

**PROBLEMS OF STRESS-TESTING APPLICATION FOR ESTIMATION OF INTEREST RISK OF THE BANK****Kushchik A.P.***Zaporizhzhia National University  
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**Key words:**

duration, interest rate policy, interest rate risk, stress testing, GAP-model.

The article deals with the estimation of interest rate risk in commercial banks of Ukraine and the use of such an urgent tool as stress testing in particular. It is defined that the question of interest policy is one of the most important at the present time, because after a certain stabilization of the banking system, commercial banks must widely apply all their skills, knowledge and intuition to develop the most optimal interest rate policy. Interest rate policy (deposit, credit, currency, etc.) is one of the most important components of banking activity. It is stressed that achieved a certain stability of the exchange rate, inflation rate and discount rate of NBU enable managers of banks to use the main approaches during years of working in foreign countries for the formation of interest rate policy which primarily focuses on: the correlation of supply and demand on the market of credit resources; to take into account the risk of changes in interest rates; the correlation of attracting and providing resources according to terms and interest rates. It is noted that for general estimation of volumes and tendencies of interest rate risk during short-term time intervals very important to apply methods of analysis of gaps and durations of a bank. At the same time, it is appropriate to use of the gap management model to study different scenarios for changing interest rates in accordance with static models of the bank's breakdown and the management model of the duration for the discount of the effect of changing the economic value of the bank. For the purpose of more detailed qualitative and quantitative research of interest risk from the long-term perspective, it is pertinent to use the method of stress testing. Thus, banks may seek to get not so much speculative short-term profit, but to form a weighty base (repulsive point) for further activities that will ensure the success and prosperity of the banking institution in the long run. It was proposed the estimation of the level of interest risk, which enables the bank to determine in advance the amount of losses in the case of emergencies, as well as its potential abilities to cover these losses, assess the state of equity and determine the adequacy of their own methods for managing interest rate risk. Different methods of estimating interest rate risk can give different results and the bank management should determine a set of methods, the results of which will be taken into account when making decisions. It was established that the construction of an effective interest rate policy of any bank is impossible without interconnection of the optimization of elements of banking risk management.

**ПРОБЛЕМИ ЗАСТОСУВАННЯ СТРЕС-ТЕСТУВАННЯ  
ДЛЯ ОЦІНЮВАННЯ ПРОЦЕНТНОГО РИЗИКУ БАНКУ****Кущик А. П.***Запорізький національний університет  
Україна, 69600, м. Запоріжжя, вул. Жуковського, 66***Ключові слова:**

дюрація, процентна політика, процентний ризик, стрес-тестування, GAP-модель.

У статті розглянуто оцінювання процентного ризику в комерційних банках України і, зокрема, застосування такого актуального інструменту, як стрес-тестування. Зазначено, що питання процентної політики зараз є одним із найважливіших, оскільки після певної стабілізації банківської системи, комерційні банки повинні широко застосовувати всі свої навички, знання та інтуїцію, щоб розробити найоптимальнішу процентну політику. Наголошено, що досягнута певна стабільність валютного курсу, темпів інфляції та облікової ставки НБУ дає можливість менеджерам банків застосовувати напрацьовані роками в зарубіжних країнах основні підходи до формування процентної політики, що насамперед орієнтується на: співвідношення попиту та пропозиції на ринку кредитних ресурсів; враховує певною мірою ризик зміни процентних ставок; співвідношення залучених та наданих ресурсів за строками та відсотковими ставками. Зазначено, що для загальної оцінки обсягів і тенденцій процентного ризику на короткострокових часових інтервалах доцільно застосовувати методи аналізу гепу та дюрацій банку. При цьому модель управління гепом

