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The Governor

**GUIDELINES N° 4230/2023 - 00032[616] OF 07/07/2023 ON
STRESS TESTING FOR BANKS**

July 2023

BNR RESTRICTED

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ACRONYMS

AMA	Advanced Measurement and Approach
BoD	Board of Directors
CCF	Credit Conversion factor
EAD	Exposure at Default
EL	Expected Loss
FSIs	Financial Soundness Indicators
GDP	Gross Domestic Product
GDP	Gross Domestic product
HHI	Herfindahl-Hirschman Index
ICAAP	Internal Capital Adequacy Assessment Process
ILAAP	Internal Liquidity Adequacy Assessment Process
LGD	Loss Given default
MST	Macro Stress Testing
NBR	National Bank of Rwanda
P&L	Profit and Loss
PD	Probability of default
RBC	Risk Board Committee
RMC	Risk Management Committee
RST	Reverse Stress Test
RWA	Risk Weighted asset
STF	Stress Testing Framework

GUIDELINES NO 4230 /2023 - 00032[616] OF 06/07/ 2023 ON STRESS TESTING FOR BANKS

The National Bank of Rwanda;

Pursuant to Law n° 48/2017 of 23/09/2017 governing the National Bank of Rwanda as amended to date, especially in articles 6, 6bis, 8,9 ,10 and 15;

Pursuant to Law N° 47/2017 of 23/9/2017 governing the organisation of banking, especially in article 117;

The role of guideline on stress test as an instrument is to provide guidance to banks and banking groups on how to develop stress testing and include it into overall risk management programs. The stress testing to banks indicates the behaviour of unfavorable events by including the variety of risks as well as the required capital to absorb losses and how much liquidity is needed during the adverse conditions.

This guideline also provides guidance on how to develop internal stress testing framework which includes governance, policies, processes, methodology, resources and documentation that guide stress testing activities and facilitate the use, implementation, reporting as well as the oversight of stress testing frameworks. It also informs the regulatory authorities the unexpected adverse outcomes resulting from a wide range of risks by banks in their oversight of banks' internal stress testing activities.

ISSUES THE FOLLOWING GUIDELINE:

CHAPTER ONE: GENERAL PROVISIONS

Article One: Purpose of these Guidelines

These guidelines set out how banks develop an internal stress testing framework and its management approaches.

Article 2: Interpretation

In these Guidelines:

- (1) “Stress test for the banking sector” means simulation exercises conducted to assess the resilience to a hypothetical scenario of a single bank or of the system as a whole, whereby it makes recommendations for the management of risks in normal business conditions, emphasizing the significance of effective risk management systems that include a forward-looking component and recognize the need to manage risks throughout the business cycle;

- (2) “Risk Weighted assets” mean assets used to determine the minimum amount of capital that must be held by banks and other financial institutions in order to reduce the risk of insolvency;
- (3) “Sensitivity analysis” means assessment of the possible impact of a set of assumed single factor (hypothetical or historically adverse) credit, market, operational and liquidity shocks on the solvency and liquidity profile of banks;
- (4) “Scenario analysis” means assessment of the impact of extreme but plausible scenarios on a given portfolio/ financial position of an institution/system, using sophisticated modeling techniques and typically incorporating macroeconomic variables;
- (5) “Credit risk” means the current or prospective risk to earnings and capital arising from an obligor’s failure to meet the terms of any contract with the bank or if an obligor otherwise fails to perform as agreed;
- (6) “Market risk” means the risk that the value of on and off-balance sheet positions of a bank will be adversely affected by movements in market rates or prices such as interest rates, foreign exchange rates, equity prices, credit spreads and/or commodity prices resulting in a loss to earnings and capital;
- (7) “Liquidity risk” means the current or prospective risk to earnings and capital arising from a bank’s inability to meet its liabilities when they fall due without incurring unacceptable losses. It arises when the cushion provided by the liquid assets are not sufficient to meet its obligations;
- (8) “Operational risk” means the risk of direct or indirect loss resulting from the absence of inadequacy of the internal control process, persons and systems or due to an external event or other disasters. It may result from breach of internal controls.

