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TECHNIQUE FOR ASSESSING RELIABILITY OF INSURANCE COMPANIES

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Abstract. The purpose of this study is to improve the research technique for assessing the reliability of non-life insurance companies' position. In this study, the author considers problems of assessment of reliability of insurance companies' position. The author analyses indicators enabling to make complex assessment of insurance companies' reliability. A technique of creating an integral indicator by using different methods of determining weighting rates of ratios validity is offered. Practical example of using an integral indicator of reliability of Latvian non-life insurance companies on the basis of public information is introduced. Rating is a risk indicator for potential consumers of insurance services. The offered technique may serve as an instrument for analysis of the reserves for enhancing reliability and competitiveness of insurance companies.

Keywords: composite indices method, methods of reliability, insurance company, fuzzy set.

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JEL classification: G22, G24.

1. Introduction

At present, there exist a number of various techniques for assessing the reliability of institutions (insurance companies, banks, enterprises): rating assessment, point assessment of reliability and financial state, techniques of bankruptcy probability. As a rule, most techniques of rating assessment rely on public and internal information. Special agencies are granting ratings. In her works (Voronova, Pettere 2008, 2010), the author studied the development of rating approach to the assessment of reliability of Latvian insurance companies. The author investigates the possibility to use the technique of creating integral indicator of reliability in order to assess reliability of insurance companies. This technique has a scientific and practical interest. The conducted research was based on information comprised of indicators that describe activities of non-life insurance companies in Latvia. These indicators can be defined only by availability of public information. In 2010, there were 9 companies in the non-life insurance market, which conformed to Solvency I criteria by 31 December 2009.

Unlike other participants of the financial market, assessment reliability of insurance companies is connected with the probability character of activities undertaken by insurance companies. Discussion on the criteria of insurance companies' comparison is combined with the problem of determing the ability of an insurance company to meet all of the obligations to indemnify the insured. Rating is the function of risk management for service users. In its turn, insurance companies' rating is a marketing function.

2. Methods of determining weighting ratios referring to the assessment of economic objects

Methods of determining weighting ratios referring to the assessment of economic object has a history of development dating back more than a century. The method of creating "a formula of comparative assessment of projects" as one of the first variants of the technique of composite indicators was mentioned in 1908, when Krilov stated his "considerations about drawing up a formula of comparative assessment" for a battleship project taking part in an international competition (Hovanov 2005). Long years of history of practical application of the composite indices method demonstrated its universality. Universality of composite indices method is connected with the widespread general idea of scalar and vector assessment of complex objects in different branches of science. The composite indices method (CIM) (Hovanov 2009) demonstrated its universality. Universality of composite indices method is connected with the widespread general idea of scalarizations of vectorial criterion of complex objects in different branches of science. CIM method is also used to assess consumers' interest in benefits. CIM and randomize aggregative indices method (Mikhaylov 2007) are applied in the theory of economic indices enabling to conduct multi-parametric assessment of different objects.

For instance, in realization of the project Sustainability Index methodology in Latvia indices method is applied (Avena 2010). Sustainability Index methodology is the Latvian research product, however, it is based on corporate social responsibility theory as well as on the most notable global indices – Dow Jones Sustainability Index and Business in the Community made of Corporate Responsibility Index. Sustainability Index used in calculating the 93 questions in 5 sections – profile and strategy (K_1), the work environment (K_2), market relations (K_3), society (K_4) and the environment (K_5). Each section and each item have its own weight in the question section and a number of the criteria of sustainability, the role of the company overall assessment. For example, the criteria weights are the following: $K_1 = 0.1$, $K_2 = 0.35$, $K_3 = 0.14$, $K_4 = 0.15$ and $K_5 = 0.25$.

Among the techniques of developing integral indicators stand out applied studies, based on the method of composite indicators or randomized composite indicators (Hovanov 2005, 2009; Mikoni 2009), which enable to develop scales of integral assessment of properties upon a greater number of criteria on the basis of existing classifications and common features. Multicriteria evaluation differs from the criteria and normalization technique of the initial data and has a very broad scope – from assessing the effectiveness of integrated financial-economic activities of enterprises in various industries (Ginevičius, Podvezko 2009, 2008a; Ginevičius, Zubrecovas 2009), the reliability of the credit institutions to measure the quality of training specialists in higher education (Mikhajlov 2007) to the evaluation of social phenomena (Ginevičius, Podvezko 2008b).

