Assessment of the state financial security level

Olha Pavelko
National University of Water and Environmental Engineering, Rivne, Ukraine
ORCID: 0000-0002-2483-2245, e-mail: o.v.pavelko@nuwm.edu.ua

Olena Doroshenko
National University of Water and Environmental Engineering, Rivne, Ukraine
ORCID: 0000-0002-6428-0326, e-mail: o.o.doroshenko@nuwm.edu.ua

Inna Lazaryshyna
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
ORCID: 0000-0002-1183-7530, e-mail: in2003@ukr.net

Yulia Vashai
National University of Water and Environmental Engineering, Rivne, Ukraine
ORCID:0000-0002-0664-0485, e-mail: y.v.vashai@nuwm.edu.ua

DOI: 10.14595/CP/02/019

Abstract: The article describes the methodical approaches to assessment of the state financial security level. Ukraine has been taken as an example. A set of indicators that determine the level of financial security of Ukraine has been analyzed. For the purpose of optimizing the list of indicators that are taken into account while determining the integrated financial security level of Ukraine, the elements of correlation analysis have been used. The development of correlation matrix made it possible to identify the level of interrelationship between financial security indicators. A lot of indicators, proposed by the Methodical guidelines on the calculation of the level of economic security of the state, are closely correlated with each other, enhancingthe overall effect of their dynamics on the integrated level of financial security. The need to neutralize them has been established. All things considered, suggestions for improvement the Methodical guidelines on the calculation of the level of economic security of the state, based on the optimization of the indicator numbers and taking into consideration the close correlations between them, have been proposed. Such indicators as: level of capitalization of listed companies to GDP; gross international reserves of Ukraine; the share of loans in foreign currency; ratio of liquid assets to short-term liabilities; level of GDP redistribution through consolidated budget; the difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU) have been recommended for removal from the method of Ukraine's financial security assessment. The changes of methodical approaches to the diagnosis of the state financial security level will allow us to obtain a relevant information base for the analysis of the state financial security and make appropriate decisions concerning neutralization of threats and strengthening of security.

Keywords: assessment, financial security, security level, indicators, the correlation matrix, correlations.

JEL: E60, H56

Introduction

In modern economic realities, one of the fundamental factors of a sovereign state's independence is the state financial security as a set of measures for fiscal and monetary policies in order to achieve stability of the financial system and create favorable investment

climate. Market conditions as well as a complex system of economic relations, the unsatisfactory state of the domestic financial sector and the significant changes that have taken place in recent years in Ukraine have created new threats to the domestic economy. Consequently, monitoring of the state domestic financial sector due to the instability of the internal and external environments is becoming increasingly difficult. Financial security, as an integral part of economic security, has a significant impact on the level of economic growth in a country. The key to financial security is the transparency of the processes occurring in public finances and banking sector [Józef Antoni Haber, 2018].

In order to achieve the highest level of financial security and ensure its strengthening, the state should implement an appropriate mechanism. A key aspect is the constant monitoring of the financial security level dynamics. Significant changes that have occurred in recent years have also created new threats to the domestic economy, necessitating the diagnosis of Ukraine's financial security [Mihus, 2018]. We should verify individual data to determine financial security by establishing correlations between them. There are still many questions regarding the assessment of the state financial security level.

The purpose of this research is to identify the level of interrelationship between financial security indicators and to improve the Methodical guidelines on the calculation of the level of economic security of the state based on the optimization of the indicator numbers, taking into account the close correlations between them.

Literature review

A significant number of articles and other research are devoted to the exploration of state financial security, its level and assessment. Scientists have been thoroughly working out the structure of financial security, its indicators, factors, threats to financial security, and the ways of their neutralization. The works of scientists such as Baldwin (1997), Yong (2009), Nesadurai (2005), Nanto (2011), Ronis (2011), Wang (2004) are of a fundamental nature. The authors consider the structure and concepts of financial security support, possible threats and directions for their neutralization, basing on the example of the countries all over the world. Studies of the relevant literature indicate the difficulties that arise in identifying the concept of financial security.

A country's financial security is a multifaceted phenomenon: to start with, it is a component of economic security, and, secondly, it is a subsystem of national security. At the same time, financial security is a complicated multi-level system, which is formed by several subsystems, each of which has its own structure and logic of development [Józef Antoni Haber, 2018; Savytska, 2012]. It is the state of financial and credit sphere, characterized by balance and quality of the system of financial interests, sufficient financial resources for all economic entities and the population as a whole, that ensures the effective functioning of the national economic system and social development [Yermoshenko, 2001]; protection of the state's interests in the financial sphere, or the state of the budget, tax and monetary systems that guarantees the state's ability to rationally use financial resources [Sukhorukov, 2004]; implementation of a targeted set of measures on fiscal and monetary policies in order to achieve stability of the financial system and create a favorable investment climate [Kulpinskyy, 2000].

According to Methodical guidelines on the calculation of the level of economic security of Ukraine, approved by the Order of the Ministry of Economic Development and Trade of Ukraine dated October 29, 2013, No. 1277, financial security is the state of the country's financial system, which creates the necessary financial conditions for stable socio-economic development, ensures its resilience to financial shocks and imbalances, creates conditions for maintaining the integrity and unity of the country's financial system. In the article by Józef, Haber, Bukhtiarova, Chorna, Iastremska & Bolga (2018), the level of financial security of the country based on regression analysis of impact factors is forecasted. Based on the calculation of the arithmetic mean of absolute deviations of independent variables, the estimated value of Ukraine's financial security level is calculated. Proposals for improving the Methodical guidelines on the calculation of the level of economic security of Ukraine, concerning the choice of indicators for assessing financial security, are made. We also believe that indicators used to determine financial security should be revised. With this, we propose to establish correlations between relevant indicators.

The study by Shkolnyk, Kozmenko, Polach & Wolanin (2020) aimed to assess the level of financial security. Its structural analysis is carried out, and the factors influencing it are identified, using the case of Poland and Ukraine. The countries' financial security is analyzed by four indicator groups. Using Harrington's Desirability Function, an integrated financial security indicator was created for each country. We fully share the position, formed in this

study, that the set of indicators is wide, therefore it is not possible to use them as a standard for all countries, since the structure and level of development of financial systems differ. Thus, it's necessary to determine their list individually within countries or regions.

