“Estimation of the capacity of the Ukrainian stock market’s risk insurance sector”

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Estimation of the capacity of the Ukrainian stock market's risk insurance sector

Abstract

The purpose of the article is to determine the degree of financial interaction between the stock and insurance market, or, in other words, to determine the potential capacity of the stock market's risk insurance sector for the Ukrainian insurance market. The authors examine the insurance not of all possible risks on the stock market, but only the most potentially important for the development of the stock market at this stage of economic development: insurance of professional risks of depositories and insurance of individual investments of individuals – participants of the stock market. In order to calculate the capacity of the stock market's risk insurance sector in the context of the two above mentioned types, the authors apply the models that are widely used in the economic-mathematical analysis. For mathematical calculations we used 31 absolute indicators of the characteristics of the state of the stock and insurance markets, as well as some macroeconomic indicators. When forming an array of input data for mathematical calculations we used annual values of absolute indicators for the period 2005–-2015 were used. For the adequacy of the received calculations the normalization of the selected indicators was carried out. All indicators were divided into two groups: stimulators and de-stimulators. The normalization of stimulator indicators was carried out by the method of natural normalization, and of de-stimulator indicators – according to the Savage formula. The capacity of the segment of the new type of insurance was determined by the authors as the maximum possible amount of insurance premiums that insurers can get in the process of implementing a new insurance product based on the current state of development of the insurance market. The capacity of the sector of the new type of insurance was presented as a function of the main component (an indicator that directly characterizes the created segment) and the corrective component (a set of indicators characterizing the segments created indirectly). The weight coefficients of the corrective component were determined by using the Fischer's formula. As a result of the calculations, the authors obtained the data on the prospects of simultaneous introduction for the stock and insurance markets of such types of insurance as a professional liability insurance of depositories and an insurance of individual investors on the stock market.

Keywords: stock market, insurance market, individual investors, depository institutions, market capacity.
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Introduction

Between the stock market of Ukraine and its insurance market there are interconnections in various aspects: organizational, legal, financial. The financial aspect of the relationships between the two markets is that, on the one hand, insurance companies are participants of the stock market as institutional investors and, on the other hand, they can provide insurance services to the stock market participants for relevant types of risks.

In both cases, the movement of financial resources taking place on the stock market can have a direct impact on the volume of insurance premiums and insurance payments that characterize the insurance market in its dynamics. Investigations in this area are actively carried out by Olga Kozmenko, Olena Pakhnenko, Olga Kuzmenko (2012), Relwende Sawadogo, Samuel Guerineau (2015), Volodymyr Kurylo, Lyudmyla Kurylo, Yaroslav Zhovnirchyk, Yevgen Kartashov, and Sergii Sokol (2017). In addition, significant attention is paid to the role of the insurance market in stabilizing the economic situation in different countries and promoting economic growth by such researchers as Paul Moon Sub Choi, Won Young Chae, Joung Hwa Choiand Young BinHan (2017), Vucetich, Roger Perry and Richard Dean (2014). At the same time, researchers study the risks, which are formed both on the stock market and on the insurance market, as well as possible instruments for their diversification: Relwende Sawadogo, Samuel Guerineau (2015), Duverne Dand, Hele (2016), Hufeld, Koijen, Thimann (2017).

This study is focused on risk insurance of the stock market participants. The participants of the stock market, especially individual investors, are interested in obtaining additional protection for their investments. The increasing level of security of the investment process for private investors will contribute to the development of the country's stock market by attracting more and more investors with temporarily free financial resources. Therefore, the insurance market can have an impact on the development of the stock market and the formation of its financial flows.

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Despite the fact that the stock market and the insurance market are independent systems, the creation of favorable conditions can lead to a certain interdependence between these markets, resulting in the creation of a new market segment – a market for insuring the risks of the stock market.

Since the stock market by its nature is characterized by a high degree of riskiness of its operations, then the subjects of the stock market require the existence of instruments for its neutralization, including insurance. The segment of insurance of the stock market risks in Ukraine is not developed at all, which can be explained by the low level of development of the stock market itself, the lack of the necessary insurance products, low insurance culture in the country and the lack of any attention to this issue by the regulator. The stock market insurance is an instrument for reducing the specific risks borne by both investors and professional stock market participants. In the times of economic and political instability that are characteristic of our country, the insurance and stock markets need additional incentives for development, which for them can become the new insurance products. In this context, we see great opportunities for the development of the both markets through the expansion of cooperation between them.

Consequently, as a result of cooperation between the securities market and the stock market through new insurance products, both markets gain financial benefits (maximizing profits for all participants in the cooperation) and become a new stimulus to the development of each other (the emergence of a synergistic effect for each partner).

The purpose of our study is to determine the degree of financial interactions between the stock and insurance markets or, in other words, to determine the potential capacity of the stock market's risk insurance sector for the Ukrainian insurance market. In this paper we examine the insurance not of all possible risks on the stock market, but only the most potentially important for the development of the stock market at this stage of economic development: insurance of professional risks of depositaries and insurance of individual investments of individuals – participants of the stock market.

1. Output data of research

In order to calculate the capacity of the stock market's risk insurance sector in the context of the two above mentioned types, we apply the models that are widely used in the economic-mathematical analysis. The calculation was carried out in several stages. For mathematical calculations, we used 31 absolute indicators of the characteristics of the state of the stock and insurance markets, as well as some macroeconomic indicators.

Since risk insurance of the stock markets in Ukraine is not developed, it is impossible to obtain the data on its development. Therefore, for our calculations we selected indicators of an indirect nature that can indirectly characterize the phenomena we are investigating. When forming an array of input data for mathematical calculations we used the annual values of absolute indicators for the period 2005–2015.

Table 1 presents the indicators that directly and indirectly characterize the investigated elements in groups: indicators of the stock market development, indicators of the segment of insurance of depositaries' professional risks and indicators of the segment of insurance of individual investors on the stock market. For the convenience of comparing the results of calculations, certain indicators were used twice in different groups. The statistical data in the context of these indicators are given in Appendix A.

