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Stress Testing for Assessing the Impact of Market Shocks on Banks' Financial Stability

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Abstract--- *Modern processes of integration and globalization not only provide new development and growth prospects but also serve as a transfer mechanism for various shocks that affect negatively the economic development of countries. For instance, one of the recent shocks was associated with a sharp drop in oil prices at the end of 2014. These changes affected the financial stability of the banking sector that is generally responsible for the functioning of the entire economy.*

Keywrods--- *Financial Stability, International Monetary Fund (IMF), Central Bank of Russia (CBR).*

I. INTRODUCTION

Over the past decade, interest in analyzing (using stress testing) the impact of market shocks on the banking system increased significantly. Regulators published most of the research on stress testing: the International Monetary Fund (IMF), the Central Bank of Russia (CBR), and others. According to these regulators, stress testing aims to analyze the effects and losses of a bank in an adverse situation. Scientific literature discusses different approaches to stress testing methods; of particular interest is the article by Moretti, Stolz, and Swinburne [24, p. 19-23] where the authors give a detailed description of the financial sector assessment program (FSAP) and of macro stress testing methodology in FSAP on the example of Eastern Europe. Blaschke [10, p. 58] describes the tools for conducting stress tests; the work also provides simplified approaches to stress testing for cases where the quantity and quality of data is not complete. Among the Russian studies, the work by Petrov, Rasskazov, Salina, and Sevruk [2, c. 88-104] stands out, since it addresses the issues of building systemic risk models, lists the main indicators of financial status and compares financial stability indicators according to the methods of the IMF and the CBR. Of particular interest is Andrievskaya's review of the methodology for conducting stress testing [1, c. 1-13]. The author identifies the basic concepts of stress testing, describes the types of stress tests and risk factors that can emerge in the process. According to Borio, [11, c. 1-57] a stress test is the key discovering information, that is, a tool for restoring confidence in the financial system, for increasing transparency and reducing market uncertainty.

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Thus, the lack of generally accepted approaches and methods for assessing the impact of market shocks on the financial stability of banks and the insufficient elaboration of the problem in the context of developing countries determine the relevance of the present study.

The present study aims at identifying the degree of influence of market shocks on the financial condition of the banking systems of the BRIC countries.

To achieve this goal, the following tasks were set:

- To analyze the existing empirical research on the effect of market shocks on the financial stability of banks;
- To form a complete sample of banks operating in the BRIC countries;
- To identify and justify the most relevant variables for studying the issue in question;
- To build an econometric model and to identify the degree of interconnection of financial stability and independent variables;
- To analyze market shocks using modern scientific literature and to monitoring the current economic situation to identify the most likely (and suitable for analysis) factors;
- To formulate the main hypotheses;
- To conduct a series of scenario-based stress tests of the BRIC countries;
- To analyze changes in the financial stability of banks before and after the shocks.

II. MATERIALS AND METHODS

To determine the degree of influence of market shocks on the financial condition of banking systems, the BRICS countries were considered which include Brazil, Russia, India, China, and the Republic of South Africa; these are emerging economies whose banking sector is experiencing the most significant effects of market shocks. The fact that developing countries may be the most vulnerable is associated, for example, with much higher volatility of financial instruments than in countries with developed economies. It is also noteworthy that in the research literature the economic development of South Africa is practically not considered, therefore the banking system of this country is not the subject of analysis in the present study.

To obtain the required indicators for banks, the following databases were used::

- BankScope;
- The World Bank data;
- Banco Central Do Brasil data;
- The People's Bank of China statistics;
- Statistics of the CBR;
- Ruslana.

For more information, the Bloomberg database was also used which contains data on global and national capital markets, on transactions with financial assets (including transactions with derivative financial instruments), on market liquidity parameters, including bids submitted during the exchange trading, and the news feed.

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Thus, the final sample for the study comprised 120 banks whose activities were considered for the period from 2005 to 2016. A sample is a panel data, i.e., it consists of observations of the same economic units in successive periods. Firstly, the selected banks conform to the law of normal distribution, and, second, show significant results due to a significant market share.

To assess the sensitivity of banks to the most likely macroeconomic shocks, the state and development of the banking system of the BRIC countries was analysed.

To characterize the financial state of the banking system of the BRIC countries, it is necessary to take the following into account: these countries occupy more than 25% of the Earth's territory and are home to more than 40% of the world's population. Moreover, these countries account for about 15% of the global GDP. The main purpose of the Big Four is the collective use of the growing economic potential of each country to achieve common goals.

