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THE MODEL OF EVALUATION AND FORECASTING THE FINANCIAL STABILITY OF COMMERCIAL BANKS AND THE BANKING SECTOR IN THE REPUBLIC OF MOLDOVA

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The banking sector plays an important role in the economy, fulfilling specific functions that other infrastructures cannot replace. It has a key role in the functioning of the system of payments and settlements, being the subject of money issuance and the main institutional conductor of the state monetary policy, supporting and ensuring the financial flows in the country, which ensures the development of the economy. In addition, banks perform the traditional function of financial intermediation - depositing the savings of natural and legal persons and redirecting this money to: lending the economy, interbank investments, investments in securities, etc. In this context, the stability of the banking sector is the key for the development of the economy as a whole. This state of the banking sector is in the interest of all subjects who in one way or another are related to banks (citizens, economic agents, government, supervisory authority), and banks themselves. The instability of the banking system, whose prolonged duration leads to financial crises, leads to disruption of the normal functioning of the economy. This article is devoted to the elaboration of the model of evaluation and forecasting the financial stability of commercial banks and the banking sector in the Republic of Moldova. It can be an efficient tool for monitoring the evolution of the financial stability by the supervisory authority and banks' management.

Keywords: *financial stability, commercial banks, banking sector, liquidity, assets quality, profitability, financial balance, evaluation, forecast.*

MODELUL DE EVALUARE ȘI PROGNOZARE A STABILITĂȚII FINANCIARE A BĂNCILOR COMERCIALE ȘI A SECTORULUI BANCAR ÎN REPUBLICA MOLDOVA

Sectorul bancar deține un rol important în economie, îndeplinind funcții specifice pe care alte infrastructuri nu le pot înlocui. Acesta are un rol cheie în funcționarea sistemului de plăți și decontări, fiind subiectul emiterii de bani și principalul dirijor instituțional al politicii monetare de stat, susținând și asigurând fluxurile financiare din țară, care asigură dezvoltarea economiei. În plus, băncile îndeplinesc funcția tradițională de intermediere financiară – atragerea economiilor persoanelor fizice și juridice și redirecționarea acestor bani spre: dezvoltarea economiei, investiții interbancare, investiții în valori mobiliare etc. În acest context, stabilitatea sectorului bancar este cheia dezvoltării economiei în ansamblu. Această stare a sectorului bancar este în interesul tuturor subiecților care, într-un fel sau altul, au legătură cu băncile (cetățeni, agenți economici, guvern, autoritățile de supraveghere) și băncile în sine. Instabilitatea sistemului bancar, a cărei durată prelungită duce la crize financiare, duce la întreruperea funcționării normale a economiei. Acest articol are ca subiect elaborarea modelului de evaluare și prognozare a stabilității financiare a băncilor comerciale și a sectorului bancar din Republica Moldova. Modelul poate fi un instrument eficient pentru monitorizarea evoluției stabilității financiare de către autoritatea de supraveghere și managementul băncilor.

Cuvinte-cheie: *stabilitate financiară, bănci comerciale, sector bancar, lichiditate, calitatea activelor, rentabilitate, echilibru financiar, evaluare, prognoză.*

Introduction

To determine the financial stability of a commercial bank or the banking sector, it is not sufficient to know the information about the current state and the performance indicators. It is also important to predict the probability of maintaining stability in the future or the possibility of its degradation. The main goal of this article is the construction of the model of evaluation and forecasting the financial stability of commercial banks and the banking sector in the conditions of the of Moldova. Nowadays, the economists from the scientific and practical field are actively looking for the optimal model for evaluating and forecasting the financial status of commercial banks. Waiting for the evolution and changes of the financial indicators of a bank until the critical values, under the influence of external and internal factors, can lead to the situation in which it will be too late to take measures to restore banks and the banking sector.

