Serhiy Kozmenko (Ukraine), Inna Belova (Ukraine)

Peculiarities of identification of systemically important banks and assessment of their impact of the occurrence of economic crisis

Abstract

The countries of Western Europe and the US have a sufficient experience in solving problems related to the identification and management of systemically important financial institutions. In Ukraine, where the vector of the market economy development was taken only in the 2000s, all processes associated with the regulation and stabilization of the financial system are quite new. Since the biggest share of the financial market in Ukraine is occupied by the banking sector, the establishment of systemically important banking institutions should be a priority in forming stabilization measures of the country's economy. This paper carries out an analysis of methods for determining systemically important bank as proposed by the National Bank of Ukraine, offering the author's vision of a system of indicators of banks' systemic importance. The authors have offered their own approach to determining a systemically important bank in Ukraine, which is based on a combination of quantitative and qualitative approaches. During the second stage of the research a binary logit model was built, which helped to find a correlation between the activity of systemically important banks and the onset of economic crisis in Ukraine in 2008, 2009 and 2013.

Keywords: systemically important bank, systemically important financial institution, indicators of systemically important banks, the Basel Committee, the National Bank of Ukraine, binary logit-model.
JEL Classification: G21, E58.

Introduction

Problem statement and its connection to important scientific and practical tasks. The existing approaches to the definition of systemically important banks demonstrate the variety of methods, the choice of which depends on the specifics of banking activities and strategic objectives of the main regulator of the banking system's stability.

However, the reality shows that the availability of a methodology does not always mean its implementation in reality. Today, more and more different researchers increasingly ask the following questions: is it advisable to identify systemically important banks and whether a failure of such a bank will cause adverse structural shifts of the entire financial system. For Ukraine, this subject is particularly relevant since the banking system holds the biggest share on the financial market.

Analysis of the recent research and publications. Much has been said about various methods of determining systemically important financial institutions, particularly banks. Considerable attention is given to the use of a particular methodology in determining systemically important banks by such organizations as the International Monetary Fund, the Basel Committee on Banking Supervision, the European Central Bank, the National Bank of Ukraine and others. In addition, a number of domestic and foreign researchers, Zhou [10], Bech [4],

Embree [5], Rajan [7], Segoviano [8], Tarashov [9], Huang et al. [6], conducted the analysis of approaches and methods of determining systemically important banks.

Goal setting. The main purpose of this paper is to develop a methodology as well as a set of criteria and indicators, with which it could be possible to identify a systemically important bank in the Ukrainian banking system.

The main material of the research. A systemically important bank is a financial institution that has a significant share of financial participation on the market and works closely with other financial institutions whose failure could trigger an imbalance in the functioning of other financial institutions operating on the financial market. All financial institutions, including banks, interact with each other on the issues of redistribution of financial flows, forming a network of relationships – channels of redistribution. As the activity of any financial entity is associated with many risks, risks can be transferred through the redistribution channels as well.

One of the channels of systemic risk's distribution is a widespread use of off-balance sheet special investment vehicles (SIVs). The key participants in the redistribution of these instruments are commercial and investment banks. After the mortgage crisis in the US in 2007, which led to the big global crisis, those institutions that were directly dependent on external financing became vulnerable to external shocks. This, particularly, applies to banks. The collapse of the world's biggest players in the banking sector Northern Rock (UK), Lehman Brothers (USA) and the insurance sector –

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AIG (USA) confirms and determines the role of systemically important banks and other financial institutions in the global financial environment. Let us compare such banks as Northern Rock and Lehman Brothers and determine why they became systemically important institutions and launched a chain reaction of collapsing financial players around the world.

Northern Rock is one of the largest banks in the UK, which from the mid-twentieth century has led a successful activity not only in the UK, but also internationally. Prior to the global crisis in 2007 it was classified as one of the six major banks in the British banking group (MBBG), although according to many financial indicators it was inferior to other British banks (Figure 1).

Thus, the size of its assets accounted for less than 2 per cent of the UK banking system, which was one of the least concentrated in Europe. General liabilities of the Northern Rock bank was about

2.5% of the total liabilities of MBBG and the level of capitalization of the bank at the end of 2006 accounted for 0.3% of the total capitalization of the British banking market. In general, on the global market Northern Rock has established itself as a bank that is specialized in mortgage loans and borrowings mainly on the wholesale money markets. The bank conducted a transparent activity and was able to diversify its funding sources. In addition, the bank always had a relatively high level of capitalization. However, a considerable dependence of the bank on the wholesale credit markets played a cruel joke with it.

