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MODELING THE LEVEL OF COMPETITIVENESS OF INSURANCE COMPANIES

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Abstract. In the article reviewed the necessity of assessing the level of competitiveness of insurance companies. Identified factors that affect competitiveness and insurers activity taking into account them in econometric models. By means of coefficients of regression of fictitious variables factors that have a significant impact on the insurance company's competitiveness: payments, gross premiums are determined. We combine all insurance companies in a single set and estimate the regression with differentiated coefficients, respectively, forming the fictitious variables of the slope and intersection. According to the position of the insurance company in the rating, we introduce the following fictitious variables: 1 — for an insurance company with a high level of insurance payments; 0 — for insurance companies with insufficient level of insurance payments. A multi-factor regression model and a variance analysis and their comparison are constructed that are statistically significant and adequate. The model is checked for absence of autocorrelation, and can be used as predicted and to assess the state of the insurance company in the insurance market.

Keywords: insurance company, competitiveness, payout, gross premiums, modeling.

Formulas: 2; fig.: 0; tabl.: 8; bibl.: 9.

МОДЕЛЮВАННЯ РІВНЯ КОНКУРЕНТОСПРОМОЖНОСТІ СТРАХОВИХ КОМПАНІЙ

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Анотація. Визначено, що конкуренція у сфері страхування має особливості, пов'язані зі специфікою страхової діяльності, доведено необхідність оцінки рівня конкурентоспроможності страхових компаній. Виявлено фактори, що впливають на конкурентоспроможність і діяльність страховиків. Відповідно до результатів перевірки статистичної значущості коефіцієнтів регресії фіктивних змінних визначено лише ті фактори, які мають суттєвий вплив на конкурентоспроможність страхової компанії: виплати (що є безпосереднім показником діяльності страхової компанії, адже її фінансовий потенціал складається зі страхових резервів, страхових виплат та інших показників); валові премії. Побудовано багатофакторну регресійну модель і дисперсійний аналіз та їх порівняння, що є статично значущі та адекватні. Перевірено статистичну значимість параметрів багатофакторної моделі та адекватність за критерієм Фішера. Для перевірки гіпотези про значимість регресійної моделі використано дисперсійний аналіз. Проведено моделювання впливу факторів на діяльність страхової компанії для визначення впливу страхових премій на виплати за допомогою фіктивних змінних з урахуванням характеристик моделей для різних груп страхових компаній. Побудовано регресійне рівняння для групи великих і середніх страхових компаній, що надало можливість оцінити регресію з диференційованими коефіцієнтами, відповідно сформувавши фіктивні змінні нахилу і перетину. Відповідно до становища страхової компанії в рейтингу, введено такі фіктивні змінні: 1 — для страхової компанії, що має високий рівень страхових виплат; 0 — для страхових компаній, що мають недостатній рівень страхових виплат. Перевірено модель на наявність автокореляції, що є відсутньою і може використовуватись як прогнозованою і оцінювати стан страхової компанії як малих, так і великих на страховому ринку.

Ключові слова: страхова компанія, конкурентоспроможність, виплати, валові премії, моделювання.

Формул: 2; рис.: 0; табл.: 8; бібл.: 9.

МОДЕЛИРОВАНИЕ УРОВНЯ КОНКУРЕНТОСПОСОБНОСТИ СТРАХОВЫХ КОМПАНИЙ

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Аннотация. Рассмотрена необходимость оценки уровня конкурентоспособности страховых компаний. Определены факторы, которые влияют на конкурентоспособность и деятельность страховой компании для определения влияния страховых премий на выплаты с помощью фиктивных переменных.

Ключевые слова: страховая компания, конкурентоспособность, выплаты, валовые премии, моделирование.

Формул: 2; рис.: 0; табл.: 8; библи.: 9.

Introduction. At the modern phase of economic development of Ukraine, the problem of increasing of the insurance company's competitiveness becomes more relevant, because the competitive struggle both

on the domestic and on the world market are intensifies under the conditions of foreign trade development, the strengthening of the processes of integration of the country into international organizations. To achieve a dominant



position, it is necessary to improve the process of managing in the competitiveness of an insurance company, increase its competitive advantages in more active way, research and analyze both the internal and external environment constantly.

Therefore, the question arises in the approach to the assessment of the competitiveness of insurance companies, considering the influence of factors on the practice.

