закордонних, у першу чергу російських компаніях. Зокрема, одна з найбільших фірм-розробників «БИФИТ» вже випустила версію своєї банківської програми для України: «iBank 2 UA». Очевидно, якщо найближчим часом в Україні не з'являться національні розробники банківського ПЗ, цей ринок буде захоплений іноземними компаніями. Тому бажано вжити ряд заходів щодо активізації та стимуляції Українського ринку програмного забезпечення.

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PROBLEMS OF INSURANCE ORGANIZATION INVESTMENT PORTFOLIO OPTIMIZING

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Methdological problems of insurance organization investment portfolio management, optimization and formatting have been discussed and insurer's functions as portfolio investors have been investigated. It has been defined that peculiarity of insurance companies participation in investment processes is connected with insurer's ability to act on the one hand as a object that posseses considerable investment resources and, from the other hand – as a subject that guarantees payment of possible damages as a result of influence of undesirable factors on investment projects. The purposes of investment portfolio of insurance company management and investment portfolio optimization as obtaining of maximal investment profit on the assumption of observance of general restrictions by all financial market participants. Main

functions and principles of insurance organization balanced investment portfolio formatting have been analyzed. The main stages of optimal investment portfolio formatting have been defined. The stochastic approach for profitability estimation based on profit distribution histogram building has been proposed. The structure of investment portfolio of NJSIC «Oranta» was investigated. Markowitz' model for insurance organization NJSIC «Oranta» investment portfolio optimization have been used. It has been shown that financial asset portfolio is insufficiently filled by bank deposit (UAH) that leads to profit deficiency. Also it has been shown that technical resources portfolio of NJSIC «Oranta» is insufficiently filled by bank metals that leads to profit deficiency. Ukrainian emitents shares is characterized by high level of risk and low level of profit and their portion exceeds the optimal level. Unsufficient attention is paid to state bonds though they are optimal by risk-profit criteria.
Key words: insurance organization investment portfolio, investment portfolio structure optimization, insurance portfolio management.

ОПТИМІЗАЦІЯ ІНВЕСТИЦІЙНОГО ПОРТФЕЛЯ СТРАХОВОЇ ОРГАНІЗАЦІЇ

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Досліджено методологічні проблеми формування, оптимізації та управління інвестиційним портфелем страхової компанії та визначено функції страховиків як портфельних інвесторів. Визначено, що особливість участі страхових компаній в інвестиційних процесах пов'язана з можливістю страховиків виступати у двох основних якостях – як суб'єктів, що володіють значним обсягом інвестиційних ресурсів та, з іншого – у якості суб'єктів, які можуть гарантувати покриття певних можливих збитків в результаті впливу на інвестиційні проекти небажаних факторів. Визначено задачі управління інвестиційним портфелем страхової компанії та мету оптимізації інвестиційного портфеля страхової компанії як отримання максимального інвестиційного доходу за умови дотримання загальних для всіх учасників фінансового ринку обмежень. Проаналізовано основні функції та принципи формування збалансованого інвестиційного портфеля страховика. Визначено основні етапи формування оптимального інвестиційного портфеля. Запропоновано стохастичний підхід для оцінки доходності фінансових інструментів на основі побудови гістограми розподілу доходності. Проаналізовано структуру інвестиційного портфеля страхової організації НАСК «Оранта». Застосовано модель Марковіца для оптимізації інвестиційного портфеля страхової організації НАСК «Оранта». Показано, що портфель фінансових інструментів, недостатньо наповнений депозитами у національній валюті, що призводить до недоотримання доходів. Також відзначено, що в портфелі технічних резервів НАСК «Оранта» недостатня кількість банківських металів, що може призвести до втраченої вигоди. Акції українських емітентів характеризуються високим рівнем ризику та високою дохідністю, причому їх частка перевищує оптимальний показник. Недостатня увага приділена державним облігаціям, хоча даний інструмент є оптимальним за критерієм ризик-доходність.
Ключові слова: інвестиційний портфель страховика, оптимізація структури інвестиційного портфеля, управління страховим портфелем.