The method of analytic hierarchy process (AHP) developed by T. Saaty (2005, 2008) can be used for calculations of integral indicator. The method presents information processing received by means of couple comparison of each level indicator fulfilled by experts. According to the method of hierarchies' analysis it is sufficient to have range preference (priorities) assessments (better, worse, approximately, equal). There are various examples of the AHP method for assessing the risks of investment projects, such as construction (Ustinovichius *et al.* 2009).

Determination of integral indicator may be produced by using the method of range correlation, allowing lying out objects of study in the increasing or decreasing order of any of their appropriate feature. To do this, it is necessary to correctly make receipt and processing of expert assessments. Complex assessment may be made on the basis of fuzzy descriptions (Doumpos, Zopounidis 2002; Nedosekin 2003a; Ahrameiko *et al.* 2004; Demidova 2009). For example, in the study by A. Nedosekin (2003b) for aggregating it is offered to use OWA-operator Jager (OWA – Ordered Weighted Averaging) (Yager 1993), moreover, Fushbern's ratios serve as weights in convolution.

There exist methods of calculating ratings which are based on the comparison of rated object on every financial-economic indicator with a standard object. In this case, the initial point for obtaining rating assessment is not subjective expert opinion, but established best results out of all combination of compared objects. Such methods as method of sums, method of sum places, method of geometrical average, method of distance (Taxometric method) and many other are used in different sources. Application of taxometric method for forming the reliability rating of insurance companies is considered by the author (Voronova, Pettere 2010). Each of the mentioned methods has its advantages and disadvantages. Therefore there may exist many methods and it is not possible to determine, which is better and more objective than others as the used method is related to the aim of its user.

3. Choice of indicators for assessing reliability of insurance companies

There exist a number of indicators characterizing the activities of insurance companies. The choice of indicators depends on the purposes of assessment. To select indicators it is necessary to meet the following two requirements: to calculate indicators only public information must be used and there should be absence of linear interdependence of ratios. The first requirement refers to the fact that many specialized indicators on the state of an insurance company require information not available in public. If the latter requirement is not met, assessment of reliability based on adequate convolution provides an incorrect result.

Analysing 120 literary sources in Latvian and English the author selected 64 financial indicators and drew up a table of the frequency. In conducting analysis financial indicators were divided into 9 groups: solvency indices, operative activity indices, profitability indices, leverage, liquidity indices, coverage ratio, cash flow ratio, different assets indices and other indices. Identified top 20 financial indicators used by insurance companies' activities analysis are shown in Fig. 1.

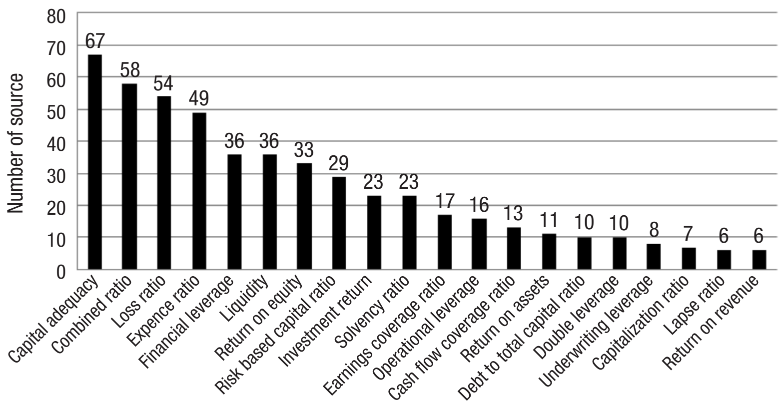

Fig. 1. Identified financial indicators of top 20 insurance companies' activities analysis[1]

The author singled out the first group of indicators – solvency (F_1), where were selected the most popular financial indicators characterizing operational efficiency (loss ratio and expense ratio), which occupy the third and the fourth place in popularity in the system of financial indicators as well as the indicator of investment efficiency (gross return rate of investments) (the ninth place in popularity), liquidity index (the sixth place) and reinsurance indicator (Fig. 1). The author refused to include combined ratio in the first group as there exists linear dependence between combined ratio and loss and expense ratios. In selecting indicators it is necessary to take into account the problem of determining probability of an insurance company to meet all its obligations in insurance premiums that is why the author offered to single out the second group of indicators connected with insurance company ability to undertake risks (F_2). This group contains indicators characterizing sufficiency of capital and reserve leverage. The third group of indicators characterizes insurance company competitiveness and commercial potential (F_3). This group incorporates 4 indicators. Thus, the total number of indicators amounts to 13 and these indicators were grouped into 3 base groups. Key indicators of the tree of criteria of assessment of non life insurance companies' reliability are given in the Fig. 2.

