which the elements of financial statements in the balance sheet and in the income statement should be recognized and reflected. The financial statements provide for the use of several different bases of valuation with varying degrees and in different combinations. These include: historical cost; current cost; cost of realization (redemption); present value.

In our view, accounting valuation is the process of expressing economic information in monetary (cost) terms, which is reflected in accounting and financial statements to meet the needs of users of accounting data. And valuation, as one of the methodological techniques (elements) of accounting, should be considered as a system of measuring the value of accounting objects.

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## *USING KOHONEN MAPS IN ANALYSIS OF THE STABILITY FACTORS OF UKRAINIAN BANKS DURING THE 2014-2017 CRISIS*

In Ukraine, the banking crisis began in 2014 and continued until mid-2017. The formal end to the crisis can be considered a statement made at the beginning of 2017 by the head of the NBU on the transition to the final stage of cleaning the banking system (National Bank of Ukraine, 2017). For Ukrainian banks, this crisis has become unprecedented in terms of losses. Specifically, out of the 181 banks operating in the country in January 2014, only 77 remained operational by May 2019 (National Bank of Ukraine, 2019).

Since the banking system is closely integrated into the structure of the state, its crisis has resulted in many negative consequences, among which there is a deterioration in the development opportunities of economic entities due to the almost complete cessation of lending; growth of social tension due to blocking of deposit funds of the population; mass outflow of funds from turnover, etc.

So, it's actual to develop an approach to the analysis of the activities of Ukrainian commercial banks in a systemic crisis. Further described a method based on intelligent data clustering techniques (Kohonen maps) and its using to identify factors of banks' financial stability in the times of crisis.

The analysis of bank stability using self-organizing neural networks involves several stages, which will be discussed below.

*Stage 1. Preparation and preprocessing of the input data sample.*

The research information base is made up of open data of the National Bank of Ukraine (NBU) on assets, liabilities and capital of Ukrainian banks (about 60 items in total) (National Bank of Ukraine, 2019). From the general database, annual data on the balance sheet ratios of banks and information on their work, or facts of license revocation were selected. Balance sheet figures are taken according to the following sections:

1) January 2014 (before the crisis and the massive bank failures);

2) January 2015 (peak of the economic crisis);

3) January 2016 (end of the first wave of bankruptcies);

4) January 2017 (end of the second wave of bankruptcies and stabilization of the banking system).

To comply with data comparability, instead of the absolute values of the indicators of banking activity, taken the ratio of the respective indicators to the total value of the bank's assets.

In addition to the normalized balance sheet ratios, the following parameters that fulfill the service function are also included in the input sample:

• the year, to which the data relates;

• information on the fact of the bank's bankruptcy in the near future;

• information on the closing time of the bank, if any, before 2019.

*Stage 2. Preliminary data analysis using statistical methods.*

Statistical analysis of the input sample is carried out in order to identify emissions, that is, anomalous values that are outside acceptable limits. If this is not done, then the effectiveness of further analysis can be significantly reduced due to the peculiarities of the work of neural network learning algorithms.

The analysis showed that out of 549 lines in the input data, 36 lines contain data outside the interval [-1; 1] (only two of them avoided further bankruptcy). After excluding banks with anomalous balance sheet ratios from the input data, 513 lines remained. Of these, 111 lines contain the "bankrupt" label, which means that the bank with these balance sheet ratios has ceased to be solvent within one year.

*Stage 3. Building self-organizing Kohonen maps*.

The process of drawing SOM within the Deductor Studio analytical platform is carried out interactively, without programming. In this case, it is only necessary to set the basic parameters: the composition and purpose of the data used, Kohonen map parameters, training parameters and settings for the result visualization.

After several experiments with different sizes of Kohonen maps, their dimension was selected 8x6, as a compromise, based on the size of the input data sample and the necessary accuracy of clustering. Other parameters set based on the requirements for obtaining an accurate result, to the detriment of the speed of training.

The Deductor Studio allows us to automatic clustering Kohonen map. As a result of this process, the most "Safe" of 4 zones was contain 10% failed banks, the most "Hazardous" zone was containing 28% failed banks.