ОПТИМИЗАЦИЯ ИНВЕСТИЦИОННОГО ПОРТФЕЛЯ СТРАХОВОЙ ОРГАНИЗАЦИИ

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Рассмотрены методологические проблемы формирования, оптимизации и управления инвестиционным портфелем страховой компании и определены функции страховщиков как портфельных инвесторов. Показано, что особенность участия страховых компаний в инвестиционных процессах связана с возможностью страховщиков выступать в двух основных качествах – как субъектов, которые владеют значительным объемом инвестиционных ресурсов, и, с другой стороны – в качестве объектов, которые могут гарантировать покрытие возможных убытков в результате влияния на инвестиционные процессы неблагоприятных факторов. Определены задачи управления инвестиционным портфелем страховой компании и цель оптимизации инвестиционного портфеля страховой компании как получение максимального инвестиционного дохода при условии соблюдения общин для всех участников финансового рынка ограничений. Проанализированы основные функции и принципы формирования сбалансированного инвестиционного портфеля страховщика. Определены основные этапы формирования оптимального инвестиционного портфеля. Предложен стохастический подход оценки доходности финансовых инструментов на основе построения гистограммы распределения доходности. Проанализирована структура инвестиционного портфеля страховой организации НАСК «Оранта». Использована модель Марковица для оптимизации инвестиционного портфеля страховой организации НАСК «Оранта». Показано, что портфель финансовых инструментов, недостаточно наполнен депозитами в национальной валюте, что приводит до недополучения доходов. Также отмечено, что в портфеле

технических резервов НАСК «Оранта» недостаточно банковских металлов, что может привести до упущенной выгоды. Акции украинских эмитентов характеризуются высоким уровнем риска и высокой доходностью; их количество превышает оптимальный показатель. Недостаточное внимание уделено государственным облигациям, хотя данный инструмент является оптимальным по критерию риск-доходность.
Ключевые слова: инвестиционный портфель страховщика, оптимизация структуры инвестиционного портфеля, управление страховым портфелем.

PROBLEM STATEMENT

Insurance organizations constitute one of the major segments of financial system in all economies of the world. As financial institutions, they are involved in financial intermediation; mobilizing financial resources and channeling them into the economy for productive usage.

Particular qualities of insurance companies participation in investment processes are connected with insurers' double nature.

From the one hand, insurance companies possess large amount of investment resources, from the other – as subjects guarantee the defrayal of certain possible unfavorable losses as a consequence of undesirable factors influence on investment activity. As for another aspect, that is the main destination of insurance companies as participators of financial market.

Thus, by insurance companies investment activity implementation it is necessary to consider the close interconnection between insurance and investment activity, the «secondary character» of the investment activity on Ukrainian insurance market with respect to insurance activity and clearly regulation of domestic insurers' investment activity. Therefore the insurance companies investment portfolio formatting and optimization problem is very important.

As institutional investors, insurance companies are among the most important participants in the financial market, especially in the capital market. One of the important factors that determine the structure of investments of insurance companies in the world, certainly are the level of development of financial markets in a country, because if the capital market is more developed, there are more high quality paper and as more investors to invest in it.

Therefore, when making investment decisions in the types of assets will qualify for the funds, portfolio managers must take into account the safety of those investments. If the insurance companies own the remaining funds invested in high-risk assets would be uncertainty about the fulfillment of their basic functions. For this reason, insurance companies have to sell their assets primarily in low risk assets.

