

STABILITY OF THE BANKING SECTOR: DERIVING STABILITY INDICATORS AND STRESS-TESTING**Gulaliyev M.G., Ashurbayli-Huseynova N.P., Gubadova A.A., Ahmedov B.N., Mammadova G.M., Jafarova R.T.***

Abstract: The purpose of this article is to composite a banking stability indicator (BSI) from independent sub-indices (capital adequacy ratio (CA), asset quality (AQ), profitability (P) and liquidity (L)). The BSI was calculated using the Minimax normalization method. The composite index was used to analyze the financial stability of the banking sector of 29 countries and to build a risk map based on their national basic economic indicators. The Fitch's Banking Stability Indicator (BSI) is a composite measure of banking system quality, which ranks countries by five levels of banking system quality ("very high" or A, "high" or B, "acceptable" or C, "low" or D and "very low" or E). This study also uses a novel method of stress-testing to measure banking stability. The proposed BSI index is intended both for comparative international assessment of financial stability of the banking sector and for its evaluation in the country. It gives the ability in the most general form to assess the banking sector from the point of view of international competitiveness and to compare it with other countries. On the other hand, it allows identifying the strengths and weaknesses of the current financial condition of the banking sector at the level of individual countries and monitoring its sustainability.

Keywords: financial stability, banking sector, risk analysis, composite index, stress-testing

DOI: 10.17512/pjms.2019.19.2.15

Article's history:

Received February 14, 2019; *Revised* April 28, 2019; *Accepted* May 10, 2019

Introduction

Assessment practice of such financial indicators as the capital adequacy ratio, an indicator of the quality of assets, the level of profitability, liquidity and sensitivity to market risks is based on the standards of the CAMELS methodology, which is used in assessing the financial condition of commercial banks (Aspal and Dhawan, 2016). To compose an index from variables expressed in different units, they should first be converted to a common scale (measurer). A variety of methods are suitable for this purpose, such as the standardization methods (z - score), the

***Mayis G. Gulaliyev**, Assoc. Prof., PhD, Institute of Economics of Azerbaijan National Academy of Sciences, Baku, Azerbaijan; **Nigar P. Ashurbayli-Huseynova**, Assoc. Prof., PhD; **Aybaniz A. Gubadova**, Assoc. Prof., PhD; **Gulsum M. Mammadova**, Assoc. Prof., PhD; Azerbaijan State University of Economics (UNEC), Baku, Azerbaijan; **Rumella T. Jafarova**, PhD, Azerbaijan State University of Architecture and Construction, Baku, Azerbaijan; **Bahruz N. Ahmedov**, PhD, Association of Azerbaijan Banks, Baku, Azerbaijan

✉ Corresponding author: mayis_gulaliyev@yahoo.com

✉ Nigar.ashurbeyli-huseynova@unec.edu.az; a.gubadova@unec.edu.az;

behruz.ahmedov@gmail.com; gulsum.mammadova75@gmail.com; Rumella17_22@mail.ru

Minimax method, method of separation from the compared country, the method of scale categories, the method of indicators above the average and below the average price, the method of cyclical indicators, balance reviews method (Freudenberg, 2003). The use of any of these methods depends on the research objectives and properties of the used variables. Besides those methods intended for calculating the financial stability indicator, there are also several conflicting views on which indices should be touched while calculating the FCI. There is an entire range of them introduced in numerous research papers on the financial stability indicator. For example, the Bank of England has involved those indices that characterize the status of financial institutions in order to estimate the stability of financial system. The FCI that was applied to the monetary policy of Netherlands was a modified index known as the Financial Stability Conditions Index (FSCI). Besides the generally accepted variables, this index included volatility in stock market prices (Willem van den, 2006). Financial stability indicator was also defined as a product of change in the term spread; real M2; S&P 500 index; the level of the federal funds rate; short-term credit spread (Hatzius et al., 2010).

Stress testing of systemic risk indicators is a modern method for assessing banking risks. The method of computing the indicators of systemic risk in the banking system (BSI) was compiled by the Fitch rating agency and approved in 2005. Although higher MPI scores indicate low vulnerability to systemic risk, the emerging market countries remain vulnerable. A great deal of cheaper foreign-currency debt makes these countries vulnerable to the further strengthening of the US dollar and the monetary policy normalization. In addition, private debt ratios remain high in some developed markets, even though macroprudential measures mitigated part of the vulnerabilities (Macro-Prudential Risk Monitor, 2018; Fitch Ratings, 2019). Recently, stress testing has become more popular as a method for assessing the financial stability of banks and the banking system. Over the past 2-3 years, stress testing has been conducted in developing countries in the CIS region, namely Russia, Ukraine, etc. In general, stress testing should be aimed at determining the stability of bank capital to shocks, at assessing the maximum size of resulting losses, at finding gaps in the banking activity, at assessing the impact of various risks, at linking these risks, and at defining the degree of bank's dependence on macroeconomic factors. A stress test model should fit the scope and complexity of specific banking activity. Despite the wideness of the range of estimation methods, there is a lack of publicly available aggregate measure (indicator, index) for the overall banking system that could be used in assessing financial stability and even building a model for prediction of the future financial crisis. Therefore, the purpose of this article is to composite a banking stability indicator (BSI) which would allow identifying the strengths and weaknesses in the banking system with the use of data on 29 countries and monitoring its stability. The advantage of this indicator is that its calculation touches upon the bank solvency (capital adequacy ratio (CA), asset quality (AQ), profitability (P) and