Debt financing at Northern Rock was one of the highest among the MBBG banking group. The tendency to build up debt financing was observed among other UK banks. The collapse of the US mortgage market triggered a decline in demand for mortgage bonds, and, consequently, led to funding problems at Northern Rock.
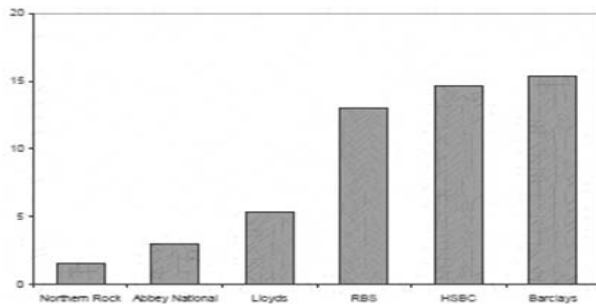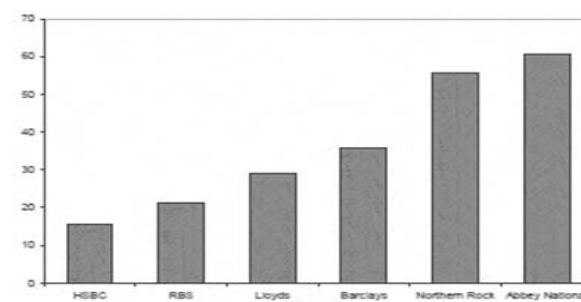

The structure of MBBG according to total assets of the group's participants, %
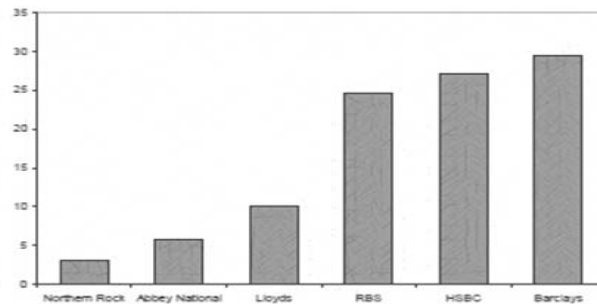
The structure of MBBG according to liabilities of the group's participants, %
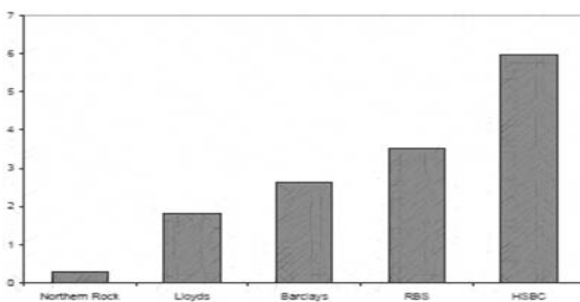
The structure of MBBG according to the level of market capitalization of the group's participants, %

The structure of MBBG according to the level of leverage of the group's participants, %

Fig. 1. The main indicators of activities of Major British Banking Group (MBBG) [1, 2]

The situation with the Lehman Brothers bank was the following. Prior to the global crisis it was a big, in fact, the fourth largest US investment bank, which formed a holding company – Lehman Brothers Holding Company (LBHI). The bank's history began inthe middle of the IX century. For 150 years the bank successfully conducted its activities and gradually took the leading position in the global economy. The Lehman Brothers bank is

specialized in providing various financial services and investment management. At the end of 2008 the bank went through bankruptcy. The reasons for this include:

♦ "uncertainty" in the value of assets (due to the deteriorating conditions in the real estate market investors were concerned about the quality of their large holdings of residential and commercial mortgage-backed securities. This was ac-

companied by reduction in the book value of companies from 29 to 4 billion dollars);

♦ the lack of a coherent plan of recapitalization.

We see that Lehman Brothers and Northern Rock banks significantly differ from each other according to their specific activities, the size in their respective national banking systems and the global community as a whole. However, what unites them is that both banks are systemically important because their collapse had a clear negative impact on the global

economy (Fig. 2). That is, the onset of the economic crisis is directly linked to the activities of systemically important financial institutions, particularly banks.

