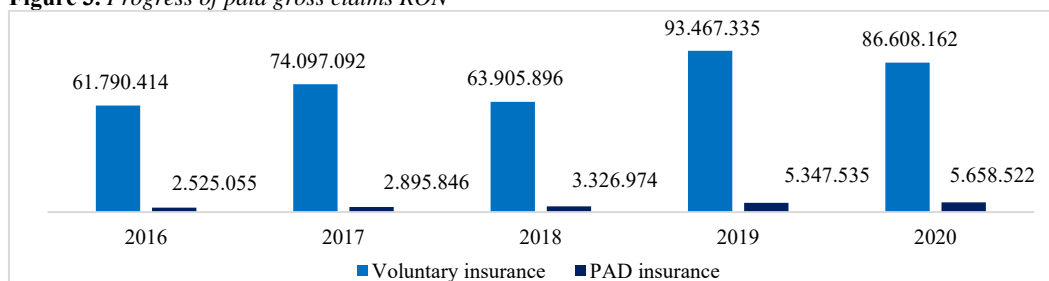
Figure 1. *Home insurance progress (number of policies)*
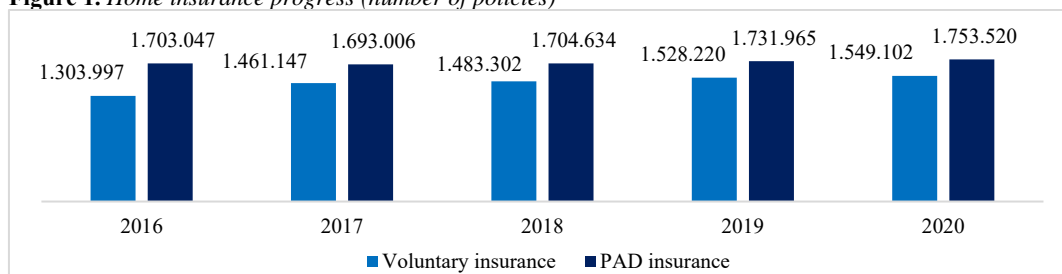
Source: Information processed by the author based on yearly reports submitted by the Financial Supervisory Authority of Romania.

Figure 2. *Progress of gross underwritten premiums RON*
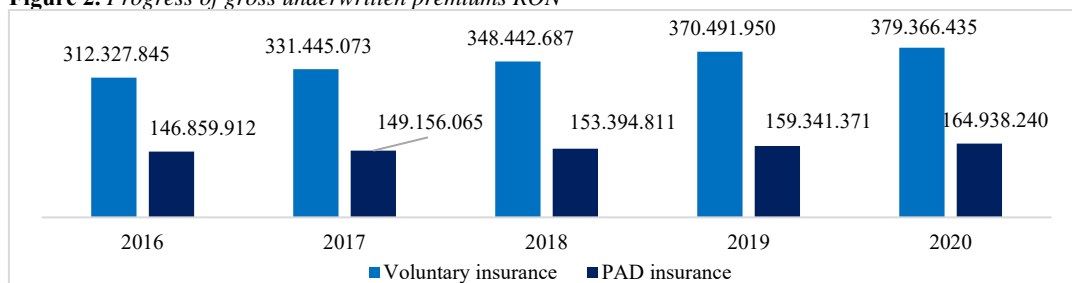
Source: Information processed by the author based on yearly reports submitted by the Financial Supervisory Authority of Romania.

Figure 3. *Progress of paid gross claims RON*

Source: Information processed by the author based on yearly reports submitted by the Financial Supervisory Authority of Romania.

In the Table 2, the author compiles the figures from the Figure 1, Figure 2, and Figure 3, and measures the progress of PBS and paid gross claims for home insurance.

Table 2. *Progress of PBS and paid gross claims for home insurance*

RON	Home insurance	Gross underwritten premiums	Gross paid claims
2016	3,007,044	459,187,757	64,315,469
2017	3,154,153	480,601,138	76,992,938
2018	3,187,936	501,837,498	67,232,870
2019	3,260,185	529,833,321	98,814,870
2020	3,302,622	544,304,675	92,266,684

Source: compiled by the author based on the information submitted in the Financial Supervisory Authority reports.

The information presented in the PAID reports and that submitted by the National Institute of Statistics of Romania was processed to develop the following graph (Figure 4).

