MUHANDISLIK & IQTISODIYOT

№11

ijtimoiy-iqtisodiy, innovatsion texnik, fan va ta'limga oid ilmiy-amaliy jurnal

2025
noyabr

Milliy nashrlar

OAK: https://oak.uz/pages/4802

05.00.00 - Texnika fanlari
08.00.00 - Iqtisodiyot fanlar

Elektron nashr, 176 sahifa.
2025-yil, noyabr

muhandislik & iqtisodiyot

ijtimoiy-iqtisodiy, innovatsion texnik,
fan va ta'limga oid ilmiy-amaliy jurnal

muhandislik & iqtisodiyot

ijtimoiy-iqtisodiy, innovatsion texnik, fan va ta'limga oid ilmiy-amaliy jurnal

05.01.00 – Axborot texnologiyalari, boshqaruv va kompyuter grafikasi
05.01.01 – Muhandislik geometriyasi va kompyuter grafikasi. Audio va video texnologiyalari
05.01.02 – Tizimli tahlil, boshqaruv va axborotni qayta ishlash
05.01.03 – Informatikaning nazariy asoslari
05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta'minoti
05.01.05 – Axborotlarni himoyalash usullari va tizimlari. Axborot xavfsizligi
05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
05.01.07 – Matematik modellashtirish
05.01.11 – Raqamli texnologiyalar va sun'iy intellekt
05.02.00 – Mashinasozlik va mashinashunoslik
05.02.08 – Yer usti majmualari va uchish apparatlari
05.03.02 – Metrologiya va metrologiya ta'minoti
05.04.01 – Telekommunikasiya va kompyuter tizimlari, telekommunikasiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
05.05.03 – Yorug'lik texnikasi. Maxsus yoritish texnologiyasi
05.05.05 – Issiqlik texnikasining nazariy asoslari
05.05.06 – Qayta tiklanadigan energiya turlari asosidagi energiya qurilmalari
05.06.01 – To'qimachilik va yengil sanoat ishlab chiqarishlari materialshunosligi
05.08.03 – Temir yo'l transportini ishlatish
05.09.01 – Qurilish konstruksiyalari, bino va inshootlar
05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
10.00.06 – Qiyosiy adabiyotshunoslik, chog'ishtirma tilshunoslik va tarjimashunoslik
10.00.04 – Yevropa, Amerika va Avstraliya xalqlari tili va adabiyoti
08.00.01 – Iqtisodiyot nazariyasi
08.00.02 – Makroiqtisodiyot
08.00.03 – Sanoat iqtisodiyoti
08.00.04 – Qishloq xo'jaligi iqtisodiyoti
08.00.05 – Xizmat ko'rsatish tarmoqlari iqtisodiyoti
08.00.06 – Ekonometrika va statistika
08.00.07 – Moliya, pul muomalasi va kredit
08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
08.00.09 – Jahon iqtisodiyoti
08.00.10 – Demografiya. Mehnat iqtisodiyoti
08.00.11 – Marketing
08.00.12 – Mintaqaviy iqtisodiyot
08.00.13 – Menejment
08.00.14 – Iqtisodiyotda axborot tizimlari va texnologiyalari
08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
08.00.17 – Turizm va mehmonxona faoliyati

Ma'lumot uchun, OAK Rayosatining 2024-yil 28-avgustdagi 360/5-son qarori bilan "Dissertatsiyalar asosiy ilmiy natijalarini chop etishga tavsiya etilgan milliy ilmiy nashrlar ro'yxati"ga texnika va iqtisodiyot fanlari bo'yicha "Muhandislik va iqtisodiyot" jurnali ro'yxatga kiritilgan.

Muassis: "Tadbirkor va ishbilarmon" MChJ

Hamkorlarimiz:
1. Toshkent shahridagi G.V.Plexanov nomidagi Rossiya iqtisodiyot universiteti
2. Toshkent davlat iqtisodiyot universiteti
3. Toshkent irrigatsiya va qishloq xo'jaligini mexanizatsiyalash muhandislari instituti" milliy tadqiqot universiteti
4. Islom Karimov nomidagi Toshkent davlat texnika universiteti
5. Muhammad al-Xorazmiy nomidagi Toshkent axborot texnologiyalari universiteti
6. Toshkent davlat transport universiteti
7. Toshkent arxitektura-qurilish universiteti
8. Toshkent kimyo-texnologiya universiteti
9. Jizzax politexnika instituti