Article 3: Scope of these Guidelines

These Guidelines apply to banks and banking group. The Stress test takes into account all types of material risks having regard to both the on- and off-balance-sheet assets and liabilities of an institution including relevant structured entities. Moreover, the scope of stress testing may vary from simple portfolio level sensitivity or individual risk level analyses to comprehensive institution-wide scenario stress testing.

CHAPTER II: STRESS TESTING FRAMEWORK

Article 4: Stress test hypothetical scenarios

(1) Stress test shall be carried out assuming three different hypothetical scenarios:

- (a) Minor Level Shocks. These represent small shocks to the risk factors. The level for different risk factors can vary. This is considered as a lower level of shocks experienced by any bank in the past;

- (b) Moderate Level Shocks. They envisage medium level of shocks and the level is defined in each risk factor separately. The moderate shock is also an average of previous shocks experienced by individual bank; and
 - (c) Major Level Shocks. They involve big shocks to all the risk factors and is also defined separately for each risk factor. In the context of major shocks, bank only use the maximum shock experienced in the past.
- (2) At this point, the stress test merely includes a sensitivity analysis of one element. Three different levels of shocks shall apply for each risk variables. For all three levels of shocks, the shock magnitude shall be determined independently for each risk factor.

Article 5: Responsibilities of the Board and Senior Management

- (1) Directors and Senior Managers of Banks exercise effective oversight of the stress test process and ensure that the expectations set out in these guidelines are met. In particular, the Board endorse a specific policy covering the stress test procedure, which includes:
- (a) The structure and methodology of the process, to ensure that these are consistent with bank's capital strength and risk profile;
 - (b) The detailed responsibilities and authorities of relevant personnel, to ensure that formal lines and appropriate segregation of duties are well established in order to maintain effective check and balance within the stress test process; and
 - (c) Stress test policies are evaluated independently on a regular basis in order to ensure their quality and effectiveness.
- (2) Senior managers are actively involved in the process of designing the stress tests program as part of their responsibility for managing the bank-wide risk, they take responsibility of:
- (a) Selecting the form of stress scenario to examine;
 - (b) Ensuring that the IT systems are capable of handling sufficient and granular data for conducting adequate stress testing for the individual bank or at group level;
 - (c) Ensuring that risk management staff have adequate training and qualifications of identifying and quantifying stresses that may affect bank.

Article 6: Stress testing procedure

- (1) **The stress testing framework** shall be designed to meet clear objectives that are documented and approved at the board level of the bank, the objectives shall be the basis for setting out the framework's requirements and expectations, and shall be consistent with the bank's or supervisory authority's risk management framework and its overall governance structure. The following aspects shall be detailed and clearly defined in policies and procedures governing the stress testing framework:
- (a) Types, specification of stress testing and scenarios and the main purpose of each component of the program;

- (b) Frequency of stress testing exercises which might vary in accordance with the type, purpose or regulatory request;
- (c) The definition and detailed methodology of each component; and
- (d) A list of potential remedial activities based on the purpose, type, and outcome of stress testing, including an assessment of the feasibility of corrective actions under stressful situations.

(2) Stress testing results shall be used:

- (a) in formulating and pursuing strategic and policy objectives; and
- (b) in reviewing risk appetite and limits, financial and capital planning, liquidity, capital adequacy and funding risk assessment, contingency planning and recovery and resolution planning.

(3) Stress test results shall be used as an input to:

- (a) risk identification, monitoring and assessment; and
- (b) support portfolio management and new product approval processes, and to inform other corporate decision-making processes such as the evaluation of strategic options.

