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IMPROVING THE ASSESSMENT OF INSURANCE COMPANIES' FINANCIAL STABILITY

Summary: *The theoretical aspects of assessment of insurance companies' financial stability were investigated. System of quality and quantity indicators was formed. Author developed methodological approach to assessment of insurance companies' financial stability.*

Key words: *financial stability, insurance company, methodological approach.*

Insurance is an important branch of the economy, which gives insurance protection for people and economic entities and generates significant investment resources for economic development. Financial soundness of insurance companies is the main condition for ensuring the ability of the insurance sector to perform its own functions and to fulfill its obligations to customers.

Objective processes taking place in the insurance market of Ukraine, e.g. the growth of the number of insurers with the interim administration, the decrease in the quality of regulation of insurance events and the decline in consumer confidence in insurance services are due to insufficient financial insecurity of insurers and low ability to cover unforeseen losses in their activities. The main reason for the low level of financial insecurity of insurers in Ukraine is the lack of the necessary theoretical and methodological support for its assessment, which would enable them to identify problems at the earliest stages of their occurrence,

to make informed decisions about the definition of tools and methods for increasing financial reliability.

The aim of the article is to develop methodological approach to assessment of insurance companies' financial stability.

Financial stability is one of the most important characteristics of the financial condition of the insurance company. It, in the first place, affects the stability of the financial relations of the insurer with other entities, in particular, consumers of insurance services. In this paper, the author agrees with the point of view V.Bezugloi, according to which financial stability is the ability of the insurance company to fulfill the insurance obligations assumed under the insurance and reinsurance contract in the event of the impact of adverse factors [1].

According to the author position, the financial stability of insurance companies includes the following components: solvency, efficiency and competitiveness. In the scientific literature [4, 6-8] a number of indicators to assess the components of financial instability insurer were developed (table 1).

Table 1

Indicators of the financial stability of insurance companies

Criterion of financial stability	Indicator of financial stability
1	2
Solvency of the insurance company	The ratio of the actual solvency margin to the standard solvency margin (X1)
	Indicator of insurance risk (X2)
	Indicator of the ratio of net insurance reserves to capital (X3)
	Level of insurance payments (X4)
The effectiveness of the insurance company	Profitability of insurance activity (X5)
	Profitability of investment activity (X6)
	The indicator of management efficiency (calculated as the ratio of revenue from the implementation of insurance services to administrative costs) (X7)
Competitiveness of an insurance company	Duration of business activity of an insurance company (X8)
	The number of structural divisions of the insurance company (X9)
	Number of types of activities of the insurance company (X10)
	Average number of staff members (X11)
	Growth rate of gross insurance premiums (X12)
	The growth rates of net insurance premiums (X13)

Continuation of table 1

1	2
Competitiveness of an insurance company	Level of diversification of the insurance portfolio (X14)
	Indicator of insurance coverage (X15)
	The share of foreign capital (X16)
	Average length of senior management work (X17)
	The company's share in the market volume of insurance premiums (X18)
	The number of complaints to the insurance company during the year (X19)

Presented in table 1 indicators do not provide a comprehensive assessment of the financial stability of an insurance company. Therefore, there is a need to develop an integrated assessment methodology that takes into account the main indicators that determine financial stability and eliminates the subjectivity of judgments of experts in determining the financial reliability of the insurer.

In order to optimize the time spent on conducting valuation procedures in the work it becomes necessary to choose the most informative indicators of financial reliability of insurance companies from those presented in table. 1. To solve this problem in the work factor analysis is used which allows to separate the interdependent index from independent, essential from non-essential, to substantiate the choice of the system of indicators, to evaluate their informativeness [3].

In the course of the work, the formation of a system of indicators for assessing the financial stability of insurance companies was carried out in accordance with the public reporting of 44 insurance companies of Ukraine, which according to the data of the information and analytical publication «Forinshurer» [5] are leaders in the insurance market of Ukraine in terms of gross and net insurance premiums.