Koilo, Ryabushka, Kubakh & Halik (2020) examined the financial security characteristics and analyzed an integral indicator, based on a taxonomic approach. The research of Khalatur, Pavlova & Zhylenko (2018) aimed at analyzing the current state of financial security indicators of the national economy of Ukraine and defined the directions of increasing financial security of Ukraine in the context of transnationalization and national interests on the basis of studying and evaluating the practical bases. A correlation analysis was conducted to determine the dependence of the money supply on other indicators of the national economy in Ukraine. Unlike regression analysis, this is the only indicator that calculates this method of statistical research. The correlation coefficient varies from +1 to –1. Pochenchuk G. (2014) proves the point of view that financial security of the state firstly depends on governance efficiency. We support this point of view, but we also suppose that the transparency of processes taking place in public finances, the banking and non-banking sector, underlie the level of financial security. Basing on the analysis of the key balance of payments accounts and several proposed financial security indicators, a ranking of the analyzed economies is suggested by Siemiątkowski. It is based on the Financial Security Index, which uses linear alignment methods (Siemiątkowski, 2017).

Ensuring financial security at all levels of management is an urgent task for many countries, including Ukraine. It is impossible to solve the economic problems facing the country do not provide its financial security. This task becomes a special priority in conditions of instability, financial crisis, changing economic realities, transnationalization and deepening of global financial instability, increasing threats to all parts of the financial security of the state. The indicators of state financial security must be studied under these conditions.

Methodology of the research

There are difficulties in assessing the state financial security due to different approaches to the selection of appropriate indicators. Thus, according to the methodology proposed by the Institute of Economics of the Russian Academy of Sciences, there are used 15 indicators, which are characterized by the highest level of sensitivity. In the methodology that

has been used in Ukraine until 2013 (developed by the Ministry of Economic Development and Trade of Ukraine, dated March 02, 2007, No. 60), financial security indicators were defined according to the types of security: budget security; money market security and inflation; currency security; debt security; insurance market security; stock market security; banking security.

In modern economic realities, the assessment of the state financial security level in Ukraine is based on the Guidelines dated October 29, 2013, No. 1277. Currently, in accordance with the legal framework, financial security is formed by the following components: banking, non-banking, debt, budget, currency and monetary security. Among the main indicators of financial security of the country, scientists identify: GDP, GDP growth rate, GDP per capita, income differentiation index, unemployment rate, industrial production growth rate, import-export balance, inflation rate, natural population growth rate [Bilorys, 2002]; budget, currency, monetary, debt security, insurance market and stock market security [Savytska, 2012].

The International Monetary Fund has developed its own methodology and set of indicators to assess the financial stability of countries. Financial soundness indicators (FSIs) provide insight into the financial health and soundness of a country's financial institutions as well as corporate and household sectors. FSIs support economic and financial stability analysis. The IMF methodology operates on a number of indicators, grouped by the following: FSI Code Core; FSIs for Deposit Takers; Additional FSIs for Deposit Takers; FSIs for Other Financial Corporations; FSIs for Nonfinancial Corporations; FSIs for Households; FSIs for Market Liquidity; FSIs for Real Estate Markets [Financial Soundness Indicators and IMF, 2019]. Each component of financial security, in addition to performing the relevant functions, is an integral part of the synergetic system designed to ensure the stability of the national economy in relation to internal and external negative impacts for its effective functioning [Mihus, Akimova & Harnyk, 2018].

The list of indicators of economic security, defined by the Methodical guidelines on the calculation of the level of economic security of Ukraine, contains a large number of financial security indicators. In our opinion, the above list has some shortcomings: there is a large number of proposed indicators and there is a fairly conditional distribution of their components, which are often related; correlation between indicators in some way may distort the integrated indicator of economic security. In order to avoid certain shortcomings, we

propose to identify possible correlations between financial security indicators. For those that significantly correlate with other indicators we consider their weights to be reduced or we should exclude them altogether. This will allow a wide range of scholars and practitioners to have access to information characterizing the state of financial security of Ukraine, as well as to make appropriate decisions concerning neutralization of threats and strengthening of security.

Results

Let's analyze the closeness of the relationship between the sets of financial security indicators. The initial data for analysis are given in Table 1. The same table indicates the symbols of economic security indicators for standardization of further calculations. The research period is 2013-2019.

Table 1. Initial data for the analysis of the closeness of the mutual influence of financial security indicators of Ukraine

Indicators	Symbols	2013	2014	2015	2016	2017	2018	2019
1. Banking security								
1.1. Share of arrears on loans in the total volume of loans granted by banks to residents of Ukraine, %	x_1	12,89	18,98	28,03	13,61	22,21	25,89	26,03
1.2. The ratio of bank loans and deposits in foreign currency, %	x_2	125,15	154,21	180,96	134,50	125,88	107,77	83,5
1.3. Share of foreign capital in the authorized capital of banks, %	x_3	27,37	31,48	35,04	39,58	46,34	48,05	50,34
1.4. Ratio of long-term (over 1 year) loans and deposits, times	x_4	1,76	2,83	3,89	4,13	3,41	3,76	3,76
1.5. Return on assets, %	x_5	0,11	-3,99	-6,22	-15,55	-1,38	1,60	4,35
1.6. Ratio of liquid assets to short-term liabilities, %	x_6	89,11	86,14	92,87	92,09	98,37	93,52	94,06
1.7. The share of assets of the five largest banks in total assets of the bank's securities, %,	x_7	40,01	43,41	53,62	55,63	26,21	89,97	57,62
2. Non-banking security								
2.1 Level of insurance penetration (insurance premiums to GDP), %	x_8	1,96	1,71	1,50	1,48	1,46	0,98	1,33
2.2 Level of capitalization of listed companies to GDP	x_9	21,28	29,21	3,21	0,82	0,41	0,28	0,29
2.3 Volatility level of the PFTS index, the number of critical deviations (-10%)	x_{10}	0,00	1,00	1,00	0,00	0,00	0,00	0,00
2.4 Share of insurance premiums of the three largest insurance companies in the total amount of insurance premium receipts (except life), %	x_{11}	13,50	15,60	14,70	18,90	21,30	14,90	15,23
3. ***Debt security***								
3.1 The ratio of the state and state-guaranteed debt to GDP, %	x_{12}	39,88	70,26	79,40	80,97	71,80	60,94	52,38
3.2 The ratio of gross external debt to GDP, %	x_{13}	16,32	33,10	43,60	41,64	36,59	31,22	78,5
3.4 The average weighted yield of T-bills (government bonds) in the primary market	x_{14}	736,80	1 013,50	2374,60	762,50	564,20	454,60	568
3.5 The ratio of official international reserves to the volume of gross external debt, %	x_{15}	68,23	22,91	36,99	42,58	48,37	51,89	20,78
4. ***Budget security***								
4.1 The ratio of the deficit / surplus of the state budget to GDP, %	x_{16}	-4,45	-4,98	-2,28	-2,94	-1,60	-1,66	-2,09
4.2 Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	x_{17}	-0,45	-1,02	-2,62	-2,1	-0,83	-0,25	-0,67
4.3 Level of GDP redistribution through consolidated budget, %	x_{18}	30,43	29,11	32,94	32,84	34,08	33,28	31,15