[1] The study was conducted jointly with I. Gregore. The study materials used by international rating agencies – Standard & Poor's (ASV), Fitch Ratings (ASV), Moody's Investors Service (ASV), AM Best (ASV) and other materials.

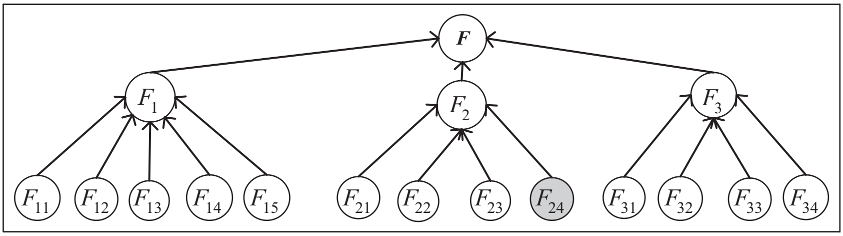

Fig. 2. Structure of indicators of assessment of non-life insurance companies' reliability:
F – selected factors of non-life insurance company reliability assessment; F_1 – solvency; F_2 – ability to undertake risks; F_3 – competitiveness and commercial potential; F_{11} – loss ratio; F_{12} – expense ratio; F_{13} – liquidity ratio; F_{14} – rinsurance indicator; F_{15} – gross return rate of investments; F_{21} – company own capital over the minimum capital requirements by law; F_{22} – own capital over technical reserves; F_{23} – own capital over earned premiums; F_{24} – own capital over incurred claims; F_{31} – market share; F_{32} – gross premium growth rate; F_{33} – gross premium growth rate; F_{34} – reserve adequacy ratio

If any two predictors are perfectly correlated (correlation coefficient between any two predictors is greater than or equal 0.75), then there a multicollinearity problem may arise between predictors. Hence, it is not feasible to use closely correlated indicators in one model. Correlation analysis was done to see which factors are highly correlated to avoid multicollinearity problem. Table 1 shows obtained correlation matrix which is determined by using Pearson's method.

Given indicator, besides company own capital over incurred claims (F_{24}) refers to independent or poorly dependent indicators that are proved by conducted correlated analysis (Table 1). Thus, to draw up complex indicator of reliability the author left only 12 indicators (Table 2).

Table 1. Correlation matrix

	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}	F_{21}	F_{22}	F_{23}	F_{24}	F_{31}	F_{32}	F_{33}	F_{34}
F_{11}	1.00												
F_{12}	0.68	1.00											
F_{13}	–0.45	–0.83	1.00										
F_{14}	–0.17	0.513	–0.684	1.00									
F_{15}	0.60	0.76	–0.77	0.43	1.00								
F_{21}	–0.31	–0.64	0.62	–0.62	–0.55	1.00							

Continued Table 1

	F_{11}	F_{12}	F_{13}	F_{14}	F_{15}	F_{21}	F_{22}	F_{23}	F_{24}	F_{31}	F_{32}	F_{33}	F_{34}
F_{22}	–0.27	–0.173	–0.186	0.166	0.06	–0.06	1.00						
F_{23}	–0.61	–0.52	0.58	–0.01	–0.61	0.040	0.16	1.00					
F_{24}	–0.71	–0.49	0.54	0.10	–0.59	0.04	0.16	0.98	1.00				
F_{31}	–0.23	–0.41	0.34	–0.39	–0.29	0.18	–0.08	–0.04	0.00	1.00			
F_{32}	0.42	0.13	–0.031	–0.37	0.49	0.36	0.029	–0.47	–0.475	0.01	1.00		
F_{33}	–0.55	–0.57	0.182	0.10	–0.52	0.34	0.26	0.21	0.20	0.21	–0.445	1.00	
F_{34}	–0.33	–0.65	0.64	–0.42	–0.78	0.14	0.06	0.73	0.61	0.21	–0.553	0.38	1.00

4. Defining weighting ratios of complex assessment of non life insurance companies reliability

Complex indicator (*CI*) of insurance company reliability assessment is found by double convolution according to the formula

$$CI = \sum_{i=1}^{n} \beta_i \sum_{j=1}^{m} \alpha_{ij} R_j , \qquad (1)$$

where: – indicator; β_i – weight i of the group of base indicators; α_{ij} – weight j of indicators within the framework of the group of base indicators.

