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RESEARCH AND OPTIMIZATION OF THE INSURANCE PORTFOLIO SERVICES OF PJSC "IC "PZU UKRAINE"

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ДОСЛІДЖЕННЯ ТА ОПТИМІЗАЦІЯ ПОРТФЕЛЯ СТРАХОВИХ ПОСЛУГ ПРАТ «СК «ПЗУ УКРАЇНА»

During martial law in Ukraine, financial market entities suffer from low solvency and financial stability. Exploring the insurance market, we observe a decrease in demand for insurance services and insurance premiums, as well as a decrease in the number of customers.

Such reasons have led to a decrease in the solvency of insurance companies that need to effectively manage insurance risks through the optimization of the insurance portfolio. The purpose of optimizing the insurance portfolio is to maximize the profitability of the insurance business while minimizing risks.

The article studies the essence and features of optimization of the insurance portfolio. The concept of "insurance portfolio" is considered and its types are characterized. It has been found that the aggressive type of insurance portfolio is characterized by a high level of risk and high profitability, and conservative - on the contrary. The criteria that are inherent in the insurance portfolio are considered. The structure of the insurance portfolio of PJSC "IC" ROM Ukraine "is analyzed. It is established that the largest share of the insurance portfolio of the company is CASCO insurance, civil liability of vehicle owners and tourist insurance. The level of payments of the insurance company by types of insurance services is investigated.

In the course of the study, the optimization of the insurance portfolio of PJSC "IC" PZU Ukraine "was carried out using the model of G. Markowitz, supplemented by the authors by limiting the share of the most risky types of insurance services. Optimization of the insurance portfolio is carried out using the "Find a solution" function in Microsoft Excel 2016. During the study, it was determined that the insurance portfolio is considered the most optimal, provided the risk level is 5% and the yield is 65%. The main disadvantage of applying the G. Markowitz model is that it is advisable to use it with stable economic development. Given the unstable economic situation in Ukraine, profitability and the risk of an optimal insurance portfolio can have significant errors. It was found that the smaller the share of risky types of insurance services in the portfolio

В умовах воєнного стану учасники фінансового ринку зіштовхнулися з проблемами зниження фінансової стійкості та платоспроможності. Ринок

страхових послуг також потерпає від низки проблем, зокрема, скоротилися страхові премії, підвищився ризик настання страхових випадків, знизився попит на страхові послуги, а також зменшилася кількість клієнтів. Такі події в Україні призвели до зниження платоспроможності страхових компаній, які потребують ефективного управління страховими ризиками через оптимізацію страхового портфеля. Метою оптимізації страхового портфеля є максимізація прибутковості страхового бізнесу при мінімізації ризиків.

У статті досліджено сутність та особливості оптимізації страхового портфеля. Розглянуто поняття «страховий портфель» та охарактеризовано його типи. З'ясовано, що агресивному типу страхового портфеля притаманний високий рівень ризику та високий доходності, а консервативному - навпаки. Розглянуті критерії, які притаманні страховому портфелю. Проаналізовано структуру портфеля страхових послуг ПрАТ «СК «ПЗУ Україна». Встановлено, що найбільшу частку страхового портфеля компанії займає страхування КАСКО, цивільно правова відповідальність власників транспортних засобів та страхування туристів. Досліджено рівень виплат страхової компанії за видами страхових послуг.

В процесі дослідження здійснено оптимізацію страхового портфеля ПрАТ «СК «ПЗУ Україна» з використанням моделі Г. Марковіца, доповненої авторами обмеженням частки найбільш ризикових видів страхових послуг. Оптимальний портфель страхових послуг для ПрАТ СК «ПЗУ Україна» було здійснено за допомогою функції "Пошук рішення" в Microsoft Excel 2016. У ході дослідження визначено, що найбільш оптимальним для страховика буде портфель за рівня ризику 5% та доходністю 65%. Основним недоліком застосування моделі Г. Марковіца є те, що її доцільно використовувати при стабільному економічному розвитку. Враховуючи нестабільну економічну ситуацію в Україні, дохідність та ризик оптимального страхового портфеля можуть мати значні похибки.