Article 7: Stress testing methodology

- (1) Depending on the purpose of the stress test, a banking institution uses top-down or bottom-up methodologies in its stress testing program.
- (2) A top-down approach to stress testing is a high-level assessment in which a defined set of macroeconomic scenarios and related stress factors are applied to a group of exposures aggregated at the portfolio level to identify areas of vulnerability that can arise from changes in economic and financial conditions. In contrast, a bottom-up method uses a more detailed evaluation that is targeted to specific sectors within a portfolio or at an individual risk exposure level. The adoption of both methodologies allows bank to confirm its wide view of risks that influence it. When modeling hypothetical and macroeconomic scenarios, a bank must consider model limits. The model's assumptions and outputs are reviewed and challenged on a regular basis.

Article 8: Stress testing techniques

- (1) Banks may apply one of the following techniques in carrying out stress testing exercise. The use of any other techniques not provided by BNR shall be accompanied with explanations.
- (2) Simple Sensitivity Analysis (single factor tests). Banks use simple sensitivity analysis to measure the change in the value of portfolio for shocks of various degrees to different

independent risk factors while the underlying relationships among the risk factors are not considered.

- (3) Scenario Analysis. It encompasses the situation where a change in one risk factor affects a number of other risk factors or there is a simultaneous move in a group of risk factors. Scenarios can be designed to encompass both movements in a group of risk factors and the changes in the underlying relationships between these variables (for example correlations and volatilities). Stress testing can be based on the historical scenarios, a backward looking approach, or the hypothetical scenario, and forward-looking approach.
- (4) Extreme Value/ Maximum Shock Scenario. The maximum shock scenario measures the change in the risk factor in the worst-case scenario, i.e. the level of shock which entirely wipes out the capital.

Article 9: Stress testing infrastructure

- (1) A bank's infrastructure is strong and adaptable enough to support various and perhaps changing stress tests at an adequate degree of granularity. The infrastructure allows bank to:
 - (a) Retrieve, process, and report information for internal and bank-run supervisory stress tests;
 - (b) Aggregate its exposures to a given risk factor, product or counterparty; and
 - (c) Modify its methodologies to facilitate the application of new scenarios as needed.
- (2) In times of crisis and rapidly changing market conditions, the stress testing infrastructure is also flexible enough to allow targeted or ad-hoc stress tests at line of business or firm-wide level to assess specific risks. It is important for the system to be flexible in order to:
 - (a) Manage personalized and evolving stress tests, as well as aggregate comparable risks and exposures throughout a bank; and
 - (b) Satisfy on-demand requests resulting from internal requirements as well as supervisory inquiries.
- (3) Banks have mechanisms in place to ensure that they can continue to conduct stress tests in accordance with their written policies and procedures. This involves the consideration of stress testing data infrastructure as one of main parts of business continuity planning process.

Article 10: Stress testing resources and organizational structures

- (1) The stress testing framework shall ensure that there are adequate resources including staff with relevant skills set and appropriate systems/ IT infrastructure.
- (2) Where banks use services provided by third parties or by their respective parent bank to supplement their internal resources, the framework shall ensure that they have adequate

oversight and control over the stress testing exercises, and adequate service knowledge transfer.

Article 11: Development of scenarios

- (1) Banks consider different form of stress scenarios such as baseline, hypothetical, historical as well as reverse stress test scenarios. The baseline scenario reflects business as usual and project the bank's outlook over the projection horizon. Furthermore, banks may consider historical scenario related to recurrence of the historical adverse period, this reflects an example of severe macroeconomic stress experience in 2008 or historical high inflation levels.
- (2) In principle, the baseline scenario is purely model-based and does not include any stress. However, to increase the accuracy of the baseline scenario, those business decisions and economic policy changes that would be undertaken within the projection period might be added. The baseline scenario can be used as a benchmark to compare the outcomes of stress testing and identify any relevant regulatory shortfall.
- (3) In the historical scenario, Banks carefully examine historical data and identify adverse periods while taking into account the macroeconomic and political environment. The main rationale for including this scenario is to see if the bank can withstand the adverse periods in the future. The position of banks under this scenario is compared with the position during the past adverse times and the strengths and weaknesses are highlighted. This would also help to determine the dynamic behavior of risk correlations during situations of pressure, as well as developing risk mitigation and recovery strategies.
- (4) In addition to baseline and historical scenarios, banks run at least one hypothetically designed stressed scenario. Furthermore, the reverse stress test scenario may assume the worst-case scenario (e.g., a bank's failure) and then proceed to find the factors which may cause this to happen.
- (5) The reverse stress test begins with a worst-case scenario, such as a bank's bankruptcy or insolvency, and then looks for and evaluates the factors that might lead to this. This may be due to vulnerabilities associated with credit, operational, market, liquidity or reputational risks. Banks can design ways to reduce the identified areas of vulnerability after doing this type of investigation. Banks may also consider other scenarios in reverse stress test, for instance, falling of capital adequacy ratio (CAR) below the minimum regulatory benchmark.
- (6) Banks consider macroeconomic and other external situations that may have a direct or indirect influence on a bank's capital or liquidity position.

