

**МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ  
СУМСЬКИЙ ДЕРЖАВНИЙ УНІВЕРСИТЕТ  
ФАКУЛЬТЕТ ІНОЗЕМНОЇ ФІЛОЛОГІЇ  
ТА СОЦІАЛЬНИХ КОМУНІКАЦІЙ**



**СОЦІАЛЬНО-ГУМАНІТАРНІ  
АСПЕКТИ РОЗВИТКУ СУЧАСНОГО  
СУСПІЛЬСТВА**

**МАТЕРІАЛИ VII ВСЕУКРАЇНСЬКОЇ НАУКОВОЇ КОНФЕРЕНЦІЇ  
СТУДЕНТІВ, АСПІРАНТІВ, ВИКЛАДАЧІВ ТА СПІВРОБІТНИКІВ**

**(Суми, 18-19 квітня 2019 року)**

**Суми  
2019**

**Tetiana Bochkarova,**

PhD student, Sumy State University

## **A DISCRIMINANT ANALYSIS OF FINANCIAL SOUNDNESS OF DEPOSIT TAKERS: UKRAINE VERSUS ISRAEL CASE**

Discriminant models for determining the financial soundness for Ukraine and Israel are discussed. These models determine the level of a financial soundness of deposit takers. In this paper The discriminant model based on twenty-four financial soundness indicators for deposit takers over the period from 2008 till 2018 is developed.

Though Ukraine and Israel are unitary states, Ukraine, being an industrial and agricultural country with a predominant production of raw materials, is a dynamic industrializing country, while Israel is an industrial country that is dynamically developing, that is why, they are comparable. According to Doing Business-2018, Israel ranked the 54<sup>th</sup> in the annual rating ease of doing business, while Ukraine did the 76<sup>th</sup>. Ukraine also ranked the 77<sup>th</sup> in the ranking of Best Countries for Business (Forbes), and Israel ranked the 74<sup>th</sup>. Ukraine's GDP was 112.2 billion USD in 2017, and Israel's GDP was 350.9 billion USD. This fact reflects national development, progress and living standards of both states, as well as differences between them. The period from 2008 to 2018 was chosen for analysis, because it covers crisis and post-crisis periods of the world economy.

Financial soundness indicators (FSIs) are defined as the best tool to monitor financial risks and vulnerabilities of the national financial systems [1]. In the article, it is emphasized that FSIs focus on the compilation of soundness and risk information. According to the authors, the specific feature of methodology is the combination of monetary statistics, bank supervisory frameworks, and international financial accounting standards. In addition, the authors described the main methodological differences between Monetary statistics and FSIs. All points of the article completely display the main aspects of framework and implementation of FSIs without any suggestions for improvement.

Though, an integrated approach for financial soundness assessment is missing in the article and, instead, the individual indicator (Capital Adequacy) is analyzed [2]. Despite the fact that it is one of the important indicators, it is not enough for an objective banking activity assessment.

Notwithstanding the fact that financial soundness indicators are determined, the holistic discriminant model for assessing and forecasting financial soundness for deposit takers has not been developed yet. The discriminant function allows to calculate an integral indicator for both Ukraine and Israel and, therefore, to provide an opportunity to determine the future level of financial soundness and to predict the probability of financial instability. In addition, it is easy to use, the necessary information is available, and the reliability of the assessment is rather high. The next step is highlighting the following hypotheses.

Hypothesis 1. The discriminant function is an effective instrument for forecasting of the financial soundness for both Ukraine and Israel.

Hypothesis 2. The discriminant function has a high level of quality.

The algorithm for constructing models for discriminant analysis of financial soundness is displayed below.