The most significant competitive advantages of BRICS are:

- Hydrocarbon resources of Russia;
- Relatively cheap labor resources of China and India in the production of goods related to IT;
- Natural resources of South Africa;
- Brazil's leading global position in the production of sugar, soybean, iron ore, biofuels, and ethyl alcohol.

Table 1 shows the main economic positions of the BRIC countries.

Table 1: Indicators of GDP and Net Exports of the BRIC Countries

Country	GDP		
	2005, bil.USD	2016, bil.USD	Growth rate, 2005-2016, %
China	2286.0	11199.1	489.9%
India	808.9	2263.8	279.9%
Brazil	891.6	1796.2	201.4%
Russia	764.0	1283.2	167.9%

Source: analysis based on World Bank data

The data in Table 1 indicate a high GDP growth rate of the BRIC countries from 2005 to 2016. The banking system of the BRIC countries is represented by a significant group of state-owned banks, private banks, banks with foreign capital, and offshore banks. The main share of deposit and loan portfolios is occupied by state banks. According to the rating of The Banker's Top 1000 World Banks 2017, the profit in 11 Brazilian banks increased by 179.4% compared to 2015, and the profit of Russian banks by 369% (Table 2).

Table 2: Bank Profit of the BRIC Countries

Countries	Profit 2015, bil.USD	Profit 2016, bil.USD	Change, %
Brazil	10.47	29.24	179%
China	307.99	292.87	-5%
India	6.51	8.18	26%
Russia	3.12	14.65	369%

Source: analysis based on the rating of The Banker International Press Release: Top 1000 World Banks 2017

According to the aforementioned rating, there are 22 banks of the BRIC countries listed among the Top 100 (Table 3).

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Table 3: BRIC Banks in the Top 100 World Banks

Countries	**Banks in the Top 100**	Place in the world	Place of the leading national bank in the world	Range of assets, bil. USD
China	16	1-94	4	229.99-3473.24
Brazil	4	59-70	59	366.23-426.19
India	1	55	55	492.98
Russia	1	64	64	413.58

Source: analysis based on the rating of The Banker International Press Release: Top 1000 World Banks 2017

The leading banks in Brazil, India and Russia own assets worth 2 trillion USD. Banks of China occupy four leading lines of the rating with total assets over 4 trillion USD. Despite the weak capital base of most banks in the BRIC countries, they as monetary institutions generally perform their role in lending to industry, agriculture and people in the range from 70% of GDP in India to 260% in Brazil.

The next step in assessing the sensitivity of the banking system to the most likely macroeconomic shocks is to determine the effective indicator reflecting the financial condition of the bank. In the scientific literature, a wide range of works considers the profitability of banks as such indicator. Thus, according to Gropp and Heider [19, p. 13], profit largely determines the banking capital, which in turn is a significant indicator of the bank's financial condition. Stable profitability increases capital, as it allows the bank to use net income to replenish it.

Van Den Heuvel [28, p. 34-37] believes that banks having difficulty with profit are forced to cut back on lending in order to comply with various norms of the regulator. Demirguc-Kunt and Detragiache [12, p. 18] noted that the bank's profitability indicator is primarily an indicator of financial collapse.

Numerous authors, based on the ability of an individual bank to generate income in order to preserve financial stability, use aggregated indicators of profitability, such as return on assets (ROA) and return on equity (ROE) [14,12]. Some authors use an indicator similar to ROA – the return on average assets (ROAA). For example, Golin and Delhaise [18, p. 17-25] argue that ROAA is a key indicator for assessing the profitability of a bank in the modern economic literature. The authors of the present research, having considered the main indicators of bank profitability, conclude that ROAA is most suitable for analysis, since a large database for a long period is used, and this indicator is able to level out sharp changes in determinants.

When analyzing independent variables, they can be divided into two groups. Firstly, these are factors characteristic of the country's economic development as a whole, and second, these are internal factors affecting the profitability of a bank.

In the scientific literature [6, 13, 27], the first group of factors usually includes economic growth, inflation, interest spread, volatility, profitability of stock indices, and credit growth. In the second group of factors, many authors include indicators of the bank size which is determined by the amount of capital, assets, and expenses. According to Goddard [17, p. 363-381], size expressed as the average value of assets is an important determinant affecting the profitability of a bank – large banks can benefit from a better market position.