Literature review and the problem statement. The theoretical problems of competition and competitiveness are studied in quite widely way in the modern literature but the authors have not yet reach a consensus on the estimating and analysis of the insurance companies' competitiveness. Issues of competitiveness are analyzed in the works of foreign scientists, such as: F. Knight, K. P. McConnell and S. L. Brue, I. Schumpeter, P. Heine etc. Also problem of evaluation, analysis and enhancement of competitiveness is the subject of native authors' scientific interest, such as: G. M. Azarenkova, O. G. Golovko [1], P. V. Zabelin, N. K. Moiseyeva, V. P. Groshev, A. I. Kredisov, N. V. Tkachenko [2], V. Ya. Vovk, A. Ya. Kuznetsova [3], S. S. Osades [4] etc. At the same time, there are still a sufficient number of unresolved issues which prevent the full evaluation of the insurance companies' competitiveness. The aim of the research is to model the level of competitiveness in the insurance market based on econometric models with fictitious variables.

Research results. The process of integrating national markets for financial services in general and the segments of this market leads to the needs of assessing the competitive advantages of each economic entity.

The insurance companies are no exception. The development of insurance in the conditions of globalization of the world insurance market, the concentration of capital lead to the huge increasing of competition between powerful transnational insurers. Competitive processes become more acute, and competition is becoming more and more diverse.

It is necessary to consider an indicators like the amount of own funds, the possibility of obtaining additional funds in the form of targeted financing; the amount of accounts receivability; efficiency of financial management, etc. Assessing the insurance company's competitiveness, it is necessary to distinguish factors those influence on activities to determining the insurance company's competitiveness. That is why the modeling of the influence of factors on the insurance company's activity was conducted.

The analysis of complicated socio-economic phenomena and processes leads to the necessity of reflecting both quantitative and qualitative (attributive) factors in econometric models of action. The direct introduction of qualitative factors of its kind in regression models is impossible to implement, because their planes acquire qualitative, not quantitative values. At the same time, attributive factor signs can significantly affect on density of the connection between the features that explained and explanatory features [5].

According to the results of review of the statistical significance of the regression coefficients of fictitious variables, only factors those have a significant impact on the

competitiveness of an insurance company are identified [6; 7].

For this purpose, 20 insurance companies of Ukraine were identified:

- PJSC «Insurance Company «INGOSSTRAKH» (hereinafter referred to as INGOSSTRAKH);
- PJSC «Insurance Company «AXA Insurance» (hereinafter — AXA INSURANCE);
- PJSC «Insurance Company «UNIQUA» (hereinafter referred to as UNIQUA);
- PJSC «Insurance Company «PROVIDNA» (hereinafter referred to as PROVIDNA);
- PJSC «Joint-stock insurance company «INGO Ukraine» (hereinafter — INGO UKRAINE);
- PJSC «Insurance Company «Ukrainian Insurance Group» (hereinafter — UKRAYINSKA STRAKHOVA);
- PJSC «Insurance Company «Pzu Ukraine» (hereinafter — PZU UKRAINE);
- PJSC «STR GRU «TAS» (hereinafter — TAS);
- PJSC «Insurance Company «Arsenal Insurance» (hereinafter — ARSENAL INSURANCE);
- PJSC «Ukrainian Insurance Company «Knyazha Vienna Insurance Group» (hereinafter referred to as KNAZHA);
- PJSC «Alliance Ukraine» (hereinafter — ALLIANZ UKRAINE);
- PJSC «NASK «ORANTA» (hereinafter — ORANTA);
- PJSC «Insurance Company «PERSHA» (hereinafter — PERSHA);
- PJSC «Insurance Company «Universalna» (hereinafter — UNIVERSALNA);
- PJSC «Insurance Company «Alfa Insurance» (Ukraine) (hereinafter — ALPHA INSURANCE);
- PJSC «Insurance Company «Krayina» (hereinafter referred to as the «KRAYINA»);
- PJSC «Insurance Company «VUSO» (hereinafter — VUSO);
- PJSC «Ukrainian Transport Insurance Company» (hereinafter — UTICO);
- PJSC «Ukrainian joint stock company «ASKA» (further — ASKA);
- PJSC «Insurance Company «Colonnade Ukraine» (hereinafter referred to as COLONNEYD UKRAINE) [8].

That is why a number of indicators of the activity of insurance companies for 2016 were selected and analyzed, namely:

- payments ($Y_{viplaty}$). Insurance payments are monetary amounts paid to the insured or those entitled to this right in case of an insured event [2]. This is a direct indicator of the activity of an insurance company, because its financial potential consists of insurance reserves, insurance payments and other indicators. This is the indicator we build the rating of insurance companies on;
- gross premiums ($Xi_valovi\ premii$). The economic content of the insurance premium is that it is part of the national income carried out by the insured in order to guarantee his interests in the event of unwanted, unfavorable events (cases of insurance) [4].



