“Non-banking financial services market efficiency evaluation”

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Non-banking financial services market efficiency evaluation

Abstract

The article offers a scientific and methodical approach to the non-banking financial services market efficiency evaluation. By using a concrete example it carries out the calculation of the market efficiency.

Keywords: non-banking financial services market, multi-objective optimization, integral indicator, mathematical formalization.
JEL Classification: D53.

Introduction

The development of financial markets around the world under conditions of intensification of globalization and integration processes is characterized by certain regularities, including an increase in the scale and intensity of financial crises. Given the prevalence of bank-centric model of financial markets organization in different countries, banks belong to the main group of financial intermediaries. On the one hand, banking institutions perform such important functions as accumulation and redistribution of financial resources among economic entities, but on the other hand, the concentration of financial intermediation services in the banking sector increases the risks of a rapid expansion of destabilizing processes in the economy. In this regard, there is a need in developing financial services that are provided by non-bank financial institutions as alternatives channel of accumulation and distribution of financial resources. The importance of this problem necessitates the evaluation of functioning of the market of non-bank services. This requires the development of an appropriate scientific and methodical approach.

1. Analysis of the recent research and publications

The works of many scientists are dedicated to the research of the non-banking financial services market. In Ukraine this issue was studied by I. Boyarko, O. Deyneka, L. Grytsenko [1], O. Klymenko [2], Y. Kovalenko [3], O. Kozmenko [6], V. Unynets-Khodakivska [8], I. Shkolnik [7], S. Yuriy, O. Lutsyshyn [10]. The methodology of using multi-objective optimization is described in such works as the monograph of P. Verchenko [9] and the article of O. Kozmenko A. and O. Kuzmenko [4, 5].

Earlier unresolved parts of the problem. The study of scientific papers dedicated to this topic leads to the conclusion that their authors pay attention only to the theoretical aspects and the review of the non-bank financial services market. They do not attempt to make mathematical formalization of methods for evaluating the effectiveness of the market, which could form the basis for making appropriate managerial decisions.

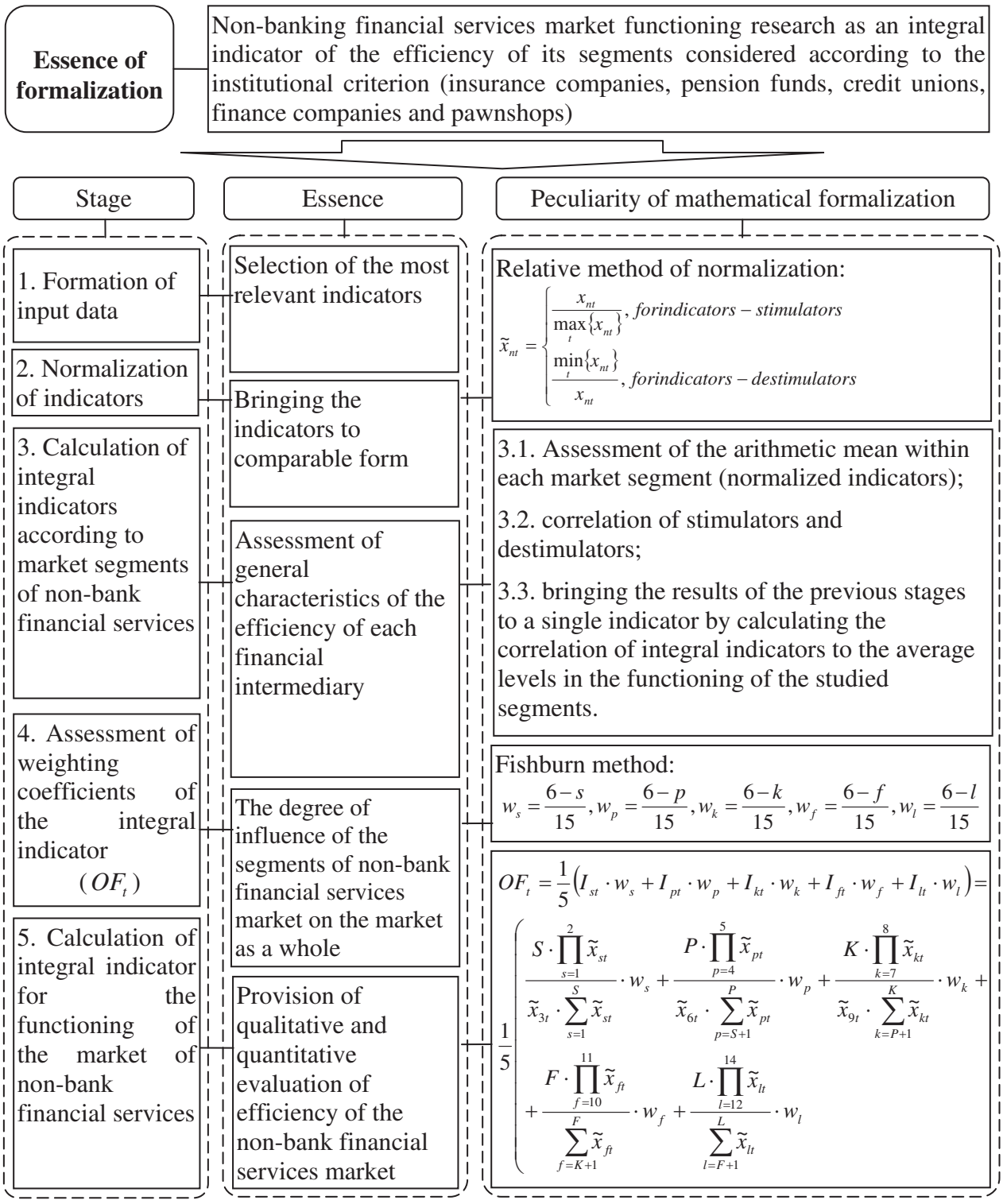
Goal of the research. Development of methodological framework for evaluating the efficiency of the market of non-bank financial services.