Figure 4. *PAD Portfolio evolution for 2013-2021*
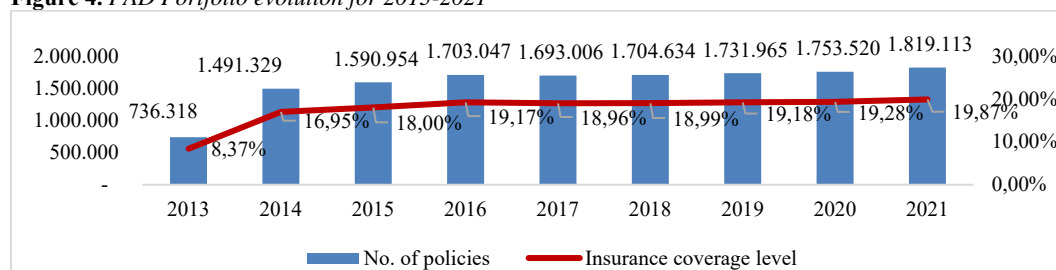
Source: compiled by the author, based on the information submitted by the National Statistical Institute and PAID Romania.

Overview of the residential stock and of the residential stock insured in the compulsory insurance system

The residential stock in Romania (Table 3) has recently recorded an upward trend, as a result of the construction of new housing units, as well as through the conversion of other premises into housing units.

Table 3. *The residential stock of Romania*

Total households	Urban	Rural	Private property	State-owned property
9,156,311	5,005,544	4,150,767	9,042,824	113,487

Source: data processed by the author based on information from National Statistical Institute. TEMPO Online_2020 query.

Of the total of 9,156,311 housing units registered in Romania (according to the National Statistical Institute-2020), on 31.12.2021, 1,819,113 housing units were insured in the compulsory system (a slight increase as compared to the same period of last year: 1,753,520 housing units), which add up to a level of coverage of 19.87%. Bucharest Municipality with the County of Ilfov has an insurance coverage level of 41.46% and an aggregated share of 25.40% in the total insured sum. The counties with the smallest insurance coverage level are Olt (7.97%), Teleorman (8.23%) and Botosani (8.38%).

The breakdown of the residential stock and of the mandatorily insured housing stock by urban and rural Romania are shown in the Figure 5.

Figure 5. *Residential stock split by urban/rural and insured stock split by urban/rural*
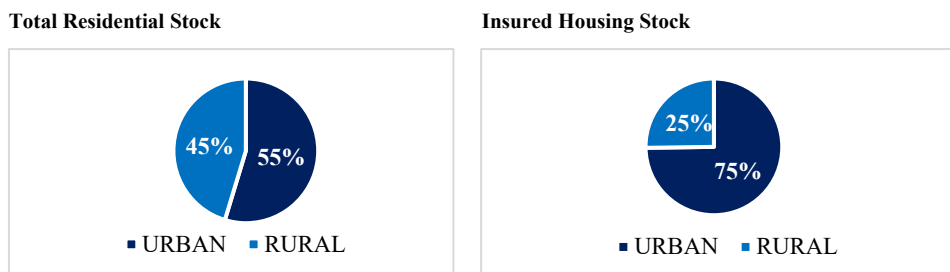
Total Residential Stock   **Insured Housing Stock**

Source: data processed by the author based on information from National Statistical Institute National Statistical Institute and www.paidromania.ro

In Table 4 the author structures the portfolio of PAID by years of construction at December, the 31st 2020, and December, the 31st 2021, underlining the variation in stock.

Table 4. *PAID portfolio structure by years of construction*

	31.12.2020		31.12.2021		2021 vs 2020 variation	
INTERVAL	PAD number	Share [%]	PAD number	Share [%]		%
Before 1919	14,123	0.81%	11,019	0.61%	- 3,104	-21.98%
1919-1945	53,812	3.07%	51,534	2.83%	- 2,278	-4.23%
1946-1960	117,419	6.70%	116,553	6.41%	- 866	-0.74%
1961-1970	219,721	12.53%	221,098	12.15%	1,377	0.63%
1971-1980	422,308	24.08%	425,344	23.38%	3,036	0.72%
1981-1990	300,093	17.11%	308,210	16.94%	8,117	2.70%
1991-2000	120,358	6.86%	124,098	6.82%	3,740	3.11%
2001-2010	197,728	11.28%	202,475	11.13%	4,747	2.40%
2011-2020	263,570	15.03%	316,994	17.43%	53,424	20.27%
Unavailable information	44,388	2.53%	41,788	2.30%	2,600	-5.86%
Grand Total	1,753,520	100.00%	1,819,113	100.00%	65,593	3.74%