MUNDARIJA • СОДЕРЖАНИЕ • CONTENTS

MUNDARIJA

THE IMPORTANCE OF STRESS TESTING AND ITS IMPLEMENTATION IN COMMERCIAL BANKS OF THE REPUBLIC OF UZBEKISTAN

Mamatova Sevara
Independent researcher

Abstract. Management and minimization of risks in the activity of banks is one of the urgent issues that must be resolved. Stress testing allows analysis of risks arising in the activity of commercial banks, assessment of their changes and development of forecast indicators for any possible future situations, as well as making necessary decisions. This article covers stress testing in the banking system and its importance. Issues of credit risk management and minimization of stress test in bank's activities are analyzed on the basis of practical data and scenarios.

Keywords: stress test, macroeconomics, inflation, problem credit, Central Bank, macroprudential policy.

Annotatsiya. Banklar faoliyatida risklarni boshqarish va minimallashtirish masalasi hal etilishi lozim boʻlgan dolzarb yoʻnalishlardan biridir. Stress-testlash tijorat banklari faoliyatida yuzaga keladigan risklarni tahlil qilish, ularning oʻzgarishlarini baholash, kelajakdagi ehtimoliy holatlar uchun prognoz koʻrsatkichlarini ishlab chiqish hamda zarur qarorlar qabul qilish imkonini beradi. Ushbu maqolada bank tizimida stress-testlash jarayoni va uning ahamiyati yoritilgan. Tijorat banklarining faoliyatida kredit risklarini boshqarish va stress-testlash orqali ularni kamaytirish masalalari amaliy ma’lumotlar va ssenariylar asosida tahlil qilingan.

Kalit soʻzlar: stress-test, makroiqtisodiyot, inflyatsiya, muammoli kredit, Markaziy bank, makroprudensial siyosat.

Аннотация. Управление и минимизация рисков в деятельности банков является одной из актуальных задач, требующих решения. Стресс-тестирование позволяет анализировать риски, возникающие в деятельности коммерческих банков, оценивать их изменения, разрабатывать прогнозные показатели для возможных будущих ситуаций и принимать необходимые решения. В статье рассматриваются вопросы стресс-тестирования в банковской системе и его значение. Анализируются вопросы управления кредитными рисками и их минимизации посредством стресс-тестов на основе практических данных и сценариев. Управление и минимизация рисков в деятельности банков является одной из актуальных задач, требующих решения. Стресс-тестирование позволяет анализировать риски, возникающие в деятельности коммерческих банков, оценивать их изменения, разрабатывать прогнозные показатели для возможных будущих ситуаций и принимать необходимые решения. В статье рассматриваются вопросы стресс-тестирования в банковской системе и его значение. Анализируются вопросы управления кредитными рисками и их минимизации посредством стресс-тестов на основе практических данных и сценариев.

Ключевые слова: стресс-тест, макроэкономика, инфляция, проблемный кредит, Центральный банк, макропруденциальная политика.

INTRODUCTION

The globalization of the world economy and the emerging financial and economic crises are forcing countries to take appropriate measures to ensure the stability of the banking and financial system. Because these effects, as a result of their widespread spread in the banking system and financial system, which are the lifeblood of the economy, have a negative impact on other entities at the macro level, and ultimately on the country’s economy.

In most countries of the world, macro stress testing practices have become widely used as a method of ensuring the stability of the banking system and assessing the risks existing in the financial system. Macroprudential stress testing practices are carried out by the Central Bank, as the body supervising the country’s banking system.

The macroprudential policy of the Central Bank is a set of warning measures aimed at minimizing systemic risks in the financial sector or its individual sectors, and is a warning sign in the activities of banks.

Also, stress testing practices can be carried out by each financial institution at the micro level. Independent stress testing by commercial banks is used to assess their vulnerability to potential risks and develop measures to prevent them.

The above justifies the urgency of developing methods for stress testing risks in the banking system and their application in analyzing the stability of commercial banks.

REVIEW OF LITERATURE ON THE SUBJECT

According to the definition of the Bank for International Settlements, a stress test is a method for assessing the vulnerability of a portfolio of instruments, financial institutions, or the financial system as a whole to extraordinary but possible losses.

