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THE DEVELOPMENT OF METHODOLOGICAL APPROACH TO MANAGEMENT OF CAPITAL ADEQUACY OF INSURANCE COMPANY THROUGH REINSURANCE

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The article defines the essence of capital adequacy of insurance company. Theoretical aspects of estimation capital adequacy of insurer in accordance with the requirements of the Directive Solvency II are discussed. The methodological approach to management of capital adequacy of insurance company through reinsurance is developed in the article. The usefulness of using the developed approach for managing capital adequacy ratio is proved on the basis of conducted experiments.

Keywords: *capital adequacy, solvency capital requirement, own funds, reinsurance.*

Introduction. Insurance is an important sector of the economy, which provides insurance protection for individuals and business entities and generates considerable amount of investment resources for economic development. A sufficient amount of capital to cover unexpected losses provides the ability of insurance sector to carry out their own functions, including fulfilling obligations to customers.

The urgency of the problem of capital management of insurance companies rises with the approval of the Concept of introduction of prudential supervision of nonbank financial institutions [8]. The main task of this concept is the development of prudential standards of capital adequacy in accordance with the provisions of the Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance (Solvency II) [3].

On the one hand, implementation of the new capital requirements in the national legislation will enhance the financial stability of insurers, but, on the other hand, will create additional regulatory burden for the insurance market. To reduce this negative impact it is necessary to develop adequate methodological support of capital adequacy management, which confirms the urgency of the chosen research topic.

Analysis of recent researches and publications. Theoretical aspects of management of capital adequacy of financial institutions are discussed in scientific works of A. Boyko [1], O. Kozoriz [6], N. Suprun [10], N. Tkachenko [12] and others. Methodological support of management of capital adequacy of insurance companies through reinsurance is still insufficiently developed.

Main purpose of the article. The aim of this article is to develop a methodological approach to management of capital adequacy of insurance company by optimizing the reinsurer's part in the insurance premiums for a separate line of business.

Results and discussions. The Solvency II Directive is an EU standard that codifies and harmonizes the EU insurance regulation. Primarily this concerns the amount of capital that EU insurance companies must hold to reduce the risk of insolvency. Solvency II is expected to replace the current solvency regime Solvency I from 2016 onwards.

According to the Solvency II Directive, capital adequacy is a level of eligible own funds that enables insurance company to absorb significant losses with a specified confidence level over the defined period of time. The capital adequacy ratio of the insurance company is calculated as follows:

$$\text{CAR} = \frac{\text{OF}}{\text{SCR}}, \quad (1)$$

where CAR – capital adequacy ratio;
OF – own funds of insurance company;
SCR – solvency capital requirement.

Own funds in broad sense is regarded as the difference between assets and liabilities. Liabilities include technical provisions and other liabilities. Certain items such as other liabilities in the balance sheet may be treated as capital resources for solvency purposes. For example, perpetual subordinated debt, although usually classified as a liability under the relevant accounting standards, could be classified as a capital resource for solvency purposes. This is because of its availability to act as a buffer to reduce the loss to policyholders and senior creditors through subordination in the event of insolvency. Solvency capital requirement is a target amount of own funds needed to meet obligations to policy holders and beneficiaries with a probability of at least 99,5 % over the following 12 months [3]. This indicator is calculated on the basis of risk and serves as an early warning indicator of insolvency of the insurer.

Given the characteristics of the calculation of the CAR, insurance companies can increase capital adequacy in two ways: 1) by attracting additional own funds; 2) by reducing the risks that are taken into account in the calculation of solvency capital requirement.

Specialists of audit and consulting company «Ernst & Young» note that the introduction of Solvency II will promote the use of reinsurance as a tool to reduce

risk and capital requirements [11]. Reinsurance is a system of redistribution of risk between insurance companies in which the assignor assumes the risk and then allocates it among reinsurers in order to create a balanced insurance portfolio [4]. Reinsurance enables insurance companies to meet obligations to policy holders and beneficiaries through the transfer of the accepted insurance risks to other insurers.

Solvency II goes beyond the pure calculation of the capital required and encourages reinsurance managers to develop and use coherent approaches to analyze reinsurance and implement capital efficient buying strategies that go beyond buying reinsurance according to a pre-defined budget. Reinsurers may find they need to become more flexible. The reinsurance market will change and insurance companies will realize that they need more reinsurance in some areas and less in others. If not for regulatory purposes, reinsurance buyers have a strong economic incentive to improve their modeling techniques that will ensure all reinsurance purchases make optimum use of their capital [9].

According to the Solvency II [3], solvency capital requirement is the sum of basic solvency capital requirement and capital requirement for operational risk (Formula 2).

$$SCR = BSCR + SCR_{op} = \sqrt{Corr_{ji} \cdot SCR_j \cdot SCR_i} + SCR_{op}, \quad (2)$$

where BSCR – basic solvency capital requirement;

SCR_{op} – capital requirement for operational risk;

$Corr_{ji}$ – correlation coefficients between the risks according to the correlation matrix;

SCR_i – capital requirements for the individual SCR risks according to the rows of the correlation matrix;

SCR_j – capital requirements for the individual SCR risks according to the columns of the correlation matrix.