Source: data processed by the author based on information from www.paidromania.ro

4. Reinsurance program of the Insurance Pool against Natural Disasters (PAID SA). Case study

In keeping with the legal provisions, PAID SA must also contract reinsurance, thus ensuring the risk transfer. PAID has a reinsurance policy which ensures the continuity of a quality reinsurance program so as to provide for the optimization of the capital requirement and company protection.

For the period 01.06.2021-14.07.2022, PAID SA holds an *Excess of loss* reinsurance program worth 1 billion euro, the largest catastrophe reinsurance program in Central and Eastern Europe. The company renews the reinsurance program on a yearly basis, so that it can best address its needs.

The progress of the reinsurance program 2014-2020 (Table 5) follows the level of company exposure.

Table 5. *Progress of the reinsurance program vs. PAID exposure*

	Type A	Type B	Total	Aggregated exposure EUR	Reinsurance program capacity EUR
2014	1,360,478	130,851	1,491,329	28,518,070,000	450,000,000
2015	1,445,071	145,883	1,590,954	30,360,250,000	500,000,000
2016	1,568,354	134,693	1,703,047	32,714,010,000	800,000,000

	Type A	Type B	Total	Aggregated exposure EUR	Reinsurance program capacity EUR
2017	1,575,227	117,779	1,693,006	32,682,330,000	900,000,000
2018	1,594,110	110,524	1,704,634	32,987,440,000	901,000,000
2019	1,630,069	101,896	1,731,965	33,620,340,000	950,000,000
2020	1,660,445	93,075	1,753,520	34,139,650,000	950,000,000
2021	1,732,754	86,359	1,819,113	35,518,670,000	1,000,000,000

Source: data processed by the author based on information from PAID.

The construction and annual purchase of the reinsurance program follows a well-established process, going through a certain flow, in stages and deadlines, so that the renewal of the reinsurance program could be carried out in due time, while ensuring the quality of the contractual partners and optimizing costs.

Analysis of PAID reinsurance program

The reinsurance program capacity is set as a result of modelling PAID portfolio and estimating the probable maximum loss (PML) using various earthquake scenarios, using the Solvability II and RMS models. The return period scenario used for setting the limit of the reinsurance program is minimum of 1:200-year. Based on the portfolio, the capacity is adjusted recurrently with new layers.

Company own retention is set considering its impact on solvability and own funds. Pursuant to the articles of incorporation, own retention may only be a maximum of 50% of the company net assets. The risk management policy also limits the amount of own retention for earthquake and flood to a maximum of 75% of the catastrophe reserve.

The lay-out of intake considers the program placement strategy of the reinsured, the appetite and capacity that reinsurers can allocate, as well as ensuring an optimal ratio between cost and level of protection.

The selection of reinsurers is made considering the level of their ratings, given by the most important rating agencies, respectively: Standard & Poor's, A. M. Best, Fitch and Moody's. The minimum accepted rating is "A-" given by Standard & Poor's, A. M. Best and Fitch, or A3 given by Moody's. In order to maintain a high standard of reinsurers, there is a rating downgrade clause in the reinsurance treaty, which allows PAID SA to replace a reinsurer who is downgraded below the agreed minimum level during the reinsurance contract period. In order to avoid the risk of counterparty concentration, the company aims to ensure that no single reinsurer/group can hold more than 15% of the reinsurance program intake in the reinsurance portfolio.

The *reinsurance premium* is set separately for each layer of the Reinsurance Program. The information underlying the calculation of the reinsurance cost is: the company's portfolio (exposure), the loss history, the structure of the reinsurance program (intake, retention, layers, reunifications) and the terms of the reinsurance contract.

The *cover granted through reinsurance* fully follows the PAD cover conditions, i.e. the reinsurance contract covers direct and indirect damage caused by natural disasters (earthquake, landslides and floods) as provided for in Romanian laws and regulations and covered by the PAD policy.