Article 12: Severity of stress testing scenarios

- (1) Stress testing is used to alert bank management to unanticipated outcomes associated to a variety of risks and the required capital to absorb losses. Banks operate stress testing framework that encourages comprehensive risk identification and control, additional risk management measures with a heightened risk viewpoint, contributes to the development

and Improve overall capital management quality while pursuing strategic and policy objectives.

- (2) Directors and senior managers shall ensure that the stress testing outcomes are effectively used in bank's risk governance and capital planning process. This comprises their involvement in: setting stress testing objectives, defining and selecting scenarios, discussing and challenging the results of stress tests and assessing the potential management actions. The internal debate is encouraged during the stress testing process, and major assumptions are challenged in a credible manner.

Article 13: Reporting of stress test results

- (1) The banks present detailed results and methodology on quarterly basis to the RBC of the Board and disseminate them to all concerned departments at the hierarchy level in order to obtain feedback. Banks also ensure that the results are understandable and ensure transparency at all level.
- (2) The banks shall submit to the Central Bank the stress test results as described in chapter IV of this guideline. This shall cover at least the following:
 - (a) Scope, objectives, and governance structure;
 - (b) Narratives and calibrations of scenarios;
 - (c) Methodology which indicates assumptions, data, models and work files;
 - (d) The stress test results which incorporate the pre and post shock levels of risk indicators; and
 - (e) Action plan of RMC or RBC held to present ST results.

Article 14: Monitoring of stress testing results

- (1) The results of the stress tests shall be reported and monitored on a regular basis to the board and senior management at the appropriate level of aggregation for decision making purposes.
- (2) The results of stress testing assessments influence decision-making at the appropriate management level, including Board and senior management strategic business decisions. Board and senior management should ensure that the stress testing is integrated into the bank's risk management framework.
- (3) The results of stress tests inform the bank's calibration of risk appetite and limits, capital planning, liquidity and risk assessment, contingency planning, recovery and resolution planning.

Article 15: Periodical review and Challenge

- (1) As the environment in which Banks operate is quite dynamic, the stress testing framework (STF) is reviewed on annual basis or regularly as deemed necessary, both quantitatively and qualitatively, to determine its usefulness and to decide whether any of the aspects need to be modified. The review of STF shall cover the following aspects:
 - (a) The effectiveness of STF in meeting its objectives;
 - (b) Integration of STF in bank risk management framework;
 - (c) The realistically imposed stress testing levels;
 - (d) Systems implementation;
 - (e) Management oversight;
 - (f) Data quality and MIS;
 - (g) Documentation;
 - (h) The business or other managerial assumptions used; and
 - (i) The quantitative procedure shall include the benchmarking within and outside of the bank.
- (2) The independent functions such as risk management and audit departments should play a key role in stress testing development and review.

CHAPTER III: GUIDANCE ON STRESS TEST OF INDIVIDUAL RISK AREAS

Article 16: Risk Factors and Stress Scenarios for Banks

Banks shall consider various risk factors and stress scenarios in their stress testing program, including the following:

- (1) Credit and counterpart risks;
- (2) Market Risk Stress Scenarios;
- (3) Liquidity Risk;
- (4) Operational risk;
- (5) Concentration risk, and
- (6) Other factors that can have an impact on liquidity position or solvency of the bank.