Therefore, it is necessary to forecast the probable events, for preventive interventions in the process of their evolution. The lack of efficient estimations in the conditions of uncertainty causes the implementation of an inefficient management of the financial institutions, which influences the increase of the banking risks. Thus, it is necessary to make a forecast of the financial stability of the commercial banks and of the banking sector as a whole in an optimal time.

Scientific approach

The main features of the forecast, which will serve as a basis for the further development by the author of the model of financial stability evaluation and forecasting are:

1. The forecast is the result of the activity as a whole, and the future reflected in the forecast is the result of a complex set of reasons and conditions, that determine the change of the predicted phenomenon. The forecast is the result of conclusions, empirical data, reasonable proposals and presents a motivated conclusion on the future directions of development.
2. The probability of the future, as a result of real events, is an element of uncertainty. Therefore, the forecast should have an estimate of the probability of occurrence of events.
3. The forecast is affected by various external and internal factors.
4. For forecasting, it is necessary to own quantitative and qualitative information about the analyzed object.
5. The forecast makes possible to take the preventive actions for the expected events, taking into account their positive and negative consequences, the intervention in the development process, being a guide for planning and offering the research base for the preparation of the plan.
6. The accuracy of the forecast is verified over time.

As a result of the above-mentioned facts, in the methodology of forecasting the financial stability of a commercial bank/banking sector, elaborated by the author, the following aspects will be considered:

1. The financial stability of the bank/banking sector is considered as a qualitative feature of the activity of the bank/banking sector in the future.
2. The methodology proposed by the author can be used in the strategic planning stages, which determines the prospects of the activity of a commercial bank/banking sector.
3. For the elaboration of the forecast, the existing forms of the financial reports of the banks are used.
4. The forecast is based on data from the last 5 years of the financial status of commercial banks/banking sector.
5. When assessing the financial stability of a bank, it is compared with other commercial banks in the Republic of Moldova.
6. The calculation of the indicators and the factors of influence is carried out by using the necessary computer programs.

The theoretical research on the financial stability and its factors of influence reveals that the financial stability of commercial banks/banking sector is influenced mainly by the capital adequacy, quality of assets, liquidity, profitability, return.

In order to be simultaneously representative and to cover all the factors that influence the financial stability of a commercial bank/banking sector and, at the same time, be as clear and simple as possible to understand and perform the calculations, it is necessary to include in the model the most significant indicators in each group of factors mentioned above.

Therefore, in practice, a sufficiently large number of indicators are used to evaluate these factors and it is necessary to select from the existing indicators only those that have the greatest impact on the financial stability of commercial banks/the banking sector.

The model of evaluation and forecasting the financial stability of commercial banks and the banking sector will be elaborated based on the optimal bank model.

For the first time, the optimal bank model was developed in 1888 by the scientist F.Edgeworth as part of the mathematical theory of banking activity.

Initially, in theory there were used two different approaches of the optimal bank modeling.

The supporters of the first approach (E.Kane, V.Melkayl and D.Pyle – 1965) relied on the asset selection process or the liability management process.

Assets management was considered the main function performed by choosing the optimal structure of the loan portfolio and the reserves of the bank. The focus was on liquidity.

The advantage of this portfolio approach is that the model takes into account the uncertainty associated with the random risk factors that affect the choice of assets. However, the model does not take into account the costs of real resources and the impact of changes in interest rates.

The second approach to the optimal bank model (M.Klein – 1971) considers the impact of market imperfections and cost of the deposits on bank performance [9]. However, this excludes the influence of random risk factors associated with the asset selection process.

The models of C.Seeley and E.Baltensperger combine both directions. Therefore, in C.Seeley's model, a portfolio approach is used in terms of choosing risky opportunities, taking into account the costs of real resources and the interest rates on deposits.