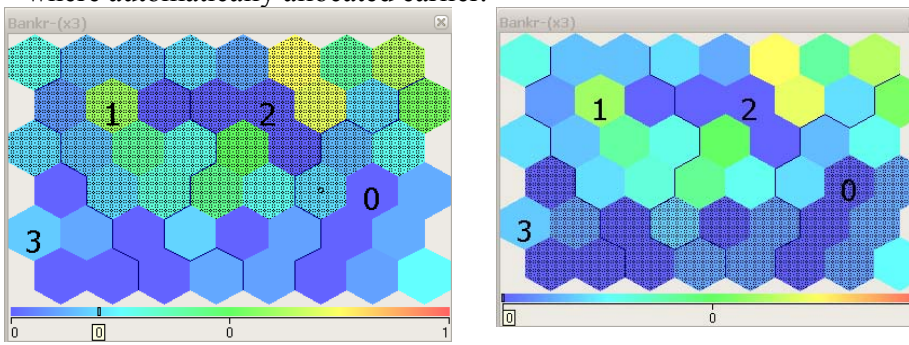
An analysis of the clustering results shows that the most specific features of “Safe” cluster are as follows:

• a high share in liabilities of other banks (especially in foreign currencies);

• a high share of foreign currency loans of legal entities.

However, automatic clustering does not always allow for finding the best way to divide data into groups. If we consider the map as a whole, it can be noted that the "safe" zone is located at its bottom, the "hazard" zone is, on the contrary, on the top of the map (Figure 1). The numbers 0 trough 3 on this figures indicate clusters which

where automatically allocated earlier.




a) “Safe” zone b) "Hazardous" zone

Figure 1. Global zones on the bank solvency map in 2014-2017 (shaded).

The marked zones in Figure 3 correspond to the following solvency ratios:

• zone a): 97 banks out of 325 (29.8%) are insolvent;

• zone b): 11 banks out of 174 (6.3%) are insolvent.

Also in zone b) it possible to find two zones with high concentration of insolvent banks. First of them contains of 78 banks, 34 were insolvent (43.6%). In second zone 32 out of 65 banks (49.2%) became insolvent.

A visual analysis of the full set of Kohonen maps showed that its liabilities structure is closely related to the bank's solvency. The boundaries of the zones on the liabilities maps are predominantly horizontally oriented, which corresponds to the location of the "hazardous" and "safe" zones.

Analysis of Kohonen maps built for bank liabilities indicators allows for identifying a cluster of banks with a high level of funds of other banks in liabilities. A cluster of banks borrowing from other banks in foreign currency has a record low level of bankruptcies is observed: four banks out of 70 (5.7%). The "safe" zone also includes banks, in the liabilities of which a large share is accounted for funds of legal entities, especially funds in foreign currency and demand deposits. The bankruptcy rate in the corresponding cluster is 8%

(five banks out of 62).

On the contrary, a large share of individuals' funds, regardless of currency and terms, puts the bank in the "hazardous" zone. Thus, 252 banks were included in the cluster built on the map of "Funds of individuals, total", of which 72 became insolvent (28.5%).

**Conclusion:** The Kohonen self-organizing neural networks and maps allow efficiently segmenting data samples according to various criteria, including bank solvency. The "hazardous" zones with a bankruptcy rate of 43.6% and 49.2% and the "safe" zone with a bankruptcy rate of 6.3% were highlighted on the constructed map. It can also be concluded that during the 2014-2017 banking crisis in Ukraine, the bank's resource base was the main factor of its stability.

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## *FORECASTING THE BITCOIN RATE BASED ON THE GRANGER CAUSALITY TEST*

The rapid development of IT and computerization not only affects the automation of our daily lives, but also makes significant adjustments to the economy of the country, modifying its components. That is why cryptocurrencies are increasingly consolidating their position in the foreign exchange market – analogous to traditional means of payment.

The question of how cryptocurrencies work is a new scientific issue not only nationally but also internationally [1]. The main features of cryptocurrencies include the following: complete anonymity, lack