Article 17: Credit and counterpart risks

- (1) Banks analyze at least:
 - (a) The ability of borrowers to repay their obligations, e.g. the PD;
 - (b) The recovery rate in the event of a borrower defaulting including the deterioration of the collateral values or creditworthiness of the guarantee provider, e.g. the LGD; and

- (c) The size and dynamics of credit exposure, including the effect of undrawn commitments from borrowers, e.g. the exposure at default.
- (2) Banks ensure that credit risk is assessed at various levels of shock scenarios, from simple sensitivity analysis to institution-wide stress tests, or to group-wide stress tests, in particular:
- (a) Market-wide shock scenarios (e.g. a sharp slowdown of the economy that affects portfolio quality for all of the creditors);
 - (b) Counterparty-specific and idiosyncratic shock scenarios (e.g. bankruptcy of the largest bank creditor);
 - (c) Sector-specific and region-specific shock scenarios; and
 - (d) A combination of the above.
- (3) Banks subject risk factors to sensitivity analysis, which in turn provides quantitative background information for the design of scenarios.
- (4) When stress testing financial collateral values, Banks identify conditions that would adversely affect the realizable value of their collateral positions including deterioration in the credit quality of collateral issuers or market illiquidity.
- (5) Banks quantify the impact of the scenario in terms of credit losses (i.e. provisions), risk exposures, income and own funds requirements. In addition, they shall be able to quantify such impacts by relevant segments/portfolios.
- (6) Banks consider, wherever possible, the following relevant parameters: PD, LGD, EAD, expected loss and risk exposure amount, and the impact on credit losses and own funds requirements.
- (7) For the estimation of future losses in stress tests, banks shall, where appropriate, rely on credit risk parameters different from the ones applied in the calculation of capital requirements, which are usually through-the-cycle or hybrid parameters (a combination of through-the-cycle and point-in-time parameters) for PD and under downturn conditions for LGD. In particular, banks shall, where relevant, apply estimates based on point-in-time parameters in accordance with the severity of the scenario for the purpose of estimating credit losses.
- (8) For the computation of EAD, a bank also considers a credit conversion factor and, in particular, the effect of the bank's legal capacity to unilaterally cancel undrawn amounts of committed credit facilities especially in stressed conditions; and
- (9) Other examples of Credit Risk Stress Scenarios
- (a) Decline in asset quality. This assesses the impact on the bank's profitability and capital due to increases in classified loans and provision. In designing this scenario, the bank seeks to apply varying percentages of increase in its classified loans and provisioning level to its loan portfolio;
 - (b) Failure of major counterparties. This has implications for profitability, liquidity and solvency. In designing this scenario, the bank estimates the impact of one or more of the major counterparties defaulting;

- (c) Large exposures and concentrations. This assesses the impact on the bank's profitability and liquidity due to losses resulting from default in large loans or default in aggregate exposures to major industries/markets, geographic locations or loan types. In designing this scenario, the bank assesses the impact of one of its large loans or loans to a major sector defaulting; and
- (d) Domestic economic downturn. This estimates the impact of adverse changes in selected macroeconomic variables (e.g. GDP growth, unemployment rate, and inflation) on a bank's asset quality, profitability and capital adequacy.

Article 18: Market Risk Stress Scenarios

- (1) Repricing risk. This assesses the effects on a bank's profitability due to timing differences in interest rate changes and cash flows related to fixed and floating rate assets, liabilities and off-balance sheet instruments.
- (2) Basis risk. This assesses the effect on a bank's profitability due to unfavorable differential changes in key market rates.
- (3) Yield curve risk. This assesses the effects on a bank's profitability due to yield curve shape change.
- (4) Option risk. This assesses the effects of changes in the value of both stand-alone option instruments (e.g. bond options) and embedded options (e.g. bonds with call or put provisions and loans which give borrowers the right to prepay outstanding) due to adverse interest rate movements.
- (5) Adverse changes in exchange rates between major currencies. This estimates the impact on a bank's net open positions in major currencies.
- (6) Losses from adverse movements in market price of commodity, credit, equity, foreign exchange and interest rate risk factors.
- (7) Adverse changes in values of financial instruments which affect the P&L: This estimates the impact of adverse changes in market prices and liquidity conditions on the market values of financial instruments.