Insurance payments are the main indicator of the built model, and that is why we will place insurance companies in order to their decreases. Accordingly, the first places

will be of those insurance companies that have paid the most sum and have a large cash flow. *Table 1* shows certain indicators.

Table 1

Data on payments and gross premiums on companies, for 2016, thousand UAH

№	The company name	Y_viplaty	X1_valovi premii
1	INGOSSTRAKH	1136199	1479194
2	AXA INSURANCE	601896	1400430
3	UNIQUA	482183	1064115
4	PROVIDNA	387693	786642
5	INGO UKRAINE	368357	903449
6	UKRAYINSKA STRAKHOVA	321085	745944
7	PZU UKRAINE	314406	1120361
8	TAC	262224	763238
9	ARSENAL INSURANCE	243454	1211259
10	KNYAZHA	185767	434880
11	ALLIANZ UKRAINE	341369	123235
12	ORANTA	149940	508651
13	PERSHA	116885	362492
14	UNIVERSALNA	128273	501721
15	ALPHA INSURANCE	120237	476363
16	KRAYINA	115752	293714
17	VUSO	104053	352822
18	UTICO	71509	290433
19	ASKA	92791	603748
20	COLONNEYD UKRAINE	64938	148071

Software package Statistica has been chosen as main software [9]. Let's construct a linear multivariate econometric model and define all of its characteristics. Check

the statistical significance of the model parameters and the adequacy of the model according to Fisher's criterion. The results of constructing the model are given in *Table 2*.

Table 2

Results of multivariate regression analysis

Regression Summary for Dependent Variable: Y_viplaty (Spreadsheet.sta)						
R= 0,78777340 R ² = 0,62058693 Adjusted R ² = 0,60334088 F(1,22)=35,984 p						
	Beta	Std.Err. - of Beta	B	Std.Err. - of B	t(22)	p-level
Intercept			-2656,69	16449,36	-0,161507	0,873168
X1_valovi premii	0,787773	0,131324	0,23	0,04	5,998691	0,000005

Analysis of adequacy:

R = 0,77877 — is the coefficient of multiple correlation (the closer its value to 1, the stronger the tightness of the connection). Connection is tight; R² = 0,6205 — determination factor;

Adjusted R² = 0,6033 — Adjusted determination coefficient based on the number of observations and number of model parameters;;

F (1,22) = 35,98 — Fisher's criterion for the statistical significance of the model with the number of degrees of freedom and the level of significance p.

Therefore, there is a connection in the model (R is close to 1); the determination coefficient is significant and equals approximately 0,62, which means that the factors are influenced by 62 %, while the remaining 38% indicates the dependence on the factors not included in the model. Then, the model statistically significant and adequate.

A dispersion analysis is used to test the hypothesis of the regression model's significance. This table shows the sum of the squares of regression deviation, the sum of the squares of error deviation, the variance of errors, Fisher's criteria (*Table 3*).

Table 3

Table of dispersion analysis

Analysis of Variance; DV: Y_viplaty (Spreadsheet!. sta)					
	Sums of - Squares	df	Mean - Squares	F	p-level
Regress.	1,029114E+11	1	1,029114E+11	35,98430	0,000005
Residual	6,291776E+10	22	2,859898E+09		
Total	1,658292E+11				



This table shows the sum of the squared deviations by regression, the sum of the squares of error deviations, the variance of errors, and Fisher’s criteria. These results indicate that the model is adequate, but not all parameters are statistically significant. Fischer’s criteria is 35,98. The value is more tabular, so the model is statistically significant.

The next step of the research is to determine the characteristics of models for different groups of insurance companies those use fictitious changes.

We construct a regression equation for a group of large and medium-sized insurance companies (Table 4, 5).

Table 4

Table of dispersion analysis for large insurance companies

Analysis of Variance; DV: Y_viplaty (Spreadsheet1.sta) Exclude cases: 1:12					
	Sums of - Squares	df	Mean - Squares	F	p-level
Regress.	141916255	1	141916255	1,694777	0,222161
Residual	837374414	10	83737441		
Total	979290669				

Table 5

Dispersion Analysis Table for Medium-Term Insurance Companies

Analysis of Variance; DV: Y_viplaty (Spreadsheet1.sta) Exclude cases: 13:24					
	Sums of - Squares	df	Mean - Squares	F	p-level
Regress.	9,313874E+10	1	9,313874E+10	16,30140	0,002371
Residual	5,713540E+10	10	5,713540E+09		
Total	1,502741E+11				

We combine all insurance companies in a single set and estimate the regression with differentiated coefficients, respectively, forming the fictitious variables of the slope and intersection. According to the position of the insurance

company in the rating, we introduce the following fictitious variables: 1 — for an insurance company with a high level of insurance payments; 0 — for insurance companies with insufficient level of insurance payments (Table 6).