The basic solvency capital requirement shall consist of at least the four risk modules: non-life underwriting risk (SCR_{nl}); health underwriting risk (SCR_h); market risk (SCR_{mkt}); counterparty default risk (SCR_{def}). Reinsurance operations are included in the calculation of three indicators: SCR_{nl} , SCR_h and SCR_{def} . In this case, the relationship between the amount of premiums passed to reinsurers and underwriting risk is the reverse, and the relationship between the amount of premiums passed to reinsurers and risk of counterparty default is the a straight. The effectiveness of the management of insurance risk through reinsurance depends on the financial strength rating of the reinsurer counterparty and the structure of premiums passed to reinsurers.

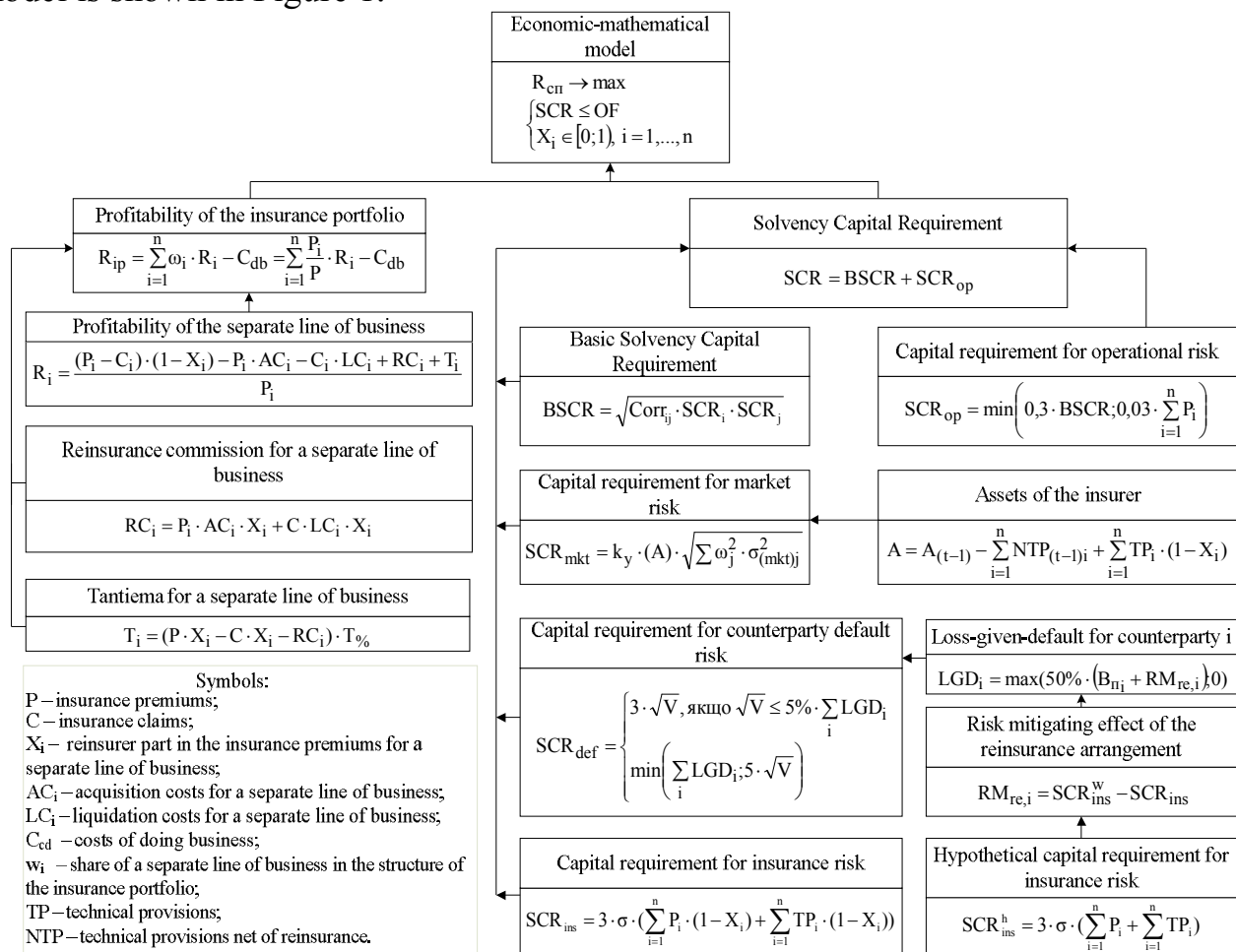
When talking about optimizing the SCR through reinsurance two different aspects have to be considered. Reinsurance reduces insurance risk and revenue of insurer. Therefore, it is necessary that the insurer could assess the feasibility of reinsurance operations, optimize the level of own risk and profitability of insurance operations.

Theoretical aspects of management of reinsurance operations are investigated in scientific works of A. Boyko [1], Y. Dyachkova [2], E. Emelianova [4], V. Narkaev [7] and others. But the use of reinsurance operations to fulfill the capital adequacy ratio calculated according to the requirements Solvency II in these researches is not considered.