The process of identifying systemically important bank depends on a number of internal indicators that characterize banking. Today there are many approaches to determining systemically important banks. The Basel Committee on Banking Supervision developed its own methods (Fig. 3), which determine systemically important banks in the world.
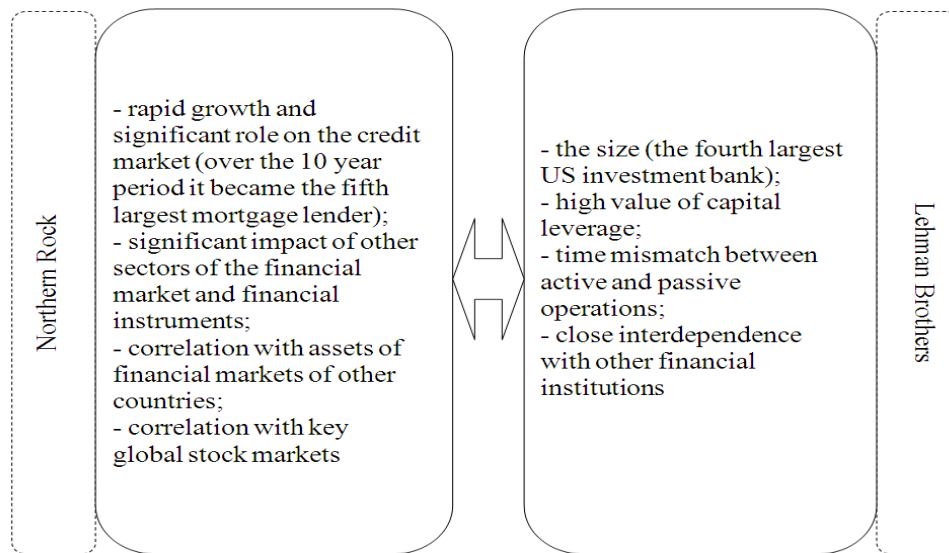

Fig. 2. The main reasons for identifying Northern Rock and Lehman Brothers as systemically important banks

At the last summit of the G-20 countries held in November 2014 in the Australian city of Brisbane an updated list of global systemically important banks was presented (Table 1). In comparison with 2013 added to the list was a new bank – Agricultural Bank of China. Now the list includes 30 banks covering America, Europe and Asia, particularly China. In the recent years the Chinese financial institutions have not only intensified their activities, but became systemically important. The sad experience of the global crisis 2007-2009 makes countries pay more attention to systemically important financial institutions, primarily to banks. Because they were the main "agents of infected financial assets" among other financial market participants.

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Table 1. The list of global systemically important banks in 2014 and their distribution into groups ("baskets") [6]

Basket	Global systemically important banks	The range of estimates
5	-	530-629
(3.5%)		
4 (2.5%)	HSBC, JP Morgan Chase	430-529
3 (2.0%)	Barclays, BNP Paribas, Citigroup, Deutsche Bank	330-429
2 (1.5%)	Bank of America, Credit Suisse, Goldman Sachs, Mitsubishi UFJ FG, Morgan Stanley, Royal Bank of Scotland	230-329
1 (1.0%)	Agricultural Bank of China, Bank of China, Bank of New York, Mellon, BBVA, Groupe BPCE, Group CréditAgricole, Industrial and Commercial Bank of China Limited, ING Bank, Mizuho FG, Nordea, Santander, SociétéGénérale, Standard Chartered, State Street, Sumitomo Mitsui FG, UBS, Unicredit Group, Wells Fargo	130-229

In the post-crisis period the Central Bank of the Netherlands allocated 18% of GDP to support the banking sector and established a number of additional capitalization requirements for systemically important banks. The central banks of Denmark, Sweden and the Czech Republic did similarly. In Germany, for example, the principle of proportionality of bank management is used, that is, the intensity of supervision over banks on the part of the Bundesbank is carried out according to their systemic importance. In addition, periodic stress testing of banks considering various aspects of their activities is conducted.

Thus, we can conclude that in the recent years, especially in the post-crisis period, many countries have begun to pay great attention to the management of systematically important banks. This policy is carried out in order to reduce the probability of systemic risks and to minimize negative consequences of a bank's collapse for the economy in general.

The main and, one might say, the only regulator of stability of the banking system in Ukraine is the National Bank of Ukraine (NBU). As a guarantor of stable development of the national banking sector it has too many functions leading to the dispersal of attention and the loss of control over certain processes. Although the problem is gradually solved by creating a special committee on Banking Supervision regarding the definition of systemically important banks, Ukraine is only beginning to pay attention to this issue. On December 25, 2014 a decree of the NBU "On approval of the procedure for determining systemically important banks" was published [1]. According to this decree, the NBU offers the following criteria for determining systemically important banks (Table 2).