Table 1. Absolute indicators of the development of the stock and insurance markets, as well as the Ukrainian economy as a whole by groups

Factor	Indicator
1. Absolute indicators of the stock market	
x_1	Volume of trade on the securities market, billion UAH
x_2	PFTS index, points
x_3	Volumes of securities registered by the Commission, billion UAH
x_4	Official exchange rate, UAH
x_5	GDP, billion UAH
x_6	Net portfolio investments, million US dollars
x_7	Investments in fixed assets, million UAH
x_8	NBU discount rate,%
x_9	Deposit interest rate, %
x_{10}	Volume of gold and foreign exchange reserves of Ukraine, million UAH

Table 1 (cont.). Absolute indicators of the development of the stock and insurance markets, as well as the Ukrainian economy as a whole by groups

Factor	Indicator
x_{11}	Consumer price index (2010 – 100%)
x_{12}	The level of the economy's monetization, %
x_{13}	Index of industrial production (% to the previous year)
2. Absolute indicators of the segment of insurance of depositaries' professional risks	
x_{14}	Gross insurance premiums for voluntary liability insurance, million UAH
x_{15}	Total amount of depository assets of the National Depository of Ukraine, million UAH
x_{16}	Volumes of securities registered by the Commission, billion UAH
x_{17}	Nominal value of securities belonging to their owners, billion UAH
x_{18}	Number of accounts of securities' owners, million
x_{19}	Gross insurance payments on voluntary liability insurance, million UAH
x_{20}	Investments in fixed assets, million UAH
x_{21}	Volume of gold and foreign exchange reserves of Ukraine, million UAH
3. Indicators of the segment of insurance of individual investors on the stock market	
x_{22}	Gross insurance premiums on insurance of financial risks, million UAH
x_{23}	Funds of physical persons in Ukrainian banks, million UAH
x_{24}	Deposit interest rate, %
x_{25}	Official exchange rate, UAH
x_{26}	Consumer price index (2010 – 100%)
x_{27}	Gross accumulation, billion UAH
x_{28}	Gross insurance payments on insurance of financial risks, million UAH
x_{29}	NBU discount rate, %
x_{30}	Gross insurance premiums on insurance of loans, million UAH
x_{31}	Gross insurance payments on loans insurance, million UAH

We will substantiate the choice of indicators for the characteristics of the stock market in Ukraine. Since the stock market is a very volatile system heavily influenced by macroeconomic factors, in addition to the standard indicators of the stock market, we have also chosen the following macroeconomic indicators: GDP, official exchange rate, deposit interest rate, net portfolio investment, consumer price index, index of industrial production, discount rate of the National Bank of Ukraine, investment in fixed assets, the volume of gold and foreign exchange reserves of Ukraine.

Regarding the substantiation of the choice of indicators for calculating the capacity of the segment for insuring the professional risks of depositories, the main indicator for calculating x_{OS} became the indicator of gross liability insurance premiums, since, in our opinion, this indicator reveals the type of insurance that according to its economic content is the closest to the insurance of professional risks depositories. The corrective component includes: indicator of gross insurance premiums for voluntary liability insurance, indicators that exclusively characterize the activities of depositories (the total volume of assets of the National Depository of Ukraine, number of accounts of securities' owners and nominal value of securities belonging to their owners) and some macroeconomic indicators. A specific feature of information provision for the calculation of capacity for the segment of insurance of depositories' professional risks is that all selected indicators indirectly characterize the investigated element. This situation is primarily explained by the fact that this type of insurance is absent in Ukraine. Therefore, there is no statistical basis for direct indicators.

Only indirect indicators were used to estimate the capacity of the segment of individual investor insurance on the stock market. The main indicator for calculating the gross insurance premiums for financial risk insurance was selected. Such choice is explained by the fact that according to its economic nature the type of insurance we propose is very similar to the following types of insurance: insurance of loans, deposits (through the Deposit Guarantee Fund), investments, which are the components of financial risk insurance.

The corrective component includes indicators that directly affect the volume of savings of individuals, their investment capacity and interest in investing in the stock market: the official exchange rate, deposit interest rate (deposit – the main instrument of investing for private investors: the greater the interest on deposits, the smaller the interest to invest in the stock market), the consumer price index, the volume of funds of physical persons in Ukrainian banks (considered by us as the main resource for

investing) and the discount rate of the National Bank of Ukraine (as an instrument that directly influences the cost of deposit resources).

The indicators that characterize credit risk insurance were chosen based on the same logic as the indicators of financial risk insurance.

2. Methodology

The first stage determines an input array of information that is given above.

At the second stage of calculations we carried out the normalization of the selected indicators in order to bring them into comparative form. All indicators were divided into two groups: stimulators and de-stimulators. The stimulators include indicators that lead to an increase in the resulting indicator: PFTS index, volumes of securities registered by the Commission, GDP, net portfolio investments, investments in fixed assets, the volume of Ukraine's gold and foreign exchange reserves, the level of monetization of the economy, index of industrial production, gross insurance premiums for voluntary liability insurance, number of accounts of securities' owners, total amount of depository assets of the National Depository of Ukraine, nominal value of securities belonging to their owners, gross insurance premiums for insurance of financial risks, gross insurance premiums on insurance of loans.

The normalization of such data is carried out with the method of natural normalization by using the formula 1:

$$n = \frac{k_i - min_i\{k_i\}}{max_i\{k_i\} - min_i\{k_i\}}, \quad (1)$$

where n is the normalized value of the i-th indicator;

k_i – the actual value of the indicator;

$min_i\{k_i\}$ – the minimal value of the i-th indicator for the studied period;

$max_i\{k_i\}$ - the maximal value of the i-th indicator for the studied period.

Destimulating indicators includes: the official exchange rate, NBU discount rate, deposit interest rate, gross insurance payments on financial risk insurance, consumer price index, funds of physical persons in Ukrainian banks, gross insurance premiums on the insurance of loans, gross insurance payments on voluntary liability insurance.

For the normalization of destimulating disintegrators, the following Savage formula is used:

$$n = \frac{max_i\{k_i\} - k_i}{max_i\{k_i\} - min_i\{k_i\}}. \quad (2)$$

The results of normalization of the study's information database are systematized in tabular form (Appendix B).