З'ясовано, що чим менша частка ризикових видів страхових послуг у портфелі, тим більша його рентабельність. Сформований оптимальний *страховий портфель повинен забезпечити максимальну прибутковість при заданому рівні ризику.*

***Keywords**: insurance company, insurance portfolio, insurance services, optimization, risk, profitability.*

***Ключові слова:** страхова компанія, страховий портфель, страхові послуги, оптимізація, ризик, дохідність.*

Statement of the problem. Under martial law, financial market participants faced problems of reduced financial stability and solvency. The insurance market also suffers from a number of problems, in particular, insurance premiums have decreased, the risk of occurance of the insured events has increased, the demand for insurance services has decreased, and the number of customers has decreased. Such events in Ukraine have led to a decrease in the solvency of insurance companies that need effective management of insurance risks through the optimization of the insurance portfolio.

Analysis of the latest research and publications. The issue of optimizing the insurance portfolio was dealt with by such domestic and foreign scientists as: V. Bazylevych, V. Kravchenko, S. Osadets, O. Zhuravka, N. Vnukova, L. Pozdnyakova, V. Plysa, N. Yashyna, H. Markowitz, etc. However, the issue of optimizing the insurance portfolio remains debatable and requires further research.

Formulation of the goals of the article (statement of the task). The aim of the article is to study the formation of an optimal portfolio with the help of G. Markowitz's model on the example of PJSC «Insurance Company «PZU Ukraine».

Description of the main material of the study with a full justification of the scientific results obtained. In the current conditions of the insurance market of Ukraine, an important role in the stability of the insurance company is played by the insurance portfolio. The insurance portfolio is an indicator of the financial stability and solvency of the insurance company.

The aim of optimizing the insurance portfolio is to maximize the profitability of the insurance business while minimizing risks.

The insurance portfolio should be understood as a set of insurance risks that have been accepted by the insurer for insurance. Depending on the degree of risk, the following types of insurance portfolio are distinguished: aggressive, conservative and diversified.

The following four factors are inherent in the types of insurance portfolio:

1. Portfolio risk level;
2. Profitability;
3. Financial stability;
4. Structure of the insurance portfolio.

Describing the aggressive type of insurance portfolio, we can say that it has a high level of risk with a high level of profitability. As a part of such an insurance portfolio contracts for specific types of insurance, which are characterized by large insurance amounts with high risk, will be dominated. Such risks in the portfolio of an insurance company can account for more than 40% of the total volume of all insurance contracts. To increase the financial stability of this insurance portfolio, the company must use certain financial instruments, specifically a flexible tariff policy, as well as reinsurance.

The conservative type of insurance portfolio is characterized by a low degree of both risk and profitability. It includes property, personal and liability insurance contracts.

A diversified insurance portfolio is characterized by an average degree of riskiness, profitability and financial stability. This insurance portfolio is usually formed by property and personal insurance contracts, and there are also a small number of contracts that account for liability and business risk insurance.

In order to form an effective insurance portfolio, an insurance company must set strategic goals, specifically:

1. Profit maximization;
2. Capital gains assurance;
3. Maintaining the achieved positions in the insurance market.

Insurance companies strive to form such a portfolio that it is balanced and effective, which is a guarantee of financial reliability for them.

As follows, the insurance portfolio is balanced when it satisfies the company's needs in the ratio between income and risk.

The object of the study is of PJSC «Insurance Company «PZU Ukraine», which is part of the PZU Group, meanwhile which is one of the oldest and largest insurance groups in Poland in terms of premiums, according to the Polish financial regulator PFSA, and includes a wide range of insurance and financial products [1; 4].

In 2021, «Insurance Company «PZU Ukraine» ranked 7th in the ranking of insurance companies in terms of insurance premiums (UAH 1,745,928 thousand) and insurance payments (UAH 687,113 thousand) [2]. In 2022, the insurance company continued to actively develop a new direction with online partners. It actively developed cooperation with new online aggregators, set up the sale of products on sites such as OSAGO, Tourism, Green Card, accidents with coverage of military risks, Mini CASCO, voluntary medical insurance, which made it possible to increase premiums in this segment every month [3].

To assess the financial flows of the PJSC «Insurance Company «PZU Ukraine», an analysis of the insurance portfolio will be carried out, which is a generalized indicator of the company's insurance activities. The insurance portfolio is the actual number of insured objects or the number of valid insurance policies, as well as the total liability of the insurer for all existing insurance policies.

The insurance portfolio shows the activities of the insurer, its financial stability and solvency.

The analysis of the insurance portfolio of PJSC "Insurance Company "PZU Ukraine" is given in Table 1.

Based on the results of the analysis of the company's insurance portfolio, it can be concluded that the total level of payments for 2022 amounted to 39.36% of insurance premiums. In 2022, there were large payments under agricultural insurance contracts, the level of payments of which reached 77.80%. It should be noted that the company's reinsurance rate is 37.3%.