liquidity (L)), and represents the number of standard deviations, which together with a yield drop (risk of loss) can cause capital.

Literature Review

Assessment of financial stability of the banking sector based on different indicators has a fairly deep level of scientific study. The study of systemic risks in financial markets of different countries has increased after the mortgage crisis in the United States, which began in 2007, and after the start of the sovereign debt crisis in the Euro-zone (Laeven and Valencia, 2013). The current economic system has placed considerable emphasis on transferring resources from the production segment to the financial sector, and therefore, ignoring the comprehensive assessment of the banking sector threatens with a more severe financial instability (Afanasyev and Shash, 2018). Attempt to develop an assessment of the financial stability of banking sector was made by Oort (1990). However, now, it does not correspond to the new challenges and driving forces of the financial industry. Although the study provided the basis for subsequent work, there is also a model, according to which the continuing consolidation of the financial system increases the systemic risk (De Nicolo and Kwast, 2002). It is pertinent to point out that the risk indicators, that only take into account the specific risk of the institution, do not just help in monitoring systemic risk across the banking sector, but may exacerbate it authors (Danielsson et al., 2016). One can note that the policy of the Central Bank based on the wrong choice of indicators leads to increases in bank failures and growth of bank risks (Bean, 2018). For all this research area, there is a significant methodological problem. These models do not explain the behavior of financial sectors with imperfect information base that can be observed in emerging market economies. At the same time, each new work in this direction shows the same subject of study from different points of view. Although the results stated in this literature are not final and cause a lot of controversies (Jones and Oshinsky, 2009; Ongena and Penas, 2009; Pais and Stork, 2011; Gong and Jones, 2013), the paper complements the works devoted to the evaluation of the financial market on the basis of composite index by the fact that the elaborated indicator correctly displays the rating both at the international level and at the level of individual countries. Thus, it eliminates the difficulties of scientific research of trends, associated with the fact that the same indicators in different countries in practice mean very different states of the market.

The American company JP Morgan Chase & Co. first applied stress testing as a tool for internal risk management in 1997 to assess market risk from exogenous shock. Then this approach was implemented in Credit Suisse. However, early stress testing took into account a limited number of risk factors and was poorly integrated into the overall risk management and business capital planning system (IMF, 2006). In 2004, the Basel Committee on Banking Supervision developed the *Basel II: International Convergence of Capital Measurement and Capital Standards (A Revised Framework)*, which provides for micro-prudential stress testing in the

procedures for assessing capital adequacy and calculating credit risk. The global financial crisis propelled the development of a new stress-testing concept aimed at crisis management. This approach was implemented in the Supervisory Capital Assessment Program, which has been conducted by the Fed in the United States since 2009. This program was designed to assess the financial sustainability of the 19 largest financial institutions in the country that were “too big to fail”. The main purpose of macro-prudential stress testing is to understand whether bank capitalization is adequate (against the minimum capital adequacy ratio) throughout the horizon forecasting under a difficult but plausible macroeconomic scenario (Covas et al., 2014). The first stage sets a stress scenario, which is then integrated into a macroeconomic model to obtain the projection of macroeconomic variables. These projections are integrated into the model of credit risk assessment. The result of macro-prudential stress testing is usually a loss estimate and required capitalization amount. The feedback effects on financial markets or the real economy fall into focus. In this case, it is necessary to understand whether an unfavorable situation in the financial market can have feedback effects on macroeconomic variables (Constâncio, 2010). To involve feedback effects, contagion models are often used. These models help to take into account the relationship between financial market participants, as a shock is able to use this relationship to travel from one institution to another under stress (domino effect) (European Central Bank, 2011). In negative response (financial institutions do not redistribute their portfolios during the time horizon), the bankruptcy of one or several banks can potentially generate a domino effect on the interbank lending market. This “hidden” correlation can be a source of endogenous risk in addition to the exogenous risk (Sorge, 2004). The effects generated by macroeconomic scenarios are usually assessed using: 1) econometric models; 2) vector regression methods and 3) statistical approaches. The Bank for International Settlements offers two main methodological approaches to macro-prudential stress testing: a “piecewise approach” that evaluates the vulnerability of the financial sector to single risk factors, by forecasting several “financial soundness indicators” (such as non-performing loans, capital ratios and exposure to exchange rate or interest rate risks) under various macroeconomic stress scenarios (Marcelo et al., 2008); an “integrated approach” combining the analysis of the sensitivity of the financial system to multiple risk factors into a single estimate of the probability distribution of aggregate losses that could materialize under any given stress scenario (Sorge, 2004).

