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COMPARISON WORLDWIDE AND UKRAINIAN PRACTICE OF BANK STRESS TESTING

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Abstract. Early stress tests, used primarily as risk management tools, date back as far as the 1990s. Programs conducted by the IMF, Bank of England, Dodd-Frank Act, Bank of Japan, Swiss Financial Market Supervisory Authority and the World Bank promoted the used of stress tests. The basic idea the introduction of stress testing was to ensure that banks have sufficient capital to cover their risks, and to ensure that banks and banking systems are more resilient to economic and financial shocks. This paper provides an overview of the recent implementation of stress testing by regulatory agencies in the United States, the United Kingdom, Japan, Switzerland and the European Union. This article also gives an overview of the stress testing methodology developed by the National Bank of Ukraine and in accordance with Basel III recommendations. The **aim** of research is comparative evaluation of key aspects of system-wide stress tests in different finance systems: Euro area, United Kingdom, Switzerland, Japan, the United States and Ukraine, identifying identification of similarities and differences and prospects for the development in our country. To substantiate the theoretical positions and reasoning of the conclusions general scientific **methods** are used, including system, abstract-logical approach, as well as methods of formalization, analysis and synthesis of information, comparative analysis. During the study, a comparative analysis of the stress-testing methodology in six countries was conducted. The **scientific importance** of the work lies in the fact that on the basis of the conducted research it is possible to improve stress-testing of Ukrainian banking system based on best practices from developed countries. The **value** of the research is that it is increasingly necessary to used best practices of stress tests as a powerful tool in risk management, in micro prudential and macroprudential policies. Results of researches can to used not only in development methodology of stress-testing, but also in case-study of banking.

Key words: financial stability, Basel III, core capital, regulatory capital

JEL Classification: E37, E44, G10, G21, G28

INTRODUCTION

The Basel Committee on Banking Supervision (BCBS) requires banks to conduct their own stress tests as an important risk management tool, earning bank management to adverse unexpected outcomes related to various risks and estimating capital that may be needed to weather a storm (BIS

Working Paper, 2009). Additionally, in Worldwide practice, stress tests came to be recognized as a powerful tool not only in risk management, but also in micro prudential and macroprudential policies. Despite the existence of studies of stress testing programs in various countries, few studies have been conducted on their comparative evaluation. This paper is one of the few studies.

LITERATURE REVIEW

The issues of assessing the financial stability of a banking system are studied by a sufficient number of foreign and domestic scholars. In particular, foreign experts as Frame, Scott, Kristopher Gerardi, and Paul Willen (2015), Hirtle, Beverly, Anna Kovner, James Vickery, and Meru Bhanot (2016) effectively described research of the top-down methodologies, which actually applied to stress testing. The research on the bottom-up methods is limited but the models used at regulatory agencies still use “extreme yet plausible” exogenous macroeconomic scenarios to obtain stress-driven results using the loan-level data.

The policy of the stress-testing in the US, the UK, and the EU area wide describes in researches Wall, Larry (2014), Goldstein, Morris (2017), Kapinos, Pavel, Oscar Mitnik, and Christopher Martin (2018).

Domestic researchers in the sphere of risk management and in particular in the field of stress testing are represented by such scientists as I. M. Posokhov, O.O. Khodyreva (2018), Ramskyi A., Loiko V., Sobolieva-Tereshchenko O., Loiko D., Zharnikova V. (2017), Krykliy O., Luchko I., (2018). However, the fact that the use of stress testing is not wide-spread, makes it possible to judge about certain problems of the adaptation of the proposed methods to the current realities of the banking sector of the Ukrainian economy.

The purpose of the article is the study of special features and approaches to conducting stress testing of the banks in Ukraine, in the comparison with Worldwide practice.

PAPER OBJECTIVE

The stress tests as a powerful tool in risk management, in micro prudential and macroprudential policies is important direction of the world economy financial stability. The purpose of the article is identifying of similarities and differences of system-wide stress tests in finance systems Euro area (EU), United Kingdom (GBR), Switzerland (CHE), Japan (JPN), the United States (USA), Ukraine (UA) and determining prospects for the financial stability improvements in our country.