According to the table, we observe that the largest number of insurance premiums was received under CASCO contracts, the amount of which amounted to 412740 thousand rubles. UAH.

Table 1. Analysis of the insurance portfolio PJSC IC "PZU Ukraine" for 2022

Insurance portfolio PZU Ukraine	Insurance premiums and payments for 2022		
Insurance type	Insurance premiums	Insurance payments	Level of payments %
CASCO	412 740	190 534	46,16%
Vehicle insurance	327 399	173 695	53,05%
Travel insurance	196 166	29 238	14,90%
Voluntary medical insurance	169 135	96 957	57,33%
Property insurance	164 038	46 700	28,47%
Agricultural insurance	137 806	107 212	77,80%
Green Card	108 841	29 339	26,96%
Accident insurance	68 328	1 342	1,96%
OTHER TYPES	60 495	394	0,65%
Cargo and baggage insurance	28 706	1 096	3,82%
Financial risk insurance	28 668	823	2,87%
Voluntary vehicle insurance	23 403	5 415	23,14%
Compulsory aviation insurance	14 246	4 269	29,97%
Health insurance in case of illness	5 957	99	1,66%
TOTAL	1 745 928	687 113	39,36%

Source: developed by the authors [4; 5]

A study of the structure of the insurance portfolio of PJSC "Insurance Company "PZU Ukraine" was also carried out (Fig. 1).

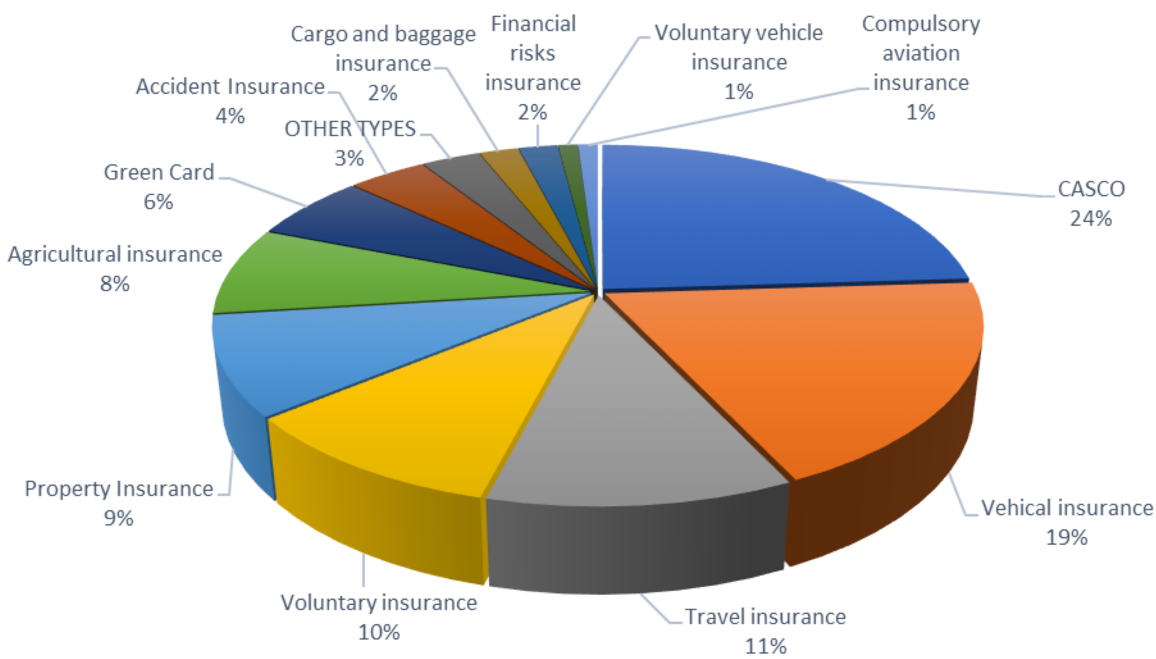

Fig.1. Structure of the insurance portfolio of PJSC "Insurance Company "PZU Ukraine"

Source: formed based on [4; 5]

According to the results of the study, it can be seen that the largest share of the company's insurance portfolio is occupied by CASCO insurance and accounts for 24% of the total portfolio.

Military operations in Ukraine have a negative impact on the development of insurance companies, which require an in-depth study of their activities. With the help of SWOT analysis, we will assess the strengths and weaknesses of PJSC "Insurance Company "PZU Ukraine", as well as consider threats and opportunities (Table 2).