Data and Methodology

The proposed index of financial stability of the banking sector BSI (Banking Stability indicator) with certain modifications is intended to be used for both the analysis and evaluation at the international level and the level of individual country. For the measurement, the indicator of open foreign currency positions was used. Here, when the construction of BSI index, the Minimax normalization

method was used (Liu et al., 2005). The sub-index of capital adequacy (CA) reflects the adequacy of the total capital. For its calculation, the eponymous indicator was applied. The sub-index of asset quality (AQ) expresses the quality of the loan portfolio, which constitutes the basis of the bank assets. For this purpose, the ratio of the share of non-performing loans in the loan portfolio was used. The sub-index of profitability (P) assesses the level of general profitability of the banking sector. Sub-index of liquidity (L) maintenance characterizes the liquidity risks of the sector. When evaluating based on weight in the world economy, the averaged sector values were used: the liquidity ratio (the ratio of liquid assets to total assets) and the ratio of instant liquidity (the ratio of liquid assets to short-term liabilities). The sub-index of sensitivity to risk (S) reflects the sensitivity of the sector to foreign exchange risks. Based on the assumption about the difference of impact force on the financial stability of the banking sector variables used to construct the sub-indices, BSI was calculated in two variants on the basis of equal and different weights of sub-indices. Coefficients in formulas below are available from (Kočišová, 2014).

$$BSI_1 = 0.2 \times CA + 0.2 \times AQ + 0.2 \times P + 0.2 \times L + 0.2 \times S \quad (1)$$

$$BSI_2 = 0.1 \times CA + 0.6 \times AQ + 0.2 \times P + 0.05 \times L + 0.05 \times S \quad (2)$$

Here, *CA* – the sub-index of capital adequacy; *AQ* – the sub-index of the assets quality; *P* – the sub-index of profitability; *L* – the sub-index of liquidity; *S* – the sub-index of sensitivity.

The value of BSI_1 calculated according to the formula (1) a priori estimates the equivalent contribution of each of the sub-indices in the overall assessment of the sector. Therefore, the sub-index of the assets quality resulting from the main functions of the banking system (effective allocation of financial resources) should be different from other sub-indices by higher specific weight, which is reflected in the calculation of BSI_2 . Additionally, banking stability was evaluated using vulnerability assessment and stress testing. Thus, the starting point for systemic vulnerability analysis is the assessment of banking system quality/sustainability using Fitch's ratings for banks. BSI is a generalized calculation of an average individual rating, which is weighted by assets of the average banks and refers to the critical mass of banks in any banking system (Table 1).

Table 1. Average individual rating vs Banking system indicator

Average individual rating	Banking system indicator (BSI)	BSI score from Table 3
A	A	0.8 -1
A/B	A	0.8 -1
B	B	0.6-0.79
B/C	B	0.6-0.79
C	C	0.4 – 0.59
C/D	C	0.4 – 0.59
D	D	0.2 -0.39
D/E	D	0.2 -0.39

E	E	0.2 and lower
Note: recommendations issued by the Fitch rating agency (Systemic risks of the banking system, 2006), amended with a score scale for A-B division		

This paper distinguishes nine risk categories, namely high indebtedness, total lending and deposit concentration, risks associated with foreign currency and government clients, interbank risks, poor supervision and/or insufficient transparency. However, Fitch believes that to some extent, the current individual ratings take into account these common risk factors. The BSI indicator is based on the weighted average individual ratings of banks, which assets account for at least 2/3 of total assets in any country. Therefore, a change in the individual rating is unlikely to lead to a change in the overall weighted average and thus, in BSI. This is not true for cases when the bank is large and when the average value closely approaches the related category (Basel Committee on Banking Supervision, 2005 and 2013; Systemic risks of the banking system, 2006; IMF, 2006). Given these limitations, macro-prudential indicators are recommended while assessing sustainability to take into account the impact of external macroeconomic factors and to reach higher accuracy. The macro-prudential indicator (MPI) is used to objectively reflect the presence and complexity of macroeconomic conditions, which caused the majority of significant systemic crises back in the past. This approach focuses on the rapid growth of private sector credit, which causes the credit-to-GDP ratio, the real effective exchange rate (REER) and asset/real estate prices to reach a critical high. High vulnerability (MPI 3) is assigned when: (1) private sector credit-to-GDP ratio exceeds the trend by more than 5%; (2) asset prices or real estate prices exceed the trend by more than 40%; (3) REER exceeds trends by more than 9%. Moderate (MPI 2) and low vulnerability (MPI 1) are set from the value of the credit-to-GDP ratio, REER and asset price trends according to the principles given in Table 2. If the value of the credit-to-GDP ratio or exceeds the trigger level by more than 5 percentage points or approaches it from 3 percentage points, then the MPI 2 is assigned. This also applies to the situation when other indicators are close to the trigger value or exceed it.