RESULT AND DISCUSSION

The purpose of stress testing is to assess to what extent an individual bank, group of banks or the banking system as a whole are resistant to exceptional, but plausible shocks. Stress tests are aimed at determining the sensitivity of a bank's portfolio or the whole banking system to negative shocks, carrying out a forecast impact assessment of the effects of these shocks on financial indicators and capital of banks, and further defining measures to enhance the resilience of the banking system to such shocks.

The comparison of country practices showed that authorities design stress tests in different ways, additionally some employing more than one type of test. For better understand these differences and their niches covered practices on system-wide stress tests for banks in the Euro area, United Kingdom, Switzerland, Japan and the United States. In general, a stress test is composed of various modelling blocks, which interact with one another to produce the overall results. The practices on system-wide stress tests has been researched in the few main blocks, which identifies in the setup of any stress test. These blocks are governance (essence and coverage of

exercise), implementation (scenario and disclosure). Each block comprises various elements, they are detailed in the tables below. The essence and coverage of exercise in system-wide stress tests for banks in the Euro area, United Kingdom, Switzerland, Japan, United States and Ukraine are summarized in table 1.

Table 1

Comparison of key aspects of system-wide stress tests (ST)

GOVERNANCE (ESSENCE AND COVERAGE OF EXERCISE)	
Essence	
EU	Bottom-up micro prudential exercise using individual bank data to primarily assess solvency risk.
GBR	Bottom-up micro prudential exercise. Banks submit their projections, Bank of England uses those submissions as a starting point for the stress test, with its own adjustments.
CHE	Top-down exercise mainly to assess the solvency risk of the two Swiss global systematically important banks and bottom-up micro prudential exercise using individual bank data and bank-internal models.
JPN	Top-down exercise using individual bank data, mainly to assess solvency risk. Bottom-up exercise for micro prudential risk assessment and for financial stability risk assessment for a macroprudential perspective.
USA	Dodd-Frank Act Stress Test top-down micro prudential exercise using individual bank and industry level data to assess the impact of stressful economic and financial market conditions on the solvency of banks with \$100 billion or more in total assets.
UA	Bottom-up micro prudential exercise using individual bank data. Individual stress-testing assessment of large exposures and portfolio- based assessment for other.
Coverage of exercise	
EU	Institutions 123 banking groups from 22 countries Sample of banks covering at least 50% of the national banking sector in each EU Member State in terms of total assets.
GBR	Include all PRA-regulated banks and building societies with total retail deposits greater than £50 billion. Institutions 7 major UK banks and building societies
CHE	Banks covered represent roughly about 80% of total assets in the Swiss banking sector and covers two Swiss G-SIBs on the basis of their systemic relevance to the global financial system and the Swiss economy.
JPN	Covers a total of roughly 370 financial institutions, G-SIBs banks (roughly about 70% of total assets in the banking sector), small community orientated banks, representing roughly 80 to 90% of total credit outstanding.
USA	35 banks represent approximately 80% of domestic bank assets. Among them, 6 banks with large trading operations and 8 banks with substantial trading or processing operations. 31 holding companies with total assets of \$50 billion.
UA	34 banks, 79% of assets in 2014, 20 of the largest banks in 2017, 25 banks, 93% of assets in 2018, 24 banks, 90% of assets in 2019, 29 banks, 93% of assets in 2020

Source: compiled by the authors according to the ST source (EU, GBR, CHE, JPN, USA, UA).

Typically, coverage of exercise in stress testing, which of the supervisory authority or the central bank represent roughly 80% of the total bank’s assets. However, in each case, the central bank and supervisors run a stress test exercise different number of institutions (for example, in UK 7 major banks and building societies, in Euro area in 123 banking groups from 22 countries).

As a rule, the supervisor or the central bank conduct stress testing. In some countries, the central bank and supervisors both run a stress test exercise, but independently of each other, with the central bank taking a mainly macroprudential perspective, and the supervisory authority - primarily a micro-prudential (for example, Switzerland and Japan). In other countries, the system-wide exercises are run by a single authority, which assumes both micro- and macroprudential functions (for example, Euro area, United Kingdom and United States). According to BCBS (2017), most supervisory authorities do not have a formal process for coordinating supervisory stress testing frameworks with other domestic authorities.