2. The main results of the research

Theoretical basis and practical implementation of the methodology for evaluating the efficiency of functioning of the market of non-banking financial services should be formalized through the sequence of certain stages (Figure 1).

During the first stage we will form an input array of statistical data to characterize the market of non-bank financial services.

In assessing the functioning of Ukraine's market of non-bank services it is appropriate to consider the quantitative characteristics of the research subjects: insurance companies, pension funds, credit unions, finance companies and pawnshops. These are the participants of the market of nonbank financial services, who form almost all of its financial flows and build its infrastructure. In addition, each participant of the market of nonbank financial services must be quantitatively described with the help of appropriate indicators. The number and the list of relevant indicators to characterize each segment, in which the respective group of participants of the market of non-bank financial services operates, may be different. Indicators may vary by country as well. Relevant indicators for characterizing different segments of the market of non-bank financial services in Ukraine are shown in Table 1.



Notes: $\tilde{x}_{nt}$ – normalized value of the *n*-th indicator for the characteristics of segments of the non-bank financial services market in the year *t*; x_{nt} is the absolute value of the *n*-th indicator for the characteristics of segments of the non-bank financial services market in the year *t*; w_s, w_p, w_k, w_f, w_l are weight coefficients of the indicators of functioning for insurance companies (*s*), private pension funds (*p*), credit unions (*k*), finance companies (*f*) and pawnshops (*l*); OF_t is an integral indicator for assessing the functioning of the market of non-bank financial services in the year *t*.

Fig. 1. Methodology for assessing the functioning of the market of non-bank financial services

Table 1. Statistical data describing the functioning of non-bank financial services market in Ukraine in the period 2008-2013, mln. Hryvnias