Table 2. Principles of assigning MPI 1 and MPI 2
(Systemic risks of the banking system, 2006)

	REER and Asset Price Trends		
	Exceed Trigger Value	Close to Trigger Value	Below Trigger Value
<i>Credit-to-GDP Ratio – trend overshoot</i>			
5 percentage points and more	MPI 3	MPI 2	MPI 2
3 percentage points	MPI 2	MPI 2	MPI 1
Under 3 percentage points	MPI 1	MPI 1	MPI 1

Note: Trigger value is a critical trend value by Fitch Ratings. For REER, the trigger value is 9%; for

asset prices or real estate prices, the trigger value is 40%. The value that is close to the trigger value is 6% and 30%, respectively (Systemic risks of the banking system, 2006)

In total, the analysis included 29 countries, including 19 countries of Central and Eastern Europe and the CIS, as well as 10 countries with the developed market economies. The information base of the assessment and evaluations is the database of the International Monetary Fund (International Financial Statistics/ Financial Soundness Indicators). The calculations were carried out on the basis of available materials over the last period of 17.01.2019.

Results and Discussions

International practice shows that the efficient operation of the banking sector is possible only if the asset quality and profitability are high (that is, the non-performing loan ratio is low). In most cases, especially when the economy is facing a deep recession, stress in the banking sector is accompanied by; namely, a deterioration of asset quality that in chain reaction leads to a decrease in profits, weakening of liquidity support and requires costs of capital reserves for compliance with obligations. This fact points to the inadequacy of the contribution of each of the sub-indices into the calculation of BSI, which is considered in the calculation of BSI₂ according to the formula (2). Norway and Georgia close the first five countries with the evaluation indices 0.764 and 0.736 respectively (Table 3). The table below represents data on financial stability in the CEE countries, CIS countries and some developed countries. These data are obtained by financial stability assessment with regard to BSI and MPI.

Table 3. The results of the evaluation of the index of financial stability of the banking sector in the CEE countries, CIS countries and some developed countries

Name of the country	Sub-indices					BSI 1	BSI 2	Group of BSI	MPI
	CA	AQ	P	L	S				
Sweden	0.788	0.927	0.702	0.550	0.968	0.787	0.851	A	MPI 1
United Kingdom	0.442	0.930	0.671	0.187	0.931	0.632	0.792	A	MPI 1
The South Korean Republic	0.127	0.967	0.489	0.686	0.996	0.653	0.775	B	MPI 2
Norway	0.450	0.921	0.611	0.000	0.895	0.575	0.764	B	MPI 1
Georgia	0.348	0.755	0.939	0.252	0.955	0.650	0.736	B	MPI 2
Latvia	0.408	0.744	0.888	0.386	0.974	0.680	0.733	B	MPI 2
Belgium	0.402	0.771	0.581	0.377	0.980	0.622	0.687	B	MPI

									1
Lithuania	0.338	0.682	0.783	0.355	0.985	0.629	0.667	B	MPI 2
Austria	0.306	0.789	0.424	0.346	0.992	0.571	0.656	B	MPI 1
Germany	0.520	0.773	0.399	0.127	0.945	0.553	0.649	B	MPI 1
Czech Republic	0.271	0.667	0.786	0.351	0.897	0.595	0.647	B	MPI 1
Poland	0.322	0.710	0.575	0.189	0.995	0.558	0.632	B	MPI 1
Kyrgyzstan	0.661	0.550	0.709	0.456	0.984	0.672	0.610	C	MPI 3
Kazakhstan	0.285	0.476	0.917	0.222	0.988	0.577	0.558	C	MPI 3
Slovenia	0.446	0.469	0.714	0.323	0.994	0.589	0.534	C	MPI 3
Macedonia, FYR	0.226	0.521	0.707	0.236	0.914	0.521	0.534	C	MPI 3
Moldova	1.000	0.260	0.942	0.668	0.945	0.763	0.525	C	MPI 3
Hungary	0.303	0.336	0.898	0.474	0.853	0.573	0.478	C	MPI 2
Armenia	0.345	0.378	0.446	0.686	0.976	0.566	0.433	C	MPI 3
Romania	0.450	0.246	0.697	1.000	0.996	0.678	0.432	C	MPI 3
Belarus	0.275	0.231	0.703	0.379	0.953	0.508	0.373	D	MPI 3
Russian Federation	0.024	0.357	0.343	0.541	0.971	0.379	0.361	D	MPI 3
Bosnia and Herzegovina	0.243	0.193	0.514	0.265	0.962	0.435	0.304	D	MPI 3
Croatia	0.626	-0.060	0.440	0.382	0.951	0.468	0.181	E	MPI 2
Tajikistan	0.262	-0.270	0.969	0.377	0.997	0.467	0.127	E	MPI 3
Italy	0.188	-0.167	0.363	0.360	0.988	0.347	0.059	E	MPI 2
Ukraine	0.141	-1.067	0.000	0.586	0.000	-0.068	-0.597	E	MPI 3
Greece	0.381	-1.467	0.334	0.292	0.983	0.105	-0.711	E	MPI 1
Cyprus	0.272	-2.130	0.537	0.242	0.998	-0.016	-1.082	E	MPI 1