At the third stage, we conducted the calculations of the capacity of the stock market, the potential segment of depositor risk insurance and the segment of insurance of individual investors on the stock market.

The development of the Ukrainian stock market directly depends on the composition of the market's investors and the amount of financial resources available to them and which they intend to invest in those or other financial instruments. An important investor on the world stock markets is a private investor. The appearance of these investors and their long-term activity on the Ukrainian stock market depend on the implementation of certain conditions, first of all, on ensuring the safety of activities on the market and the preservation of its funds and securities on its accounts. The realization of security and the formation of confidence of private investors in the stock market instruments are mainly related to the introduction of new insurance products.

The development and implementation of the new types of insurance for the insurer is associated with significant financial costs and the occurrence of new risks. If we consider the insurance product as a business project, then before the beginning of its implementation it is necessary to develop a "business plan": to identify potential customers, to evaluate the market, to make sure that the project will bring a positive economic effect both for the company and for the society. In the context of this study, it is not possible to evaluate all the nuances in the development and introduction of a new insurance product, but it is possible to estimate the capacity of sectors of the new insurance products. Under the capacity of a sector of any type of insurance we understand the possible volume of sales of certain insurance services on the insurance market of Ukraine for a certain period of time.

Since we carry out the calculations of the segment's capacity for the insurance market, the capacity is understood as the maximum possible amount of insurance premiums that could be obtained by insurers in the process of realization of a new insurance product based on the current state of development of the insurance market. The capacity of the sector of a new type of insurance is proposed to be presented in the form of the following function:

$$E_n(t) = f(\text{the main component}, \text{corrective component}). \quad (3)$$

$$E_n(t) = x_{os} \cdot k_{kor}, \quad (4)$$

$$k_{kor} = p \cdot m, \quad (5)$$

$$p = \sum_{i=1}^{n} x_i \cdot w_i, \quad (6)$$

$$p = \sqrt[n]{x_i^{w_i}}, \quad (7)$$

$$m = w_i \cdot v_i, \quad (8)$$

where x_{OS} is the main component of the indicator of capacity of the insurance market segment;

x_{OS} – corrective component of the indicator for the capacity of the insurance market segment;

k_{kor} – element of the corrective component that characterizes the significance of the component indicators;

m – element of the corrective component that characterizes the degree of influence of indirect indicators on the resulting indicator;

x_i – the value of the *i*-th indicator for the studied period, which is part of the corrective component;

w_i – weight coefficient of the corrective component;

v_i – the importance of influence of indirect indicators of the corrective component on the resulting indicator.

The formula for calculating the element of the corrective component, which characterizes a significance of indicators, consists of two options depending on which formula can describe the main component of the capacity indicator. In the case where x_{OS} is described by a linear function formula 6 is used. If the function is non-linear, then formula 7 needs to be used to calculate it.

Calculation of the capacity of any market segment or the market in general with the use of the given formulas is only possible if there are no direct data on the activity of the market or segment, that is, for new products and markets. If calculations are made for the capacity of the market or segment already working, then it is necessary to eliminate from the formula the element of the corrective component, which characterizes the degree of influence of indirect indicators on the resulting indicator *m*.

We determine weight coefficients for the corrective component w_i by using the Fisher formula. The Fisher formula makes it possible to determine weight coefficients if some data about the indicators are available – indicators can be placed according to the decrease in their importance: $x_1 \geq x_2 \geq \ldots \geq x_m$. In this case, weight coefficients form a decreasing arithmetic progression and can be determined with the following formula:

$$w_i = \frac{2(m-i+1)}{m(m+1)}, i = \overline{1,m}, \quad (9)$$

where m – the number of indicators for which weight coefficients are determined.

In order to determine the capacity of the segment of depository risk insurance and insurance of individual investors on the stock market, it is necessary to make interim calculations, which consist in calculating the capacity of the stock market in Ukraine.

The final stage involves calculation of the ratio of the capacity of potential stock market risk insurance segments according to two types and the capacity of the stock and insurance markets, as well as graphical interpretation of the data.

3. Findings

To conduct calculations, we need to determine the function (growth curve), which describes the volume of trades on the Ukrainian securities market in 2005–2015. To determine the type of growth curve we will use the method of analytical alignment. The analytical alignment of the time series involves the finding of analytic function $\hat{y}=f(t)$, which characterizes the basic trend in the changing level of a series over time.

The following methods are used to determine the level of trends (analytical dependence):

- qualitative analysis of the investigated process;
- building and visual analysis of the graph for the dependence of time series on time;
- calculation and analysis of the dynamics of time series (absolute growth, growth rate, etc.);

- analysis of the autocorrelation function of the output and converted time series.;
- selection method, in which growth curves of different species are built with the subsequent selection of the best based on the values of determination coefficient R^2

To determine the type of growth curve we used the method of selection, which involves the calculation of the values of determination coefficient R^2. The building of the graph of trading volumes on the Ukrainian stock market and the calculation of determination coefficients were made by using the MSExcel package. The results of calculations are given in Table 2.

Table 2. Interim calculations to determine the type of growth curve for the volume of trade on the Ukrainian stock market in 2005–2015

Function type	Values of determination coefficient R^2
Exponential	0.8586
Linear	0.826
Logarithmic	0.7875
Polynomial	0.8533
Power	0.9145

The determination coefficient R^2 assumes values in the range from zero to one $0 \le R^2 \le 1$ and reflects, which part of the dispersion of the resulting indicator is explained by the regression equation. . The higher the value R^2, the better this model is consistent with the data of observations.