4.4 The ratio of aggregate payments for servicing and repayment of state debt to the state budget revenues, %	x_{19}	32,9	47,7	38,9	33.85	28,3	20,32	47,12
5. Currency security								
5.1 The index of the change in the official rate of the national currency to the US dollar, the average for the period	x_{20}	1,00	1,41	1,96	1,16	1,04	1,02	1,02
5.2 The index of the change in the official rate of the national currency to the US dollar, the average for the period	x_{21}	-24,70	-454,18	-2,73	9,09	-8,78	-2,17	-1,85
5.3 Gross international reserves of Ukraine, months of import	x_{22}	2,70	1,00	3,20	3,70	3,60	3,40	3,80
5.4 The share of loans in foreign currency in the total amount of loans granted, %	x_{23}	33,82	46,31	55,81	49,43	43,87	42,78	36,85
5.5 Balance of sale and purchase of foreign currency by the population, billion US dollars	x_{24}	-1,16	-0,79	1,55	2,48	2,14	1,48	4,93
5.6 Dollarization of the money supply, %	x_{25}	27,24	32,16	32,17	32,87	31,90	29,25	29,49
6. Currency and monetary security								
6.1 Specific weight of cash outside banks in the total amount of money supply (M0/M3), %	x_{26}	26,16	29,57	28,44	28,51	27,51	28,46	26,73
6.2 The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	x_{27}	4,90	4,55	5,93	5,46	6,28	6,32	5,62
6.3 The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	x_{28}	16,33	5,52	-26,87	4,64	1,96	8,23	7,46
6.4 Share of consumer loans granted to households in the general structure of loans granted to residents, %	x_{29}	15,08	13,24	10,68	10,17	12,01	14,13	17,87
6.5 Share of long-term loans in the total amount of loans granted (corrected for the exchange rate difference), %	x_{30}	66,34	53,85	44,25	50,59	56,15	57,24	19,63
6.6 Total export of financial resources outside the country, billion dollars USA	x_{31}	10,50	11,90	15,60	15,10	14,30	13,87	13,52

Source: calculated by the authors on the basis of Official site of the State Statistics Service of Ukraine [https: ukrstat.gov.ua]

Table 2. Correlation matrix of financial security indicators of Ukraine

		Financial security indicators																														
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Financial security indicators	x_1	1,00																														
	x_2	-0,03	1,00																													
	x_3	0,58	-0,65	1,00																												
	x_4	0,54	-0,01	0,68	1,00																											
	x_5	0,45	-0,58	0,33	-0,34	1,00																										
	x_6	0,46	-0,33	0,76	0,53	0,17	1,00																									
	x_7	0,39	-0,28	0,39	0,44	0,12	-0,02	1,00																								
	x_8	-0,67	0,39	-0,86	-0,76	-0,19	-0,56	-0,74	1,00																							
	x_9	-0,49	0,32	-0,80	-0,79	0,05	-0,87	-0,36	0,74	1,00																						
	x_{10}	0,27	0,81	-0,50	0,00	-0,22	-0,49	-0,13	0,26	0,47	1,00																					
	x_{11}	-0,12	-0,02	0,39	0,39	-0,39	0,60	-0,43	-0,15	-0,41	-0,29	1,00																				
	x_{12}	0,18	0,61	0,09	0,69	-0,73	0,19	-0,04	-0,25	-0,30	0,44	0,56	1,00																			
	x_{13}	0,52	-0,40	0,64	0,60	0,18	0,35	0,14	-0,41	-0,50	-0,06	0,07	0,09	1,00																		
	x_{14}	0,34	0,84	-0,43	0,17	-0,33	-0,16	-0,09	0,21	0,06	0,79	-0,28	0,46	0,01	1,00																	
	x_{15}	-0,43	-0,03	-0,28	-0,47	0,01	0,11	-0,03	0,20	0,00	-0,48	-0,04	-0,37	-0,75	-0,20	1,00																
	x_{16}	0,67	-0,32	0,85	0,72	0,18	0,92	0,34	-0,80	-0,95	-0,39	0,38	0,25	0,44	-0,06	0,00	1,00															
	x_{17}	-0,06	-0,74	0,26	-0,49	0,77	0,01	0,13	-0,12	0,20	-0,53	-0,16	-0,76	-0,15	-0,79	0,27	-0,04	1,00														
	x_{18}	0,36	-0,02	0,57	0,62	-0,18	0,87	0,18	-0,60	-0,86	-0,36	0,56	0,44	0,05	0,03	0,30	0,87	-0,24	1,00													
	x_{19}	0,02	0,16	-0,26	-0,07	-0,02	-0,46	-0,34	0,42	0,42	0,53	-0,23	0,02	0,52	0,31	-0,77	-0,47	-0,27	-0,70	1,00												
	x_{20}	0,37	0,87	-0,39	0,25	-0,37	-0,21	-0,05	0,13	0,10	0,88	-0,22	0,58	0,03	0,97	-0,34	-0,08	-0,80	0,00	0,36	1,00											
	x_{21}	0,17	-0,33	0,44	0,34	0,03	0,71	0,22	-0,36	-0,81	-0,64	0,13	-0,11	0,19	-0,05	0,46	0,71	-0,09	0,73	-0,53	-0,21	1,00										
	x_{22}	0,26	-0,45	0,67	0,56	0,01	0,83	0,24	-0,52	-0,93	-0,67	0,33	0,04	0,43	-0,16	0,21	0,83	-0,10	0,77	-0,43	-0,27	0,94	1,00									
	x_{23}	0,29	0,78	-0,09	0,61	-0,68	0,05	0,07	-0,18	-0,22	0,64	0,25	0,93	0,01	0,73	-0,31	0,18	-0,86	0,37	0,05	0,81	-0,09	-0,04	1,00								
	x_{24}	0,49	-0,51	0,84	0,75	0,10	0,68	0,23	-0,62	-0,82	-0,38	0,32	0,17	0,89	-0,15	-0,46	0,74	-0,12	0,46	0,11	-0,15	0,53	0,76	0,03	1,00							
	x_{25}	0,10	0,56	0,06	0,61	-0,71	0,12	-0,22	-0,11	-0,17	0,47	0,62	0,96	0,18	0,39	-0,51	0,11	-0,72	0,27	0,22	0,52	-0,26	-0,07	0,84	0,18	1,00						
	x_{26}	0,15	0,55	-0,08	0,41	-0,50	-0,30	0,24	-0,25	0,15	0,63	0,15	0,76	-0,12	0,31	-0,44	-0,13	-0,41	-0,01	0,09	0,50	-0,58	-0,47	0,74	-0,20	0,73	1,00					
	x_{27}	0,63	-0,20	0,74	0,63	0,16	0,90	0,34	-0,77	-0,88	-0,35	0,38	0,27	0,22	-0,02	0,16	0,97	-0,03	0,93	-0,63	-0,04	0,69	0,76	0,23	0,56	0,10	-0,07	1,00				
	x_{28}	-0,57	-0,71	0,05	-0,50	0,32	-0,21	0,02	0,13	0,30	-0,66	-0,02	-0,66	-0,20	-0,91	0,29	-0,32	0,80	-0,37	-0,16	-0,91	-0,12	-0,11	-0,84	-0,16	-0,57	-0,37	-0,34	1,00			
	x_{29}	0,16	-0,76	0,27	-0,34	0,84	-0,08	0,17	-0,06	0,13	-0,34	-0,48	-0,84	0,38	-0,49	-0,14	-0,05	0,74	-0,46	0,26	-0,53	-0,01	0,01	-0,84	0,21	-0,75	-0,58	-0,17	0,56	1,00		
	x_{30}	-0,54	0,34	-0,54	-0,54	-0,21	-0,25	-0,16	0,35	0,42	-0,03	0,06	-0,05	-0,99	-0,10	0,77	-0,37	0,17	0,04	-0,59	-0,11	-0,15	-0,35	-0,02	-0,83	-0,13	0,12	-0,15	0,24	-0,41	1,00	
	x_{31}	0,51	0,23	0,51	0,93	-0,45	0,62	0,24	-0,60	-0,80	0,08	0,46	0,79	0,42	0,38	-0,28	0,74	-0,66	0,77	-0,17	0,42	0,45	0,59	0,75	0,63	0,67	0,36	0,70	-0,70	-0,57	-0,37	1,00