Note: the values of CA, AQ, P, L and S across countries were taken from the database of the International Monetary Fund (International Financial Statistics/ Financial Soundness Indicators). The

calculations were carried out on the basis of available materials over the last period of 17.01.2019

In Germany, with a BSI 2 index of 0.649, financial institutions achieve disintermediation by expanding fee-earning activities. This approach leads to a greater diversification of income sources, which help banks to reduce risks and stabilize profits in the banking sector. Stability may have been enhanced by forced mergers and acquisitions, but at the expense of competition. This is particularly true for distressed countries - Ireland, Portugal, and Spain (as for Greece and Italy). The countries of CEE and the CIS are mainly in the center. With that, the US banks raised a lot more equity in a much more concentrated timeframe in order to stabilize the banking system when compared to EU banks. In this context, the EU banks are lagging. Thus, banks in Belgium, Greece, Ireland, Italy, Portugal, and Spain are most affected in the midst of the European sovereign debt crisis. Banks from Japan, the United Kingdom, and the United States can be included to cover the core mature markets. The systemic risk assessment of the banking system resulted in a matrix of systemic risks, which involves 29 countries and combines two complementary indicators – BSI and MPI (Table 4).

Table 4. Matrix of Systemic Risks
(*Systemic risks of the banking system, 2006; Fitch Ratings, 2019*)

Banking system indicator (BSI)	Macro-Prudential Indicator (MPI)		
	MPI 1 – low vulnerability	MPI 2 – moderate vulnerability	MPI 3 – high vulnerability
A – very high quality	United Kingdom, Sweden		
B – high quality	Norway, Belgium, Austria, Germany, Czech Republic, Poland	The South Korean Republic, Latvia, Georgia, Lithuania,	
C – acceptable quality		Hungary	Romania, Armenia, Moldova, Macedonia, Slovenia, Kazakhstan, Kyrgyzstan
D – low quality			Bosnia and Herzegovina, Russian Federation, Belarus
E – very low quality	Greece, Cyprus	Croatia, Italy	Tajikistan, Ukraine

Table 4 shows ambiguous results with respect to Cyprus, Croatia and Italy. However, the MPI level balances them. The MPI levels for each country were taken from Fitch's 2017 report (Macro-Prudential Risk Monitor, 2018; Fitch Ratings, 2019). Thus, the report notes macro-prudential risk indicators (MPI scores) suggest low vulnerability to systemic stress in an unprecedented number of

markets. This reflects widespread and sustained low real credit growth, the key determinant of MPI scores. The global median for real credit growth was 2.8% in 2017, down from 3.1% growth in 2016 and a record low since the global financial crisis of 2008, according to Fitch's latest Macro-Prudential Risk Monitor. In 2017, the MPI scores of two markets improved. Thus, the Czech Republic has improved to a score of MPI 1, indicating low vulnerability to systemic risk as measured by credit growth and appreciation in asset markets or the real exchange rate. Macao has also improved to a score of MPI 2. At the same time, Luxembourg and Japan's scores have deteriorated, falling to MPI 2 (from MPI 1 before). Nevertheless, the proportion of markets scoring MPI 1 stands at 79%, on a par with the 80% scored in March 2018, which was the highest level recorded since Fitch began this report in 2005. In 2018, the European Banking Authority-EBA (2014) published a methodology and templates for stress testing the EU banking system. The exercise covered broadly 70% of the EU banking sector and assessed the ability of EU banks to meet the supervisory capital ratios during an adverse economic shock. The methodology covers all relevant risk areas and, for the first time, incorporates IFRS 9 accounting standards. Test results will be used in the supervision and capital adequacy assessment process when checking bank investment plans. This will allow for reaching adequate control. The exercise will also provide increased transparency so that market participants can consistently compare and analyze the sustainability of EU banks. The results of this stress test have been published by EBA in 2019 (Table 5). The test involved 48 banks from 15 EU and EEA countries, covering broadly 70% of total EU banking sector assets. These results include detailed information at the starting and end point of the exercise, under both the baseline and the adverse scenarios. From Table 5, it can be seen that the adverse scenario had an impact of -395 bps on banks' CET1 fully loaded capital ratio (-410 bps on a transitional basis), leading to a 10.1% CET1 capital ratio at the end of 2020 (10.3% on a transitional basis). These results are an input to the supervisory decision-making process and enable a broader vulnerability assessment (EBA, 2019; Fitch Ratings, 2019).