Each group of base indicators and each indicator within the group are assessed according to their usefulness, then a system of weights for base n group indicators and every indicator (R_j) within the framework of base groups is drawn up so that

$$\begin{cases} \sum_{j=1}^{n} \beta_i = 1, \\ \beta_i \geq 0, i = 1, \ldots, n, \end{cases} \quad \text{and} \quad \begin{cases} \sum_{j=1}^{m} \alpha_{ij} = 1, \\ \alpha_{ij} \geq 0, j = 1, \ldots, m, \end{cases} \qquad (2)$$

where: n – a number of base groups $(n = 3)$ (Fig. 2), m – a number indicator within the group.

A calculation of complex assessment according to the groups of base indicators, in the author's option, enables to arrange insurance company not only on the aggregate of indicators, but also on each of the groups of base indicators. Such an approach of complex assessment is likely to find out reserves of increasing reliability and competitiveness as well as direct management decisions on improving those parameters, where competitors have advantages.

Let us consider different ways of finding weighting ratios, received by ranging groups and indicators within the framework of groups. If all base groups and indicators in groups have equal usefulness, then weights of base groups and indicators within the framework of the group of base indicators are determined according to the formulae:

$$\beta_i = \frac{1}{n}, \quad \text{and} \quad \alpha_{ij} = \frac{1}{m}, \tag{3}$$

where: n – a number of base groups indicators; m – a number of indicators in each of base groups indicators.

In the case when there exists a system of preferences base groups and indicators in a group are ranged according to the descending of usefulness. In this case to determine base group weights and indicators in a group it is recommended to use Fishburn's scale (Baron, Barrett 1996; Potapov, Evstafjeva 2008):

$$\beta_j = \frac{2(n-i+1)}{n(n+1)}, \quad \text{and} \quad \alpha_{ij} = \frac{2(m-j+1)}{m(m+1)}, \tag{4}$$

where: i, j – the number of current base group and the number of indicators within the framework of every base groups.

To determine weighting ratios may be principle of fuzzy descriptions. The function $j:[0,1]] \to [0,1]$ meets $j(0)=0$ and $j(1)=1$. Weighting ratios are determined by the formula

$$\alpha_i = j(\frac{1}{n}) - j(\frac{i-1}{n}), i = 1,...,n, \tag{5}$$

where: i – the number of indicator; n – a number of indicators.

One may choose any function, for example polynomial of second order: $j(x) = ax^2 + bx + c$. As $j(0)=0$, then $c=0$.

5. Sample evaluation reliability of non life insurance companies

The study was carried out based on 10 Latvian non life insurance companies. In her research the author used the available data for 2009 year. Initial data for assessing reliability of insurance companies are given in Table 2. To create weighting systems 3 experts were enquired. To avoid overloading the study with mathematic calculations, let us suppose that expert opinions are agreed upon to a certain degree. The study introduces calculations of weighting rations only by 2 methods: by using Fishburn's technique and fuzzy cluster.

If the significance of both basic groups of indicators and indices in the groups are equivalent, then the formula (3) weights of basic groups (β_i) in this case is – 0.333, but weighting ratios of the first core group $\alpha_{1j} = 0.2$, for the second performance

$\alpha_{2j} = 1/3$ and third groups are $\alpha_{3i} = 0.25$. Using formula (4), for example, basic groups $F_1 > F_2 > F_3$ we have weights for each of the basic groups

$$F_1 : \beta_1 = \frac{2(3-1+1)}{3(3+1)} = 0.5,$$
$$F_2 : \beta_2 = \frac{2(3-2+1)}{3(3+1)} = \frac{1}{3} = 0.333,$$
$$F_3 : \beta_3 = \frac{2(3-3+1)}{3(3+1)} = 0.167.$$

System of weighting ratio for the first base group indicators having preferences

$F_{11} > F_{12} > F_{13} > F_{14} > F_{15}$ is $\alpha_{11} = 0.333$; $\alpha_{12} = 0.267$; $\alpha_{13} = 0.2$; $\alpha_{14} = 0.133$ and $\alpha_{15} = 0.067$.