Source: calculated by the authors

It is well known that the value of correlation coefficients determines how closely related the empirical parameters of linear dependence are. With a positive relationship between them, the correlation coefficient $r_{y,x}$ takes values from 0 to 1. The closer $r_{y,x}$ to 1, the closer the empirical dependence to the functional [Venetsky, Kildysheva, 1956].

Table 2 contains the results of calculations of paired correlation coefficients for all these indicators in the form of a correlation matrix. The correlation matrix *n* of random variables $X_1, \ldots, X_n$ is a matrix of size $n \times n$ elements of row *i* and column *j* of which $\rho(X_i; X_j)$. The adequacy of the obtained data will be checked using Fisher's test. According to the values of the coefficient of determination R^2 obtained in the model, the experimental value of *F*-statistics is calculated:

(1) $$F_{\text{эксп}} = \frac{R^2}{1 - R^2} \cdot \frac{n - m - 1}{m}.$$

which is compared with the tabular value of the Fisher distribution at a given level of significance α (usually α = 0.05 or α = 0.01). If $F_{table} < F_{exp}$, the null hypothesis is rejected, there is a coefficient in the regression equation that differs significantly from zero, and the corresponding factor affects the studied variable. The deviation of the null hypothesis indicates the adequacy of the constructed model. Otherwise, the model is considered inadequate [Kozmenko & Kuzmenko, 2014]. F_{table} for the significance level α = 0.05 and degrees of freedom 1 and 5 is 2.57. The calculated values of F statistics are given in Table. 3. The fill highlights cases when $F_{table} < F_{exp}$, i.e., cases of statistically significant correlation coefficients.

Based on the results of checking the correlation coefficients for significance and removing statistically insignificant coefficients from the correlation matrix, the “cleaned” correlation matrix reflects the “true” statistically significant relationships between the variables (Table 4).