Table 6

Results of multi-factor regression analysis

Regression Summary for Dependent Variable: Y_viplaty (Spreadsheet!.sta) R= ,99552436 R²= ,99106875 Adjusted R²= ,98972906 F(3,20)=739,78 p						
	Beta	Std.Err. - of Beta	B	Std.Err. - of B	t(20)	p-level
Intercept			43558	4251,740	10,24489	0,000000
X1_valovi premii	-0,12676	0,042255	-0,003	0,012	-2,99992	0,007077
Di	-0,26188	0,033505	-43536	5570,153	-7,81611	0,000000
Di*X	1,234	0,052106	1,1	0,047	23,69358	0,000000

Adequacy analysis:

R = 0,9955 — the coefficient of the multiple correlation (the closer it is to 1, the stronger the tightness of the connection). Connection is tight;

R2 = 0,9910 — model determination coefficient;

Adjusted R2 = 0,9897 — Adjusted determination coefficient based on the number of observations and number of model parameters;

F (3,2) = 739,78 is a Fisher’s criteria for the statistical significance of a model with the number of degrees of freedom and the level of significance of p.

Therefore, there is a close connection in the model (R is closer to 1); the determination coefficient is significant and equals about 0,99, which means that effect of the factors is 99 %, while the remaining 1 % indicates the dependence on the factors not included in the model. Therefore, the model as a whole is statistically significant and adequate.

The coefficients of pair correlations and scatter plot diagrams indicate differences in the degrees of linear interrelation between the pairs of variables studied.

Models for developed (form. 1) and less developed insurance companies (forms. 2) are as follows:

$$Y=22=1.097 \cdot X1, \tag{1}$$

$$Y=43558,6 - 0,003 \cdot X1, \tag{2}$$

Y — insurance payments;

X1 — gross premiums.

Calculate and analyze the remnants. We obtain a table with the observed values of the dependent variable, the theoretical values of the dependent variable and the model errors.

Next, check the model for auto-correlation. We obtain the value of autocorrelation of error models according to the Darwin—Watson criterion and the value of non-cyclic coefficient of autocorrelation (Table 7).

Table 7

Value of the Durbin-Watson criterion

	Durbin - Watson d	Serial - Corr.
Estimate	1,531469	0,224857

Analyzing the data, we find that $DL = 0,95$; $Du = 1,53$. Therefore, there is no auto-correlation. After analyzing the data, it was found that the constructed model is adequate,

its parameters are statistically significant, and therefore the model can make a prediction. The results of the forecasting of the econometric model are given in *Table 8*.

Table 8

Results of the forecast of the model of large and medium-sized insurance companies

	B-Weight	Value	B-Weight * Value
1	2	3	4
X1 valovi premii	-0,0	500000,0	-18114,0
Di	-43536,9	1,0	-43536,9
Di · X	1,1	500000,0	561324,4
Intercept			43558,6
Predicted			543232,1
-95,0 %CL			507012,8
+95,0 %CL			579451,4
Predicting Values for (Spreadsheet1.sta) variable: Y_viplaty			
	B-Weight	Value	B-Weight * Value
X1 valovi premii	-0,0	70000,00	-2535,95
Di	-43536,9	0,00	-0,00
Di · X	1,1	0,00	0,00
Intercept			43558,60
Predicted			41022,65
-95,0 %CL			33513,72
+95,0 %CL			48531,58

Therefore, this analysis gives an opportunity to construct a model for determining the impact of insurance premiums on payments with fictitious variables. The model gives an opportunity to assess the condition of the insurance company in the insurance market. The conformity between insurance payments and a model with fictitious variables, gives an opportunity to determine the competitiveness of an insurance company.

Conclusions. Competition in the area of insurance has features that are related to the specific nature of insurance activity. It follows that the main position in the insurance market is occupied by existing competitors. The growth rates of the insurance industry, the degree of concentration of the market, together with the level of operating expenses of insurance companies and the degrees of differentiation of insurance services determine the intensity of rivalry among competing insurers. Therefore, if the

growth rate of the industry is high, then the participants in the insurance market can expect to receive a high level of profit not only from insurance but also from investment activity, which, in turn, positively affects the financial security of insurers. Therefore, competition on the insurance market is intended to promote the formation of an effective competitive environment as a mechanism that will promote economic growth in the short term, and in the long run it will become one of the most important factors for the establishment and functioning of a socially oriented market economy.