Table 2. Criteria for identifying systemically important banks in Ukraine, as defined by NBU

Criterium	Indicators within each criterion
Size of banks	Total assets of the bank
	Deposits of physical persons, businesses and NBFIs
Degree of financial obligations	Funds placed with other banks
	Funds attracted from other banks
Area of activities	Loans to economic entities in industry, agriculture and construction

To further consolidate banking regulation the NBU issued a relevant Resolution of 12 May 2015 "On Amendments to the Instruction on regulation of banks in Ukraine" [1]. This Regulation pays considerable attention to the refinement and replacement of some concepts regarding banking capital and its standards in accordance with the current provisions of the Basel Committee on Banking Supervision. Similar to the method of "baskets" proposed by the Basel Committee, the National Bank defines the so-called "buffers" of systemic importance (Table 3).

Table 3. The size of buffers of systemic importance of banks defined by NBU

The value of systemic importance of bank, %	The size of systemic importance buffer, %	Category of systemic important bank
Less than 5	1	1 category
5 – 10	1.5	2 category
More than 10	2	3 category

According to these regulations of NBU, a systemically important bank is required to report to the regulator regarding any of their actions. This, according to the NBU, will allow to react to any structural changes in the bank and immediately make the necessary adjustments to its regulation in order to prevent failures.

Of course, the NBU technique of definition of systemically important bank is one of the important steps in implementing a Comprehensive Program of developing Ukraine's financial sector by 2020 [5]. However, in our opinion, it is necessary to change some things. First, in determining systemically important banks one cannot consider only quantitative indicators. Secondly, from our point of view, the list of the selected indicators of systemic importance is too short and needs to be expanded because it does not fully disclose the essence of interbank relations. Thirdly, the system of buffer evaluation of systemically important banks is not very relevant to the domestic banking system due to the fact that not all Ukrainian banks fully execute all the provisions of the Basel Committee.

Examining the main approaches to determining systemically important banks, which are already used around the world, we offer to develop our own methodology and adapt it to the domestic banking system. Since quantitative and qualitative approach is considered optimal in determining systemically important institutions, in the proposed method we tried to combine both quantitative and qualitative indicators of banking. The indicator approach proposed by the Basel Committee on Banking Supervision has gained popularity in many countries (Denmark, Czech Republic, Netherlands, Sweden, Australia). The results obtained through the use of this approach have repeatedly been confirmed by the real situation of the banking system in a particular country. In our opinion, this technique is relevant for Ukraine, but given the fact that not all domestic banks have fully implemented the principles of Basel II and Basel III, it must be slightly modified according to the peculiarities of functioning of Ukrainian banks.

The process of identifying systemically important banks in the Ukrainian banking system is reduced to calculating an integral indicator of systemic importance (*Integral indicator of systemically importance, IISI*). Let us consider the stages of this mechanism.

First stage. Formation of criteria and indicators characterizing the activities of banks.

Second stage. Determination of the share of each bank according to the selected indicator.

Third stage. Determination of the average value for specific weight according to *n*-criterion.

Fourth stage. Conversion of the results into binary point system of assessments "1-0".

Fifth stage. The obtained binary estimates for each bank need to be defined as a ratio of points to their maximum value.

Sixth stage. The calculated values of the integral indicator of systemic importance of bank interpreted by using the Chedoke scale (Table 4).

50 – 70%	average
70 – 90%	high
90 – 99%	very high
100%	functional

Table 4. Qualitative assessment of the relationship based on the Chedoke scale

Quantitative characteristics of the relationship	Qualitative characteristics of the relationship
0%	absent
10 – 30%	weak
30 – 50%	moderate

We propose to use the indicators for determining systemically important banks according to the following criteria (Table 5).

The research period covered the time interval 01.01.2006 – 01.01.2015. The following results were obtained (Table 6 below).