Table 2. Matrix of SWOT analysis of PJSC IC "PZU Ukraine"

Impact	Opportunities	Threats
Similar aspects	1.Increase in net profit by attracting a large number of customers. 2.Improving liquidity by optimizing the investment portfolio. 3.Entering new markets with new applications. 4.Optimisation of insurance portfolio 5.Establishment of the most accepted conditions of insurance.	1.Aggressive Sales Policy in Motor Vehicle Insurance 2.Competition with leading companies 3.Insufficient level of culture of consumption of insurance services.
Weaknesses	1.New channels for the sale of insurance services in order to increase the number of policyholders. 2.Realization of investment potential through effective allocation of reserves. 3.Optimization of the investment portfolio. 4.Guaranteeing payment of insurance amounts in the event of an insured event in full.	1.Loss of solvency due to payment of insurance indemnities by the factor of occurrence of insured events. 2.The need to reduce the cost of running an insurance business. 3. Taking anti-crisis measures to prevent deterioration of the company's financial condition and its strategic position in the financial market.

Source: formed based on [4; 6-9]

From the analysis, it can be concluded that the insurance company needs to increase profits by attracting new customers, improve liquidity by optimizing the investment portfolio, and entering new markets with new programs. It is important for the company to find new channels for the sale of insurance services in order to increase the number of insureds, use the investment potential through the effective placement of reserves and optimize the investment portfolio and form an optimal insurance portfolio.

The formation of the company's insurance portfolio will allow you to determine the optimal ratio of risk and profitability.

The optimization of the insurance portfolio of PJSC "Insurance Company "PZU Ukraine" is based on the optimization model of H. Markowitz.

The H. Markowitz's model is traditionally used to optimize the structure of the securities portfolio, but can be adapted to form the optimization portfolio of an insurance company [10]. For the analysis, the insurance services provided by the PJSC "Insurance Company "PZU Ukraine" and prevailing in terms of insurance premiums were chosen, which was determined in the analysis of the insurance portfolio earlier and the indicators for the periods of 2020-2022 will be used and are shown in table 3.

Table 3. Insurance payments and insurance fees PJSC "Insurance Company "PZU Ukraine"

Insurance type	Insurance premiums (UAH thousands)			Insurance payments (UAH thousands)		
	2020	2021	2022	2020	2021	2022
CASCO	381779	382931	412 740	206829	187477	190 534
Vehicle insurance	213372	255202	327 399	124514	116252	173 695
Travel insurance	267640	140524	196 166	64744	40060	29 238
Voluntary medical insurance	139938	166134	169 135	82208	89195	96 957
Property insurance	163293	166521	164 038	98215	178014	46 700
Green Card	98376	99227	137 806	51689	230123	107 212
Agricultural insurance	145951	88653	108 841	37636	36392	29 339
Accident insurance	113617	56057	68 328	2326	1799	1 342
Cargo and baggage insurance	27753	20689	28 706	1960	3267	1 096
Financial risk insurance	20317	21034	28 668	209	7776	823
Voluntary vehicle insurance	25273	21014	23 403	8013	7829	5 415
Compulsory aviation insecure	10656	9580	14 246	5818	1	4 269
Health insurance in case of illness	12580	5388	5 957	400	407	99

Source: developed by the authors [4; 5]

The main feature of the insurance portfolio should be its profitability. In order to determine the profitability of the portfolio, it is necessary to calculate the ratio of profit from a particular type of insurance to insurance payments. Profitability for a particular type of insurance is determined by the formula:

$$Pr_i = 1 - \frac{Nip_i}{NIP_i} \qquad (1)$$

in which: Pr_i – profitability of the type of insurance; Nip_i – net insurance payments by the type of insurance; NIP_i – net insurance premiums by the type of insurance.

Indicators of profitability of types of insurance of PJSC "Insurance Company "PZU Ukraine" are shown in Table 4.