System of weighting ratio for the second base group indicators having preferences $F_{21} > F_{22} > F_{23}$ is $\alpha_{22} = 0.333$; $\alpha_{23} = 0.1667$. System of weighting ratio for the third base group indicators having preferences $F_{31} > F_{32} > F_{33} > F_{34}$ is $\alpha_{31} = 0.4; \alpha_{32} = 0.3; \alpha_{33} = 0.2; \alpha_{34} = 0.1$.

Table 2. Investigated insurances' companies 2009 indicator matrix (example)*

Factors	Insurance company code									
	1	2	3	4	5	6	7	8	9	10
F_1 Insurance company solvency										
F_{11}	0.534	0.459	0.574	0.711	0.637	0.547	0.612	0.537	1.092	0.610
F_{12}	0.402	0.515	0.434	0.526	0.322	0.328	0.315	0.324	0.672	0.347
F_{13}	1.284	0.854	0.530	0.331	1.535	1.394	1.377	1.732	0.552	1.384
F_{14}	0.015	0.500	0.304	0.361	0.029	0.021	0.007	0.079	0.087	0.059
F_{15}	3.865	8.681	8.547	7.486	4.487	5.350	7.274	2.186	11.441	7.195
F_2 Insurance company ability to undertake risks										
F_{21}	11.100	1.513	2.699	1.190	10.194	4.034	12.166	4.947	0.666	2.977
F_{22}	0.727	0.473	2.699	0.348	0.533	0.681	0.736	0.835	0.320	0.762
F_{23}	0.484	0.649	0.546	0.391	0.426	0.563	0.554	1.082	0.262	0.601
F_{24}**	0.905	1.412	0.950	0.550	0.669	1.029	0.906	2.016	0.240	0.986
F_3 Insurance company competitiveness and commercial potential										
F_{31}	0.205	0.040	0.064	0.043	0.236	1.029	0.224	0.051	0.025	0.045
F_{32}	–0.315	–0.388	–0.312	–0.589	–0.339	–0.388	–0.003	–0.579	–0.086	–0.362
F_{33}	11.000	11.000	14.000	15.000	16.000	13.000	13.000	13.000	6.000	10.000
F_{34}	1.27	0.98	1.26	1.34	1.38	1.53	1.26	1.98	1.03	1.47

*Calculated by the author on the basis of the given financial statements on 2009 available on the home page of insurance companies – Balta, BAN, RSK, Balticums, BTA, If, ErgoLatvija, Gjensidiga and SEESAM
**Excluded from drawing up complex indicator of insurance companies reliability

To draw up a system of weighting ratios 3 experts are used. Total weighting ratio is calculated as a mean arithmetic of weights, determined by experts. There were no difference in opinions on ranging indicators of base groups and indicators of the first and third groups. As for preferences of the third group of indicators, there were distinctions, which are summed up in Table 3.

Table 3. Meaning of weighting ratios and their mean values for third base group indicators

Expert	F_{31} – Market share	F_{32} – Gross premium growth rate	F_{33} – Portfolio diversification	F_{34} – Reserve adequacy ratio
First	0.4	0.3	0.2	0.1
Second	0.4	0.3	0.1	0.2
Third	0.4	0.2	0.1	0.3
Mean value	0.4	0.267	0.133	0.2

As for preferences, let us consider determination of weighting ratios by using the principle fuzzy cluster for base groups of indicators. By formula (5) we have:

$$\begin{cases} \beta_1 = \mathrm{j}(1/3), \\ \beta_2 = \mathrm{j}(2/3) - \mathrm{j}(1/3), \\ \beta_3 = \mathrm{j}(3/3) - \varphi(2/3). \end{cases} \quad (6)$$

Let us take that $\phi(1/3) = 0,5$, which corresponds to the firts weight ratio calculated on the Fishburn's formula. As a $\phi(x) = ax^2 + bx + c$ and $c = 0$, we have

$$\begin{cases} \mathrm{j}(\frac{1}{3}) = a \cdot (1/3)^2 + b \cdot \frac{1}{3} = \frac{a}{9} + \frac{b}{3} = 0.5, \\ \varphi(1) = a + b + 1. \end{cases} \quad (7)$$

From (7) find $a = -0.75,\ b = 1.75$. Thus, as a result $\phi(1/3) = 0.5.$ Let us calculate weighting ratios for the rest base groups

$$\beta_2 = \phi(2/3) - \phi(1/3) = -0.75 \cdot 4/9 + 1.75 \cdot 2/3 - 0.5 = 0.83334 - 0.5 = 0.33334,$$
$$\beta_3 = \phi(1) - \phi(1/3) = 1 - 0.83334 = 0.16666.$$

A determined quantity of weight ratios coincided with the meanings calculated according to Fishburn's technique. Weights of each base group determined by the four methods are presented in Table 4, column "Weight of base groups of indicators", which is divided into four parts: on the left – all base groups have equal meaning, in the middle – base groups are strictly ranged, weights are determined by Fishburn's technique, on the right – weights of base groups are assessed with a view to expert opinions, and on the last – on the basis of fuzzy cluster principle.