Necessary task, which is preceded by factor analysis, is the verification of the selected indicators for the presence of multicollinearity, that is, for the existence of a close linear relationship between the coefficients, which may lead to a shift in the estimates of the model parameters and, consequently, the

impossibility of a correct interpretation of the results [3]. According to the Chaddock scale [3], the lower value of the strong correlation between the indicators is the coefficient of pair correlation with the value of 0.7. To determine from the system indicators of coefficients, which have a close linear relationship between them, the pair correlation coefficients, which should not exceed 0,7, are calculated.

According to the results of calculations, it is determined that presented in table. 1 indicators do not have a close linear relationship with each other. Therefore, all the indicators from the table 1 are included in the subsequent factor analysis.

The essence of the method of factor analysis consists in identifying hidden interdependencies between indicators that are versatile characterizing the financial reliability of insurance companies for a certain period and having different nature, reducing their plurality to a smaller number and using the new most important characteristics to explain a significant part of the variation in the data values that are analyzed [2].

In the process of performing the procedures of factor analysis performed using the software STATGRAPHICS Centurion [2].

A prerequisite for the reliability of factor analysis is the doubling of the number of observations for each indicator of the number of indicators, that is, the number of values of each indicator should be twice the number of indicators used.

In this study, this requirement is observed for a sample of insurance companies, since each of the 19 indicators is characterized by 44 observations, and at least 36 observations are sufficient.

One of the most common methods of factor analysis is the main component method (MCM). Among other similar methods, which allow generalizing the values of elementary characteristics, MCM stands out as a simple logical construct. The method of the main components makes it possible to allocate m-numbe of the main components or generalized features on the m-number of initial

characteristics. The space of the main components is orthogonal. The mathematical model of the method of the main components is based on the logical assumption that the value of the set of interrelated attributes generates some general result [2].

MCM consists of a sequential search of factors. The search for a simple factor structure is carried out using various orthogonal or oblique rotation procedures, in which the value of some factor loads increases, while others decrease. The most commonly used procedure (Varimax), which maximizes the variation of the squares of factor loads for each component and simplifies the interpretation of selected general factors [2].

The obtained results of factor analysis for insurance companies are presented in the table 2, where the required number of factors is determined by the magnitude of the accumulated dispersion. Sufficient is the value of the accumulated dispersion, which is higher than 70%. This demonstrates that the created factors really explain 70% of the variability of the investigated process or phenomenon, and 30% are explained by other factors [2].

Table 2

Characteristics of factors that determine the financial stability of insurance companies

Factor	The actual value of the factor	Percentage of total dispersion	Percentage of accumulated dispersion
1	3,19775	16,82982	16,82982
2	2,42299	12,75279	29,58261
3	1,91297	10,06881	39,65142
4	1,81423	9,54822	49,19964
5	1,62070	8,53035	57,72999
6	1,59781	8,40936	66,13935
7	1,35470	7,12953	73,26888
8	1,31060	6,89754	80,16642

The results of the conducted factor analysis (table 2) demonstrated that it is advisable to assess the financial soundness of insurance companies based on the eight factors obtained, which explain 80.16% of the variability of the financial

reliability assessment. The presence of eight factors is due to the variability of indicators that characterize all aspects of the financial soundness of insurance companies. Each of the selected factors includes all the analyzed indicators, but to reduce the size of the number of coefficients, their significance is assessed on the basis of the size of the load. It is believed that the figure entered the factor if the corresponding load is greater than 0.70. Such a load is called weighty or significant [2].

According to the results of rotation according to the procedure, the factor loads obtained in the table 3 are obtained, which show a correlation between indicators and factors.

Table 3

The tightness of the link between the indicators of financial reliability and generalized factors