Table 5. 2017 EU-wide stress test results (EBA, 2019; Fitch Ratings, 2019)

	Starting 2017	Starting 2017 restated	Baseline 2020	Adverse 2020	Delta adverse 2020-2017	Delta adverse 2020-2017 restated	Starting Leverage ratio	Leverage Ratio 2020
Transitional CET 1 capital ratio	14.5%	14.4%	15.4%	10.3%	-419 bps	-410 bps	5.4%	4.4%
Fully loaded CET capital 1 ratio	14.2%	14.0%	15.3%	10.1%	-416 bps	-395bps	5.1%	4.2%

Next, for each group, the risk map of the financial stability of the banking sector is shown (Fig. 1). As can be seen from the risk map in Fig. 1, the main difference between groups of countries is evident in the quality of bank assets as banking systems of developed countries has a higher quality of loan portfolio.

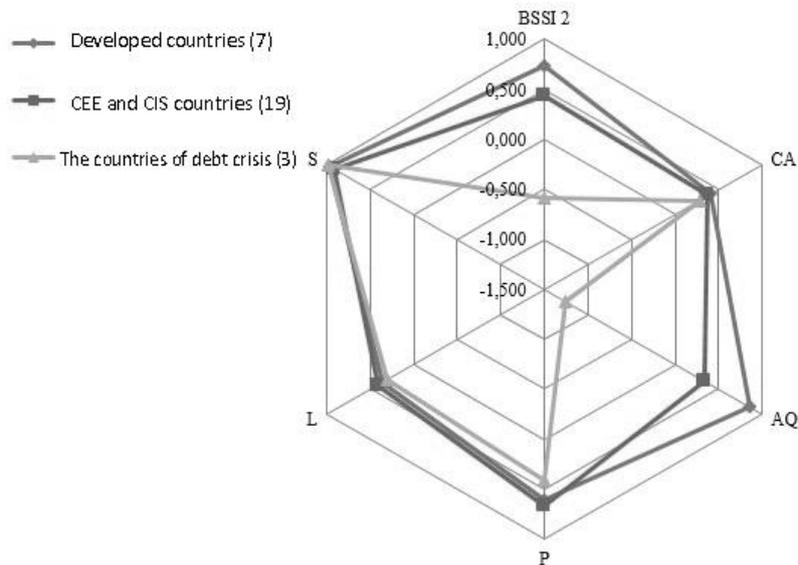


Figure 1. Risk map of the financial stability of the banking sector according to groups of countries

The results for the other risk factors are close to each other. The CEE and the CIS countries are even ahead of developed countries according to the results regarding the indicators of profitability and liquidity. This can be explained by characteristics of the market (in CEE and the CIS countries, the profit margins are higher) and the difference in approaches to the management of assets and liabilities. The economic theory does not offer a clear definition of safe rates of financial convergence. On the one hand, fundamental indicators can justify the high expansion rates of financial institutions. Excessive optimism and aggressive strategies of the increasing market share at low-interest rates, an open capital flow account and in many countries, a controlled exchange rate can lead to excessive credit or low-quality loans. This can result in collateral problems in the banking sector, especially in the event of sharp negative shocks. In 2005, Fitch Agency added a number of improvements to its methodology. It is noteworthy to mention the introduction of macro-prudential measures in countries under the direct supervision of the European Central Bank (ECB). The supervision is executed under Regulation No. 1024/2013. As of 2017-2018, the most frequently used instruments over the past year were the systemic risk buffer (SyRB), the cap on the loan-to-value (LTV) ratio and the countercyclical capital buffer (CCyB). Most measures