The number of banks covered and the overall share of total banking assets they represent; resources, both in terms of number of staff and their technical skills; data accessibility and access are crucial. Resources that can be devoted to stress exercises can impact sample coverage, the number of stress scenarios and modelling approaches.

The scenario and disclosure of exercise in system-wide stress tests for banks in the Euro area, United Kingdom, Switzerland, Japan, United States and Ukraine are summarized in table 2.

Table 2

Comparison of key aspects of system-wide stress tests (ST)

IMPLEMENTATION (SCENARIO AND DISCLOSURE)	
Scenario	
EU	One adverse scenario as well as a common baseline scenario
GBR	Baseline scenario, annual cyclical scenario, and an additional scenario intended to probe the resilience of the system to risks
CHE	Consists of a baseline and multiple stress scenarios (in the range of 3 to 5), which are evaluated in parallel, in order to avoid ex ante focus on a specific stress scenario.
JPN	Two stress scenarios are compared against a baseline scenario: a “tail event” scenario, assessing the stability of the banking system under severely adverse economic and financial conditions, and a “tailored event” scenario, which to investigate the vulnerability of the financial system under specific circumstances.
USA	Consists of one baseline and two adverse scenarios (adverse and severely adverse). The scenarios are based on narratives published by the Federal Reserve and the baseline scenario does not represent official forecasts.
UA	In 2014 two stress scenarios: baseline and pessimistic, during 2015-2017 baseline and macroeconomic scenarios, after 2018 - baseline and adverse scenarios
Disclosure	
EU	Banks have access to the assessment of their results during the QA phase, their final results are made public. Banks and the public get the same information, i.e. euro area level results with no country-specific or bank-specific results released.
GBR	Detailed disclosure of aggregate bank results (consolidated for the whole banking sector), capital-ratio data on individual banks.
CHE	Neither the scenarios nor the results of the exercises themselves are disclosed in quantitative terms to banks or the public. Results of the exercise are summarized in qualitative terms and disclosed to participating banks only, not to the public.
JPN	Results are publicly disclosed with no difference in disclosure between the banks and the public. Results of the exercise is to benchmark against individual banks’ stress test results from a micro prudential perspective.
USA	Both post-stress capital ratios and adjust them planning capital distributions are publicly disclosed at bank level. Also, information about its scenario design framework and detailing materials about model changes are published.
UA	In 2014 not made public, during 2015-2017 public only participating banks public, after 2018 - public with no difference in disclosure between the banks and the public.

Source: compiled by the authors according to the ST source (EU, GBR, CHE, JPN, USA, UA).

The script can be developed in at least three different ways. The first approach is to focus on macroeconomic variables. This requires the inclusion of shocks in some key macroeconomic variables (for example, asset prices, unemployment) that suffered the most during a recession. Shocks for other macro-financial variables are set consistently in terms of magnitude and direction, also in accordance with the narrative. The second approach to determining the shocks underlying the scenario is to obtain them by aggregating information about individual bank portfolios and the corresponding granular risk factors. This approach is typically used in bottom-up stress tests, and its applicability largely depends on the availability of relevant data. The third approach is reverse stress testing, in which the scenario is calibrated in such a way as to provide a given estimated probability

or the expected capital ratio after stress (for example, Breuer et al (2010)). While useful for identifying additional vulnerabilities in the future, this approach is difficult to implement and interpret (for example, due to the diversity and complexity of the interactions between types and risk factors).

The publications on the results of the stress testing exercise are very important for used as a risk management tool and an instrument of informing about business decisions. In most cases, information about stress testing results disclosure consolidated for the whole banking sector and summarized in qualitative terms. Usually, the results of the macroprudential stress testing are publicly disclosed with no difference in disclosure between the banks and the public. More disclosure information in Euro area and little disclosure information in Switzerland: in Euro area banks and the public get the same information with no country-specific or bank-specific results released. Traditionally, in Switzerland results of the stress testing exercise are only disclosed to participating banks, not to the public.

In Ukrainian practice, NBU disclose results of stress testing exercises and high-level methodologies and scenario specifics. In addition to disclosure by the authorities, the banks themselves can also decide to publish their results. The integration of Ukraine into the European banking system requires implementation effective tool for cleaning the Ukrainian banking system in accordance with compliance with the Basel III regulations. Since 2015 according to level disclosure stress testing exercise in Euro area Ukraine started to publish their results.