Indicator	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8
X1	0,48	0,21	-0,06	0,03	0,86	-0,19	-0,07	-0,01
X2	-0,04	0,19	0,02	-0,14	-0,41	0,61	0,06	0,02
X3	0,06	0,91	0,04	0,06	0,01	-0,01	-0,03	-0,06
X4	-0,47	0,30	0,35	-0,34	0,46	0,00	-0,10	-0,24
X5	-0,03	0,01	-0,14	0,91	-0,04	0,07	0,00	0,03
X6	-0,36	0,19	0,79	-0,02	-0,20	0,00	-0,02	0,20
X7	-0,23	0,21	-0,63	-0,22	-0,11	0,30	0,20	0,45
X8	0,11	0,51	-0,43	0,24	-0,10	0,29	-0,18	0,19
X9	-0,19	0,37	0,18	0,89	0,12	-0,11	0,06	0,03
X10	-0,02	0,80	-0,17	0,32	0,13	-0,13	0,23	-0,37
X11	-0,32	0,36	0,00	0,13	0,03	-0,03	0,75	0,26
X12	0,15	-0,14	0,81	-0,07	-0,02	0,32	0,01	0,09
X13	-0,58	0,51	0,07	-0,21	0,01	-0,29	0,13	0,19
X14	-0,20	-0,08	-0,08	0,03	0,66	0,13	0,03	0,17
X15	-0,04	0,08	0,14	-0,12	-0,21	0,83	-0,07	-0,06
X16	0,81	0,03	-0,10	-0,26	-0,25	0,11	-0,26	0,11
X17	0,07	-0,15	0,10	0,09	0,14	-0,10	-0,04	0,94
X18	0,85	0,12	0,12	-0,11	0,17	-0,17	0,26	0,00
X19	0,19	-0,14	-0,06	-0,03	-0,06	-0,09	0,98	-0,19

Analysis and generalization of data table 3 makes the following conclusions: the first factor was the indicator of the share of foreign capital (X16) with loads of 0.81 and the share of the company in the market volume of insurance premiums (X18) with a load of 0.85. Such composition of the factor shows that the increase of the share of foreign capital and the share of the company in the market volume of insurance premiums testifies to high competitive positions of the company in the insurance market. This allows us to interpret the first factor as the insurance company's competitiveness.

In the second factor, the indicator of the ratio of net insurance reserves to capital (X3) with a load of 0.91 and the number of activities of the insurance company (X10) with a load of 0.80 is significant, which allows to determine such a connection as a factor of the volume of insurance activity of the insurer.

The structure of the third factor is determined by the indicators of the return on investment of the insurance company (X6) with a significance of 0.79 and the growth rate of gross insurance premiums (X12) with a significance of 0.81, which allows determining this factor as the investment potential of the insurance company. The fourth factor is the indicators of the insurance company's insurance company's profitability (X5) with a load of 0.91 and the number of structural units of the insurance company (X9) with a load of 0.89. Therefore, this factor can be interpreted as the effectiveness of insurance activities.

The fifth factor includes the ratio of the actual solvency margin to the standard solvency margin (X1) with a significance of 0.86. Therefore, this factor can be interpreted as the solvency of an insurance company.

In the sixth factor, the indicator of insurance volumes (X15) with a load of 0.83 is significant, which makes it possible to determine such a connection as a factor of business activity. In the structure of the seventh factor, the key is the number of complaints to the insurance company during the year (X19) with a load of 0.98. This allows you to interpret the essence of the seventh factor as the honesty of the insurance company.

The structure of the eighth factor is determined by the average seniority of the management work of the insurance company's officials (X17) with a load of 0.94. Accordingly, this factor characterizes the stability of the management of the insurance company.

Thus, according to the results of factor analysis, it was found that it is expedient to assess the financial reliability of insurance companies based on 12 indicators.

The rational use of information obtained on the basis of the assessment of financial reliability, on the basis of the formed system of indicators, is possible provided that it is converted into a form that is convenient for further analysis. The instrument of such formalization may be a scientific methodological approach to determining the class of financial reliability of insurance companies.

The methods of cluster and discriminant analysis are used for distribution of insurance companies by classes of financial reliability. Cluster analysis allows distributing insurance companies according to financial reliability classes. In order to determine which class should be included in an insurance company not included in the sample of financial institutions in this study, there is a need for using the method of discriminatory analysis. This method makes it possible to construct a classification using a training sample [3].

Before implementing discriminant analysis, it is necessary to determine the possibility of dividing the aggregate of insurance companies into separate clusters. To solve this problem, a cluster analysis is used to divide a number of indicators into groups or clusters. At the same time for the application an aggregate agglomeration method is chosen, representing a consistent association of objects close to their parameters in a single cluster. The process of such a consistent association can be represented graphically in the form of a dendrogram or a union tree. Such a convenient representation allows us to visualize clustering by agglomerate algorithms [2].