Table 5. List of criteria and indicators necessary for determining systemically important banks

Criterion	Indicator	Conventional units
Size	Assets	thousand UAH
Interdependence	Bank funds	thousand UAH
	Resources in other banks	thousand UAH
	The percentage of other banks' funds in liabilities	%
Complexity	Securities in the trading portfolio of a bank	thousand UAH
	Securities in the portfolio of a bank for sale	thousand UAH
	Investments into associated companies and subsidiaries	thousand UAH
Uniqueness	Participation as a primary dealer	Binary value
Social importance	Funds of physical persons	thousand UAH
	The percentage of physical persons' funds in liabilities	%
	The ratio of deposits of physical persons to total deposits	%
International activity	The presence of foreign capital	Binary value
	The presence of foreign branches, representative offices	Binary value

Table 6. Systemically important banks in Ukraine in the period from 01.01.2006 to 01.01.2015

Period	Integral indicator of systemic importance, banks		
	76.92%	84.61%	92.3%
01.01.2006	-	Nadra	-
01.01.2007	Privatbank Raiffeisen Bank Aval Nadra	-	-
01.01.2008	-	Raiffeisen Bank Aval	-
01.01.2009	Privatbank Raiffeisen Bank Aval Forum	-	-
01.01.2010	Ukrsibbank Forum	-	Raiffeisen Bank Aval
01.01.2011	Ukrsibbank Ukrgasbank	-	Raiffeisen Bank Aval
01.01.2012	Privatbank Delta Bank	Raiffeisen Bank Aval Ukrsibbank	-
01.01.2013	Oshchadbank Delta Bank	Raiffeisen Bank Aval Sberbank of Russia	-
01.01.2014	Oshchadbank Delta Bank Raiffeisen Bank Aval PUMB VAB	Sberbank of Russia	
01.01.2015	Privatbank Oshchadbank Delta Bank Raiffeisen Bank Aval Ukrgasbank VAB Bank		

However, the presence of systemically important banks does not give an answer about their importance to the country's economy. Therefore, we decided to investigate how the onset of an economic crisis in the country is linked to the collapse of systemically important banks. For this goal we use a binary logit model that will identify the key factors of the crisis phenomena on the example of Ukraine. A general view of the binary logit model and values of the resultant variable are presented as follows (1, 2):

$$Log_{it} = b_0 + b_1 X_1 + \ldots + b_n X_n + \varepsilon. \quad (1)$$

$$Y = \frac{exp(b_0 + b_1 X_1 + \ldots + b_n X_n)}{1 + exp(b_0 + b_1 X_1 + \ldots + b_n X_n)}. \quad (2)$$

where Log_{it} is a binary function that assumes values in the interval [0; 1] and identifies the onset of economic crisis; Y – binary target function, the value of which should be foreseen; b_0 – absolute term of the model; X_n – values of the independent variable model; b_n – betacoefficient with an independent variable; ε – standard error of the model; n – total number of independent variables of the model.

If the target function assumes the value 0, the model will take the following form (3):

$$Y = \frac{1}{1 + exp(b_0 + b_1 X_1 + \ldots + b_n X_n)}. \quad (3)$$

The quality and adequacy of results obtained by using the binary logit model can be assessed in many ways: graphical method of maximum likelyhood, Akaike information criterion, coefficient of determination R2, etc.

After analyzing the redistribution of systemically important banks in each year, we can make assumptions about the link between the activities of systemically important banks and the onset of economic crisis in the country. To ascertain whether domestic systemically important banks affect the emergence of a crisis situation or whether it is necessary to pay attention to the regulatory process and support systemically important banks, we will proceed to the second phase of our research – determination of the relationship between the activities of systemically important banks and the onset of the crisis. We use this binary logit model. As independent variables we use a group of economic indicators, which are united by certain criteria. We study the relationship between the onset of the crisis and the following indicators (Table 7).

Table 7. Groups of indicators needed to identify the relationship between change in the economic situation of the country and the onset of crisis

Group of indicators	Indicator	Conventional units
Macroeconomic	GDP	Billion UAH
	Discount rate (DR)	%
	Openness of the economy (OE) (the difference between exports and imports, divided by GDP)	%
	Budget deficit (BD)	Billion UAH
	Exchange rate (ER)	Dollar – UAH
Financial	The ratio of bank reserves to bank assets (Res)	%
	The ratio of domestic credits to the private sector (Cred)	% of GDP
	The ratio of loans to deposits (LD)	%
Failure of bank	Product of losses of the bank and its size (Loss) (% of the share of assets to total assets of the whole banking sector)	%

While in the second part of our study the main goal is to identify the impact of systemically important banks on the emergence of economic crisis, we cannot omit macroeconomic and financial indicators. An indicator that reflects the state of systemically important banks must be calculated. We offer to find a product between the annual financial result (profit or loss levels) of the bank that was identified as systemically important, and the share of its assets to total assets of the whole banking sector. This will make it possible to take into account the impact of the bank's systemic importance for the entire economy of the country.