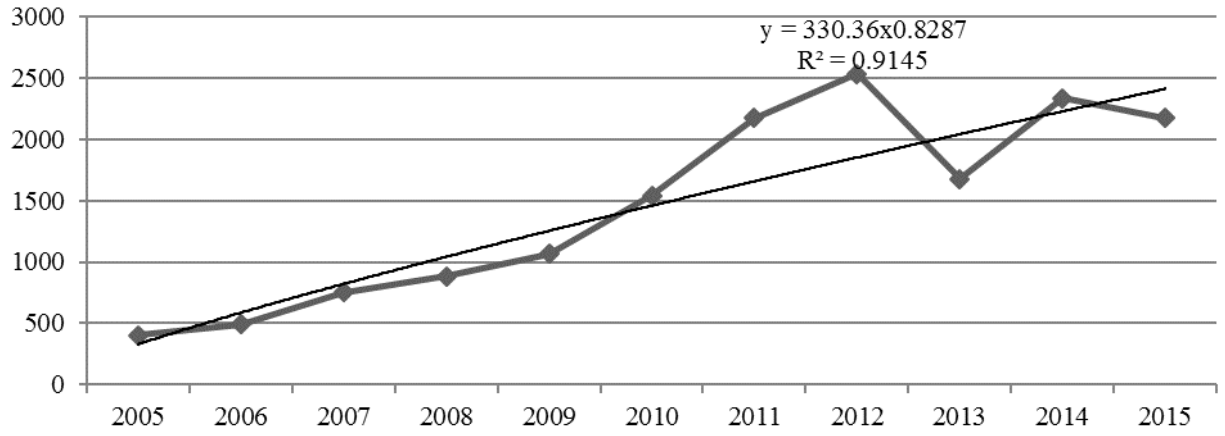

Fig. 1. Definition of the type of growth curve for the indicator of trade volumes on the stock market of Ukraine

According to the results of calculations, the best volume of trade on the stock market of Ukraine in 2005–2015 is described by the power function (Fig. 1). Then the function of trade volumes is as follows:

$$y = 330,36 \cdot x^{0.8287}. \quad (10)$$

Since the function we have obtained is not linear, we will use formula 7 to calculate the stock market capacity in terms of the correction indicator *p*. The results of calculation of the correction coefficient and the resulting indicator (stock market capacity) are given in Table 3.

In the same graph we will combine the real volume of trading on the stock market and the obtained values of the stock market's capacity for the period 2005–2015 (Fig. 2). We see on the graph that throughout the studied period the volume of the potential stock market's capacity exceeded the real indicator, which demonstrates the adequacy of the conducted calculations.

Table 3. The results of calculations of the correction coefficient and the capacity of the Ukrainian stock market for the period 2005–2015

Year	Correction coefficient *p*	Capacity of the stock market, billion UAH
2005	1.196	482.97
2006	1.222	601.97
2007	1.226	924.61
2008	1.224	1081.47
2009	1.206	1287.26
2010	1.225	1888.35
2011	1.227	2663.32
2012	1.223	3095.00
2013	1.215	2037.96
2014	1.216	2835.20
2015	1.185	2574.45

This conclusion is based on the fact that the market's capacity represents the maximum possible volume of sales of services on this market while its real value is adjusted under the influence of economic, political, social and other factors.

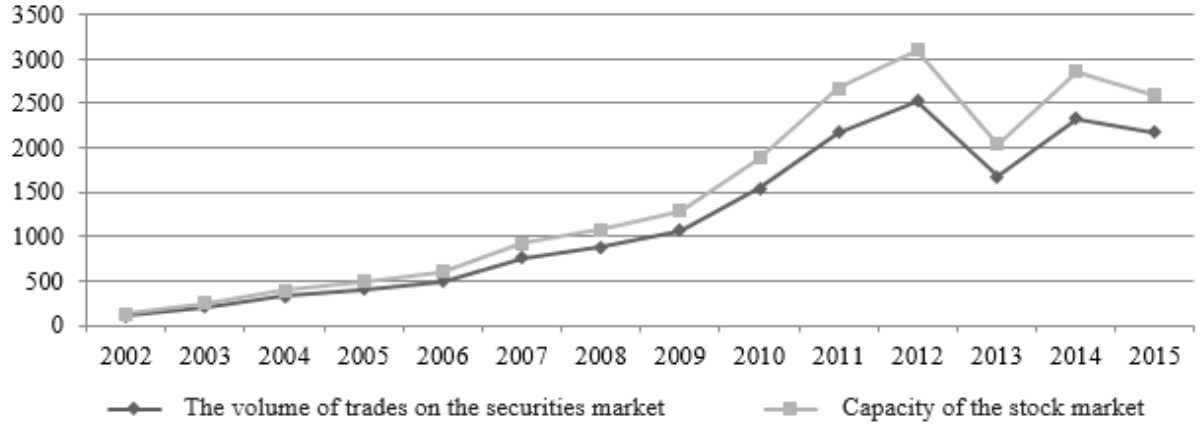

Fig. 2. The real values of the volume of trades on the Ukrainian securities market and the estimated values of its capacity for the period of 2005–2015

The results of calculations of the capacity of the insurance market of Ukraine are given in Annex B. Similarly, we will make calculations of the capacity of the sectors of insurance of professional liability of depositories and insurance of individual investors on the stock market. The only difference is that these calculations are made for the markets that do not really work at the moment, therefore, another correction coefficient m is added to the formula for calculating the capacity (formula 8).

As an indicator representing the main component for the insurance of professional liability of depositories we use the indicator of gross insurance premiums for voluntary liability insurance, and for insurance of individual investors on the stock market – gross insurance premiums for insurance of financial risks. The corrective indicator for the first surveyed sector consists of seven factors, and for the second one – of 9 factors.

We need to determine the type of the growth curve that describes the indicators, which were chosen both for the insurance of professional liability of depositories and the insurance of individual investors on the stock market. The determination of the growth curves is carried out by checking the values of determination coefficient for different types of functions separately for each segment (Table 4).