LITERATURE REVIEW

Problems of insurance portfolio formation have been investigated by scientists and practical experts: D. S. Nesterova, K. O. Grave and L.A. Luntzt, E.T. Kagalovska, L.A. Motylev, F.C. Gulya ev and others. Works of N. Yu.Shurigina, K.E. Turbina, L.V. Yurchenko are devoted to practical aspects of insurance portfolio management. K.G. Vobly, V.B. Gomel, A.A. Peresada, O.G. Shevchenko made an important contribution to insurance portfolio theory. T.Yu. Yuldashev and Yu.M. Tronin have elaborated the predicted and a posteriori models of insurance portfolio.

Nesterova D.S. [1] defines the purpose of optimization of the investment portfolio of the insurance company. General restrictions for the insurance company, compliance with which is a requirement in the investment activities of the insurer are studied. Determined that criterion for selection of assets to the investment portfolio is the ability to comply with all principles of investment activity of insurer — diversification return, profitability and liquidity. Havrylyak T.S. [2] substantiates the necessity of forming the optimal structure of the investment portfolio. The dynamics of the assets of insurance companies and areas of placement of insurance reserves.

Shurigina N.Yu. [3] discusses the importance of investment the insurance company in various aspects. It's generalized causes and factors that hinder investment of domestic insurers and

determined legal and economic measures from the government for investment to strengthen the insurance market.

Author of article [4] defines the term «investment portfolio» and investigates how to optimize the process of forming the investment portfolio of the insurance companies of Ukraine in view of regulatory restrictions and factors that determine the effectiveness of their investment. The same problems have been discussed in [5].

Insurance portfolio management allows to provide opportunely response to environment and internal system of insurer and to form balanced insurance portfolio as basis of insurance company reliability. That's why investigation of insurance portfolio management abilities and ensuring its equilibration are of great importance.

In aforenamed articles practical and theoretical aspects of insurance portfolio have been investigated as well as peculiarities of insurance portfolio optimization. But to statistical investigations of asset risks were not given consideration and risk distribution differential function have not been examined.

PURPOSE OF THE ARTICLE

The research objective is to examine theoretical and practical aspects of insurance portfolio optimization of NJSIC «Oranta».

KEY RESEARCH AND FINDINGS

One can define the main tasks of insurance company investment portfolio management:

- ensuring higher pace of economical development of insurance company due to effective investment activity;
- ensuring the maximum profit. In the presence of some alternatives, the most profitable is chosen which secure the acceptable risk ratio;
- ensuring the investment risk minimization. By unfavourable conditions on financial market risks may cause not only investment profit loss but negative consequences in insurance activity perfomance because the most part of invested capital of insurance company is the debt capital formed at the expense of insurance resources;
- ensuring financial stability and solvency of insurance company during investment activity implementation.

Investment activity is connected with financial resources withdrawal from insurance company turnover, that may cause reducing of insurer' solvency on revenue expenditures. Most insurance company investments is accomplished at the expense of debt capital, and that is why their influence on financial stability and solvency of insurance company must be forecasted beforehand.

Insurance company investment portfolio is characterized by certain peculiarities:

- high portfolio liquidity connected with character of debt capital and insurance assets liquidity legislation claims;
- low risk ratio due to clearly defined restrictions of insurer financial resources investment;
- portfolio formatting at the expense of debt capital as well as own capital that allows to control profitability ratio of insurance company investment portfolio;
- medium-dated and long-dated nature of investments.

The functions of insurance companies as portfolio investors could be defined in such a way [6,7]:

- individual investors financial resources mobilization into insurance fund and their transformation into investment capital;
- accumulate and own funds investment in legislative resolved aseets;

- balancing of capital market demand and proposition by financial resources redistribution between suppliers and customers of investment capital;
- investment risks diversification;
- arrangement of conditions for liquidity increasing by professional asset managers facilities attraction.

The aim of insurance company investment portfolio is to obtain maximal investment profit on the assumption of general restrictions observance by all financial market participants:

1) financial tools usage restrictions;

2) asset investment process state regulation and control;

3) the necessity of well-grounded investment of own funds considering investor' financial state;

4) investment portfolio liabilities structure peculiarities;

5) the necessity of availability of certain volume of high- liquidity assets with the purpose of insurance company badly quantitative analysed risks liabilities performance;

6)the experience of actuaries and analitic managers with the purpose of insurance company investment portfolio certain ratio security ensuring [7].