The concept of a stress test is to assess the degree of risk under conditions of an adverse (stressful) event. At the same time, a stress test does not answer the question: «What is the probability of an adverse (stressful) event», it answers the question: «What will happen if it happens?». Following the objectives of a stress test, losses arising from the implementation of adverse scenarios are compared with the existing «safety margin» of the system.[9]

Regular stress testing is an important part of banks' internal risk management and is also carried out by Central Banks through the regulation of capital adequacy in accordance with the Basel II approach. [2]

According to S. Moiseev, from the point of view of ensuring confidence in the results of stress tests of financial intermediaries, the transparency of the methodology and the independence of the risk assessment institution from the assessed participants play an important role. In addition, stress testing is necessary in a rapidly changing macroeconomic situation and should ensure a prompt assessment of potential financial risks. Unfortunately, the stress tests currently conducted by commercial banks do not meet these requirements. In addition, the regulator does not fully disclose the methodology and results of stress tests, and they are published with a significant delay. [10]

In addition, examples have been given in world practice that raise doubts about the regulators' lack of interest in receiving the relevant test results. Therefore, it is urgent to develop methods for conducting remote stress tests.

Espinoza, Prasad (2010) [2], Nkusu (2011) [6] use empirical measures of credit risk as part of a bank balance sheet-based credit risk model. The most common measure of credit quality is the ratio of non-performing loans (NPLs) to the loan portfolio of a bank in stress testing.

Hoggarth et al. (2005) [4] and Pesola (2005) [7] use the ratio of loan write-offs to loan portfolio from bank balance sheets to stress test the resilience of banks to losses.

Quagliariello (2007) [8] and Głogowski (2008) [3] use the ratio of loan loss provisions to impairment provisions. Due to the lack of a clear criterion and data on bank loan write-offs, they estimate the variable ratio of loan loss provisions based on cross-country panel data analysis.

According to Klein (2013) [5], the impact of inflation on credit quality is not known in advance. On the one hand, accelerating inflation reduces the real value of debt, thereby making it easier to service it. On the other hand, in conditions of high inflation and fixed wages, real incomes of borrowers may decrease. In addition, in countries with a large share of variable-rate loans, an increase in inflation may lead to an increase in debt servicing costs and, accordingly, an increase in the default rate. In such conditions, the Central Bank may increase the managed interest rate in order to combat inflation.

RESEARCH METHODOLOGY

The research methodology is based on the collection of statistical and financial data from the Central Bank of the Republic of Uzbekistan and selected commercial banks. The analysis employs comparative, correlation, and scenario-based methods to assess the impact of macroeconomic shocks on banking stability. Stress testing models are used to evaluate risk resilience and forecast capital adequacy under adverse conditions.

ANALYSIS AND RESULTS

Stress testing is an assessment of the potential impact on the financial condition of banks, taking into account changes in risk factors based on possible contingencies.

According to the rules of the International Monetary Fund, stress testing is a method of assessing the sensitivity of a bank's portfolio (assets and financial instruments) to changes in macroeconomic indicators or to possible adverse events.

The mechanism of influence between the financial and macroeconomic sectors is manifested in:

1. The ability of business entities and households to repay loans decreases and their probability of default increases.

2. By increasing the costs of credit operations of commercial banks, the amount of profit that can be obtained will decrease.

3. As a result of the decrease in the market value of financial assets and exchange rates, the bank's capital will decrease and the capital adequacy indicators will not be fulfilled (Figure 1).