Table 4. Profitability indicators of PJSC "Insurance Company "PZU Ukraine" by the types of insurances during the 2020-2022

Type of insurance	Years		
	2020	2021	2022
CASCO	0,4582	0,5104	0,5384
Vehicle insurance	0,4164	0,5445	0,4695
Travel insurance	0,7581	0,7149	0,8510
Voluntary medical insurance	0,4125	0,4631	0,4267
Property insurance	0,3985	-0,0690	0,7153
Agricultural insurance	0,4746	-1,3192	0,2220
Green Card	0,7421	0,5895	0,7304
Accident insurance	0,9795	0,9679	0,9804
Cargo and baggage insurance	0,9294	0,8421	0,9618
Financial risks insurance	0,9897	0,6303	0,9713
Voluntary vehicle insurance	0,6829	0,6274	0,7686
Compulsory aviation insurance	0,4540	0,9999	0,7003
Heath insurance in case of illness	0,9682	0,9245	0,9834

Source: developed by the authors [4; 5]

For each type of insurances of PJSC "Insurance Company "PZU Ukraine", the average value of profitability, variance, as well as standard deviation are calculated. These calculations were made on the basis of data on the profitability of the types of insurance services presented in Table 4.

Table 5. Indicators of the average mean of profitability, dispersion and risk for certain types of insurance of PJSC "Insurance Company "PZU Ukraine"

Type of insurance	Average mean of profitability	Dispersion	Standard deviation (risk)
CASCO	0,5023	0,0011	0,0407
Vehicle insurance	0,4768	0,0028	0,0643
Travel insurance	0,7747	0,0032	0,0695
Voluntary medical insurance	0,4341	0,0005	0,0261
Property insurance	0,3483	0,1038	0,3946
Agricultural insurance	-0,2075	0,6285	0,9709
Green Card	0,6874	0,0048	0,0849
Accident insurance	0,9759	0,0000	0,0070
Cargo and baggage insurance	0,9111	0,0026	0,0619
Financial risks insurance	0,8638	0,0273	0,2024
Voluntary vehicle insurance	0,6930	0,0034	0,0711
Compulsory aviation insurance	0,7181	0,0498	0,2734
Heath insurance in case of illness	0,9587	0,0006	0,0306

Source: developed by the authors [5]

In order to apply H. Markowitz's model and determine the variance, the values of paired covariance coefficients for certain types of insurance services were obtained using the functions of Microsoft Excel 2016.

The optimal insurance portfolio of PJSC "Insurance Company "PZU Ukraine" was formed on the basis of H. Markowitz's model using the "Solution Search" function in Microsoft Excel 2016. When calculating the optimal insurance portfolio, a restriction on the share of the most risky types of insurance services has been introduced at the level of 20%.

Table 6. Optimal insurance portfolio of PJSC "Insurance Company "PZU Ukraine"

Type of insurance	Average mean of profitability	Risk	Structure of portfolio
CASCO	50%	4%	11%
Vehicle insurance	48%	6%	10%
Travel insurance	77%	7%	6%
Voluntary medical insurance	43%	3%	8%
Property insurance	35%	39%	5%
Agricultural insurance	-21%	97%	6%
Green Card	69%	8%	7%
Accident insurance	98%	1%	19%
Cargo and baggage insurance	91%	6%	5%
Financial risks insurance	86%	20%	5%
Voluntary vehicle insurance	69%	7%	7%
Compulsory aviation insurance	72%	27%	6%
Heath insurance in case of illness	96%	3%	5%
Total			1
Total risk of insurance portfolio			5%
Optimal profitability of the formed insurance portfolio			65,0%

Source: developed by the authors [5]

With the help of the adapted model of H. Markowitz, we have formed an optimal insurance portfolio for PJSC "Insurance Company "PZU Ukraine", which will provide maximum profitability at a certain level of risk. The most optimal for an insurance company is to set the total risk of the insurance portfolio at the level of 5%, which will allow to obtain the highest profitability of the insurance portfolio in the amount of 65%.

Conclusions from this study and prospects for further research in this direction. Thus, in the course of the study, the optimal insurance portfolio for PJSC "IC "PZU Ukraine" has been determined using the model of H. Markowitz. For the analysis of the portfolio, insurance services were chosen, which prevail in terms of insurance premiums for 2020-2022. For each of the analyzed types of insurance services, the following indicators were calculated: the average value of profitability of each type of insurance services, variance and standard deviation. The optimal portfolio of insurance services for PZU Ukraine was carried out using the "Solution Search" function in Microsoft Excel 2016. In the course of the study, it was determined that the most optimal portfolio for the insurer will be with a risk level of 5% and a return of 65%. Therefore, we can conclude that the formation of an optimal insurance portfolio will ensure an increase in profitability and increase the financial stability of the insurer.

The main disadvantage of using G. Markowitz's model is that it is expedient to use it in stable economic development. Given the unstable economic situation in Ukraine, the profitability and risk of the optimal insurance portfolio may have significant errors.

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