доцільно використовувати для дослідження різних сценаріїв змін процентних ставок відносно статичних моделей розриву балансу банку, а модель управління дюрації – для обліку ефекту зміни економічної вартості банку. Із метою детальнішого якісного та кількісного дослідження процентного ризику на довготривалу перспективу доцільно використовувати метод стрес-тестування. Таким чином банки можуть прагнути отримати не стільки спекулятивний короткостроковий прибуток, скільки сформувати вагому базу (точку відштовхування) для подальшої діяльності, що забезпечить успіх та процвітання банківської установи в довгостроковому періоді. Запропоновано оцінку рівня процентного ризику, який дає змогу банку заздалегідь визначити розмір збитків у разі виникнення надзвичайних подій, а також свої потенційні можливості покривати ці збитки, оцінити стан власного капіталу та визначити адекватність власних методик щодо управління процентним ризиком. Різні методи оцінювання процентного ризику можуть давати різні результати, і керівництво банку має визначити комплекс методів, результати яких враховуватимуть при прийнятті рішень. Установлено, що побудова ефективної процентної політики будь-якого банку неможлива без взаємопов'язання оптимізації елементів банківського ризик-менеджменту.

### Statement of the problem

The tense economic situation and increased competition in the banking sector compel commercial banks use all modern methods for quality management and to increase the profitability of their activities. Implementing of effective interest rate policy is an important part of the overall strategy of the lending institution, since interest income is the main source of profit for the bank. Analysing the possibility and expediency of optimizing interest policy, commercial banks of Ukraine pay particular attention to minimizing interest risk by the way of conducting stress testing. Since 2014, the National Bank began tough market clean from doubtful banking institutions. As a result, during four and half years, about 100 financially weak, opaque and schematic banks have been withdrawn from the market. Nowadays about 80 banks operate in our country, and according to the results of quality assessment of assets and stress testing in the basic macroeconomic scenario for 2018, there is a need for capital for another eight banks for the total amount of UAH 6.1 billion [1]. The main problem of ensuring the profitability of the banking system in practice is timely tracking of interest risk factors and this process must be continuous.

### Analysis of recent studies and publications

At present, important attention in commercial banks is given to the theoretical and methodological foundations of the formation of interest policy.

A significant contribution to the study of interest rate policy has been made by many foreign and domestic scientists. Among the authors there are the works of such economists as J. Sinkey, P. Rose, A. Martens, O. Lavrushin, R. Hubbard [2] and some others. Some aspects of the problem of analysis and assessment of interest rate risk in commercial banks were studied by domestic and foreign scholars such as I.T. Balabanov, O.P. Zarutskaya, V. Usosky [3].

Economic literature presents different points of view regarding the concept of interest rate risk. Some authors treat it as a risk of loss due to changes in interest rates (A. Moroz, A. Galchinsky, O. Komar) [4]. Other authors consider it as a probability of occurrence of losses in the case of changing interest rates on financial resources

(L. Pristostka, V. Sevruk). Also, some authors believe that interest risk is a risk of losses due to the adverse changes in interest rates on the monetary market, which finds its external expression in the fall of the interest margin, its reduction to zero or a negative value, indicating simultaneously the possible negative impact on the market value of capital (T. Savchenko, F. Myshkin, L. Sloboda) [5]. However, despite the importance of existing scientific developments, it should be noted that a significant number of problems in the study of this topic remains unresolved, in particular, it is necessary to generalize theoretical approaches and practical experience in the formation and implementation of bank lending policies, including the assessment of interest rates in the conditions of economic instability.

### Objectives of the article

The purpose of the article is to study the problems of interest-rate policy of commercial banks and to substantiate the feasibility of introducing stress testing for the estimation of interest rate risk. According to this goal, a set of main tasks are defined its achievements: to reveal the essence of interest policy and its importance in banking management; consider interest policy as a means of managing the profitability of a commercial bank; consider ways to improve interest rate policy in the context of the impact of assets and liabilities management on the profitability and financial stability of the bank; to formulate and substantiate recommendations for improving the formation of interest policy.