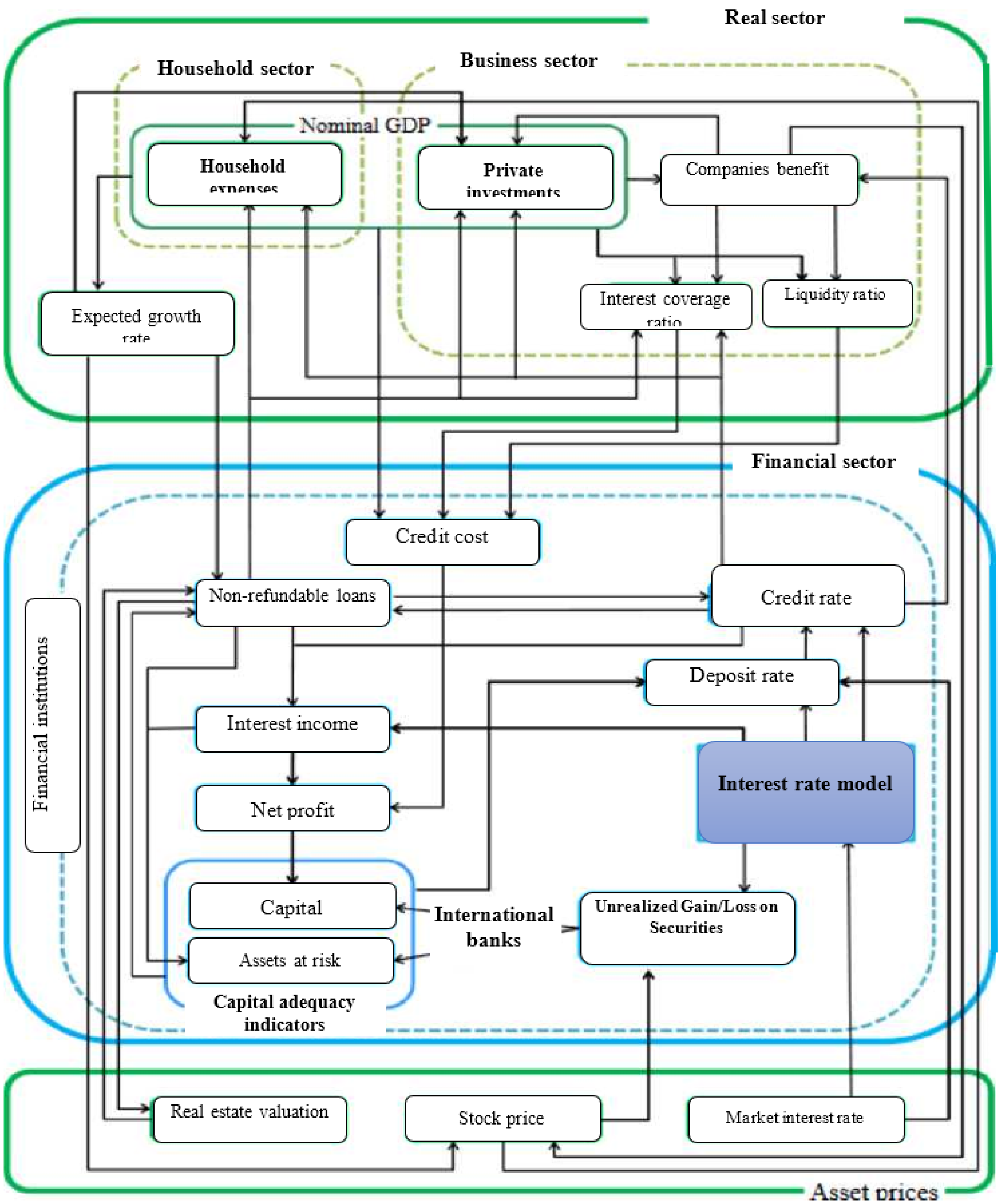

Figure 1. Structure of the macroeconomic model of the economy

In many studies, the main indicator of macroeconomic conditions is the growth rate of real

GDP. Growth in production leads to an increase in the income of economic entities and improves the quality of debt servicing. This reduces the credit risks of banks. The same logic applies to the unemployment rate. This is because this indicator reflects the income of households (directly) and firms (indirectly, through layoffs, if companies resort to reducing staff, they are forced to do so under the pressure of falling income). The inclusion of macroeconomic factors such as GDP dynamics and the unemployment rate is intended to take into account the impact of the business cycle phase on the state of banks' loan portfolios.

Stress testing includes components of quantitative and qualitative analysis. Qualitative analysis is mainly aimed at identifying possible changes in key macroeconomic indicators and assessing their impact on various components of bank assets.

Qualitative analysis focuses on two main tasks of stress testing:

1. Assessing the ability of a commercial bank's capital to absorb possible large losses;
2. Determining a set of measures to be taken to reduce bank risks and preserve capital.

At the initial stage of conducting a stress test, the authenticity of the information is checked. The criteria for consistency (continuous sequence of data) and comparability (changes in the method of calculating indicators) of bank reports must be met.

For stress testing, it is necessary to create the necessary database, analyze loan and trade portfolios in detail, and identify the risks that a commercial bank can most affect.

In the future, the analysis of the dynamics of the dominance of risk factors will be carried out by determining the change in their values over a certain period of time. In this case, the calculation can be made by calculating the difference between the maximum and minimum values of the factor over a certain period of time and the difference between the values at the beginning and end of this period. In the future, depending on the purposes of the analysis, the average or maximum value of the change in the risk factor will be used in the calculations.