Thus, based on existing approaches and development features of the banking system of the BRIC countries, it is possible to single out the most significant macroeconomic ones, first of all, economic growth and inflation.

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To take economic growth into account, GDP annual growth rate is to be considered. Scientific research demonstrated a different effect of the GDP dynamics on the profitability of banks. For example, Bikker and Hu [9, p. 143] indicated a positive correlation with the profitability of banks, while Masood and Ashraf revealed a negative relationship [22, p. 255-268].

To measure inflation, the consumer price index (CPI) is used. Inflation affects the real values of indicators and incomes of the bank, which is extremely important in the current economic situation. As a rule, an inflation increase negatively affects the profitability of banks, yet in the literature, there are known cases of getting the opposite result. For instance, Kosmidou, Masood, and Ashraf [22, c. 8-15] found a positive relationship in their works.

In addition to the above-mentioned macroeconomic indicators, the oil price changes require special attention. For the banking system of developing economies of the BRIC countries, oil prices are among key indicators. This study examines the price of BRENT oil; the relevance of the indicator lies in its sharp fluctuations and its direct impact on the exchange rate, which directly affects the profitability of banks.

The exchange rate indicator is also important. For example, the positive impact of the devaluation of the national currency on the profitability is observed in those banks whose activities are more associated with foreign exchange transactions, leading to an increase in their income, which compensates for the reduction in the profitability of assets. However, for the most part this has a negative effect on the banking sector, which can be easily noticed by reviewing the reporting of banks for 2014-2016.

Another indicator affecting the profitability of the banking systems of the BRIC countries is stock market indexes; the following ones are considered in the resent research:

- MICEX (Moscow Interbank Currency Exchange) index which is calculated as the ratio of the total market capitalization of shares included in the index calculation base to the total market capitalization of these shares on the initial date multiplied by the index value on the initial date;
- index of the Shanghai Stock Exchange SSE Composite which reflects the dynamics of the shares of all the companies listed on the Shanghai Stock Exchange and is a statistical indicator of the state and development of the Chinese stock market;
- National Stock Exchange Index of India (NSE) – S&P CNX Nifty which includes 50 main shares of companies by market capitalization;
- São Paulo Stock Exchange Index (Bolsade Valores de São Paulo, BVMF3) - BOVESPA (BVSP) which includes the blue chips of the 50 largest companies in Brazil, three financial companies of the financial sector and eight companies of the energy sector.

Stock market returns are also often highly correlated with GDP growth; this makes the applicability of the indicator as a determinant of bank profitability a rather problematic task, especially since GDP growth is already included in the model. However, the volatility of the stock market can bring significant income to individual banks.

Another external indicator is the interest spread, the difference between average interest rates on assets and liabilities that generate income. The effect of the interest spread on bank profitability depends on the nature of the bank’s core business, thus, a higher interest spread is likely to have a positive effect on bank profitability.

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Such indicator as credit growth is associated with the traditional source of income for banks. Among the various sources of income, it is likely to have a positive impact on the bank's profitability.

The internal factors affecting the profitability of the bank are as follows:

- Capital equity. In the present study, this indicator is calculated as the ratio of equity to total assets. This ratio represents a kind of solvency index which measures the number of assets financed by owners' investments. Equity has two important aspects – firstly, it shows how much of the company's total assets belong directly to investors, second, demonstrates the degree of self-sufficiency - the share of investors in the company. It turns out that a higher ratio shows to potential investors that the company is more sustainable and less risky for further investments.
- Ratio of the net operating profit of a certain bank to the net operating profit of the banking industry. The determinant of market power suggests that firms with large market shares and differentiated products can use market power to receive greater profits.
- Cost-to-income ratio (CIR). This determinant is widely used to assess the effectiveness of a bank by investors, shareholders, etc. CIR shows how much rubles were spent to get one ruble of income; the smaller this figure, the more profitable the bank.
- Ratio of reserve for losses (loan loss reserves) to the total volume of loans (gross loans). This indicator is a measure of the quality of bank assets – a high ratio may indicate poor credit quality and, consequently, a higher risk of the loan portfolio. Yet it can also mean a positive relationship between risk and profit, which is consistent with the hypothesis: the higher the risk, the higher the profit. Therefore, it is difficult to predict 'the sign' of this indicator. However, its negative impact on the profitability of the bank will indicate the poor quality of loans that reduce interest income [15, 20].
- Ratio of interest revenue to assets (net interest margin). Net interest margin is a measure of the success of a bank's investment decisions. A negative value means that the bank does not work optimally, since interest expenses are greater than the number of returns from investments.
- Indicator of net commission income. Currently, there is a trend of transition from interest income to commission, so this indicator is important for completeness of the analysis. Commission income represents remuneration for services rendered by a bank due to its specific activity.