Thus, a binary logit model of determining the dependence of economic crisis detection on macroeconomic and financial indicators as well as systemically important banks, will have the following form (4, 5).

$$Z_t = b_0 + b_1 \times Macroeconomic_t + b_2 \times Financial_t + \\ + b_3 \times Failure\ of\ Bank_{it} + \varepsilon \quad (4)$$

$$Failure\ of\ Bank_{it} = Bank\_result_{it} \times Bank\_size_{it} \quad (5)$$

where Z is a binary variable that characterizes an economic crisis and assumes values in the range [0; 1]; b_0 – absolute term of the model; b_1, b_2, b_3 – betacoefficient with an independent variable; $Macroeconomic_t$ – a group of variables that characterizes the macroeconomic situation in Ukraine; $Financial_t$ – a group of variables that describes the state of the financial system, particularly the banking sector; ε – standard error of the model; t – research period; $Failure\ of\ Bank_{it}$ – indicator, which characterizes the current state of the i-th systemically important bank; $Bank\_result_{it}$ – financial result of the i-th systemically important bank; $Bank\_size_{it}$ – the share of assets of the i-th systemically important bank in total assets of the banking system.

The building of the binary logit model involves the finding of values for the target binary function Z_t predicted on the basis of indicators in Table 7. The function Z_t can assume the values "0" if in the

studied period no crisis phenomena are observed and "1" if the country's economy is in crisis. Given the global and domestic economy in the studied time period, we can distinguish three years of economic crises in Ukraine: in 2008, 2009 and 2013. The world economic crisis of 2007-2009 made a negative impact on the economies of many countries including Ukraine.

The period 2013-2014 was marked by a significant decline in real estate prices, reduced production, foreign investment, negative trade balance, active development shadow sector. The banking system of Ukraine suffered from the fact that the NBU imposed a number of restrictions on commercial banks on conducting a number of active operations (an active economic reproduction process). In addition, 2013 was marked by several waves of inflation, accompanied by a significant increase in the general price level, particularly of utility tariffs. There were also devaluation processes of the national currency, the consequence of which was a reduction of Ukrainian foreign exchange reserves by almost 10 billion US dollars. Regarding the foreign policy of Ukraine, the trade deficit created a high devaluation pressure on Hryvnia. The ratio of loans to deposits in the banking system also suffered imbalances. A significant withdrawal of deposits from commercial banks and the National Bank and recalculation of loans at the devalued rate led to a large gap between loans and deposits. For comparison, during the crisis period 2008-2009 the deposit resources worth over 35 billion UAH were withdrawn while in the period 2013-2014 – more than 40 billion UAH.

Thus, the function Z_t assumes the value "1" in 2008, 2009 and 2013. All other years are designated as "0". Based on the previous results (Table 6) as a systemically important bank for almost all the research period we chose early termination of deposit agreements, restrictions on cash payments (in local and foreign currencies) in order to stabilize the crisis processes, establishing a 5 per cent corridor on the fluctuation of the hryvnia-dollar exchange rate.

The year 2013 can be called a crisis year due to the fact that Ukraine's economy did not manage to completely upgrade itself and achieve a new level in its development. Ukraine's GDP in relation to the pre-crisis period 2010-2011 decreased by about a third, which eventually contributed to the weakening of macroeconomic stability of the country. Inadequate investment policy in 2013 contributed to the formation of an unattractive investment climate for both domestic and external investors. According to this period's data, the share of investment in the GDP was only 18-19%, which is not enough to establish Raiffeisen Bank Aval, except for the year 2005, which had only one systemically important bank – Nadra.

In 2011 a systemically important bank was UkrSibbank and in 2013 – Sberbank of Russia. This decision was taken based on the study of the banking system of Ukraine in this period.

The equation of the logit-model with consideration of a variable of systemically important bank has the following form (6):

$$Z_t = -380 - 194.2 \times BD + 18 \times Res + 3.24 \times Cred + {}+0.07 \times LD - 167.2 \times Loss \qquad (6)$$

As we see, the impact of systemically important banks is strong and has a negative character. The main purpose of constructing a binary logit-model is to determine the functional dependence of the onset of crisis on the selected indicators. According to our study, crisis years 2008, 2009 and 2013 were functionally confirmed by the following results (Table 8).