Since the analyzed indicators have different ranges of values, to prevent the

distortion of the results obtained, the standardization of the values of the aggregate of data is carried out. For the implementation of the tree-clustering method, the following conditions are used: the distance measure between the objects is the Euclidean distance. The rule of association or communication is the Ward method [2].

The results of the applied unifying agglomeration method for grouping insurance companies by classes of financial reliability are presented in fig. 1.

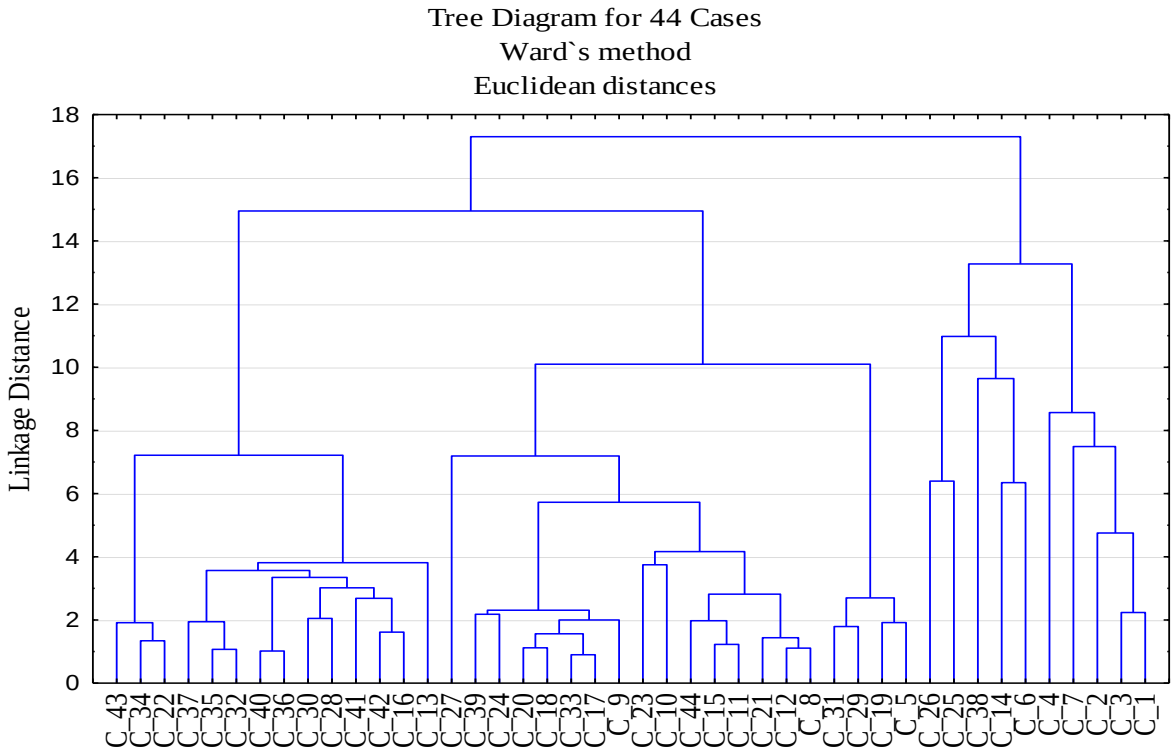

Fig. 1. Dendrogram of the association of insurance companies into clusters according to financial reliability indicators

As can be seen from fig. 1, the whole set of insurance companies is not distinct and it can form separate clusters according to the levels of financial reliability.

A prerequisite for conducting a discriminatory analysis is the prior assignment of research objects to classes, that is, the preliminary definition of the classes of financial reliability of insurance companies serving as the basis of research.

To solve this problem, the K-mean cluster analysis method is used. The K-medium method is the most common non-hierarchical method (also called rapid cluster analysis) [3]. The main factor justifying the feasibility of choosing this method is that for the possibility of its use it is necessary to have a hypothesis about the most probable number of clusters, in contrast to hierarchical methods that do not require previous assumptions about the number of clusters. From fig. 1 one can make the assumption that it is expedient to divide insurance companies into 6 classes by the level of financial reliability.