Indicators	Year					
	2008	2009	2010	2011	2012	2013
Insurance companies						
Assets	23904.9	23690.9	27695	28642.3	48831.5	37914
Net insurance premiums	15981.8	12658	13327.7	17970	20277.5	21551.4
Net insurance payments	6546.1	6056.4	5885.7	4699.2	4970	4566.6
Private pension funds						
Assets	612.2	857.9	1144.3	1386.9	1660.1	2089.8
Pension contributions	582.9	754.6	925.4	1102	1313.7	1587.5
Pension payments	27.3	90.1	158.2	208.9	251.9	300.2
Credit unions						
Assets	6064.9	4218	3432.2	2386.5	2656.9	2598.8
Earnings	1799.9	1086.1	706.2	689.4	755.1	764.6
Expenses	1642	1533	681.8	686.7	625.8	665.3
Finance companies						
Assets	6011.8	7578.5	10226.9	19894.2	29703.2	39781.2
Amount of the provided financial services	15073.2	21834	27059.6	26466.8	37765	47835.9
Pawnshops						
Assets	525.3	618.9	888.2	1203.8	1558.4	1518.6
Amount of the given secured financial loans	2134.471	3686.3119	5362.205	7187	8842.9	8368.2
Amount of repaid financial loans	2008.451	3517.5499	5223.12	6938.9	8672.9	8347.8

The expediency of normalization of the indicators is caused by the need of bringing them into comparable form due to the different impact of each indicator on the assessment of functioning of the non-bank services market (direct and inverse) and different measurement units. The selection of the relative method as a method of normalization is explained by the need to take into account the peaks and slumps in the behavioral dynamics of all statistical indicators and the impossibility for comparable indicators to assume zero values. This makes it possible to carry out mathematical formalization of the assessment of the non-bank financial services market according to the criterion of its efficiency, because as a result of normalization zero values can be obtained with the help of other methods. Practical realization of the second stage of the proposed approach is presented in Table 2.

Table 2. Normalized data for the characteristics of Ukraine's non-bank financial services market

Indicator	Symbol	Year					
		2008	2009	2010	2011	2012	2013
Insurance companies							
Assets	$\tilde{x}_{1t}$	0.4895	0.4852	0.5672	0.5866	1.0000	0.7764
Net insurance premiums	$\tilde{x}_{2t}$	0.7416	0.5873	0.6184	0.8338	0.9409	1.0000
Net insurance payments	$\tilde{x}_{3t}$	0.6976	0.7540	0.7759	0.9718	0.9188	1.0000
Private pension funds							
Assets	$\tilde{x}_{4t}$	0.2929	0.4105	0.5476	0.6637	0.7944	1.0000
Pension contributions	$\tilde{x}_{5t}$	0.3672	0.4753	0.5829	0.6942	0.8275	1.0000
Pension payments	$\tilde{x}_{6t}$	1.0000	0.3030	0.1726	0.1307	0.1084	0.0909
Credit unions							
Assets	$\tilde{x}_{7t}$	1.0000	0.6955	0.5659	0.3935	0.4381	0.4285
Earnings	$\tilde{x}_{8t}$	1.0000	0.6034	0.3924	0.3830	0.4195	0.4248
Expenses	$\tilde{x}_{9t}$	0.3811	0.4082	0.9179	0.9113	1.0000	0.9406
Finance companies							
Assets	$\tilde{x}_{10t}$	0.1511	0.1905	0.2571	0.5001	0.7467	1.0000
Amount of the provided financial services	$\tilde{x}_{11t}$	0.3151	0.4564	0.5657	0.5533	0.7895	1.0000

Table 2 (cont.). Normalized data for the characteristics of Ukraine's non-bank financial services market

Indicator	Symbol	Year					
		2008	2009	2010	2011	2012	2013
Pawnshops							
Assets	$\tilde{x}_{12t}$	0.3371	0.3971	0.5699	0.7725	1.0000	0.9745
Amount of the given secured financial loans	$\tilde{x}_{13t}$	0.2414	0.4169	0.6064	0.8127	1.0000	0.9463
Amount of repaid financial loans	$\tilde{x}_{14t}$	0.2316	0.4056	0.6022	0.8001	1.0000	0.9625

During the third stage we calculate integral indicators for characteristics of each segment of the non-bank financial services market. In other words, we assess the efficiency of functioning of insurance companies, pension funds, credit unions, finance companies and pawnshops.

It is proposed to carry out a number of intermediate calculations.

At first we determine the arithmetic mean of normalized indicators of the market segments for each year of the researched time range, i.e. the convolution of normalized indicators. The selection of this method of formalization is explained by the need to obtain a generalized characteristic of dynamic changes for each segment of the non-bank financial services market.