The basis of legislative support of insurance reserves investment is the Law of Ukraine "About insurance", the Rules of formatting, accounting and investment of insurance reserves of non-life insurance and the Rules of formatting, accounting and investment of insurance reserves of life insurance.

Insurance recourses investment considering current legislation claims means upholding of legislative: 1) investment directions; 2) investment principles; 3) investment norms. Moreover, insurance law determines the main principles of means of insurance resources investment as: security, liquidity, profitability and diversification.

With the purpose of practical recommendations of insurance organization investment portfolio formation the effective portfolio of permissible risk of NJSIC «Oranta» using Markowitz' theory has been calculated. As main indices the model uses yield and risk which completely could be calculated for certain portfolio tools.

Risk is a probabilistic valuation, its quantitative estimation couldn't be unequivocal and clearly predictable. Depending on realized calculation methodic the risk value could appreciably change. The main methods of risk estimation are realized in practice: conjuncture sensitivity estimation and probable profitability distribution estimation [7-9]. The first approach consists in risk calculation as asset profitability variation spread (V), on the assumption of pessimistic ($R_{\text{п}}$) and optimistic ($R_{\text{оп}}$) profitability estimation. Profitability variation spread acts as risk measure (range of profitability change) associates with certain financial asset:

$$V = R_{\text{оп}} - R_{\text{п}} \quad (1)$$

The more is the expected profitability change spread (range) from the lowest to highest value, the more is the risk. Some experts are convinced, that only alternatives characterised by risk less than expected ratio should be taken into account by investors.

For second approach the initial indices are of financial aseets profitability forecasting estimation (R_i) and their probabilities (P_i). The most widespread risk measure is dispersion or standard deviation of expected profitability [8]. The possibility of certain incident forecasting with highest probability allows to elaborate risk counteraction strategy plan. The ratio of risk value and yield is estimated using statistic methods, probability allows to obtain the quantitative risk characteristics.

The stochastic approach defines not the probability of certain loss value but the probability that loss value will not exceed certain established value is defined.

Let‘s consider stochastic approach to risk value of insurance organization investment tool estimation. Let assume that the ranged sample of certain financial tools yield values (X_i, % ; i=1, n) based on previous years’ activity results is known and is considered to be ranged. Using the results of the sample has been built the interval row of relative frequencies.

Let Δ_i is the interval length. Thus based on i-th interval the rectangle was built whose area is equal to W_i, and its altitude is $h_i = W_i / \Delta_i$. As a result the stepped figure – the distribution histogram as the analogue of empirical probability density has been obtained [10].

The problem is to define frequency distribution using sample data. For specific sample the hypothetical distribution function $F(x)$ has been chosen and choice verification using goodness of fit χ^2 [10] has been performed. If the hypothesis of hypothetical distribution function $F(x)$ choice adequacy is confirmed, the value of risk could be defined. On the assumption of known distribution law $F(x)$ (or $f(x)$), the probability that investment yield will be less than given yield value R, could be found from.

$$P = \int_{-\infty}^{R} f(x)dx. \tag{2}$$

It should be noted that not all investment pattern could be estimated in correspondent manner and actually their employment in optimal investment portfolio formation is incorrect [7]. Thus in structure of assets represents insurance resources the considerable segment of claims to reinsurers is emphasized. This asset is not a financial tool and only determines the value of insurance resources which could be paid by reinsurer in case of insurance incident approach. That is why such group of assets have not been taken into account by optimal investment portfolio calculation. Moreover it turned out that the mean yield of immovable property is negative and also have not been included into calculation as long as its weight in process of optimization would be equal to zero.