reflected a tighter policy, designed to address increased cyclical risks including in residential real estate (RRE) markets. As there are indications that the financial cycle is turning in some countries, more Member States tightened the CCyB. The findings indicate that the strategy of banks from the point of view of growth of credit and liquidity risks will differ in the extent of economic fluctuations. For example, as banks face higher liquidity risk, they create more risks during recessions than during economic expansions. Two approaches in this article – BSI-MPI methodology and stress testing – are understudied from a comparative perspective due to a short distance between the time when they become applied internationally and this publication. However, this article demonstrates that these approaches can be complementary, given the diversity of procedures and indicators. Together, these approaches are able to provide transparent results with higher accuracy. This conclusion is consistent with the recent policy of the Central Bank of different countries, where regulators have been more focused on liquidity management in the banking sector. The size of the bank may be an effective tool for risk reduction, according to these authors. The global median for real credit growth was 2.8% in 2017, down from 3.1% growth in 2016 and a record low since the global financial crisis of 2008, according to Fitch's latest Macro-Prudential Risk Monitor. Elaborated index also allowed concluding that increased competition stimulates banks to diversify risks, indirectly making the system less vulnerable to shocks, but only in cases where an institutional system is strong.

Conclusions

In this study, based on data on the basic indicators of the stability of the banking sector of 29 countries, the BSI index was composed and calculated using the independent variables, which allowed considering all the aspects of risk and estimate banking stability. In particular, based on the BSI index, a map of risks for the financial stability of the banking sector in developed countries, the CEE and CIS countries, and countries with risky debt was constructed. On the other hand, this index allows identifying the strengths and weaknesses of the current financial condition of the banking sector at the level of individual countries and monitoring its sustainability. At the same time, the index does not allow to judge the sources of risk if, for example, they are financial instruments. Research results reveal that increased competition stimulates banks to diversify risks, indirectly making the system less vulnerable to shocks, but only in cases where an institutional system is strong. By BSI, countries such as Sweden (0.851), United Kingdom (0.792) and South Korea (0.775) have the most stable banking system. Index application revealed that the strategy of banks from the point of view of growth of credit and liquidity risks would differ in the extent of economic fluctuations. It can be pointed that the paper also has an important managerial implication that a country may use risk factors as a framework to make decisions regarding financial management and to ensure banking stability. Limitations are a single-source approach (the study

involves only Fitch Ratings). Future plans involve stress testing of banks in developing countries, including those in the CIS region.

References

- Afanasyev M., Shash N., 2018, *Interrelation of Economic Growth and Levels of Public Expenditure in the Context of Wagners Law*, Public administration issues, 6.
- Aspal P., Dhawan S., 2016, *Camels Rating Model For Evaluating Financial Performance of Banking Sector: A Theoretical Perspective*, „International Journal of System Modeling and Simulation”, 1(3).
- Basel Committee on Banking Supervision, 2005, *International convergence of capital measurement and capital standards*, 347.
- Basel Committee on Banking Supervision, 2013, *Liquidity stress testing: a survey of theory, empirics and current practices*, BCBS Working Paper No. 24.
- Bean C., 2018, *Central banking after the great recession*, Economic Affairs, 38(1).
- Constâncio V., 2010, *Macro-prudential regulation as an approach to containing systemic risk: economic foundations, diagnostic tools and policy instruments*, ECB speech, Frankfurt am Main, 27 September.
- Covas F.B., Rump B., Zakrajšek E., 2014, *Stress-testing US bank holding companies: A dynamic panel quantile regression approach*, „International Journal of Forecasting”, 30(3).
- Danielsson J., James K., Valenzuela M., Zer I., 2016, *Model risk of risk models*, „Journal of Financial Stability”, 23.
- De Nicolo G., Kwast M., 2002, *Systemic risk and financial consolidation: Are they related?* „Journal of Banking and Finance”, 26(5).
- EBA, 2019, *EBA publishes 2018 EU-wide stress test results*. Available at: <https://eba.europa.eu/-/eba-publishes-2018-eu-wide-stress-test-results>.
- European Banking Authority, 2014, *Methodological note EU-wide stress test 2014*, 70.
- European Central Bank, 2011, *Central bank statistics: what did the financial crisis change?* Fifth ECB Conference on Statistics on 19 and 20 October 2010. Available at: <http://www.ecb.europa.eu/pub/pdf/other/centralbankstatistics201102en.pdf>, February.
- Fitch Ratings, 2019, *Fitch Ratings: Low Macro-Prudential Risk in Record Number of Markets, Latent Risks Remain*. Available at: <https://www.fitchratings.com/site/pr/10042901>.
- Freudenberg M., 2003, *Composite indicators of country performance*. OECD Science, Technology and Industry Working Papers, 16.
- Gong N., Jones K., 2013, *Bailouts, Monitoring, and Penalties: An Integrated Framework of Government Policies to Manage the Too-Big-to-Fail Problem*, „International Review of Finance”, 13(3).
- Hatzius J., Hooper P., Mishkin F.S., Schoenholtz K.L., Watson M.W., 2010, *Financial conditions indexes: A fresh look after the financial crisis*, NBER Working Paper No. 16150.
- IMF, 2006, *Financial Soundness Indicators – Compilation guide*, Washington DC, March, as amended in July 2008.
- Jones K., Oshinsky R., 2009, *The effect of industry consolidation and deposit insurance reform on the resiliency of the US bank insurance fund*, „Journal of Financial Stability”, 5(1).
- Kočíšová K., 2014, *Banking Stability indicator: A cross-country study*, Faculty of Economics, Department of Banking and Investments, Košice.
- Laeven L., Valencia F., 2013, *Systemic banking crises database*, IMF Economic Review, 61(2).
- Liu Z., Van Heerden F.A., Wang Z.Q., 2005, *Nodal type bound states of Schrödinger equations via invariant set and minimax methods*, „Journal of Differential Equations”, 214(2).
- Macro-Prudential Risk Monitor - September 2018, 2018. Available at: <https://www.fitchratings.com/site/re/10042899>.