The macroeconomic stress testing of the Ukrainian banking system was first carried out in 2008 (with the participation of 17 banks), then in 2010. However, the results of these tests were not made public. We only know that the capital of 61 out of 176 banks had to be increased by a total of 40 billion UAH. However, the need for active use of stress-testing process arose in early 2014 due to a number of internal and external factors. Approaches to stress testing in the period from 2014 to 2020 are presented in Table 3.

Table 3

History of stress testing of Ukrainian banking system

Indicators	Stress testing					
	2014	2015-2016	2017	2018	2019	2020
Auditors	AC	NBU	NBU	AC, NBU	AC, NBU	AC, NBU
Date of diagnosis evaluation	01.01.14	01.04.15, 01.01.16, 01.04.16	01.01.17	01.01.18	01.01.19	01.01.20
Individual stress test	No	large borrowers	large borrowers	large borrowers	large borrowers	large borrowers
Portfolio stress test	Loans	Loans	Loans	Loans	Loans	Loans
Risks that are being analyzed	Credit, currency	Credit, currency	Credit, currency	Credit, market	Credit, interest, currency	Credit, interest, currency
Result	9 banks passed stress testing. Need of capital > 50 billion UAH.	34 banks needed capitalization. 5 banks are not solvent.	20 largest banks had to bring to positive value the capital adequacy ratio.	The NBU imposed on banks 15 fines > 67.6 million UAH.	13 banks needed capitalization of 42.1 billion UAH under the adverse scenario.	-
Liquidated banks	33	32	22	9	1	-

Source: compiled by the authors according to the ST source (NBU).

According to the historical retrospective data, in the formation of the strategy of banking stress testing in Ukraine two stages of assessing the financial stability of the banking system are distinguished as follows: the first stage – 2014-2017 and the second stage – 2018 to date.

The first stage is characterized by a set of diverse approaches to assessing the financial stability of banks using the basic macroeconomic scenario of stress tests. For the first time, the banking system for assessing the financial sustainability of banks began to analyze not only the banks' compliance with banking standards, but also to assess the macroeconomic environment. The specific features of this stage were significant fluctuations in the number of banks subject to stress testing, floating dates for assessing the diagnosis of banks, analysis of credit and currency risks. But the most important factor was practical non-disclosure of the results of stress testing for wide public.

The second stage of banking stress testing strategy in Ukraine is linked to the NBU Board Resolution No. 141 as of December 22, 2017, which approved “The Regulations on the Evaluation of the Resilience of Banks and the Banking System of Ukraine” (NBU, 2017). The second stage is characterized by a higher consistency compared with the first stage of the banking stress testing strategy in Ukraine. An annual assessment of the resilience of banks and the banking system of Ukraine initiated by the NBU unified the size of the banks' sample for research, the general approach to selecting auditors, the dates and periods of assessment of diagnosis, macroeconomic scenarios, individual and portfolio stress testing, types of risks analyzed. But the most important was the legislative approval of the publication of the results of stress testing.

CONCLUSION

Asset quality assessment and stress testing are a permanent practice of leading international financial organizations. It provides an opportunity to prevent excessive accumulation of systemic risks and prepare banks for possible future crises.

The study of specific features and approaches to stress testing of banks in Ukraine with comparison worldwide practice, permitted to identify the following aspects of formation of the strategy of banking stress testing:

- Stress testing methodology developed by the NBU in accordance with the implementation stages of Basel III recommendations and similar to the EU system.
- Stress testing models, results and frameworks should be reviewed regularly in accordance with the worldwide best practices, especially United Kingdom, Switzerland.
- Stress testing results should be made public and used as a risk management tool and an instrument of informing about business decisions.

Reliable and detailed information on banks' resilience via stress tests can help anchor market assessment of banks, provided that comprehensive and sufficiently severe adverse scenarios are used. Combined with robust follow-up for banks that do poorly in the stress test and credible and well-funded support tools, disclosure can make stress tests useful tools for respond to a crisis.

The conclusions and proposals received on the basis of the study of Ukraine's and worldwide experience will not only improve the financial stability of Ukrainian banking system, but ultimately contribute to overall financial stability.