Table 4. Interim calculations to determine the type of growth curve of gross insurance premiums for voluntary liability insurance and gross insurance premiums for financial risk insurance in 2005–2015

Function type	The value of determination coefficient R^2 for the indicator of gross insurance premiums of voluntary liability insurance	The value of determination coefficient R^2 for the indicator of gross insurance premiums of financial risk insurance
Exponential	0.8985	0.0047
Linear	0.8711	0.0022
Logarithmic	0.7496	0.0489
Polynomial	0.8825	0.439
Power	0.8739	0.0549

Based on the calculations, the best volume of gross insurance premiums for voluntary liability insurance in 2005–2015 is described by exponential function (Fig. 3). Then the function of gross insurance premiums for voluntary liability insurance will be as follows:

$$y = 427.63 \cdot e^{0.1501x} \quad (11)$$

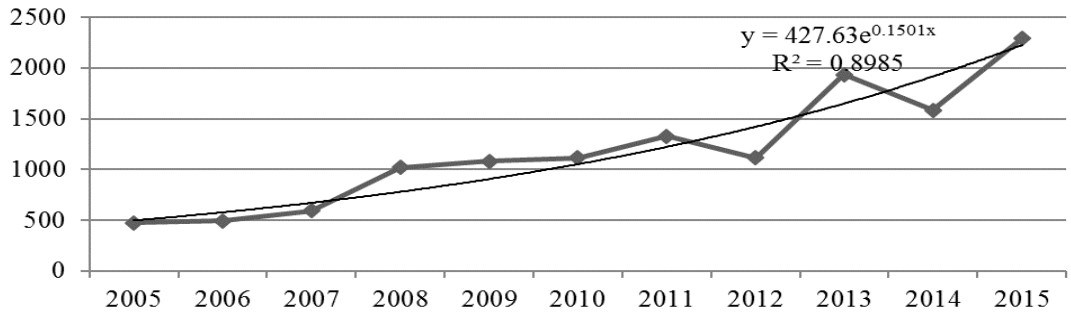

Fig. 3. Determination of the type of growth curve for the indicator of gross insurance premiums for voluntary liability insurance in 2005–2015

The volume of gross insurance premiums for financial risk insurance is best described by polynomial function (Fig. 4). Then the function of gross insurance premiums for financial risk insurance will be as follows:

$$y = 47,814x^2 - 583,34x + 4691,9. \quad (12)$$

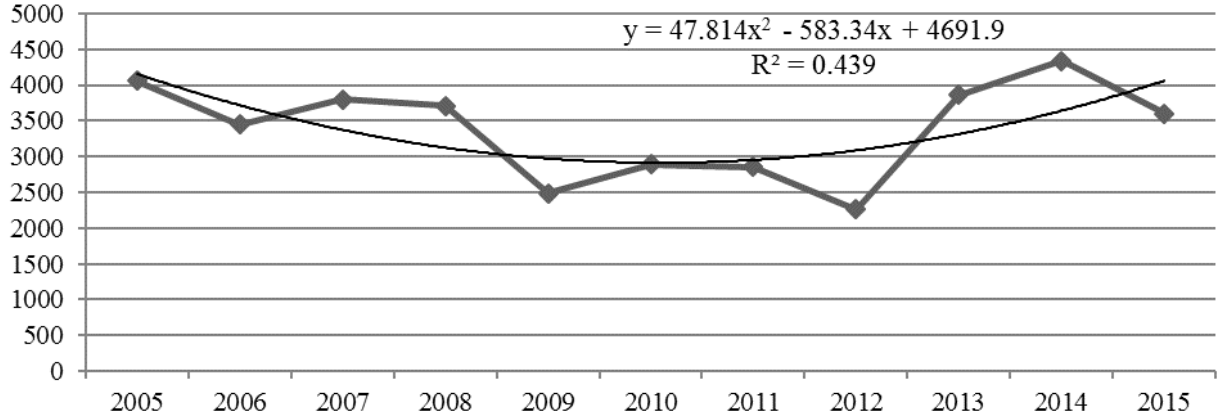

Fig. 4. Determination of the type of growth curve for the indicator of gross insurance premiums for financial risk insurance in 2005–2015

Since the obtained functions are not linear we use formula 7 with corrective indicator *p* to calculate the capacity of the segments of insurance of professional liability of depositories and insurance of individual investors on the stock market. The results of calculation of correction coefficients and resulting indicators for both segments are given in Table 5.

Table 5. Results of calculations of corrective coefficients and the capacity of the segments of insurance of professional liability of depositories and insurance of individual investors on the stock market in 2005–2015

Year	Insurance of professional liability of depositories			Insurance of individual investors on the stock market		
	Correction coefficient *p*	Correction coefficient *m*	Segment capacity, billion UAH	Correction coefficient *p*	Correction coefficient *m*	Segment capacity, billion UAH
2005	1.168	0.24	133.07	1.239	0.18	882.04
2006	1.268		149.94	1.270		768.51
2007	1.281		182.94	1.272		847.9
2008	1.287		316.11	1.269		825.33
2009	1.289		335.71	1.212		529.33
2010	1.291		347.37	1.264		642.16
2011	1.301		417.06	1.269		636.14
2012	1.298		348.41	1.262		501.35
2013	1.300		605.98	1.250		846.86
2014	1.274		485.94	1.259		959.20
2015	1.253		691.71	1.200		757.95

For greater clarity of the received data, it is necessary to compare them with the capacity of the stock and insurance markets of Ukraine, which will make it possible to estimate the potential significance of the creation and development of such types of insurance as: insurance of professional liability of depositories and insurance of individual investors on the stock market. To this end, we carried out calculations of the capacity of the insurance market of Ukraine in a similar manner.

In the end we made calculations of relative values – the ratio of the capacity of the segment of potential stock market's risks to the capacity of the stock and insurance markets giving their graphic interpretation.