Table 3. The value of the F-criterion

		Financial security indicators																														
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
Financial security indicators	x_1	x																														
	x_2	-0,06	x																													
	x_3	1,58	-1,93	x																												
	x_4	1,42	-0,03	2,06	x																											
	x_5	1,13	-1,58	0,78	-0,81	x																										
	x_6	1,17	-0,78	2,64	1,38	0,38	x																									
	x_7	0,94	-0,65	0,96	1,11	0,27	-0,04	x																								
	x_8	-2,00	0,95	-3,70	-2,62	-0,43	-1,50	-2,49	x																							
	x_9	-1,25	0,76	-2,96	-2,90	0,10	-3,88	-0,86	2,45	x																						
	x_{10}	0,63	3,12	-1,30	-0,01	-0,50	-1,27	-0,30	0,61	1,18	x																					
	x_{11}	-0,28	-0,06	0,96	0,94	-0,93	1,68	-1,07	-0,35	-1,00	-0,67	x																				
	x_{12}	0,42	1,70	0,21	2,15	-2,42	0,44	-0,08	-0,57	-0,71	1,11	1,50	x																			
	x_{13}	1,36	-0,98	1,85	1,67	0,42	0,84	0,32	-1,00	-1,29	-0,14	0,17	0,21	x																		
	x_{14}	0,80	3,43	-1,08	0,38	-0,79	-0,36	-0,21	0,48	0,13	2,89	-0,64	1,16	0,01	x																	
	x_{15}	-1,07	-0,07	-0,64	-1,18	0,03	0,26	-0,07	0,47	0,00	-1,23	-0,08	-0,89	-2,53	-0,46	x																
	x_{16}	2,00	-0,76	3,60	2,29	0,41	5,29	0,82	-2,99	-6,64	-0,95	0,93	0,57	1,11	-0,14	-0,01	x															
	x_{17}	-0,14	-2,45	0,59	-1,25	2,73	0,02	0,28	-0,27	0,46	-1,39	-0,36	-2,65	-0,33	-2,92	0,61	-0,10	x														
	x_{18}	0,86	-0,05	1,56	1,78	-0,41	3,87	0,41	-1,67	-3,84	-0,87	1,52	1,10	0,12	0,07	0,71	3,95	-0,54	x													
	x_{19}	0,05	0,37	-0,59	-0,16	-0,04	-1,17	-0,81	1,04	1,04	1,41	-0,54	0,05	1,37	0,74	-2,70	-1,20	-0,62	-2,16	x												
	x_{20}	0,90	3,89	-0,95	0,57	-0,90	-0,48	-0,11	0,30	0,22	4,16	-0,49	1,59	0,06	9,67	-0,81	-0,19	-2,95	-0,01	0,86	x											
	x_{21}	0,38	-0,79	1,10	0,81	0,08	2,28	0,51	-0,85	-3,05	-1,86	0,30	-0,24	0,44	-0,12	1,16	2,28	-0,20	2,38	-1,41	-0,48	x										
	x_{22}	0,60	-1,12	2,03	1,51	0,02	3,27	0,55	-1,37	-5,71	-2,00	0,78	0,09	1,05	-0,37	0,48	3,37	-0,22	2,74	-1,08	-0,63	6,30	x									
	x_{23}	0,67	2,80	-0,21	1,71	-2,09	0,12	0,15	-0,41	-0,49	1,85	0,58	5,61	0,03	2,37	-0,72	0,40	-3,77	0,89	0,11	3,13	-0,21	-0,09	x								
	x_{24}	1,27	-1,32	3,48	2,57	0,21	2,05	0,54	-1,75	-3,19	-0,91	0,77	0,40	4,39	-0,34	-1,16	2,50	-0,27	1,15	0,24	-0,35	1,39	2,61	0,08	x							
	x_{25}	0,23	1,52	0,13	1,70	-2,24	0,27	-0,50	-0,25	-0,39	1,20	1,75	7,90	0,41	0,95	-1,32	0,26	-2,32	0,64	0,51	1,38	-0,61	-0,17	3,49	0,42	x						
	x_{26}	0,33	1,49	-0,19	1,01	-1,29	-0,71	0,56	-0,58	0,34	1,84	0,34	2,58	-0,27	0,73	-1,10	-0,29	-1,00	-0,03	0,21	1,30	-1,61	-1,18	2,49	-0,45	2,38	x					
	x_{27}	1,83	-0,46	2,50	1,81	0,35	4,51	0,82	-2,72	-4,23	-0,83	0,91	0,62	0,50	-0,04	0,37	8,81	-0,06	5,45	-1,83	-0,10	2,15	2,62	0,52	1,51	0,22	-0,15	x				
	x_{28}	-1,57	-2,27	0,12	-1,28	0,74	-0,49	0,04	0,28	0,69	-1,94	-0,04	-1,96	-0,45	-4,82	0,69	-0,76	3,03	-0,89	-0,36	-4,89	-0,27	-0,24	-3,44	-0,35	-1,54	-0,90	-0,82	x			
	x_{29}	0,37	-2,62	0,62	-0,82	3,51	-0,18	0,38	-0,13	0,30	-0,82	-1,23	-3,49	0,92	-1,24	-0,32	-0,11	2,49	-1,16	0,59	-1,39	-0,03	0,01	-3,41	0,49	-2,56	-1,58	-0,38	1,50	x		
	x_{30}	-1,43	0,81	-1,45	-1,44	-0,48	-0,58	-0,37	0,83	1,04	-0,07	0,14	-0,11	-14,46	-0,23	2,66	-0,89	0,40	0,09	-1,64	-0,26	-0,34	-0,85	-0,05	-3,31	-0,30	0,27	-0,33	0,56	-1,01	x	
	x_{31}	1,31	0,53	1,34	5,56	-1,12	1,75	0,56	-1,69	-3,01	0,18	1,17	2,84	1,04	0,93	-0,64	2,43	-1,98	2,70	-0,39	1,03	1,12	1,65	2,51	1,80	2,02	0,86	2,20	-2,18	-1,55	-0,89	x

Source: calculated by the authors

Table 4. Purified correlation matrix of indicators of financial security

		Financial security indicators																																Total horizontally
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}	x_{12}	x_{13}	x_{14}	x_{15}	x_{16}	x_{17}	x_{18}	x_{19}	x_{20}	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	x_{26}	x_{27}	x_{28}	x_{29}	x_{30}	x_{31}	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33		34
Financial security indicators	x_1																																	0
	x_2		x																															0
	x_3			x																														0
	x_4				x																													0
	x_5					x																												0
	x_6			0,76			x																											1
	x_7							x																										0
	x_8			-0,86	-0,76				x																									2
	x_9			-0,80	-0,79		-0,87			x																								3
	x_{10}		0,81								x																							1
	x_{11}											x																						0
	x_{12}												x																					0
	x_{13}													x																				0
	x_{14}		0,84								0,79				x																			2
	x_{15}															x																		0
	x_{16}			0,85			0,92		-0,80	-0,95							x																		4
	x_{17}					0,77							-0,76		-0,79			x																	3
	x_{18}						0,87			-0,86							0,87		x																3
	x_{19}															-0,77				x														1
	x_{20}		0,87								0,88				0,97			-0,80			x													4
	x_{21}									-0,81												x													1
	x_{22}						0,83			-0,93							0,83		0,77			0,94	x												5
	x_{23}		0,78										0,93					-0,86			0,81			x											4
	x_{24}			0,84						-0,82				0,89									0,76		x										4
	x_{25}												0,96											0,84		x									2
	x_{26}												0,76																						1
	x_{27}						0,90		-0,77	-0,88							0,97		0,93				0,76					x							6
	x_{28}														-0,91			0,80			-0,91			-0,84					x						4
	x_{29}					0,84							-0,84											-0,84						x					3
	x_{30}													-0,99		0,77									-0,83						x				3
	x_{31}				0,93					-0,80			0,79						0,77													x			4
Total vertical			4	5	3	2	5	0	2	7	2	0	6	2	3	2	3	3	3	0	2	1	2	3	1	0	0	0	0	0	0	0		
The number of factors with which it is established	close relationship (r_{xy} >0.75)	0	4	5	3	2	6	0	4	10	3	0	6	2	5	2	7	6	6	1	6	2	7	7	5	2	1	6	4	3	3	4		
	very close connection (r_{xy} >0.9)	0	0	0	1	0	1	0	0	2	0		2	1	2	0	3		1		2	1	2	1	0	1	0	2	2	0	1	1		

Source: calculated by the authors

The results of the calculations of the correlation coefficients indicate that there is a relationship between many indicators of financial security of different densities. The list of indicators, ranked by the number of factors with a very close relationship, is given in Table 5.