To determine the impact of these factors on the financial stability of the banks of the BRIC countries, the following regression model will be used:

$$\pi_{i,t} = \alpha + \sum_{j} \beta_i * X_{i,j} + \sum_{k} \varphi_k * Y_{i,j} + \varepsilon_{i,t}, \quad (1)$$

where $\pi_{i,t}$ is ROAA variable,

α – constant in the regression equation

β_i – constant in the regression equation

$X_{i,j}$ – macroeconomic factor

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φ_k – constant in the regression equation

The next task of stress testing is the formulation of hypotheses describing the effect of macroeconomic variables on the profitability of banks. The following hypotheses were formulated:

1. GDP decline has a negative impact on the profitability of banks.
2. Exchange rate depreciation adversely affects the profitability of banks.
3. Shock prices of the Brent crude oil have a negative impact on the profitability of banks.
4. The shocks of 2016 occurring have a stronger impact on the profitability of banks than the shocks of 2015 and 2014.
5. Shock prices of the Brent crude oil produce a greater negative effect on the financial condition of banks than the shocks of GDP and the ruble exchange rate.

Table 4 contains hypotheses on the influence of intrabank indicators on banks' profitability.

Table 4: Impact of Intrabank Variables

Variable	Abbreviation	Expected sign
Amount of capital	Capital	+
Bank efficiency	CIR	-
Bank loan quality	LLR	-
Successful investment decisions	NIM	+

III. RESULTS

To build a stress-testing model of bank profitability, the following variables were taken into account (Table 5).

Table 5: Indicators affecting banks' ROAA

Variable		Explanation	Abbreviation	
Dependent variable	Profitability indicator	Net profit Total average assets	ROAA	
Explaining variables	Release	Annual GDP change	GDP	Outer variables
	Inflation	Consumer price index	CPI	
	Cost of oil	Price of BRENT oil	BRENT	
	Exchange rate	USD → RUR exchange rate	USD	
	Exchange index	Exchange index yield	MICEX/ SSE Composite/ S&P CNX Nifty/ BVSP	
	Amount of capital	Equity Total assets	Capital	Intrabank variables
	Market power	Net op.profit of the bank Net op.profit of the industry	Marketpower	
	Bank's eficiency	Costs Income	CIR	
	Bank loan quality	Loss allowance Total loans	LLR	
	Successful investment decisions	Interest revenue Total assets	NIM	
	Successful investment decisions	Amount of commission income	NFC	

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The models were built for each country of the BRIC group, and their assessment was carried out with the help of the statistical tests of Wald, *Breusch–Pagan*, and Hausman. The model was adjusted according to the analysis results, since individual factors turned out to be statistically insignificant due to the strong correlation with other explanatory variables. To preserve the adequacy of the model and its predictive power, the indicators of inflation, market power, stock indices and commission income were removed.

Thus, the stress testing model of the profitability of banks in the BRIC countries is as follows:

$$ROAAt = GDPt + GDPt\text{-}1 + GDPt\text{-}2 + BRENTt + BRENTt\text{-}1 + BRENTt\text{-}2 + USDt + USDt\text{-}1 + USDt\text{-}2 + CAPITALt + CIRt + NIMt + LLRt + const, \quad (2)$$

The calculated model parameters are presented in Table 6.

Table 6: Calculation Results

Variable	Coefficients			
	Russia	Brazil	India	China
Release (GDP))	+0.026	+0.029	+0.040	+0.029
Oil price (BRENT)	+0.337	+0.284	+0.543	+0.024
Exchange rate (USD)	-0.409	-0.859	-1.189	-3.179
Amount of capital (Capital)	+0.097	+0.073	+1.481	+0.055
Bank's efficiency (CIR)	-0.097	-0.145-	-0.012	-0.123
Bank loan quality (LLR)	-0.122	-0.094	+0.213	-0.142
Successful investment decisions (NIM)	+0.147	+0.151	+2.281	+0.133

To conduct stress testing of the banking systems profitability in case of probable financial shocks, it is necessary to distinguish clearly defined scenarios that must combine both drastic change and plausibility and relevance.