This process regulates the number of companies in the market, the level of prices and quality of services provided to customers, as well as stimulates the further development of the market. The behavior of the insurance market subjects is also determined by the conditions of the competitive environment.

Список використаної літератури

1. Azarenkova G. Determining the level of competitiveness and financial capacity of the insurance company / G. Azarenkova, O. Golovko, K. Piddubna, D. Polurezov // *European Journal of Service Management*. — 2017. — № 22 (2). — P. 5—11.
2. Ткаченко Н. В. Страхування : навч. посіб. / Н. В. Ткаченко. — Київ : Ліра-К, 2007. — 375 с.
3. Кузнецова А. Я. Механізм забезпечення конкурентоспроможності банків в умовах економіки знань : монографія / А. Я. Кузнецова, Н. Є. Рак. — Київ : УБС НБУ, 2013. — 266 с.
4. Осадець С. С. Страхова справа : підручник / С. С. Осадець. — Вид. 2-ге, перероб. і доповн. — Київ : КНЕУ, 2002. — 599 с.



5. Войнаренко М. П. Формування конкурентного потенціалу підприємств на основі семантичних мереж [Електронний ресурс] / М. П. Войнаренко, Л. В. Скоробогата // Вісник Хмельницького національного університету. — 2013. — № 4. — Режим доступу : http://tribology.khnu.km.ua/vestnik/pdf/ekon/VKNU-ES-2013-N4-2-e_202.pdf.
6. Студопедия. Кластерный анализ [Электронный ресурс]. — Режим доступа : http://studopedia.net/4_24446_klasterniy-analiz.html.
7. Центр статистических технологий. Кластерный анализ [Электронный ресурс]. — Режим доступа : <http://www.nickart.spb.ru/analysis/cluster.php>.
8. Рейтинг страхових компаній — 2016. Forbes Україна [Електронний ресурс]. — Режим доступу : <http://forbes.net.ua/ua/business/1398567-rejting-strahovih-kompanij-2016>.
9. Халафян А. А. Statistica 6.0. Статистический анализ данных : учебник / А. А. Халафян. — Москва : Бином-Пресс, 2007. — 512 с.

References

1. Azarenkova, G., Golovko, O., Piddubna, K., & Polurezov, D. (2017). Determining the level of competitiveness and financial capacity of the insurance company. *European Journal of Service Management*, 22 (2), 5—11.
2. Tkachenko, N. V. (2007). *Strakhuvannya [Insurance]*. Kyiv: Lira [in Ukrainian].
3. Kuznjecova, A. Ja., & Rak, N. Je. (2013). *Mekhanizm zabezpechennja konkurentospromozhnosti bankiv v umovakh ekonomiky znanj [Mechanism for ensuring the competitiveness of banks in the knowledge economy]*. Kyiv: UBS NBU [in Ukrainian].
4. Osades, S. S. (2002). *Strakhova sprava [Insurance business]*. Kyiv: KNEU [in Ukrainian].
5. Vojnarenko, M. P., & Skoroboghata, L. V. (2013). Formuvannja konkurentnogho potencialu pidpryjemstv na osnovi semantychnykh merezh [Formation of competitive potential of enterprises on the basis of semantic networks]. *Visnyk Khmelnytskoho natsionalnoho universytetu — Herald of Khmelnytsky national university*, 4. Retrieved from http://tribology.khnu.km.ua/vestnik/pdf/ekon/VKNU-ES-2013-N4-2-e_202.pdf [in Ukrainian].
6. Studopediia. Klasternyi analiz [Studios. Cluster analysis]. (n. d.). *studopedia.net*. Retrieved from http://studopedia.net/4_24446_klasterniy-analiz.html [in Russian].
7. Sait statisticheskikh tekhnologii. Klasternyi analiz [Center of Statistical Technologies. Cluster analysis]. (n. d.). *www.nickart.spb.ru*. Retrieved from <http://www.nickart.spb.ru/analysis/cluster.php> [in Russian].
8. Reiting strahovykh kompanii 2016. Forbes Ukraina [Rating of insurance companies — 2016. Forbes Ukraine]. (n. d.). *forbes.net.ua*. Retrieved from <http://forbes.net.ua/ua/business/1398567-rejting-strahovih-kompanij-2016> [in Ukrainian].
9. Halafian, A. A. (2007). *Statistica 6.0. Statisticheskii analiz dannykh [Statistica 6.0. Statistical analysis of data]*. Moscow: Binom-Press [in Russian].