Article 19: Liquidity Risk

- (1) Significant changes in client behavior. This analyses the adequacy of the bank's short-term liquidity to meet large withdrawals of deposits or increased drawdown of commitment lines. The bank adopts behavioral assumptions for borrowers and depositors.
- (2) The outcomes of liquidity stress test can be measured as liquidity ratios, e.g. liquidity coverage ratio (LCR) and net stable funding ratio (NSFR).

Article 20: Operational risk

- (1) Banks are aware that relevant risk parameters related to operational risk derive from inadequate or failed internal processes, people and systems, including legal risks, or from external events, and affect all products and activities within the institution.
- (2) In order to stress relevant risk parameters, banks use the profit and loss effect of operational losses as the main metric. Any intrinsic impact caused by the operational risk event are considered as an operational risk loss (e.g. intrinsic impacts from opportunity costs, or internal costs such as overtime/bonuses, etc., where they relate to an operational risk event). In addition, and only for the purpose of stress testing, any loss of future earnings caused by operational risk events (excluding second-line effects on the macroeconomic environment) are included. At least banks under the advanced measurement approach also take these losses into account as they flow into the internal loss database to calculate the additional capital requirements. When using historical data, external data or scenarios as inputs for both P&L and RWA projections, banks consider and avoid possible double-counting effects on the input side.
- (3) Banks shall consider cyber resilience scenario stress testing to assess the impact of a cyber-incident and analyze its potential effect. Two approaches exist for testing institutions' resilience in severe but plausible cyber incident scenarios. The first approach is to incorporate cyber risk scenarios into existing financial stress testing to assess intermediaries' cyber-related loss-absorbing capacity. The second approach is to add an additional layer to the stress-testing framework, namely cyber resilience scenario stress test. This layer is a specific and separate stress test based on a severe but plausible cyber incident scenario and assesses the capability earlier in the cyber crisis lifecycle.
- (4) As operational losses induce second-round effects (i.e. reputational risk), in order to account for such effects, the operational risk stress testing program shall be thoroughly integrated into the institution-wide stress test and include interconnections with liquidity and own funds requirements. Banks analyze at least:
 - (a) The exposure of the bank to activities and its associated risk culture and past record of operational losses, with a focus on the level and change in losses and gross income in the past few years;
 - (b) The business environment, including geographical locations, in which the institution operates and macroeconomic conditions;
 - (c) The evolution in headcount and in balance-sheet size and complexity over the past few years, including structural changes due to corporate events such as mergers and acquisitions;
 - (d) Changes to significant elements of the information technology infrastructure;
 - (e) The degree and orientation of incentivizing in compensation schemes;
 - (f) The complexity of processes and procedures, products and information technology systems;
 - (g) The extent of outsourcing, with regard to the concentration risk associated with all outsourcing arrangements and external market infrastructures; and