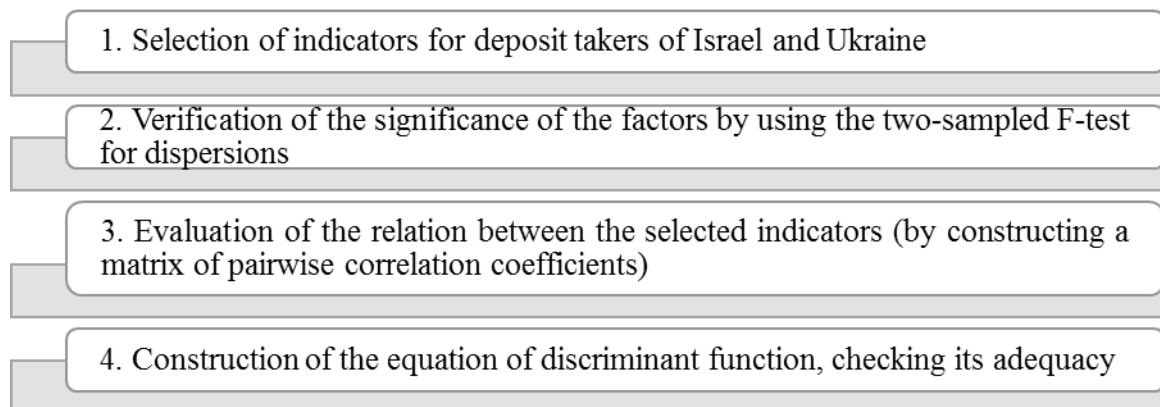


Figure 1. Algorithm for constructing models for discriminant analysis of financial soundness

The first stage. A representative sample includes FSIs for deposit takers of Ukraine and Israel from 2008 to 2018 (Table 1).

Table 1. The list of FSIs for deposit takers

№	Core FSIs	Encouraged FSIs
1	Regulatory capital to risk-weighted assets	Capital to assets
2	Regulatory Tier 1 capital to risk weighted assets	Large exposures to capital
3	Nonperforming loans net of provisions to capital	Gross asset and liability positions in financial derivatives to capital
4	Return on equity (net income to average capital [equity])	Net open position in equities to capital
5	Net open position in foreign exchange to capital	Customer deposits to total (noninterbank) loans
6	Liquid assets to total assets (liquid asset ratio)	Residential real estate loans to total loans
7	Liquid assets to short-term liabilities	Commercial real estate loans to total loans
8	Return on assets (net income to average total assets)	Geographical distribution of loans to total loans
9	Nonperforming loans to total gross loans	Foreign-currency-denominated loans to total loans
10	Sectoral distribution of loans to total loans	Foreign-currency-denominated liabilities to total liabilities
11	Interest margin to gross income	Trading income to total income
12	Noninterest expenses to gross income	Personnel expenses to noninterest expenses

The second stage. The two-sampled F-test verifies the null hypothesis that both samples come from two independent populations having the equal variances. It is run in Excel (Table 2).

Table 2. The calculations of the two-sampled F-test

Indicator	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>
-----------	----------------	----------------	----------------	----------------	----------------	----------------	----------------

F-criterion	7.17	3.57	50.94	336.13	1.12	0.10	5.88
Indicator	X <sub>8</sub>	X <sub>9</sub>	X <sub>10</sub>	X <sub>11</sub>	X <sub>12</sub>	X <sub>13</sub>	X <sub>14</sub>
F-criterion	10.59	1.59	1.12	196.46	101.71	13.08	1.44
Indicator	X <sub>15</sub>	X <sub>16</sub>	X <sub>17</sub>	X <sub>18</sub>	X <sub>19</sub>	X <sub>20</sub>	X <sub>21</sub>
F-criterion	231.80	283.8 4	15.01	27.88	1.30	0.52	0.14
Indicator	X <sub>22</sub>	X <sub>23</sub>	X <sub>24</sub>	X <sub>25</sub>	X <sub>26</sub>	X <sub>27</sub>	X <sub>28</sub>
F-criterion	23.23	1.91	0.00	33.63	5.22	447115863.40	5.82
Indicator	X <sub>29</sub>				X <sub>30</sub>		
F-criterion	2.91				1.41		

The tabular value of the F-criterion is 1.86 and it gives the levels of freedom with a probability of 0.95. The calculated values were compared with the tabular value. As a result, such variables: X<sub>5</sub>, X<sub>6</sub>, X<sub>9</sub>, X<sub>10</sub>, X<sub>14</sub>, X<sub>19</sub>, X<sub>20</sub>, X<sub>21</sub>, X<sub>24</sub>, X<sub>30</sub> were excluded.