Based on the analysis of scientific works and methods of the Central Banks of the BRICS countries, the following stress testing scenarios were selected:

Shocks:

- GDP decline by 3% in 2015, 2013, 2014;
- GDP decline by 5% in 2015, 2013, 2014;
- Decrease in the exchange rate by 19% in 2015, 2013, 2014;
- Oil prices decrease by 20% in 2015, 2013, 2014.

Based on the model, a series of scenario stress tests were conducted for the banks of the BRIC countries. As a result, the authors of the present study obtained a 'stressful' indicator of bank profitability which can be correlated with the ROAA value without introducing any shocks.

Table 7 shows the impact of market shocks on the banks' financial condition in the BRIC countries.

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Table 7: Results of Stress Testing

Change of indicators	ROAA change in Russia	ROAA change in China	ROAA change in India	ROAA change in Brazil
3% GDP 2016	1.11%	1.24%	1.71%	1.24%
3% GDP 2015	1.36%	1.52%	2.09%	1.52%
3% GDP 2014	1.24%	1.38%	1.91%	1.38%
5% GDP 2016	1.62%	1.81%	2.49%	3.23%
5% GDP 2015	2.30%	2.57%	3.54%	4.59%
5% GDP 2014	2.06%	2.30%	3.17%	4.11%
19% USD 2016	-10.66%	-16.50%	-14.00%	-13.00%
19% USD 2015	-3.00%	-4.64%	-3.94%	-3.66%
19% USD 2014	-1.07%	-1.66%	-1.41%	-1.30%
20% BRENT 2016	5.59%	2.00%	9.01%	4.71%
20% BRENT 2015	5.81%	2.08%	9.36%	4.90%
20% BRENT 2014	4.13%	1.48%	6.65%	3.48%

IV. DISCUSSION

Analysis of the regression results (Table 7) shows that the hypotheses about the nature of the influence of macroeconomic and intrabank indicators on the profitability of banks are not rejected.

Indeed, greater GDP growth has a positive effect on the banks' profitability in the BRIC countries. This can be explained by the fact that the higher the GDP growth, the better the borrowers feel, and, consequently, the higher the bank's profit. Market power allows the bank to attract more customers, which also increases profits. The most relevant indicators are the oil price and the exchange rate. It turns out that with an increase in the price of BRENT oil, banks in the BRIC countries become more profitable. This fact is not so obvious, since the growth of banks' profitability may well be justified not by an increase in the money supply or in loans of large oil and gas companies but by an increase in customer confidence in banks. The positive impact of the net interest margin can be interpreted as the best work of the bank in the field of investment decisions, which allows increasing interest income, and, consequently, profit.

The positive impact of the capital value is connected with the fact that banks with large capital can cope with unexpected problems more effectively, which is confirmed by other studies [16,25].

As expected, the bank's performance indicator has a negative effect on ROAA since the bank's profitability decreases with increasing costs. Researchers also note that cost management efficiency is a significant factor in determining the profitability of banks [16,26].

The quality indicator of bank loans also showed a negative impact, which means that a higher share of reserves to cover losses indicates a worse quality of loans and, consequently, a higher risk of the loan portfolio.

The final factor that adversely affects the profitability of banks is the exchange rate. If banks take loans abroad, then with an increase in the exchange rate, loans become more expensive. In addition, the devaluation of the national currency worsens the situation of corporate borrowers, and the decline in real incomes of the population reduces their ability to pay retail loans.

Based on the model, stress testing of the developed scenarios was conducted.

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If we consider the dynamics of shock indicators over the past five years, then these scenarios are quite likely. For example, the GDP level of India, Brazil and Russia in 2013-2016 was quite unstable and showed negative dynamics. A similar situation was observed with the exchange rate – over the past 5 years, the ruble exchange rate in Russia decreased by about 50%. Moreover, at the time of the study, this trend continued, but with less effect.

Let us consider the impact of market shocks on the banks' financial condition in the BRIC countries (Table 8).