The simplest solution is to select the maximum values of all risk factors for a certain retrospective period (2, 3, 5 years) over a specific time period and apply them to the current values of the risk factors. If the number of risk factors affecting the credit institution is very large, it is necessary to focus only on the main ones, assuming that the remaining unchanged or changing secondary factors will not cause significant damage to the credit institution.

At the same time, it is not always rational to study individual risk factors, therefore it is necessary to compare the time period during which different values of risk factor values are observed simultaneously with their average values.

As part of the stress test, credit ratings of the debtor issued by external organizations can also be used.

In the future, based on the rating system, it is possible to model a «transition matrix» that reflects the migration of credit claims of one category to other classes (indicating the probability of these events) or the share of credit claims that can change their class under stress conditions. Based on the calculations, the potential losses of the bank are estimated. In case of identification of serious potential threats to the bank, the bank's management will have to make appropriate management decisions (Table 1).

Table 1. Methods of stress testing in commercial banks

<table>
<tr><th rowspan="3">Object of analysis</th><th colspan="9">Financial market position</th></tr>
<tr><th colspan="4">Financial market in normal condition</th><th></th><th colspan="4">Financial market in crisis</th></tr>
<tr><th colspan="9">Stress testing</th></tr>
<tr><td rowspan="3">Impact on banking activity</td><td colspan="5">Analysis of sensitivity of banks to various risks</td><td colspan="4">Historical types Hypotheses</td></tr>
<tr><td rowspan="2">Operational risk</td><td rowspan="2">Liquidity risk</td><td rowspan="2">Credit risk</td><td rowspan="2">Market risk</td><td rowspan="2">Reputational risk</td><td rowspan="2">Тарихий типлар</td><td colspan="3">Hypotheses</td></tr>
<tr><td>C1</td><td>C2</td><td>C3</td></tr>
</table>

Various stress testing methods are used in international banking practice. The most common method today is scenario analysis (based on historical or hypothetical events).

Scenario analysis is mainly aimed at assessing the strategic prospects of the bank. This allows you to simultaneously assess the impact of a number of risk factors on the bank's activities in conditions of high risk, but at the same time, when a possible event occurs.

Unlike scenario analysis, the results of sensitivity analysis are mainly short-term. Impact analysis directly affects the risk factor in the asset portfolio of a credit institution (for example, an increase / decrease in the national currency exchange rate, an increase / decrease in interest rates).

When calculating maximum losses, a combination of risk factors is determined, the negative dynamics of which can cause maximum losses for the credit institution.

Commercial banks carry out stress testing in accordance with certain methods. The stress test can be conducted based on various hypothetical analytical scenarios of the types of risks that may affect the bank's activities. The loan portfolio of Bank A was studied through a stress test as of January 1, 2023, according to the reporting forms submitted to the Central Bank of the Republic of Uzbekistan.

The stress test was conducted based on 2 scenarios, according to which the following were observed in the scenarios of an increase in the weight of loans with a risk level of 100% and above (microloans and overdraft loans allocated to the population and loans allocated to legal entities and individuals for the purchase of passenger cars) in the bank's loan portfolio

Scenario 1. When the balance of loans with a risk level of 100% and above in the bank's loan portfolio increases by 5% (optimal level), the following situations may be observed (Table 2):

Table 2. Impact of a 5% Increase in Credit Risk on Capital Adequacy Indicators

Indicators	Fact	Scenario -1 (5%↑)	Impact
Balance of loans with a risk level of 100% and above, (billion soums)	9 977,6	10476,5	498,9
Risk level of loans with a risk level of 100% and above (billion soums)	10 971,2	11519,8	548,6
Total amount of assets at risk (billion soums)	16 461,6	17 010,1	548,6
Capital adequacy indicator (%)	14,27	13,81	– 0,46

It can be seen that a 5% increase in the balance of high-risk loans allocated by the bank will increase the amount of risk-weighted assets by 548.6 billion soums and reduce the bank's capital adequacy ratio by 0.46 percent, resulting in 13.81 percent. At the same time, along with an increase in the amount of risky assets of the bank, which is 100%, changes may also be observed in the part of problem assets. As a result, the bank's capital may fall below the minimum requirements for adequacy. Therefore, it is necessary to constantly monitor risky assets in commercial banks.