Categories of expenditure deducted on the reinsurance program: Compensation paid to policy holders (in excess of own retention), benefits, expenses relating to expert appraisals and claims handling, court costs (including court costs in the event of an appeal against a claim), direct damage caused by demolition activities carried out by order of a duly constituted civil or local authority at the time and during the period of the event, for the purpose of providing claims management, subject to compliance with the terms and conditions of the reinsurance contract. The Nat Cat reinsurance contract only covers the natural catastrophes and not the man-made ones, as neither the PAD policy covers these risks. By way of an exception, the reinsurance contract covers damages caused to residential properties caused by landslides and/or floods, as a result of acts of terrorism.

Loss recovery through the reinsurance program: There is no need for any official certification to recover loss from reinsurance. The reinsured is the only party able to define/set a loss which is covered by the PAD policy and the limits of the contract. Loss shall be recovered from reinsurance based on the statements of claims.

Claim notification: Pursuant to the reinsurance contract, the Reinsured shall notify the Reinsurers in writing upon the receipt of a claim notification, if the claims paid and the reserve make up more than 75% of PAID net retention. As an event-related claims increase, the reinsurers shall be informed thereupon in the statements of claims which tabulate the damages on each layer. PAID shall inform the reinsurance brokers thereupon and the latter shall notify each reinsurer in its turn.

Reserves: The notified claims reserve shall be calculated by the Claims Department as the sum of the reserves for notified claims. The reserve for non-notified claims shall be calculated by the Actuarial Department. The assigned reserve for claims shall be calculated by the Reinsurance Department in the case of the notified claims and by the Actuarial Department in the case of the non-notified claims.

The recovery shall be performed vertically, based on layers, from a sublayer upwards until the last layer, depending on the size of the loss. Loss shall be recovered based on the estimated loss value, within the limits set in the *Claims settlement* clause, based on the assigned statements of claims, drafted by PAID.

Reintegrating the program intake: The reinsurance contract provides for a pre-paid reintegration. Reintegration is necessary to provide protection through post-event reinsurance and decrease the solvability capital requirement, pursuant to Solvency II provisions. In the case of Nat Cat contracts, the reintegration premium is usually 100% of the reinsurance premium. The reintegration premium shall be calculated pro-rata in connection with the value of the loss and the remaining contract time.

Criteria to supplement the reinsurance program: The reinsurance program may be supplemented by additional layers, whenever the PML exceeds the intake. Increasing portfolio results in increasing PML, which, in its turn, influences program intake. The reinsurance cost shall also increase depending on the intake increase. Thus, the relation between the two is a chain increase.

Conclusions

Reinsurance should not only be understood as an element of cost, but more than ever, it should be seen as an element that brings added value for insurance companies and can be considered a risk transfer element, but also a financing system.

Currently, there is a growing trend in the regulatory and supervisory system at EU and even global level, which focuses on the risk sensitivity/vulnerability of the capital requirements and the transparency of the insurance market. In view of a stable growth of the insurance and reinsurance market, the trend is to further the intensive dialogue between the regulatory authorities and the insurance-reinsurance companies.

In the case of Romania, traditional reinsurance contracts are still seen as the best risk transfer option, as these also focus on other objectives, such as the level of financial results or efficient capital management. In fact, risk-based supervision is mainly aimed at the efficient management of the risk profile and the regulatory capital, considering the risk transfer in corroboration with partners' rating, which leads to the conclusion that reinsurance becomes a capital management tool.

Capital management through reinsurance can have effects on the volatility of profits/earnings, dividend levels and return on equity. One of the most important aspects of a reinsurance program is to estimate the reinsured risk transfer level. In order to determine this risk transfer level companies as well as the regulators may need to carry out quantitative tests. The regulators should be more risk-based oriented. The risk management should be enhanced in order to have a more prudential approach.

Due to the technical complexity of quantitative tests, the lack of resources and specialized technical tools, both insurance companies and supervisory and regulatory authorities may face problems in applying and using them individually and directly, having to turn to companies specialized in catastrophic risk modelling (reinsurance brokers) or actuarial consultancy. Romania, one of the objectives of the BSR (Balance Sheet Review) exercises in 2015 and 2021, as organized by the Financial Supervisory Authority at the insurance market level, was to verify the level of risk transfer in reinsurance programs.

Risk-based management allows insurance companies to include reinsurance as a capital management tool, transparently and increasing adequacy, whereas reinsurers focus on the value proposition of reinsurance solutions based on quantitative and qualitative capital management analyses.

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