As calculations show, a GDP decrease leads to a direct decline in interest income of banks due to a decrease in demand for loans, and to a drop in asset profitability due to rising costs for banks to finance borrowed funds, which, in turn, leads to a fall in banking profit growth system. The results also show that a 5% decline in GDP growth does not lead to a greater slowdown in ROAA growth than a 3% decline in GDP growth. In this case, the greatest impact of these shocks was on the banking systems of India and Brazil.

The depreciation of the exchange rate adversely affected the profitability of banks. Note that the ruble devaluation in the short term can have a positive effect on the profitability of those banks whose activities are more closely associated with foreign exchange transactions. At the same time, about a third of the banks' credit portfolio in the BRIC countries comprise loans in foreign currency, so the devaluation of the exchange rate sharply reduces the banks' capital adequacy ratio. Consequently, there is an urgent need for additional reserves for foreign currency loans. In addition, the financial situation of borrowers is deteriorating. All this, of course, reduces the profitability of banks. Calculations showed this shock has the greatest impact on the banking systems of China and India.

The price decline for Brent crude oil also has a negative impact on the profitability of banks. This is explained by the fact that, for example, almost half of Russia's budget revenues over the past 10 years consist of revenues from the oil and gas industry. Brazil and India are also heavily dependent on the hydrocarbon market situation.

When comparing the impact of shocks in 2016, 2015 and 2014 on the profitability of banks, we can conclude that GDP has the weakest effect on it, since in recent years, the GDP growth rate noticeably decreased, which has a weakening effect on the banks' profitabilit. In addition, shocks from a GDP decline level subsided by the end of the period in question, while other shocks did not demonstrate this trend.

The exchange rate has the most significant influence on the financial condition of the banking systems in the BRIC countries because it follows the change in oil prices. Therefore, this shock occurs later and increases by the end of the period under consideration.

Since the considered shocks are interrelated, and one is likely to result in another, based on the results obtained we can assume that the profitability of banks will not remain positive with the combined action of the shocks in question. Oil prices decrease by 20% will have the strongest impact and will entail a corresponding depreciation of the ruble.

Thus, the advantage of the model used is the flexibility of stress testing scenarios, i.e., both individual macroeconomic shocks in a certain period, and their one-time impact on the profitability of the banking system for different years and in aggregate can be assessed. In addition, based on the review of the Russian literature, the authors of the present study concluded that this work is one of the first researches to analyze the sensitivity of

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financial stability indicators of Russian banks to changes in the economic sphere based on the data for each specific bank.

V. CONCLUSION

The present research analyzes the results of empirical studies that consider the impact of market shocks on the financial stability of banks. The most relevant variables for studying this issue in the BRIC countries are substantiated. Various methods of stress testing are considered, and their advantages and disadvantages are revealed.

According to the analysis results, an aggregated stress testing method was suggested; this includes constructing a regression model of the dependence of bank profitability on macroeconomic and intrabank factors, and the development of stress testing scenarios.

To assess the sensitivity of the profitability in the BRIC countries to the most likely macroeconomic shocks, the ROAA indicator was considered as an independent variable. In scientific studies, this indicator is the key to analyze the profitability of the bank because it is able to level dramatic changes in determinants. In turn, this allows for more relevant results.

As macroeconomic factors, changes in GDP, prices for BRENT oil, exchange rate, and stock market indexes are considered. As part of the intrabank factors, the amount of bank capital, the indicator of 'market power', the quality of bank loans, the success of investments, and commission income were analyzed.

The advantage of the developed model is the flexibility in the choice of stress testing scenarios and the consistency of the calculated values of the profitability index, both before and after the shocks. In addition, both individual macroeconomic shocks in a certain period and their one-time impact on the rate of profitability of the banking system can be assessed in different years and in aggregate.

To conduct stress testing of the profitability of banks, scenarios close to the real economic situation were developed. Indicators such as a GDP decline, a decline in the exchange rate and in oil prices were taken as shocks.

Stress testing based on the model shows that the selected financial shocks can have a significant effect on the profitability of banking systems. In particular, the model used in the present study revealed the most critical factors ths, the shock of the exchange rate in 2016 had the greatest negative effect on the financial condition of banks. In 2015 and 2016, oil price shocks had a dominant negative impact on bank profitability.

The considered stress testing method is able to reveal structural weaknesses and the general risk exposure of a bank with respect to profitability during a period of sharp financial shocks. The present research aimed at reflecting the real situation; consequently, the work can serve as a substantial practical basis for further research.

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