### The main material of the research

The use of stress testing techniques is an obligatory element in risk management systems of leading foreign financial and credit organizations and primarily banks. Unfortunately, in the Ukrainian banking practice, this methodology has not become desirable, and therefore its implementation in banking institutions becomes particularly relevant, considering that the Ukrainian economy is a developing market, in which extreme situations are perceived as a norm. Stress testing of interest rate risk enables the bank to determine in advance the amount of losses in the event of an emergency, as well as its potential ability to cover these losses, assess the state of equity and determine the

adequacy of its own techniques for managing interest rate risk.

Stress testing by the NBU experts is a method of quantification of risk, which is determined by the size of uncoordinated position that carries the bank to risk, and in determining the shock value of changes in external factors-factors that is the exchange rate, interest rate, etc. A combination of these quantities gives an idea of the amount of losses or revenues which a bank can receive if the events will be developed according to scenario assumptions [6].

In banking practice, different methods of stress testing are used. Currently, the most common method is scenario analysis. It allows to assess the potential effects of simultaneous exposure to a number of risk factors on the activities of a credit institution. Using this approach, the scenarios of possible simultaneous changes in risk factors are formed either on the basis of past events or on the basis of hypothetical events that are likely to occur in the future. Scenario analysis allows to evaluate not only possible losses, but also to conduct a study of the sensitivity of the financial results of the banking portfolio to the fluctuations of the values of the factors of interest risk. The sensitivity analysis demonstrates the consequences of influencing the financial institution's portfolio of events associated with changes in the values or variability of one of the specified risk factors (for example, in our case, growth / decrease in interest rates; however, for other types of risk, options such as growth / reduction of exchange rate, growth / decrease of volatility of market indices, etc.).

Unlike the VaR methodology, stress testing procedures prescribe the necessary changes in risk factors that may not fit into current market trends and market conditions. Thus, stress testing allows "to lose" the consequences of hypothetical events, the probability of occurrence of which is small, but at the same time, the consequences of which can be catastrophic to the bank. Joint changes of the specified risk factors that may occur as a result of such events are merged into different scenarios for further testing of the bank portfolio. Scripts may be based on:

on the characteristic events of the past, accompanied by significant changes in the factors of risk and their volatility, for example: market crises or other extreme events;

on potential changes in risk factors and their variability, as a result of market crises, which, although not in the past, but which are quite probable in the future, due to the sharp and unpredictable change in market conditions;

on probable changes in risk factors and their variability, as a result of the occurrence of hypothetical events of a local nature, reflecting the peculiarities of bank operations.

From the list above, it can be concluded that banks can use historical or hypothetical scenarios to revise the underlying interest rate, parallel or non-parallel to the shift in interest rate curves, to assess the impact of interest rate risk. The historical scenario method is used

to determine scenarios for observing significant market fluctuations and to assess the impact of these historical market shocks on profit. The advantage of this type of stress test is the more adapted formulation of possible events. Such scenarios can be used to identify probable events, in relation to which the bank is most vulnerable. Hypothetical scenarios can be of different types. For example, many financial institutions use so-called pessimistic scenarios. The essence of such stress testing is that all considered risk factors take their worst values (for a certain historical period). Further, on the basis of these values, there is a revaluation of the interest position.

The main result of stress testing of interest rate risk is the ability to provide management with such information on the basis of which it is possible to prepare biased strategic and tactical actions that will reduce the impact of interest rate risk on the bank's activities. The order of stress testing is as follows. Firstly, sources of interest rate risk appear for the bank. In our case, such sources are the daily volatility of the average market value of deposit account and credit resources, which directly affect bank interest rates.