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ПОРІВНЯННЯ СВІТОВОЇ Й УКРАЇНСЬКОЇ ПРАКТИКИ БАНКІВСЬКОГО СТРЕС ТЕСТУВАННЯ

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Перші стрес-тести, які використовувалися переважно в якості інструментів управління ризиками, датуються 1990-ми роками. Програми, впроваджені МВФ, Банком Англії, Законом Додда-Франка, Банком Японії, Швейцарським органом з нагляду за фінансовим ринком і

Світовим банком, сприяли подальшому використанню стрес-тестів. Основна ідея введення стрес-тестування полягала в забезпеченні банків достатнім капіталом для покриття своїх ризиків і зростанні стійкості банків і банківських систем до економічних і фінансових потрясінь. У даній статті узагальнено досвід стрес-тестування регулюючими органами в Сполучених Штатах, Великобританії, Японії, Швейцарії та Європейському союзі. У цій статті також дається огляд методології стрес-тестування, розробленої Національним банком України відповідно до рекомендацій Базель III. Метою дослідження є порівняльна оцінка ключових аспектів загальносистемних стрес-тестів в різних фінансових системах: зоні євро, Великобританії, Швейцарії, Японії, США та України, виявлення подібностей, відмінностей і перспектив подальшого розвитку. Для обґрунтування теоретичних положень і висновків використовуються загальнонаукові методи, в тому числі системний, абстрактно-логічний підхід, а також методи формалізації, аналізу та узагальнення інформації, порівняльний аналіз. В ході дослідження було проведено порівняльний аналіз методології стрес-тестування в шести країнах. Наукова значимість роботи полягає в систематизації передового досвіду стрес-тестування розвинених країн та розробці на їх основі рекомендацій щодо поліпшення методики стрес-тестів банківської системи України. Цінність дослідження полягає в обґрунтуванні необхідності використовувати кращі методи стрес-тестів в якості потужного інструменту управління ризиками в мікропруденціальній і макропруденційних політиці. Результати досліджень можуть бути використані не тільки в розробці методології стрес-тестування, але і в тематичному дослідженні банківської справи.

Ключові слова: фінансова стійкість, Базель III, основний капітал, регулятивний капітал

СРАВНЕНИЕ МИРОВОЙ И УКРАИНСКОЙ ПРАКТИКИ БАНКОВСКОГО СТРЕСС ТЕСТИРОВАНИЯ

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Ранние стресс-тесты, используемые в основном в качестве инструментов управления рисками, датируются 1990-ми годами. Программы, проводимые МВФ, Банком Англии, Законом Додда-Франка, Банком Японии, Швейцарским органом по надзору за финансовым рынком и Всемирным банком, способствовали использованию стресс-тестов. Основная идея введения стресс-тестирования состояла в обеспечении банков достаточным капиталом для покрытия своих рисков и сделать так, чтобы банки и банковские системы были более устойчивыми к экономическим и финансовым потрясениям. В данной статье обобщен опыт недавнего стресс-тестирования регулирующими органами в Соединенных Штатах, Великобритании, Японии, Швейцарии и Европейском союзе. В этой статье также дается обзор методологии стресс-тестирования, разработанной Национальным банком Украины и в соответствии с рекомендациями Базель III. Целью исследования является сравнительная оценка ключевых аспектов общесистемных стресс-тестов в различных финансовых системах: зоне евро, Великобритании, Швейцарии, Японии, США и Украине, выявление сходств, различий и перспектив дальнейшего развития. Для обоснования теоретических положений и выводов используются общенаучные методы, в том числе системный, абстрактно-логический подход, а также методы формализации, анализа и обобщения информации, сравнительный анализ. В ходе исследования был проведен сравнительный анализ методологии стресс-тестирования в шести странах. Научная значимость работы

состоит в систематизации передового опыта стресс-тестирования развитых стран и разработке на их основе рекомендаций по улучшению методики стресс-тестов банковской системы Украины. Ценность исследования заключается в обосновании необходимости использовать лучшие методы стресс-тестов в качестве мощного инструмента управления рисками в микропруденциальной и макропруденциальной политике. Результаты исследований могут быть использованы не только в разработке методологии стресс-тестирования, но и в тематическом исследовании банковского дела.

Ключевые слова: финансовая устойчивость, Базель III, основной капитал, регулятивный капитал