- (h) The vulnerability of modelling risk, especially in areas related to the trading of financial instruments, risk measurement and management, and capital allocation.
- (5) Banks shall take into account legal related risk under the scope of operational risk, arises because of the current or prospective risk of losses from the inappropriate supply of financial services and the associated litigation costs, including cases of willful or negligent misconduct.
- (6) In their stress testing, banks assess the relevance and significance of the following exposures to conduct-related risk and associated litigation costs:
- (a) The mis-selling of products, in both the retail and the wholesale markets;
 - (b) The pushed cross-selling of products to retail customers, such as packaged bank accounts or add-on products that customers do not need;
 - (c) Conflicts of interest in conducting business;
 - (d) The manipulation of benchmark interest rates, foreign exchange rates or any other financial instruments or indices to enhance an institution's profits;
 - (e) Unfair barriers to switching financial products during their lifetime and/or to switching financial service providers;
 - (f) Poorly designed distribution channels that result in conflicts of interest with false incentives;
 - (g) Unfair automatic renewals of products or exit penalties; and
 - (h) The unfair processing of customer complaints.
- (7) When measuring conduct-related risk, banks consider:
- (a) The uncertainty around provisions or expected losses originating from conduct-related events; and
 - (b) Extreme losses associated with tail risks (unexpected losses).
- (8) Banks assess their capital needs under such events and scenarios and also consider the reputational effect of conduct losses. In principle, expected losses from known conduct-related issues are covered by provisions and included in the P&L account, whereas unexpected losses are quantified and covered by capital requirements from the institution. The possible excess of amounts after projection of stressed conduct losses are included in bank's assessment of potential capital needs.
- (9) In order to capture the risk that the provisions are insufficient or timely inconsistent, banks assess expected losses from conduct-related risk in excess of existing accounting provisions and factor these into their projections. Where appropriate, banks assess whether or not future profits will be sufficient to cover these additional losses or costs in the scenarios and incorporate this information into their capital plans.
- (10) Banks collect and analyze quantitative and qualitative information about the extent of their business in relevant, vulnerable areas. Banks also provide information to support material assumptions underlying their estimates of conduct-related costs.

- (11) In rare cases where a bank is unable to provide an estimate for an individual material conduct-related risk because of the extent of uncertainty, the bank clarifies that this is the case and provide evidence and assumptions supporting its assessment.
- (12) Banks form a view on the unexpected losses that originate from conduct related events based on a combination of:
 - (a) Judgement;
 - (b) Historical loss experience (e.g. the bank's largest conduct-related loss over the past five years);
 - (c) The level of expected annual loss for conduct-related risk;
 - (d) To conduct-related scenarios where potential exposures over a shorter time horizon (e.g. five years) are considered; and
 - (e) Losses experienced by similar entities or by entities in similar situations (e.g. in cases of litigation costs).

Article 21: Concentration risk

- (1) Stress testing is a key tool in the identification of concentration risk, as it allows banks to identify interdependencies between exposures, which become apparent in stressed conditions as well as hidden concentrations. Furthermore, banks consider the concentration risk under both assets and liabilities categories.
- (2) In assessing this risk in their stress testing programs, banks take into account the credit risk of each exposure but also consider the additional sources of risks arising from the similar behavior of certain exposures (i.e. higher correlation) and other different sources of funds (Eg: deposits). These additional sources of risk under analysis cover, but not be limited, to the following:
 - (a) Single obligor concentrations;
 - (b) The sectoral concentrations;
 - (c) The geographical concentrations;
 - (d) The product concentrations;
 - (e) The collateral and guarantee concentrations; and
 - (f) Deposits concentration risks (Eg: by Business Segments, Name, Geographical location etc....)
- (3) In stress testing, especially institution-wide and including group stress testing, banks assess concentration risk considering on- and off-balance-sheet exposures, as well as banking, trading and hedging positions.
- (4) Stress tests take into account changes in the business environment that occur and lead to the materialization of concentration risk. In particular, stress tests consider unusual but plausible changes in correlations between various types of risk factors as well as extreme and unusual changes in risk parameters, going beyond single risk factors, to look

at scenarios that take account of interrelated risk factors and that feature not only first-round but also feedback effects.

- (5) The way in which concentrated exposures perform in response to the same risk factors are factored into the stress tests, including the risk of additional short-term losses as a result of concentrated exposures across the retail and corporate credit books or across different entities in a group.
- (6) Banks consider the impact on trading books from exposures to a single risk factor or from multiple risk factors that are correlated.
- (7) In order to assess the extent level of concentration risk and/or impact of the scenario on the concentration level, banks, where appropriate, consider more or less complex tools/indicators, for instance the Herfindahl-Hirschman Index among other tools.

Article 22: Other risks that can have an impact on liquidity position or solvency of the Bank.

Where applicable banks shall consider other factors determined by a sound risk identification process with significant effects on both liquidity position and solvency then apply stress tests that are sufficiently severe.