After that it is necessary to calculate integral indicators of the functioning of these segments in the dynamics for each year that involves the convolution of normalized indicators. This step makes it possible to assess the activity of segments of the non-bank financial services market according to the criterion of its efficiency, because the numerator of formula (1) considers the product of normalized indicators-stimulators, and the denominator – of indicators-destimulators.

$$sd_{st} = \frac{\prod_{s=1}^{2} \tilde{x}_{st}}{\tilde{x}_{3t}}, sd_{pt} = \frac{\prod_{p=4}^{5} \tilde{x}_{pt}}{\tilde{x}_{6t}}, sd_{kt} = \frac{\prod_{k=7}^{8} \tilde{x}_{kt}}{\tilde{x}_{9t}}, sd_{ft} = \prod_{f=10}^{11} \tilde{x}_{ft}, sd_{lt} = \prod_{l=12}^{14} \tilde{x}_{lt} \quad (1)$$

where sd_{st}, sd_{pt}, sd_{kt}, sd_{ft}, sd_{lt} is the correlation of the product of stimulators to destimulators of normalized indicators of characteristics of the functioning of insurance companies (respectively, private pension funds, credit unions, finance companies and pawnshops) in the year t.

Further, it is necessary to bring the results of the previous steps to a single indicator to assess the functioning of segments in each year by calculating the correlation of integral indicators to the medium levels of functioning of these components. Mathematical provision of this step can be presented as the formulas that are mentioned below (2):

$$I_{st} = \frac{sd_{st}}{sr_{st}} = \frac{\frac{\prod_{s=1}^{2} \tilde{x}_{st}}{\tilde{x}_{3t}}}{\frac{\sum_{s=1}^{S} \tilde{x}_{st}}{S}} = \frac{S \cdot \prod_{s=1}^{2} \tilde{x}_{st}}{\tilde{x}_{3t} \cdot \sum_{s=1}^{S} \tilde{x}_{st}}, I_{pt} = \frac{sd_{pt}}{sr_{pt}} = \frac{\frac{\prod_{p=4}^{5} \tilde{x}_{pt}}{\tilde{x}_{6t}}}{\frac{\sum_{p=S+1}^{P} \tilde{x}_{pt}}{P}} = \frac{P \cdot \prod_{p=4}^{5} \tilde{x}_{pt}}{\tilde{x}_{6t} \cdot \sum_{p=S+1}^{P} \tilde{x}_{pt}},$$

$$I_{kt} = \frac{sd_{kt}}{sr_{kt}} = \frac{\frac{\prod_{k=7}^{8} \tilde{x}_{kt}}{\tilde{x}_{9t}}}{\frac{\sum_{k=P+1}^{K} \tilde{x}_{kt}}{K}} = \frac{K \cdot \prod_{k=7}^{8} \tilde{x}_{kt}}{\tilde{x}_{9t} \cdot \sum_{k=P+1}^{K} \tilde{x}_{kt}}, I_{ft} = \frac{sd_{ft}}{sr_{ft}} = \frac{\prod_{f=10}^{11} \tilde{x}_{ft}}{\frac{\sum_{f=K+1}^{F} \tilde{x}_{ft}}{F}} = \frac{F \cdot \prod_{f=10}^{11} \tilde{x}_{ft}}{\sum_{f=K+1}^{F} \tilde{x}_{ft}}, \quad (2)$$

$$I_{lt} = \frac{sd_{lt}}{sr_{lt}} = \frac{\prod_{l=12}^{14} \tilde{x}_{lt}}{\frac{\sum_{l=F+1}^{L} \tilde{x}_{lt}}{L}} = \frac{L \cdot \prod_{l=12}^{14} \tilde{x}_{lt}}{\sum_{l=F+1}^{L} \tilde{x}_{lt}}$$

where I_{st}, I_{pt}, I_{kt}, I_{ft}, I_{lt} is the integral indicator of the functioning of insurance companies (respectively, pension funds, credit unions, finance companies and pawnshops) in the year t.

The results of the practical realization of the third stage of the researched method are shown in Table 3.