Table 5. Ranking of financial security indicators by the number of factors with which there is a very close relationship

Financial security indicators	The number of factors with which there is a very close relationship (r_{xy} >0.9)
The ratio of the deficit / surplus of the state budget to GDP, %	3
The ratio of the state and state-guaranteed debt to GDP, %	2
Level of capitalization of listed companies to GDP	2
The average weighted yield of T-bills (government bonds) in the primary market	2
The index of the change in the official rate of the national currency to the US dollar, the average for the period	2
Gross international reserves of Ukraine, months of import	2
The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	2
The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	2
The ratio of long-term (over 1 year) loans and deposits, times	1
The ratio of liquid assets to short-term liabilities, %	1
The ratio of gross external debt to GDP, %	1
Level of GDP redistribution through consolidated budget, %	1
The index of the change in the official rate of the national currency to the US dollar, the average for the period	1
The share of loans in foreign currency in the total amount of loans granted, %	1
Dollarization of the money supply, %	1
Share of long-term loans in the total amount of loans granted (corrected for the exchange rate difference), %	1
Total export of financial resources outside the country, billion dollars USA	1

Source: defined by the authors.

As we see, the largest number of financial security of the presented studied (3) is very closely correlated with the indicator «The ratio of the deficit / surplus of the state budget to GDP, %»; two indicators are closely correlated with the indicator «The ratio of the state and state-guaranteed debt to GDP, %» and others. The list of indicators presenting very close relationships is illustrated in Table 6.

Table 6. List of indicators with a very close pair correlation

Financial security indicators	An indicator of very close pair correlation (r_{xy} >0.9)	The type of connection
The ratio of the deficit / surplus of the state budget to GDP, %	Ratio of liquid assets to short-term liabilities, %	direct
	Level of capitalization of listed companies to GDP	reverse
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
The ratio of the state and state-guaranteed debt to GDP, %	The share of loans in foreign currency in the total amount of loans granted, %	direct
	Dollarization of the money supply, %	direct
Level of capitalization of listed companies to GDP	The ratio of the deficit / surplus of the state budget to GDP, %	reverse
	Gross international reserves of Ukraine, months of import	reverse
The average weighted yield of T-bills (government bonds) in the primary market	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
The index of the change in the official rate of the national currency to the US dollar, the average for the period	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
	The average weighted yield of T-bills (government bonds) in the primary market	direct
Gross international reserves of Ukraine, months of import	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	Level of capitalization of listed companies to GDP	reverse
The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of GDP redistribution through consolidated budget, %	direct
The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	The index of the change in the official rate of the national currency to the US dollar, the average for the period	reverse
	The average weighted yield of T-bills (government bonds) in the primary market	reverse

Source: suggested by the authors.

An analysis of financial security indicators that are very closely related to other indicators allows us to draw the following conclusions. The indicator «The ratio of the deficit / surplus of the state budget to GDP, %» is closely correlated with the ratio of liquid assets and short-term liabilities (direct relationship), the level of capitalization of listed companies to GDP (reverse relationship), the difference between the interest rates on loans granted by deposit-taking corporations to interest rates on deposits attracted by deposit-taking institutions (except NBU) (direct relationship). The ratio of the state and state-guaranteed debt to GDP is closely related to the share of loans in foreign currency in the total amount of loans granted and the dollarization of the money supply. The level of capitalization of listed companies to GDP is closely related to the indicators «The ratio of the deficit / surplus of the state budget to GDP» and «Gross international reserves of Ukraine, months of import». Table 7 contains information about the indicators that have the largest number of factors with which a close relationship is established (r_{xy}> 0.77).

Table 7. The list of indicators with a close pair of correlations

Financial security indicators	An indicator of the close pair correlation (r_{xy} >0.8)	The type of connection
Level of capitalization of listed companies to GDP	The ratio of the deficit / surplus of the state budget to GDP, %	reverse
	Level of GDP redistribution through consolidated budget, %	reverse
	The index of the change in the official rate of the national currency to the US dollar, the average for the period	reverse
	Gross international reserves of Ukraine, months of import	reverse
	Balance of sale and purchase of foreign currency by the population, billion US dollars	reverse
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	reverse
	Total export of financial resources outside the country, billion dollars USA	reverse
	Share of foreign capital in the authorized capital of banks, %	reverse
	Ratio of long-term (over 1 year) loans and deposits, times	reverse
	Ratio of liquid assets to short-term liabilities, %	reverse
The ratio of the deficit / surplus of the state budget to GDP, %	Level of GDP redistribution through consolidated budget, %	direct
	Gross international reserves of Ukraine, months of import	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	Level of capitalization of listed companies to GDP	reverse
	Level of insurance penetration (insurance premiums to GDP), %	reverse
	Ratio of liquid assets to short-term liabilities, %	direct
	Share of foreign capital in the authorized capital of banks, %	direct

Gross international reserves of Ukraine, months of import	Balance of sale and purchase of foreign currency by the population, billion US dollars	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	Level of GDP redistribution through consolidated budget, %	direct
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of capitalization of listed companies to GDP	reverse
	Ratio of liquid assets to short-term liabilities, %	direct
The share of loans in foreign currency in the total amount of loans granted, %	Dollarization of the money supply, %	direct
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
	Share of consumer loans granted to households in the general structure of loans granted to residents, %	reverse
	The index of the change in the official rate of the national currency to the US dollar, the average for the period	direct
	Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	reverse
	The ratio of the state and state-guaranteed debt to GDP, %	direct
	The ratio of bank loans and deposits in foreign currency, %	direct
Ratio of liquid assets to short-term liabilities, %	Level of capitalization of listed companies to GDP	reverse
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of GDP redistribution through consolidated budget, %	direct
	Gross international reserves of Ukraine, months of import	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	Share of foreign capital in the authorized capital of banks, %	direct
The ratio of the state and state-guaranteed debt to GDP, %	Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	reverse
	The share of loans in foreign currency in the total amount of loans granted, %	direct
	Dollarization of the money supply, %	direct
	Specific weight of cash outside banks in the total amount of money supply (M0/M3), %	direct
	Share of consumer loans granted to households in the general structure of loans granted to residents, %	reverse
	Total export of financial resources outside the country, billion dollars USA	direct
Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	The index of the change in the official rate of the national currency to the US dollar, the average for the period	reverse
	The share of loans in foreign currency in the total amount of loans granted, %	reverse
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national	direct