Table 4. Comparison of weighting ratios of base groups

Code	Name of base groups	Weight of base groups of indicators β_i			
F_1	Insurance company solvency	0.334	0.5	0.5	0.5
F_2	Insurance company liability to undertake risks	0.333	0.333	0.333	0.333
F_3	Insurance company competitiveness and commercial potential	0.333	0.167	0.167	0.167

Similarly, we define weights for each of the basic groups. The results are the following:

$$\alpha_{11} = 0.334; \alpha_{12} = 0.266; \alpha_{13} = 0.2; \alpha_{14} = 0.134; \alpha_{15} = 0.066,$$

$$\alpha_{21} = 0.416;\ \alpha_{22} = 0.334;\ \alpha_{23} = 0.25.$$

The calculations provide evidence of some difference in the weights only in the second subgroup. Based on these weights and the initial data (Table 2), a comprehensive indicator of reliability of the insurance company is determined according to the formula (2). Example of calculating the complex index of reliability for the insurance companies' initial data for 2009 is given in Table 5.

Table 5. Example of calculating the complex index of reliability of non life insurance companies (2009, Fishburn's technique)

Factors	Weight inindicator	Insurance company code									
		1	2	3	4	5	6	7	8	9	10
F_1	0.500	0.401	0.553	0.525	0.495	0.454	0.454	0.524	0.384	0.714	0.530
F_{11}	0.333	0.178	0.153	0.191	0.237	0.212	0.182	0.204	0.179	0.364	0.203
F_{12}	0.267	0.107	0.137	0.141	0.140	0.086	0.087	0.084	0.086	0.179	0.092
F_{13}	0.200	0.257	0.171	0.106	0.066	0.307	0.279	0.275	0.346	0.110	0.277
F_{14}	0.133	0.002	0.067	0.041	0.048	0.004	0.003	0.001	0.010	0.012	0.008
F_{15}	0.067	0.258	0.579	0.570	0.499	0.299	0.357	0.485	0.146	0.763	0.480
Total F_1	1.000	0.802	1.107	1.049	0.991	0.908	0.908	1.049	0.768	1.428	1.060
F_2	0.333	1.958	0.341	0.541	0.258	1.782	0.779	2.140	0.977	0.161	0.614
F_{21}	0.500	5.551	0.757	1.350	0.593	5.097	2.017	6.083	2.473	0.333	1.489
F_{22}	0.333	0.242	0.158	0.182	0.116	0.178	0.227	0.245	0.278	0.107	0.254
F_{23}	0.167	0.081	0.108	0.091	0.065	0.071	0.094	0.092	0.180	0.044	0.100
Total F_2	1.000	5.874	1.023	1.622	0.774	5.346	2.338	6.420	2.932	0.483	1.843
F_3	0.167	0.224	0.199	0.264	0.268	0.312	0.253	0.274	0.257	0.132	0.201
F_{31}	0.400	0.082	0.016	0.026	0.017	0.094	0.026	0.089	0.020	0.010	0.018
F_{32}	0.300	–0.094	–0.117	–0.094	–0.177	–0.102	–0.116	–0.001	–0.174	–0.026	–0.11
F_{33}	0.100	1.100	1.100	1.400	1.500	1.600	1.300	1.300	1.300	0.600	1.000
F_{34}	0.200	0.255	0.195	0.251	0.268	0.277	0.306	0.253	0.397	0.206	0.294
Total F_3	1.000	1.342	1.195	1.583	1.609	1.870	1.516	1.641	1.543	0.791	1.204
CI total		2.583	1.093	1.329	1.021	2.547	1.486	2.938	1.619	1.007	1.345

In order to divide insurance categories according to a certain scale (Table 6), the author investigates mathematical approach, taking into account that all insurance companies, which have obtained points over the first quartile, could be considered as high reliability company, between the first quartile and the third quartile could be considered as a moderate reliability company, but which are below the third quartile – as low reliability company (Voronova, Pettere 2010). The results of determining the complex index of the reliability of insurance companies using the weights found on the basis of Fishburn's technique and based on the fuzzy description shows full match results. In the dynamics of a composite index of insurance companies shows that they belong to the stable grade.