Table 3. Integral values of the functioning of the segments of Ukraine's non-bank financial services market in 2008-2013

Indicator	Year					
	2008	2009	2010	2011	2012	2013
Insurance companies						
Mean value	0.6429	0.6088	0.6538	0.7974	0.9532	0.9255
Correlation of the product of stimulators to destimulators	0.5204	0.3779	0.4520	0.5033	1.0240	0.7764
Integral indicator	0.8094	0.6207	0.6914	0.6312	1.0742	0.8389
Private pension funds						
Mean value	0.5534	0.3963	0.4344	0.4962	0.5768	0.6970
Correlation of the product of stimulators to destimulators	0.1076	0.6440	1.8497	3.5252	6.0657	10.9963
Integral indicator	0.1944	1.6251	4.2585	7.1048	10.5167	15.7771

Table 3 (cont.). Integral values of the functioning of the segments of Ukraine's non-bank financial services market in 2008-2013

Indicator	Year					
	2008	2009	2010	2011	2012	2013
Credit unions						
Mean value	0.7937	0.5690	0.6254	0.5626	0.6192	0.5980
Correlation of the product of stimulators to destimulators	2.6238	1.0280	0.2419	0.1654	0.1838	0.1935
Integral indicator	3.3058	1.8066	0.3868	0.2940	0.2968	0.3236
Finance companies						
Mean value	0.2331	0.3235	0.4114	0.5267	0.7681	1.0000
Correlation of the product of stimulators to destimulators	0.4796	0.4174	0.4545	0.9039	0.9458	1.0000
Integral indicator	2.0574	1.2903	1.1047	1.7161	1.2314	1.0000
Pawnshops						
Mean value	0.2700	0,4065	0,5929	0,7951	1,0000	0,9611
Correlation of the product of stimulators to destimulators	0.3513	0,4082	0,5739	0,7847	1,0000	0,9581
Integral indicator	1.3012	1.0041	0.9680	0.9869	1.0000	0.9968

After carrying out generalization of performance indicators for the segments of the non-bank financial services market it is necessary to calculate their weight coefficients. The formation of the general integral indicator for assessing the performance of the non-bank financial services market should take into account the impact made on it by each segment as they vary in scope and importance. In order to fulfill this task we offer to use the method of Fishburne (Table 4).

Table 4. Weight coefficients of various segments of the market of non-bank services

Subjects of the non-bank financial services market	Assets (average value for the researched range), mln. Hryvnias	Rank	Weight coefficient according to the Fishburne method	Symbols
Insurance companies	31779.77	1	0.333333	w_s
Private pension funds	1291.867	4	0.133333	w_p
Credit unions	3559.55	3	0.2	w_k
Finance companies	18865.97	2	0.266667	w_f
Pawnshops	1052.2	5	0.066667	w_l

On the basis of integral performance indicators of the market segments for the year t and weight coefficients for the segments of the non-bank services market we assess the functioning of the market in its dynamics. It is proposed to apply the arithmetic mean weighted value which is based on the introduced symbols, that takes on the form of the following formula:

$$OF_t = \frac{1}{5}\left(I_{st}\cdot w_s + I_{pt}\cdot w_p + I_{kt}\cdot w_k + I_{ft}\cdot w_f + I_{lt}\cdot w_l\right) =$$

$$= \frac{1}{5}\left(\frac{S\cdot\prod_{s=1}^{2}\tilde{x}_{st}}{\tilde{x}_{3t}\cdot\sum_{s=1}^{S}\tilde{x}_{st}}\cdot w_s + \frac{P\cdot\prod_{p=4}^{5}\tilde{x}_{pt}}{\tilde{x}_{6t}\cdot\sum_{p=S+1}^{P}\tilde{x}_{pt}}\cdot w_p + \frac{K\cdot\prod_{k=7}^{8}\tilde{x}_{kt}}{\tilde{x}_{9t}\cdot\sum_{k=P+1}^{K}\tilde{x}_{kt}}\cdot w_k + \right.$$

$$\left. + \frac{F\cdot\prod_{f=10}^{11}\tilde{x}_{ft}}{\sum_{f=K+1}^{F}\tilde{x}_{ft}}\cdot w_f + \frac{L\cdot\prod_{l=12}^{14}\tilde{x}_{lt}}{\sum_{l=F+1}^{L}\tilde{x}_{lt}}\cdot w_l\right) \quad (3)$$

where OF_t is the general assessment of the market of non-bank services for the year t.