	currency of the country, in relation to the consumer price index	
	The average weighted yield of T-bills (government bonds) in the primary market	reverse
	The ratio of the state and state-guaranteed debt to GDP, %	reverse
	Return on assets, %	direct
Level of GDP redistribution through consolidated budget, %	Gross international reserves of Ukraine, months of import	direct
	The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	direct
	Total export of financial resources outside the country, billion dollars USA	direct
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of capitalization of listed companies to GDP	reverse
	Ratio of liquid assets to short-term liabilities, %	direct
The index of the change in the official rate of the national currency to the US dollar, the average for the period	The share of loans in foreign currency in the total amount of loans granted, %	direct
	The average weighted interest rate on loans provided by deposit-taking corporations (except the NBU) in national currency of the country, in relation to the consumer price index	reverse
	Deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP	reverse
	The average weighted yield of T-bills (government bonds) in the primary market	direct
	Volatility level of the PFTS index, the number of critical deviations (-10%)	direct
	The ratio of bank loans and deposits in foreign currency, %	direct
The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU)	Gross international reserves of Ukraine, months of import	direct
	Level of GDP redistribution through consolidated budget, %	direct
	The ratio of the deficit / surplus of the state budget to GDP, %	direct
	Level of capitalization of listed companies to GDP	reverse
	Level of insurance penetration (insurance premiums to GDP), %	reverse
	Ratio of liquid assets to short-term liabilities, %	direct

Source: suggested by the authors.

The results of modeling the correlation between the indicators of Ukraine financial security allowed to identify several indicators that have a large number of interrelated factors. Therefore, the level of capitalization of listed companies to GDP correlates with ten indicators of financial security; the ratio of the deficit / surplus of the state budget to GDP, %, gross international reserves of Ukraine, the share of loans in foreign currency in the total amount of loans granted correlate with seven indicators; ratio of liquid assets to short-term liabilities, the ratio of the state and state-guaranteed debt to GDP, deficit / surplus of budget and

extrabudgetary funds in the sector of the state administration to GDP, the level of GDP redistribution through consolidated budget, the index of the change in the official rate of the national currency to the US dollar, the difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU) correlate with six indicators of financial security of Ukraine. The total capitalization of listed companies as an indicator of the value of capital existing in the form of securities traded on stock exchanges, primarily in the form of shares, integrates other indicators of the financial market, so its inclusion to the integrated indicator of financial security enhances its impact on the overall level. Thus, we recommend to remove this indicator from the method of Ukraine's financial security assessment. Gross international reserves of Ukraine, the share of loans in foreign currency in total correlate with indicators of currency, budget security, security of non-banking financial market, also have limited independent value for calculating financial security, so it is appropriate not to take them into account while assessing the integrated indicator. Concerning those indicators that have a smaller number of interrelated factors, in the method of calculating it is advisable to leave the amount of public and state-guaranteed debt to GDP, deficit (surplus) of budget and extrabudgetary funds in the sector of the state administration, the index of the change in the official rate of the national currency to the US dollar as indicators illustrating the overall financial picture of the state stability.

After our formation of an improved list of financial security indicators, the prospects for further research in this area are to determine the values characteristic of the indicators; rationing of indicators; determination of weights; calculation of the integrated financial security index as a whole. In this case, to calculate the integrated index, it is appropriate to use Harrington's Desirability Function [Harrington, 1965]. The Harrington scale establishes a correspondence between linguistic estimates of the desirability of the values of x and numerical intervals d (x) (Table 8).

Table 8. Numerical intervals of the Harrington scale

Linguistic assessment	Intervals of values of the desirability function d(x)
Very good	1,00-0,80
Good	0,80-0,63
Satisfactory	0,63-0,37
Bad	0,37-0,20
Very bad	0,20-0,00

Source: [Harrington, 1965].

With such scaling, the values of the desirability function d (x) of the level of financial security vary in the range from 0 to 1, and the value of di≈0 corresponds to the absolutely unacceptable value of the i-th indicator being evaluated, and di≈1 – the ideal value. In practice, the Harrington scale is often limited to three gradations, which corresponds to the linguistic categories of "bad", "satisfactory", "good". In this case, the area corresponding to the level of "satisfactory" expands from 0.37 to 0.69, and the areas of "bad" and "good" are characterized by intervals 0.00-0.37 and 0.69-1.00 respectively [Proskurnina, 2020].

Analytically for monotonic criteria, the Harrington desirability function is given by the following formula:

(2) $$d_i = d(z_i) = exp[-exp(-z_i)]$$

(3) $$z_i = \frac{x_i - x_{i0}}{x_{i1} - x_{i0}}$$

where z_i – coded values of the i-th indicator, which are dimensionless quantities; x_i – the value of the i-th informative indicator; x_{i0} and x_{i1} – the boundaries of the region "satisfactory" in the initial scale.

The introduction of the desirability scale allows to reduce the initial (original) multicriteria decision problem with different criteria to a multicriteria problem with criteria measured by one scale, so the next step is to collapse the partial desirability functions d_i into a generalized criterion D.

Advantages of using desirability functions in a preliminary design context come from the multicriteria ranking of every candidate solution, even the undesirable ones (if one of the criteria is not completely satisfied, the level of desirability is close to zero but not null). Moreover, the specification of the AC and SL values lead to a soft formulation of constraints, and thus, provides the design problem with a high degree of flexibility [Quirante, Sebastian & Ledoux, 2012].

Conclusions

The analysis of methodical approaches to the assessment of financial security revealed that separate indicators, taken as a basis for calculating the integrated level of financial security, are very closely related to other indicators. Consequently, «The ratio of the deficit / surplus of the state budget to GDP, %» is closely correlated with seven indicators, three of which have a very close relationship. «The ratio of the state and state-guaranteed debt to GDP, %» is closely correlated with six indicators, whereas with two – very closely. The level of capitalization of listed companies to GDP correlates with ten indicators of financial security, two of which have a very close relationship. Gross international reserves of Ukraine, the share of loans in foreign currency in the total amount of loans granted correlate with seven indicators of financial security, ratio of liquid assets to short-term liabilities, the ratio of the state and state-guaranteed debt to GDP, deficit/surplus of budget and extrabudgetary funds in the sector of the state administration to GDP, level of GDP redistribution through consolidated budget, the index of the change in the official rate of the national currency to the US dollar, the difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU) correlate with six indicators of financial security of Ukraine.