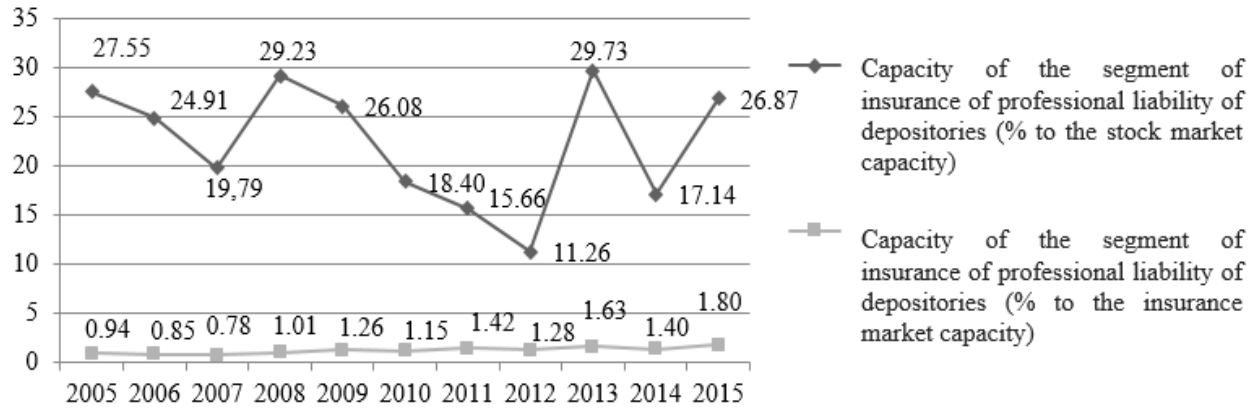

Fig. 5. The ratio of capacity of insurance of depositories' professional liability to the capacity of the stock and insurance markets

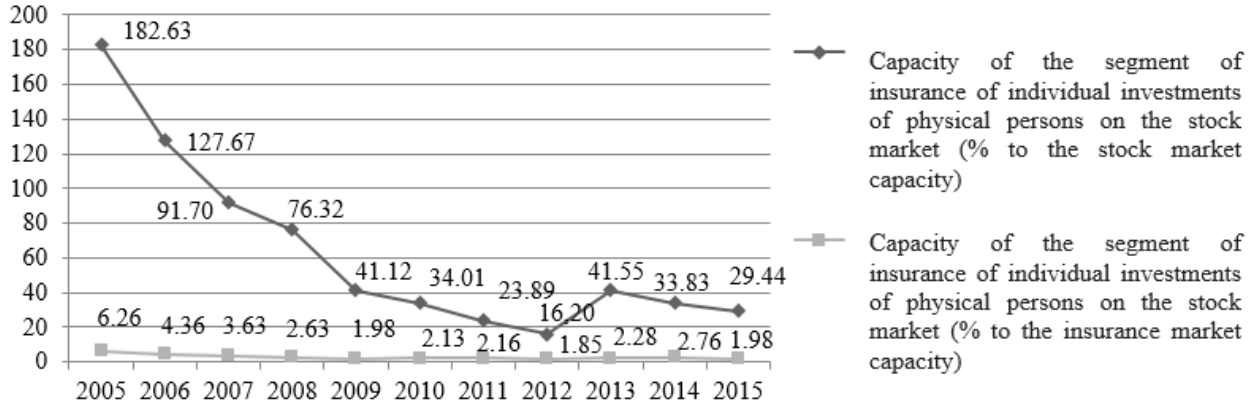

Fig. 6. The ratio of the volume of insurance of individual investments of physical persons on the stock market to the capacity of the stock and insurance markets

Conclusion

On the basis of the conducted calculations, it can be concluded that the introduction of such types of insurance as professional liability insurance of depositories and insurance of individual investors on the stock market is promising both for the stock and insurance markets. The implementation of these two types of insurance can annually give to the insurance market about 4% of the sum of its gross insurance premiums, which is about 1,500 million UAH. For the stock market, this sum will be almost half of its capacity. Obviously, the volume of the received insurance premiums does not directly increase the volume of trading on the stock market, but some of these funds will return to it through investments made by insurance companies into stock market instruments. And most importantly, the creation of new insurance products will increase the level of security of investments on the stock market for individuals, which will stimulate the development of the market itself.

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Appendix A

Table A.1. Information provision for the research of capacity of the sectors of insurance of depositories' professional risks and insurance of individual investments of physical persons – participants of the stock market

Indicator	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Volume of trading on the securities market, billion UAH	403.8	492.8	754.31	883.39	1067.26	1541.38	2171.1	2530.87	1676.97	2331.94	2172.67
PFTS index	352.97	498.86	1174.02	301.42	572.91	975.08	534.43	330.7	300.53	386.92	240.7
Volumes of securities registered by the Commission, billion UAH	61.99	84.07	133.25	153.05	162.68	95.55	179.17	107.73	142.03	204.85	148.51
Official exchange rate, UAH	5.12	5.05	5.05	5.27	7.79	7.94	7.97	7.99	7.99	11.89	21.84
GDP, billion UAH	441.45	544.15	720.73	948.06	913.35	1082.57	1316.60	1411.24	1454.93	1566.73	1979.46
Net portfolio investments, million US dollars	-2757	-3583	-5753	1280	1533	-4342	-1569	-4689	-8787	2700	-367
Investments in fixed assets, million UAH	93096	125254	188486	233081	151777	189061	259932	293692	267728	219420	273116
NBU discount rate,%	9.5	8.5	8	12	10.25	7.75	7.75	7.5	6.5	14	22
Deposit interest rate, %	8.57	7.57	8.12	9.95	13.76	10.56	7.9	12.96	10.78	12.1	13.01
Volume of gold and foreign exchange reserves of Ukraine, million UAH	19390.58	22358.1	32479.06	31543.2	26505.11	34576.4	31794.61	24546	20415.71	7533.33	13300
Consumer price index (2010 – 100%)	51.19	55.82	62.99	78.89	91.43	100	107.96	108.56	108.26	121.46	180.63
The level of the economy's monetization, %	43.75	47.67	54.29	54.06	53.08	55.13	51.78	54.73	62.29	60.97	50.2
Index of industrial production (% to the previous year)	43.75	47.67	54.29	54.06	53.08	55.13	51.78	54.73	62.29	60.97	50.2
Gross insurance premiums for voluntary liability insurance, million UAH	472.6	490.7	592.6	1018.8	1080.4	1116	1329.3	1113.4	1933.5	1582.4	2290.8
Gross insurance payments on voluntary liability insurance, million UAH	48.8	35	47.1	34.1	25.7	27.3	32.1	41.1	41.6	56.6	516.5
Number of accounts of securities' owners, million	15.956	14.588	13.418	12.93	12.609	11.281	9.37	8.76	5.54	5.5	5.4
Total amount of depository assets of the National Depository of Ukraine, million UAH	661.63	1308.68	2588.5	8087.5	17832.17	76090.8	193526	277562	956438	1107023	1199467
Nominal value of securities belonging to their owners, billion UAH	344.14	375.1	408.84	445.62	485.71	610.21	612.07	652.57	751.45	852.71	887.69
Gross insurance premiums on insurance of financial risks, million UAH	4056.1	3446.4	3798.4	3705.5	2488.4	2894.3	2856.5	2263	3857.6	4339.9	3598.6
Gross insurance payments on insurance of financial risks, million UAH	566.9	792.2	1076.7	1611.8	2115.1	2042.5	827.6	565.4	119.3	46.9	1402.6
Funds of physical persons in Ukrainian banks, million UAH	73.58	107.14	166	216.32	213.54	275.07	310.54	369.91	441.89	422.73	379.67
Gross insurance premiums on insurance of loans, million UAH	516.01	513.84	815.01	655.10	362.90	500.30	469.60	518.30	1026.00	684.70	388.20
Gross insurance payments on loans insurance, million UAH	655.06	223.44	100.51	253.52	77.66	153.20	49.70	163.90	98.80	60.00	302.60