The third stage. The correlation matrix is used to investigate the dependence between multiple variables at the same time.

It has been proved that there are factors, which have a strong interconnection such as X<sub>1</sub>, X<sub>2</sub>, X<sub>3</sub>, X<sub>4</sub>, X<sub>7</sub>, X<sub>8</sub>, X<sub>11</sub>, X<sub>12</sub>, X<sub>13</sub>, X<sub>16</sub>, X<sub>17</sub>, X<sub>18</sub>, X<sub>22</sub>, X<sub>26</sub>, X<sub>27</sub>, X<sub>28</sub>, X<sub>29</sub>. The new list of factors is the following: X<sub>1</sub> is Liquid Assets to Total Assets (Liquid Asset Ratio); X<sub>2</sub> is Cost Asset Position in Financial Derivatives to Capital; X<sub>3</sub> is Trading Income to Total Income.

The fourth stage. The equation of discriminant function is constructed. The discriminant function is described by the formula (1):

$$Z = -0.602 * X_1 + 0.629 * X_2 - 0.175 * X_3 , \quad (1)$$

Where X<sub>1</sub> is Liquid Assets to Total Assets (Liquid Asset Ratio);

X<sub>2</sub> is Cost Asset Position in Financial Derivatives to Capital;

X<sub>3</sub> is Trading Income to Total Income.

For assigning a country to a financially stable or financially insolvent one, the critical values of the integral indicator (C<sub>1</sub> and C<sub>2</sub>) are determined. Then it is compared with a Z-value.

Thus, the scale of interpretation of the indicator Z is as follows:

a)  $Z \geq 9.72$  – the level of financial soundness of the country is high;

b)  $-6.69 < Z < 9.72$  – ambiguous conclusions about the level of financial soundness, so additional analysis is needed;

c)  $Z \leq -6.69$  – the level of financial soundness of the country is unsatisfactory.

Its adequacy and reliability is checked by calculation of the Root Mean Squared Percentage Error (Formula 2):

$$\text{RMSPE} = \sqrt{\frac{100}{n} \sum_{j=1}^n ((y_j - \hat{y}_j)/y_j)^2}, \quad (2)$$

Finally, the Root Mean Squared Percentage Error is calculated and it makes 10.72%. It means that forecast has a good quality. Moreover, the model can be used for determination of the level of a financial soundness of deposit takers.

### References:

1. Armida, S. J. Financial soundness indicators (FSIs): framework and implementation [Electronic resource] / S. J. Armida, A. Georgiou ; IFC Bulletin. – 2009. – 277–282. – Retrieved from <https://www.bis.org/ifc/publ/ifcb31v.pdf>
2. Fatima, N. Capital adequacy: a financial soundness indicator for banks [Electronic resource] / N. Fatima ; Global Journal of Finance and Management. – 2014. – 771–776. – Retrieved from [https://www.ripublication.com/gjfm-spl/gjfmv6n8\\_12.pdf](https://www.ripublication.com/gjfm-spl/gjfmv6n8_12.pdf)
3. Financial soundness indicators: compilation guide [Electronic resource] / International Monetary Fund. – 2006. – Retrieved from <https://www.imf.org/external/pubs/ft/fsi/guide/2006/pdf/fsiFT.pdf>
4. Financial soundness indicators: data and metadata tables [Electronic resource] / International Monetary Fund. – 2018. – Retrieved from <http://data.imf.org/?sk=51B096FA-2CD2-40C2-8D09-0699CC1764DA&sId=1411569045760>

English Language Advisor: A. M. Diadchko – PhD in Philology, Associate Professor of foreign languages department, Sumy State University