The authors propose to remove from the Methodical guidelines on the calculation of the level of economic security of Ukraine such indicators characterizing financial security as: Level of capitalization of listed companies to GDP, Gross international reserves of Ukraine, The share of loans in foreign currency in the total amount of loans granted, Ratio of liquid assets to short-term liabilities, Level of GDP redistribution through consolidated budget. The difference between the interest rates on loans granted by deposit-taking corporations and interest rates on deposits attracted by deposit-taking institutions (except NBU). The changes of method to the diagnosis of the state financial security level will allow us to obtain a relevant information base for the analysis of the state financial security and make appropriate decisions concerning neutralization of threats and strengthening of security. Further research in this area should be conducted in the context of the financial security indicators optimizing according to their groups - budget security; currency and monetary security; currency security; debt security; non-banking security; stock market security; banking security. They should also be aimed at determination of optimal parameters to the assessment of the financial security integrated level.

Consequently, our research and refinement of the list of financial security indicators on the basis of correlation and regression analysis is an important element and prerequisite for the development of an integrated model for the state financial security assessment.

References

BALDWIN, D. (1997). The Concept of Security. Review of International Studies, 23, 5-26.

BILORUS, O., LUKIANENKO, D. (2002). Hlobalizatsiia i bezpeka rozvytku, Kyiv National Economic University named after Vadym Hetman.

FINANCIAL SOUNDNESS INDICATORS AND IMF: The official website of the International Monetary Fund. https://www.imf.org/external/np/sta/fsi/eng/fsi.htm, access:19.01.2021.

HABER, J., BUKHTIAROVA, A., CHORNA, S., IASTREMSKA, O., BOLGAR, T. (2018). Forecasting the level of financial security of the country (on the example of Ukraine). Investment Management and Financial Innovations, 15, 304-317.

KOILO, V., RYABUSHKA, L., KUBAKH, T., & HALIK, J (2020). Assessment of government debt security of emerging markets: theory and practice. Investment Management and Financial Innovations, 17(1), 35-48.

KHALATUR S., PAVLOVA G., ZHYLENKO K. (2018). The role of some indicators of financial security in Ukraine in the context of transnationalization and national interests. Investment Management and Financial Innovations, 15, Iss. 3, 237-248.

KOZMENKO, O., KUZMENKO, O. (2014). Ekonomiko-matematychni metody ta modeli (ekonometryka), Universytetska knyha, Sumy.

KULPINSKYY, S. (2000) The role of financial security of Ukraine in deepening of integration relations with European countries. Financial advice. 5, 34-38.

LVOVSKIY, E. (1988). Statisticheskie metodyi postroeniya empiricheskih formul. Vyzshaia shkola, Moskva.

METHODS FOR CALCULATING THE LEVEL OF ECONOMIC SECURITY OF UKRAINE, Order of the Ministry of Economy of Ukraine on March 02, 2007 № 60, http://me.kmu.gov.ua. access: 12.01.2021.

METHODICAL GUIDELINES ON THE CALCULATION OF THE LEVEL OF ECONOMIC SECURITY OF UKRAINE, Order of the Ministry of Economic Development and Trade of Ukraine on October 9, 2013 № 1277. http://cct.com.ua/2013/29.10.2013_1277.htm, access:12.01.2021.

MIHUS, I., AKIMOVA, L., HARNYK, O. (2018). Diagnostics of the state of financial security of Ukraine. Scientific Bulletin of Polissia. 3(15), 12–18.

NANTO DICK, K. (2011). Economics and National Security: Issues and Implications for U.S. Policy. Congressional Research Service, 4 January, 78.

NESADURAI, H. (2005). Conceptualising Economic Security in an Era of Globalisation: What Does the East Asian Experience Reveal? CSGR Working Paper. 157/05, 26.

NESADURAI, H (2005). Globalisation and Economic Security in East Asia – London and New York, Routledge.

POCHENCHUK, G. (2014). Issues of country financial security governance. Forum Scientiae Oeconomia, 2, 27-37.

RONIS, S. (2011). Economic Security. Neglected Dimension of National Security? Washington: Center for Strategic Conferencing Institute for National Strategic, Studies by National Defense University Press, D.C.

SHKOLNYK, I., KOZMENKO,S., POLACH, J., WOLANIN, E. (2020). State financial security: comprehensive analysis of its impact factors. Journal of International Studies, 13(2), 291-230.

SAVYTSKA, O. (2012) Assessment and ways to ensure the financial security of Ukraine. Economic Forum. 3.

SIEMIĄTKOWSKI, P. (2017). External financial security of the European Union member states outside the Eurozone. Journal of International Studies, 10(1), 84-95.

STATE STATISTICS SERVICE OF UKRAINE, Official site. https:// ukrstat.gov.ua, access: 12.01.2021.

SUKHORUKOV, A. (2004) Problems of financial security of Ukraine.

VENETSKIY, I., KILDYISHEVA, G. (1956). Posobie po matematicheskoy statistike. Gosudarstvennoe statisticheskoe izdatelstvo, Moskva.

WANG, Z. (2004). Conceptualizing Economic Security and Governance: China Confronts Globalization. The Pacific Review, 17(4), 524.

YERMOSHENKO, M. (2001). Financial security of the state, national interests, the real threats, strategy support.

YONG, J. (2009). Financial Security Is at the Heart of National Economic Security. English Edition of Quiche Journal, 1, https://english.qstheory.cn/international/ 201109/t20110924_112469.htm,access: 10.01.2021.

HARINGTON, J. (1965). The Desirability Function. Industrial Quality Control 21, 494–498.

PROSKURNINA, N.V. (2020). Methodical basis of the evaluation of digital marketing activities with applying the Harrington desirability function. Visnyk KHNAU im. V.V. Dokuchayeva. Seriya „Ekonomichni nauky". 3, 144-161.

QUIRANTE, T., SEBASTIAN, P., LEDOUX, Y. (2012). A trade-off function to tackle robust design problems in engineering. Journal of Engineering Design. 24. 1-18.