The main task of the K-medium method is to divide the population into a given number of clusters in such a way that the variance between clusters is as large as possible, and the intraclass variance is the smallest, that is, the distance between the clusters should be sufficiently large and the distance between the elements of each cluster is insignificant [2]

Characteristics of intercluster and intracluster dispersion according to the formed clusters of insurance companies are given in table 4.

Table 4

Statistical analysis of variance based on the formed clusters of insurance companies

Indicator of financial stability	Intercluster dispersion	Number of degrees of freedom	Intracellular dispersion	Number of degrees of freedom	Fisher's criterion
X1	31,9444	5	15,3556	38	21,6183
X3	30,0707	5	17,2293	38	15,7894
X5	47,1773	5	0,1227	38	3214,3595
X6	34,7639	5	12,5361	38	23,1836
X9	23,9673	5	23,3327	38	8,5877
X10	26,2541	5	21,0459	38	10,4291
X12	31,1832	5	16,1168	38	15,3208
X15	40,8935	5	6,4065	38	122,3101
X16	24,6648	5	22,6352	38	9,1091
X17	43,4886	5	3,8114	38	87,6326
X18	43,8449	5	3,4551	38	88,6589
X19	43,4041	5	3,8959	38	93,1392

Information is presented in the table 4. demonstrates that the interclass variance significantly exceeds the internal class, indicating the effectiveness of clustering. The Fisher's statistical criterion significantly exceeds the table value, which allows us to conclude that the results of the cluster analysis of the totality of insurance companies according to the indicators of financial reliability are adequate.

Distribution of insurance companies of the analyzed aggregate for certain classes of financial reliability is given in table 5.

Table 5

Distribution of insurance companies by classes of financial stability

Class of financial stability of the insurance company	Share of insurance companies by classes of financial stability,%
Class 1 – very high financial stability	11,36
Class 2 – high financial stability	2,27
Class 3 – medium financial stability	34,09
Class 4 – satisfactory financial stability	34,09
Class 5 – low financial stability	6,82
Class 6 – critical financial stability	11,37

Based on the table presented in the table 5 distribution of insurance companies by financial reliability classes using the software package of Statistica 8 constructed a discriminant for the classification of insurance companies according to financial reliability levels (figure 2). For discriminatory analysis of insurers, the total number of observations was 44, of which: 5 observations, according to which insurance companies are characterized by very high financial reliability, 1 company has high financial reliability, 15 – average financial reliability, 15 – satisfactory financial reliability, 3 – low, 5 is critical. The input data array is designed to maximally equalize the dimension of classes - the number of observations in them, to increase the reliability of the results of simulation.

Constructed using discriminant analysis of the functions presented in fig. 2, allow on the basis of financial indicators to determine the class of the insurance company by the level of financial reliability. To determine the class of financial

reliability of an insurance company, it is necessary to calculate the value of the classification function (Y). The insurance company correlates with that class by the level of financial reliability, for which the calculated function value is maximal [3].