Practical results are presented in Table 5.

Table 5. Dynamics of the actual values in assessing the market of non-bank services

Subjects of the non-bank financial services market	Year					
	2008	2009	2010	2011	2012	2013
Insurance companies	0.8094	0.6207	0.6914	0.6312	1.0742	0.8389
Private pension funds	0.1944	1.6251	4.2585	7.1048	10.5167	15.7771
Credit unions	3.3058	1.8066	0.3868	0.2940	0.2968	0.3236
Finance companies	2.0574	1.2903	1.1047	1.7161	1.2314	1.0000
Pawnshops	1.3012	1.0041	0.9680	0.9869	1.0000	0.9968
Assessment of the market performance in general	0.3185	0.2392	0.2470	0.3480	0.4429	0.5562

Given the fact that the significance of the obtained indicator may fluctuate in the range from 0 to 1, the state of development of the non-bank financial services market, that is, its efficiency, is not high enough assuming the maximum value – 0.5562 in 2013. Despite the latent crisis in Ukraine in this period, this indicator can be explained by the growth of indicators-stimulators of the financial market's researched segments. The assessment of the effectiveness of the non-bank financial services market assumes its minimum value (0.2392) in the post-crisis year 2009, in which the destructive impact of the global financial crisis in Ukraine was at its highest level. However, it should be noted that the development dynamics of the analyzed market in the period 2009-2013 can be characterized as positive as the value of the integral indicator grows permanently (Figure 2).

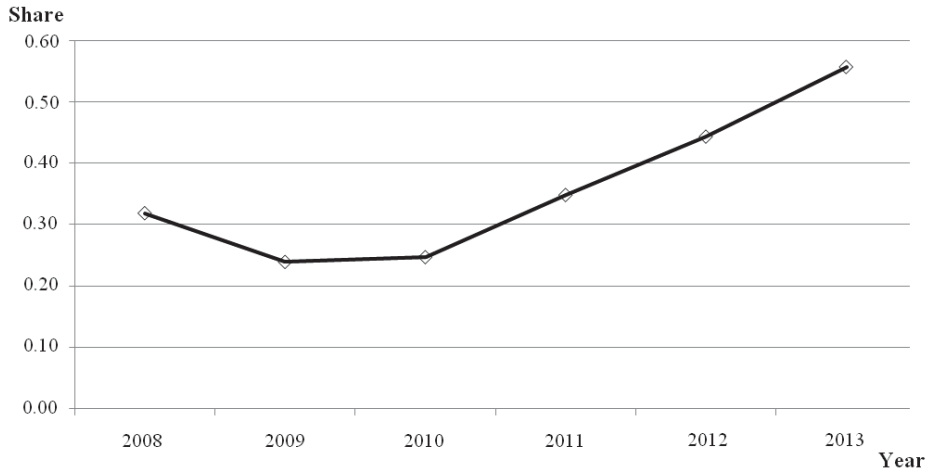


Figure 2. General indicator of non-banking financial services market efficiency in the period 2008-2013

Qualitative interpretation of the obtained results can be realized through the provision of equal ranges describing the corresponding level of the market's efficiency: from 0 to 0.25 – low; from 0.25 to 0.50 – sufficient; from 0.50 to 0.75 – average; from 0.75 to 1 – high.

Conclusion

The efficiency of the market of non-bank financial services in Ukraine during the study period is mostly sufficient, that is, the indicator's integral value is in the range 0.25-0.50, but in 2009-2010 it is low and only in 2013 it is characterized by an average level of efficiency. Summarizing the results of the study it should be noted that the market of non-bank financial services in Ukraine is dynamically developing, especially those of its segments with the functioning insurance companies, finance companies and private pension funds, which demonstrate the growing popularity of alternative financial services, which in modern conditions is a positive trend as it makes it possible to diversify the sources of origin and transmission of financial risks, as well as to increase the effectiveness of the financial resources' redistribution into more productive spheres through additional channels.

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