Table 6. Insurance company reliability assessment scale

2008				2009			
weights determined using				weights determined using			
Fishburn's technique		fuzzy description		Fishburn's technique		fuzzy description	
Code	Obtained assessment	Code	Obtained assessment	Code	Obtained assessment	Code	Obtained assessment
7	2.709	7	2.361	7	2.938	7	2.616
5	2.421	5	2.117	1	2.583	1	2.288
1	2.342	1	2.031	5	2.547	5	2.276
8	1.693	8	1.530	8	1.619	8	1.511
3	1.360	3	1.251	6	1.486	6	1.389
6	1.312	6	1.189	10	1.345	10	1.279
10	1.177	10	1.071	3	1.329	3	1.269
2	1.140	2	1.067	2	1.093	2	1.069
4	1.091	4	0.993	4	1.021	4	0.999
9	0.942	9	0.846	9	1.007	9	0.996

☐ – high reliability; ☐ – moderate reliability; ☐ – low reliability

Available movement of insurance companies in the second group of reliability is associated with a change in the group of indicators of their solvency. Having done a lot of research in the field of assessing insurance companies' reliability the author considers that the results of the study fully conform to the obtained ranging of insurance companies according to complex indicator.

6. Conclusions

Conducted analisis of some methods of integrated assessment of complex objects showed their versatility. The methods are not ideal, and the choice of this or that method depends on the purpose of study, availability of information and competence of specialists. There is an extensive use of multicriteria evaluation in decision-making in economic and financial sphere and ratings of economic entities. The quality of drawing up the technique of integrated assessment of reliability to a great extent is largely determined by a quality selection of indicators included in the complex indicator.

The selection of indicators was carried out using frequency analysis of the popularity of performance in financial analysis, insurance companies and the experience of international rating agencies including restrictions on publicity of information sources and the absence of a linear mutual dependence.

Selected indicators (except indicators of F_2) are independent. As for indicators of the group "Insurance company solvency" it is necessary to carry out additional research in order to find the best combination of indicators with weakly dependent parameters. Let us consider two methods of calculating the weighting ratios to assess reliability of insurance companies – on a Fishbur's technique and using the principle of a fuzzy description. Calculated ratios for methods have some drawbacks. Fishburn's technique has dependence on the number of indicators for whose weighting ratios are determined and the character of indicators is not taken into account. If exspert opinions are used for creating Fishburn's technique the competence of the experts should be up to standards.

By using the method of fuzzy descriptions, the results fully depend on a selected function. Though in this research the function was randomly chosen, the results practically did not differ from those received by using Fishburn's technique.

A practical example of using complex assessment of reliability showed an opportunity to carry out assessment of insurance companies' reliability basing on public information. Availability of double convolution in the technique enables to study additionally the reserves of increasing reliability and competitiveness of the insurance company. This technique helps to direct management improvement of those insurance company parameters where competitors have advantage.

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DRAUDIMO KOMPANIJŲ PATIKIMUMO ĮVERTINIMO METODIKA

I. Voronova

Santrauka

Šio tyrimo tikslas yra pagerinti ne gyvybės draudimo kompanijų pozicijos patikimumo vertinimo tyrimų metodiką. Nagrinėjamos šių kompanijų pozicijos patikimumo vertinimo problemos, analizuojami rodikliai, sudarantys prielaidas atlikti kompleksinį draudimo kompanijų patikimumo vertinimą. Straipsnyje siūlomas sukurto integruotojo rodiklio metodas, naudojant skirtingus reikšmingumo nustatymo būdus, pateikiama Latvijos ne gyvybės draudimo kompanijų praktinių pavyzdžių ir remiamasi viešąja informacija. Reitingas yra draudimo paslaugų potencialių vartotojų rizikos rodiklis. Siūloma metodika gali būti naudinga priemonė draudimo kompanijų konkurencingumui didinti.

Reikšminiai žodžiai: sudėtinių indeksų metodas, patikimumo metodai, draudimo kompanija, *fuzzy* metodas.

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