As a basic function, the C.Seeley's model uses the basic equation of profit, which depends on the constraints of the balance sheet and the deposit offer [13]. This function will be adjusted to the conditions of the Republic of Moldova:

$$P = I - E - Oe, \text{ where:} \quad (1)$$

P – profit; E – interest expenses; I – income; Oe – other expenses;

As an equation of the respective model is used:

$$L = D + X, \text{ where:} \quad (2)$$

L – loans; D – deposits; X – compound variable, defined as the difference between the funds received and provided on the short-term capital market (interbank loans).

The solution of C.Seeley's model represents the formation of an optimal loan portfolio, the deposit rate and the bank liquidity position. This solution is determined simultaneously depending on costs, liquidity and risk. The disadvantage of this model is that only a part of the bank's behavior is analyzed and the optimal structure of liabilities and assets is not determined simultaneously.

The most complete model is E.Baltensperger's one, he considers the expected profit function as an objective function, taking into account the real costs of resources, liquidity and solvency [3]. This model will be further developed, to obtain the optimum structure of assets and liabilities within the national banking sector.

Data sources and used methods

The data used for the model development are taken from the reports published on the official web site of the supervisory authority of the Republic of Moldova – the National Bank of Moldova: the balance sheet and information on the economic and financial activity of banks [4]. In the research were used the following methods: quantitative analysis, qualitative analysis, synthesis and comparison.

The necessary steps to be taken in order to develop the model are:

1. Establishment of the indicators to evaluate the financial stability of the commercial banks/banking sector;
2. Analysis of the dynamics of the financial stability indicators of the commercial banks/ banking sector of the Republic of Moldova for the last 5 years;
3. Calculation of the forecast value of the financial stability indicators of the commercial banks/ banking sector of the Republic of Moldova;
4. Taking into account the selected indicators (factors) and their weight, the elaboration of the model for evaluation and forecasting the financial stability of commercial banks/banking sector of the Republic of Moldova's done;
5. Applying the proposed model in practice, calculating the current and forecasting the future financial stability of the commercial banks and banking sector and the comparative analysis of the situation between the local commercial banks.

The results of our own research

According to the first step, it was selected the list of indicators that are more relevant to the analysis of the financial stability. The indicators and the description of their impact on the financial stability of the banks/banking sector are presented in the Table 1.

Compliance with liquidity requirements is not sufficient for the financial stability of a commercial bank/banking sector, as a sustainable bank must have a development potential, which is ensured by a sufficient level of profitability.

Therefore, for the model there were selected the indicators that determine the liquidity, the quality of the assets, the financial balance, return, profitability and operational extent.

Table 1

Indicators that characterize the financial stability used to develop the model of evaluation and forecasting the financial stability

Criteria	Indicators	Description of the indicators
Liquidity	Principle I – Long term liquidity (≤ 1)	Allows to assess the vulnerability of the sector to the losses resulting from the lack of access to the market funds or the withdrawal of deposits
	Principle II – Current liquidity ($\geq 20\%$)	Characterizes the degree of assets coverage by liquid means
	Principle III – Liquidity on maturity bands (>1) - over 12 months	Presents the potential liquidity reserves
Assets quality	Monthly average value of interest bearing assets/Monthly average value of assets	Represents the degree of investment activity and shows the size of the risks assumed by the bank
Financial balance	Own funds/Total assets	Reflects the value of own funds in total assets
	Total debt/Total capital	Reflects the ratio between debt and equity
	Non-performing loans/Total loans	Indicates the share of non-performing loans in the total loans granted
	Balance of net non-performing assets/Own funds	Indicates the share of net non-performing assets in own funds
Return	Return on equity (ROE)	Reflects the efficiency of using the equity
	Return on assets (ROA)	Characterizes the efficiency of bank's operations
Profitability	Loans/Deposits	Shows how much of the attracted deposits the bank prefers to invest in loans
Operational extent	Total assets/Total equity	Characterizes the extent of the bank's operations

Source: elaborated by the author based on the sources [1], [7].

These indicators are interdependent and depend on the amount of income-generating assets; they reflect the financial stability of the bank policy, the degree of financial performance, the ability to work efficiently and to compete with other financial institutions on the banking services market of the Republic of Moldova.