Scenario 2. In the event of an increase in the balance of risky loans in the bank's loan portfolio by 10% (critical level) by the level of risk exposure of 100% and above, the following situations may be observed (Table 3):

Table 3. Impact of a 10% Increase in Credit Risk on Capital Adequacy Indicators

Indicators	Fact	Scenario -1 (10%↑)	Impact
Balance of loans with a risk level of 100% and above, (billion soums)	9 977,6	10975,4	997,8
Risk level of loans with a risk level of 100% and above (billion soums)	10 971,2	12068,3	1 097,1
Total amount of assets at risk (billion soums)	16 461,6	17 558,7	1 097,1
Capital adequacy indicator (%)	14,27	13,38	– 0,89

Due to a 10% increase in the balance of high-risk loans allocated by the bank, the amount of assets at risk will increase by 1,097.1 billion soums, and it can be seen that the bank's capital adequacy ratio will decrease by 0.89% to 13.38%.

An increase in the volume of high-risk lending operations in the bank may have a negative impact on the fulfillment of economic norms in the future.

It is recommended to temporarily limit high-risk lending practices of bank «A» and increase the volume of low-risk stable income-producing asset practices.

1. Temporarily reduce the bank's high-risk lending practices and expand investment in low-risk highly liquid state securities;

2. To increase the volume of short-term interbank lending operations in order to ensure the balance between bank liquidity and profitability;

3. Regularly diversifying the loan portfolio by sectors, supplies and terms;

4. Classification of loans within the bank's loan portfolio in the established order and formation of appropriate reserves for them;

CONCLUSIONS AND SUGGESTIONS

In conclusion, stress testing in commercial banks can accurately assess potential risks in banking activities, attract additional risk management tools, and develop measures to prevent possible negative situations.

The introduction of stress testing in the banking and financial system, its widespread use today, allows for effective management and minimization of risks in the system.

Stress testing practices are characterized by quantitative and qualitative indicators, the main features of which are as follows:

- in quantitative analysis, changes in various stress factors of the bank are quantitatively assessed due to changes in macroeconomic indicators.

- in qualitative analysis, it is possible to model and predict certain changes based on various scenarios and assess the likelihood of their occurrence.

Multi-factor stress testing can be used to determine and evaluate long-term strategic plans. It allows assessing the impact on banking activities in crisis conditions. Such a stress test is technically complex, and in cases where the wrong approach or insufficient data are used, positive decisions may not be made based on the results of the analysis.

List of used literature:

1. Basel Committee on Banking Supervision (2009). Principles for sound stress testing practices and supervision.
2. Espinoza R., Prasad A. (2010) Nonperforming loans in the GCC banking system and their macroeconomic effects. IMF Working Paper 10/224.
3. Głogowski A. (2008) Macroeconomic determinants of Polish banks' loan losses – results of a panel data study. National Bank of Poland working paper No. 53. November 2008.
4. Hoggarth G., Sorensen S., Zicchino L. (2005) Stress tests of UK banks using a VAR approach. Bank of England. Working Paper No. 282
5. Klein N. (2013). Non-performing loans in CESEE: determinants and impact on macroeconomic performance. WP/13/72
6. Nkusu M. (2011). Nonperforming loans and macrofinancial vulnerabilities in advanced economies. IMF Working Paper /11/161.
7. Pesola J. (2007). Financial fragility, macroeconomic shocks and banks loan losses evidence from Europe. Bank of Finland Research Discussion Papers 15 / 2007.
8. Quagriariello M. (2009). Stress-testing the banking system: methodologies and applications. Cambridge University Press.
9. Sorge M. (2004). Stress-testing Financial Systems: An Overview of Current Methodologies. BIS Working Papers No 165.
10. Моисеев С. (2010). Тайны стресс-тестов // Банковское дело, №6

muhandislik & iqtisodiyot

ijtimoiy-iqtisodiy, innovatsion texnik, fan va ta'limga oid ilmiy-amaliy jurnal

Ingliz tili muharriri: Feruz Hakimov

Musahhih: Zokir Alibekov

Sahifalovchi va dizayner: Iskandar Islomov

2025. № 11

"Muhandislik va iqtisodiyot" jurnali 26.06.2023-yildan O'zbekiston Respublikasi Prezidenti Adminstratsiyasi huzuridagi Axborot va ommaviy kommunikatsiyalar agentligi tomonidan №S–5669245 reyestr raqami tartibi bo'yicha ro'yxatdan o'tkazilgan.
Litsenziya raqami: №095310.

Manzilimiz: Toshkent shahri Yunusobod tumani 15-mavze 19-uy