Table 8. The available and projected values of the target function

Years	Available values	Projected values	Balances
2005	0.000000	0.008994	-0.008994
2006	0.000000	0.000000	-0.000000
2007	0.000000	0.000000	-0.000000
2008	1.000000	0.978007	0.021993
2009	1.000000	1.000000	0.000000
2010	0.000000	0.058227	-0.058227
2011	0.000000	0.001552	-0.001552
2012	0.000000	0.000000	-0.000000
2013	1.000000	0.933993	0.066007

As we see, the existing crises in 2008, 2009 and 2013 were confirmed with nearly 100% matchup (0.97; 1.0; 0.93, respectively).

We can make an interim conclusion that systemically important banks have a functional impact on economic crises taking place in the country. To confirm or refute this opinion, we have excluded from consideration a variable that describes systemically important banks and conducted the same analysis. The results have shown the following. The logit-regression equation has changed and acquired the following form (7):

$$Z_t = -12.7 - 14.56 \times Open\_econ + 0.09 \times Budget\ deficit - + 0.56 \times Ratio\_bank\_reserves\_to\_bank\_assets$$
$$+ 0.60 \times Ratio\_internal\_credits\_private\_sector - 0.16 \times Ratio\_credits\_to\_deposits \tag{7}$$

Table 9. Available and projected values of the target function excluding the variable of systemically significant bank

Years	Available values	Projected values	Balances
2005	0.000000	0.000000	-0.000000
2006	0.000000	0.000006	-0.000006
2007	0.000000	0.001836	-0.001836
2008	1.000000	0.991936	0.008064
2009	1.000000	0.706791	0.293209
2010	0.000000	0.049905	-0.049905
2011	0.000000	0.259203	-0.259203
2012	0.000000	0.303875	-0.303875
2013	1.000000	0.788269	0.211731

The available values of the target function were confirmed by the projected values although with lower matching compared with the previous table. As we see, the projected values other than 0 are observed in the period 2010-2012 indicating that this period was characterized by unstable processes in the economic life of the country and the onset of a new crisis in 2013-2014.

Conclusions

The obtained results are rather interesting. Some banks, including Privatbank, were not systemically important for the entire study period. In the years when Privatbank was not designated as systemically significant in Table 5 its integral indicator of systemic importance was 69%. In addition, some banks may be considered systemically significant only for several years, for example, Ukrsibbank, Oschadbank, Sberbank, etc. Since 01.01.2007 Raiffeisen Bank Aval has been systemically important just changing the values of the integral indicator.

The situation with Privatbank can cause some confusion. This bank is consistently in the top list of Ukrainian banks in terms of their assets. However, it is not systemically important every year. We can explain this by the fact that for a long time this bank had a purely Ukrainian capital (excluding the recent years) and was focused on attracting savings from the public, not on securities transactions. Because of the low level of activity of the bank on the stock market it did not become systemically important confirming the thesis that it is impossible to consider the size of a bank a decisive criterion in determining its systemic importance. Raiffeisen Bank Aval is a bank with foreign capital, which is systemically important for the national banking system. The weakening of its systemic importance in the years 2009 and 2014 can be explained by the crisis phenomena in the country, which led to the withdrawal of some of the bank's capital abroad. After analyzing the redistribution of systemically important banks in each year we can make assumptions about the connection between the activities of systemically important banks and the onset of economic crisis in the country.

Based on the building of a binary logit-model we found a functional relationship between the occurrence of crises in 2008, 2009 and 2013 in Ukraine and activities of systemically important banks. However, the exclusion of a variable describing systematically important bank did not change the final result. The crises taking place in those years were not solely banking crises and would have occurred even without the participation of systemically important banks.

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Appendix

General indicators for determining systemically important banks		
Category, weight coefficient	Individual indicator	Weight
Cross-jurisdictional activity (20%)	Cross-jurisdictional requirements	10%
	Cross-jurisdictional commitments	10%
Size (20%)	The total amount of all positions needed to calculate a financial leverage under the Basel III methodology	20%
Interdependence (20%)	Assets of the financial system	6.67%
	Commitments of the financial system to other financial institutions	6.67%
	Coefficient of non-deposit sources	6.67%
Interchangeability (20%)	Assets under regulation	6.67%
	Payments made through payment systems	6.67%
	Cost of underwriting transactions on the debt market and the stock market	6.67%
Complexity (20%)	Notional value of OTC derivatives	6.67%
	Assets of the third level	6.67%
	Securities for trading and sales	6.67%

Individual indicators for determining systemically important banks	
Category	Individual indicator
Cross-jurisdictional activity	The share of domestic income in the total income
	Cross-jurisdictional requirements and liabilities as a share of total assets and liabilities
Size	Gross or net income
	Capitalization of the share market
Interchangeability	Level of market participation: 1. Gross market value of repo, reverse repo with securities and lending operations 2. General assessment of operations with OTC derivatives
Complexity	Number of jurisdictions