CHAPTER IV: DISCLOSING AND REPORTING REQUIREMENTS

- (1) Banks may disclose their stress-testing results to enable the market or their stakeholders to better understand their risk profile and risk management framework. In doing so, banks pay particular attention to ensure that adequate relevant supporting information (such as the major stress-testing limitations, underlying assumptions, methodologies used and an evaluation of the impact of the stress tests) are provided with a view to ensuring an informed and accurate interpretation of the stress-testing results by third parties.
- (2) The stress test exercise shall be performed on quarterly basis, therefore, the banks shall report the results to BNR no later than one month after the end of each quarter.
- (3) A bank may be required to revise and submit the results of stress test or even report on more regular period than quarterly basis.

CHAPTER V: FINAL PROVISIONS

Article 23: Violation of provisions of these Guidelines

Any bank that contravenes any of the provisions of these guidelines commits a fault and is liable to an administrative fine in accordance with applicable laws or regulations.

Article 24: Repealing provision

Any prior provisions of guidelines contrary to these guidelines are hereby repealed.

Article 25: Entry into force

These guidelines come into force on the date of its signature.

Done at Kigali, on July 7th, 2023.

**RWANGOMBWA John
Governor**

**ANNEXE TO GUIDELINES NO 4230 /2023 - 00032[616] OF 06/07/ 2023 ON
STRESS TESTING FOR BANKS**

EXAMPLES OF FACTORS AND SCENARIOS FOR STRESS-TESTING

(1) Credit risk

a) Increase in ECL when there is a stress on PD, LGD and EAD

Magnitude of Shock	% (Minor)	% (Moderate)	% (Major)
Expected Credit Loss			
Migration from low EL to higher EL bands			

b) increase in NPLs

Magnitude of Shock	% (Minor)	% (Moderate)	% (Major)
Total Loan portfolio			
Total Performing Loan book			
Total Non-Performing Loan Book (NPLs)			
NPLs to Total outstanding loans (%)			
Increase in RWA amounts due to migration of exposures in PL to NPLs			
Total restructured loans			
Total upgraded loan portfolio			
Migration from PL to NPL			
Net migration ratio (%)			

2) Market risk

a) Change (decrease or increase) in interest rate,

Exchange Rate Risk –Adverse Movement in Exchange Rate: Magnitude of Shock	% (Minor)	% (Moderate)	% (Major)
Net Exposure in FX			
Loss on Exchange Rate movement			

3) Liquidity risk

Magnitude of Shock	% (Minor)	% (Moderate)	% (Major)
Withdrawal of Top 10/20 largest single customers			

Increase of withdrawal in foreign currency deposits Top10/20 customers			
Drop in value of High Quality Liquid Assets			
Increase in total net cash out flow			
Revised LCR (%)			
Available Amount of Stable Funding(Decrease/Increase)			
Required Amount of Stable Funding (Decrease/Increase)			
Revised Net Stable Funding Ratio (NSFR)			

4) Concentration risk

a) Assets concentration

- (i) Default by largest single counterparty;
- (ii) Default by largest groups of connected counterparties;
- (iii) Default by Top (Ex: 5, 10, 20 & 50) largest borrowers;
- (iv) Default by Top sector of economic activities; and
- (v) Default by Top counterparty/ groups of connected counterparties by country.

b) Deposits concentration

- (i) Change in the top (10, 20 etc..) of total deposits

5) Operational risk

Operational losses due to internal/external frauds, IT security breaches and cyber incidents including impact on Reputational risk as well as the litigation cost.

External fraud	Internal fraud	Employment practices & workplace safety	Clients, products & business practice	Damage to physical assets	Business Disruptions and systems failure	Execution, Delivery and process management
Losses due to acts of fraud by a third party	Losses due to acts of fraud by internal party	Losses due to internal employees malpractices	Losses due to failure of meeting client requirement	Losses due to damage of physical assets	Losses due to business/system failure (For e.g. IT, Cyber security incidents etc...)	Losses due to failure in delivery/ process of transactions related to vendors & counterparty