- Marcelo A., Rodríguez A., Trucharte C., 2008, *Stress tests and their contribution to financial stability*, „Journal of Banking Regulation”, 9(2).
- Ongena S., Penas M., 2009, *Bondholders' wealth effects in domestic and cross-border bank mergers*, „Journal of Financial Stability”, 5(3).
- Oort J., 1990, *Banks and the stability of the international financial system*, De Economist, 138(4).
- Pais A., Stork P.A., 2011, *Contagion risk in the Australian banking and property sectors*, „Journal of Banking and Finance”, 35(3).
- Sorge M., 2004, *Stress-testing financial systems: an overview of current methodologies*, BIS Working Paper, 165.
- Systemic risks of the banking system, 2006, Fitch Agency. Available at: www.fitchratings.com.
- Willem van den End J., 2006, *Indicator and boundaries of financial stability*, DNB Working Paper, 97.

STABILNOŚĆ SEKTORA BANKOWEGO: TWORZENIE WSKAŹNIKÓW STABILNOŚCI I BADANIA WRAŻLIWOŚCI

Streszczenie: Celem tego artykułu jest połączenie wskaźnika stabilności bankowej (BSI) z niezależnych subindeksów (współczynnik adekwatności kapitałowej (CA), jakość aktywów (AQ), rentowność (P) i płynność (L)). BSI obliczono za pomocą metody normalizacji Minimax. Złożony indeks został wykorzystany do analizy stabilności finansowej sektora bankowego w 29 krajach i do stworzenia mapy ryzyka opartej na ich krajowych podstawowych wskaźnikach ekonomicznych. Wskaźnik stabilności bankowości Fitch (BSI) jest złożoną miarą jakości systemu bankowego, która klasyfikuje kraje według pięciu poziomów jakości systemu bankowego („bardzo wysoki” lub A, „wysoki” lub B, „dopuszczalny” lub C, „niski” lub D i „bardzo niski” lub E). W badaniu wykorzystano również nowatorską metodę testów warunków skrajnych do pomiaru stabilności bankowości. Proponowany indeks BSI jest przeznaczony zarówno do międzynarodowej oceny porównawczej stabilności finansowej sektora bankowego, jak i do jego oceny w kraju. Daje to w najbardziej ogólnej formie możliwość oceny sektora bankowego z punktu widzenia międzynarodowej konkurencyjności i porównania go z innymi krajami. Z drugiej strony pozwala zidentyfikować mocne i słabe strony obecnej sytuacji finansowej sektora bankowego na poziomie poszczególnych krajów i monitorować jego trwałość.

Słowa kluczowe: stabilność finansowa, sektor bankowy, analiza ryzyka, wskaźnik złożony, testy warunków skrajnych.

银行业的稳定性：推导稳定性指标和应力测试

摘要：本文的目的是将银行稳定性指标（BSI）与独立子指数（资本充足率（CA），资产质量（AQ），盈利能力（P）和流动性（L））相结合。使用 Minimax 归一化方法计算 BSI。综合指数用于分析 29 个国家银行业的金融稳定性，并根据其国家基本经济指标建立风险图。惠誉的银行稳定性指标（BSI）是衡量银行系统质量的综合指标，它将银行系统质量的五个级别（“非常高”或“A”，“高”或“B”，“可接受”或“C”，“低”列为国家或 D 和“非常低”或 E）。该研究还使用一种新的压力测试方法来衡量银行稳定性。建议的 BSI 指数既适用于银行业金融稳定性的国际评估，也适用于该国的评估。它以最一般的形式提供从国际竞争力的角度评估银行业并与其他国家进行比较的能力。另一方面，它可以确定各个国家一级银行业当前财务状况的优缺点，并监测其可持续性。

关键词：金融稳定，银行业，风险分析，综合指数，压力测试。