In order to achieve the maximum effectiveness of stress testing results, it is advisable to make calculations in several alternative scenarios for the development of the situation. In conducting stress tests using both hypothetical and historical scenarios, it is substantial to use different degrees of influence of risk factors: moderate, medium, significant. According to these recommendations on the second stage scenarios are being developed for the stress test, there are three of them. Due to the optimistic scenario, the volatility of interest rates is minimal, which stabilizes the level of the interest rate and is the most acceptable for the bank; therefore, the value for further calculations under this scenario will be minimal by changing the average market value of deposit and credit resources for the investigated time horizon. The basic scenario is the most likely development of events for the bank, so data as for changing rates according to this scenario should be calculated according to the VaR analysis methodology. The pessimistic scenario characterizes extreme changes in rates, in which the bank is exposed to the highest interest rate risk. Data on the volatility of rates in this scenario are the largest one recorded for the analysed period of change in the value of attracting deposits or credit resources.

According to world practice, such stress testing should be conducted quarterly, but its frequency is usually regulated not only by establishing time intervals, but also if necessary [7].

Examples of such cases may be a fairly rapid increase in the volume of interest-rate assets and liabilities of the bank over a short period; or destabilization of the economic situation in the country as a whole, or in a specific region where the bank has a significant part of interest-rate assets and liabilities; serious shifts on the currency markets of those currencies in which the bank has interest-rate assets and liabilities.

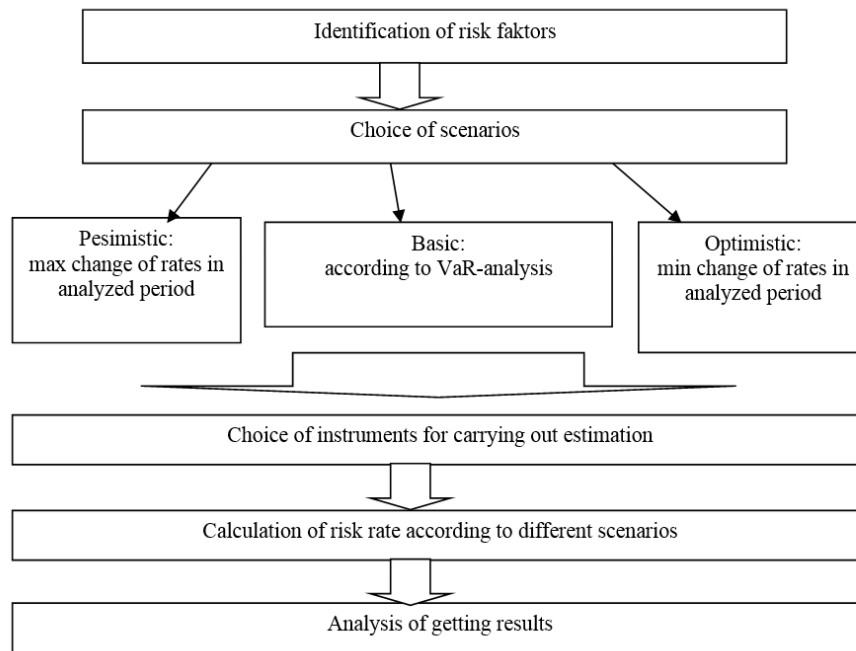


Fig. 1. Stress testing algorithm

The choice of a model and the parameters of stress scenarios requires assumptions from the side of the risk manager, so their reliability can be put into doubt due to false judgment. So, regardless of which model the bank uses in its stress tests, periodic back testing or other procedures should be carried out in order to confirm the results of the calculations and the adequacy of the chosen model. Back testing is a process to confirm the accuracy of the model in comparison with the actual results. This analysis should demonstrate that the actual results over a sufficient period of time are within the expected range defined by the model [8]. In accordance with the organization of an interest rate risk management system in

large commercial banks using VaR analysis and stress testing should be given to Risk Management and should be supervised and carried out by direct involvement of the Bank's management, which will more accurately identify scenarios that require stress-testing. The results of the calculation are brought to the Risk Management and AMC Committee for the adoption of appropriate management decisions (Figure 2). The role of top management is to develop and apply in practice policies, procedures and practices for managing interest rate risks that would provide adequate operating standards based on purpose, objectives and limits.