The dynamics of the indicators of the activity of commercial banks is a series of times. Usually, the forecast is based on the regression elaboration. However, in this case, the traditional approach will have the following disadvantages:

1) If the bank has registered unsatisfactory indicators for three years and the financial situation has improved in the fourth year, then the regression will predict further growth.

2) The regression considers all the periods as equally significant, while the periods beyond the present moment should have a smaller impact on the forecast.

Thus, it is proposed to perform the financial stability forecast of a commercial bank/banking sector in the following way. For each period, to calculate the indicator:

$$Reg_t = \frac{(p_t - p_{tn})}{(1+r)^t}, \text{ where:} \quad (3)$$

t is the analyzed period; tn is the period prior to the period of forecasting; p is the value of the indicator; r is the discount rate, which, in this case, determines the degree of decreasing of the importance of the indicators over time.

The forecast value of each indicator is calculated as an average. Therefore, it is calculated the integral value of the indicator that takes into account its historical values.

$$p_{tn+1} = p_{tn} + \frac{\sum_{t=1}^{tn} Reg_t}{tn} \quad (4)$$

For a clearer determination and forecast of the financial stability of a commercial bank/banking sector and its comparison with other banks, it is necessary to integrate the values of the indicators obtained in a single formula, which will be a mathematical interpretation of the model of evaluation and forecasting of the financial stability.

The values of the weighting coefficients are calculated on the basis of choosing the optimal bank's structure. As it was mentioned above, for the determination of the optimal bank's structure will be used E.Baltensperger model.

Following this model, the components of assets, liabilities and capital of the bank should be structured according to the balance sheet. Therefore, the equation of the optimal bank model will have the following form:

$$\text{Optimal Profit} = A1d1 + A2d2 + A3d3 + A4d4 + A5d5 + A6d6 + A7d7 + A8d8 + A9d9 + A10d10 + A11d11 + A12d12 + A13d13 + A14d14 - (P1pr1 + P2pr + P3pr3 + P4pr4 + P5pr5 + P6pr6 + P7pr7 + P8pr8 + P9pr9), \text{ where:} \quad (5)$$

$A1-A14$ are 14 components of local banks' assets; $d1-d14$ is the interest for each component of assets; $P1-P9$ are 9 components of local banks' liabilities; $pr1-pr9$ is the price of the attracted liabilities.

The general equation can be presented as follows:

$$A1 + A2 + A3 + A4 + A5 + A6 + A7 + A8 + A9 + A10 + A11 + A12 + A13 + A14 = P1 + P2 + P3 + P4 + P5 + P6 + P7 + P8 + P9 \quad (6)$$

The optimal structure of the assets and liabilities of the commercial bank, as well as the maximum possible profit that can be obtained by a bank, depends not only on the prudent management of the bank, but also on the external factors and, first of all, on the state of the financial market.

Therefore, in order to develop the model of evaluation and forecasting the financial stability of commercial banks and the banking sector, it is necessary to take into account certain macroeconomic indicators that affect the financial stability of the banking sector in the Republic of Moldova as a whole and the financial stability of a certain bank.

The state of the financial market in the Republic of Moldova can be characterized by the following main macroeconomic parameters: the NBM reserve rate, the inflation rate, the interest rates for various financial instruments (interbank loans, deposits, short and long-term loans), interest rates on interbank transactions, interest rates on government bonds, as well as the return on portfolio investments.

The mentioned indicators will be used to generate the weights for the elements of the model of evaluation and forecasting the financial stability, proposed by the author.

Taking into account the financial market indicators, the optimization problem results was solved by identifying the percentage structure of the assets and liabilities of the bank.

In the next stage of forecasting the financial stability, the numerical values of the weighting coefficients were determined. The calculations made, allow combining the values of the indicators obtained in a single formula for evaluating and forecasting the financial stability of a commercial bank/banking sector.