Costs on account current and cash have not been included into analysis because they are characterized by almost zero profitability and are intended to ensure only current liquidity of the insurer. Mortgage deeds and investments in Ukrainian national economy resolved by cabinet have low weight in total portfolio (in total – 0,6%) and have not been taken into account because of profitability calculation complication. Industrial bonds haven’t been analysed on account of large number of bond issuers and issue conditions variety. Furthermore their slight weight in real resources portfolio and low demand during crisis period essentially complicate the adequate analysis of industrial bonds profitability. Certainly, industrial bonds are perspective investment pattern but nevertheless it is more reasonable to implement such investment on economy growth stage.

Thus obtained indices of insurers resources portfolio patterns mean profitability have been used in Markowitz’ model [11] shaped in the form of formula (3):

$$\begin{cases} \sum_{i=1}^{N} w_i r_i \rightarrow max \\ \sqrt{\sum_{a=1}^{N} \sum_{b=1}^{N} (w_a w_b cov_{ab})} \leq y_{req} \\ 0 \leq w_i \leq 1 \\ \sum w_i = 1, \end{cases} \tag{3}$$

where w_i – weight of i-th tool in insurance resources portfolio; r_i – profitability of i-th tool; N – tools number; cov_{ab} – covariation between pairs of different tools; y_{req} – maximum permissible risk of insurance resources portfolio.

The model has been realized using intrinsic functions of MS Excel 2010. The statistical data of asset value has been used [12]. Obtained results are represented in tab. 1.

Table 1 – Calculated ratios of risk and profitability

Asset	Profitability, %	Risk, %
Bank deposit (UAH)	12,4	4,8
Metals	22,1	65,9
Shares	37,3	201,8
State bonds	11,9	4,4

[own development]

The asset structure of NJS IC «Oranta» presented the insurance reserves and calculated optimal portfolio structure are represented in tab. 2.

Table 2 – The asset structure and **o**ptimal ratio of analyzed assets in investment portfolio, **%** of NJSIC «Oranta»

Asset	Asset structure, %			Optimal portfolio,%
	2014	2015	2016	
Costs on account current	12,4	12,4	13,2	13,75
Bank deposit (UAH)	33,3	38,8	35,1	44,59
Metals	1,4	1,3	1,2	7,75
immovable property	2	1,2	2,2	–
Shares	35,4	29,4	39,5	14,05
Mortgage deeds	0,1	0,2	0,3	–
State bonds	2,3	2,4	2,7	4,77
Claims to reinsurers	12,9	14,2	5,8	15
Cash	0,1	0,1	0,00	0,09
Total	100,0	100,0	100,0	100

Source: [12] and [own development]

CONCULUSIONS

Comparing the calculated structure of optimal investment portfolio with real data of NJSIC «Oranta» assets investment one could resume:

1. Investment portfolio is insufficiently filled by bank deposit (UAH). This leads to income deficiency since deposit interest in UAH is higher. Though deposits in foreign currency are not in the least represented in portfolio. Thus such portfolio is not enough protected from currency risks.

2. Shares of Ukrainian issuers increase total portfolio risk, whose weight exceeds optimal ratio. Having enough high profitability, at the expense of market value fluctuations and correspondent risk ratio, shares needs careful analysis while choosing concrete issuer.

3. State bonds are not paid enough attention by NJSIC «Oranta», though they are enough profitable and from the other hand – ultrareliable, that is optimal by criteria « risk – profitability».

4. Insufficiency of metals as high-risky but highly remunerative asset in investment portfolio of NJSIC «Oranta» leads to loss of possible profit. From the point of profitability forecasting the metals are the most complicated asset. Though in short-term outlook, in phase of financial market reviving when, as a rule, metals rise in price, such investment could be advantageous on the assumption of quick profit fixation.

5. As for investments in Ukrainian national economy, it should be noted the existing of great problem for our country.

Insurance company investment portfolio optimization should be performed permanently and should be based on systematic monitoring, using statistical data and mathematical methods and on portfolio structure diversification.

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