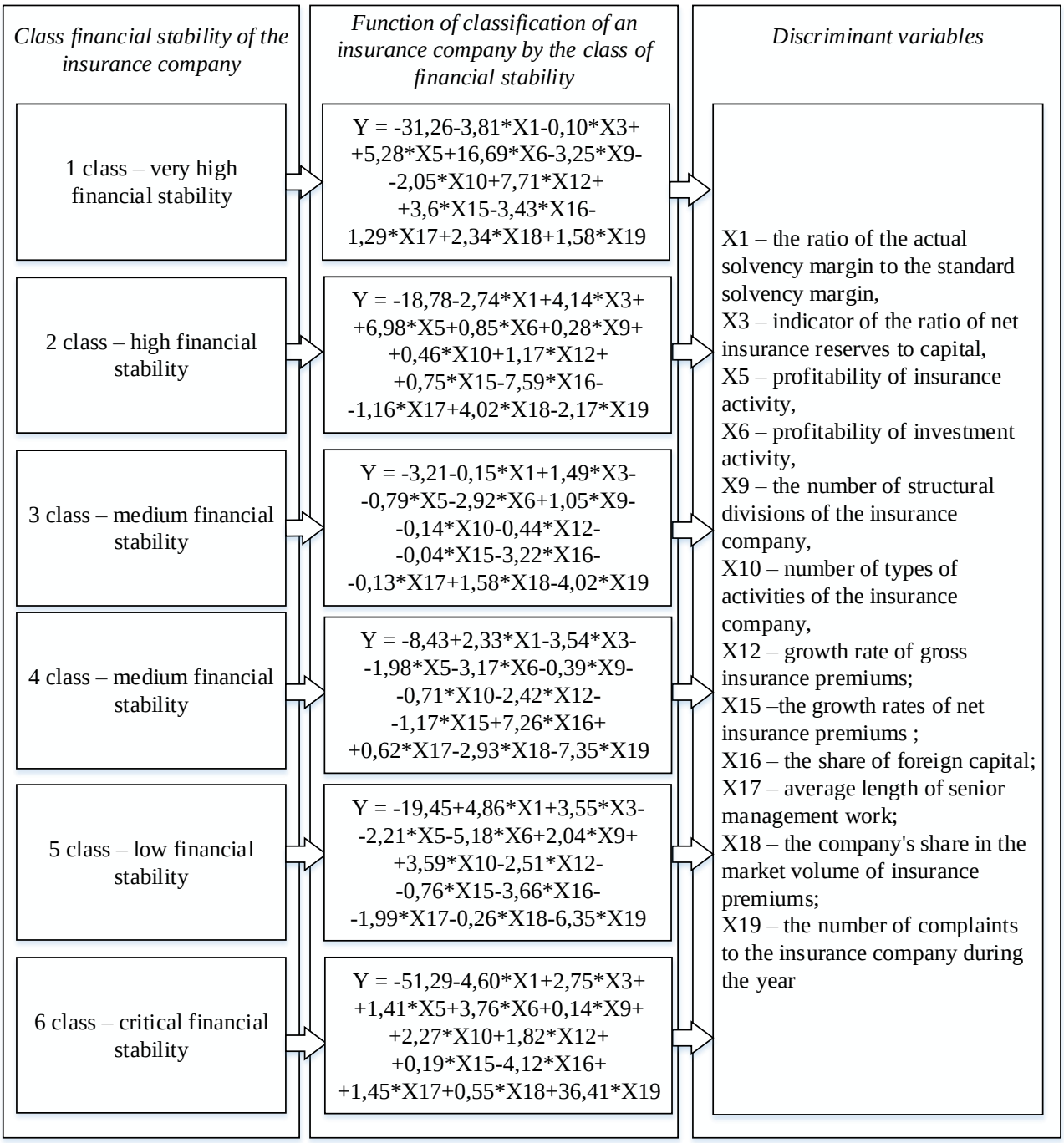

Fig. 2. Functions of classification of insurance companies by classes of financial reliability

Constructed using discriminant analysis of the functions presented in fig. 2, allow on the basis of financial indicators to determine the class of the insurance company by the level of financial reliability. To determine the class of financial reliability of an insurance company, it is necessary to calculate the value of the classification function (Y). The insurance company correlates with that class by the level of financial reliability, for which the calculated function value is maximal [3].

It is determined that each specific class of financial reliability corresponds to a specific constructed function that describes the model. The results obtained during the research model for each class of financial reliability provide an opportunity to analyze the insurance companies in future periods, as well as to predict the state of insurance companies for each area of analysis, based on the predicted values of the set of indicators. In the course of the study, the author proved that the obtained classification functions can be used to assess the financial reliability of insurance companies that are not included in the sample, but require the analysis and development of measures to improve financial reliability.

The process of regulation and management of the financial reliability of insurance companies is systemic, the implementation of which should be based on the formation of a set of quantitative indicators and the development of a method of integrated assessment of the level of financial reliability. In this study, the author uses a factor analysis to form a system of quantitative and qualitative indicators to assess the financial reliability of insurance companies. A new method of calculating integral indicators of financial reliability and a scientific and methodical approach to determining the class of financial reliability of insurance companies with the use of cluster and discriminatory analysis is proposed.

In the first stage, a cluster analysis was used that allowed the insurance companies to be divided into financial reliability classes. On the basis of discriminant analysis, classification functions that can be used to assess the

financial reliability of insurance companies that are not included in the sample, but require the analysis and development of measures to improve financial reliability are obtained.

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