Appendix B

Table B.1. The results of normalization of the input data array

Indicator	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Volume of trading on the securities market, billion UAH	0.000	0.042	0.165	0.225	0.312	0.535	0.831	1.000	0.599	0.906	0.832
PFTS index	0.000	0.155	0.499	0.637	0.705	0.235	0.820	0.320	0.560	1.000	0.606
Volumes of securities registered by the Commission, billion UAH	0.996	1.000	1.000	0.987	0.837	0.828	0.826	0.825	0.825	0.593	0.000
Official exchange rate, UAH	0.000	0.067	0.182	0.329	0.307	0.417	0.569	0.631	0.659	0.732	1.000
GDP, billion UAH	0.525	0.453	0.264	0.876	0.898	0.387	0.628	0.357	0.000	1.000	0.733
Net portfolio investments, million US dollars	0.000	0.160	0.476	0.698	0.293	0.478	0.832	1.000	0.871	0.630	0.897
Investments in fixed assets, million UAH	0.806	0.871	0.903	0.645	0.758	0.919	0.919	0.935	1.000	0.516	0.000
NBU discount rate,%	0.838	1.000	0.911	0.616	0.000	0.518	0.947	0.129	0.482	0.268	0.121
Deposit interest rate, %	0.438	0.548	0.922	0.888	0.702	1.000	0.897	0.629	0.476	0.000	0.213
Volume of gold and foreign exchange reserves of Ukraine, million UAH	1.000	0.964	0.909	0.786	0.689	0.623	0.561	0.557	0.559	0.457	0.000
Consumer price index (2010 – 100%)	0.625	0.681	0.776	0.772	0.758	0.788	0.740	0.782	0.890	0.871	0.717
The level of the economy's monetization, %	0.724	0.816	0.877	0.479	0.000	1.000	0.877	0.617	0.500	0.322	0.233
Index of industrial production (% to the previous year)	0.000	0.155	0.499	0.637	0.705	0.235	0.820	0.320	0.560	1.000	0.606
Gross insurance premiums for voluntary liability insurance, million UAH	0.000	0.010	0.066	0.300	0.334	0.354	0.471	0.352	0.803	0.610	1.000
Gross insurance payments on voluntary liability insurance, million UAH	0.953	0.981	0.956	0.983	1.000	0.997	0.987	0.969	0.968	0.937	0.000
Number of accounts of securities' owners, million	1.000	0.870	0.760	0.713	0.683	0.557	0.376	0.318	0.013	0.009	0.000
Total amount of depository assets of the National Depository of Ukraine, million UAH	0.000	0.001	0.002	0.006	0.014	0.063	0.161	0.231	0.797	0.923	1.000
Nominal value of securities belonging to their owners, billion UAH	0.000	0.057	0.119	0.187	0.260	0.490	0.493	0.567	0.749	0.936	1.000
Gross insurance premiums on insurance of financial risks, million UAH	0.863	0.570	0.739	0.695	0.109	0.304	0.286	0.000	0.768	1.000	0.643
Gross insurance payments on insurance of financial risks, million UAH	0.749	0.640	0.502	0.243	0.000	0.035	0.623	0.749	0.965	1.000	0.345
Funds of physical persons in Ukrainian banks, million UAH	1.000	0.909	0.749	0.612	0.620	0.453	0.357	0.195	0.000	0.052	0.169
Gross insurance premiums on insurance of loans, million UAH	0.231	0.228	0.682	0.441	0.000	0.207	0.161	0.234	1.000	0.485	0.038
Gross insurance payments on loans insurance, million UAH	0.000	0.713	0.916	0.663	0.954	0.829	1.000	0.811	0.919	0.983	0.582

Table B.2. Information provision for the study of the capacity of the Ukrainian insurance market in 2005–2015

Indicator	Year										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total (gross) amount of insurance premiums, million UAH	12853.50	13829.99	18008.20	24008.60	20442.10	23081.70	22693.50	21508.20	28661.90	26767.30	29736.00
Total (gross) amount of insurance payments, million UAH	1894.20	2599.60	4213.00	7050.70	6737.20	6104.60	4864.00	5151.00	4651.80	5065.40	8100.50
The formed insurance reserves	5045.80	6014.10	8423.30	10904.10	10141.30	11371.80	11179.30	12577.60	14435.70	15828.00	18376.30
Level of insurance payments,%	14.70	18.80	23.40	29.40	33.00	26.40	21.40	23.90	16.20	18.90	27.20
The share of gross insurance premiums in GDP, %	2.91	2.54	2.50	2.53	2.24	2.13	1.72	1.52	1.97	1.71	1.50
Volume received for reinsurance of risks, million UAH	6041.15	5621.60	6423.90	9064.60	8888.40	10745.20	5906.20	2552.80	8744.80	9704.20	9911.30
Insurance premiums for life insurance, million UAH	321.30	450.80	783.90	1095.50	827.30	906.50	1346.40	1809.50	2476.70	2159.80	2186.60
Insurance premiums for risk insurance, million UAH	12532.20	13379.20	17224.30	22913.00	19614.70	22175.20	21347.10	19698.70	26185.10	24607.50	27549.40