In this article, the author proposes a methodological approach to optimize the reinsurer's part in the insurance premiums for a separate line of business. Using this approach allows the insurance company to achieve target level of the profitability of the insurance portfolio and solvency capital requirement.

The optimization approach is based on the use the method of economic-mathematical programming, which includes objective function and restrictions in the form of equations and inequalities.

The order of constructing the objective function and restrictions of mathematical model is shown in Figure 1.



In the model presented in Figure 1, types of insurance according to the Law of Ukraine «On insurance» were merged into line of business by the level of insurance risk according to the requirements of Solvency II Directive (see Table 1).

Table 1. Composition of classes of insurance according to the level of insurance risk

Line of business according to the Solvency II [3]	Types of insurance according to the Law of Ukraine "On insurance" [13]
Line of business 1 – income protection	Accident insurance, health insurance
Line of business 2 – medical expenses	Medical insurance, medical expense insurance
Line of business 3 – motor vehicle liability	Insurance of motor vehicle liability
Line of business 4 – motor, other classes	Motor insurance, railroad insurance
Line of business 5 – marine, aviation and transport	Insurance of aviation transport, insurance of marine transport, cargo insurance, insurance of liability of aircraft ownership, insurance of liability of marine transport owners, civil aviation insurance, insurance of liability of maritime carrier.
Line of business 6 – fire and other damage	Property insurance against fire risks and natural disasters

Data about the structure of the insurance portfolio Ukrainian insurer were used for approbation the developed methodical approach. The results of the calculation of the profitability of the insurance portfolio, solvency capital requirement and own funds of the insurance company are presented in Table 2.

Table 2. Parameters of the insurance portfolio

Line of business	Level of reinsurance, %	R_{ip} , %	SCR, thousand UAH
Line of business 1	4,47	-7,20	–
Line of business 2	0,34	21,74	–
Line of business 3	3,36	3,62	–
Line of business 4	6,77	-7,61	–
Line of business 5	46,07	20,22	–
Line of business 6	60,09	14,57	–
Total for insurance portfolio	19,79	5,28	162 542,31

The actual size of the solvency capital requirement (Table 2) was used by the author as a limitation of the numerical simulation.

The task of optimization the reinsurer's part in the insurance premiums for a separate line of business was solved using the Microsoft Excel function «search for a solution». The results are presented in the Table 3.

Table 3. The parameters of the insurance portfolio obtained using the mathematical economic model

Line of business	$X_i, \%$	$R_{ip}, \%$	Insurance premiums net of reinsurance, thousand UAH
Line of business 1	99,00	-0,08	238,08
Line of business 2	0,00	21,81	57 658,76
Line of business 3	0,00	3,75	105 517,40
Line of business 4	99,00	-0,08	1 310,79
Line of business 5	0,00	37,50	11 001,85
Line of business 6	0,00	36,52	112 875,70
Total for insurance portfolio	34,69	13,97	288 602,59

The Table 3 shows the results of experiment on the formation of the structure of the insurance portfolio. By adopting the methodological approach the insurance company receives the economic benefits in the form of an increase of profitability at 8.69 percentage points.

Conclusion. Results of the study demonstrate that reinsurance is an effective tool for managing capital adequacy of the insurance company. In this connection, the author developed methodical approach to the determination of optimal conditions of proportional reinsurance, which allows calculating the reinsurer's participation in the insurance premiums for a separate line of business based on the required level of capital and the return on insurance operations.

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РОЗРОБКА МЕТОДИЧНОГО ПІДХОДУ ДО УПРАВЛІННЯ ДОСТАТНІСТЮ КАПІТАЛУ СТРАХОВОЇ КОМПАНІЇ ЗА РАХУНОК ПЕРЕСТРАХУВАННЯ

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У статті розкрито сутність поняття достатність капіталу страхової компанії. Визначено теоретичні аспекти оцінки достатності капіталу страхової компанії відповідно до вимог Директиви Solvency II. Розроблено методичний підхід до управління достатністю капіталу за рахунок перестрахування. На основі проведених експериментів обґрунтовано доцільність використання розробленого методичного підходу до управління показником достатності капіталу.

Ключові слова: достатність капіталу, необхідний капітал платоспроможності, власні фонди, перестрахування.

РАЗРАБОТКА МЕТОДИЧЕСКОГО ПОДХОДА К УПРАВЛЕНИЮ ДОСТАТОЧНОСТЬЮ КАПИТАЛА СТРАХОВОЙ КОМПАНИИ ЗА СЧЕТ ПЕРЕСТРАХОВАНИЯ

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В статье раскрыта сущность понятия достаточность капитала страховой компании. Определены теоретические аспекты оценки достаточности капитала страховой компании в соответствии с требованиями Директивы Solvency II. Разработан методический подход к управлению достаточностью капитала страховой компании за счет перестрахования. На основе проведенных экспериментов обоснована целесообразность использования разработанного методического подхода для управления показателем достаточности капитала.

Ключевые слова: достаточность капитала, необходимый капитал платежеспособности, собственные фонды, перестрахование.