The final interpretation of the model of evaluation and forecasting the financial stability of a commercial banks/banking sector under the conditions of the Republic of Moldova, taking into account the values of the weighting coefficients, has the following formula:

1) Evaluation of the financial stability of a commercial bank/banking sector of the Republic of Moldova (MESF) in the year n :

$$\text{MESF} = (P1n * K_1 + P2n * K_2 + P3n * K_3 + P4n * K_4 + P5n * K_5 + P6n * (1/K_6) + P7n * (1/K_6) + P6n * (1/K_7) + P8n * (1/K_8) + P9n * K_9 + P10n * K_{10} + P11n * (1/K_{11}) + P12n * (1/K_{12}))/12 \quad (7)$$

(/11 for the years 2014-2015), where:

$P1-P12n$ are the values of the weighting coefficients in the year n , $K1-K12$ are the values of the financial stability indicators mentioned in the table 1.

In order to forecast the financial stability, was calculated the average value of the weighting coefficients for the last 5 years.

2) Forecasting the financial stability of a commercial bank/or banking sector of the Republic of Moldova (MFSF) in the period 2019-2021:

$$\text{MFSF} = (0,88 * K_1 + 0,54 * K_2 + 0,92 * K_3 + 0,85 * K_4 + 0,13 * K_5 + 0,49 * (1/K_6) + 0,52 * (1/K_7) + 0,13 * (1/K_8) + 1,00 * K_9 + 1,02 * K_{10} + 0,45 * (1/K_{11}) + 0,14 * (1/K_{12}))/11 \text{ for the years } 2014 - 2015 \quad (8)$$

The lower limit of financial stability will be the calculated as the weighted average that reflects the stability of commercial banks (Table 2).

Table 2

The lower limit of financial stability of the commercial banks and banking sector

Years	2014	2015	2016	2017	2018	2019-2021
Limit	7,50	8,20	8,00	8,20	8,50	9,00

Source: elaborated by the author.

Banks with a MESF/MFSF coefficient value above the limit – they are financially stable commercial banks. Banks whose financial stability is at the limit level – are at high risk. Banks with MESF/MFSF below the limit are in critical conditions regarding financial stability.

By comparing the obtained results, it is possible to compare the financial stability of different banks within the national banking sector (Table 3).

Table 3

Application of the MESF/MFSF model for evaluating and forecasting the financial stability of commercial banks/banking sector in the Republic of Moldova

Banks	Years							
	2014	2015	2016	2017	2018	2019	2020	2021
BC „Moldindconbank” S.A.	10,97	9,97	8,92	9,70	10,87	11,34	12,01	12,75
BC „Victoriabank” S.A.	9,15	8,49	8,15	8,73	9,09	9,56	10,19	11,10
BC „Mobiasbancă” S.A.	10,00	11,72	11,92	9,99	10,22	10,79	10,91	10,57
BC „Energbank” S.A.	9,38	10,34	9,28	9,02	9,38	9,87	10,07	10,18
BC „Banca de Economii” S.A.	-1,66							
Banking sector	6,37	10,07	9,18	9,14	9,59	10,77	11,26	11,69

Source: elaborated by the author.

Analyzing the data from table 3, we observe that during the period 2014-2018, BC “Moldindconbank” S.A., BC “Victoriabank” S.A., BC “Mobiasbancă” S.A. and BC „Energbank” S.A. recorded the MESF coefficient values above the limit, which confirms that these financial institutions are financially stable commercial banks.

The financial stability of BC “Victoriabank” S.A. is close to the limit in the period 2016-2017, which shows that during this period the financial institution was exposed to an increased risk. The MESF indicator value of Banca de Economii S.A. is below the limit in 2014, which shows us that the financial institution was in critical conditions in terms of financial stability.

Analysing the evolution of the MFSF indicator, during the forecast period (2019-2021), we can see that all the analysed commercial banks are financially stable (the value of the MFSF indicator exceeds the lower limit of 9.00 of the financial stability).