Table B.3. Interim calculations to determine the type of growth curve for the volume of gross insurance premiums in 2005–2015

Function type	Values of determination coefficient R^2
Exponential	0.8001
Linear	0.8242
Logarithmic	0.8312
Polynomial	0.8365
Power	0.8728

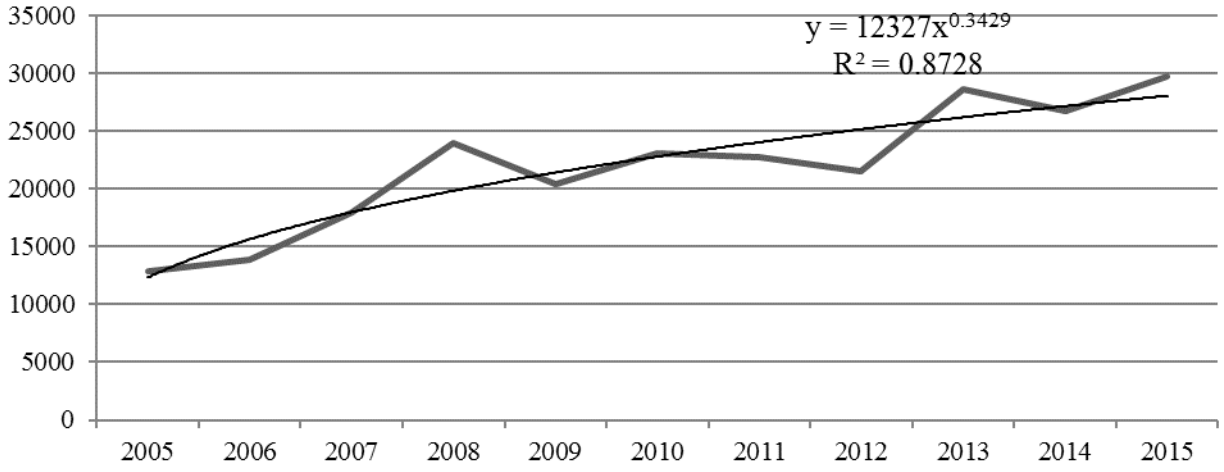

Fig. B.1. Determination of the type of growth curve for the indicator of gross insurance premiums in 2005–2015

Table B.4. The results of calculations of the correction coefficient and the capacity of the Ukrainian insurance market for the period 2005–2015

Year	Correction coefficient *p*	Capacity of the stock market, billion UAH
2005	1.097	14101.10
2006	1.276	17641.03
2007	1.296	23333.93
2008	1.310	31439.37
2009	1.307	26716.53
2010	1.306	30137.69
2011	1.295	29396.47
2012	1.263	27159.60
2013	1.298	37201.03
2014	1.301	34814.47
2015	1.289	38329.70

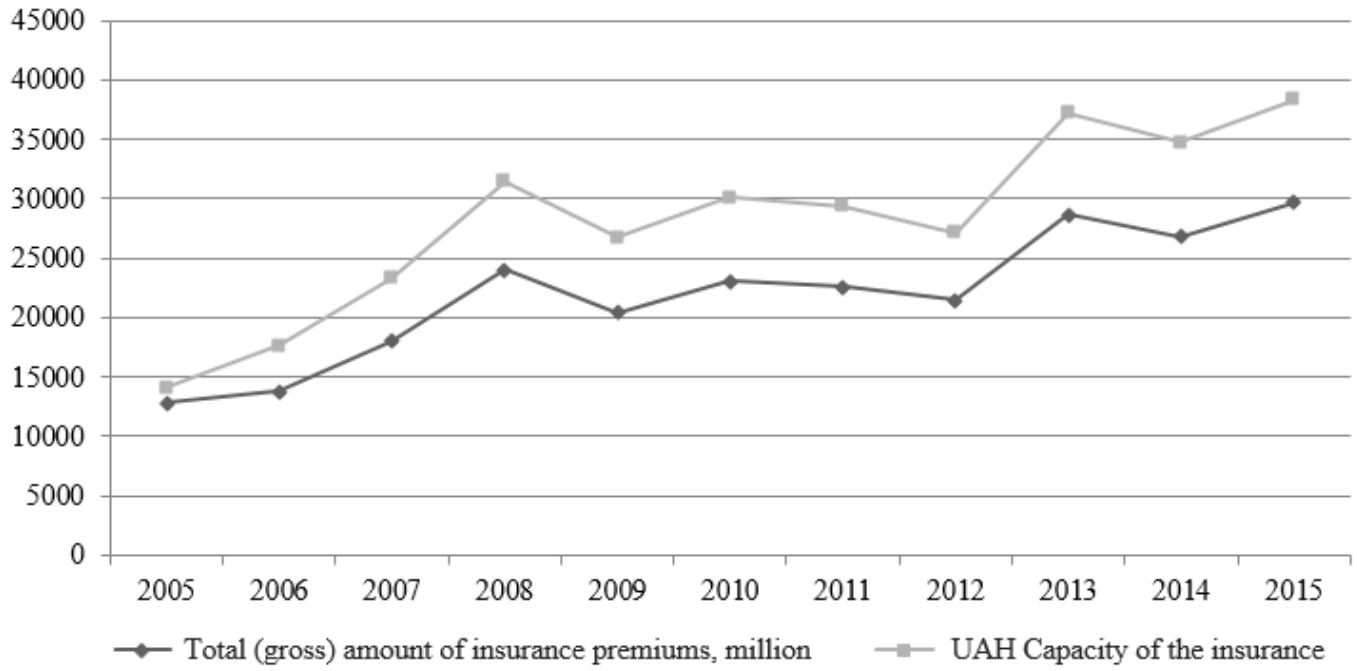

Fig. B.2. The real values of the volume of gross insurance premiums and the estimated values of the insurance market's capacity for the period 2005–2015