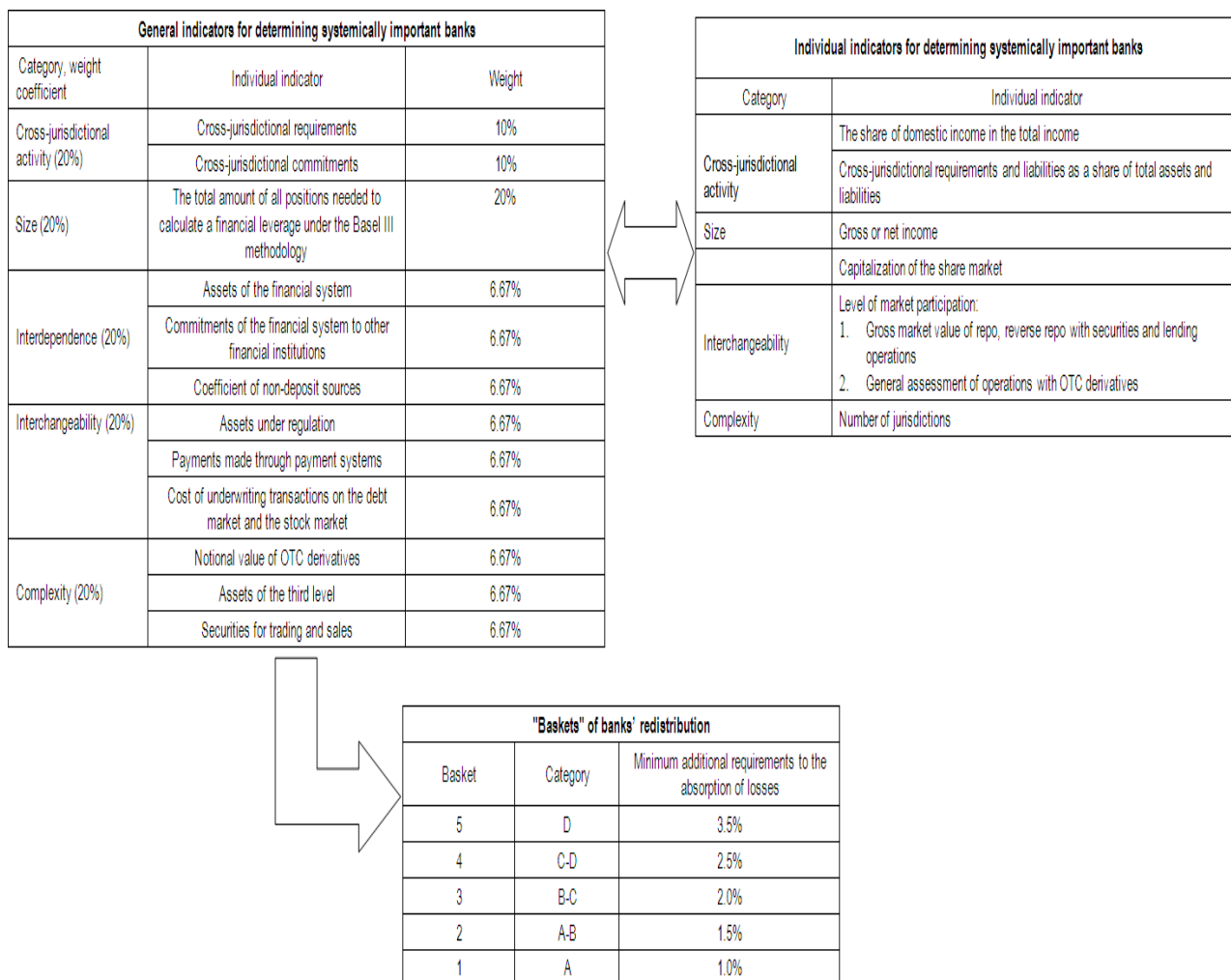| "Baskets" of banks' redistribution		
Basket	Category	Minimum additional requirements to the absorption of losses
5	D	3.5%
4	C-D	2.5%
3	B-C	2.0%
2	A-B	1.5%
1	A	1.0%

Fig. 3. A scheme of using the method of "baskets" for determining systemically important banks, developed by the Basel Committee (compiled on the basis of [9])