The highest financial stability is recorded, in the years: 2014 at BC “Moldindconbank” S.A., 2015-2017 at BC “Mobiasbancă” S.A., 2018 at BC “Moldindconbank” S.A., and during the forecast period (years 2019-2021) at BC “Moldindconbank” S.A.

Following the analysis of table 3 it can be noted that the financial stability of the banking sector of the Republic of Moldova has been increasing since 2017, which is achieved by regulating the current and potential risks, implementing macroprudential instruments to prevent the accumulation of systemic risks. This fact shows us the increase of confidence of the population in the national banking sector.

Conclusions

The proposed model allows determining both the current state of commercial banks/banking sector and as well as analyzing the previous data, it is possible to predict the financial stability of commercial banks/banking sector of the Republic of Moldova in the future.

The forecast of the financial stability of the commercial banks/banking sector through the MESF/MFSF model allows the assessment of the financial status and the identification of the optimal ways in the process

of the management decisions. As well, it helps to the identification of risks/problems that are not currently important but may be critical in the future and identification of alternative development pathways in the future; determination of the degree of risk of banking activities and avoiding uncertain losses; elaboration of the optimal financial policy.

The users of the MESF/MFSF model of evaluation and forecasting the financial stability of commercial banks and the banking sector in the Republic of Moldova in the present and future, can be the customers of the financial institutions, the partner banks or the competitors, as well as the management of the banks.

References:

1. AKHTER, S., DALY, K. Indicators of Financial Soundness can they forewarn us of impending crisis? In: *International Review of Business Research Papers*. Vol.5 No.2, March 2009, p.293-316.
2. ALLEN, W., WOOD, G. Defining and achieving financial stability. In: *Journal of Financial Stability*, June 2006. p.152-172.
3. BALTENSPERGER, E. Alternative Approaches to the Theory of the Banking Firm. In: *Journal of Monetary Economics*, January, 1971, p.205-218.
4. Banca Națională a Moldovei. Rapoarte: Informație privind activitatea economico-financiară a băncilor din RM. [online] [Accesat: 10.12.2019]. Disponibil: <http://bnm.md/bdi/pages/reports/drsb/DRSB1.xhtml?id=0&lang=ro>.
5. BASNO, C., DARDAC, N. *Management Bancar*. București: Editura Economică, 2002. 271 p.
6. CAPRARU, B. Sistemele bancare: între trecut și viitor. In: *Revista Oeconomica*. Iași: Universitatea „Alexandru Ioan Cuza”, 2010, nr.4, p.57-69.
7. CISMAȘ, L., DONATH, L. Determinants of Financial Stability. In: *The Romanian Economic Journal*, March 2008. 18 p.
8. DIACONU, R.-I., OANEA D.-C. The Main Determinants of Bank's Stability. Evidence from Romanian Banking Sector, 21st International Economic Conference 2014, IECS 2014, 16-17 May 2014, Sibiu, Romania, p.329-355.
9. KLEIN, M.A. A theory of the Banking Firm. In: *Journal of Money, Credit and Banking*, may, 1971, p.241-253.
10. NICULAE, M. *Stabilitatea financiară a agenților economici în condiții de criză economică: Teză de doctor în economie*. Chișinău, 2016. 181 p.
11. Отчет о финансовой стабильности Казахстана. Специальные исследования в области финансовой стабильности – Мониторинг финансовой устойчивости банковского сектора на базе агрегированного индекса финансовой устойчивости, декабрь 2008 года, с.108-134.
12. SEALY, C.W. and Lindley J.T. Inputs, Outputs and Theory of production and Cost at Depository Financial Institutions. In: *Journal of Finance*, September, 1977, p.289-314.
13. SEALY, C.W., Deposit Rate Setting, Risk Aversion, and the Theory of Depository Financial Intermediates. In: *Journal of Finance*, December 1980, p.345-360.

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