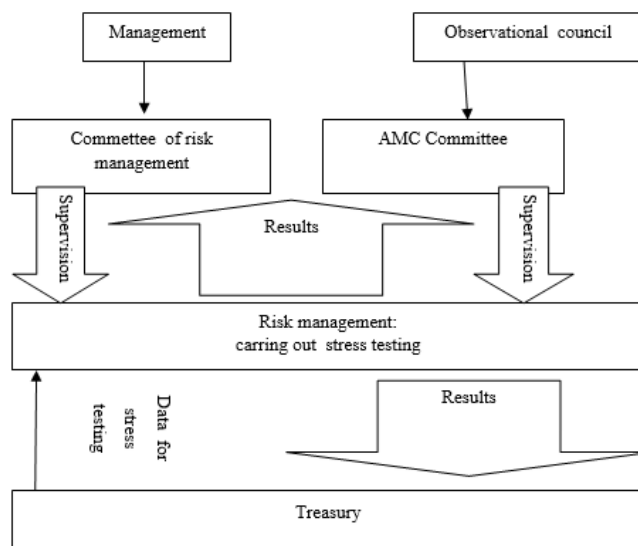


Fig. 2. Organizational support for stress testing

Also, the introduction of stress testing puts new requirements for banking activity namely:  
 – availability of sufficient human resources with the appropriate qualifications at the level necessary for

operation of internal bank programs of stress-testing of interest rate risk and interpretation of their results;  
 – resources for regular and comprehensive evaluation of programs used for stress-testing of interest rate risk;

– development of an effective system of reacting in case of shortage in the system of stress testing itself or in the correctness of the applied management decisions;  
 – the possibility of taking into account the results of stress-testing of interest rate risk in assessing capital adequacy and bank liquidity [7].

It is important to remember that the complexity of stress tests should correspond to the circumstances of a particular bank. Simple tests which use simple assumptions that cover the main risks may be more useful than complex simulations that are difficult to understand and validate. However, it is expected that a prudent risk-manager who performs proper management will regularly check the quality and content of these tests and will eventually try to improve the methodology.

As version, further development of methods in a bank may conclude the improving of stress testing from the following positions:

working out in detail calculation of scenarios at each of the intervals of repayment of interest-rate assets and liabilities: that is, for the term of “1-7days,” “8-30 days,” “31-90 days,” “91-180 days,” “181-365 days,” “1-2 years” and “2-5 years”;

use of the combined scenario for stress testing of interest rate risk of the bank. If, according to the proposed methodology, a separate scenario is prepared for the interest rate changes on loans and deposits, then the combined scenario can identify three scenarios (moderate or optimal, average or basic and significant or pessimistic) changes in the base interest rate for a given number of percentages are the parallel for assets and liabilities which are sensitive to interest rate changes.

### Conclusions

Thus, in the current market conditions, the formation of an effective interest rate policy is an important financial

problem. The interest rate is one of the tools that from all sides; it covers the practical side of realizing the interests of the bank as a lender on the one hand and as a borrower on the other. This stipulates the necessity of the formation of an interest rate policy of banks taking into account its constituent elements, pricing methods as for active and passive operations, interest rate risk management.

According to world practice, stress testing should be conducted quarterly, and its frequency is usually regulated not only by fixed time intervals but also by the particular case of necessity.

In accordance with the organization of an interest rate risk management system in large commercial banks, VaR-analysis and stress testing is assigned for Risk Management and is conducted under the supervision and with the direct participation of the Bank's management which allows more accurate identification of the scenarios that require stress testing. The results of the calculation are brought to the Risk Management and AMC Committee for the adoption of appropriate management decisions.

The effective interest rate policy of the bank in the first place is to develop a strategy for minimizing interest rate risk and gaining profit rather than maximizing returns from financial transactions at a predetermined level of risk. Nowadays this approach is innovative, but at present, in a deep financial recession, it is supported by domestic bankers who argue the importance of forming all elements of interest policy, which is an integral and important component of the pricing strategy in order to combine effectively a bank with borrowers and owners of free financial resources.

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